GLENAAN STATION FARM IQ FIELD DAY

Monday 30 March 2015

2623 DOUBLE HILL RUN ROAD,
RAKAIA GORGE

NEW ZEALAND merino

FARM IQ

Agenda

10.00am **Introduction and welcome**
– Steve Knight, Farm^{IQ}

10.10am **Overview of Farm^{IQ} at Glenaan**
– Paul Ensor, Glenaan Station

10.20am **The requirements for a productive and vibrant Merino industry**
– Keynote presentation, Paul Swan, Australian Wool Innovation

11.05am **Farm overview including principles that lead to change on the farm** – Paul Ensor

11.30am **Farm Tour**

Stop 1 **Unlocking the potential in ewe production systems**
– Chris Mulvaney, AgriNetworks Ltd
→ Improving condition score profiles and feed allocation

Stop 2 **Caring for pregnant ewes**
– Graeme Ogle, Ogle Consulting
→ Practical management to ensure ewes are adequately fed and prioritised
→ Winter feeding programmes, including fodder beet for sheep

12.50pm **Lunch**

Stop 3 **Fully feeding lactating ewes**
– Nick Hamilton, The New Zealand Merino Company
→ Opportunities during lactation to optimise lamb production
→ Hill country management for singles, and lucerne for twin ewes

Stop 4 Replacement stock – Graeme Ogle

2.55pm **Optimising ewe performance** – Chris Mulvaney
→ Linking Glenaan's actions to best practice

3.25pm **Balancing EBVs with subjective assessment tools to make the right breeding decisions** – Mark Ferguson, The New Zealand Merino Company and Duncan Campbell, Earnscleugh Station

3.50pm **Questions, feedback and summary** – Steve Knight

4.30pm **BBQ and refreshments**

Farm facts

Glenaan

Size and topography

Located in the Upper Rakaia Gorge, Glenaan is 1,035ha and has three distinct land types: high country tussock hill – 598ha, cultivated paddocks on the fan – 140ha, and river flats – 297ha. Altitude ranges from 440-1,200 m.a.s.l.

Ownership and management

Owned and farmed by Paul and Prue Ensor, employing a full time shepherd.

Climate/rainfall

Annual rainfall of 850mm; typically Summer and Autumn dry, 110 day winter where pasture growth rates are near zero.

Sheep numbers and policies

Merino Ewe Lambs	1,120
Merino Wether Lambs	1,068
Merino Terminal Lambs	310
Terminal Romney Lambs	90
Trading Merino Hoggets	40
	2,628
Two Tooth Merino Ewes	600
MA Merino Ewes	2,200
	2,800
Romney Two tooths	200
Mixed Age Romney Ewes	530
	730
Total Breeding Ewes	**3,530**
Merino Rams	32
Terminal Sires	10
	42
Total Sheep	**6,200**

Romney ewes are mated to a terminal sire, with ewe replacements brought in as two-tooths. Merinos lamb on the hill historically achieving a weaning percentage of 92%. Romney's are lambed on the cultivated paddocks at 160%. The goals are 105% and 165% respectively.

Cattle numbers and policies

Calves	70
R2 Heifers	36
Mixed Age Cows	70
R2 Steers	2
Bulls	3
Total Cattle	**181**

Surplus calves are typically wintered and sold in spring, which represent around 15% of farm income. 180 Angus cattle are run, including 90 in-calf cows and heifers mated at 14 months. Steers are sold store at 15 months.

Paddocks, pasture and cropping

The hill is well subdivided into 22 blocks averaging 22 hectares and annually 110kg 30% Sulphur Super is flown on.

The cultivated paddocks average 5.5ha in size, run as estimated 15 su/ha and grow all supplementary feed. Currently 90ha of the river flats have been renovated into lucerne and lucerne mix based pastures; a further 40ha is top dressed and over-sown. There is also 120ha of ryecorn grown on the river flats as part of development into lucerne.

Data collection

All stock are EID tagged; with recording and reading carried out using a Gallagher TSi. Stock are weighed regularly, and ewes are condition scored three times a year.

Pasture cages are located on three different land types and pasture assessments are carried out monthly.

Where possible data is recorded in the Farm^{IQ} System.

Farm goals

Overall: We are a moderate scale farm and we need to grow to be a vibrant and sustainable business. Our mission is to:

→ Increase production by 20% by 2016,

→ Increase efficiency so that our farm working expenses to gross income ratio is below 50%.

Business goals

Business

→ Be in the top 10% of merino farms for productivity and economic farm surplus.

→ Continue to be innovative and lead the way with technology transfer.

→ Be in a position to expand the business.

→ Increase the scale of the business by increasing the lucerne area on the flats to 260 hectares.

→ Contract a minimum of 50% of the Merino wool.

Livestock

→ Finish merino hoggets' to 20kg carcass weight (average kill date 15th November).

→ Optimally feed ewes by monitoring ewe condition scores regularly.

→ Achieve merino lambing of 100%+ consistently.

The focus for the 2014/15 season will include continued development of the river flats, a focused animal health and management programme for the hoggets', and to grow high quality forages.

Steering team

Paul & Prue Ensor
paulensor@farmside.co.nz
(03) 318 5125

Sam Lucas
sam.lucas@mrb.co.nz
021 758 079

Grant King
grant.king@rabobank.com
027 742 8068

Steve Williams
meremeadows@hotmail.com
027 447 5363

Graeme Ogle
graeme.ogle@rezare.co.nz
027 557 0823

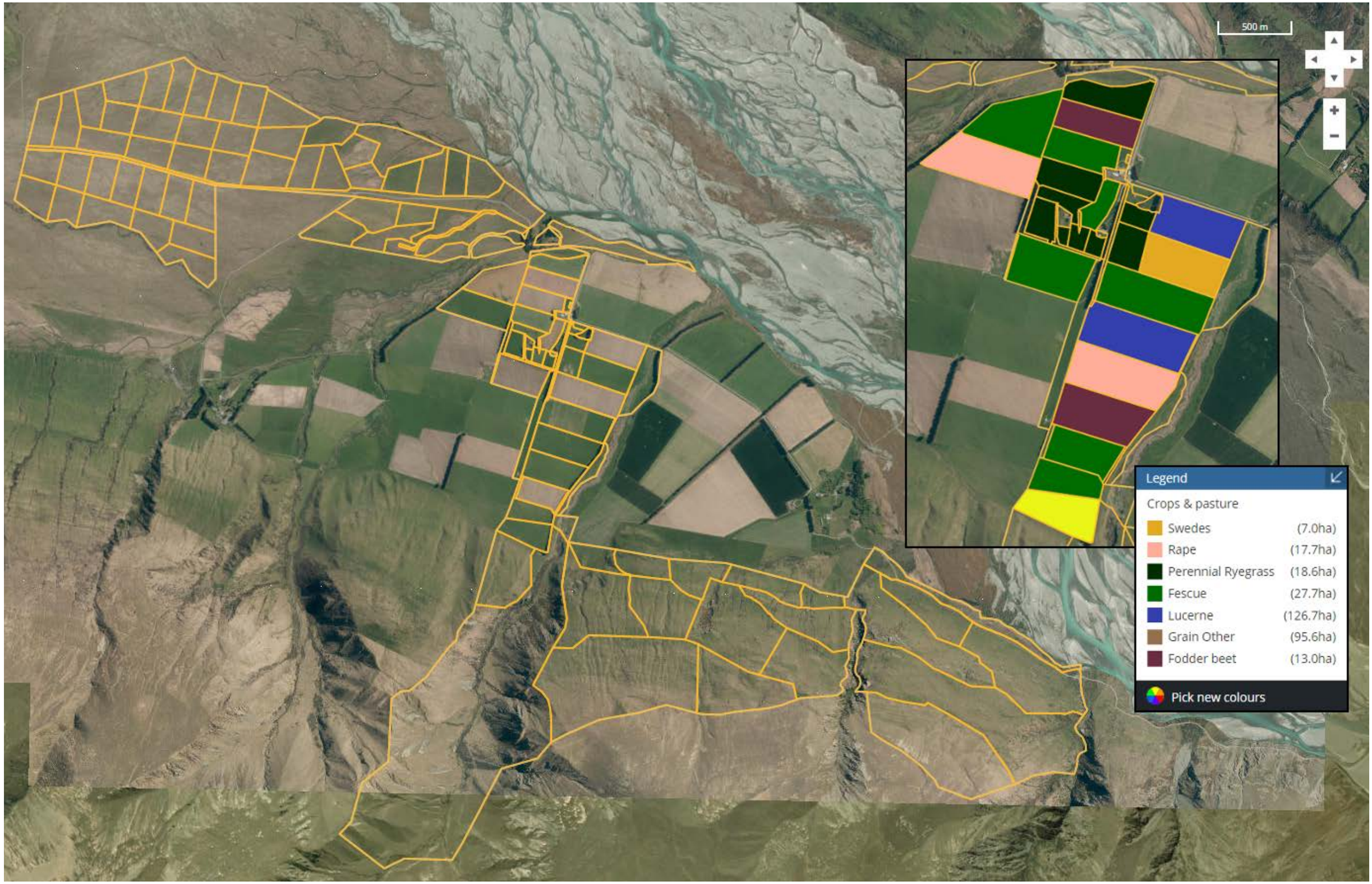
Nick Hamilton (NZ Merino)
Nick.Hamilton@nzmerino.co.nz
027 546 6434

