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ANALYSIS AND DISCUSSION OF YEARLING MERINO SHEEP PRODUCTION SYSTEMS

Prepared for:

Sheep CRC

Prepared by:

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14th May 2004

Executive Summary

- A yearling merino sheep system will allow producers to capture the benefits of the current high sheep meat prices within their existing resource base. They can do this without having to change their genetics or substantially alter their pasture resource base to provide out of season feed. The system enables them to utilise two springs for weight gain purposes, whereas a weaner production system only has one.
- Based on the assumptions used in this analysis, over the long term and at the extreme ends of historical meat and wool prices the spring lambing, self replacing yearling merino wool production system is competitive with the profitability of all other flock structures and enterprise mixes.
- The extreme market circumstance where the yearling sheep flock structure is marginally outperformed by other flock structures or enterprises is when there are concurrent top quartile wool prices and bottom quartile sheep meat prices. Under this situation the wether dominant wool flocks came to the fore. Or alternatively where there are concurrent bottom quartile wool prices and top quartile sheep meat prices in which case the dual purpose flocks came to the fore.
- Current market prices would suggest that some incorporation of a dual purpose enterprise into the system is likely to lift farm profitability. To do this the manager would join a percentage of cull or older age group ewes to a terminal sire and sell all progeny.
- In making a change to either enterprise mix or flock structure the individual farm manager should be cognisant of the changed demands on their pasture resources, labour requirements, and their ability to control worms.
- It is recommended that further geographic area specific work needs to be done with regard to the ability for sheep liveweight specifications to be met across a range of seasons and with a varied pasture base to get a better understanding of the suitability of these enterprises to different locations. It is felt a large part of that work could be done using the CSIRO Plant Industries Grassgro model.

Section 1: The Gross Margin Model and Assumptions Used

Background

Holmes Sackett and Associates have been commissioned to compare a yearling Merino meat-wool production system with the profitability of other sheep enterprises. The aim of the study is to highlight key impacts that a yearling Merino production system is likely to have on the product mix and profitability of a wool enterprises and to develop a list of the qualitative 'management and resource' issues that will need consideration should a change to a yearling production system be implemented.Table 1 shows the proposed enterprise and management structures that were modelled using a sheep flock gross margin spreadsheet. The merino cross and prime lamb enterprises were included to provide perspective on whether the impacts of changing to a yearling sheep production system based on merinos are more or less significant than changing the genetics of the flock to specialise in sheep meat production.

A yearling system carries progeny past one year of age but they are sold before they reach 2 years of age. A weaner is sold before it reaches 1 year of age. The yearling system for prime lamb was included for the purposes of a theoretical comparison rather than as a suggested system for adoption.

Table 1: Enterprises analysed

Enterprises	Self Replacing Merinos	Merino x Terminal Sire	Prime Lamb
Variations	Sell Weaners	Sell Weaners	Sell Weaners
	Sell Yearlings	Sell Yearlings	Sell Yearlings
	Sell Wethers @ 3y.o.		
	Sell Wether @ 5y.o.		

A sophisticated gross margin model of a sheep flock was used for this analysis which determines the relative gross margins per DSE and per hectare based on interactions between the whole flock structure including age classes, the physiological state of each animal through winter and their relative intake requirements.

The model incorporates the impact of age effects on survival, reproductive performance, wool quality and wool quantity.

Assumptions

Flock Numbers

A fixed area with a predetermined maximum mid-winter DSE rating is used to determine the number of animals and the relative flock structure that can be run. The winter DSE limit is in place under the assumption that it is the time of the year where feed is most limiting. A constant flock structure is maintained from one year to the next. For the purposes of this study a stocking rate limit of 15 DSE's per hectare was chosen which is representative of a 600 to 700mm rainfall region in southern temperate Australia.

Expenses

The gross margin is derived by deducting the enterprise specific expenses from the gross income generated from the flock. Enterprise specific expenses include shearing, crutching, drenching, vaccinations, supplementary feed and selling costs.

The gross margin analysis does not include expenses such as labour, fertiliser, pasture costs or other general farm running expenses.

Genetics

The merino genetics used in the gross margin model have an adult wool fibre diameter of 20.5 micron and a clean fleece weight of 4kg. For the dual purpose flock the adult fibre diameter was increased to 21 micron with a clean fleece weight of 4kg. The prime lamb flock had an adult fibre diameter of 29 microns with a clean fleece weight of 4kg.

Lambing Time

Within any geographic region the lambing time chosen by producers may vary from March to October. The lambing times chosen for the modelling in this project are shown in Table 2. The chosen lambing dates were deemed to be reflective of a significant portion of the industry.

Because one of the most significant advantages of a yearling system might be increasing producer comfort with a spring lambing the yearling systems were replicated with a change in lambing time to spring to highlight the impact that a change in lambing time may have on profitability.

Table 2: Selected lambing times for individual enterprises

Self Replacing Merino Flock	Initial Lambing Date	Spring Lambing Date
Sell weaners	15th July	1st Sept
Sell yearlings	15th July	1st Sept
Sell 3 year old wethers	15th July	1st Sept
Sell 5 year old wethers	15th July	
Dual Purpose Flock		
Sell weaners	1st Jun	
Sell yearlings	1st Aug	1st Sept
Prime Lamb Flock		
Sell weaners	1st Jun	
Sell yearlings	1st Aug	1st Sept

The choice of lambing time is important to the model because it determines the DSE rating of the ewes through winter. This is then used to determine the number of animals that can be run per hectare and the required flock structure.

For the dual purpose and prime lamb enterprises the lambing date for turning off weaners was different to that chosen for the yearling production system. It is normal practice to lamb earlier in an attempt to achieve maximum weight gain in weaner lambs before the spring pasture growth finishes. This gives lambs a better chance of meeting suitable market weights and therefore a June lambing was chosen for this production system.

In the yearling system it was assumed that lambs would not need to reach maximum weights by the end of their first spring because they were to be run for another 12 months and sold at the end of their second spring. Therefore an August lambing was chosen so that more ewes could be run through winter as they would have less feed demand than ewes lambing earlier.

