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Impact of Scanning Pregnancy Status on farm profitability in South West Victoria

John Young
Farming Systems Analysis Service
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Executive Summary

Scanning for pregnancy status is being adopted by a growing number of producers because it allows them to target the nutrition of their ewes more accurately.

There are two levels of scanning possible:

1. Pregnancy status or ‘Scan Drys’: identify dry ewes and pregnant ewes.
2. Litter size or ‘Scan Twins’: within the pregnant ewes identify single bearing and twin bearing ewes.

Identifying pregnancy status allows the nutrition of the dry ewes to be reduced and it provides the opportunity to cull the dry ewes. Culling the dry ewes may lead to an increase in the fertility of the flock and if the ewes are sold at scanning then there will be a further reduction in the amount of feed required by the flock. Identifying litter size allows targeting of the nutrition to the twin bearing ewes to increase production and survival from these ewes and their progeny.

The Hamilton Lifetimewool version of MIDAS was used for this analysis. MIDAS represents the whole flock and it includes a powerful feed budgeting module that optimises animal and pasture management across the whole farm. It describes the biological relationships of a representative farm and calculates the profitability of the whole flock based on the productivity of each class of stock, the commodity prices and the farm carrying capacity calculated in the detailed feed budget. Being an optimizing model it calculates the optimum stocking rate and optimum rate of grain feeding that will maximize profitability while achieving the targets specified for the ewes. The model also accounts for changes in flock structure and the change in ewe energy requirements that result from increasing lambing percentage and the number of ewes pregnant or lactating with singles or twins when ewe nutrition is altered.

The relationships that were developed in the Lifetimewool project that relate progeny performance and peri-natal survival to ewe nutrition profile were included in this analysis.

This report describes the analysis carried out for South West Victoria to quantify the benefits from scanning ewes for pregnancy status and litter size and determine the optimum management of the dry ewes and determine whether the optimum nutrition profile changes for dry, single and twin bearing ewes.

The benefits of scanning ewes for pregnancy status and litter size were calculated to be $7 800 for a typical farm. Of this total benefit approximately 60% was achieved through management of the dry ewes and the remaining 40% was achieved through improved management of the twin bearing ewes. The benefits of identifying dry ewes was calculated to be $8.15 per dry ewe and the extra benefits of identifying the twin bearing ewes was calculated to be $1.95/twin ewe.

The optimum nutrition profile for the single bearing ewes was not affected when dry ewes or twin ewes were identified, however, the optimum nutrition profiles of the drys and twins were altered. The optimum for the dry ewes involved losing condition from scanning through to lambing and the optimum for the twin bearing ewes was to

gain extra condition from scanning through to lambing so that by lambing these ewes were above their joining condition.

The management of the dry ewes was important in achieving the benefits from scanning. The most profitable strategy in a normal year is to run the dry ewes through to shearing and sell the ewes off-shears. This is most profitable unless the reproductive rate of the flock means that selling the drys would require delaying the sale of the CFA ewes by a year – if this would be necessary then it is more profitable to retain the dry ewes and join them again.

The profitability of identifying pregnancy status is higher if there are more dry ewes in the flock. If the proportion of drys is less than 5% then the net benefit of identifying pregnancy status is negligible. This indicates that scanning the maiden ewes that typically have a high proportion of drys will be the most profitable mob. For the older ewes that typically have fewer drys, the decision to scan will be based on the value achieved from identifying the twin bearing ewes knowing that the benefits from identifying the drys will only be offsetting some of the cost associated with scanning.

The benefits of scanning are greater in seasons or on farms with greater grazing pressure. Therefore scanning could be a useful tactic to manage poor seasons, although for it to be used tactically would require that sufficient scanning capacity was in reserve to handle the increase in demand. In very bad years it can be profitable to sell the dry ewes at scanning and forego the wool income from the dry ewes.

The cost of scanning is relatively unimportant in the decision on the profitability of scanning. A saving of 10c/hd in the cost of scanning would be offset if 1.2% of the ewes were identified as dry but were singles, or 3.6% of the ewes were identified as singles but were twins.

Including the biology identified in the Lifetimewool project is important in the calculation of the profitability of scanning ewes for pregnancy status or litter size because the changes in progeny production and survival have a big impact on the calculations. If both the progeny wool production and the progeny survival relationships developed in the Lifetimewool project are ignored the conclusion from the analysis would be that scanning is not profitable and if farmers did scan then there is very little incentive to alter the nutrition profiles for the dry and twin bearing ewes. If the progeny survival relationship is included but the progeny wool production relationship is ignored then the analysis indicates that scanning can be profitable but the potential increase in profitability is reduced by 30%.

1. Introduction

Scanning for pregnancy status is being adopted by a growing number of producers because it allows them to target the nutrition of their ewes more accurately.

There are two levels of scanning possible:

1. Pregnancy status or ‘Scan Drys’: identify dry ewes and pregnant ewes.
2. Litter size or ‘Scan Twins’: within the pregnant ewes identify single bearing and twin bearing ewes.

Identifying pregnancy status allows the nutrition of the dry ewes to be reduced - which may allow more animals to be carried - and it also provides the opportunity to cull the dry ewes. Culling the dry ewes may lead to an increase in the fertility of the flock and if the ewes are sold at scanning then there will be a further reduction in the amount of feed required by the flock.

Identifying litter size is slower and hence more expensive than just identifying pregnancy status, however, it allows the nutrition of the ewe flock to be targeted to requirements more accurately, which can increase the fleece value and survival of twin born lambs.

The relationships developed in the Lifetimewool project have been used in this analysis to calculate the production from the progeny of the single and twin bearing ewes. Feed budgeting allows the impacts on stocking rate and supplementary feeding to be calculated. Then combining the flock productivity and the feed budgeting allows the impacts on wholefarm profit to be examined.

The aim of this analysis is to determine the profitability of scanning ewes for pregnancy status and litter size and determine the optimum management of the dry ewes and determine whether the optimum nutrition profile changes for dry, single and twin bearing ewes.

2. Method

2.1 MIDAS

The Hamilton Lifetimewool version of MIDAS (Young 2007) has been used to calculate the profitability for a range of nutrition profiles for reproducing ewes in the Hamilton district of Victoria. MIDAS is a computer model used to assess the impact of change in a farming system. It describes the biological relationships of a representative farm. This information is used to estimate the profitability of particular enterprises or management strategies. MIDAS was selected as the modelling tool for the economic component of this project because it represents the whole flock and it includes a powerful feed budgeting module that optimises animal and pasture management across the whole farm. This makes MIDAS an efficient tool to examine different nutrition strategies for a flock.

MIDAS calculates the profitability of the whole flock based on the productivity of each class of stock and commodity prices and the farm carrying capacity calculated in the detailed feed budget. Being an optimizing model it calculates the optimum stocking rate and optimum rate of grain feeding that will maximize profitability while achieving the targets specified for the ewes. The model also accounts for changes in flock structure and the change in ewe energy requirements that may result from increasing lamb survival or altering the number of ewes pregnant or altering the proportions of ewes lactating with singles or twins.

The feed budgeting module in MIDAS is based on the energy requirement and intake capacity equations of the Australian Feeding Standards (SCA 1990), these are also the basis of the GrazFeed model. The feed year is divided into 10 periods and the feed budget is calculated for each period. With different targets for ewe nutrition the metabolisable energy (ME) requirement for the ewes can vary for each of the 10 periods. The model then calculates whether the most profitable way to achieve the required nutrition for the flock is by adjusting stocking rate, adjusting grain feeding or adjusting the grazing management of pastures and varying the severity of grazing at different times of the year to alter the pasture production profile.

MIDAS is a steady state model, so an implicit assumption is that any management change has been applied for sufficient time for the impact to have permeated the entire flock. This is important in this analysis because altering the ewe nutrition strategy will take a number of years before the impacts on progeny wool production will have worked through the entire flock. A full investment analysis would account for the interest cost of money and discount the future benefits achieved from altering ewe nutrition now, however, this is not possible within the MIDAS framework and hasn't been included in this analysis.

