Unpublished Report

Document ID: SheepCRC_2_9

Title: Impact of Scanning Pregnancy Status on farm profitability in the Great Southern of W.A.

Author: Young, J.

Key words: pregnancy scanning; benefit analysis; sheep; economics; profitability

This report was prepared as part of the Sheep CRC Program 2007-2014. It is not a refereed publication. If the report is quoted it should be cited as:

Sheep CRC Report 2_9

Impact of Scanning Pregnancy Status

on

farm profitability

in the

Great Southern of W.A.

John Young
Farming Systems Analysis Service
21 September 2009

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 Great Southern 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 the Great Southern region of Western Australia 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 $2 950 for a typical farm. All of the benefit is achieved through improved management of the twin bearing ewes and is equal to $2.85/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 maintaining 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 scanning is higher if there are more twin ewes in the flock. If the proportion of twins is less than 10% there is no benefit from scanning. This makes the old ewes that typically have a high proportion of twins the priority mobs to scan.

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 some 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 2.5% of the ewes were identified as dry but were singles, or 3.2% of the ewes were identified as singles but were twins.

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. 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 Great Southern version of MIDAS (Young 1995) has been used to calculate the profitability for a range of nutrition profiles for reproducing ewes in the Great Southern region of WA. 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 Great Southern region of Western Australia. The total area of the farm is 1000ha and is comprised of 5 land management units (LMUs; Table 2.1). The pasture production profile varies on each LMU.

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

Land Management Unit	Area (ha)	Description	Past. Growth (% of S4)
S1 - Saline Soils	100	Shallow saline sands over heavy gleyed or mottled clay.	55
S2 - Waterlogged soils	150	Deep sands often waterlogged over grey gleyed clay.	85
S3 - Deep Sands	50	Deep sands but not waterlogged over mottled clay.	90
S4 - Sandy Gravels	500	Gravels and sandy gravels to 50cm over clay or gravelly clay.	100
S5 - Sandy Loams	200	Sandy loam, loamy sand over clay. Rock outcropping in landscape.	105

2.2.2 Animal production system

The analysis is based on a self-replacing merino flock growing medium micron wool. Surplus ewes and all wethers are sold as hoggets off shears at 1.5 years old. Details on the productivity of the flock are in Appendix 1. A spring lambing and an autumn lambing system have been compared. The feed profile is quite different for each time of lambing so the ewe nutrition profiles compared are quite different (see section 2.4).

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)	50
Fleece weight (clean kg/hd)	3.0
Mean fibre diameter (µm)	20.0
Weaning rate (%)	87

2.2.3 Pasture production

The pasture production is based on a pasture consisting of sub-clover, annual grasses and herbs typical of farms in the region. This pasture is grown on all land management units. Further 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 CS2.5, slight loss to mid pregnancy andregain by lambing) and assume the rate of lamb survival observed in the paddock scale experiments.

	July/Aug
Profit ($/ha)	140
Number of ewes	4320
Stocking rate (DSE/WG ha)[1]	12.9
Supplementary feeding (kg/DSE)	40
(t)	390
Flock structure	
% ewes	68
Sale age of CFA ewes	5.5
Sale age of surplus young ewes	hoggets
Sale age of wethers (yrs)	hoggets
Lambing (%)	84
Crop Area (%)	25
Pasture growth (t/ha)	6.1
Pasture utilization (%)	56
Wool income ($/ha)	426
Sale sheep income ($/ha)	156

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.

[1] Stocking rate calculated using 1.5 DSE/ewe & 1DSE/hd for hoggets.

Table 2.4 : Coefficients fitted in the statistical model that explains progeny production from Ewe condition score (CS) at joining and CS change during pregnancy using the Austral Park 2001 and 2002 progeny. Assuming one CS equals 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	0.10		0.27	
Ewe CS change				
Day 0-90	0.19	-0.31	0.33	
Day 90-lambing	0.19	-0.36	0.45	
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. The 'Paddock Scale' is considered the best bet estimate of the result that most farmers will achieve in their paddocks (Andrew Thompson *pers. comm.*) because the response in survival in the small plot trials was increased by the frequent management interventions.