Steve Knight (Farm^{IQ})
steve.knight@farmiq.co.nz
021 311 105

Key Performance Indicators at Glenaan

	Historic average	This Season	Five years time
Scanning %	125	142	150
Tupping Weight (kg)	51	53.2	55
Scanning index	2.45	2.67	2.73
Ewe CS at Mating	3	3.2	3.35
Winter Weight loss (% of tupping weight)	-10%	+4%	+6%
Ave Clean Fleece weight/hd	2.8	3	3.2
Average Adult Micron	16.3	15.8	15.3
Wool Staple Strength	36	40.3	44
Tailing %	91	100	105
Average Carcass weight	15.4	18.8	19.5
Adjusted Weaning weight (100 days)	23.4	24.8	28

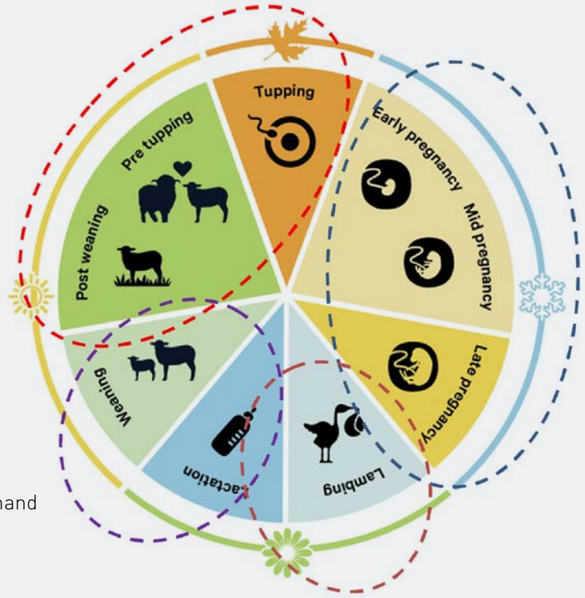
Glenaan station map



Realising ewe flock potential

Base system

Maintenance Feeding



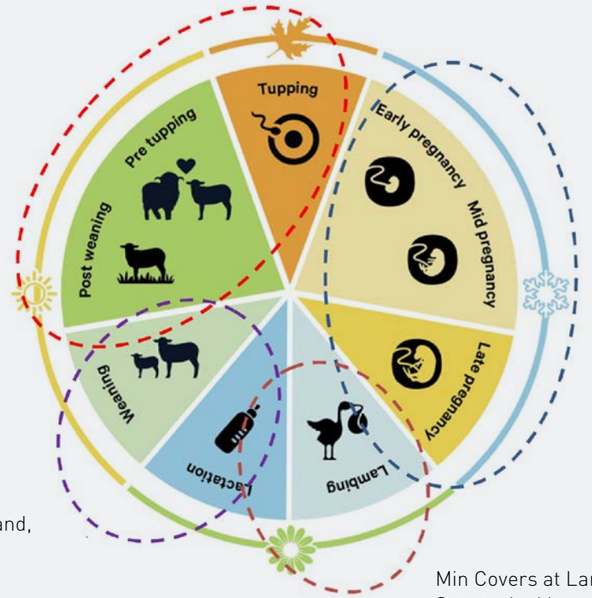
Ewes lose ¾ of a Condition Score

Feed Supply meets demand
Weaning Weight 24kg

Low Covers at Lambing 1200kgDM/ha

Target system

Lift all Ewes above 3CS



Maintain Ewe Condition, lift light Ewes

Feed supply meets demand, improve feed quality to multiple bearing ewes.
Weaning Weight 26kg

Min Covers at Lambing 1250kgDM/ha
Set stocked based on condition score and Scan Result

1. Unlocking the potential in ewe production systems

Weaning to tupping

The breeding ewe provides the potential for the production system – she is the engine room of the business. Science shows optimal weights and condition scores that drive:

→ Reproduction levels and lamb survival

→ Wool production of herself and her progeny

→ Pasture utilisation and efficient use of feed resources

The key to achieving this is monitoring condition score of the ewes. Individuals are then managed to ensure ewes that require a lift in condition receive enough quality feed whilst at the same time ewes that have excess condition can be used to tidy up pastures and ensure quality is optimised throughout the season.

Principles

Manage all ewes to be at CS 3 – 3.5 by mating (above 3). Practically this means drafting ewes into the following mobs:

Body Condition Score	Feed requirements
‹3.0	1.5x maintenance
3.0-3.5	Maintenance
›3.5	Less than maintenance (clean up duty)

Science

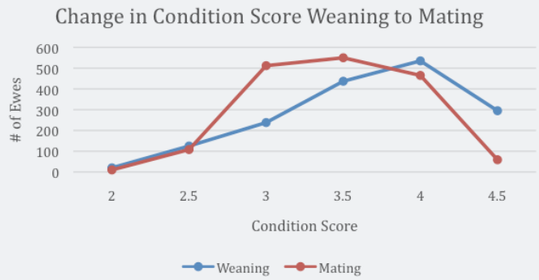
The payoff for managing ewe condition score is significant. The Lifetime Wool program showed there are 20 more lambs conceived per 100 ewes mated for every one Condition Score increase.

Graph 1: Conception at tupping

Conception starts with fully feeding ewes through lactation. Every ewe that is below 3 CS results in a hogget that is 2 months behind slaughter date.

Farm data

Graph 2: 2014 Condition Score comparison for Merino ewes



The above graph illustrates how Glenaan has shifted condition score from weaning to mating.

Table 1: Change in Condition Score from weaning to tupping for 2013 and 2014 years

2013 Data				
Condition Score at weaning	Weaning Avg CS	%	Mating Avg CS	Change
Low CS (2-2.5)	2.85	12	3.18	0.33
Medium CS (3-3.5)	3.31	39	3.34	0.02
High CS (4-4.5)	4.09	48	3.63	-0.45

2014 Data				
Condition score at Weaning	Weaning Avg CS	%	Mating Avg CS	Change
Low CS (2-2.5)	2.43	9	3.23	0.80
Medium CS (3-3.5)	3.32	41	3.17	-0.15
High CS (4-4.5)	4.18	50	3.68	-0.50

Ewes were condition scored and then fed differently based on their condition score. The emphasis was to have all ewes above condition score 3 at mating excluding the 4 tooth ewes. The aims was to have these at condition score 3.0-3.5. The impact on the scanning results is shown below.

Table 2: Priority feeding low BCS ewes (period from 24/1/2015 to 9/3/2105)

Body Condition Score				
	Number of ewes	Number ‹ 3.0 BCS 24/01/15	Number › 3.5 BCS 9/3/15	Percent of Mob
Mob1 Paddock Fed	181	181	72	40%
Mob2 Hill fed	308	308	35	11%

This table illustrates that whilst Mob 2 (low BCS ewes) were fed well on hill blocks and rotated quickly, they did not show a marked response in terms of a lift in the percent to a BCS ›3.5 as at early March. However 40% of the paddock fed mob made a shift from below BCS 3.0 to BCS 3.5+ in just 44 days on predominantly a clover/fescue sward.