2.2 The model farm

The following section outlines the main assumptions underpinning this analysis and the management of the property for the 'standard' ewe nutrition strategy. Further detail is presented in Appendix 1.

2.2.1 Land management units

The model represents a 'typical' farm in the Hamilton region in south west Victoria. The total area of the farm is 1000ha and is comprised of 3 land management units (LMUs; Table 2.1). The pasture production profile varies on each LMU (Appendix 1)

Table 2.1: Description and area of each LMU on the model farm

Land Management Unit	Area (ha)	Description
Ridges	200	Well drained gravely soils at tops of hills.
Mid slopes	600	Moderately drained loams in the mid slopes
Flats	200	Clay soils in lower slopes that are often waterlogged.

2.2.2 Animal production system

The analysis is based on a self-replacing merino flock producing wool from a traditional Victorian fine wool genotype lambing in August/September and shearing in March. Surplus ewes are sold as hoggets off shears in March and wethers are sold off shears in March at 2.5 years. Individual sheep characteristics (Table 2.2) were based on data for the top 25% of wool producers from the South West Monitor Farm Project and the south west region in the Victorian Wool Industry Benchmarking project for the period 2004/05.

Table 2.2: Summary of production assumptions for the sheep flock. The values represent the ewe flock averages (2, 3, 4 and 5 year old).

Standard reference liveweight (kg)	45
Fleece weight (clean kg/hd)	3.6
Mean fibre diameter (μm)	18.9
Weaning rate (%)	79

2.2.3 Pasture production

The pasture production is based on a moderately productive perennial ryegrass and sub-clover stand typical of pastures on farms based on top 20% of the monitor farm project. This pasture is grown on all land management units.

The growth rate of the pasture has been based on simulations using the GrassGro model with climate data from the Hamilton weather station (Steve Clark *pers comm.*). More details on the pasture productivity assumptions are presented in Appendix 1.

2.2.4 Farm management

Table 2.3: Production and management parameters for the 'optimum' ewe nutrition profile if ewes aren't scanned (Join in CS2.7 slight loss to day 90 and regain by lambing) and assume the rate of lamb survival observed in the Vic. paddock scale experiments.

Profit ($/ha)	378
Number of ewes	5250
Stocking rate (DSE/WG ha)[1]	14.5
Supplementary feeding (kg/DSE)	3.6
(t)	47
Flock structure	
% ewes	61
Sale age of CFA ewes	5.5
Sale age of surplus young ewes	hoggets
Sale age of wethers (yrs)	2.5
Lambing (%)	75
Pasture growth (t/ha)	7.8
Pasture utilization (%)	48
Wool income ($/ha)	573
Sale sheep income ($/ha)	121

[1] Stocking rate calculated using DSE ratings as outlined in the Farm Monitor Project, Dec 2001

2.3 Lifetimewool assumptions about progeny production

For this analysis the production of the progeny was adjusted based on the CS profile of the ewes (nutritional strategy). The adjustment was calculated using the coefficients derived from the statistical analysis of the Austral Park 2001 and 2002 progeny (Gavin Kearney *pers. comm.*), see Table 2.4. The adjustment was applied to all age groups of progeny because the weight of evidence supports the progeny effects being permanent (Andrew Thompson *pers. comm.*). This includes the production of the adult ewe and wether component of the flock because those animals are the progeny of the ewes from the previous generation, and it is assumed that the nutrition strategy for the ewes has been applied and the flock has achieved a steady state.

The base levels of production (CFW, FD, staple strength and reproductive rate) for each age group and class of sheep was calculated using the MIDAS simulation model and the calculated value varies with the CS profile of that class of stock. This simulation model calculates wool cut as a linear function of ME intake, FD as a function of wool growth rate and staple strength as a function of minimum FD and average FD.

Table 2.4 : Coefficients fitted in the statistical model that explains progeny production from Ewe condition score (CS) at joining (kg) and CS change (kg) during pregnancy and lactation using the Austral Park 2001 and 2002 progeny where one CS equal 10 kg of maternal live weight (Gavin Kearney *pers. Comm.)*.

	CFW (kg)	FD (μ)	Birth Weight (kg)	Survival (%)
Constant[2]	2.87	17.34	3.67	-9.64
Ewe CS - Joining	0.010		0.027	
Ewe CS change				
Day 0-90	0.019	-0.031	0.033	
Day 90-lambing	0.019	-0.036	0.045	
Birth class Twin	-0.143	0.128	-1.12	-0.473
Rearing class Twin born Single reared	-0.274	0.482		
Rearing class Twin		0.286		
Progeny Female			-0.192	0.586
Birth weight				4.32
Birth weight squared				-0.395

The change in progeny CFW and FD measured in the paddock scale experiments was similar to that measured in the plot scale experiments (Ralph Behrendt *pers. comm.*). However, the impact of ewe nutrition on progeny survival was greater in the paddock scale experiments than the plot scale experiments and the impact was greater still in the Western Victorian sites than the other sites. For this analysis the progeny survival as measured in SW Victoria has been used.

2.4 The condition score profiles

27 different CS profiles have been evaluated in this analysis for each of the dry, single and twin bearing ewes. The profiles examined vary in the average condition of the ewes at joining and the average amount of condition lost to the minimum and then the change of condition from scanning to lambing (Figure 2.1). There are 3 alternate CS at joining (2.6, 3.0 and 3.4), 3 rates of condition loss to scanning (no loss, lose 0.3CS and lose 0.6CS) and up to 4 levels of change in condition between scanning and lambing (gain 0.6CS, gain 0.3CS, maintain and lose 0.2CS).

Only certain combinations of these patterns are possible when scanning drys or twins because the profile of each group of ewes must be the same until the point when the pregnancy status or litter size is identified.

The selection of the 27 patterns allows comparison of the effects on profitability of varying condition at joining, varying rate of loss of condition after joining and the rate of gain in condition prior to lambing. Each nutrition strategy examined has a similar pattern that varies in one of the above factors. This pairing of patterns allows the cost or benefit of varying the CS targets of ewes at different times of the reproductive cycle.

[2] Constant is value fitted for the genotypes and management evaluated in the Lifetimewool small plot trials. For this analysis the constant has been replaced by values calculated in the MIDAS simulation model.

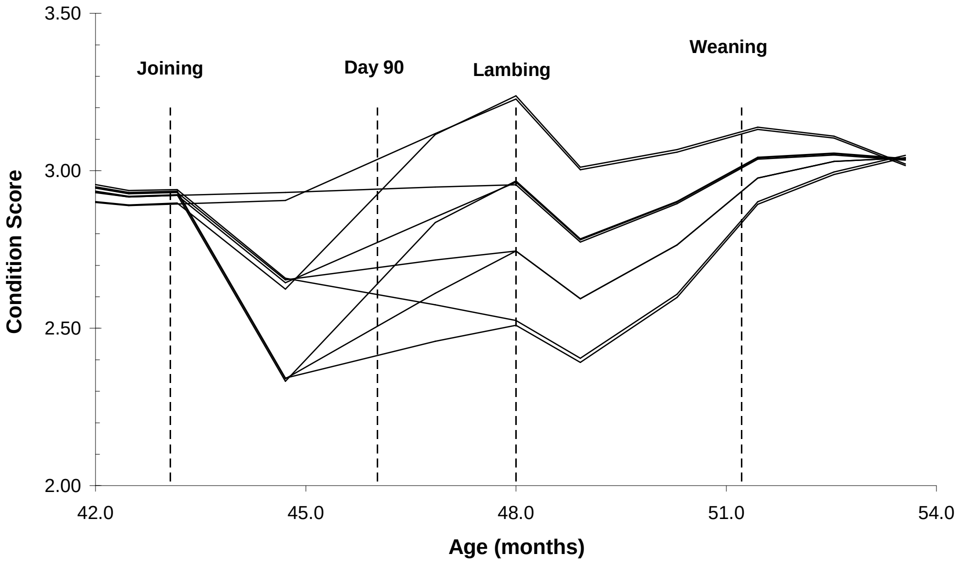

Figure 2.1: The 9 nutrition profiles examined in MIDAS that start with a joining condition of CS3. Note: there are a similar set of profiles that start with CS3.4 and CS2.6.