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 (2.5, 2.9 and 3.2), 3 rates of condition loss to scanning (no loss, lose 0.4CS and lose 0.8CS) and up to 4 levels of change in condition between scanning and lambing (gain 0.8CS, gain 0.4CS, maintain and lose 0.3CS).

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.

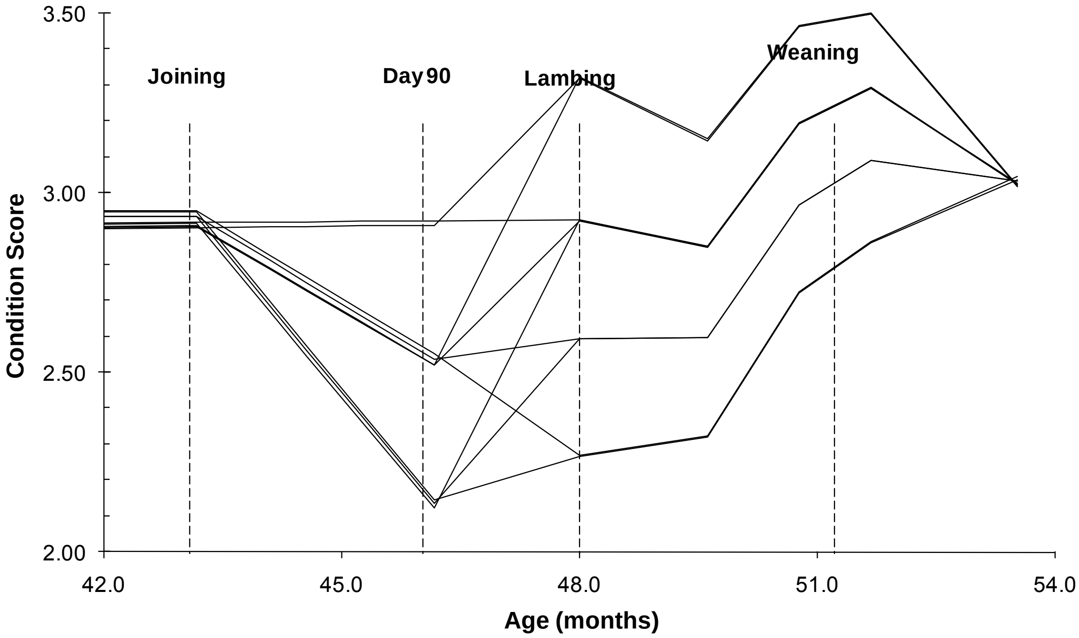

Figure 2.1: The 9 nutrition profiles examined in MIDAS that start with a joining condition of CS2.9. Note: there are a similar set of profiles that start with CS3.2 and CS2.5.

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 and the range examined in the sensitivity analysis.

	Standard	Sensitivity Levels
Prices		
Wool Price		
(c/kg sweep the board)		
18μ	1044c/kg	
19μ	942c/kg	

20µ	850c/kg	
21µ	796c/kg	
Meat Price ($/hd net)		
Ewe Hgt	34	
Wether	46	
CFA Ewe	32	
Increase in ewe price when sold at scanning	25%[3]	0, 25, 50 & 100%
Grain Price ($/t fed out)		
Oats	163	
Lupins	222	
Pasture Production	6.7t/ha	60% to 120%[4]
Flock Structure		
Sale Age of Wethers	17 months	
% ewes	68%	
Time of Lambing	21Jul -24Aug	
Cost of Scanning		
Pregnancy status	45c	40, 45 & 50c
Litter size	70c	50, 70 & 90c
Reproduction		
Proportion dry	11%	0% up to 18%
Proportion twins	30%	15, 30 & 45%
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.

