Maximising beef production and profits using high quality forages

Results and outcomes from the DAF and MLA co-funded project, B.NBP.0636: "High-output forage systems for meeting beef markets – Phase 2"

Key Project Messages

- Forage crops or perennial legume-grass forages can substantially increase beef output compared to perennial grass-only pastures.
- However, an increase in beef production does not always translate to a higher paddock gross margin.
- Forage costs and cattle price margin (sale price less purchase price, $/kg liveweight) also have a significant effect on the profitability of forages.
- Furthermore, a positive paddock gross margin does not necessarily mean that the forage type is going to be the most profitable option compared to other alternative uses of the land (e.g. perennial grass or grain cropping).
- Whole farm economic analyses, or profit budgets, estimate the value of the sown forage system to the 'whole farm' or business, relative to other alternative activities. These analyses incorporate additional costs associated with growing forages that are not captured in a gross margin analysis, such as differences between systems in un-paid labour, herd structure and capital.
- Whole farm economic analyses showed that perennial legume-grass pastures, particularly leucaena-grass, had a substantial advantage in terms of profitability, compared to perennial grass-only pastures and annual forage crops.
- Download the new guide to forage use: '*Feeding forages in the Fitzroy*' and forage gross margin spreadsheets from the FutureBeef website: https://futurebeef.com.au/resources/projects/high-output-forage-systems-for-meeting-beef-markets/

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A recently completed DAF and Meat and Livestock Australia (MLA) co-funded research project, 'High-output forage systems for meeting beef markets – Phase 2', examined the relative production and profitability of key alternative forage options for backgrounding or finishing cattle in the Fitzroy River catchment of Queensland.

Six forage production systems were benchmarked at 24 sites across 12 commercial beef cattle properties in the Fitzroy River catchment over 2011-2014 (31 individual data sets in total). The forages studied included oats, forage sorghum, lablab, leucaena-grass and butterfly pea-grass as well as perennial grass-only pasture as a baseline for comparison. The researchers documented forage and beef production as well as paddock gross margins at each site. In addition, more complete economic analyses (farm case studies) were conducted with five beef producers to give insights into the effect of sown forages on overall farm profitability. Finally, the factors affecting forage profitability were further investigated through constructed, or modelled, forage scenarios. In these scenarios, standard management practices were assumed and the performance of forages was modelled over a longer time-frame, therefore reducing the variation due to management, seasonal and market fluctuations.

This work has provided a better understanding of the expected forage, animal and economic performance from key forage options under commercial management conditions. Overall, high output forages substantially increased beef output compared to perennial grass-only pastures but this did not always translate to a more profitable outcome for the farm business. Forage

establishment and management costs, and cattle price margin, were also critical factors affecting profitability.

A summary of key performance figures averaged across all forage sites is given in Table 1. The shaded cells indicate the highest values in each row.

Leucaena-grass pastures resulted in the greatest **beef production** (198 kg/ha/annum averaged across all sites and years) of all forage systems monitored. Production from leucaena-grass pastures was 2.6 times greater than the average annual beef production from perennial grass pastures (76 kg/ha/annum). Furthermore, there was less variability between sites and years in total beef production from leucaena-grass pastures compared to butterfly pea-grass pastures or perennial grass-only pastures. The next highest average total beef production was for butterfly pea-grass pastures (125 kg/ha/annum). Forage sorghum, produced twice as much forage biomass as the other two annual forages, oats and lablab, but on average resulted in only slightly higher total beef production (108 vs. 93 and 99 kg/ha/annum, respectively). This was because forage sorghum was often poorly utilised due to less-than-ideal grazing management where the crop was grazed when it was too mature. This resulted in poor diet quality and thus daily weight gain as well as significant wastage of biomass.

There was a wide range in paddock gross margin, for annual and perennial forage options in the Fitzroy River catchment. In broad terms:

- Leucaena-grass sites had the highest average gross margin ($184/ha/annum across all sites and years).
- Butterfly pea-grass produced the second highest average gross margin: $143/ha/annum.
- Oats forage produced a higher average gross margin ($131/ha/annum) than perennial grass pasture ($98/ha/annum).
- Forage sorghum and lablab resulted in lower average gross margins than perennial grass pasture ($54 and $44/ha/annum, respectively).

Key management issues that commonly limited optimal performance were identified:

- Low soil fertility and lack of fertiliser application at the majority of forage sites indicated that both soil nitrogen and phosphorus may be limiting the production of many annual forage crops in the Fitzroy River catchment while phosphorus may be limiting production of perennial legume-grass pastures.
- Poor grazing management of forage sorghum crops at the majority of sites resulted in poor quality forage, poor utilisation of biomass and poor beef production per hectare.
- Some producers were not inoculating cattle grazing leucaena-grass pastures with the rumen fluid inoculum or using carrier cattle. This may be causing sub-clinical mimosine and dihydroxypyridine toxicity, which will reduce cattle growth rates.
- Hormonal growth promotants (HGPs) were not commonly used in cattle grazing high quality forages in this project despite their use not being restricted in the producers' selected target markets in most instances. There may be an opportunity for either a) premium, HGP-free markets to be targeted or b) for the cattle growth rate benefits (10-30%) and feed conversion benefits (5-15%) of HGPs to be realised.
- Many producers do not regularly monitor weight gain of cattle on high quality forages. More regular monitoring of cattle weight gain during grazing periods on high quality forages can improve timing of sales and market compliance.
- A significant proportion of cattle grazing annual forage crops were not sold directly to market but were returned to perennial grass pastures after grazing the crop. Especially where cattle graze perennial grass pastures in the summer season after grazing a forage oats crop it is highly likely that compensatory gain effects would erode most of the liveweight and financial advantage provided by forage oats. This would likely make the venture unprofitable when considered in the context of overall farm profitability.

