Sheep enterprises—what are the differences?

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Abstract: Difficult seasonal conditions during the last six years have placed many farms under significant financial pressure. Producers have been looking for enterprise changes which will quickly improve their profits. New breeds have increased the options available, but there is rarely any local production data for them. Information in the media has done little more than create confusion about the true differences between sheep enterprises. Modelling allows this complex question to be looked at in a logical fashion and combines production and financial factors in the comparison. GrassGro® was used at two locations in southern NSW, Yass and Cowra, for the period 1960 to 2007. The results indicated that no enterprise performed consistently better based on profit per hectare. More detailed work within enterprises showed that the range within an enterprise due to changes in genetics or replacement costs was far greater than the differences between enterprises. The risks associated with changing an enterprise are generally greater than from improving an existing one. It is important that advisers base their comments about enterprise choice on robust information rather than the simplistic information that circulates within the sheep industry.

Keywords: Sheep enterprises, modelling, GrassGro®, profitability.

Introduction

This paper looks at the production and financial details of a number of sheep enterprises run in the Southern Tablelands and Slopes regions of New South Wales.

The method used in this work ensures consistency in analysing how the enterprises are run. When an enterprise change is made, sheep producers will often change a number of managerial factors as well. Therefore, the on-farm result is usually due to a change in a livestock system not just the enterprise. Some of the major variables that might be changed in grazing systems are stocking rates, feed rates for finishing, fertiliser rates, and use of fodder crops. To ensure a valid comparison, the enterprises were adjusted to consume a similar amount of pasture and the enterprise stocking rates have been adjusted to achieve this.

The second part of the paper investigates strategies to improve profitability and manage risk within given sheep enterprises over the long term.

Materials and methods

The CSIRO-developed GrassGro® program can be used to evaluate the impact and assess the risk of different sheep enterprises over the long term. It uses soil, daily weather, plant and animal production data, plus financial data, to model a grazing system. The program calculates production and financial information for each year. The details provided are the averages for the period and include the variability in results between years.

GrassGro® analysis for the period 1st January 1960 to November 2008 using actual weather data for Yass and Cowra has been reported. Actual temperature and rainfall data were used to model an annual grass and clover pasture system. Previous work has shown that the model is able to replicate measured field data for Yass (Final Report to AWI Project EC245 Sustainable Stocking Rate Decisions). It reflects a productive site, with a typical southern NSW pattern of green feed starting from late April and drying off in late November. In some years the summer will be green, depending on rainfall events. Lambing occurs in late August for all enterprises. Even in dry years all animals are retained and fed grain within the model. The long-term annual pasture production was approximately 8,200 kg DM/ha/year for Yass and 7,500 kg DM/ha for Cowra.

To compare the enterprises fairly, the number of ewes/ha is adjusted so that the amount of pasture consumed is similar. For example, enterprises with larger mature weight ewes will run fewer ewes per hectare than enterprises based on smaller ewes. The utilisation rate of pasture grown by the enterprises was 46–47%. This is the average utilisation rate during the 46 years of data. The DSE /ha was approximately 14. The long-term grazing demonstration at Yass has averaged 13.5 DSE over 13 years so this level of utilisation is valid for this site. The last 13 years have been 'harder' than the average of the 46 years used in the modelling work. At a utilisation rate of 46% for this region, you achieve a balance between profit/ha and the extreme down side risk of droughts and permanent damage to pastures. Table 1 shows the enterprises that were evaluated.

The prices and costs used are kept constant between each year. So it is the pasture production and subsequent animal production

due to weather variation which generated the financial differences.

The monthly prices for both wool and meat are shown in Tables 2 and 3. They are the five-year averages for each month during the period 2003–2007. Within the meat data there is also a built-in variation between months. The lamb price for June is 1.1 times the base price. This monthly price relationship is derived from the NSW National Livestock Recording Scheme data for 2003–2007. Dressing percentage between breeds did vary for both adults and lambs. There is a within-year variation for mutton prices as well with the peak of 1.4 times base price occurring in July.