[3] Any ewes sold at scanning receive a 25% higher price ($40/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 ($32/hd) up to a 100% premium ($64/hd).

[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 $2 950 (Table 3.1) or $0.70/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)	-1 950	-45c	-$4.00
Sell drys at shearing	3 350	+80c	$6.85
Increase fertility due to culling	-250	-5c	$0.50
Reduce nutrition of drys	-1 850	-40c	$3.80
			=-$1.43/dry
Pay extra for scanning twins (70c)	-1 100	-25c	-85c
Alter nutrition of twins	4 750	$1.10	$3.70
			=$2.85/twin
Total	$2 950	$0.70	

The benefit of scanning ($2 950/farm) is all due to identifying twins (Table 3.1). This contrasts with the analysis done for SW Victoria in which 60% of the benefits accrued from identifying the dry ewes. Some of this difference between regions could be due to the improved representation of animal intake in the Hamilton EverGraze MIDAS model compared with the Great Southern MIDAS model. The Great Southern model may be underestimating the benefits from identifying dry ewes and reducing their nutrition.

When calculated per ewe that is differentially managed the benefits from identifying the twin ewes is $2.85/ewe and the benefits per farm increase as the number of 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 $1.50/ewe, whereas if the proportion of twins is below 10% 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 prolificacy on the value of identifying litter size.

Proportion of drys	Proportion of twins	Benefit from identifying litter size[5]	
		$/farm	$/ewe
6	15	875	0.20
11	30	3650	0.85
17	45	6550	1.50

[5] This is the benefit over and above the benefit from identifying pregnancy status.

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 2.5, lose 0.4CS 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 0.8CS 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 for slow weight gain to weaning	Same as scan drys

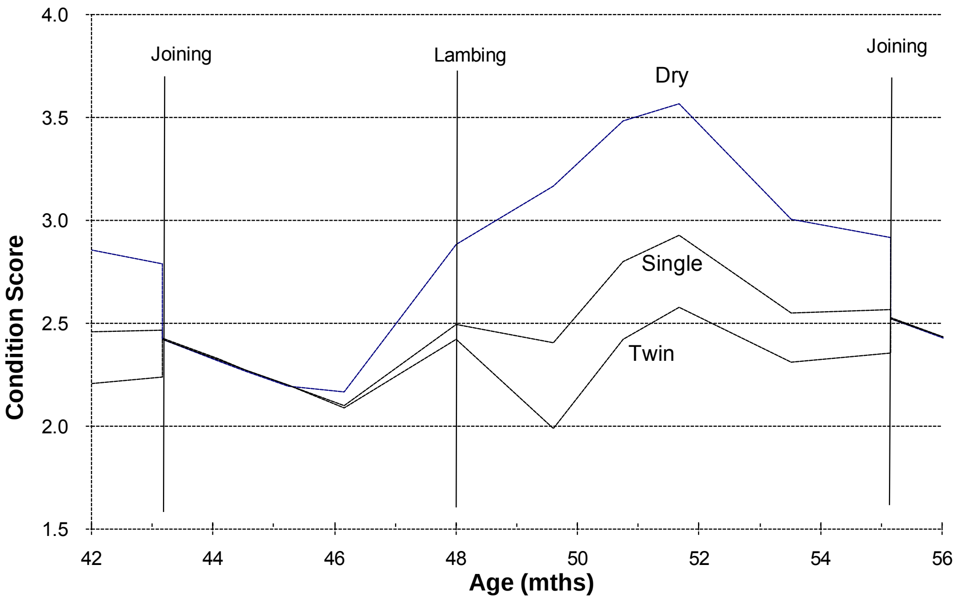

Figure 3.1: Optimum CS profile of dry, singles and twins, if all animals run together. Ewes are run so singles follow the Lifetimewool guidelines.

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 1.5 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.