Sale Date and Live Weights

Because the gross margin model sets livestock numbers according to the target mid-winter DSE limit given (which for the purposes of this study was set at 15 DSE per hectare), an actual sale date was not necessary. If a sale date of less than one year old was chosen (as for weaners) it was assumed that lambs born in any year were not there the following winter. If a sale date of one year old was chosen then lambs born in any year were run for one winter after they were born, and so on up until the age that they are sold.

In all cases, ewes were kept until six years of age and non-replacement ewes bred on the property were sold as one year olds if they were not sold as weaners. Wether lambs were

assumed to be sold at the end of the spring as either weaners, yearlings, three year olds or five year olds.

The sale live weights chosen for each system are shown in the Table 3 below. It is assumed that all sales occur at the end of spring off shears. Therefore for merino weaners to reach 30kg liveweight by mid December they must gain on average approximately 170g per day. The yearlings then must put on another 40g per day on average for the next 365 days.

The dual purpose weaners must grow at 190g per day to get to their target weight by the end of the first spring and in the yearling system they must average 60g per day from the end of their first spring to the end of the second spring assuming similar average growth rates until the end of the their first spring as occurs in the weaner system.

In the prime lamb system the weaners must gain 220g per day till the end of their first spring and in the yearling system they must average 75g per day from the end of their first spring to the end of the second spring to reach target weights assuming similar average growth rates until the end of the their first spring as occurs in the weaner system.

Table 3: Sheep live weight and age at sale (kg live weight).

	Weaners (<12 months)		Yearlings (14-18 months)		Wethers		CFA Ewes
	Ewes	Wethers	Ewes	Wethers	3YO	5YO	
Self Replacing Wool	28	30	42	46	60	60	55
Dual Purpose	41	43	54	57			55
Prime Lamb	46	49	65	65			65

Age at sale of retained progeny has a significant impact on flock structure Table 3. In this table the proportion of DSE's that were represented by joined ewes, dry ewes, and wethers is shown. Note, the percentages do not add up to 100% because rams were left out of the table.

As the flock structure changes from selling weaners to yearlings then to 3 and 5 year old wethers the proportion of ewes in the flock during winter is reduced. Because each late pregnant or lactating ewe is worth greater than 1 DSE she can be replaced by more than 1 wether in the flock. Therefore there will be more sheep run per hectare for the same grazing pressure on the pastures.

Table 4: Mid-winter flock structure of the different enterprises modelled (% of total DSE's)

	Joined Ewes	Replacement Ewes	Wethers
Self Replacing			
Weaners	84%	14%	0%
Yearlings	73%	13%	13%
3YO's	54%	9%	36%
5YO's	43%	7%	49%
Dual Purpose			
Weaners	99%	0%	0%
Yearlings	69%	15%	15%
Prime Lamb			
Weaners	99%	0%	0%
Yearlings	65%	17%	17%

Flock structure is expected to have a big impact on the quantity and quality of wool and meat produced and therefore a large impact on the findings of this report.

Weaning Percentages

The self replacing merino flock was assumed to have a weaning percentage of 80%, the dual purpose system was given a weaning percentage of 95% and the prime lamb systems were given weaning percentages of 120%. These are slightly higher than the Holmes Sackett and Associates benchmarking averages over 6 years (Table 5).

Table 5: Average weaning percentages from Holmes Sackett and Associates Benchmarking (1997-2003)

	Wool Flocks	Dual Purpose Flocks	Prime Lamb Flocks
Average	78%	86%	108%

Section 2: Impact of Flock Structure on Product Mix

Table 6: shows the relative product mix for each of the standard enterprises modelled.

Wool Quantity

As the flock structure changes from selling weaners to then yearlings to 3 and 5 year old wethers the amount of wool produced per hectare increases. This is because there are less breeding ewes which have higher feed demand, therefore more dry sheep can be run per hectare. The combination of more sheep per hectare and adult wethers cutting more kilograms of wool per head means the wool cut per hectare increases.

Wool Quality

There is also an impact of flock structure on the wool quality of the clip. In a self replacing wool flock the yearling system has the lowest average fibre diameter of any flock structure because there is a greater proportion of wool harvested from the young stock shorn each year. Both the weaner and 3 and 5 year old wether systems have a broader average clip fibre diameter due to a lower proportion of the clip coming from young sheep.

The impact of a finer clip will be greater as the flock average becomes finer because the premiums are larger. Half a micron difference in an 18 micron flock means more than half a micron difference in a 22 micron flock.

This does not apply for the dual purpose and prime lamb systems as the crossbred progeny have higher fibre diameter wool than the ewes and therefore shearing more young sheep results in an increase in the average fibre diameter and a lower fleece value.

Sheep Meat Quantity

The impact of flock structure on the amount of meat produced per hectare is determined by the age at which the sheep mature and liveweight gain begins to slow. Selling yearlings provides more kilograms of sheep meat per year than selling weaners because the lambs continue to grow rapidly past their first birthday. Retaining them in the flock past approximately 18 months of age decreases the amount of sheep meat produced per hectare because each individual gains very little weight.

Based on the assumptions of live weights and age at sale (Table 6:), keeping sheep in any system until they are between one and two years of age will increase the kilograms of sheep meat per hectare above that achieved by turning off weaners. However, beyond two years of age the sheep meat production per hectare begins to fall.

The increase in meat turn-off when comparing the weaner system to the yearling system for both the dual purpose and prime lamb flocks (Table 6:) is proportionally a lot higher than the corresponding systems in the wool flocks because there is also a shift in lambing time from June to August. This means that the ewes are no longer lactating through the middle of winter and therefore more sheep can be run per hectare.

Sheep Meat Quality

As flock structure changes from selling weaners to yearlings then to 3 and 5 year old wethers the quality and value of sheep meat produced is diminished. There is progressively less lamb and more of the older age categories sold. In the analysis of the impact of this on income, and therefore profitability it is assumed the yearling meat is of lower value than lamb but higher than mutton.

Table 6: Per hectare production for each enterprise and flock structure.