The costs used (see Table 4) are based on a five-year average and applied constantly over every year in the analysis.

The breed characteristics used are based on published data and personal experiences. The relative difference in production parameters of the different enterprises is more important than the absolute values.

Because the amount of pasture consumed has been kept constant, changes in body weight, reproductive rates, breeding replacement ewes or buying in ewes and the time of progeny sale all influence how many ewes can be run. For example, M-18L runs 613 ewes, whereas M-18Y only runs 529 ewes because the progeny are kept longer, consuming more pasture and the enterprises were compared at similar annual pasture utilisation rates.

All enterprises are self-replacing except for PL and MT; the replacement ewes are bought in at 15-months of age, PL for $100/hd and MT $70/hd.

For all enterprises, except M-18Y and M-20-Y, the surplus ewes and all wethers are sold as lambs at 44kg live weight, or by no later than 15th June. Grain is used if this weight cannot be achieved on pasture.

For the meat operations (PL, MT, S,) the lambs are finished as quickly as possible and sold, e.g. January/February. Progeny from the wool operations are fed slower, with the latest sale being for M-18L in June. It was best to shear the wool breeds before sale. The sale price per head received ranged from $82.79 for PL to $64.36 for M-20-L/M-18L. There is a difference in weaning weight of 8.2kg between M-18L and PL.

There are small changes in death rates between enterprises with the highest being where progeny are kept the longest.

The differences in the reproductive rates represent the ranges we have experienced on farms within the region. The reproductive rate varies each year depending on the fat score of the ewes at joining as driven by seasonal conditions. The results are the long-term averages. In good years the results for all enterprises were higher, e.g. PL was between 145–159%. It is the difference between the enterprises that is critical. This comment applies to all the breed characteristics.

Results

Enterprise comparison

There is little difference in the profitability or productivity ranking of enterprises between Yass and Cowra, as shown in Tables 5 and 6.

Management strategies to improve profit and manage risk

A weakness of the analysis is that it is based on "industry averages". The following work examines a number of the enterprises and how varying some key enterprise variables affects the financial outcomes. The Yass data have been used in the following analysis.

What is the impact of fast or slow finishing phase for lamb?

In Table 7 the first column is the five-year average result from the paper. The next four columns look at two lamb prices and two finishing speeds. Fast means the lambs were finished as quickly as possible, e.g. sold in January/February. Slow means the lambs were finished for a June/July sale at a higher price. The reproductive rate (RR) was kept the same as before, 118% over the long term. This indicates that holding out for the higher winter prices does not mean higher profits when looked at over the long term.

What is the impact of Improved Wool Genetics?

Table 8 looks at the top performing lamb and wool systems against a lower performing wool operation, based on wether-trials data. The variation between the wool operations is much greater than the differences between the different enterprises. Even with the current prices, lamb regarded as high and wool low, top-performing operations have similar results. Improving the genetic performance of your current enterprise might be just as profitable as changing to another enterprise. Also, changing enterprises incurs changeover costs, which are not examined here.

What is the impact of varying replacement ewe cost?

The price for first-cross and merino ewes has increased to levels well above those used in the five-year average work. Table 9 looks at the impact of varying replacement ewe prices. The bold figures are the five-year average results.

Which is more important, meat or wool in dual-purpose breeds?

With dual-purpose breeds what emphasis/weighting should be placed on wool or meat? The Dohne data were used to look at the impact of varying wool and meat prices. For the wool industry the 20th (20 micron 795c/kg clean) and 80th (20 micron 1021c/kg clean) price percentile, for the last five years were used to provide a high and low range and for lamb the prices used were low 290c/kg and high 390c/kg. These lamb prices are the base price, and the within-year variation also applies. If the lambs are sold in late autumn or winter the price increases by 10%. The codes used in Table 10 are LW/LL low wool, low lamb, 5W/5L five-year average prices, HW/HL high prices. The impact of the variation in wool price from low to high was to change profit by $56/ha. The impact of the lamb variation was $68/ha. Both have an impact and need to be considered.