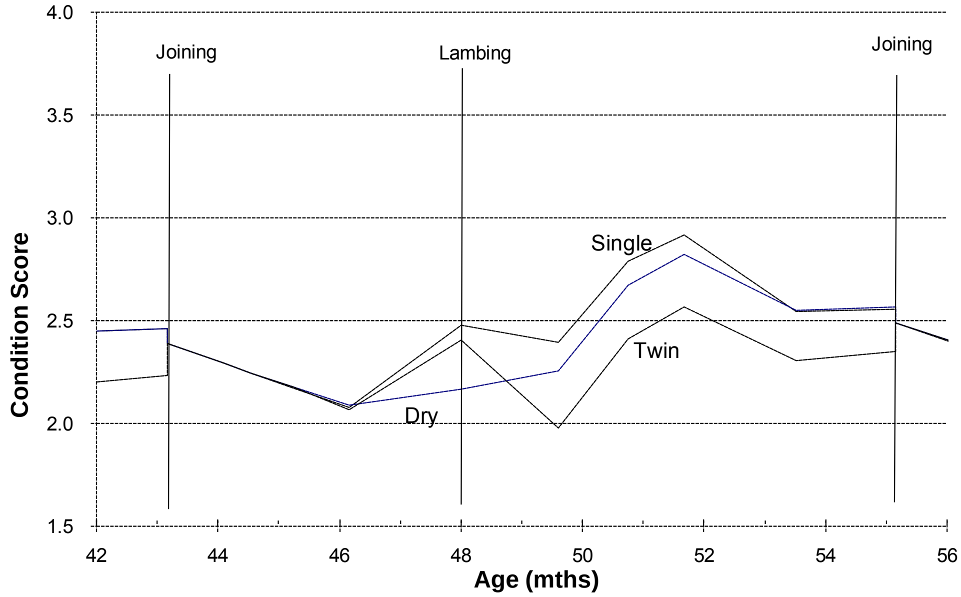

Figure 3.2: Optimum CS profile if ewes are scanned for pregnancy status and dry ewes are managed differentially.

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 maintenance or slight gain from scanning through to lambing. The production of the dry ewes is reduced by 0.7kg CFW and mortality is increased by 4% (Table 3.4).

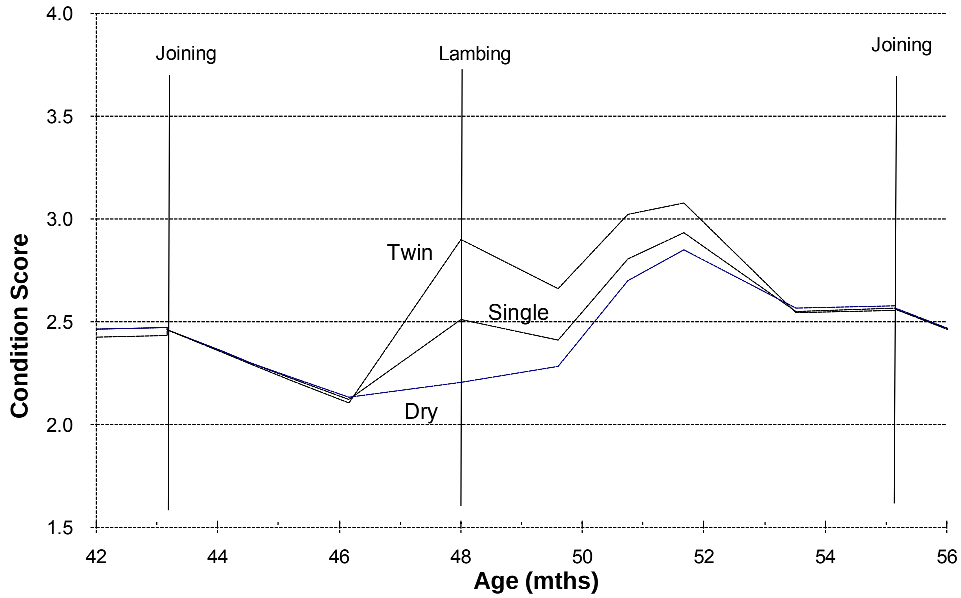

Figure 3.3: Optimum CS profile if ewes are scanned for litter size and single, twin & dry ewes are managed differentially.