	Wool		Sheep meat (Kg Lwt/Ha)			
	F.D.	Kg Clean /Ha	Total	Lamb	Yearling	Mutton
Self Replacing						
Weaners	20.6	38	188	81	36	71
Yearlings	20.4	40	197	0	135	62
3YO's	20.5	44	166	0	24	143
5YO's	20.8	46	130	0	19	111
Dual Purpose						
Weaners	22.0	29	322	254	0	68
Yearlings	23.9	46	411	0	344	67
Prime Lamb						
Weaners	29.0	21	340	278	0	62
Yearlings	28.2	38	431	0	369	62

Key findings on product mix

In a self replacing merino flock the yearling system will:

- Have higher wool cut per hectare than a weaner system but lower wool cut per hectare than if wethers are retained past 2 years of age.
- Will lower fibre diameter of the clip to a greater percentage of wool produced coming from a younger age group. Whether this translates into increased value may be dependent on being able to maintain staple strength.
- Will provide maximum kilograms of meat produced per hectare
- Will have no lamb meat available for sale but will have a large volume of hogget meat for sale which is assumed to be at a premium to mutton.

Section 3: Impact of Flock Structure on Returns

A change in the product mix will have varied implications depending on the relative values of the different products at the time. To gain some appreciation of the impact of this we have used ten and one year average historical prices as well as top quartile and bottom quartile prices over the previous ten year period. The price assumptions used are shown in Table 7 and Table 8:

Table 7: Wool price assumptions used in the model

	1 year		10 year	
Micron	**Average**	**Bottom 25%**	**Average**	**Top 25%**
17	1242	1048	1830	2463
18	1047	1002	1371	1816
19	983	829	1070	1340
20	943	679	859	1084
21	925	545	763	986
22	911	489	709	971
23	891	465	660	966
24	866	455	642	955
25	807	442	617	914
26	753	428	588	859
27	661	420	557	769
28	569	410	531	690
29	527	391	508	656
30	485	371	483	601
31	459	364	469	577

Source: Information Commodity Services

Table 8: Mutton price assumptions used in the model

	1 year	10 year		
	Average	**Average**	**Bottom 25%**	**Top 25%**
Lambs (18-20kg c/kg Dwt)	388	136	221	343
Mutton Wethers (18-24kg c/kg Dwt)	219	69	108	182

Source: Information Commodity Services

A standard discount of 30% was given to the light merino weaner lambs based on the average discount they have incurred from 16-18kg lambs over the past seven years in the Wagga sale yards. In turn the yearling product was discounted 25% from the lamb product which is thought to be reflective of actual discounts received from abattoirs. This was an estimated discount and is not supported by price data. All sheep are assumed to be sold off shears and are therefore given a nominal skin value. The lamb skins were given $10, yearling skins were given $7, adult merino sheep were given $5 and crossbred adult sheep were given $3. This

price structure reflects the current prices at the time of writing and was not varied under differing wool and sheep meat price scenarios.

The enterprise costs of the different systems are incorporated in the gross margin analysis that follows the analysis of income generating ability. The main variation in enterprise costs per hectare is caused by changes in the number of sheep run per hectare, however there are also changes associated with additional feeding costs for weaners and breeding ewes compared to dry sheep.

Impact of flock structure on income generated per hectare

10 year average prices

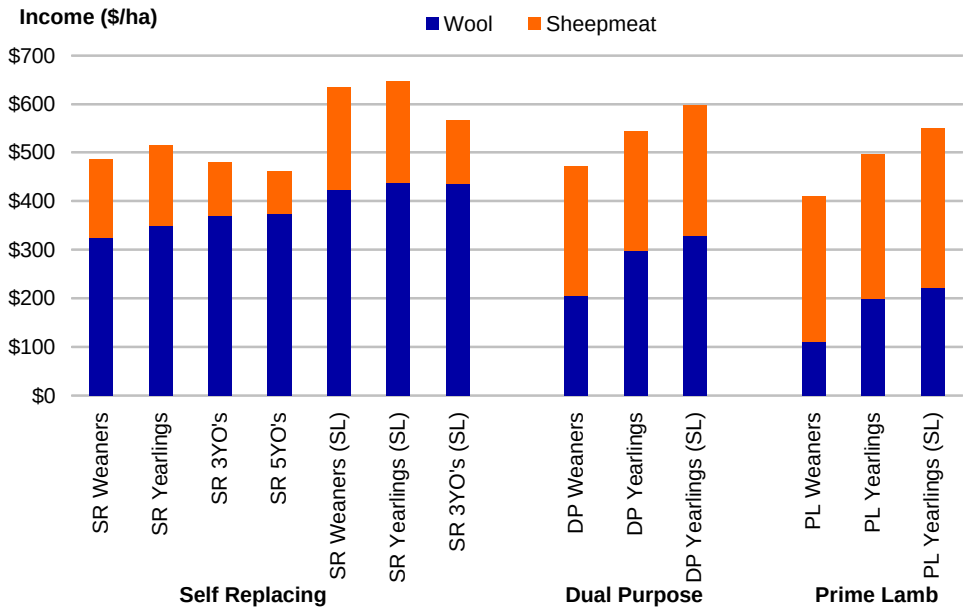
Under ten year average prices the yearling system has the potential to improve income per hectare over and above other flock structures and also other enterprise mixes should a change in lambing time be incorporated.

Graph 1 shows the relative income generated per hectare using ten year average wool, lamb and mutton prices.

The self replacing merino yearling sheep system, 'SR Yearling' produces $515 per hectare of income which is approximately $30-$55 per hectare more than the other winter lambing wool systems. This occurs because it has the optimum mix of sheep meat and wool income.

The large gains in sheep meat income over the wether systems are not offset by the reduction in wool income in the yearling system. In turn the yearling system has a higher wool and sheep meat income that the weaner system.

Graph 1: Income per hectare (10 Year Average Prices)



The labels '*SR Weaners (SL)*', '*SR Yearlings (SL)*' and '*SR 3YO's (SL)*' represent the income earned per hectare if the lambing time was changed to spring (1st of September) from winter (15th July) for the more traditional flocks. In all cases there would be a significant increase in income generated per hectare due to more stock being run through winter.