Animal health

A faecal egg count was conducted on the three bands of condition scored ewes, with results as follows.

Table 3: Potential worm burden relative to body Condition Score

Body Condition Score	Faecal Egg Count (eggs per gram)
Low CS (2.0-2.5)	2000
Medium CS (3.0-3.5)	200
High CS (4.0-4.5)	0

Table 4: Low Condition Score ewes at weaning followed through to shearing 2013

BCS	Weaning	Mating	Shearing
2	28	7	1
2.5	151	19	19
3		71	67
3.5		66	68
4		15	21
4.5		1	3
Total	**179**	**179**	**179**

The use of EID allows Glenaan to cull ewes that do not respond to priority feeding.

Concern was raised within the group that poor conditioned ewes were likely to be repeat offenders throughout the season. There were only 6 repeat offenders that stayed below CS 3 from weaning to Shearing. The whole mob however always had 8% or – 180 ewes below CS 3 at weaning, mating and shearing. This showed that individual ewes are not generally repeat offenders.

On-farm observations

→ Ewes must be physically Condition Scored (CS). The temptation to 'draft by eye' is misleading even off shears. Condition Scoring is objective versus subjective drafting.

→ Reallocate existing fed resource:

- Low CS ewes are fed as well as lambs, rotated quickly around good hill blocks but ideally grazing on paddocks that are high quality ie high legume content.
- Mid CS ewes, fed well- providing adequate maintenance.
- High CS ewes put on clean up duty on the native hill blocks, which provides flexibility in a tight season.

→ Ewes that do not show a response to better feeding are culled.

→ Faecal egg count ewes and drench accordingly.

→ Keep 4th ewes separate and anything with CS 3 or lower keep on priority feed.

→ Variation in CS within a flock creates opportunities, challenges and choices.

→ There is a positive correlation between fleece weight and CS .

Bottom line:
We know if we get this period right
we can expect to scan 15-20%
more than in the past
= 17.5% higher scanning
= 12% higher weaning %
= 300 more lambs
(from 100% lamb% v 92%)
@ 25kg @ $2.50 = $18,750 gain.

2. Caring for pregnant ewes

Tupping to set-stocking

Principles

Maintain overall condition score from tupping to set-stocking

→ Keep light ewes as a priority flock.

→ Monitor CS of all ewe mobs to ensure they are on track.

→ Preferentially feed multiple bearing ewes versus single bearing ewes.

→ Preferentially feed two tooth ewes.

Table 5: Gross Margin comparison of Winter Feed

	Actual Costs to grow crop ($/ha)			
Fodder Beet	$2,377.87		Gross Margins*	
Swedes	$1,090.27			
	Fodder Beet	**Swedes**	**Fodder Beet**	**Swedes**
Yield kg DM/ha	(c/kgDM)	(c/kgDM)	Profit ($/ha)	Profit ($/ha)
12,500	$0.19	$0.09	$747	$2,035
15,000	$0.16	$0.07	$1,372	$2,660
17,500	$0.14	$0.06	$1,997	$3,285
20,000	$0.12	$0.05	$2,622	$3,910
22,500	$0.11		$3,247	
25,000	$0.10		$3,872	
30,000	$0.09		$5,122	

*Based on 25C/kgDM income

Table 5 shows that fodder beet has to yield well to make comparable returns to swedes. We believe fodder beet has a place in Glenaan's system. Glenaan's priority has been to increase the forage yield from the winter cropping area. Last season's direct drilled Fodder Beet yielded 17T DM/ha

The other benefits of Fodder Beet are:

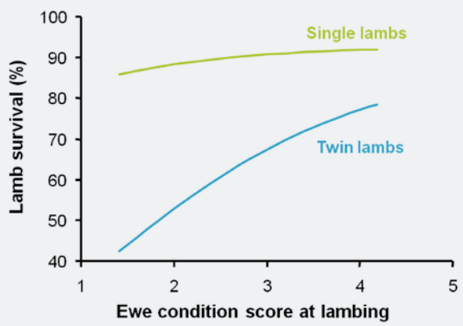
→ Greater utilisation – 90% with Fodder Beet versus 80% with Swede

→ Superior feed value – Fodder Beet 12-12.5MJME/kgDM versus Swede 11-11.5MJME/kgDM

Science

Here we show the Lifetime Wool science on ewe responses to losing weight versus maintaining weight on survival and weaning weight. What is the return on the cost of extra feed to ensure light ewes are maintained?

Graph 3

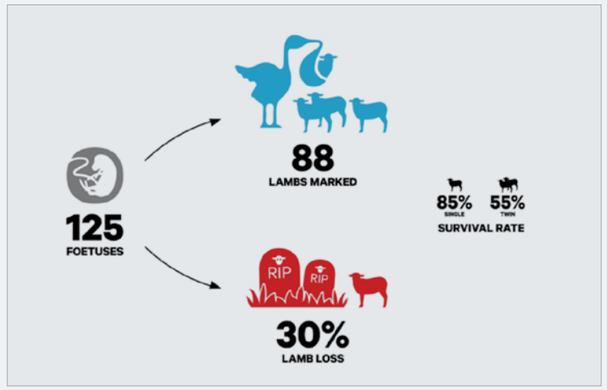


To get more lambs through the tailing pen we can attempt to do this by pulling one of two levers, increasing scanning % or reducing lamb losses. Let's examine a property that is scanning 125% with 85% survival in singles and 55% in twins.

Table 6: Scanning comparison of 2014 ewes scanning results

Scan 2013	Scan 2014	%
Single	Dry	3%
	Single	59%
	Twin	38%
Twin	Dry	2%
	Single	38%
	Twin	60%

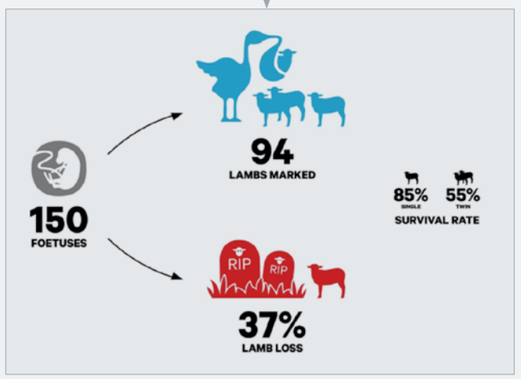
The science shows that if a ewe produces a good performance early she will go on to be a more productive ewe.



At these survival rates this farm weans 88 lambs per 100 ewes.

Now let's examine what happens when you increase scanning versus reducing lamb losses

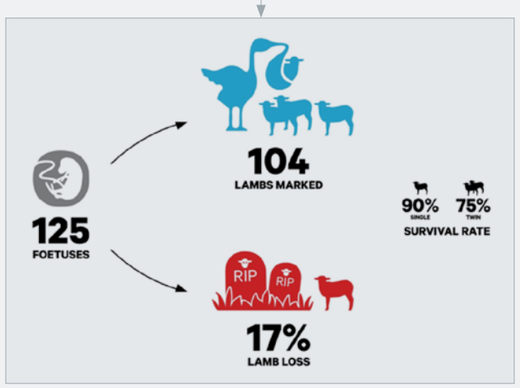
Increase scanning percentage to 150% without adjusting the management of ewes below CS 3



6 more lambs

vs

Manage ewe condition score to maintain CS 3 throughout pregnancy lifting survival rates of singles to 90% and twins to 75%



16 more lambs

2. Caring for pregnant ewes

2014 Scanning data presented in the Farm^{IQ} System

Table 7

Details | **Mating info** | **Scan results** (Dam counts / Percentages) | **Potentials**

