

## Profitability of Tasmanian beef enterprises: calving dates and stocking rates for weaner and yearling production



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### Summary

Time of calving, stocking rates and the type of beef producing enterprise are key drivers of profit for a beef producing system. The decision of when to calve affects many aspects of the business, including the size of animals on sale dates, amount of supplements fed and labour efficiency. This paper describes the use of the decision support tool GrassGro™ to examine the implications of a producer's choice of calving date for different beef production systems.

Profitable grazing businesses generate more income for roughly the same costs as less profitable farms (Holmes Sackett and Assoc, 2004). However, to be confident that changing management practice, for example increasing stocking rate, will boost income, a producer needs to understand how this affects other aspects of the grazing enterprise. Information is also needed about the impact of this change over a range of seasons. Where can we get this information? Grazing experiments can rarely address all the on-farm interactions and seasonal conditions experienced by a producer. The GrassGro decision support tool however takes into account the unique combination of resources on an individual farm.

This paper demonstrates the use of GrassGro to investigate how type of enterprise, stocking rates and time of calving affect the profitability of beef production systems in the southern midlands of Tasmania. Many of the key biological messages in this paper are applicable to other areas of Tasmania.

### Filling information gaps –why GrassGro was developed

Even if there is a grazing trial site up the road, it is often difficult to know the extent to which the results apply to your own soil, pastures, livestock and management. GrassGro was developed by CSIRO to put results from decades of research into a context that allows a producer to seek solutions to practical grazing enterprise problems. Importantly, GrassGro takes into account the extent of seasonal variability by using local historical daily weather records to drive simulations of soil water balance, pasture growth and animal production for beef and sheep enterprises in temperate Australia (Moore *et al*, 1997; Horizon Agriculture Pty Ltd, PO Box 598, Roseville, NSW, 2069, Australia). The models of these processes in GrassGro represent the current state of scientific knowledge, so the tool is an efficient way to help focus research and to deliver information about how a grazing enterprise responds to changes in management.

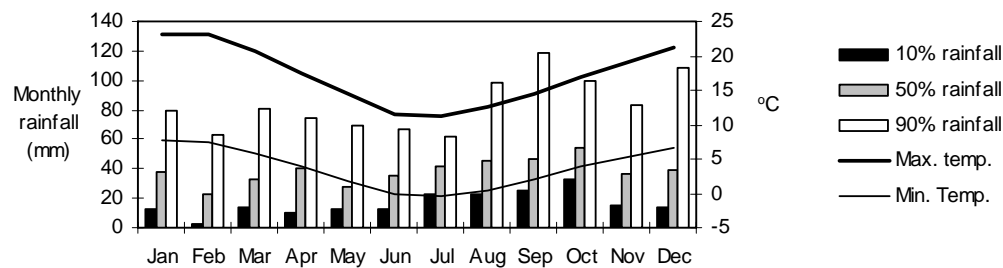
Since its release in 1997, over 200 scientists, advisers, educators, and a number of producers, have been trained to use GrassGro as a tool to support decision-making. More recent use has extended to studies in land capability, natural resource audits and as a way to help teach systems thinking to students at several universities with Agricultural Science courses (Scott *et al*, 2001).

This paper shows how GrassGro simulations over 25 years (1979-2004) were used to investigate the best long-term stocking rate and calving date to maximise profitability. The study shows some of the consequences of these management decisions on two types of beef producing systems in the southern midlands of Tasmania. Base-line pasture data from "Apsley Park" were chosen because of previous work conducted with the 8x5 Wool Profit Program gave confidence that simulations of pasture supply were comparable with local experience.

## Inputs

### Weather

Daily weather records from Apsley were used to drive simulations. The average annual rainfall over 1979-2004 was 560 mm, with highly variable summer rainfall and cold winters with average minimum temperatures for Jul-Aug below 1.0°C (Fig. 1).



**Figure 1. Average monthly temperatures and percentiles for monthly rainfall at Apsley (1979-2004).**

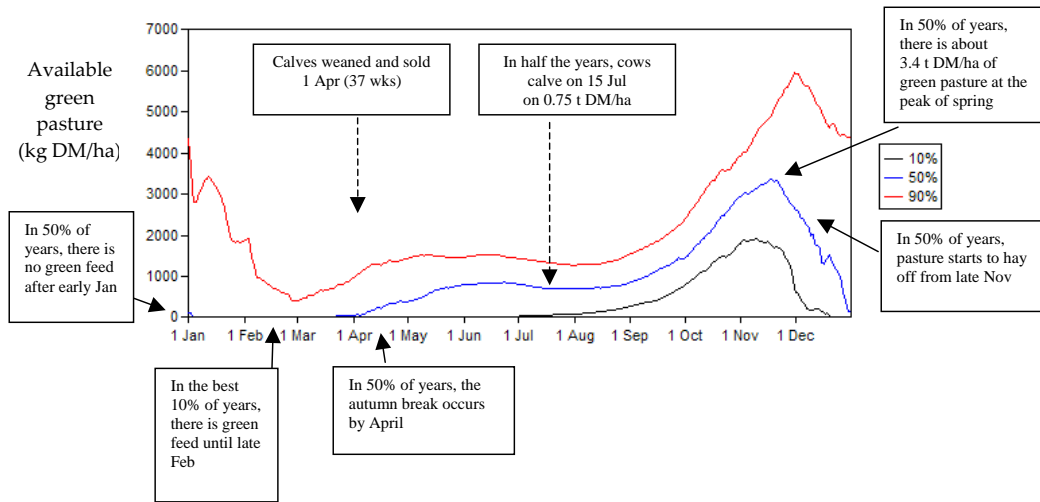
### Soil and pasture

The physical characteristics of the soils used in this study assumed a moderately fertile sandy loam (soil phosphorus = 15.3 mg/kg Olsen, potassium = 77 mg/kg Colwell). The water holding capacity of this soil was described using default values in GrassGro for a soil of similar texture. Regardless of soil type, low temperatures limit winter pasture growth in this environment. GrassGro simulations of a mixed cocksfoot-annual grass-sub clover pasture show that the pattern of pasture supply in autumn and late spring-summer is highly variable (Fig. 2).