For each profile the energy demands and the resulting production of the ewes was simulated using the MIDAS simulation spreadsheet. The production levels of the progeny were adjusted as described in the previous section.

Note: There is some finetuning of the above profiles that occurs depending on the management of each class of ewes because management during the year can alter the average weight or condition of the ewes at the following joining. For example, if the dry ewes are rationed during winter and spring then the average joining weight of the ewes will be less at the subsequent joining.

2.5 Other Production Assumptions

Culling dry ewes is likely to reduce the number of dry ewes in future years through both a genetic effect and an effect on the current generation. Based on Lee & Atkins (1996) a standard reduction of 12.5% in the proportion of drys was used, and a sensitivity analysis was carried out between 0 and 50%. Based on that data set there is no effect on prolificacy from culling drys.

2.6 Standard Prices, Production and Management and Sensitivity Levels

Table 2.5: Standard price and production levels assumed in this analysis.

	Standard	Sensitivity Levels
Prices		
Wool Price (c/kg sweep the board)		
18μ	1422	

[3] Any ewes sold at scanning receive a 25% higher price ($41/hd) than the CFA ewes sold off shears. This is to reflect that they are being sold with wool on their backs. A price sensitivity was carried out with no premium ($33/hd) up to a 100% premium ($66/hd).

19µ	1170	
20µ	962	
21µ	845	
Meat Price ($/hd net)		
Ewe Hgt	34	
Wether	46	
CFA Ewe	33	
Increase in ewe price when sold at scanning	25%[3]	0, 25, 50 & 100%
Grain Price ($/t fed out)		
Oats	163	
Lupins	222	
Pasture Production	7.8t/ha	60% to 120%[4]
Flock Structure		
Sale Age of Wethers	29 months	
% ewes	61%	
Time of Lambing	23Aug–26Sept	
Cost of Scanning		
Pregnancy status	45c	40, 45 & 50c
Litter size	70c	50, 70 & 90c
Reproduction		
Proportion dry	12%	0% up to 18%
Proportion twins	26%	13, 26 & 52%
Reduction in propn of dry ewes when culling drys	12.5%	0, 12.5, 25 & 50%
Management of Drys	Sell at shearing	Retain, Sell at shearing, Sell at scanning

Note: Sale sheep price is an average price including animals with no commercial value.

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[4] Pasture production sensitivity analysis was done as an approximation of seasonal variation. In order to achieve this, as the pasture growth rate was varied the model was run with the stocking rate fixed at the level that was optimum for 100% pasture growth. This method gives an approximation of producers encountering seasons in which they are effectively ‘over stocked’, however, it doesn’t account for other tactics they may employ in a poor season.

3. Results and Discussion

3.1 Benefits of Scanning

Scanning ewes for litter size and managing drys and twins accordingly increases profit by $7 800 (Table 3.1) or $1.55/ewe. To achieve this increase in profit the optimum management involves a slight reduction in the number of ewes due to the lamb percentage increasing because of the greater number of twin lambs surviving and an increase in fertility due to culling dry ewes. Grain feeding remains the same but there is a reallocation of the feed from the dry ewes to the twin bearing ewes.

Table 3.1: Increase in profit achievable from scanning ewes for pregnancy status and the components of the total.

	Effect on profit		
	$/farm	$/ewe	$/dry or twin
Pay for wet/dry scanning (45c)	-2 400	-45c	-$3.65
Sell drys at shearing	2 800	+55c	$4.50
Increase fertility due to culling	2 400	+45c	$3.65
Reduce nutrition of drys	2 450	+45c	$3.65
			=$8.15/dry
Pay extra for scanning twins (70c)	-1 350	-25c	95c
Alter nutrition of twins	3 900	75c	$2.90
			=$1.95/twin
Total	$7 800	$1.55	

Of the total benefit ($7 800/farm) about 60% is achieved by scanning for pregnancy status without scanning litter size. That is 60% of the total benefit is due to altering the management of the dry ewes and 40% of the total benefit is due to improved management of the twin bearing ewes.

When calculated per ewe that is differentially managed the benefits from identifying the dry ewes are $8.15/ewe which is greater than the benefit of identifying the twin bearing ewes which is $1.95/ewe.

Of the benefit that accrue to improving the management of the dry ewes the benefits are equally split between

1. the flock structure benefits of selling some of the ewes early and achieving a younger flock. This occurs because fewer animals are retained through to 5.5 years of age and less of the young animals are sold off shears as hoggets.
2. The increase in fertility achieved by culling dry ewes
3. The reduction in the quantity of feed allocated to the dry ewes.

The benefits of identifying pregnancy status and litter size increase as the number of dry ewes and twin bearing ewes increases (Table 3.2). If the proportion of twins is near 50% then the benefits from scanning for litter size are approximately $2/ewe, whereas if the proportion of twins is below 15% then the net benefit from scanning litter size is negligible because the cost of scanning cancels the benefits from improved management.

Table 3.2: Impact of varying the fertility and prolificacy on the value of identifying pregnancy status and litter size.

Proportion of drys	Benefits from identifying pregnancy status		Proportion of twins	Benefit from identifying litter size[5]	
	$/farm	$/ewe		$/farm	$/ewe
6	1455	0.30	13	133	0.05
12	5250	1.00	26	2560	0.50
18	2760	0.50[6]	52	9610	2.10

3.2 Optimum nutrition profiles

Identifying the pregnancy status and litter size of ewes allows the nutrition of the ewes to be tailored to optimize production and feed utilization and increase profit. All ewes have to be managed the same until scanning when dry and twin bearing ewes can be identified. Table 3.3 and Figures 3.1, 3.2 and 3.3 outline the optimum profiles that have been identified from the combinations of the 27 different profiles that were analysed.

Table 3.3: Optimum profiles for dry, single and twin bearing ewes and the impact of identifying drys and twins by scanning.

	No Scanning (Fig 3.1)	Scan Drys (Fig 3.2)	Scan Twins (Fig 3.3)
Single	Manage flock for singles as per LTW guidelines. Mate in CS 2.6, lose 0.25CS to day 90, then regain lost CS prior to lambing.	Same as no scan	Same as no scan
Twin	Twins lose more LW/CS than singles during late pregnancy and lactation.	Same as no scan	Gain 0.6CS from scanning to lambing, so that twin ewes are in better condition than single bearing ewes at lambing.
Dry	Drys gain weight relative to Singles during late pregnancy and lactation	Manage drys to lose a further 0.15 CS by weaning & regain the condition in spring	Same as scan drys

[5] This is the benefit over and above the benefit from identifying pregnancy status.
[6] See discussion in section 3.3 to explain why this value is lower as % of dry ewes increases.