If ewes are scanned to identify litter size and the dry ewes and twin bearing ewes are 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 0.2kg CFW, reduce the ewe mortality by 1.3%, reduce lamb mortality by 6% and improve the progeny wool production by increasing CFW by 0.08kg and reducing fibre diameter by 0.16µ (Table 3.4).

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

		Single	Run Together		Run Separately	
			Dry	Twin	Dry	Twin
Ewe	CFW (kg)	4.4	5.4	4.0	4.7	4.2
	FD (u)	19.7	20.8	19.2	20.0	19.6
	Mortality (%)	4.1	2.1	6.8	6.1	4.8
	Lamb Survival (%)	86	-	64	-	70
Progeny	CFW (kg)	-0.05	-	-0.33	-	-0.25
	FD (u)	-0.04	-	+0.47	-	+0.31

3.3 Management of drys

The management of the dry ewes after they are identified has an 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 is to sell the drys after shearing. If the proportion of drys is very high then it becomes 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. 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 there is less reduction from selling at scanning than for the flock analysed for

SW Victoria. This is because this flock is lambing earlier and scanning is occurring at about the time of the time of the main feed shortage for the year.

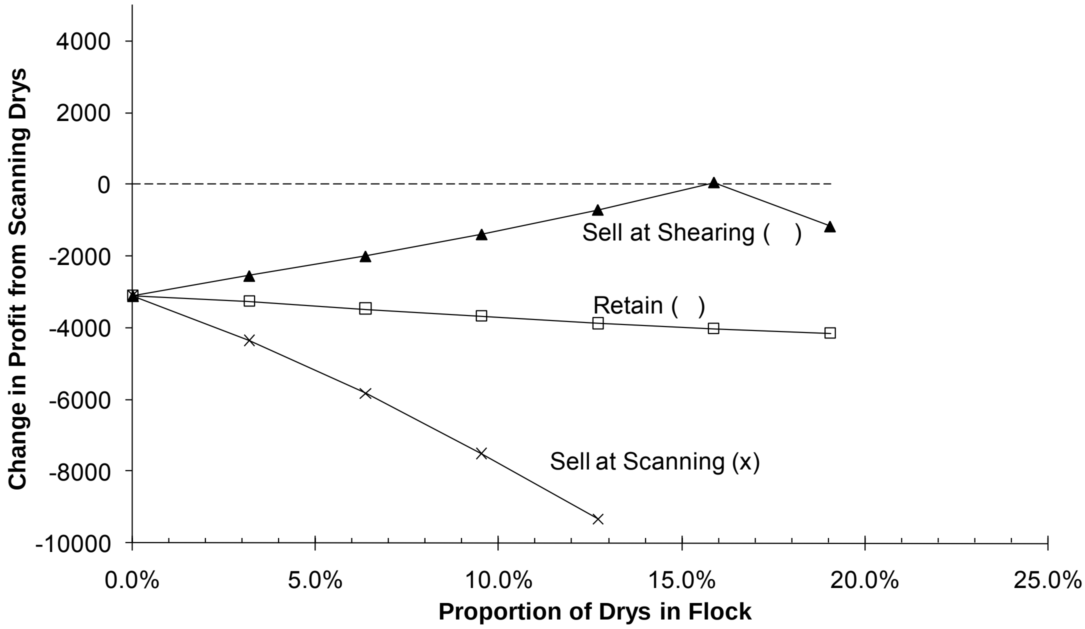

Fig 3.4: Increase in profit from scanning drys relative to not scanning and the impact of management of the dry ewes.

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.