### Livestock and management

Self-replacing Angus beef herds calving in mid-July, mid-August and mid-September were simulated (Table 1). Mature cows in average body condition (score 3.0) weighed 550kg. A 95% pregnancy rate was assigned for cows in condition score

3.0 at the time of mating. In years in which cow pregnancy rates fell significantly, sufficient dry cows were retained to maintain herd numbers and re-joined the following year. No premium was paid for pregnant cast-for-age (cfa) cows.



**Figure 2. Percentiles for green pasture available to livestock (kg dry matter/ha) for a weaner production system simulated over 1979-2004 with calving on 15<sup>th</sup> July and a stocking rate of 0.9 cows/ha.**

Two beef producing systems were modeled:

- 1) A 'WEANER' production system that sold weaners on the 1<sup>st</sup> April, apart from sufficient female weaners to maintain cow numbers.
- 2) A 'YEARLING' production system that sold steers on the 15<sup>th</sup> December, aged approximately 15-18 months. The sale date and a set price (220c/kg live weight) were chosen as the most appropriate for modelling the expected gross income from sale steers. Heifers were sold on 1<sup>st</sup> March at 20mo for 175c/kg live weight. No weaners are sold in the yearling system.

**Table 1. Herd management simulated for stocking rates of 0.3 to 1.5 cows/ha.**

	Average calving date		
	15 Jul	15 Aug	15 Sep
Average date of mating	4 Oct	5 Nov	5 Dec
Weaning date	1 Apr	1 Apr	1 Apr

In both systems, maiden heifers calved as 2 year olds. Bulls were purchased for \$4,500 and used for 4 years. Aged cows were sold at 8-9 years of age in April following weaning. A common weaning date (1<sup>st</sup> April) was chosen for all 3 yearling systems. The "mating date" was the average date that cows conceived over 2.5 oestrus cycles (i.e. bulls went out prior to this date). Similarly the "calving date" was the average birth date.

Five stocking rates (0.3, 0.6, 0.9, 1.2, 1.5 cows/ha) were tested in conjunction with three calving dates (Table 1). The GrassGro analysis assumed that land was the

limiting resource and examined the changes in grazing pressure from increasing the number of young stock carried through winter and from shifting stocking rates and calving dates.

In this study, stocking rates were compared in terms of the numbers of cows/ha in both the weaner and yearling production systems. Of course, the grazing pressure differed in each system. In the weaner systems all weaners were sold on 1<sup>st</sup> April, so that in mid-winter, only the breeding herd remained. In the yearling system, cows and weaner heifers and steers were present during winter (Table 2) and it is possible to convert these cow and weaner numbers to approximate DSE ratings (Fig. 3).

**Table 2. Stocking rates and livestock numbers on 1 July tested in GrassGro for an August-calving herd.**

Production System	Number of animals present on 1 July		Carrying capacity on 1 July	% increase in DSE's over weaner system
	Cows/ha (including replacement heifers)	Weaners/ha (excluding replacement heifer weaners)		
<b>Weaner</b>	0.3	0	3.0	-
	0.6	0	5.8	-
	0.9	0	8.4	-
	1.2	0	11.0	-
	1.5	0	13.4	-
<b>Yearling</b>	0.3	0.20	4.9	63
	0.6	0.38	9.0	55
	0.9	0.55	12.7	51
	1.2	0.71	15.7	43
	1.5	0.87	18.0	34

\* In GrassGro the energy obtained from pasture that is required to maintain a 50kg wether in average condition when grazing undulating land (8.8 MJ/day) is defined as one DSE. Using this definition, carrying capacity will not increase linearly with the number of animals/ha (last column in table above). Limitations in pasture supply from overgrazing, for example, will reduce the calculated DSE value. This is necessary to avoid misrepresenting the carrying capacity of over-stocked pastures.

#### Costs and Prices

Gross margins were calculated using 2005 prices paid at (either) Bothwell weaner sales or the 2005 forward contract prices from the Tasmanian Feedlot (Table 3). The cost of supplement was \$150/t on an as-fed basis and pasture maintenance cost \$30/ha. Animal husbandry costs were based on the annual report of the South West Victorian Farm Monitor Project 2003-04 (\$13/head for cows and \$8/head for calves).

**Table 3. Beef prices (c/kg live weight) used to calculate gross margins**

Livestock class	Production system			
	Weaners (3 weight categories)			Yearlings
Steers	< 285kg @ 270c	< 300kg @ 250c	>300kg @ 230c	All @220c
Heifers	< 285kg @ 215c	< 300kg @ 200c	>300kg @ 185c	All @ 175c
Cows (cfa)	All @ 130c/kg			All @ 130c