Table 11 outlines the impact of changing emphasis on production traits of the dual-purpose breed with a time period of five years in mind. What are the impacts if fibre diameter is decreased by 0.6um or fleece weight increased by 0.2 kg or reproductive rate is increased by 5% due to genetics not management? The five-year average prices were used. The base profit from the work was $160/ha as highlighted in Table 9 (5W/5L).

Working on a single trait will have a negligible impact on profits. With dual-purpose breeds all aspects of the animal production must be addressed in the breeding program.

What is critical within a Dorpers enterprise?

Dorpers are increasing in popularity across many regions of NSW. It seems that many people are switching to Dorpers for reasons other than just profit, including lower labour requirements, no mulesing, no shearing, and lower capital cost. The financial performance of Dorpers should be compared with beef breeding rather than other sheep enterprises.

It is our view that Dorpers have a different grazing behaviour from other sheep enterprises being evaluated in this paper, which is an advantage in areas where there is browse. In this work we have made no allowance for the different grazing behaviour and the resulting production improvements. We have assumed a Dorper-type enterprise that is fully shedding.

The base production data for the Dorper enterprise has a reproductive rate 118%, lamb price 359c/kg and $0 for the skin. Management costs have been reduced compared with other sheep breeds from $5.50/ewe unit to $3.90/ewe unit with no shearing costs. All previous comparisons in this paper have used an overhead cost of $100/ha, whereas for the Dorpers we have used two overhead figures of $100 and $70/ha. The reduced figure ($70/ha) is to take account of a potential lower labour cost. Table 12 shows the impact on profit/ha of a range of changes to prices and production.

Table 13 examines the impact on profits/ha for a combination of factors for a Dorper enterprise.

The lack of a skin market is having a major negative impact on returns and is an area that would provide a major improvement in profitability. Potentially the Dorper skin could be worth more than a XB skin. The sale of Dorper meat into the organic market for a higher price is important. For comparison a cow and calf unit has profit figures of $161/ha using five-year average prices and costs, and $100/ha overhead costs for the Yass area.

What is the impact of dry seasons and reducing stocking rate at Cowra?

What is the financial impact of an extended dry run of years on a livestock enterprise run at a stocking rate of 14 DSE/ha against the longer-term historical weather records? This was calculated to obtain a gross estimate of the likely impact a terminal ram x merino ewe enterprise run at Cowra. The relativity of the results discussed is important rather than the detail as a five-year run in GrassGro® is a relatively short period given the between-year variation experienced between 1960 and 2007.

From Table 14 we can see that the fundamental issue during the five-years examined is that rainfall is lower by 17%, resulting in a 22% reduction in the amount of dry matter grown each year. Pasture utilisation has increased and reduced ground cover has resulted, although this is not discussed here. Supplementary feeding costs have increased by 36% and profit has declined to 37% of its historical levels. Producers have managed this situation by lowering the stocking rate. If the stocking rate is reduced to 75% of the historical levels to manage the situation during 2002–2007 to reduce business/environmental risk, then there is no further negative impact on profit per hectare—it remains at approximately $50/ha. Reducing stocking rates by more than this decreases profit during 2002–2007. However, no management strategy could be modelled to return profitability to historical levels during the five years—the fundamental issue being less pasture grown and available to the livestock. You would expect that when supply of lamb is lower due to lower stocking rates that sheepmeat prices would be higher.

Interestingly, there has been an improvement in lamb price during the period from 2002.

When the average lamb price was increased by 20% (from $3.39/kg to $4.00/kg) the profit/ha returned to historical levels of $120/ha.

Discussion

The variation in the profit/ha figure between enterprises is small. No enterprise stands out as being superior to any other over the long term.

One of the major contributing factors when considering a different enterprise is a change in commodity prices, particularly the relativity between wool and meat for a sheep enterprise. To test the influence of improved lamb price, it was increased to $4.00/kg (from $3.60) for PL and $3.40 (from $3.00) for M-18L. This resulted in a $50/ha increase in profit for PL to $212/ha and a $27/ha increase for M-18L to $202/ha. An increase in lamb price will have the greatest influence on enterprises that derive a higher proportion of income from lamb such as PL and MT. The changes in the other enterprises due to increased lamb prices would reflect the amount of income they received from meat sales.

