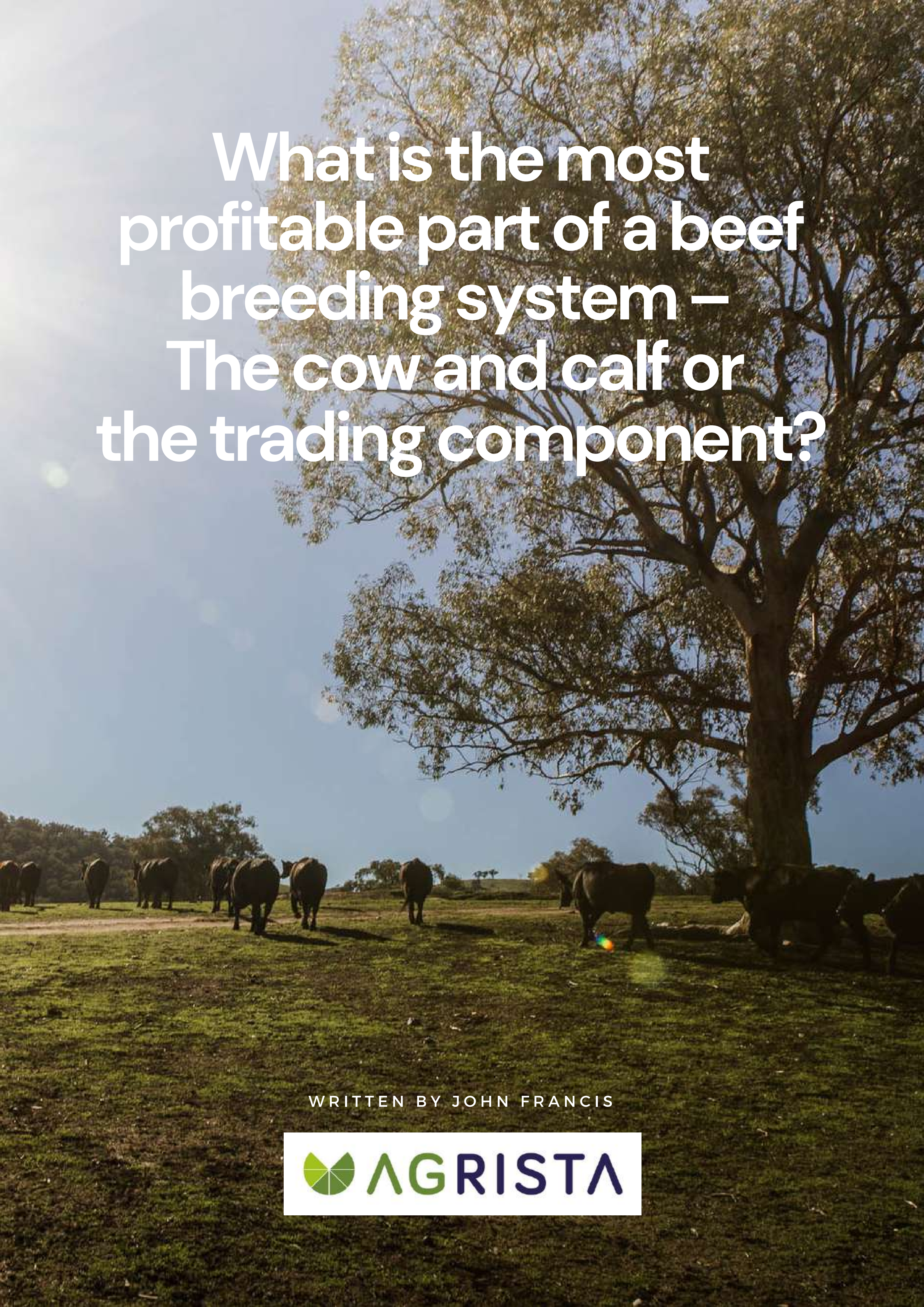
What is the most profitable part of a beef breeding system – The cow and calf or the trading component?



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In brief / overview

A self-replacing beef breeding herd consists of two components – the breeding component and the trading component. The breeding component consists of breeding females including replacement heifers, cows and bulls. While the trading component consists of sale progeny plus young female livestock surplus to breeding requirements, should there be any surplus.