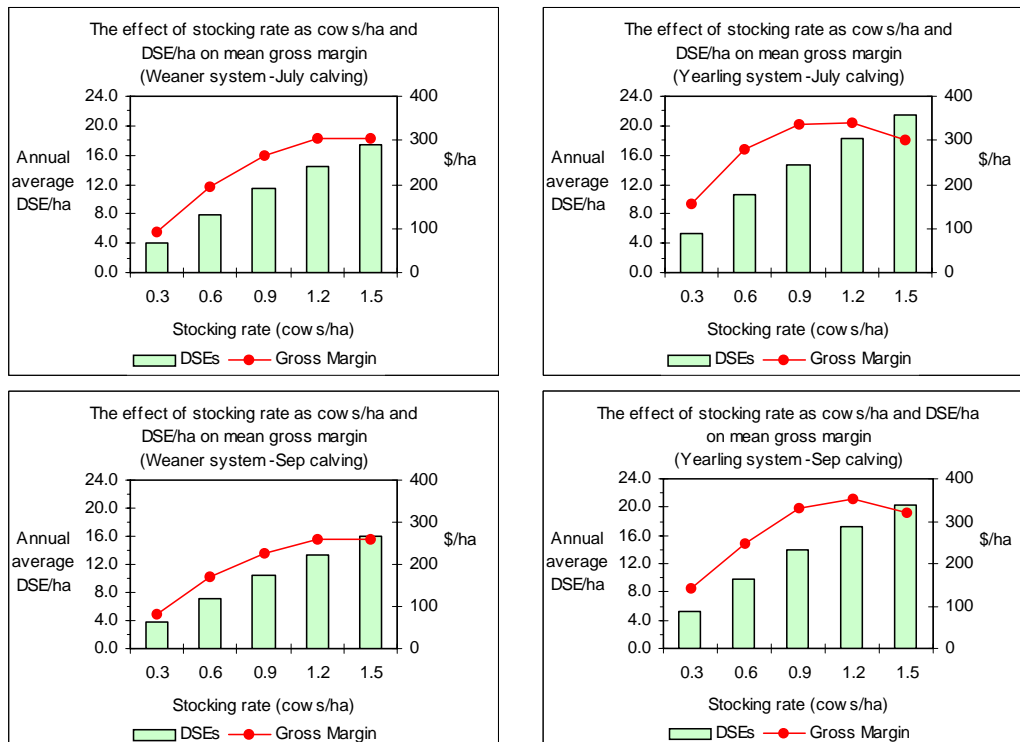
GrassGro allows for livestock to be supplementary fed when animal condition falls below a chosen threshold. In this study, cows were fed to maintain weight whenever their body condition fell below score 2.0 and weaners were fed if their condition fell below score 2.5. The only supplement fed was a reasonable quality pasture hay (\$150/t) with dry matter 86%, DMD 60%, ME:DM 8.8, crude protein 10%. Hay was assumed to be purchased and not cut from spring surpluses. Simulations using a hay of lesser quality (DMD 55%) failed to adequately maintain cow live weight in years of low pasture availability.

## Results

### Stocking rates & profitability

#### Stocking rate: cows/ha or DSEs?

The two systems were compared in terms of the number of cows/ha. Simulation results of the yearling system incorporate the additional grazing pressure from weaners retained for sale in the following spring (Fig.3). The monthly grazing pressure for the two systems was significantly different.



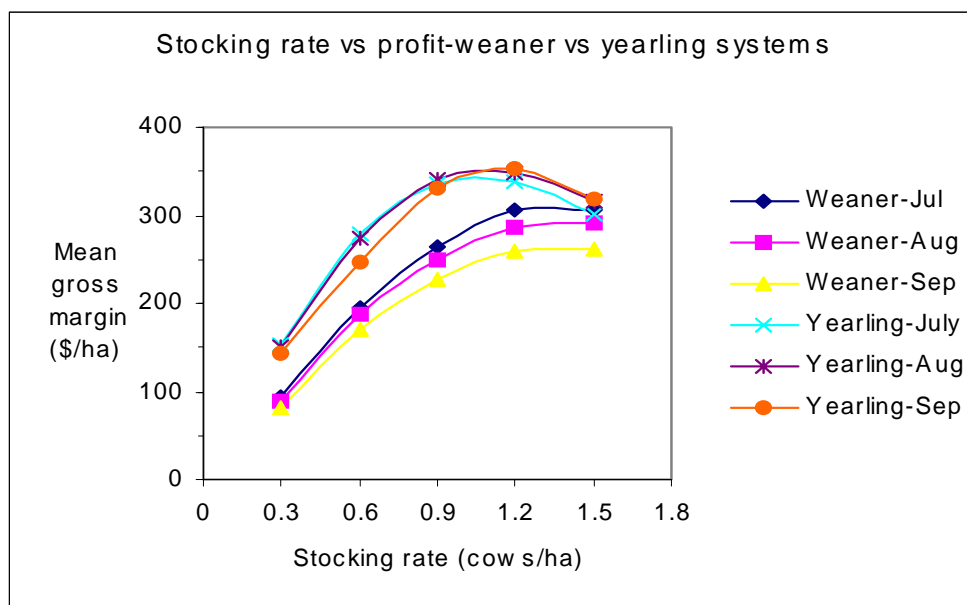
**Figure 3. Comparison of stocking rates (DSE/ha or cows/ha) and gross margins**

This analysis found that stocking rates have a pronounced affect on enterprise profitability, in both the weaner system and the yearling systems (Figs 3 and 4). Both systems had a linear increase in profitability as stocking rates increased to moderate district levels (about 0.9 cows/ha or 12-14 DSE/ha). Profit was far more sensitive to stocking rate than calving date and type of enterprise.

The yearling system achieved maximum profitability at 1.0 cow/ha and achieved an average gross margin of \$350/ha. Calving date had little impact on gross margin.

The weaner system achieved maximum profitability at approximately 1.2 cows/ha and achieved an average gross margin of \$250-300/ha, depending on the calving date. The most profitable calving date was July.

At low stocking rates (0.3 cows/ha), average gross margins were up to 80% higher in the yearling than the weaner system (when compared at the same calving date). At higher stocking rates (1.5 cows/ha), the yearling system was at most 22% more profitable (September calving). This is despite greater numbers of animals present in the yearling system.