Currently the 18-micron wool price is 130c/kg above the five-year average. This increase in price improved the M-18L profit by $35/ha to $210/ha. The drop in current medium wool prices (10 to 30c/kg) below the five-year average would negate some of the increase in lamb price for enterprises relying on income from both products.

The variability in profit is greater in enterprises most reliant on lamb sales and less volatile between years in enterprises where wool sales make a significant contribution to profit.

The cost of buying-in replacement ewes is a significant factor in enterprise choice. This is reported as a dollar/ha value for each enterprise in Table 9. Replacement-ewe cost exposes the enterprises involved (PL and MT) to significant business risk as it is their largest expense on a dollar per ha basis. An increase of $25/head, to $125/head for the PL operation reduces profit by $33/ha to $129/ha. The impact on MT would be of a similar magnitude. The ewe buy-in price varies each year exposing the enterprises to significant risk, and as lamb prices improve the ewe replacement cost also usually increase, diminishing the profit/ha. Another major management factor influencing enterprises reliant on purchasing replacements is the disease risk, availability and genetic merit of ewes as prime lamb dams available at this price from year to year.

A management dilemma for enterprises with options for finishing lambs for slaughter is whether to supplement for fast growth or slow growth when pasture conditions are inadequate to provide growth sufficient to turn-off lambs at the 44kg slaughter weight. The general principle of supplementing lambs for fast growth and finishing as soon as possible rather than slow growth in anticipation of an autumn break reduced the overall feed cost to finish the lambs held when tested over the 46 years. This was especially the case for enterprises based on faster growth genetics. The higher the wool value, the less advantage there was in finishing quickly. The higher lamb price in June generally failed to compensate for the higher feed cost of keeping lambs until winter. This relationship will vary from year to year and the decision to finish quickly with grain should be made on the basis of lamb and grain prices, and the lambs' genetic potential for growth for that year.

Table 5 shows the five-year average price received and the five-year average cost of grain used to finish the lambs on a per hectare and per head finished basis. For PL the difference between price received and cost of feeding was $74.71/head and for M-18L $51.38/head. In summary, those enterprises with genetics for high growth achieved more growth on pasture and used less grain. However, the profit of these enterprises is more sensitive to reproductive rate and the ability to turn off lambs in dry years.

Sheep enterprises that have no wool income (Dorpers) carry more market risk as they are totally reliant on the sheepmeat market. Profitability is also more sensitive to variation in reproductive rate (RR). When prices are low and RR is low then Dorper enterprise profitability is very low. If price and RR are high then profit/ha is similar to other sheep enterprises. Reduced overhead costs of $70/ha to account for less labour involved with no shearing or crutching, improves the Dorper profit/ha but the improvement is insufficient to compensate for nil skin value.

The results overall confirm that profitability alone does not determine enterprise choice, but skill set, capital improvements (yards and sheds) and labour requirements also play a significant role.

Conclusion

The variation in profit/ha between enterprises is minor compared with variation between years and within enterprises. No one sheep enterprise is by far and away superior to any other over the long term.

For all enterprises, the basic assumptions are important, we have tried to use what we believe are industry averages. A different set of breed characteristics or replacement costs makes substantial changes to the results as seen in part B of the paper. The genetic potential and how well the enterprise is managed will have greater impact on profitability than the enterprise itself.

This analysis also assumes the managerial ability to extract the assumed performance from the enterprise. This is not always the case, as a different skill set will be required to finish lamb, for example, and be a significant factor in enterprise choice.

The capacity and fertility of the basic land resource cannot be ignored. If the land capacity results in requiring an increased amount of grain to finish lambs, that will have a negative impact on the relative enterprise performance (higher supplementary feed costs). In some environments the best option would be to sell all lambs off as stores. This has not been assessed.