At current beef prices the breeding component of a beef breeding system is far less profitable than the trading component of a beef breeding system. Weaner prices need to be approximately 40% higher than feeder prices for a breeder system to deliver equivalent profits to trading system per unit of energy consumed.

At current prices, the trading component of a beef breeding enterprise delivers over twice the operating profit per unit of pasture energy consumed compared to the breeding component. In a breeder system turning off feeder weight livestock, approximately 42 percent of operating profits come from the trading component of the herd and 58 percent from the breeding component of the herd. The feed energy requirements are, however, vastly different with the trading and breeding herds requiring 25 percent and 75 percent respectively of the total herd energy consumed.

A trading enterprise values the cost of the breeding female by placing a commercial value on the progeny at the point of purchase. This analysis suggests that the remuneration for the progeny is not commensurate with the investment

While current pricing favours the trading herd over the breeding herd this isn't always the case. A beef breeding system offers the flexibility of having multiple livestock classes that can generate production from feed sources with differing quality profiles. Breeding females can generate production from low quality feed while trading livestock perform on the higher quality feed. This can be valuable in localities with seasonal pasture supply or where pasture types vary across a farm.

The challenges relating to a trading herd will be discussed in a follow up article which compares a trading only enterprise with a breeder feeder system.

Background

The disaggregation of the herd into its components can deliver insights about the differences in productivity and profitability between enterprise components.

Despite a beef breeding herd consisting of different components, enterprise analysis, which reports financial and production performance of the herd, is usually conducted over the whole herd rather than its components. While such reporting is useful in identifying opportunities for improvement in herd management, the disaggregation of the herd into its components can deliver additional insights.

Two questions that may be answered by assessing the financial performance of the components of the herd are:

- Are breeders being remunerated appropriately for the trading progeny that they produce?
- What is the most profitable component of the herd?

This analysis compares the relative production and financial performance of components of the breeding system with the whole breeding system. The aim of this approach is to establish the differences between enterprise components, understand why those differences occur and identify opportunities for change where appropriate.

This initial analysis is a precursor to an additional analysis which will investigate differences in financial returns, production, resource requirements and skills between breeding and trading enterprises.

The environment and feed base

The analysis has been conducted in an environment with a feed curve representative of a large proportion of southern Australian livestock systems. Over half of the pasture growth in the locality examined occurs in Spring with the start of the main growing season occurring in Autumn.

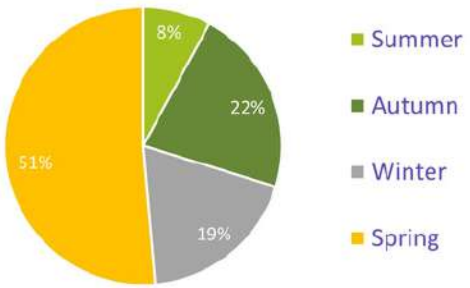

Figure 1 The majority of the annual feed supply in this system occurs in Spring

The feed curve has a shape that is typical for southern Australian systems. The pasture growth rates shown in Figure 2 represent production in a high rainfall environment. Financial performance and livestock production in the analysis is driven by optimising feed utilisation. While the outputs are specific to this rainfall environment it is likely that the relativity of the outputs will apply equally to lower rainfall environments.

Optimisation of feed supply is assumed to equate to consumption levels exceeding 50 percent of the mass of annual pasture grown.

The pasture base is assumed to provide adequate high quality feed during winter and spring to support the energy needs of pregnant and lactating females and to achieve average daily liveweight gains to meet target market weights in progeny. This analysis assumes a pasture area of 600 hectares. The average annual stocking rate is 13 DSE per hectare and the mid winter stocking rate is 10.5 DSE per hectare.

Figure 2 The feed curve is representative of a typical southern Australian pasture system.

The Breeding System

The breeding enterprise chosen for comparative analysis is a spring calving, self-replacing, breeding enterprise turning off trading steers into the feedlot market.

This enterprise has been chosen because:

- It is widely adopted;
- It matches feed demand to feed supply driving high levels of feed utilisation, and;
- It has been shown to be relatively more profitable than alternative systems given the same pasture resources (MLA Southern Beef situation analysis).

Joining of bulls to breeding females occurs in December, calving in September and weaning occurs at the end of February.