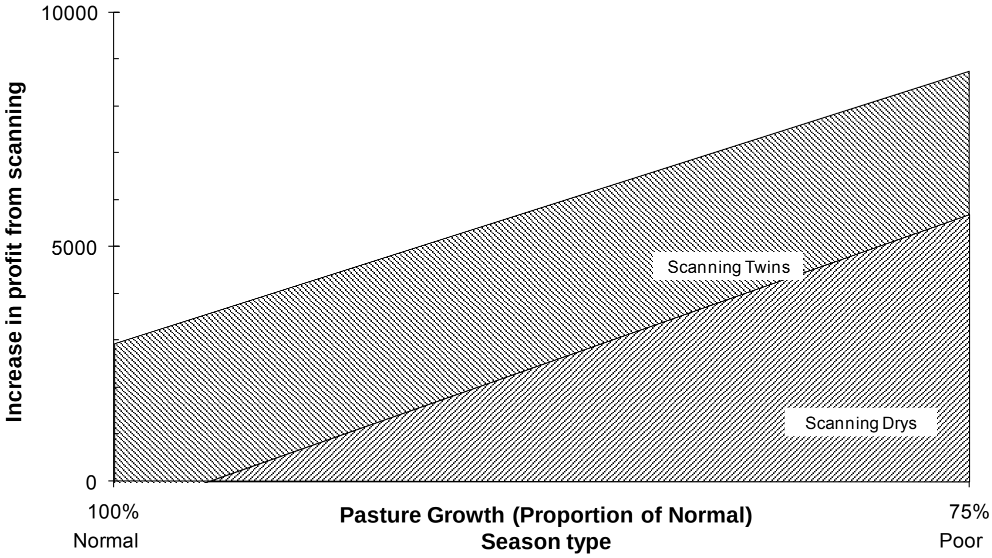

Figure 3.5: Increase in profit from scanning ewes for a normal and a poor year showing contribution from scanning drys and scanning twins.

In poorer seasons the relative profitability of selling at scanning is increased and in this analysis when pasture growth was between 80 & 90% 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.

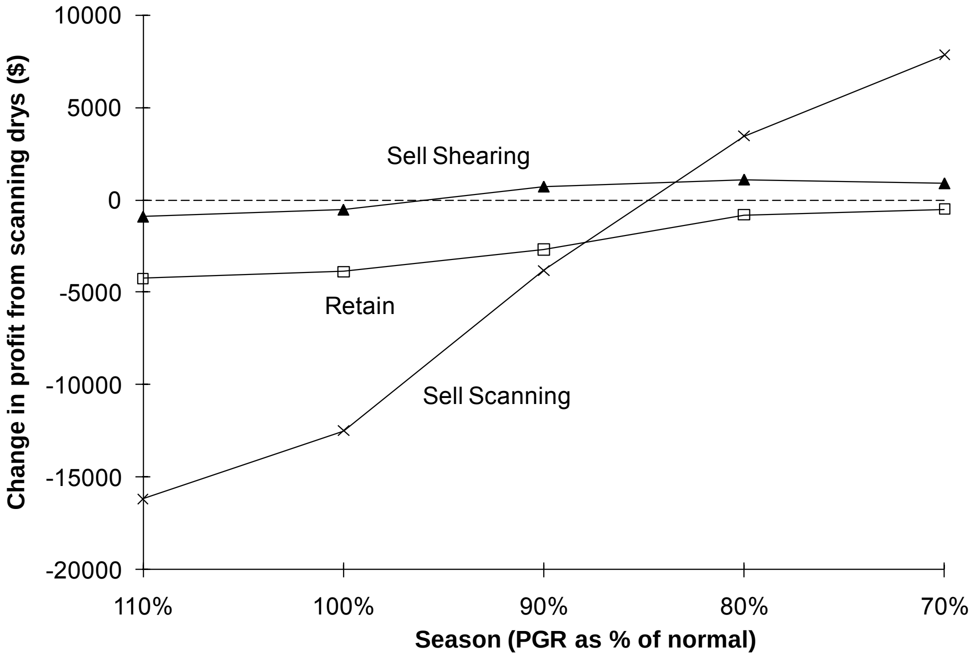

Figure 3.6: Impact of season on the value of scanning drys with the 3 alternatives for the management of the dry ewes.