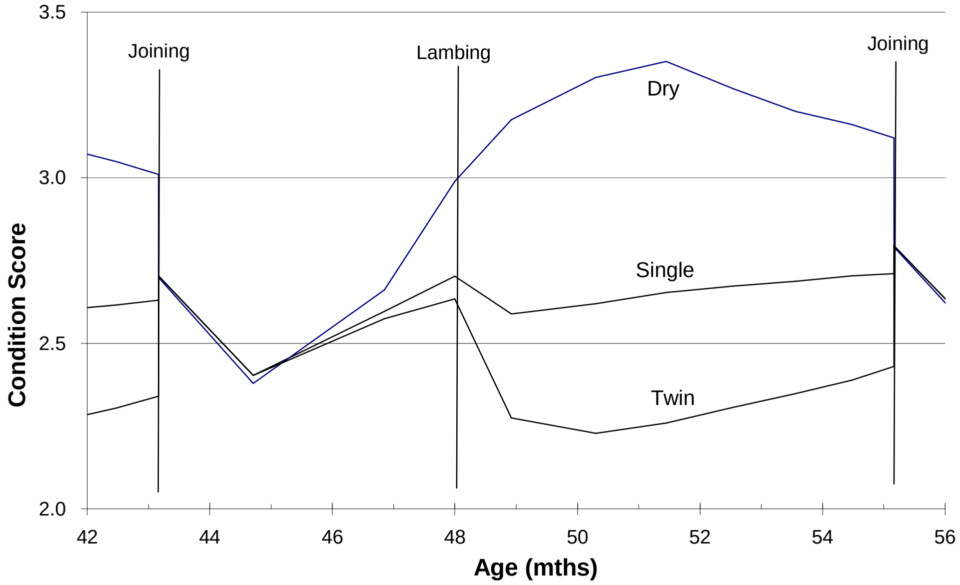

Figure 3.1: Optimum CS profile of dry, singles and twins, if all animals run together. Ewes are run so singles follow the Lifetimewool guidelines.

If ewes aren't scanned and the dry ewes have access to same feed as the reproducing ewes then it is calculated that during the period from scanning through to weaning, when the other ewes are pregnant or lactating, the dry ewes will gain about 1 condition score (Figure 3.1). This gain in condition is regularly observed on farms with dry ewes at marking being fatter than their lactating counterparts.

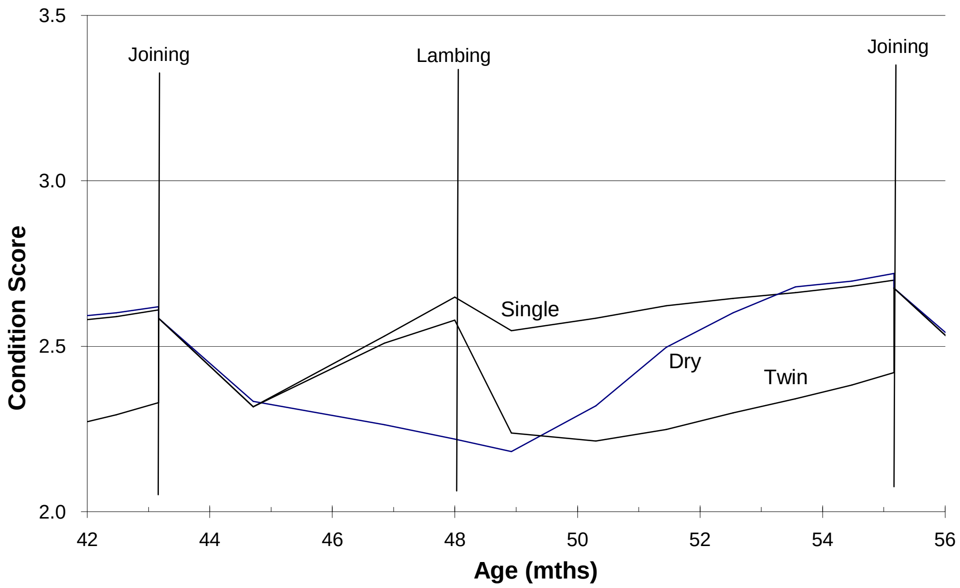

Figure 3.2: Optimum CS profile if ewes are scanned for pregnancy status and dry ewes are managed differentially.

If pregnancy status is identified and the dry ewes can be managed differentially then the optimum nutrition profile of the dry ewes is reduced whereas the profile for the reproducing ewes is unchanged (Figure 3.2). The optimum profile for dry ewes involves losing condition from scanning through to lambing. The production of the dry ewes is reduced by 0.8kg CFW and mortality is increased by 5.3% (Table 3.4).

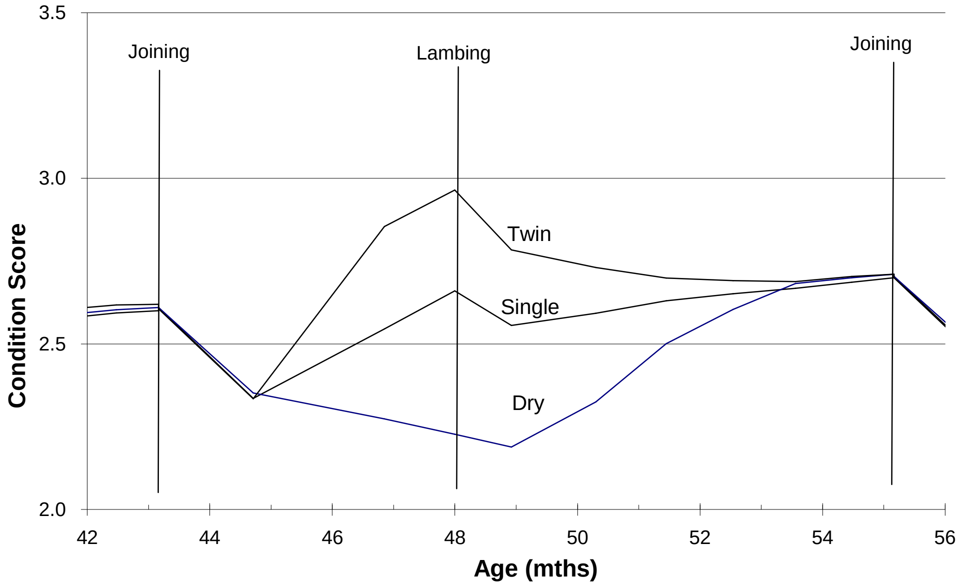

Figure 3.3: Optimum CS profile if ewes are scanned for litter size and single, twin & dry ewes are managed differentially.

If ewes are scanned to identify litter size and the dry ewes and twin bearing ewes can be managed separately then the optimum profile for the twin bearing ewes is altered, however, the profile for the singles and drys is the same as if ewes are only scanned for pregnancy status. The optimum profile for the twin ewes involves being offered better feed during late pregnancy and lactation. The optimum profile for the twin ewes is to achieve a higher CS at lambing than the singles and then lose this extra condition from weaning through to next joining. It is calculated that this change in profile for the twin bearing ewes would increase the ewes production by 0.3kg CFW, reduce the ewe mortality by 1.4%, reduce lamb mortality by 16% and improve the progeny wool production by increasing CFW by 0.05kg and reducing fibre diameter by 0.08µ (Table 3.4).

Table 3.4: Production levels of ewes and their progeny when the management of the ewes is altered

			Run Together		Run Separately	
		Single	Dry	Twin	Dry	Twin
Ewe	CFW (kg)	3.9	5.0	3.5	4.2	3.8
	FD (u)	19.0	20.3	18.5	19.5	18.9
	Mortality (%)	4.3	2.8	6.9	8.1	5.5
	Lamb Survival (%)	86	-	54	-	70
Progeny	CFW (kg)	-0.03	-	-0.25	-	-0.20
	FD (u)	-0.01	-	+0.32	-	+0.24

The cost of missing the targets for the twin bearing ewes is over 50% higher than the cost of missing targets for the single bearing ewes (see Table 3.5 comparing cost $/hd of not achieving the joining CS), this indicates that the twin bearing ewes should be given priority when allocating feed during late pregnancy and lactation. However, the benefit of the twin ewes increasing above their joining CS is less than the cost of single bearing ewes not regaining condition back to their condition. This indicates that the optimum is to have the twin ewes between 0 and 0.3CS better than the single bearing ewes at lambing.