All male trading progeny (steers) are sold at feedlot acceptable live weights of approximately 450 kilograms per head at a weighted average age of 16 months prior to feed quality declining by the end of December. All female progeny are joined to calve at 2 years of age and surplus (non-replacement) heifers are sold after pregnancy testing in February at 420 kilograms liveweight per head at a weighted average age of 18 months.

This system does not typically deliver the highest price per kilogram of beef produced rather it aims to optimise production. This typically results in cost efficiencies by lowering cost of production.

What is production and how is it measured?

Production is the process of creating, growing, manufacturing or improving goods or services. Production is usually measured as a quantity or amount. Beef herd production refers to the total weight of beef produced and is usually measured in kilograms of liveweight over a specific time (usually a year in the production cycle).

Production is measured as the live weight of sales minus the live weight of purchases plus the change in live weight of inventory. The change in weight of inventory is calculated as the total live weight at closing less the total live weight at opening.

Opening and closing are dates corresponding with the first and last day of the production period being assessed. Deaths and natural increase are accounted for in this calculation as their numbers and associated weight are captured at opening and closing. Table 1 below shows the livestock trading schedule of the breeder feeder system.

Table 1 Livestock trading schedule of the breeder feeder system.

Livestock trading schedule - Financial year 1 July opening

			Opening		Sales		Purchases		Closing	
Class	**Age**	**Sex**	**N° (hd)**	**lwt/hd)**	**N° (hd)**	**lwt/hd)**	**N° (hd)**	**(kg lwt/hd)**	**N° (hd)**	**lwt/hd)**
Cows	>24 mth	F	463	550	81	550			463	550
Heifers	12-24 mth	F	93	420	157	418			93	420
Weaners	6-12 mth	M+F	511	280					511	280
Steers	12-24 mth	M			250	448				
Bulls	>12 mth	M	13	850	4	850	5	750	13	850
Total no/average wt			1,080	415	492	458	5	750	1,080	415
Total weight (kg lwt)				**447,673**		**225,576**		**3,750**		**447,673**

Record	Weight (kg lwt)	Code	Calculation
Sales	225,576	S	Sum of (N° head sold x class x kg lwt/hd)
Purchases	3,750	P	Sum of (N° head purchased x class x kg lwt/hd)
Opening	447,673	OP	Sum of (livestock no x class x kg lwt/hd x class) @ opening
Closing	447,673	CL	Sum of (livestock no x class x kg lwt/hd x class) @ closing
Inventory change	0	IC	Total closing liveweight minus total opening liveweight
Production	**221,826**	**PR**	**Weight of sales less purchases plus inventory change**

In a steady state beef breeding herd there is no change in weight of inventory as the closing numbers and closing weight would be exactly the same as the opening numbers and opening weight.

Financial analyses of herd enterprise performance do not rely on physical weights of livestock at opening or closing rather they use assumptions to estimate liveweight of each class of livestock on hand based on nominal estimates.

Farm production assessments of breeding enterprises allocate a fixed and consistent weight to livestock by class which does not differ between opening and closing.

This means that only differences in numbers of livestock (not numbers and weight) lead to differences in inventory weight between opening and closing.

In the livestock trading account, trading enterprises are separated from breeding enterprises. Trading enterprises require a record of estimated liveweight for each livestock class at opening and closing.

As trading enterprises rely on weight gain to drive income the difference in inventory weight can lead to large production differences.

Table 2 Features of the comparison of beef systems components or whole beef systems

Column	1	2	3	4
System	**Breeder weaner**	**Weaner feeder**	**Breeder feeder 1**	**Breeder feeder 2**
Component or whole	Component	Component	Whole	Whole
System code	BWS	WFS	BFS1	BFS2
Dominant livestock class	Breeders & calves	Trading livestock	Breeders & traders	Breeders & traders
Purchases	Bulls only	Weaners	Bulls only	Bulls only
Sales	Females & weaners	Feeders	Females & feeders	Females & feeders
Internal transfers			Yes	No

The differences between systems components and systems as a whole

Table 2 above shows the differences in the features of the beef systems components or whole beef systems comparison. The breeder weaner system (BWS) shown in column 1 and the weaner feeder system (WFS) shown in column 2 are components of the breeder feeder production system (BFS1 & BFS2) shown in columns 3 and 4 respectively. BFS1 & BFS2 represent the same combined breeder feeder system but with the information generated using different methodologies.