3.5 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.

Varying the price premium received from 0 to 100% does affect the profitability of the system selling dry ewes at scanning and with a 100% price premium it is slightly more profitable to sell the ewes at scanning (Figure 3.7). A premium of 100% is unlikely to be achieved in most years because this is paying the value of a whole fleece when the fleece is only half grown.

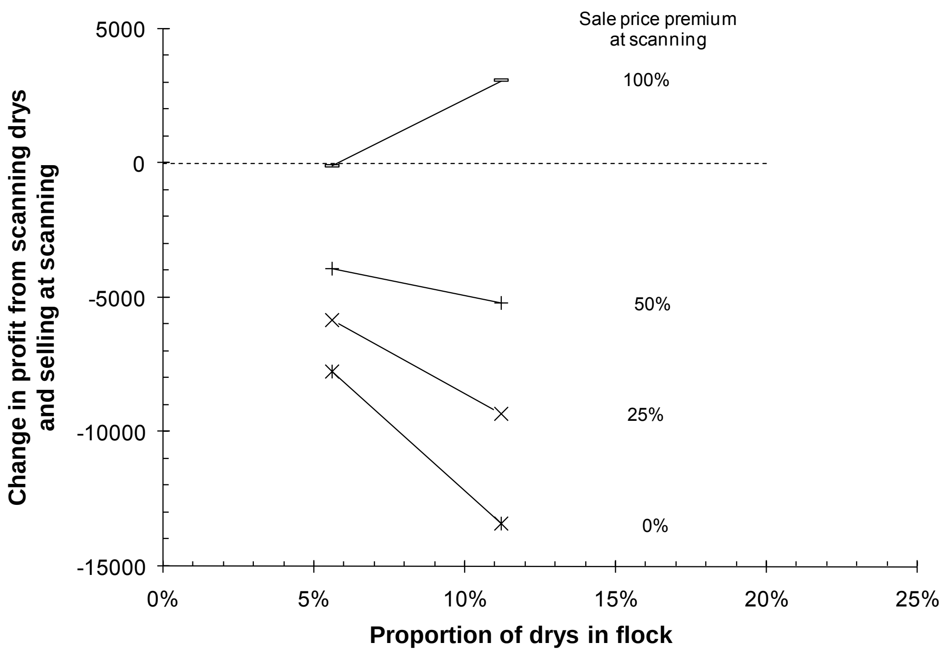

Figure 3.7: Sensitivity analysis of the increase in the sale price achieved for dry ewes if they are sold at scanning. Note: the standard premium is 25%.

3.6 Cost of scanning

Varying the cost of scanning within the ranges examined in this analysis (50 - 90c/hd for litter size) has little impact on the profitability of scanning (Figure 3.8). 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.