Table 3.5: Reduction in profit from missing the target condition at lambing by 0.3CS for singles and twins

	Cost of missing target CS	
	$/farm	$/hd
Twin - don't increase above joining CS	2750	2.00
Single – don't achieve joining CS	14100	4.00
Twins – don't achieve joining CS	11600	7.30

3.3 Management of drys

The management of the dry ewes after they are identified has a large impact on the profitability of scanning (Table 3.1). Three options were evaluated in this analysis

1. Retain dry ewes and mate again the following year.
2. Run the dry ewes separately through to the normal shearing time and sell off-shears.
3. Sell at scanning.

The most profitable management for the dry ewes depends on the proportion of dry ewes in the mob (Figure 3.4). With the standard reproductive parameters, if the proportion of drys is below 15% then it is most profitable to sell the drys after shearing. If the proportion of drys is greater than 15% then it is more profitable to retain the drys. The reason for the switch in the most profitable management is related to changes in flock structure that are necessitated to maintain the flock when there is a high proportion of drys. When there are a lot of dry ewes and they are sold, then in order to maintain the flock the breeding ewes need to be retained to 6.5 years. At this age the wool value of these ewes is diminishing because they are cutting less wool that is broader. This indicates that the optimal management of the dry ewes is affected by the reproductive rate of the flock, if the drys can be sold without necessitating a change in the sale age of the CFA ewes then it is optimal to sell.

With the standard assumptions (see Table 2.5) it is not profitable to sell ewes at scanning (Figure 3.4). This is because the value of the wool foregone by not carrying the ewes to shearing is greater than the value of the feed that is saved by selling at scanning rather than at shearing. This tradeoff between wool value and value of feed will vary with the time of lambing (and hence time of scanning and sale time). In this analysis the flock is lambing in late August & September so scanning is occurring after the main period of feed shortage in winter has passed. A sensitivity analysis indicated that if the scanning could occur earlier and dry ewes could be sold at the end of May then the profitability of selling at scanning is increased by $6000, however, this is still not sufficient to make selling at scanning profitable in a normal year.

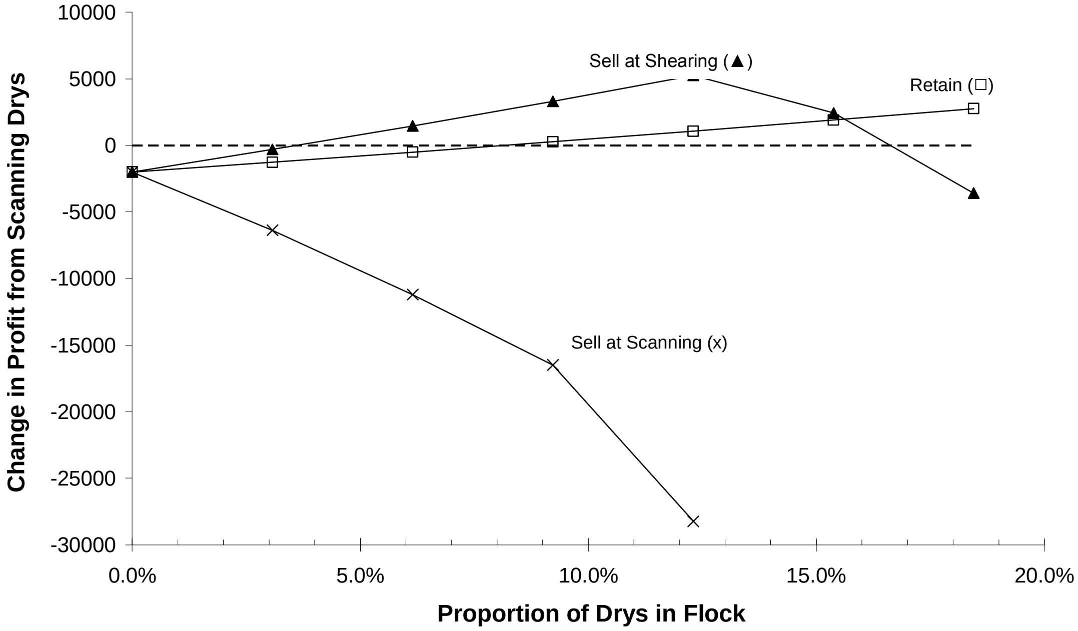

Fig 3.4: Increase in profit from scanning drys relative to not scanning and the impact of management of the dry ewes.

3.4 Impact of season on the value of scanning

The value of scanning is altered by the season or grazing pressure that is being experienced. When a feed shortage is experienced overall profit is reduced because more grain feeding is required but the value of scanning is increased. The majority of the increase in value is due to being able to adjust the management of the dry ewes rather than adjusting the management of the twin bearing ewes (Figure 3.5). This is because identifying the dry ewes allows the feed to these ewes to be reduced and there is a higher value in being able to allocate this to the higher priority reproducing ewes.

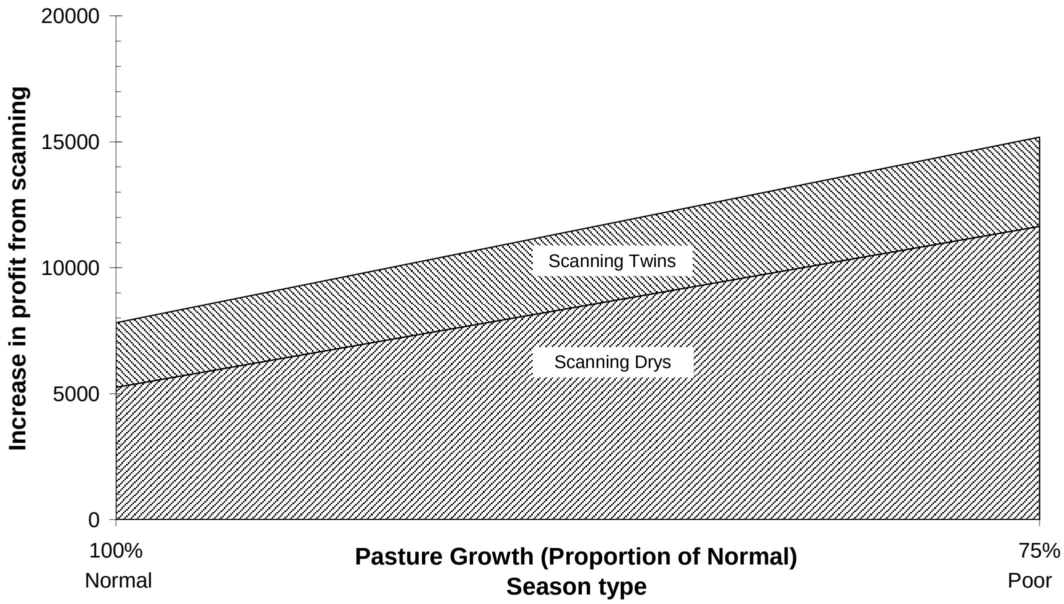

Figure 3.5: Increase in profit from scanning ewes for a normal and a poor year showing contribution from scanning drys and scanning twins.

In poorer seasons the relative profitability of selling at scanning is increased and in this analysis when pasture growth was between 60 & 70% of normal it was more profitable to sell the dry ewes at scanning than it was to retain through to shearing. This indicates that in extreme situations selling dry ewes can be a profitable tactic.