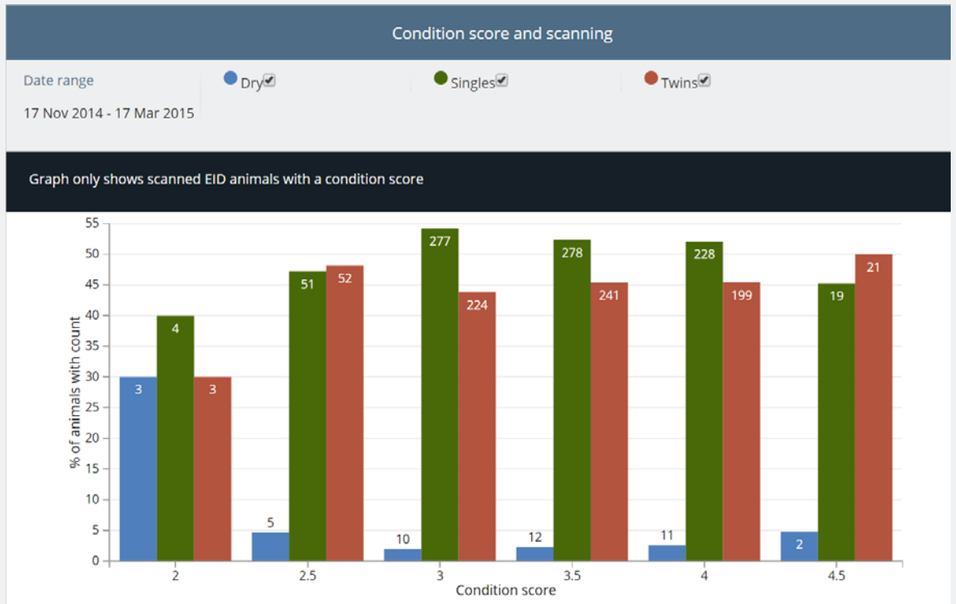
Stock	Dams	Avg. wt.	Empties	Singles	Twins	Scanning %	Scanning efficiency	Wastage %	Offspring
Sheep	2117	50.7 kg	2%	51%	45%	142%	2.80		142%

Short scanning results: multiple foetus are included as twins.

Sheep

Stock	Dams	Avg. wt.	Empties	Singles	Twins	Scanning %	Scanning efficiency	Wastage %	Offspring
▸ 2 Tooth Ewe (2011)	470	50.7 kg	2%	51%	45%	143%	2.82		143%
▾ Mixed Age Ewe	1647	50.7 kg	3%	51%	45%	142%	2.80		142%
▸ 2010	379	50.7 kg	3%	58%	38%	136%	2.68		136%
▸ 2009	443	50.7 kg	2%	49%	47%	144%	2.84		144%
▸ 2008	341	50.7 kg	2%	49%	47%	145%	2.86		145%
▸ 2007	70	50.7 kg	1%	57%	41%	140%	2.76		140%
▸ 2006	13	50.8 kg	0%	38%	61%	162%	3.19		162%
▸ 2005	1	50.7 kg	0%	0%	100%	200%	3.94		200%
▸ 2004	2	50.7 kg	50%	50%	0%	50%	0.99		50%
▸ Mixed	398	-	3%	48%	47%	144%	-		144%

Graph 4: Condition Scoring and scanning



Graph 5: Weight and scanning

Impact of condition score at weaning and tupping on wool returns

Table 8: Condition Score at weaning

CS @ Weaning	Average of Yield %	Average of CFW (kg)	Average of $/hd
2	68.86	2.35	45.89
2.5	68.66	2.43	47.32
3	69.36	2.55	50.13
3.5	70.01	2.60	51.44
4	70.06	2.65	52.23
4.5	69.41	2.68	51.83
Total	**69.75**	**2.60**	**51.11**

Table 9: Condition Score at mating

CS @ Weaning	Average of Yield %	Average of CFW (kg)	Average of $/hd
2	68.41	2.43	48.61
2.5	68.73	2.45	48.23
3	68.76	2.48	48.01
3.5	69.90	2.61	51.43
4	70.52	2.71	53.56
4.5	74.45	3.04	63.39
Total	**69.75**	**2.60**	**51.10**

2. Caring for pregnant ewes

Table 10: The impact of Dam Age on Scanning results

Age of Dam							
Year	AD Ewes (%)	6yr (%)	5yr (%)	6-tooth (%)	4-tooth (%)	2-tooth (%)	MA Avg (%)
2014	145.0	145.0	136.0	136.0	142.0	112.0	142.5
2013	143.1	145.0	143.7	135.0	141.0	121.0	141.1
2012	147.4	144.4	148.4	140.3	125.6	107.9	135.7

In 2013 major gains from the two-tooth and four-tooth mobs came through targeted feeding.

2014 was the second year in a row that Glenaan achieved record scanning results for MA ewes in yet another challenging season. Whilst two-tooth scanning was down there were less dry ewes and the number of twins was "more manageable". The scanning result of the four-tooths proved again that they require different management to the MA ewes.

Table 11: Value of lifting condition score by mating

CS at mating	Average Scan (%)	% Point change	Potential revenue ($/ewe)	$ return/kgDM to lift Ewe condition
2.0	119.23			
2.5	126.56	7.33	$3.21	$0.27
3.0	135.84	9.28	$4.06	$0.58
3.5	142.02	6.17	$2.70	$0.45
4.0	147.87	5.86	$2.56	$0.32
4.5	153.85	5.97	$2.61	$0.29
TOTAL	**141.04**			

On-farm observations

- → It is paramount to continue to priority feed low BCS ewes and twins.
- → All two-tooths require a high level of feeding.
- → Winter feed – important to feed to demand, not to feed what is on hand.
- → Ewes demand through pregnancy continues to increase, so allocation must match this.
- → Fescue with better early spring production gives vital high quality feed to twin bearing ewes pre-lamb.
- → BCS at scanning gives 6 week window to correct –but requires high cost, high concentrate feed.
- → Feed twins to absolute capacity during late pregnancy.

Fodder beet

- → Creates the opportunity to feed animals a higher ME feed, with the ability to increase body condition if required.
- → Feed to priority mobs: Low BCS, twins, two-tooths.
- → Ewes last season showed a preference for beet over swedes .
- → Early high yield growth ready by April if needed.
- → More kgDM from the same area.
- → Precision direct drilling is an option for paddocks exposed to the wind.

Rye corn

- → Our cropping rotation that sprays out ground in October is able to store moisture through to establishment in summer.
- → Large areas are now grown and provide more certainty to the feed supply in the shoulder seasons in autumn and early spring which compliments the lucerne.

Bottom line:
If we get this right
decrease lamb losses
from 30% to 23%
= 109% lambing
= another 247 lambs
@ 25kg @ $2.50/kg
= $15,437.50 + $18,750
= $34,187.50

3. Fully feeding lactating ewes

Set-stocking to weaning

Principles

The optimal condition score for ewes at lambing is 3. We therefore need to manage the ewes below CS 3 and above CS 3 appropriately.

Conserve lambing blocks to ensure pasture covers at set stocking:

→ Above 1400kgDM/ha for multiple ewes

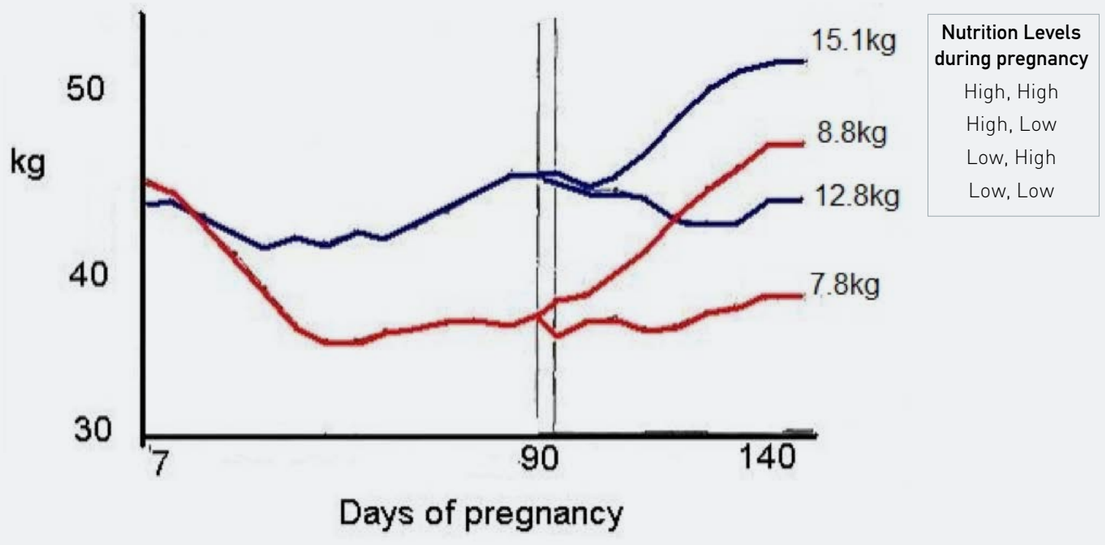
→ 1250 kg DM/ha for singles

Manage the timing of set stocking and stocking rates to have pasture covers in the lambing blocks rising through lactation to 15-1700 kgDM/ha.