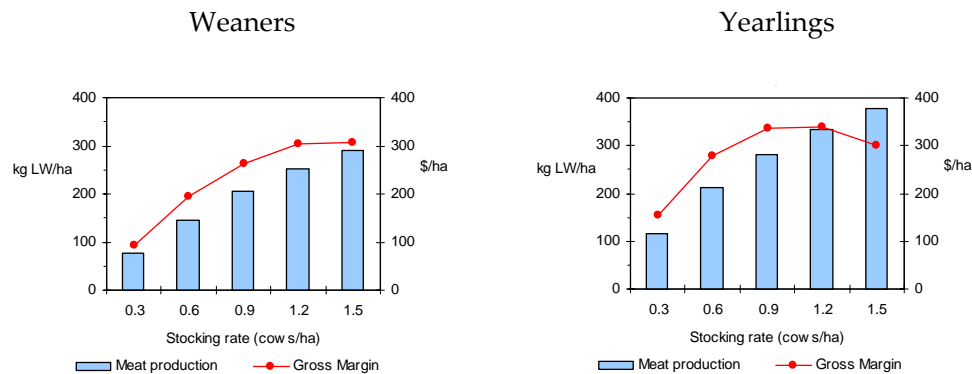
**Figure 4. Gross margins from simulations over 1979-2004 of a self-replacing Angus herd in the southern midlands, TAS at 5 stocking rates (cows/ha) and 3 calving dates (15-Jul, 15-Aug and 15-Sept).**

### Meat production

Meat production per hectare was driven to a greater extent by stocking rate than the type of beef enterprise. As stocking rate increased from 0.3 to 1.5 cows/ha, total meat production increased four-fold in the weaning system (80 to 290 kg LW/ha) and more than tripled in the yearling system (115 to 375 kg LW/ha) (Fig. 5).

Yearling systems produced 30-65% more meat/ha than weaner systems at each stocking rate. Calving date had little effect on meat production/ha, except at high stocking rates in the weaner system.

However, the GrassGro analysis showed that there was no economic advantage in producing the maximum amount of meat/ha. The highest average gross margins was achieved by producing 250 kg LW/ha in the weaner system and 280 kg LW/ha in the yearling system.



**Figure 5. The relationship between gross margin and meat production (kg LW/ha from young stock and cfa cows) at 5 stocking rates for weaner and yearling systems calving in July.**

### Calving dates & profitability

In the weaner system, calving dates were found to have a significant effect on profitability as stocking rates increased. The later September calving system was significantly less profitable than the earlier calving at the same stocking rate. The effect on profitability was mostly driven by the smaller size of calves at sale and the relatively small difference in the amount of supplement fed.

In the yearling system, calving dates had little effect on average gross margins. This contrasts with findings of Salmon et al (2004) who found an important relationship existed between lambing dates and profitability in wool sheep production systems in Tasmania. Several local spring calving Tasmanian producers also felt that this finding was inconsistent with their experience.

In this study, September-drop weaners did not have sufficient time to grow to similar weights as those born earlier, even though their rate of weight gain was higher at the same age. This loss of income was not compensated for by the small reduction in supplement costs associated with later calving (Fig. 7). The financial outcome reflects the value of beef relative to supplement used in this analysis. Sensitivity testing of beef prices may alter this finding. October calving was not modelled.

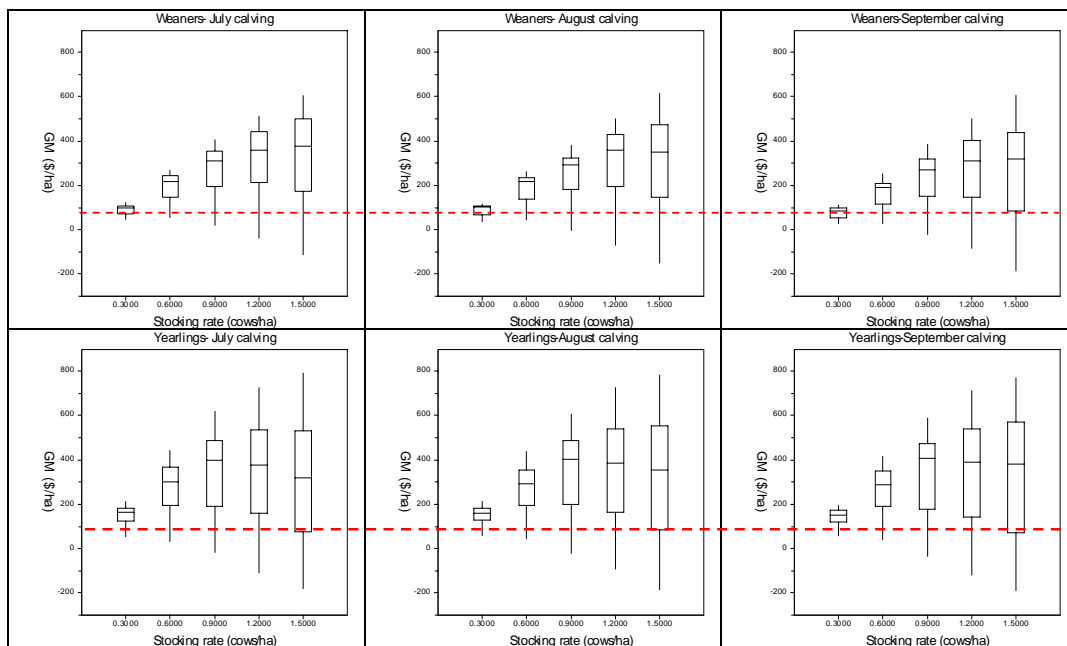
### Stocking rates and risk: profitable or "safe"?

GrassGro showed that higher stocking rates were associated with greater production but also with increased financial risk. Risk is measured in GrassGro by the variation in annual gross margin between years.

Significant risk exists in both systems at the higher stocking rates (Fig. 6) As stocking rates exceeded optimum profitability, the downside variation reached unacceptable levels.

The yearling system had greater variation in annual gross margin per hectare but this was mostly due to the greater capacity of this enterprise to achieve high gross margins (upside opportunity) than the weaner system. September calving at high stocking rates had the best chance of achieving annual gross margins of \$600/ha.