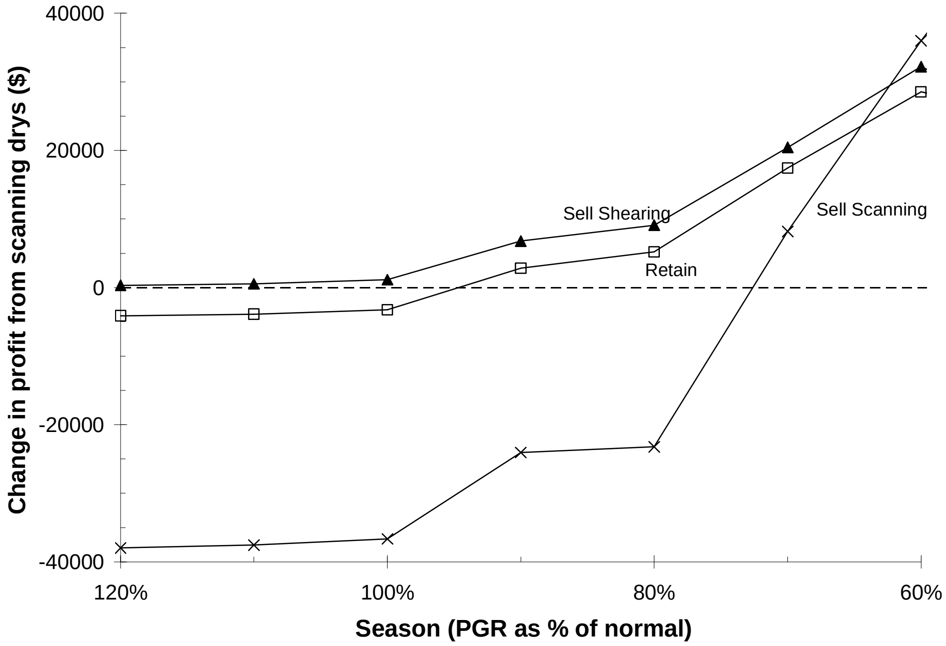

Figure 3.6: Impact of season on the value of scanning drys with the 3 alternatives for the management of the dry ewes.

3.5 Impact of culling drys on fertility

Increasing the gain in fertility (or increasing the reduction in the number of drys) achieved from culling dry ewes has an impact on the profitability of scanning for pregnancy status and culling the dry ewes (Figure 3.7). The impact is greater if the flock has a larger number of dry ewes initially. If the increase in fertility is greater than 25% then even with a high proportion of dry ewes initially it remains profitable to cull the dry ewes because the flock will achieve a level of fertility in which the sale age of the CFA ewes doesn't need to be adjusted to maintain the flock (for further discussion on this point see section 3.3).

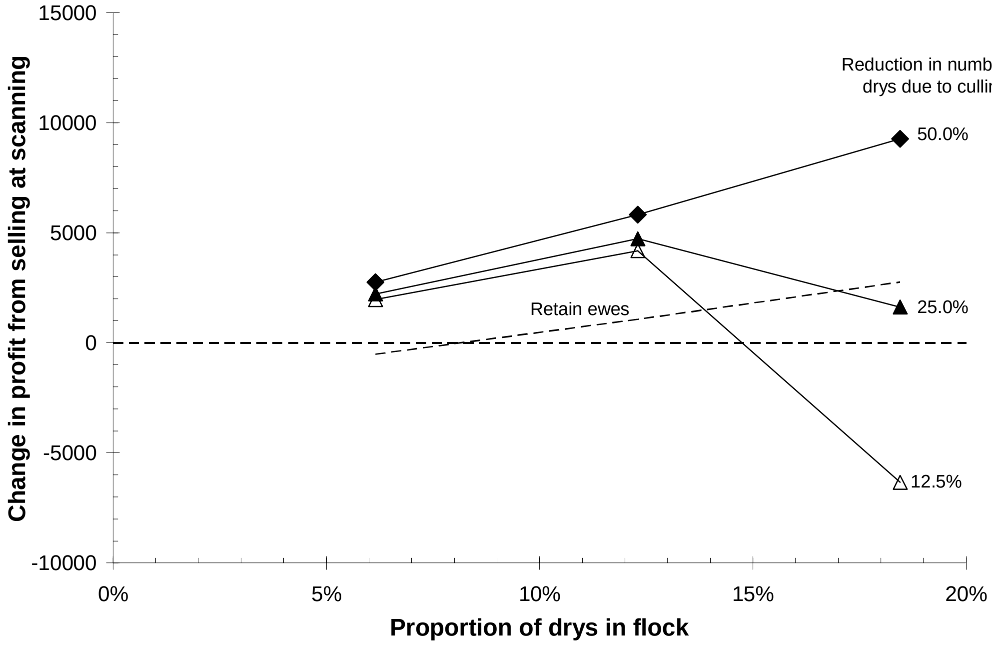

Figure 3.7: Sensitivity analysis of the increase in fertility resulting from culling dry ewes. Note: the standard value is a 12.5% response.

3.6 Price premium for selling at scanning

A sensitivity was carried out on the sale price of ewes sold at scanning because the price achieved at this time of year may vary from that achieved off shears because the ewes are being sold with wool on their backs and they are being sold into a different market (that in an average year pays a higher price), this sensitivity analysis is also a proxy for varying the duration between shearing and scanning because the sale price of the ewe is representing the value of wool on the sheep's back.

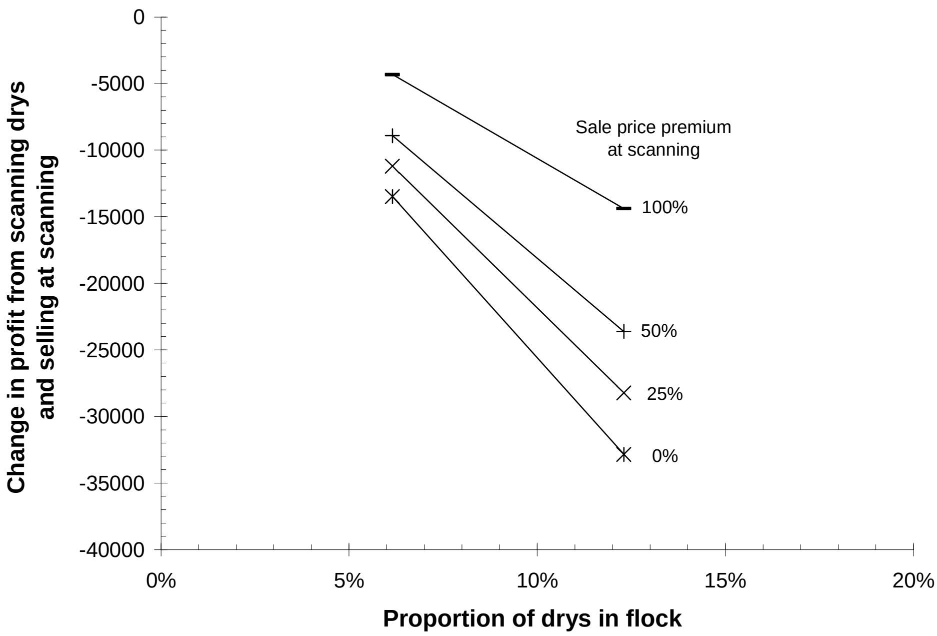

Figure 3.8: Sensitivity analysis of the increase in the sale price achieved for dry ewes if they are sold at scanning. Note: the standard premium is 25%.

Varying the price premium received from 0 to 100% does affect the profitability of the system selling dry ewes at scanning however, even with a 100% price premium it is still much more profitable to sell the ewes after shearing (Figure 3.8). It was approximated that premiums would need to be 200% before selling at scanning was a profitable option in a normal year.

3.7 Cost of scanning

Varying the cost of scanning within the ranges examined in this analysis (40 - 50c/hd for scanning pregnancy status and 50 - 90c/hd for litter size) has little impact on the profitability of scanning (Figure 3.9 and Figure 3.10). The impact is limited to the actual change in cash cost as calculated by multiplying the change in cost per head by the number of ewes in the flock.