Understand lambing block performance so priority ewes can be allocated to priority blocks. Our highest priority are twin bearing ewes below 3 CS.

Science

Graph 6: Ewe Nutrition Levels during Pregnancy



From Everitt NZ Soc Anim Prod 1967

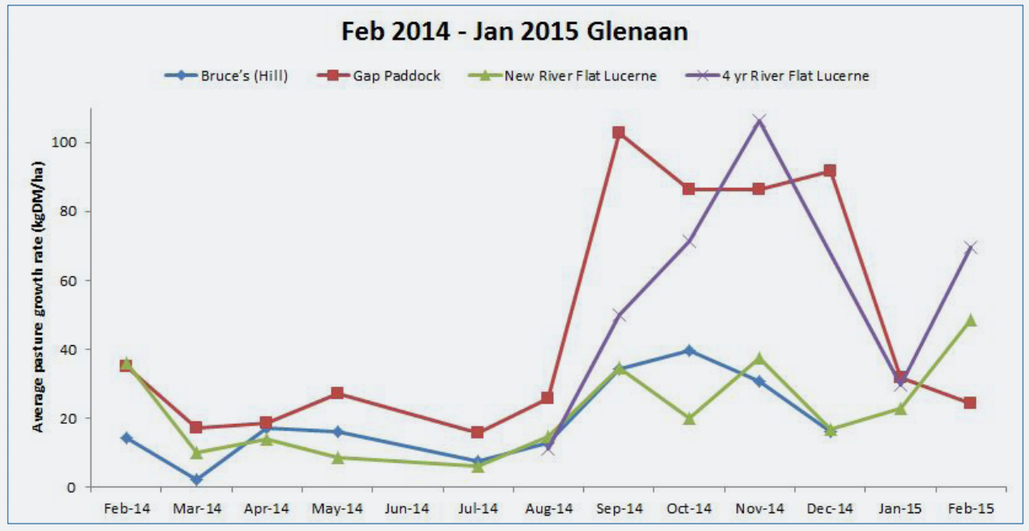
Farm data

We sort our set stocking mobs by ewe condition, scan result and cycle and put a plan together to allocate paddocks that would meet their current demand.

Table 12: Set-stocking plan - Merino MA ewes

		Early lambers	Late lambers
Multiples	Low CS	93	31
	High CS	621	
Singles	Low CS	31	5
	High CS	737	110

Graph 7: Growth profile for various pastures as taken over the 2014 calendar year (measured via pasture cuts)



We are taking pasture cuts for various land classes to help reinforce our modelling of Glenaan's actual forage production. With this information we can make better decisions around lambing dates, optimise stocking rates and analyse potential pasture development further

3. Fully feeding lactating ewes

Table 13: 2014 lambing result

	Scan	Tail	Loss
MA ewes	142.5%	100%	-29.8%
Two-tooths	112%	76%	-32.1%
OVERALL	**136%**	**95%**	**-30%**

Lamb survival remains a key challenge for our business. Through our careful system of monitoring and action it has been our best result. However, we are challenged to do better.

Table 14: Pasture covers pre and post set stocking for Twin Blocks

Paddock	Size (ha)	Stocking rate/ha	Pre-cover (kgDM/ha)	Pasture allowance (kgDM/ewe)	Post-cover	Pasture allowance (kgDM/ewe)
Clarkes	12.2	12.3	1350	110	1460	128
Little Track	3.5	15.7	1750	111	1600	106
Bottom Trig	5	14	1450	104	1680	140
Duncans	14.6	11	1700	155	1650	157
Big Track	7.8	14.7	1650	112	1640	113
Spurs	7.7	16.9	1600	95	1610	98
Average	8.5	14.1	1583	114	1606	124

In 2014 we adjusted our lambing date to ensure ewes lambed on rising covers. Stocking rates are high and pasture covers remained above the critical 1,400KgDM required for twinning ewes. Even with the above feed on offer the ewes lost 0.37 of a Condition Score from set stocking to weaning.

Table 15: Pasture quality of twin blocks prior to set stocking (per kg of DM)

Paddock	MJME	Crude protein (%)	DOMD (%)	Se (mg)	CO (mg)	Mo (mg)	B (mg)	Cu (mg)	Zn (mg)	Mn (mg)	Na %	K (%)	Mg (%)	Ca (%)	S (%)	P (%)
Clarkes	11.30	29.80	70.50	0.020	0.110	3.90	8	7	28	72	0.017	3.9	0.19	0.50	0.38	0.43
Little Track	10.70	19.70	66.80	0.070	0.090	3.00	12	6	28	131	0.047	2.8	0.22	0.84	0.29	0.33
Bottom Trig	12.00	26.20	75.10	0.040	0.110	1.30	8	7	33	143	0.029	3.5	0.20	0.53	0.37	0.39
Duncans	10.80	21.50	67.60	0.020	0.090	3.00	9	7	28	115	0.028	3.2	0.19	0.60	0.31	0.34
Big Track	11.10	21.70	69.30	0.005	0.090	2.50	10	7	25	115	0.038	3	0.22	0.64	0.27	0.31
Spurs	10.70	21.00	66.70	0.040	0.130	1.18	12	8	28	153	0.032	2.5	0.21	0.79	0.32	0.31
Average	11.10	23.32	69.33	0.03	0.10	2.48	9.83	7.00	28.33	121.50	0.032	3.15	0.21	0.65	0.32	0.35
% of Optimum	68%	92%	24%	8%	19%	297%	NA	109%	6%	77%	118%	84%	61%	110%	49%	8%

There is a significant variation in the quality of feed on offer on the various blocks at any one time. Mineral status requires consideration alongside any pre-lamb supplements.

On-farm observations

- → Pasture covers must increase from set stocking to tailing to ensure good lamb growth rate.
- → Know your lamb survival by paddock, are there any patterns?
- → Opportunity to use temporary subdivision to create more lambing sites.
- → Starvation accounts for over half perinatal deaths.
- → Wet-dry history of ewes, remove these at tailing .
- → Feed on offer, quality and quantity will have the greater impact on lamb weaning weight not whether they were set stocked or rotationally grazed.
- → Twins have to be offered highest possible protein feed to maximise growth.
- → Ewes will dry themselves off if lambs have access to high quality feed from a young age – this presents the opportunity for early weaning.
- → Early wean? Reduces overall feed demand and preserves ewe condition.
- → Target covers have to be relevant to your properties pasture growth rates into lambing.

Bottom line:
Increase lamb weaning weight from 25kg to 28kg = additional 8,991kg @ $2.50/kg = $22,477.50 + $34,187.50 = $56,665 gain

4. Replacement Stock – How to realise the potential.

Principles

Pre-winter hogget weight drives 2th ewe tupping weight

High quality diet from weaning to winter.

Science

The following tables are taken from the Lifetime Ewe Management program.

Table 16 quantifies the energy requirements for ewes throughout pregnancy and lactation.

Table 18 quantifies the ewes' energy requirement throughout the same period. If there is a deficit supplementary feeding is required.

EWE CONDITION MANAGER

Green Pasture – Low Quality

Poor quality grasses, high proportion of dead material, little or no clover.

Legume Content: ‹5%

Dead Material Content: ‹50%

Digestibility: Green 65%, Dead 45%

Note: These tables are for a 50kg animal (1 DSE). For lighter or heavier animals, multiply by the appropriate figures in Table 17 and Table 19.