BWS represents the breeding component of BFS. The breeding component in this system consists of all livestock to the point of weaning. Cash sales include surplus females (cows and heifers) and bulls. Trading livestock, which include all steers and those weaner heifers not required for breeding, are sold as weaners.

WFS represents the trading component of BFS. Trading steer and heifer weaners are purchased at market values from the BFS into the WFS and sold at market values 10 to 12 months later.

BFS1 represents the combination of BWS and WFS. The key difference between systems BFS1 and BFS2 is the way that transactions of trading livestock occur.

BFS1 applies a market value to trading livestock twice. BFS2 applies a market value to trading livestock only once.

BFS1 includes internal sales of trading livestock as weaners from the BFS shown as an internal purchase transaction in WFS. While this is a non-cash transaction it is recorded in BFS 1 to capture the value of the trading system at a point in time. This allows for assessment of the value of different components of the system.

BFS2 differs to BFS1 only in the sales and purchases lines as it does not transfer livestock internally. In BFS2 trading livestock sales occur only once which is at the point when they reach feeder weights.

Allocation of operating costs between enterprise components

Enterprise costs are those costs that are readily allocated to the enterprise and include line items such as agistment costs, animal health and breeding costs, contract mustering and handling costs, materials, freight and selling costs and supplementary feed costs. Overhead costs are the costs of doing business and are typically not easily allocated at an enterprise level. These costs include administration, contract costs other than direct livestock, pasture costs, depreciation, electricity and gas, fertiliser, fuel and lubricants, insurance, landcare, lime and gypsum, motor vehicle expenses, rates and rents, repairs and maintenance and wages and on costs.

The cost base for the analysis has been calculated by allocating $10 per DSE for enterprise expenses and $24 per DSE for overhead expenses to BFS. These costs are derived from benchmarking analysis of a high performing beef breeding business.

The cost per DSE multiplied by the average annual stocking rate equates to $105,163 and $250,000 for enterprise and overhead expenses respectively in BFS.

Enterprise expenses have been allocated to enterprise components based on the proportional contribution of each to total enterprise production. BWS contributed 63 percent of total production and WFS contributes 37 percent.

As BWS contributes 63 percent of the total production in the BFS it has been allocated $65,737 of the enterprise costs equating to 63 percent of the BFS enterprise expenses. This equates to $105 per female joined and $8.20 per DSE. WFS is allocated the remaining enterprise costs of $39,425 equating to 37 percent of the total BFS enterprise costs. This equates to $103 per average trading head or $15.50 per DSE.

Overhead expenses have been allocated to enterprise components based on the proportional pasture energy use, measured in this analysis as stocking rate (DSE). BWS utilises 74 percent of total energy consumed while WFS uses 26 percent. Of the $250,000 total overhead expenses allocated to BFS, BWS is allocated $185,275 equating to $300 per female joined while WFS is allocated $64,725 of the total equating to $164 per average trading head managed. This equates to $24 per DSE managed for BWS and WFS.

Analysis output per unit of energy consumed (DSE)

The application of DSE units to classes of livestock in beef enterprises varies based on sex, stage of reproduction and growth stage.

The differences in energy requirements of each class of livestock over the production cycle are reflected in their average annual DSE rating per head. The energy requirements of the herd over the production cycle are calculated by multiplying the annual DSE ratings per head by the average number of head over the year. While this analysis uses DSE as the means of assessing energy consumption, the same principle applies equally when adult equivalents or other livestock units are used as the standard.

The comparison of the financial performance per livestock unit by enterprise or component is a way of establishing the efficiency of resource use, in this case the utilisation of pasture energy. This is appropriate because pasture energy is one of the most limited resources on farm.

Table 3 shows the comparisons of the financial analysis per livestock unit for each system. The livestock units used in this analysis are dry sheep equivalents (DSE). A DSE is a measure of the energy required to maintain a 45-50 kilogram castrated adult male merino sheep.

Table 3 below shows that WFS generates more than twice as much profit per unit of energy consumed than BWS. As stocking rate doesn't differ between enterprise components the relative difference in profits flow through when performance is assessed on an area basis. The relative contribution of BWS and WFS to whole farm stocking rate are shown in Table 4. These numbers represent the percentage of herd energy consumption from the BWS and WFS herd components.