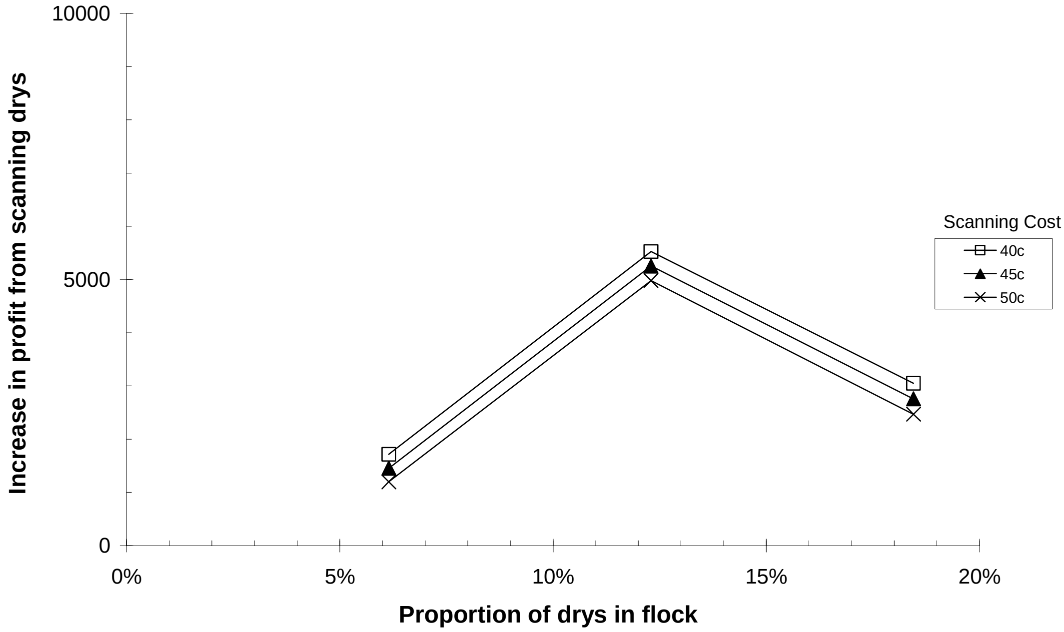

Figure 3.9: Increase in profit from scanning drys relative to not scanning and the impact of the proportion of drys in the flock and the cost of scanning.

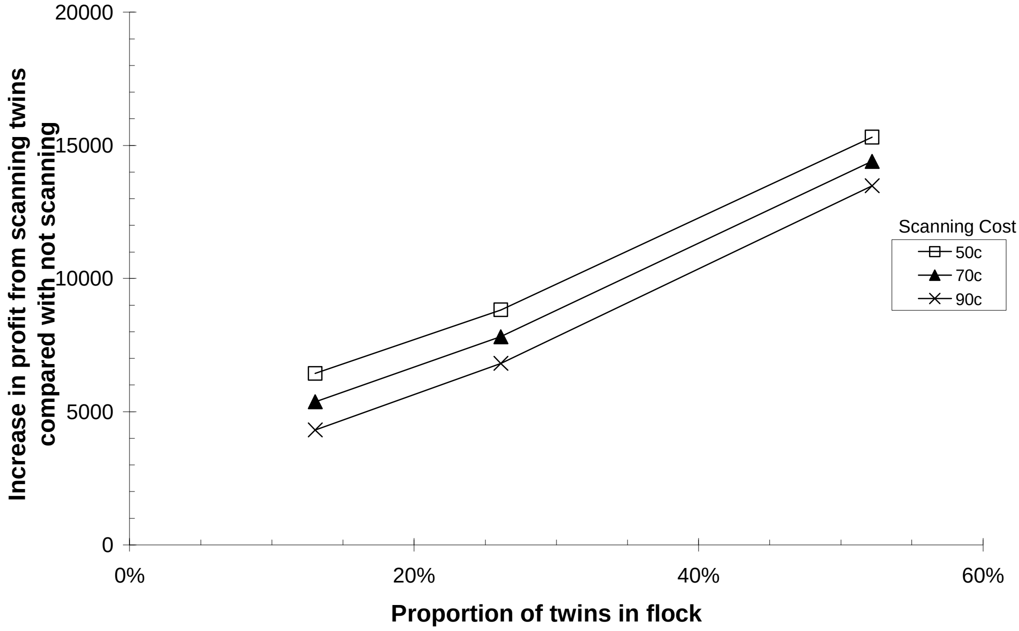

Figure 3.10: Increase in profit from scanning twins relative to not scanning and the impact of the proportion of twins in the flock and the cost of scanning. Note: the benefits of scanning includes the benefits from improved management of drys.

3.7 The importance of scanning errors

If errors are made in the scanning process then ewes will be managed inappropriately for their status and this will reduce profitability (Table 3.7). For example, if a reproducing ewe is mis-identified as being dry and is allocated to the dry mob, this ewe will receive a lower level of nutrition and will produce less wool that is finer and have a higher risk of mortality. The progeny will have a higher risk of mortality and will produce less wool that is broader.

Mis-identifying twin bearing ewes as dry has a very high cost because the nutritioin profile of the dry ewes would lead to high mortality for reproducing ewes and a large penalty to the progeny production. Mis-identifying twins as dry has an even larger cost because the survival penalty is increased and the production penalty is experienced over 2 lambs. However, mis-identifying a twin bearing ewe as single has a much lower cost and the profile that animal would follow is the profile that is optimum if ewes are only scanned for pregnancy status.

There is a trade-off between saving money on the cost of scanning versus the cost of misidentifying ewes. If 10c/hd could be saved on the cost of scanning this would be offset if 1.2% of the ewes were identified as dry but were singles, or 3.6% of the ewes were identified as singles but were twins.

Table 3.7: Reduction in profit ($/ewe) if ewes are identified incorrectly and the increase in the level of errors (%) that would offset a saving of 10c/hd in the cost of scanning.

	Cost per ewe misidentified	Level to offset 10c/hd
Single as dry	8.25	1.2%
Twin as single	2.80	3.6%
Twin as dry	13.50	0.7%

This analysis has ignored the question of whether the optimal nutrition profiles of the groups (particularly the drys) changes as the level of errors changes.

3.8 Importance of including Lifetimewool

When the analysis was repeated but excluding either the progeny wool production and the progeny survival relationships developed in the Lifetimewool project or just the progeny wool production relationships the impact of scanning on farm profit was altered (Table 3.7). If both relationships were excluded then scanning ewes reduces profit by $1 000/farm because the production benefits are less than the cost of scanning. In this scenario the optimum nutrition profiles for the twin bearing ewes are only altered slightly, this occurs because the production benefits from feeding extra to the reproducing ewes are limited to the benefits achieved from the ewes production and survival.

If the progeny survival relationship is included but the progeny wool production relationship is excluded then the calculated increase in profit from scanning is reduced by 30% and the majority of the value of scanning is due to the improved survival of the twin bearing ewes. In this scenario the value of identifying dry ewes and adjusting their nutrition is halved compared to including the relationships.

Table 3.7: Comparison of results from the analysis including and excluding the relationships developed in the Lifetimewool project.

	Effect on profit ($/farm)		
	Including LTW	Excluding LTW wool	Excluding LTW wool & survival
Scanning for Pregnancy Status	5 250	2 550	225
Scan for Litter Size	2 550	2 950	-1 250
Total	$7 800	$5 500	-$1 025

4. Conclusions

The benefits of scanning ewes for pregnancy status and litter size were calculated to be $7 800 for a typical farm. Of this total benefit approximately 60% was achieved through management of the dry ewes and the remaining 40% was achieved through improved management of the twin bearing ewes. The benefits of identifying dry ewes was calculated to be $8.15 per dry ewe and the extra benefits of identifying the twin bearing ewes was calculated to be $1.95/twin ewe.

The optimum nutrition profile for the single bearing ewes was not affected when dry ewes or twin ewes were identified, however, the optimum nutrition profiles of the drys and twins were altered. The optimum for the dry ewes involved losing condition from scanning through to lambing and the optimum for the twin bearing ewes was to gain extra condition from scanning through to lambing so that by lambing these ewes were above their joining condition.

The management of the dry ewes was important in achieving the benefits from scanning. The most profitable strategy in a normal year is to run the dry ewes through to shearing and sell the ewes off-shears. This is most profitable unless the reproductive rate of the flock means that selling the drys would require delaying the sale of the CFA ewes by a year – if this would be necessary then it is more profitable to retain the dry ewes for subsequent joining.