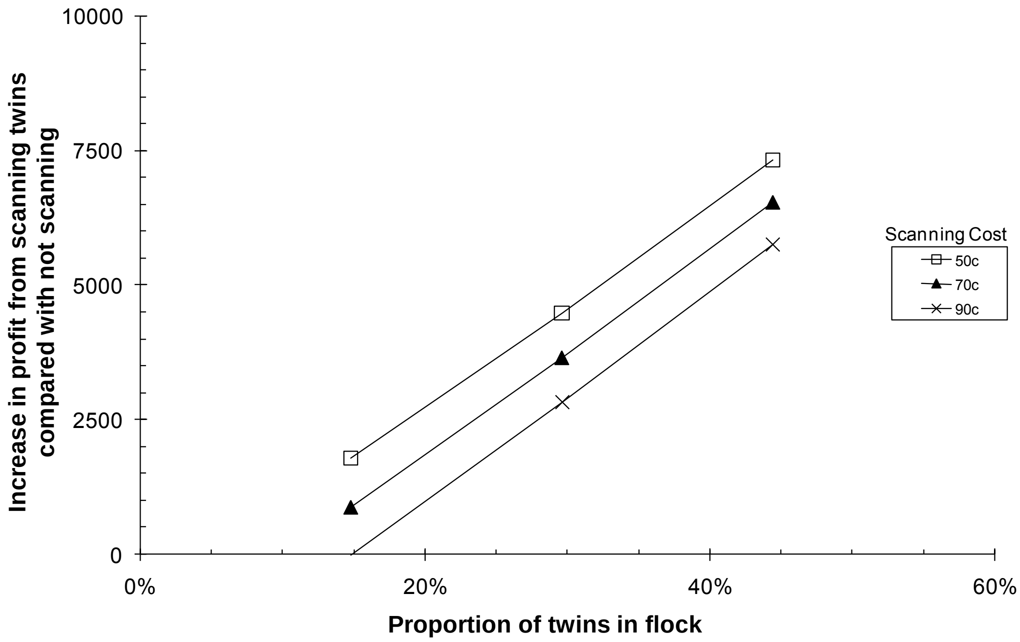

Figure 3.8: Increase in profit from scanning twins relative to not scanning and the impact of the proportion of twins in the flock and the cost of scanning. Note: the benefits of scanning includes the benefits from improved management of drys.

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 3.6). 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 also have a higher risk of mortality and will produce less wool that is broader.

Mis-identifying twin bearing ewes as dry has the highest cost because the nutrition profile of the dry ewes would lead to high mortality for reproducing ewes and a large penalty to the progeny production. Mis-identifying a twin bearing ewe as single has a 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 2.5% of the ewes were identified as dry but were singles, or 3.2% of the ewes were identified as singles but were twins.

Table 3.6: 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	4.00	2.5%
Twin as single	3.15	3.2%
Twin as dry	5.00	2.0%

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.

4. Conclusions

The benefits of scanning ewes for pregnancy status and litter size were calculated to be $2 950 for a typical farm and all the benefit is achieved through improved management of the twin bearing ewes. The benefits of identifying the twin bearing ewes was calculated to be $2.85/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 maintaining 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 scanning is higher if there are more twin ewes in the flock. If the proportion of twins is less than 10% there is no benefit from scanning. This makes the old ewes that typically have a high proportion of twins the priority mobs to scan.

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 some 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 2.5% of the ewes were identified as dry but were singles, or 3.2% of the ewes were identified as singles but were twins.

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.

Young, J.M. (1995). MIDAS Model of an Integrated Dryland Agricultural System - Manual and Documentation for the Great Southern Model (version GS92-3). Centre for Legumes in Mediterranean Agriculture, University of Western Australia, Nedlands.

Appendix 1: Standard Farm Production

Table A1.1: Sheep management program.

	July/Aug lambing	May lambing
Start of lambing	21 July	28 April
Weaning age (youngest)	8 weeks	8 weeks
Shearing time	Jan/Feb	Sept/Oct
Crutching time	Oct	June
Stock turn off		
- wether lambs	Feb	Oct
- ewe hoggets	Feb	Oct
- CFA ewes	Feb	Oct
- shippers	Feb	Oct

Other management comments:

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

Pasture productivity assumptions

Table A1.2: Growth & Digestibility of pasture on sandy gravel soils in each of the feed periods.

			Sub Clover	
Period of Year	Start of period	End of period	Growth (kg/d)	DMD (%)
1	24-Apr	14-May	37	81
2	15-May	11-Jun	19	81
3	12-Jun	6-Aug	40	81
4	7-Aug	24-Sep	55	78
5	25-Sep	29-Oct	60	75
6	30-Oct	26-Nov		68
7	27-Nov	21-Jan		60
8	22-Jan	12-Mar		54
9	13-Mar	9-Apr		52
10	10-Apr	23-Apr		50