Also shown in Table 4 is the relative contribution to herd production of BWS and WFS. Production is calculated as kilograms liveweight sold less kilograms liveweight purchased plus the difference between kilograms of liveweight between closing and opening.

Table 4 shows the BWS and WFS average annual stocking rates per farm represent 75 percent and 25 percent respectively of the total BFS stocking rate. In other words, the energy requirements of the BWS and WFS system are 75% and 25% respectively of the total energy consumed in the BFS.

The energy requirements of the BWS equate to 3 times that of the WFS. This relates primarily to the maternal energy requirements of the breeders in BWS.

Table 3 The trading component generates the majority of the value in a breeding system.

	Financial performance per production unit			
System component	BWS	WFS	BFS1	BFS2
Sales ($/DSE)	$68	$243	$112	$76
Purchases ($/DSE)	$9	$144	$43	$7
Inventory change ($/DSE)	$0	$0	$0	$0
Gross profit ($/DSE)	$59	$99	$69	$69
Enterprise expenses ($/DSE)	$10	$10	$10	$10
Overhead expenses ($/DSE)	$24	$24	$24	$24
Operating profit/EBIT ($/DSE)	$25	$65	$35	$35
Operating profit/EBIT ($/ha)	$328	$844	$457	$457
Operating profit/EBIT ($/ha/100mm)	$55	$141	$76	$76

Table 4 Breeders consume 74% of pasture energy, produce 61% of the liveweight and generate 54% of enterprise profit.

Systems component	BWS	WFS	BFS1	BFS2
Stocking rate (DSE % total)	75%	25%	100%	100%
Production (kg lwt % total)	61%	39%	100%	100%
Operating profit ($ % total)	54%	46%	100%	100%
Mid winter stocking rate (DSE % total)	69%	31%	100%	100%

Most of the key performance indicators differ between BWS and WFS (Table 5 below). This occurs due to the inherent differences between these production systems. Price received per kilogram is higher in BWS than WFS because the trading livestock (weaners) deliver a premium per kilogram when compared with the same livestock sold from the WFS as feeders.

Price received per head sold is however, lower in BWS than WFS. This occurs because the live weight of the weaners sold from BWS (213 kilograms liveweight per head) is far lower at sale relative to the same livestock sold from WFS (437 kilograms liveweight per head). Price per head sold in the BWS 7 includes surplus female sales but because the value per kilogram of these sales is low it does little to increase the price per head.

Production is lower per DSE (or per unit of pasture energy consumed) in BWS relative to WFS (Figure 3) due primarily to herd structure. The low production of BWS is a function of this enterprise component being a cow dominant herd with 80 percent of total numbers sold as weaners. These weaners have an average weight of 213 kilograms liveweight at sale. While cows, heifers and bulls are far heavier than weaners they make up only 20 percent of the total numbers sold. The production per DSE in this system is diluted because breeding females weaning a calf at 6 months of age have an average DSE rating of 12.5 DSE per head.

Table 5 Breeder energy requirements are three times higher than those of trading livestock

Productivity and efficiency key performance indicators

System component	BWS	WFS	BFS1	BFS2
Cost of production ($/kg lwt)	$1.95	$1.03	$1.60	$1.60
Price received ($/kg lwt sold)	$3.81	$3.70	$3.75	$3.50
Price received ($/head sold)	$1,065	$1,616	$1,307	$1,605
Production (kg lwt/DSE)	17.5	33.0	21.3	21.3
Production (kg lwt/ha)	227	429	277	277
Production (kg lwt/ha/100mm)	37.8	71.5	46.2	46.2
Average annual stocking rate (DSE/ha)	13.0	13.0	13.0	13.0
Mid winter stocking rate (DSE/ha)	9.7	12.9	10.5	10.5
Average annual stocking rate (DSE/farm	7,794	2,598	10,391	10,391
Mid winter stocking rate (DSE/farm)	5,828	2,577	8,406	8,406
Area allocation (ha)	600	200	800	800
Labour productivity (DSE/FTE)	13,855	13,855	13,855	13,855
Labour productivity (Gross profit/FTE)	$821,816	$1,372,206	$959,401	$959,401

Contrast this with WFS where production is 217 kilograms liveweight per average trading head (after adjusting for mortalities) but the average annual stocking rate is 6.9 DSE per head. This is how the production figure of 31.5 kilograms live weight per DSE is calculated in WFS. The reason the average annual stocking rate is 6.9 DSE per head is that from 6-12 months of age weaners carry a DSE rating of 6.5 DSE per head and from 12 to 24 months when they move to steer and heifer classes, they carry a DSE rating of 8.5 DSE per head. The steers however are sold at 16 months of age and the heifers at 18 months of age thus they carry the highest DSE rating for only 33% and 50% of the year respectively.