Table 16. ME requirements (MJ/day)

Pregnancy		
Day of Preg	Single	Twins
Dry	8.3	8.3
10	8.3	8.3
20	8.4	8.4
30	8.4	8.4
40	8.5	8.4
50	8.6	8.5
60	8.7	8.7
70	9.0	9.1
80	9.3	9.3
90	9.5	9.8
100	9.5	10.5
110	10.0	11.2
120	10.6	12.1
130	11.2	13.1
140	12.0	14.0
150	12.7	14.8

Lactation		
Day	Single	Twins
1	12.5	14.4
10	18.7	23.4
20	20.7	26.6
30	20.2	25.8
40	18.6	23.4
50	16.7	20.6
60	14.9	18.1
70	14.1	15.8
80	13.4	13.9
90	11.0	12.4
100	10.2	11.2

Table 17. Requirements multiplier for different liveweight ewes

LW @ CS 3	40	45	50	55	60	65	70
Multiply by	0.84	0.92	1.00	1.08	1.16	1.24	1.32

The table above shows that at day 120 of pregnancy a 50kg merino ewe carrying twins requires 12.1 MJME per day to maintain her condition. The table below shows how much pasture needs to be on offer to that ewe for her to meet that requirement.

Even at 2500kgDM/ha, (which is a pasture that is ankle deep), she will not be meeting her energy requirement from pasture alone. This will result in her losing condition and consequently compromising lamb survival, her ability to lactate, lamb growth rates, staple strength and wool production.

Table 18. ME intake (MJ/day)

FOO	Preg	Lactaton					
		Day 10		Day 30		Day 60	
kg DM/ha	Day 0-150	Single	Twin	Single	Twin	Single	Twin
500	2.3	3.0	3.2	3.4	3.9	3.0	3.2
600	3.2	4.2	4.7	5.0	5.6	4.2	4.7
700	4.1	5.4	5.9	6.3	7.1	5.4	5.9
800	4.9	6.4	7.0	7.5	8.4	6.4	7.0
900	5.7	7.3	8.0	8.5	9.5	7.3	8.0
1000	6.2	8.2	8.2	9.5	10.7	8.2	8.9
1100	6.9	8.9	9.7	10.4	11.7	9.0	9.7
1200	7.3	9.5	10.4	11.2	12.5	9.7	10.4
1300	7.8	10.2	11.0	11.9	13.3	10.2	11.1
1400	8.2	10.8	11.7	12.5	14.1	10.8	11.7
1500	8.7	11.2	12.2	13.1	14.8	11.3	12.2
1600	9.0	11.8	12.7	13.7	15.3	11.8	12.7
1700	9.3	12.1	13.1	14.1	15.9	12.1	13.1
1800	9.5	12.5	13.5	14.5	16.3	12.5	13.5
1900	9.9	12.9	13.9	15.0	16.8	12.9	14.0
2000	10.1	13.2	14.2	15.3	17.2	13.2	14.3
2100	10.3	13.4	14.5	15.7	17.5	13.4	14.5
2200	10.5	13.8	14.9	16.0	18.0	13.8	14.9
2300	10.7	14.0	15.1	16.3	18.2	14.0	15.2
2400	10.9	14.2	15.3	16.5	18.5	14.2	15.4
2500	11.1	14.4	15.5	16.9	18.9	14..4	15.7

Table 19. Intake multiplier for different liveweight ewes

LW @ CS 3	40	45	50	55	60	65	70
Multiply by	0.78	0.89	1.00	1.11	1.22	1.33	1.44

The tables also show the requirements for ewes during lactation.

Growing out replacements to ensure they meet first mating weight targets is pivotal in optimising the production system. To achieve this young stock need a high quality diet and protein is a key component.

For more information on these tables and the Lifetime Ewe Management program you can contact your local StockCare vet or The New Zealand Merino Company.

Table 20: Protein requirement for weaned lambs (Crude Protein %)

Energy content of diet (MJ/kg)	Lamb liveweight (kg)		
	20kg	30kg	40kg
13	19.3	16.1	13.8
12	17.5	14.7	12.9
11	15.7	13.3	11.9
10	14.0	11.9	10.8
9	12.4	10.6	9.6

A lamb weaned at 30kg on a diet of 13MJME feed requires 16.1% crude protein. Do you know what you are feeding your replacements and is it adequate?

4. Replacement Stock – How to realise the potential.

Farm data

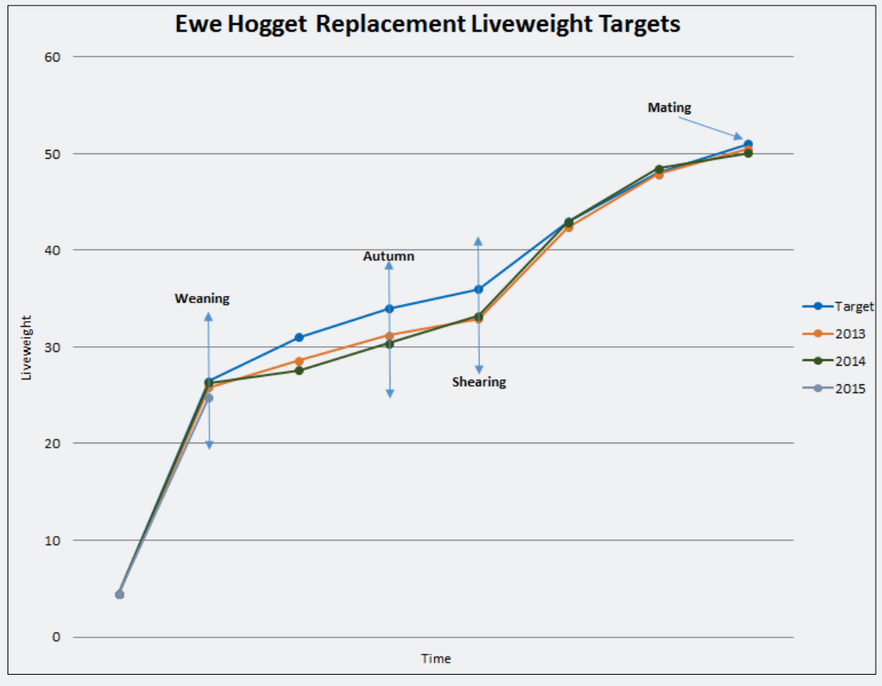
Table 21: Growth rates tailing to weaning

Blocks	#	Growth rate	Management tailing to weaning
Darkies	150	210	Set stocked on birth block
East Hill	309	200	Rotated around 3 blocks
High Face	231	212	Set stocked post tailing on High Hill
Low East Hill	187	213	Rotated around low hill
Lucerne	571	221	Twins rotated on lucerne

Table 22: Selection of replacements

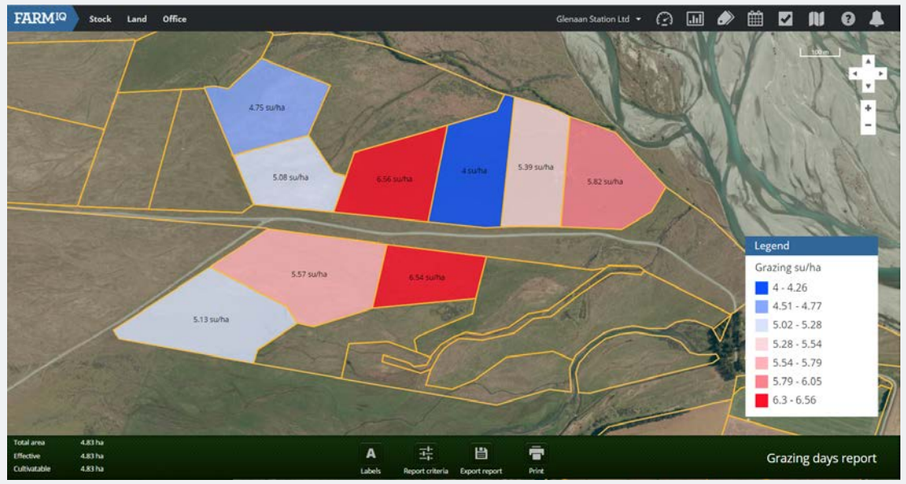
	#	Hogget Micron	Hogget CV	Hogget CFW	$/hd
Culls	264	15.5	18.9	1.57	$30.88
Replacements	635	15.2	18.6	1.78	$36.77
All	899	15.3	18.7	1.72	$35.04

Graph 8: Ewe hogget replacement liveweight targets



Grazing days data presented in the Farm[IQ] System

Tracking stock movement during the year allows us to work out the more productive paddocks based on number of times grazed and overall stocking rates.