These results are different from the current view within industry because in the modelling we have held constant the amount of grass eaten and expressed all results as dollars/ha. When producers change enterprises they change a range of factors and results are usually discussed on a dollar/head basis. These two factors mask the truth. Gross margins do not accurately account for production differences that occur between breeds unless the production factors are taken from modelling work.

As advisers we should be using the available models to ensure we provide robust advice on complex industry issues.

Appendix

Table 1. Description of enterprises evaluated

Enterprises evaluated	**Code**
2nd Cross Lamb from 1st X ewe	PL
Dohnes – lamb sold at 44kg	DI
Dohnes – lamb sold at 50kg – later lamb shearing	D2
Samm	S
Merino Ewe joined to Terminals	MT
Merino Ewe – 18 micron – lambs sold at 44kg	M-18L
Merino Ewe – 18 micron – all lambs shorn & sold at 15 mths	M-18Y
Merino Ewe - 20 micron – lambs sold at 44kg	M-20-L
Merino Ewe - 20 micron – all lambs shorn & sold at 15 mths	M-20-Y

Table 2. Wool prices

Micron	18	19	20	21	23	26
c/kg clean	1076	976	885	838	800	590

Table 3. Lamb/meat prices

Meat Price	1st Cross Ewes, Samm,	Merino/Terminal	Dohnes	Merino Lambs	Mutton
$/kg	$3.60	$3.39	$3.30	$3.00	$1.80

Table 4. Costs

Overhead costs	$100/ha
Grain	$280/tonne
Fertiliser	$30/ha
Shearing	$5.74/hd

Table 5. Breed characteristics and results for Yass

	PL	D1	D2	S	MT	M-18L	M-20L	M-18-Y	M-20-Y
Adult Ewe Weight (kg)	70	60	60	68	55	50	55	50	55
Fleece Weight Adult (kg)	4.2	4.8	4.8	3.8	4.5	4.8	5.5	4.8	5.5
Fibre Diameter Adult (µm)	27.0	20.2	20.2	23.0	20.0	18.0	20.0	18.0	20.0
Median Reproductive Rate (Lms/100 ewes)	118	97	97	113	91	84	85	80	85
RESULTS									
Utilisation Rate (%age)	46	46	46	47	46	46	47	47	48
Number of Ewes/100ha	556	511	488	506	711	635	587	532	476
Number of Lambs Sold (ave)	668	359	341	470	659	383	362	0	0
No of Hoggets Sold	0	0	0	0	0	0	0	294	285
Wool Income /ha	92	212	210	137	214	330	282	346	305
Meat Income /ha	624	324	334	422	565	284	273	184	185
Total Income ($/ha)	716	536	544	559	779	614	554	530	490
Finishing Grain ($/ha)	54	47	47	42	93	78	60	-	-
Maintenance Grain ($/ha)	62	65	67	68	65	72	72	70	68
Finishing Grain ($/head)	8.08	9.29	9.75	7.09	14.11	14.66	12	-	-
Lamb Price ($/hd)	82.79	76.08	88.26	80.00	77.40	66.04	64.46	-	-
Replacement Ewes ($/ha)	127	-	-	-	113	-	-	-	-
Total Expenses ($/ha)	554	379	376	405	597	440	407	363	350
Profit ($/ha)	162	157	168	155	181	175	147	167	141
*Variability of Profit ($/ha)	174	131	135	139	132	146	138	121	115

* The variability of profit ($/ha) is the range in profit over the 46 years, for example, the PL is positive $336 to negative $12/ha and the MT is positive $321 to $29/ha