The model has assumed no change in live weights of animals sold. Therefore in the weaner system the lambs would have to reach their target weights on feed produced outside the normal spring growing season. This would require specialty summer active pastures that are capable of providing high quality feed such as lucerne. The difficulty in achieving a saleable weight in summer with merino lambs, let alone the increased difficulty in managing them for survival through summer is a common reason for not moving to a Spring lambing.

The yearling and 3 year old wether systems require less emphasis on weight gain through the first summer as all lambs would have another spring at least on which to reach their specified sale weight.

There may however be a reduction in sale weight in a spring lambing system husbandry system, but such a large proportion of the income comes from wool that it would require virtually no income from the sale of sheep to reduce spring lambing income back to levels equivalent to those produced in an equivalent winter lambing system.

Note that the change to a spring lambing favoured the weaner system more than the 3YO wether system. This is because there are more ewes in the weaner system and therefore more additional space is created by lowering the feed requirements of the ewes through winter.

The dual purpose flocks have a much lower proportion of their income coming from wool as opposed to meat and using 10 year average prices the weaner system does not produce as much income as the self replacing wool flocks, however the yearling dual purpose system has a $29 per hectare higher income than the yearling wool flock.

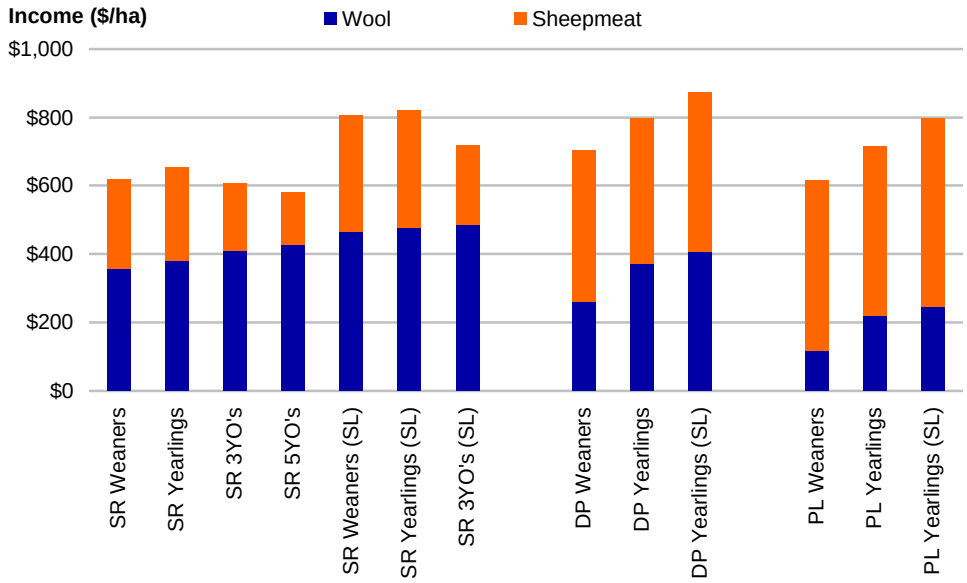
The change in lambing time from June to August in the yearling dual purpose flock will contribute a large proportion of the total increase in income generated per hectare. A further shift from the 1st of August to the 1st of September ('DP Yearlings SL') increases the income generated per hectare by $53 over the August lambing 'DP Yearling Flock'. This is purely a stocking rate benefit as weights at sale are held constant.

The traditional prime lamb weaner system underperforms the other enterprises using 10 year average prices with significantly lower wool income per hectare even though the meat income per hectare is substantially higher.

Current prices

Under current market prices a spring lambing yearling wool system will provide comparable income earning potential to any other enterprise analysed. Current prices were determined by averaging the past 12 month's wool and sheep meat prices. Graph 2 shows the impact of flock structure on income generated under the current prices.

Graph 2: Income per hectare (current prices)

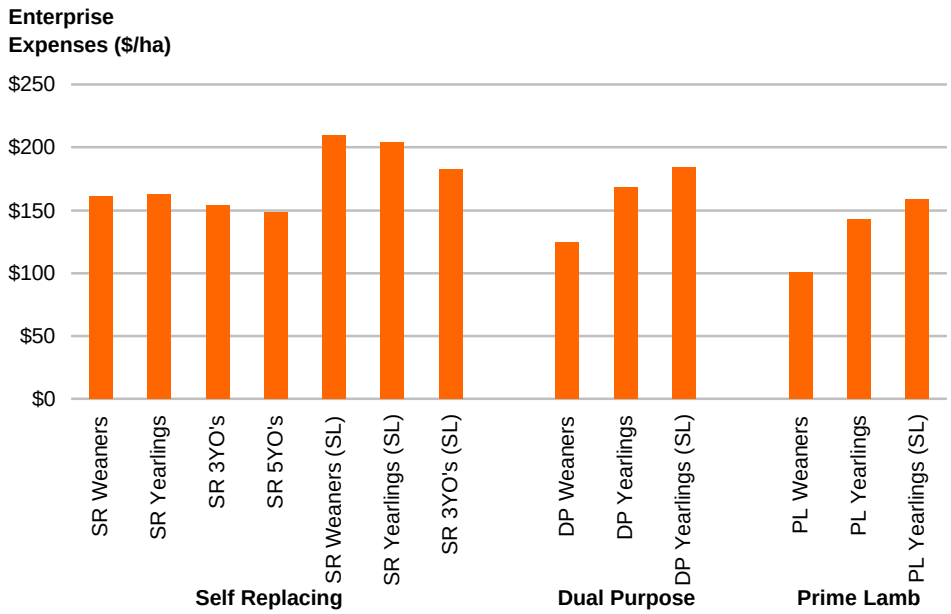


Again in the self replacing merino flocks the yearling sheep system has the highest income generating ability and this is further increased by a shift in lambing time to the spring. The main difference between the 10 year average prices and the current prices is that sheep meat is contributing to a larger percentage of the total income. This means that dual purpose enterprises have more income generating ability than any of the equivalent wool enterprises with the same lambing time. The prime lamb systems are competitive with the wool and dual purpose enterprises in their ability to generate income.