The profitability of identifying pregnancy status is higher if there are more dry ewes in the flock. If the proportion of drys is less than 5% then the net benefit of scanning for pregnancy status is negligible. Also, the profitability of identifying litter size is higher if the proportion of twin bearing ewes in the flock is higher. This makes it difficult to decide which are the priority mobs to scan. However, because the majority of benefits accrue from identifying the dry ewes this indicates that scanning the maiden ewes that typically have a high proportion of drys will be the most profitable mob. For the older ewes that typically have fewer drys, the decision to scan will be based on the value achieved from identifying the twin bearing ewes knowing that the benefits from identifying the drys will only be offsetting some of the cost associated with scanning.

The benefits of scanning are greater in seasons or on farms with greater grazing pressure. This indicates that scanning could be useful as a tactic to manage poor seasons, although for it to be used tactically would require that sufficient scanning capacity was in reserve to handle the higher demand in poor years. In very bad years it can be profitable to sell the dry ewes at scanning and forego the wool income from the dry ewes.

The cost of scanning is relatively unimportant in the decision on the profitability of scanning. A saving of 10c/hd in the cost of scanning would be offset if 1.2% of the ewes were identified as dry but were singles, or 3.6% of the ewes were identified as singles but were twins.

Including the biology identified in the Lifetimewool project is important in the calculation of the profitability of scanning ewes for pregnancy status or litter size because the changes in progeny production and survival have a big impact on the calculations. If both the progeny wool production and the progeny survival relationships developed in the Lifetimewool project are ignored the conclusion from the analysis would be that scanning is not profitable and if farmers did scan then there is very little incentive to alter the nutrition profiles for the dry and twin bearing ewes. If the progeny survival relationship is included but the progeny wool production relationship is ignored then the analysis indicates that scanning can be profitable but the potential increase in profitability is reduced by 30%.

5. References

Lee, G.J. and Atkins, K.D. (1996). Prediction of lifetime reproductive performance of Australian Merino ewes from reproductive performance in early life. *Aust. J. Exp. Agric*. **36:**123-128.

Standing Committee on Agriculture (1990). Feed standards for Australian Livestock – Ruminants. CSIRO Publishing.

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Appendix 1: Standard Farm Production

Table A1.1: Sheep management program.

	'Wool'
Lambing time	Early Sept
Weaning age	12 weeks
Shearing time	Feb/Mar
Crutching time	Oct
Stock turn off	
- wether lambs	
- ewe lambs	
- ewe hoggets	Mar/Apr
- CFA ewes	Mar/Apr
- adult wethers	Mar/Apr
Lamb slaughter wt (kg)	

Other management comments:

- Animal husbandry
    - Drenching (1 or possibly 2 summer drenches)
    - Jetting (normally spring born lambs jetted at marking or weaning)
- Crutching (contract)
- Shearing (contract)

Pasture productivity assumptions

Table A1.2: Initial growth or germination (kg/ha) of each pasture type on each soil class during the first feed period.

	Ridges	Mid-slopes	Flats
Medium production Perennial Ryegrass	426	426	426

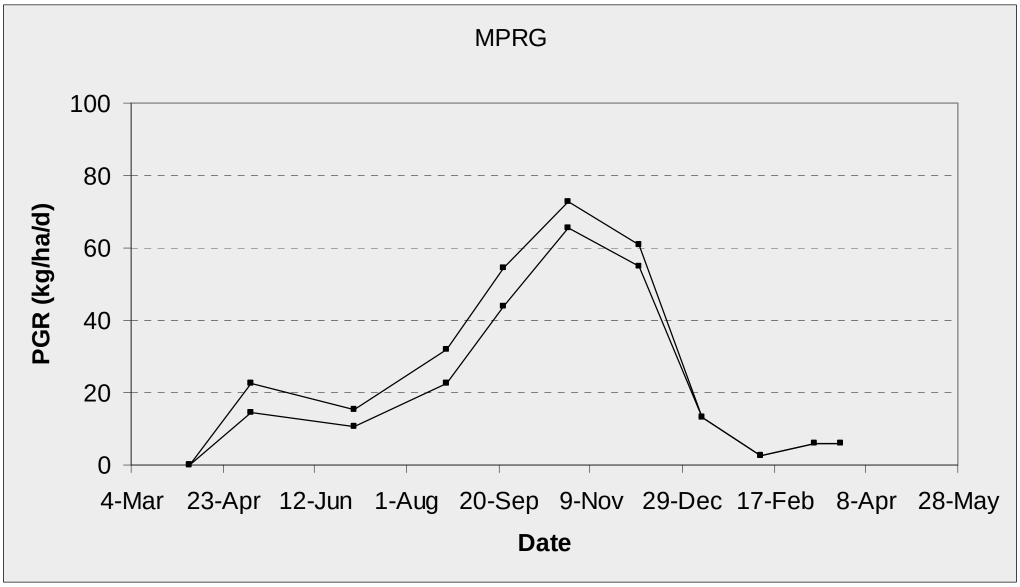

Figure A1.1: MIDAS inputs: Low & High PGR for medium productivity perennial ryegrass pasture in each feed period (1 to 10). Note the low and high PGR relate to the low & high FOO levels in the following graph. The MIDAS optimization algorithm is able to vary grazing intensity which alters FOO which then affects PGR.

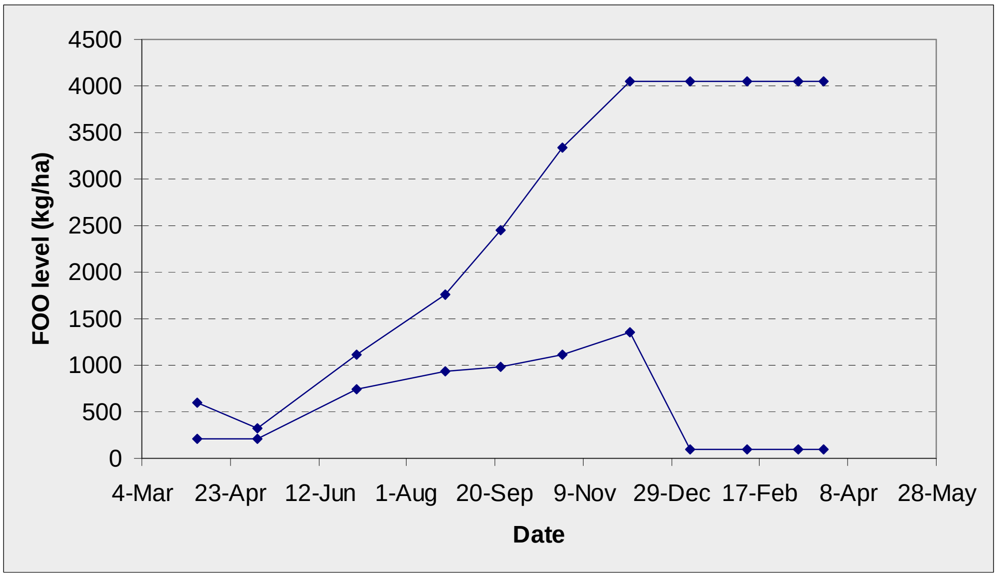

Figure A1.3: MIDAS inputs: FOO levels for the 2 different PGR levels for each pasture type.

Table A1.3: Digestibility of total pasture available in each of the feed periods.

Period of Year	Start of feed period	End of feed period	DMD (%)
1	25-Mar	14-Apr	76
2	15-Apr	31-May	77
3	1-Jun	4-Aug	78
4	5-Aug	8-Sep	77
5	9-Sep	6-Oct	77
6	7-Oct	17-Nov	74
7	18-Nov	22-Dec	71
8	23-Dec	24-Jan	60
9	25-Jan	24-Feb	54
10	25-Feb	24-Mar	51