The distribution of gross margins in Figure 6 also indicate that at low stocking rates the weaner system was less able to meet fixed costs of, say, \$80/ha. However at high stocking rates, the yearling system failed to meet fixed costs in a greater proportion of years than the weaner system.



**Figure 6. Box plots<sup>1</sup> of gross margins over 1979-2004 for a self-replacing Angus herd in the southern midlands at 5 stocking rates (0.3, 0.6, 0.9, 1.2 and 1.5 cows/ha) and 3 calving dates (15-Jul, 15-Aug and 15-Sep). The red dotted line indicates fixed costs of \$80/ha.**

#### Stocking rates and herd fertility

A drop in herd fertility occurred in the higher stocking rates. Herd fertility decreased by 10% in the yearling system, and by 7% in the weaner system as stocking rates increased from 0.3 to 1.5 cows/ha. This reduction in herd fertility occurred because,

<sup>1</sup> The length of each box shows the span of the middle 50% of the gross margin values. This is the inter-quartile range. The horizontal line in the box represents the gross margin in 50% of years (the median). The lines extending beyond the ends of a box show the best and worst 25% of years (upper and lower quartiles).



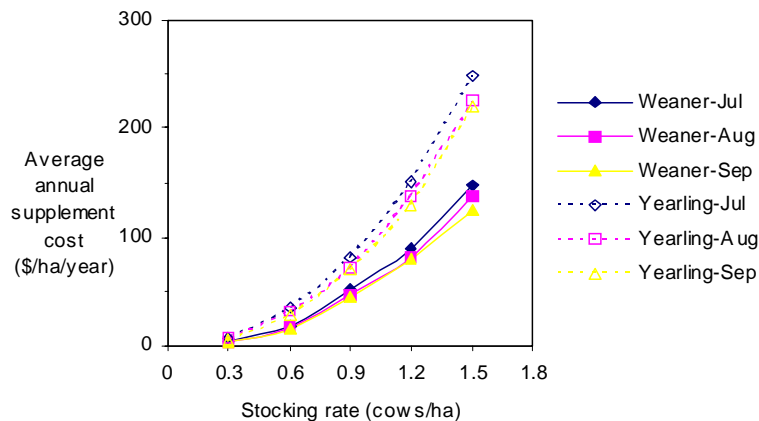
on average, cow condition at mating was lower at higher stocking rates. Cow condition reflected the supplementation policy and quality of the hay (60% DMD) used in this analysis.

#### Stocking rates and supplementary feeding

Supplementary feeding plays an integral role in Tasmanian beef cattle systems. GrassGro analyses indicated that significant supplementary feeding was required under both systems, and particularly at stocking rates close to the economic optimum.

The analyses showed the following:

1. More supplementary feeding was required for the yearling than the weaner system at each stocking rate (Fig. 7). Cows at all three calving dates required significant feeding, particularly over late winter and early spring.
2. In most years in the yearling system, weaners also required feeding over winter to maintain condition. This prevention of weight loss would have a significant effect on the weaner-yearlings being able to achieving live weight targets for sale at the end of the spring.
3. In the weaner system, the sale of weaners in April significantly reduced the number of animals that had to be carried on the farm over winter, decreasing the requirement for supplementary feed.

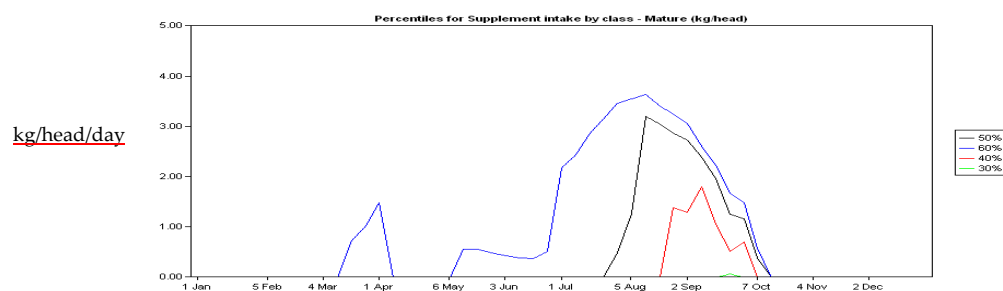


**Figure 7. The effect of stocking rate on annual supplement cost averaged over 1979-2004 for weaner and yearling systems with 3 calving dates (15-Jul, 15-Aug, 15-Sep).**

This analysis found that with these pastures, stocking rates and calving dates, high levels of supplementary feeding were required. Some producers question the need to feed supplements at these levels, considering it to be too aggressive and not resemble the real world. However it is clear from the analyses that careful attention to supplementary feeding is essential if higher profits are to be achieved through higher stocking rates. Any cut to the amount of feeding will have significant effects to profitability either through a combination of a drop in fertility, or the system

becoming unsustainable (high mortality) or poor growth rates in steers. This analysis indicates some key messages for beef producers in the southern midlands of Tasmania:

- A high stocking rate is a key to increased profits but requires a high standard of management to be sustainable
- Supplementary feeding is a necessary part of management to run a profitable beef herd in the midlands of Tasmania. Profitable beef herds require higher stocking rates where some supplementary feeding will be essential in the majority of years.
- Producers should establish rules of thumb for the amount of hay (or other forms of supplementary feed) that they should take into winter. Based on these simulations, an August calving system at the optimum stocking rate will require approximately 400kg of hay for cows and 200kg hay for steers to maintain weight. Producers will need considerable investment in infrastructure to handle the amount of feeding required.
- Knowing the cost of energy (cents/megajoule) in a supplementary feed is a critical calculation for minimising the cost of feeding. Use of cereal grains may offer a cheaper way to achieve condition score or production targets.
- Cattle systems are very susceptible to the quality of hay feed out. FEEDTEST will play a critical role for beef producers in understanding the relative quality of their feed supplements.
- With July and August calving systems, cows invariably calved down on pastures with less than 1500kg DM/ha (Fig. 2). In most years, it will be less than 1.0t DM/ha. Cows in these systems will require significant supplementation to avoid high levels of reproductive wastage (Fig.8).
- GrassGro showed that rates of supplementary feeding were largely unrelated to the 3 calving dates, with only slight increases in supplementary feeding needed for the earlier calvings.