Impact of Flock Structure on Gross Margins

As mentioned previously changes in flock structure and the associated stocking rates bring about changes in enterprise expenses per hectare. Graph 3 shows the variation in enterprise expenses per hectare when 10 year average prices are used. Enterprise expenses vary with prices due to the inclusion of selling costs.

Graph 3: Enterprise expenses (10 year average prices)



10 year Average Prices

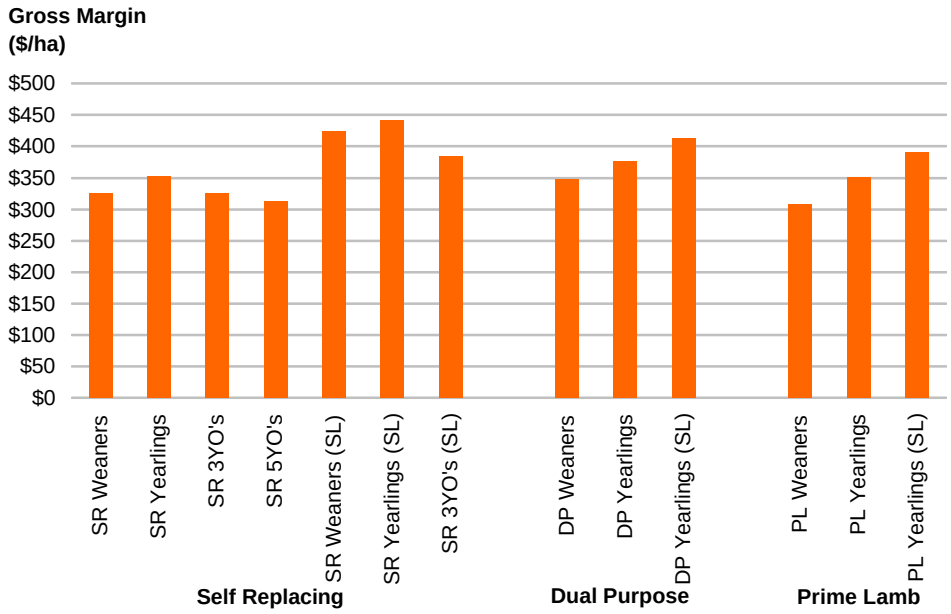
Accounting for enterprise expenses narrowed the differences in gross margins between enterprises and flock structures (Graph 4). For instance the difference between the income produced in the 3 year old wether flock structure and the yearling flock structure was $53 per hectare. However the difference in gross margins was $40 per hectare. Whilst these reductions occurred across the board there was no change in rankings as a result.

Using ten year average prices a spring lambing yearling wool system has the highest gross margins per hectare.

Of the self replacing merino wool enterprises, the yearling system produces the highest gross margin per hectare with a $27-$40 advantage over the other winter lambing flock structures, however these gross margins are $30-$40 behind the spring lambing systems.

Dual purpose gross margins are superior to the winter lambing wool systems, however the spring lambing yearling wool system is at least $30 per hectare above any other system

Graph 4: Gross margin (10 year average prices)



Current Prices

As was the case when using ten year average prices, the inclusion of enterprise expenses reduced the differences between enterprises and flock structures. Under current market prices the dual purpose enterprises have the highest gross margins and would therefore be useful in boosting farm profitability.

Graph 5 shows the yearling wool flock structure has a $33-$61 per hectare advantage over the other self replacing merino wool flock structures. The dual purpose gross margins out performed the winter lambing wool enterprises by upwards of $100 per hectare, however a switch to spring lambing would lift gross margins for the wool enterprises to within $70 per hectare of the dual purpose enterprises.

Prime lamb enterprises are competitive with the wool enterprises but lag behind the dual purpose enterprises. This is consistent with recent Holmes Sackett and Associates benchmarking data for non-drought affected properties (Table 9).

Graph 5: Gross Margin (current prices)

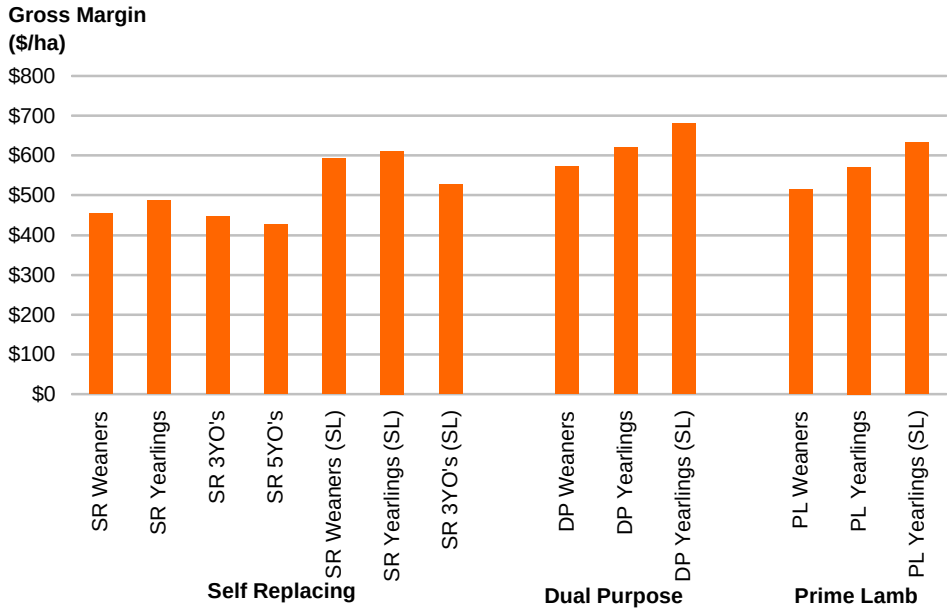


Table 9: Benchmarked enterprise gross margins.

	Wool Flocks	Dual Purpose Flocks	Prime Lamb Flocks
2001/02 Av. Gross Margin ($/DSE)	$23.36	$30.19	$25.04
2002/03 Av. Gross Margin ($/DSE)	$21.56	$24.54	$23.70

Source: Holmes Sackett and Associates

Impact of Flock Structure on Profits

Labour expenses were classified as overhead costs because whether they translate into an actual cost to the business is determined by whether the current labour resources are utilised fully. The methodology for accounting for labour costs is described below. Based on analysis of Holmes Sackett and Associates benchmarking direct labour related costs typically make up 45% of total overhead costs so the labour cost per hectare was divided by 45% to determine the total overhead costs for each enterprise. These were then deducted from the gross margins to determine the relative profitability of each enterprise.