Nutrient Report data presented in the Farm[IQ] System

When we combine the above grazing days data with soil test results we can get an idea of which paddocks we should be considering for our renewal programme and those where we will get a greater return on, in terms of applying fertiliser. In the example below we recognised that Juliet 1 and 2 required a higher fertiliser dressing than the surrounding paddocks and applied accordingly.

Animal health plan ewe lambs/hoggets

	Month	Action
Year 1	**November**	Tailing
		Scabine vax
		Lamb vaccine
		Clik treatment
	December	Preferentially feed twins
	January	Weaning
		6 in 1
		Triple drench
		Clik treatment
		Preferentially feed replacements
	February	Monitor growth rates and complete faecal egg counts
		Drench 4 weekly
		Post mortem any sheep dying on Lucerne
	March	Target weight = 32kg
		6 in 1
		First Foot vax
	April	Faecal egg count (Autumn rains = larval hatch)
	May	Target weight = 34kg
		Second Foot vax
	June	Winter feeding commences
	July	Monitor growth rates
	August	Regular faecal egg counts
	September	Shearing - Pour-on off shears
		Target weight = 36kg
	October	Drench off winter crop
Year 2	**November**	Target weight = 43kg
	December	Toxovax
	January	Target weight = 47kg
	February	First Campyvax
	March	Target weight = 49kg
	April	Flexidene
		Faecal egg count (Autumn rains = Larval Hatch)
		Second Campyvax
		6 in 1
	May	Target weight = 51kg
		Mating Commences

On-farm observations

→ Challenge to feed well in summer dry with late autumn break – river flat development should make this easier.

→ Use of rape to fill the gap

→ Can't feed them well enough. It's all about allocation – high feed covers won't limit feed intake.

Animal health

→ Regular egg count monitoring.

→ Footvax provides a return on investment.

→ B12 can be an issue but it is:

- Seasonal
- Not an issue on lucerne
- Most likely to be an issue pre wean for lambs on hill country

→ Remove lambs with low growth rates and preferentially feed.

→ Resilient genotype – genetic fat has become a selection trait in sires.

→ Nutrition has a lifetime impact on performance.

→ Have an Animal health plan and stick to it.

Genetics

Balancing estimated breeding values (EBV's) with subjective assessment to make the right decision

Finding animals that are best able to convert high country forage into saleable product is at the heart of the Glenaan Station business. When it comes to breeding, Professor Mike Goddard hit the nail on the head when he wrote that it is about:

"Assembling the ideal genotype for a particular task".

There are two really big questions in this:

1. What is the particular task?
2. What is the ideal genotype to complete that task?

The 'task' that sheep perform on your property

Each property has a slightly different production system and the suite of genes that are needed to maximise profit should therefore differ between properties. When defining the task, it is important to consider all of the income streams and variable costs associated with your livestock. This should end up in defining exactly what you are aiming to produce.

The task in the Merinos at Glenaan is to produce 3kg clean of 15 micron wool on a ewe that weans greater than 100% of lambs that can be sold off by mid-November at a carcass weight of 20kg.

The 'task' or a set of genetic goals for your sheep enterprise is called a breeding objective. Having well thought out goals or a breeding objective is a really important step for all sheep businesses.

It is important because it helps to focus you on the things that matter most to your business longer term. It also helps you to make consistent decisions between years which enhances the likelihood of some genetic gain being realised in the flock. It is important to think about long-term production systems and markets when forming a breeding objective because breeding takes time.

There are many hundreds of traits that are heritable in sheep, some have significant contributions to profit, and others have little value or none at all. It is important when setting a breeding objective to determine the relative impact of different traits on overall farm profit and focus only on those that are having a major impact.

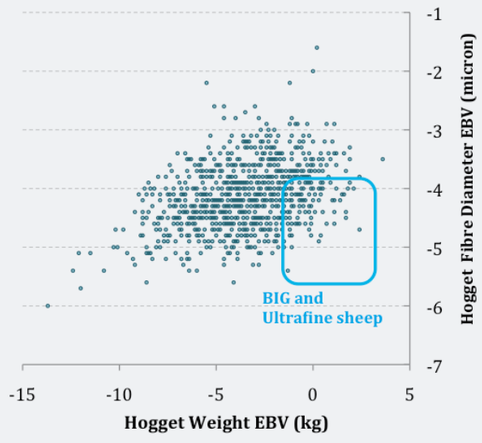
The ideal genotype to complete the task

Knowing where your profit comes from and what the main costs in your business are is a good basis to think about the traits you want to have in your sheep.

Selection for improvement in the production and labour saving traits offers a great opportunity for the sheep industry. Depending on your business you will have a different trait focus and a different emphasis on what needs the greatest improvement within your sheep flock. Across all livestock industries, it has been shown that the appropriate use of EBVs is the best way to assemble the genes that are best for your business. It allows commercial ram buyers to walk into a pen and combine the visual traits that are important to them with some objective information that is directly comparable across a range of flocks.

EBVs are available for most traits that either make you money or save you money. The ones that are important to you will depend on your business. For commercial producers it is important to minimise the number of traits you are trying to improve. At Glenaan, two of the profit drivers are lamb growth to 12 months of age and wool fibre diameter. These two traits are unfavourably correlated but by finding the right ram source and using the EBVs Glenaan are able to find the 'non-normal' animals that are good at both.

Graph 9: The EBV opportunity – finding the 'non-normal' animals.



Finding the right ram source is an important component of this equation and Paul and Prue are happy with the genetics and advice provided by Alistair and Duncan Campbell from Earnscleugh Station. With very well defined breeding objectives for their ultrafine sheep, Earnscleugh are performing at the head of the field and continue to make genetic gain. They absolutely dominate the EBV for fibre diameter in the database and are proud owners of the world's finest genetics.

Alistair and Duncan have seen the increased rate of genetic gain since they started using EBVs to guide their selection decisions. In the early years, Earnscleugh rams were performing around, or below, breed average. Using information from MERINOSELECT, Alistair and Duncan were able to source rams with superior genetics that now form the basis of their high performing flock.

Significant changes over a 10 year period (2001-2011 drops) include:

→ Increase in post weaning weight by 3.2 kg

→ Increase in hogget weight by 3 kg

→ Increase in hogget clean fleece weight by 18%

→ Increase in staple length by 6 mm

It is important to note that these improvements have not been made at the expense of the visual attributes of the sheep. Every stud sheep is annually classed by Sandy MacKirdy from Hamilton Victoria to ensure wool quality and animal structure are maintained or improved.

Sandy MacKirdy inspecting a ram at Earnscleugh

Subjective assessment of the sheep and their wool remains important. By working closely with Earnscleugh and sourcing the right ram types, Paul and Prue have significantly improved the quality of their wool and developed an ultrafine genotype that keeps the dust from the Rakaia Gorge out, preventing a potential downgrade to the wool.

That's what success looks like! One of the genetically finest rams in the world – Earnscleugh Ultrafine.