Whole farm economic case studies examined the value of the sown forages systems to the 'whole farm' or business, relative to other alternatives which could also be undertaken on the

same area of land, such as grazing perennial grass pasture or growing a grain crop. Perennial legume-grass pastures, particularly leucaena-grass, had a substantial advantage over perennial grass-only pasture and annual forage crops in terms of profitability at the whole farm level. However, legume-grass pastures were not as profitable as grain cropping when grain cropping was a feasible alternative. Annual forages were unable to add economic value to the beef enterprise due to their higher average growing costs and greater variability when compared to perennial forages.

Results from the **constructed or modelled economic scenarios**, in which best-practice management was assumed and a long-term seasonal view taken, supported the conclusions from the commercial co-operator sites and farm case studies.

Top tips to help beef producers maximise productivity and profitability of sown forages include:

- Ask the right questions
  - What is the purpose of the forage?
  - What forage types are best suited to my land type and production system?
  - What is the expected forage and cattle production?
  - What is the likelihood of the forage improving my business profitability?
- Plan ahead
- Use best-practice agronomy and animal management
- Collect data and do the sums.

The following **tools and products** have been produced in the project to assist producers in answering these questions and in getting the most out of their high-output forages:

- **A producer guide to forage use, *'Feeding forages in the Fitzroy'*,** brings together information on the agronomy, management, cattle production and economic performance from high quality forages. This guide is designed to assist graziers to make informed decisions about what forages may be best for their enterprises, and how to get the best out of them. This guide can be downloaded from the FutureBeef website: https://futurebeef.com.au/resources/projects/high-output-forage-systems-for-meeting-beef-markets/. Hard copies of the book can be mailed upon request by contacting Kylie Hopkins on ph: (07) 4923 6215 or email: kylie.hopkins@daf.qld.gov.au.
- **A series of Microsoft Excel spreadsheets** containing the example ('constructed') **gross margins** presented in the forage guide can be used to test alternative scenarios based on individual property production and input figures. These spreadsheets are available from the FutureBeef website: https://futurebeef.com.au/knowledge-centre/business-management/beef-business-tools/#hofspreadsheets
- **The Final Report to MLA**, including two technical appendices, gives full details of all project results and findings and can be downloaded from the MLA website: http://www.mla.com.au/Research-and-development/Search-RD-reports/RD-report-details/Productivity-On-Farm/High-output-forage-systems-for-meeting-beef-markets-Phase-2/2910
- **A 45-minute project summary as a webinar presentation**, available on youtube: https://www.youtube.com/watch?v=BdLL813ne1c
- **A 15-minute project summary as a webinar presentation**, available on youtube: https://www.youtube.com/watch?v=VQmegCLQW1Q

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Table 1. Summary of key performance figures across data sets

Values are the average (and range), across data sets, for each forage type. Maximum value in each row highlighted yellow

	Annual forages			Perennial forages		
	Oats	Forage sorghum	Lablab	Leucaena-grass	Butterfly pea-grass	Perennial grass
Forage biomass measurements in the grazed paddocks (kg DM/ha)[A]	4,555 (2,278-5,425)	12,150 (2,069-30,197)	6,014 (5,484-6,543)	*Leucaena*: 417 (196-744) *Grass*: 3,809 (2,700-5,620)	*Butterfly pea*: 528 (143-1,138) *Grass*: 4,591 (3,480-5,519)	3,702 (2,186-4,549)
Total grazing days per annum or total period	116 (91-158)	107 (52-139)	107 (103-111)	284 (140-476)	181 (139-223)	224 (0-476)
Diet CP (% DM)	12.3 (8.4-14.7)	8.8 (6.6-10.3)	11.5 (9.9-13.0)	12.0 (9.6-13.8)	9.7 (7.5-12.7)	6.6 (5.6-7.0)
Diet DMD (%)	63 (55-66)	55 (52-58)	59 (58-59)	59 (44-64)	59 (58-59)	55 (53-57)
Total LWG (kg/ha per annum or total grazing period) per total grazing area	93 (38-144)	108 (41-253)	99 (41-156)	198 (129-306)	125 (50-245)	76 (0-169)
Forage costs ($/ha per annum) per forage area only; owner rates[B]	136 (93-193)	96 (16-169)	99 (85-113)	34 (17-47)	21 (21-21)	2 (0-5)
Gross margin ($/ha per annum or total grazing period) per total grazing area; owner rates	131 (54-197)	54 (-48-243)	44 (38-50)	184 (90-304)	143 (34-379)	98 (-5-285)

CP: crude protein; DM: dry matter, DMD dry matter digestibility; LWG: liveweight gain.

[A]These figures are the peak biomass measured in the paddock for annuals, and the average biomass measured in the grazed paddock over the duration of monitoring for perennials. They do not indicate the total biomass grown during that period due to being the net result of what was grown and what was consumed by grazing livestock. Figures for leucaena biomass represent only the edible material (i.e. leaves and stems up to 5 mm in diameter).

[B]Annual forage costs for perennials were calculated by amortising establishment and maintenance costs (determining an average annual cost over the life of the forage).