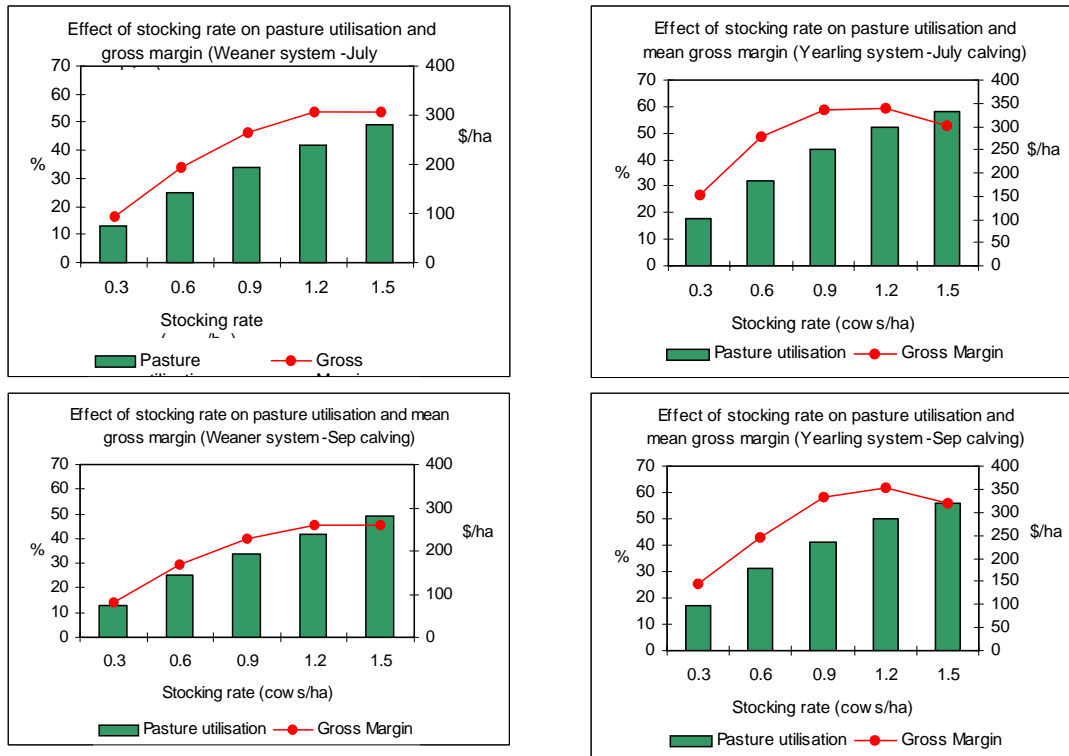
**Figure 8. Percentiles for daily intake of supplement (pasture hay) by cows for a yearling system calving on 15<sup>th</sup> September at a stocking rate of 1.2 cows/ha.**

### Pasture utilization and profit

Pasture utilization is a measure of the amount of grass grown that is consumed by livestock.

Achieving a high level of pasture utilization is not always the path to higher profit. In this study pasture utilization increased with stocking rate but profit/ha only did so

up to a point and then leveled out (Fig. 9). Somewhat higher pasture utilization was achieved in the yearling system compared to the weaner system. Differences in utilization between calving dates were minor.

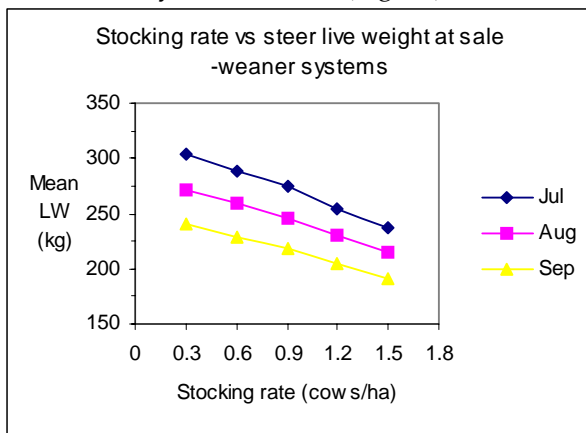


**Figure 9. The effect of stocking rate on pasture utilization and gross margin averaged over 1979-2004 for weaner and yearling systems with July and September calving.**

### Live weights of weaners sold in autumn

Producing and selling weaners at annual weaner sales in autumn is an important enterprise for many Tasmanian producers and a common goal is to have weaners at maximum bodyweights in time for the sales to attract the best prices (\$/head).

However, this analysis showed that producers who wish to present the largest weaners at a weaner sale in April would need to run the lowest stocking rate and calve early in the season (Fig. 10). Whilst this maximizes weaner bodyweights, this is

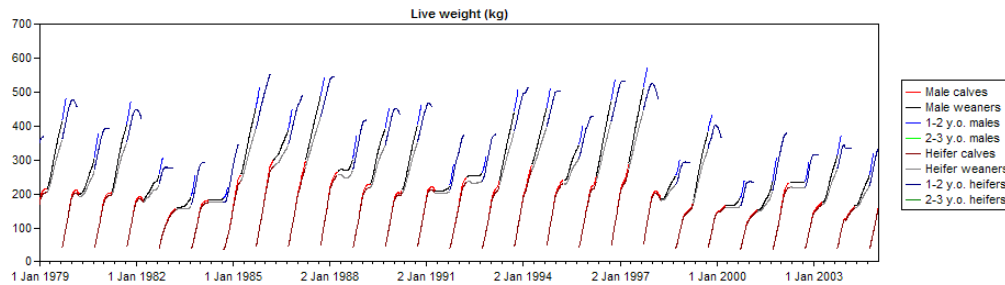


likely to be an unprofitable strategy as meat production and profit per hectare is greatly reduced.