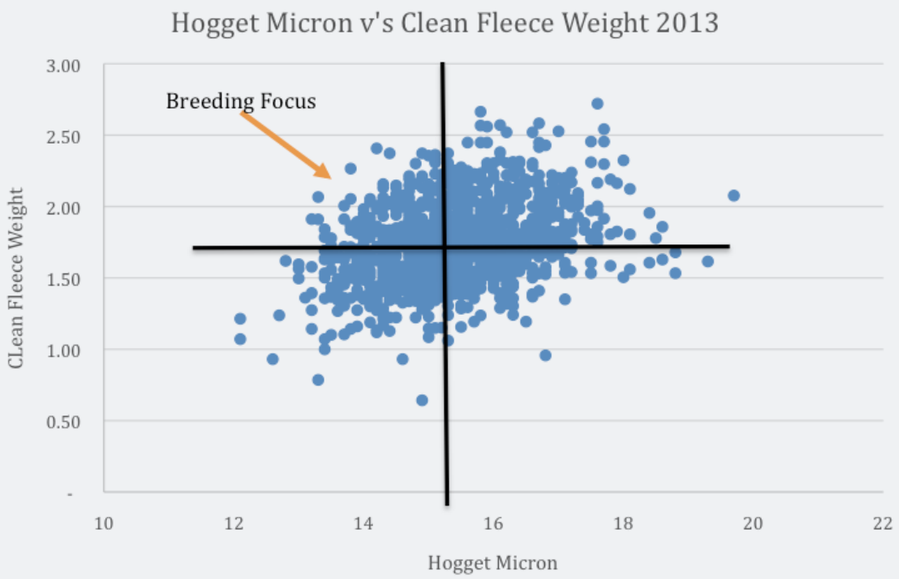
For more information on EBVs and how you can use them to your advantage visit www.perfectsheep.co.nz

Genetics

Table 23: Comparison of historical production and profitability data

Year	Fibre diameter (micron)	Yield %	Staple length (mm)	CV of Mic	Staple strength (N/ktex)	Per head income $/hd	Clean fleece weiht (kg)
MA Ewes							
2013 - 2014	15.9	68.3	86.9	14.6	39.8	46.99	3.1
2010 - 2012	16.3	67	86	13.1	41	54.14	2.9
2004 - 2006	16.7	65	80	15.1	36	33.09	3.0
Hoggets							
2013 - 2014	14.7	68.5	73.2	15.3	40.8	40.48	2.12
2010 - 2012	15.6	72.1	74.3	15	46.9	43.34	2.01
2004 - 2006	16	71	76	15.3	36.7	25.66	1.97

Graph 10: Hogget micron vs Clean Fleece Weight



On-farm observations

- → No micron effect on scanning.
- → Most important decision is which stud you buy rams from.
- → Genetic fat has become a trait we select for.
- → EID enables us to consider twin lambs that may have been discounted in the past i.e. take into account lower wool weight and higher micron they may have.
- → Ewe mature weight is a consideration.
- → EID enabling us to map annual ewe performance of individuals for selection of which ewes replacements come from v's which are mated to a terminal sire.

Efficacy of Footvax, and impacts on Merino hoggets

Aim

This study was undertaken to establish if Footvax would reduce the impact of footrot on Glenaan hogget performance; both their growth rate and wool weight. In addition the effectiveness of giving a smaller dose to young stock was investigated.

Situation

Glenaan's flock has been affected by footrot for a number of years, and it was believed the infection may be limiting hogget replacements' production.

Footvax stimulates immunity to Dichelobacter nodosus, the bacteria that causes footrot. This immunity will provide protection against new infection and help treat existing infection. (Footvax contains inactivated Dichelobacter nodosus and includes strains A to I.)

Previous research has shown that use of this vaccine can cause appetite loss and general malaise for a few days, which could impact on growth and wool quality. For maximum effect sheep should be sensitised initially and then boosted just before the expected footrot disease risk period. The booster should be given at least 6 weeks after the sensitiser but within 12 months of the sensitiser. Maximum protection will not be achieved until after the booster.

After vaccination the protection period may vary, depending on local conditions, but up to 4 months can reasonably be expected.

Method

Three mobs of Glenaan hogget replacements were created for the study, and these were split to ensure similar proportions of sex and birth rank. Two of the mobs were treated with a sensitiser dose in mid March 2014 and then 6 weeks later (late April) a booster shot was administered. These treatments were recorded against the hoggets' individual EID tags. The treated and untreated (control) animals were then run together to ensure that there was no feed or other difference.

The study mobs were set up as follows:

Table 24:

Mob	Number of animals	Dose and application
1	220	1ml Footvax, then 1ml six weeks later
2	220	*0.5ml Footvax, then 0.5ml six weeks later
3 (Control)	320	No Footvax

*Note this is an off-label rate: the recommended dose is 1ml per animal

At the end of the study period, all animals were foot-scored to give an assessment of the level of visible infection.

Also, all animals were weighed at the start of the trial and then again four months after the booster shot.

Wool weights were recorded for individual animals, as well as shearing information which will be used to determine if the vaccine caused a break in the wool.

Results

Level of footrot

The foot scores showed that 67% of the hoggets with advanced footrot (as measured on the 0-4 scale) had not been treated with Footvax, 19% had received the half dose and 14% had the full dose.

Table 25: Full Results

Foot score	Description	Footvax dose		
		Control	0.5ml	1ml
0	Clean	27%	52%	51%
1	Water maceration	17%	21%	31%
2	Interdigital dermatitis	13%	14%	9%
3	Early footrot	3%	2%	1%
4	Advanced footrot	40%	11%	8%

Wool analysis

Fleece weight: The vaccination had no significant impact on clean fleece weight, with the half-dose group having on average 3% heavier fleeces and the full-dose group having a 1% higher fleece weight, compared to the untreated group, which is within the margin of error.

Staple strength: The untreated group had a significantly higher rate of tender fleeces: 56% and 54% higher than the half-dosed and full-dosed groups respectively.

Live weight analysis

Over the period of the study, once adjusted for respective opening weights there was no difference between the full-dose and untreated group in terms of overall weight gain. However the half-dose animals gained 600gms more than both groups over this period. (See Graph 11.)

Return on investment (using half dose scenario):

Cost:

The cost for the vaccine was: 90c per full dose, plus labour @ 2 applications x 15c = $1.20

Return:

Value of higher staple strength:

In the current season there was a lower payment rate for Glenaan's tender wool: at $2.42/kg greasy fleece weight ($17.57 versus $15.15/kg)

Average greasy fleece weight was 3kg/head @ $2.42 lower rate = $7.26/head @ 55% (representing the average percentage of fleeces with poorer staple strength in the untreated group) = $3.99/head gain

Value of live weight:

Additional live weight = 0.6kg live weight @ 43% yield = 0.258kg carcass weight at $5.50/kg = $1.42/head gain

Total per-head return: $5.41 for the $1.20 investment

Outcome

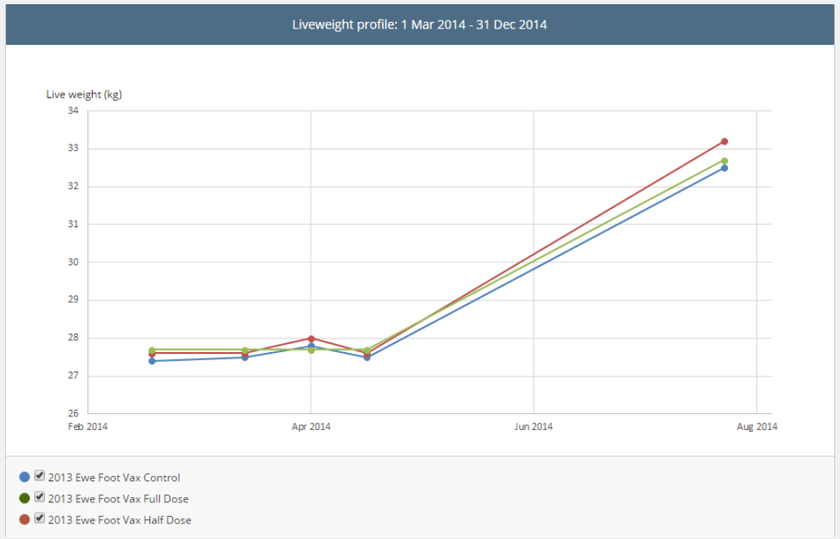
Footvax will now be used across all Glenaan hoggets due to its positive influence on production –both the live weight gain and the reduction in tender wool.

Disclaimer

It is important to note that this is a one off study pertaining to a single farm, and there are some very well-run scientific trials from the producers of these vaccines that should be referred to when making treatment decisions for other farms.

The main purpose of this case study is to demonstrate how easily the Farm^{IQ} System can record on-farm information. The value of this is helping you make informed decisions about what works for you and your particular farming system

Graph 11:



Notes

FARMIQ®

15 Allen St, Wellington,
New Zealand

PO Box 19-129, Wellington 6149

Ph: 04 212 6442

Email: enquiries@farmiq.co.nz

Web: **www.farmiq.co.nz**

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