Labour costs are assumed to vary according to which enterprise is being run. For the purposes of this model each animal was assigned a unit cost for labour and a multiple according to how intensively they are managed. These are shown in Table 10.

Table 10: Unit costs of labour

Cost Per Unit of Labour	$4
Stock Class	Multiple
Merino Weaners	2
Crossbred Weaner	1.5
1 Year Old	1.5
Breeding Ewe	1.5
Dry Ewe	1
Wether	1

In the 3 year old wether system which is thought to best represent the majority of the industry the labour cost per DSE was $5.50 which is similar to the five year Holmes Sackett and Associates benchmarking average for wool flocks of $5.43. The variation in labour costs per mid winter DSE is shown in Table 11.

Table 11: Variation in labour costs per mid winter DSE

	$/DSE
Self Replacing	
Weaners	$6.21
Yearlings	$6.28
3YO's	$5.49
5YO's	$5.04
Weaners (SL)	$8.09
Yearlings (SL)	$7.89
3YO's (SL)	$6.49
Dual Purpose	
Weaners	$4.77
Yearlings	$6.77
Yearlings (SL)	$7.43
Prime Lamb	
Weaners	$4.19
Yearlings	$6.17
Yearlings (SL)	$6.85

The labour costs decrease with increasing age at sale as there are less weaners and breeding ewes which have the higher labour inputs for the flock. They also increase with a change to spring lambing as there are more sheep run per mid winter DSE which requires more labour input.

10 year average prices

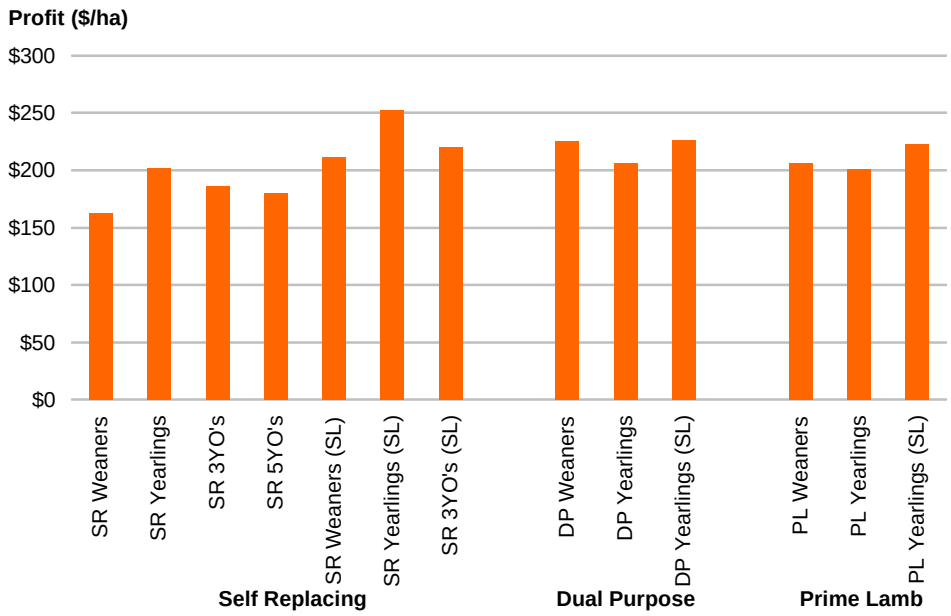
After labour costs are accounted for the winter lambing wool system generates the highest profit per hectare of the winter lambing flock structures. However, dual purpose enterprises are more profitable than winter lambing wool enterprises. The spring lambing wool system is the most profitable of all enterprises and flock structures.

Factoring in additional labour costs dramatically reduces the differences in profits between enterprises and different flock structures. As an example where the spring lambing yearling wool system had a $90 per hectare advantage in gross margin it has a $50 advantage in profit (Graph 6).

The winter lambing weaner wool flock structure, which had a higher gross margin than the wether flock structures, has a lower profit per hectare assuming the increased labour costs actually transpire. The increased labour costs come from the additional sheep being run per hectare which will require additional labour. If the current labour resources are fully utilised this will be an additional cost to the business. Therefore the availability of labour and the ability to cope with the increased labour demands will be an important consideration in any decision on a change in flock structure.

The winter lambing yearling wool production flock structure remains more profitable than the other winter lambing enterprises. Under these assumptions the spring lambing yearling system is more profitable than any other enterprise or flock structure by upwards of $25 per hectare.

Graph 6: Profit (10 Year Average Prices)



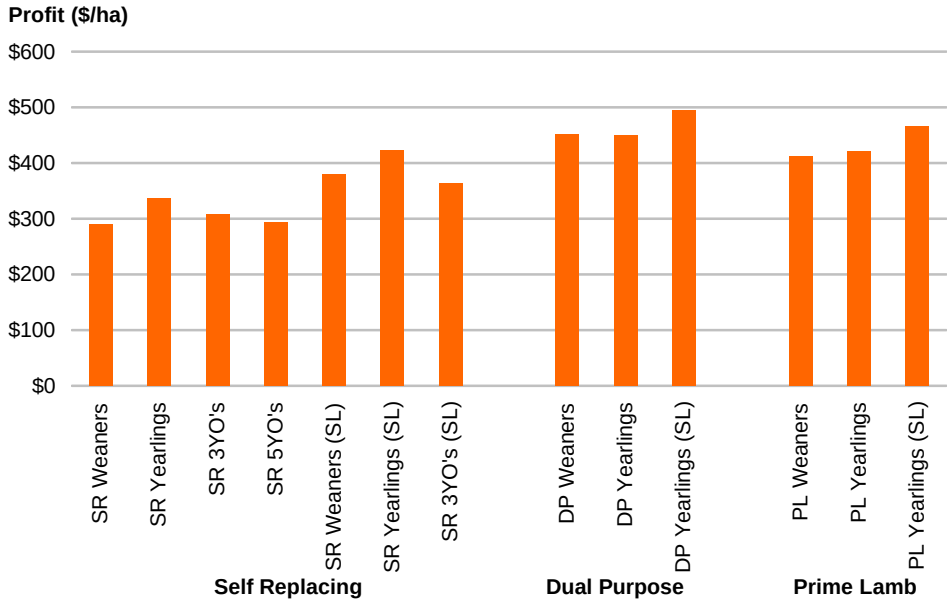
Current Prices

In the current market the dual purpose flocks, with their additional meat income are substantially more profitable than the wool enterprises.