**Figure 10. The effect of stocking rate on the average live weight of weaner steers at sale on 1<sup>st</sup> April for 3 calving dates (15-Jul, 15-Aug, 15-Sep).**

### Live weights of yearling steers sold in December

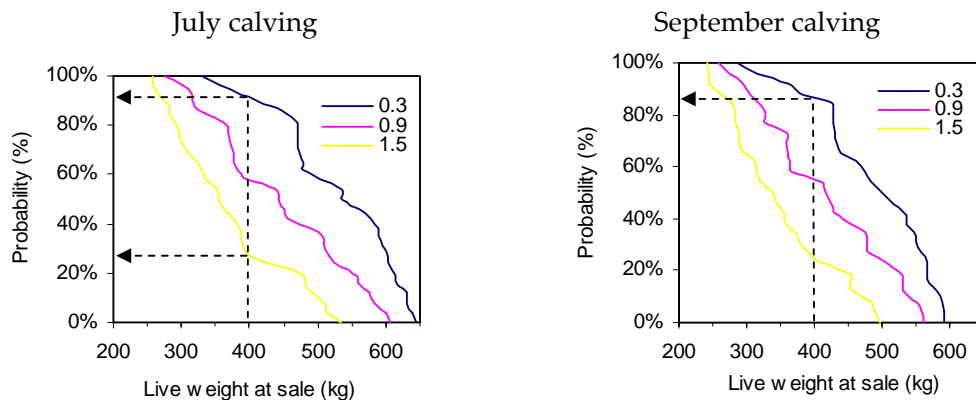
In practice, yearling steers are sold at the end of the growing season, rather than on the same date each year as simulated in this study. Achieving market specifications for steer live weight is critical to maximizing income. Hence, as a general rule, yearling producers manage their systems to ensure that steers are as heavy as possible at the end of the growing season.



**Figure 11. The predicted distribution of live weights of steers and heifers growing from calves to yearlings over 1979-2004. Steers were sold on 15 December and heifers were sold on 1 March each year in this September-calving herd at a stocking rate of 0.9 cow/ha.**

In both real and simulated systems there is considerable year-to-year variation in steer weights (Fig. 11). Beef producers must consider the impact of calving date and stocking rate on the probability of animals reaching market specifications by a date, which may determine a price premium or be the end of the period of pasture quality that is adequate for steer weight gain.

In this analysis, steer weight was significantly affected by stocking rate at all three calving dates. At 0.3 cows/ha GrassGro estimated that steers would weigh more than 400kg in December in more than 90% of years in a July-calving herd (Fig. 12). At a stocking rate of 1.5 cows/ha steers reached this target in less than 30% of years.



**Figure 12. The effect of stocking rate (0.3, 0.9 and 1.5 cows/ha) on the probability of yearling steers exceeding a particular live weight at sale on the 15<sup>th</sup> December for 2 calving dates (July and September). The dotted lines on the left graph show the likelihood of exceeding 400 kg at stocking rates of 0.3 and 1.5 cows/ha. The probability is the proportion of years out of the 25 simulated.**

### Live weights of yearling steers sold in October

The Tasmanian feedlot is an important market for steers and a premium feedlot contract requires a 380-450kg steer delivered prior to 31<sup>st</sup> Oct. (Rhodes, per comm, 2005). Table 3 shows that calving date had little effect on the probability of steers exceeding 400kg live weight by 30<sup>th</sup> October (stocking rate of 0.9 cows/ha).

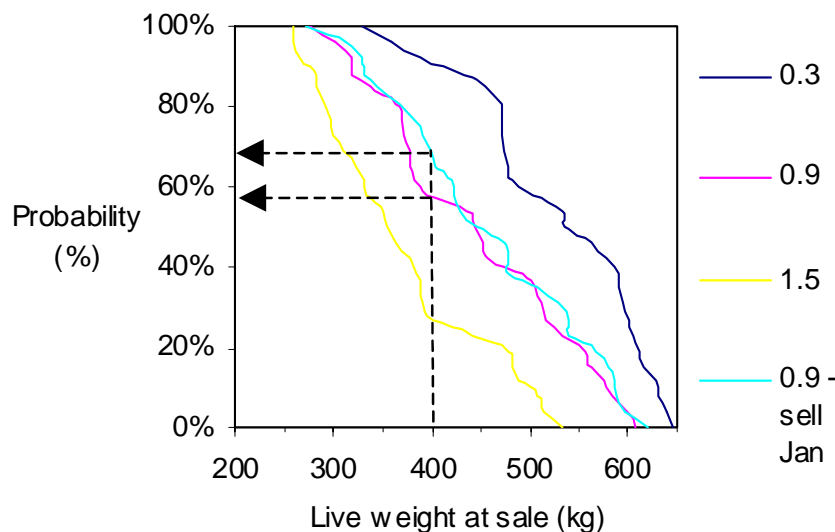
**Table 3. Effect of calving dates on the probability of steer live weight averaging >400kg on the 30<sup>th</sup> October at a stocking rate of 0.9 cow/ha.**

Calving date	Probability that steers exceed 400kg on the 30 <sup>th</sup> Oct (%)
July	48
August	44
September	42

Calving dates also had less effect than stocking rate on the average live weight of steers at sale in December (Fig. 12). The likelihood of steer live weight exceeding 400 kg by 15 December decreased from 88% in a July-calving herd to 85% in a September-calving herd at a low stocking rate (0.3 cows/ha). Over winter, smaller (younger) steers achieved higher growth rates than larger steers, and consequently steers born at the calving dates tested in this study were of similar weight at the end of winter.