Figure 3 below shows that the mid-winter stocking rate of WFS is 26 percent higher than BWS. This occurs because the total BFS1 area (800 hectares) has been allocated to enterprise components based on the proportion of average annual stocking rate carried by each enterprise component. The enterprise component mid-winter stocking rate is calculated by multiplying the number of head by the DSE rating per head and adding the total in July. The mid-winter stocking rate of BWS and WFS is 5,828 DSE and 2,577 DSE respectively. These are divided by the area allocated to enterprise component to give the mid-winter stocking rate per hectare.

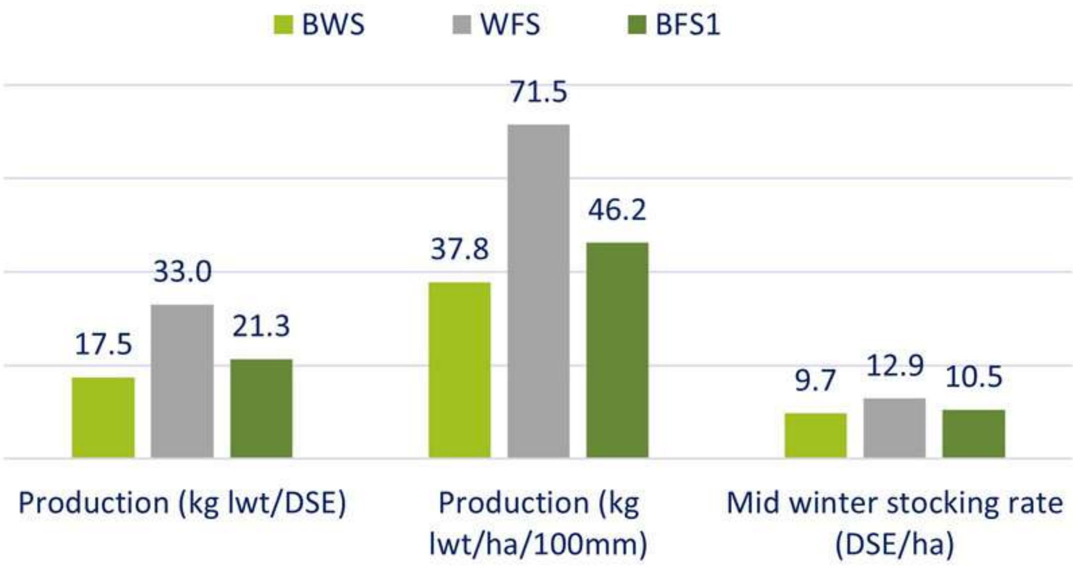

Figure 3. WFS generates 80% more production than BWS

Table 6 below shows the gross financial performance by enterprise component (BWS and WFS) and by whole enterprise (BFS1 and BFS2). The only difference between BFS1 and BFS2 is the sales and purchases to generate gross profit. In BFS1 weaners are internally transferred from BWS where a sale price is allocated to WFS where a purchase price is allocated. BFS1 is calculated as the sum of of BWS and WFS.

BFS2 sells only feeder livestock and weaners are not allocated a sale or purchase price as they move internally between classes. Irrespective of the method use to derive the figures, the gross profit, enterprise expenses, overhead expenses and operating profit remain the same for BFS1 and BFS2.

Table 6 BWS generates the highest proportion of profits but requires more pasture energy to deliver them.