Table 6. Breed characteristics and results for Cowra

	PL	D1	D2	S	MT	M-18L	M-20L	M-18-Y	M-20-Y
Adult Ewe Weight (kg)	70	60	60	68	55	50	55	50	55
Fleece Weight Adult (kg)	4.2	4.8	4.8	3.8	4.5	4.8	5.5	4.8	5.5
Fibre Diameter Adult (µm)	27.0	20.2	20.2	23.0	20.0	18.0	20.0	18.0	20.0
Median Reproductive Rate (Lms/100 ewes)	123	103	103	119	97	92	92	92	92
RESULTS									
Utilisation Rate (%age)	47	48	49	48	46	47	47	49	49
Number of Ewes/100ha	561	519	495	513	716	640	578	522	474
Number of Lambs Sold (ave)	705	395	373	516	703	437	395	0	0
No of Hoggets Sold	0	0	0	0	0	0	0	348	317
Wool Income /ha	89	221	219	132	205	326	279	340	299
Meat Income /ha	645	347	355	445	595	314	289	211	202
Total Income ($/ha)	734	568	574	577	800	640	568	551	501
Finishing Grain ($/ha)	90	81	81	70	134	125	97	-	-
Maintenance Grain ($/ha)	90	94	98	99	97	105	98	113	107
Finishing Grain ($/hd)	12.76	14.89	15.70	11.25	18.72	21.04	18.09	-	-
Lamb Price ($/hd)	84.57	77.88	91.23	80.45	77.37	67.74	66.34	-	-
Replacement Ewes ($/ha)	127	-	-	-	113	-	-	-	-
Total Expenses ($/ha)	622	454	451	468	677	529	477	416	395
Profit ($/ha)	112	114	123	109	123	111	91	135	106
Variability of Profit ($/ha)	142	143	152	146	141	157	145	134	124

Table 7. The effect of fast or slow lamb growth rate

PL 5yr $3.60/kg fast	PL $4.00/kg fast	PL $4.80/kg slow	PL $4.40/kg fast	PL $5.20/kg slow
$162/ha profit	$221/ha	$213/ha	$262/ha	$258/ha

Table 8. Impact of improved wool genetics

PL $4.40 fast	Improved genetics 6.4kg at 17.9um	Merino low performing 4.0kg at 18um
118% marking	80% marking	80% marking
5.4 ewes/ha	5 ewes/ha	5 ewes/ha
$262/ha profit	$250/ha profit	$89/ha profit

Table 9. The impact of replacement ewe cost

	Replacement cost $/hd	Profit $/ha
1st cross ewe	150	97
	125	129
	100	**162**
Merino ewe	110	115
	90	147
	70	**181**

Table 10. Varying wool and meat prices (profit $/ha)

LW/LL $110/ha	5W/LL $132/ha	HW/LL $166/ha
LW/5L $137/ha	**5W/5L $160/ha**	HW/5L $193/ha
LW/HL $178/ha	5W/HL $201/ha	HW/HL $234/ha

Table 11. Improving productivity traits (profit $/ha)

Decrease FD by 0.6 to 19.6	$165/ha
Increase FW by 0.2 kg to 5.0kg	$163/ha
Increase RR by 5% to 102%	$164/ha

Table 12. Effects of lamb price and reproduction rate on profit per hectare for Dorpers

Lamb price	Overheads $100/ha	Overheads $70/ha	
425 c/kg	$120 /ha	$150 /ha	
400 c/kg	$101 /ha	$131 /ha	Reproduction rate 118%
359 c/kg	$59 /ha	$89 /ha	
320 c/kg	$20 /ha	$50 /ha	
Reproduction rate			
127%	$78 /ha	$108 /ha	
118%	$59 /ha	$89 /ha	Lamb price 359 c/kg
110%	$30 /ha	$60 /ha	

Table 13. Effects of lamb and skin price on profit per hectare for Dorpers

	Overheads $100/ha	Overheads $70/ha
118%+450c/kg+$10 skin	$195 /ha	$225 /ha
118%+450c/kg+$0 skin	$145 ha	$175 /ha
118%+425c/kg+$0 skin	$120 /ha	$150 /ha

Table 14. Effects of dry seasons

	2002–2007	1960–2007
Ave Annual rainfall	524mm	627mm
Ave Annual Pasture Grown	5937kg	7608kg
Pasture Utilisation Rate	53%	46%
Ave Total Income/Ha	$805	$800
Ave Total Cost/Ha	$759	$677
Average Profit	$46	$123
Ave Maintenance Supp cost /Ha	$153	$97
Ave Finishing Supp cost/Ha	$159	$134