### Live weights of yearling steers sold in January

Figure 13 shows that yearlings sold on 15 January were of similar weight to those sold in December; the probability of exceeding 400 kg increased from 56% to 65%.



**Figure 13. Effect of selling yearlings on 15 January instead of 15 December at a stocking rate of 0.9 cows/ha on the probability of yearling steers exceeding 400 kg (dotted lines). Steer weights on 15 December for stocking rates of 0.3, 0.9 and 1.5 cows/ha are also shown.**

## **Other issues not examined in this analysis**

In conducting this analysis, the authors found that many other important questions arose during discussions of results of the two simulated beef systems. There is not room in this paper to explore these issues in detail. For those interested, suggested topics for future investigations with GrassGro include:

1. *Improved supplementation of steers over winter*  
The role of winter supplementary feeding of steers to ensure they hit weight targets in the early spring. It is often suggested that steers supplemented over winter, enter spring at higher bodyweights and condition and are better able to meet target weight in the late spring. This would have important implications for meeting feedlot entry specifications for the Tasmanian Feedlot. Whilst this issue was not analyzed here, GrassGro would have a useful role in answering this important production question.
2. *Cow size*  
The extent to which the size of the breeding cow improves the chance of achieving target feedlot entry weights and enterprise profitability.
3. *Cow feeding policy*  
The profitability of feeding supplements to cows when their body condition falls below score 3.0 instead of score 2.0, and of using a grain-based supplement.
4. *June and October calving*  
The profitability and risks of 15<sup>th</sup> June and 15<sup>th</sup> October calving dates.
5. *Pasture improvement*  
What is the impact of increasing the proportion of perennial ryegrass in the system? Preliminary simulations suggest PRG will persist well enough. The pasture supply curve with PRG gives worse winters and more reliable spring (a bit more like Hamilton, VIC), and therefore should confer an advantage to later calving and finisher systems.

## **Using information from GrassGro: assumptions, limitations and benefits**

GrassGro analyses support decision making but do not provide answers to production problems. Evaluation of the results requires understanding of the analysis' assumptions and of GrassGro's limitations. GrassGro assumes that animals and pastures are free of disease and parasites, that fertilizer practice is optimal or regular and supplementary feeding is precise. Thus simulation outcomes represent "best practice" management. Year-to-year variation in pasture composition is simulated but spatial variation in pasture composition, the presence of broadleaf weeds and the effects of aspect are not taken into account. "Profitability" in GrassGro reflects the choice of costs and prices used. These are not varied over the years simulated so that the results reflect production issues and production risk due particularly to climatic variation rather than market conditions. Finally, GrassGro examines the operation of only a single grazing enterprise and does not model the whole farm system where there are multiple enterprises e.g. cattle and sheep enterprises.

Producers are warned not to make direct comparisons between the profitability of the beef cattle enterprises in this study and gross margins of other enterprises analysed using other methods. Prices used in this analysis reflect current prices which are much higher than recent historical prices. This analysis should only be used for comparison between the two beef enterprises investigated. Producers should take on board the key biological messages in this analysis.

## **Conclusions**

- The analysis with GrassGro showed how a systems approach can be used to explore how key management decisions can influence the “profit drivers” of a beef production system in the southern midlands of Tasmania.
- The study found the variability of pasture supply and the minimal winter pasture growth rates made the southern midlands of Tasmania are challenges to beef production. Significant supplementary feeding is required to achieve reasonable stocking rates and ensure profitability. This is an important message to Tasmanian beef producers who, at times, will come across extension material generated from southern mainland Australia.
- The GrassGro analysis was used to examine the trade-offs between production gains from increased stocking rates, the high cost of supplementary feeding and possible low prices for under-grown steers. Simulations over a 25 year period indicated that a stocking rate of about 0.9 cow/ha would achieve the optimum profitability with manageable production risk in yearling systems. A yearling production system was found to be more profitable than a weaner system, despite a greater range in gross margins across years.
- Stocking rates below 0.6 cows/ha achieved unacceptably low gross margins and are unlikely to meet fixed costs. Gross margins per hectare increased linearly for both systems from low stocking rates to the optimum stocking rate.
- Compared with stocking rate, calving date had little impact on profitability. Later calving dates in weaner production systems affected profitability through smaller calves at sales in April, despite similar supplementary feeding rates. The calving dates tested appeared to have little effect on profitability in the yearling system.

## **References**

Fitzgerald, L., (2004), The South West Victorian Monitor Farm Project – Annual report 2003-04,

Holmes, Sackett and Assoc 2004. AgInsights 2003. pp100

Moore, A. D., Donnelly J. R., and Freer M., 1997. GRAZPLAN: decision support systems for Australian grazing enterprises. III. Pasture growth and soil moisture sub-models, and the GrassGro DSS. Agric. Syst. 55, 535-582.

Rhodes T., (pers. comm) "Killymoon", St Mary's TAS 7215.

Salmon, L., Counsell, D.J., Bastock P., Ackland S., Barrington S., Friend D., & Statham M., GrassGro™: targeted information for profitable grazing businesses. Proceedings of the National conference of the Grasslands Society of Southern Australia 2004.

Scott, J.M., Daily H.G., Moore A.D., Salmon E.M., Donnelly J.R, and McCook R. 2001. Enhancing student learning with complex Decision Support Systems. *Proceedings of the 10th Australian Agronomy Conference*, Hobart. [www.regional.org.au/au/asa/2001/](http://www.regional.org.au/au/asa/2001/)

### **Acknowledgements**

Funding of the extension of GrassGro and of the 8x5 Wool Profit Program by Australian Wool Innovation Pty Ltd is gratefully acknowledged.