Enterprise financial performance - gross				
System component	**BWS**	**WFS**	**BFS1**	**BFS2**
Sales	$532,285	$631,883	$1,164,168	$789,551
Purchases	$70,000	$374,617	$444,617	$70,000
Inventory change	$0	$0	$0	$0
Gross profit	$462,285	$257,266	$719,551	$719,551
Enterprise expenses	$77,936	$25,976	$103,912	$103,912
Overhead expenses	$187,505	$62,495	$250,000	$250,000
Operating profit/EBIT	**$196,843**	**$168,796**	**$365,639**	**$365,639**

The Sensitivities

The outcome of this analysis is sensitive to a range of factors including, but not limited to, weight at weaning, weaner to feeder price ratio, cow weight at sale and feeder steer price. Sensitivity analyses have been conducted to establish the extent to which the base case changes with changes in key factors.

Figure 4 shows that the lower the weaner weight, the greater the operating profit per DSE of the WFS compared with the BWS.

Feeder steers and heifers are sold at 448 and 418 kilograms liveweight per head, regardless of weaner weight so changes to weaner weight affect sale value in the BWS and purchase value in the WFS. The higher the weaner weight the higher the contribution of the weaner to sales in the BWS and the lower the accrued weight gain the WFS.

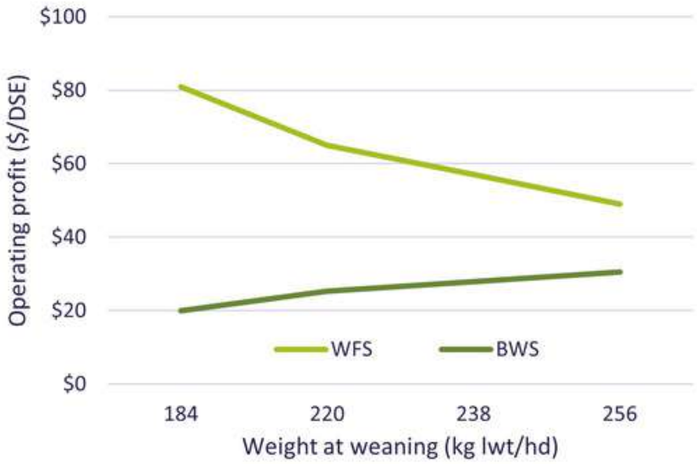

Figure 4 as weaning weight increases the relative difference in operating profit between WFS and BWS contracts.

The ratio of weaner price to feeder price influences the relative profit of the BWS and WFS (Figure 5). In this sensitivity the feeder price is fixed at $3.80 per kilogram and the weaner price changes based on changes to the weaner to feeder price ratio. A weaner to feeder price ratio of 120% equates to a weaner price of $4.56. This is derived by multiplying the fixed feeder price of $3.80/kilogram by the ratio of 120%.

Changes in the weaner to feeder price ratio have the dual impact of increasing profits in BWS due to higher prices for weaners but it is this same higher price for weaners that decreases profits in WFS. The point in this analysis at which each enterprise component has the same profit per DSE is a weaner to feeder price ratio of 140%

Figure 5 Profits between BWS and WFS are evenly distributed when the weaner to feeder price ratio sits at around 140%

Cow weight at sale influences BWS operating profit but does not influence BFS profits because cows are sold from BWS but no cows are sold from WFS. Figure 6 shows that as cow weight increases operating profit per DSE increases in BWS but there is no change in WFS.

As the weaner to feeder price in this analysis is based on current prices, and they sit at a weaner to feeder price ratio of around 120 percent, then the trading component (WFS) is delivering more profit per DSE than the breeding component (BFS).

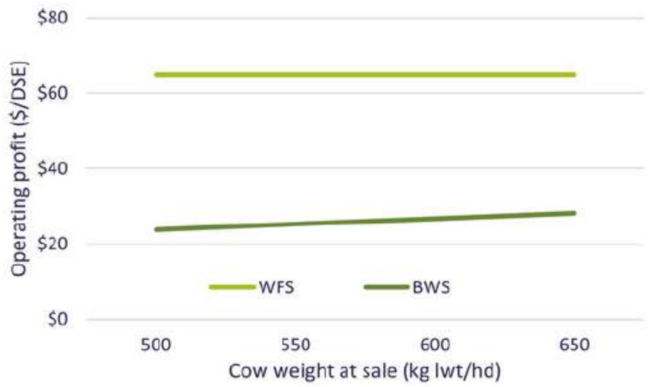

Figure 6 Cow weight at sale influences BWS but has no effect on WFS.