At current market prices (

Graph 7) the dual purpose system is the most profitable system with a 25-55% advantage over the equivalent wool production systems. Within the self-replacing merino wool systems the yearling system remains the most profitable with the benefits from a change in lambing time still apparent.

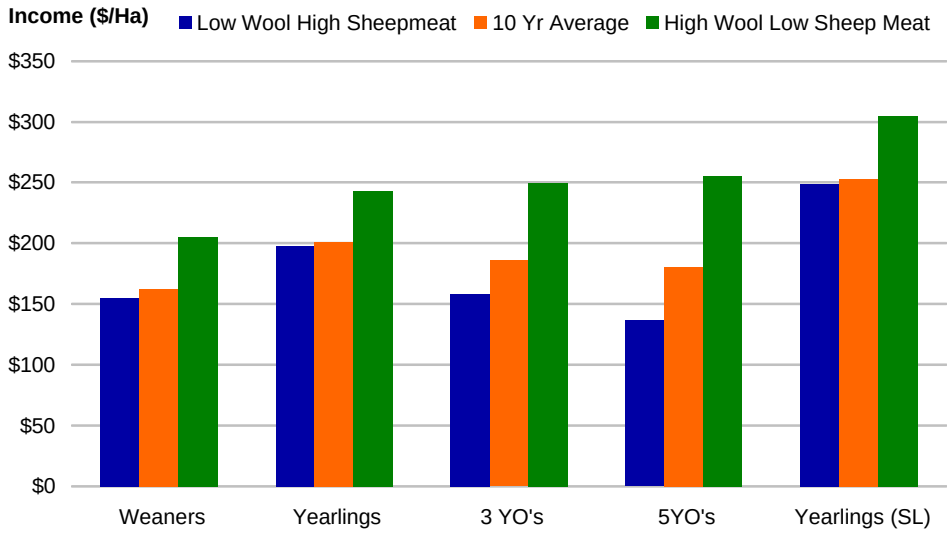
Graph 7: Profit (Current Prices)



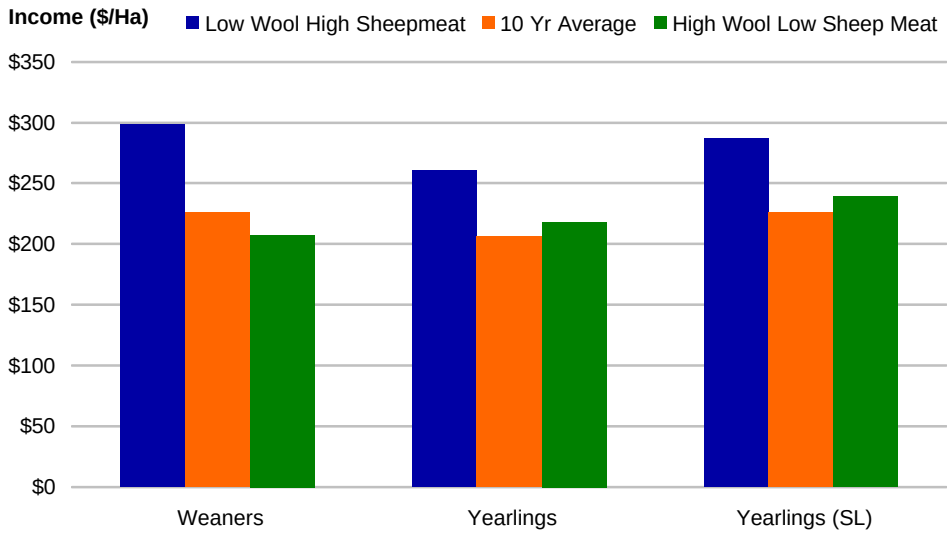
Sensitivity to Extreme Market Scenarios

The impact of extreme market scenarios on the profitability of the different flock structures within each enterprise is shown in Graph 8. The high price scenario is a top 25% wool or sheep meat price over the last ten years, while the low wool price scenario is bottom 25% wool or sheep meat price over the last ten years.

Graph 8: Self Replacing Merino Wool Flock Structures



Graph 9: Dual Purpose Flock Structures



High Wool Prices and Low Sheep meat Prices

The self replacing merino yearling sheep system and the dual purpose systems are the most resilient to extreme fluctuation in market prices due to their balance of sheep meat and wool products.

A high wool price, low sheep meat price scenario has a large impact on profitability of the wool enterprises (Graph 8). For all wool enterprises shown it improves the profitability by upwards of $50 per hectare. Most notably, however it increases the wether dominant flocks profitability over that of the ewe dominant flocks turning off weaners or yearlings. This is because a large portion of the income of these flocks comes from wool rather than meat therefore any increase in wool prices has a larger impact on the total flock income.

The spring lambing yearling sheep system profits rise to over $300 per hectare which is comparable to the best dual purpose profits modelled.

A high wool market with a low sheep meat market has only a minor impact on dual purpose flock profitability because the relative incomes from each are more evenly spread with between 35% and 55% of income coming from sheep meat using average market prices (Graph 9). Therefore, some of the gains from the improved wool income are offset by reduction in sheep meat incomes.

Low Wool Prices and High Sheep meat Prices

Low wool prices and high sheep meat prices reduce self replacing merino wool flock profits across the board (Graph 8). However, the weaner and yearling flock structures are more resilient than the wether flock structures as a greater portion of the income comes from sheep meat. While the wether flock structures lose $20 to $50 per hectare in profits, the yearling and weaner flock structures lose less than $10.