Feeder steer price has a large impact on WFS because WFS is selling feeder weight trading livestock. There is no impact on BFS operating profits per DSE (Figure 7). This sensitivity differs to the weaner to feeder price ratio analysis as the weaner price in this scenario is maintained at the base rate.

The fixed weaner price rate is why there is no change in the BFS profits. The income or sales line in WFS is heavily dependent on the feeder steer price and feeder heifer prices in this analysis are indexed to the feeder steer price. BFS operating profit does not change as weaners, not feeders are sold from this system.

Figure 7 As feeder steer price increases so do profits assuming no change in weaner steer price.

Production allocations per hectare

The allocation of area to enterprise component has been conducted on the basis of the proportion of average annual DSE carried. Where the allocation of area is based on the proportion of mid-winter stocking rate then many of the key performance indicators change. The whole enterprise financial performance and the performance per DSE are not sensitive to this change.

Figure 8 and Figure 9 show a number of key performance indicators for BWS and WFS expressed as a relative proportional change when compared of BFS1. For example, WFS production per DSE is 50 percent higher than BFS1 while BWS is 18 percent lower. BFS1 production per DSE is made up of contributions from BWS and WFS. It is the production per DSE and the liveweight contribution to total that delivers the production per DSE in BFS1.

Production per DSE doesn't change irrespective of the method by which area is allocated. The difference in production per hectare however is reduced from 89% where area is allocated according to the relative enterprise component contribution to average annual stocking rate to 43 percent where area is allocated according to mid-winter stocking rate.

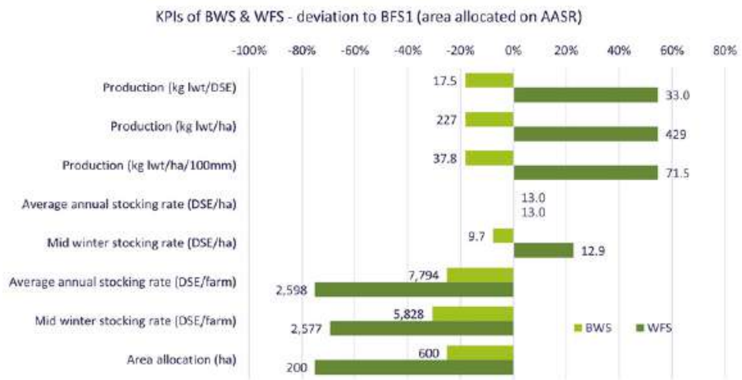

Figure 8 Where area is allocated on the enterprise component contribution of average annual stocking rate there is an 80% variation in production per hectare between BWS and WFS.

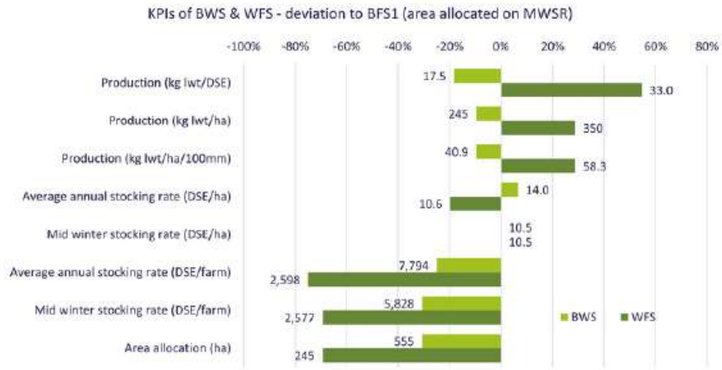

Figure 9 Where area is allocated on the enterprise component contribution of mid-winter stocking rate there is an 80% variation in production between BWS and WFS.

What this means to you

This analysis suggests that the most profitable use of a unit of pasture energy is to provide it to trading livestock in preference to breeding livestock. Current pricing has the pendulum swinging strongly in favour of the trading component of the breeding system when compared with the breeding component.

Before making a wholesale change out of breeding into livestock trading there are a number of issues that need further consideration. Some of those include:

- The ability of different livestock classes to convert feeds of different quality into product.
- The impact of transaction and induction costs when purchasing trading livestock externally compared with breeding them internally.
- The difference in skill set between trading and breeding enterprises.
- These issues and others will be covered in the next article in this series.

Like to know more?
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