The dual purpose systems gain more than $50 per hectare in profits from the low wool market and high sheep meat market scenario, with the weaner system outperforming the yearling system due to a higher percentage of income coming from sheep meat.

Section 4: Discussion of qualitative issues

Gross margin models do capture the animal health impacts of changes to a production system or the increased demands on management resources. Results suggesting a move to a more ewe dominant flock should be viewed with some caution. Holmes Sackett and Associates benchmarking data over the previous two years whilst mutton and lamb prices have been high shows that those flocks that have less than 20% wethers have produced a lower profit than those with 20-60% wethers.

These benchmarking results would suggest that constraints to capturing the benefits of the increased sheep meat income from a ewe dominant flock exist in practice.

Table 12: The most profitable flock structure remains one with 20-60% wethers

	<20%	**20-60%**
Sheep Trading	$8.29	$5.49
Wool	$22.13	$28.50
Income/DSE	**$30.36**	**$33.92**
Enterprise Expenses/DSE	**$10.29**	**$10.19**
Gross Margin/DSE	**$20.08**	**$23.74**
Total Expenses/DSE	**$24.70**	**$24.19**
Net Profit/DSE	**$5.67**	**$9.73**
No of Flocks	**32**	**128**

Results are from 2001/02 and non drought flocks in 2002/03

The gross margin model that has been used in this case does attempt to account for the impact of changes in flock structure on the numbers of each class of animal that can be carried through winter by utilising the mid-winter stocking rate. However, it does not explicitly capture the impacts with regard to the following issues:

- Autumn stocking rates
- Pasture resources and weight gains
- Labour
- Parasite control.
- Differences between merino bloodlines.

Autumn stocking rates

It is normal in southern and eastern Australia for winter to be the bottleneck in terms of feed availability with which all stock units must pass through on a farm each year, and hence the focus on winter stocking rates. However, by changing the flock structure and lambing time to run more ewes through winter you place increasing pressure on autumn pastures and therefore you pull that bottleneck closer to the autumn. This happens because more sheep are run through summer which means that there is a faster utilisation of the available dry matter left from the previous spring.

This model does not account for this, and in fact assumes that a change to spring lambing and selling all progeny as weaners will have no impact on the farms ability to provide adequate nutrition to sheep through autumn. This may not necessarily be the case with greater amount of supplementary feeding required which begins to erode the perceived advantages calculated in the model. The impact of this is better tested with tool such as GrassGro in specific locations over a number of actual growing seasons.

Pasture resources and weight gains

Profitable wool production can occur on pastures that are considered below optimum for weight gain. In fact the lower the quality and quantity of feed given to the sheep, provided it meets the minimum survival requirements, the better the product may be at the end of the year as it will be finer. This will have an impact on price received which may outweigh any loss in cut per head in the finer fibre diameter bloodlines.

Production systems that require weight gain require not only good pasture availability but also good pasture quality with a significant legume component to maximise weight gains. In doing the gross margin modelling of changes to yearling sheep systems, or dual purpose and prime lamb systems where there is a greater dependence on achieving weight gain, the model assumes that the pasture resources are available.

In the gross margin models used for this project, an end of spring sale would go some way to ensuring that the nutritional requirements are met. However, not all farms and perhaps not all areas may be capable of achieving the desired weight gains to meet the modelled targets whilst still providing the ewe portion of the flock with its required nutrition.

In addition there is an issue of grass seeds in pastures and their impact on weaner productivity. Where grass seeds are a major constraint keeping lambs may not be an option.

Again Grassgro modelling may be useful in determining whether location and also pasture quality will have a role in the ability to adopt more profitable systems shown in this gross margin analysis.

Labour

As was mentioned earlier the labour inputs required for different classes of sheep differ. A spring born weaner has a much higher labour requirement than a four year old wether. Whether this translates to dollars for the individual farm will be dependent on whether the farm currently has full utilisation of labour or not. If the farm is fully utilising its labour then it will require cash to hire more. If there is excess labour available then the additional requirements may easily be soaked up with the current resources available by working harder.

In the modelling done for this project we have used a reasonably crude estimation of relative labour costs and it cannot be expected to represent the individual farm. We have included it as a variable overhead cost because it does need to be considered when contemplating a change in enterprise.

Parasites

As drench resistance is now common to all of the currently available active compounds, worm control on farms is an increasing problem. Part of the solution to that problem is to utilise the inherent differences in the ability of different classes of sheep to suppress worm burdens through their natural immunity. Grazing a pasture with an adult wether, which has a natural immune response to worm burdens, can reduce the worm eggs that are shed in faeces onto the pasture. This strategy reduces the contamination level on the pasture and therefore can be utilised to prepare a lower risk paddock for the more susceptible classes of sheep such as weaners and lactating ewes.

This is particularly pertinent to farms where the sheep enterprise dominates the enterprise mix on the farm. The higher the breeding ewe numbers the harder it is to maintain safe pastures for susceptible stock and therefore there is increased risk of production loss and/or increases in enterprise costs through additional drenching and labour requirements.

This difficulty in flock management is not modelled in the project but may provide a major constraint. The subject of worm control needs to be given careful consideration when contemplating a change in flock structure.

Bloodline Differences

The model contains substantial assumptions about the ability of lambs, yearlings and wethers to reach a weight at a given age. Whilst the bloodline may not matter for 3-5 year old wethers in terms of their ability to reach a given weight, it may matter for weaners and yearlings.
As they stand, the current assumptions allow for no difference in maturity pattern of the young sheep. When we consider the possible differences between say a Saxon bloodline versus a South Australian merino bloodline there may in fact be substantial differences in their ability to reach a given weight by a specified age.
In future, the availability of across flock EBV's may help determine whether the right genetics are present to achieve a particular system.

Shearing Time

Fitting an appropriate shearing time for lambs into the husbandry calendar is a major challenge for producers. Consideration needs to be given to the expected discounts for staple strength, staple length, or for selling adult sheep in wool. There will always be a number of options for the producer and each individual will have to weigh up their options according to the potential problems associated with timing. Shearing should be a secondary issue to choice of lambing time.