

## Lucerne for lambs: Farmer Initiated Technology Transfer

This project is a part of a larger SFF project '09/112 Lucerne for Lambs' that aims to investigate the wider farm systems application of improved lucerne and irrigation water management on Central Otago farms.

### Objective:

This project will demonstrate the stocking rate, growth rates and ewe condition of ewes and lambs grazing lucerne or perennial pasture from tailing to weaning.

Three farms will each monitor 200 ewes and their lambs on either lucerne or perennial pasture during the spring and early summer of 2009. These will be weighed and ewes will be condition scored at tailing, and then at monthly intervals until weaning. Feed quantity and quality will be monitored at fortnightly intervals. Animal health will be monitored on a regular basis to ensure that issues are identified early and problems solved as required.

Three farmers volunteered their time and resources to monitor the performance of ewes and lambs on a variety of spring feeding options using Lucerne. These farmers each chose a theme that was appropriate for their farming system, and provided a comparison of at least two different feeding regimes.

### Theme: Comparison of lamb growth rates on the traditional grass based pastures or pure lucerne

#### Farmers - Fraser and Murray McKnight

Fraser and Murray had 65ha of pure lucerne planted on arable land including Wairau (58ha) and Force4 (7ha). Normally the lucerne is first cut for baleage and then, after being spelled for a period, is grazed with ewes and lambs. The farm winters 2500 Polwarth and Polwarth cross ewes and 600 hoggets. The mean lambing date is split for ewes run on the arable and hill land. On the arable land, 400 Polwarth and 700 crossbred ewes started lambing on the 20<sup>th</sup> September. In contrast, the remaining 1400 ewes on the hills don't start lambing until 6<sup>th</sup> October.

The McKnight's property was well set up for a ewe/lamb performance trial - directly comparing grazing on lucerne and pasture. The farm had several paddocks of pure lucerne that were available for rotational grazing and also had paddocks in pasture available to use as a control. Ewes and lambs from early lambing mobs on the arable land were available for grazing.

#### Comparisons to measure - Ewes and lambs on lucerne and pasture

Lucerne grows at approximately 30 kg DM/d on soils similar to those at Frasers property. With twin bearing ewes needing approximately 3 kg DM/d then this suggested that an average stocking rate of 10 ewes and lambs per hectare could be achieved. To offer those 10 ewes/twin lambs per hectares 3kg DM/ha/day and leaving very little residual it was expected a 40 day rotation would be required (Table 1). This assumed the lucerne paddocks had an initial cover of 800 kg DM/ha and a growth rate of 30kg DM/ha/day. Adjustments would need to be made depending on the actual measured lucerne covers and if the lucerne growth rate changes. The

maximum length of time the ewes and lambs should stay in a single paddock is 10 days.

**Table 1 Estimated pre-grazing lucerne dry matter covers and grazing days required to consume herbage during the first round of a rotation for lucerne, using 30 kg DM/ha/d as a base pasture growth rate, and 3 kg DM/hd intake by ewes.**

							Total
Grazing days	4.4	5.2	6.0	7	8.2	9.6	40.4
Cover (kg DM/ha)	800	932	1087	1267	1477	1723	

### Measurements:

- **Weights** of 50 ewes and their lambs on lucerne and 50 pasture blocks. Weights taken from both mobs when ewes/lambs are first put onto lucerne and then at monthly intervals until weaning.
- **Body condition score (BCS)** of ewes on lucerne and pasture blocks. BCS taken from both mobs when ewes/lambs are first put onto lucerne and then at weaning.
- **Paddock diary** of ewe and lamb numbers and grazing events (in and out of paddock)
- **Animal diary** recording the fate of ewes and lambs from the lucerne and pasture blocks (deaths, date sold, prime/store, and weight)
- Opening and closing **forage height** every time a mob is shifted (and estimate of broken stem height on entry).
- **Opening feed** cover assessment on lucerne and pasture blocks
- **Closing feed** cover assessment on lucerne and pasture blocks.
- **Feed quality** comparisons between lucerne and pasture blocks.

### Final programme

Two mobs, one with singles and one with twins, were monitored on the lucerne from tailing in mid October till weaning in early December. for at least 6 weeks, based on a conservative feed budget, not allowing much growth due to the dry. There was also a control mob of singles and twins on the grass pastures as a control. These were slightly later born, though tailing weights were taken to verify this. Each of the large paddocks near the house were split with electric fences into 4 blocks to slow the rotation and let some feed build up ahead of the ewes. It was estimated that the opening covers of the lucerne were approximately 1200 kg DM/ha. The mobs were started on the lucerne in parts of the paddock where there was still access to significant amounts of pasture, and that a hay feeder with some roughage in was provided. A mid spring (late November) estimate of feed supply and quality was done.

### Results

A similar number of ewes were assigned to each mob and grazed on either pure lucerne or pasture after tailing on the 15<sup>th</sup> October, until a nominal weaning date of 13<sup>th</sup> December when a first draft was taken. The average stocking rate of the ewes with singles on the lucerne was 2.5 times greater than the ewes stocked on pasture, while the ewes with twins were stocked at an intermediate rate. When weighted for the number of twins in the Pasture mob the relative stocking rate on the lucerne was

9.4 ewes and their lambs per hectare compared to the 4.0 ewes and lambs per hectare on the Pasture.

The liveweight of twin lambs on lucerne at weaning was 2 kg heavier than the lambs (mainly singles) on Pasture, while the single lambs were 4.5 kg heavier due to the higher liveweight gains measured. As a result 43% of the single lambs on lucerne were sold prime, 13% of twins on lucerne and only 8% of lambs from the Pasture cohort. When calculated as the actual number of lambs then 9 lambs per 100 ewes were sold prime from the pasture, 26 lambs per 100 ewes from the twins on lucerne and 43 lambs per 100 ewes from the singles on lucerne.

The single-bearing ewes were offered lucerne at a lower height and available feed on offer than the twin-bearing ewes, resulting in a lower estimated intake.

**Table 1: Results from a comparison of ewes and lambs on lucerne compared to ewes and lambs on pasture from tailing to weaning in spring 2009**

	Lucerne		Pasture
	Singles	Twins	Mixed
Number of ewes	235	258	241
Time ewes and lambs on pure lucerne (%)	100	100	0
Time ewes and lambs on grass-based pasture (%)	0	0	100
Ewe stocking rate at any one time (ewes/ha)	69.8	64.2	4
Ewe stocking rate over trial (ewes/ha)	10.0	5.8	4
Tailing percentage (%)	103	178	113
Lamb weight 19 October - Tailing (kg)	12.1	12.1	12.1
Lamb weight 14 December - Weaning (kg)	30.0	27.5	25.5
Lambs sold prime at weaning (%)	43	13	8
Average lamb growth rate tailing to weaning (g/d)	304	257	224
Lamb growth weighed average to match Pasture (g/d)	293		224
Estimated pasture height - Pre-graze (cm)	17	25	na
Estimated pasture height - Post-graze (cm)	1	7	na
Average feed on offer (kg DM/ewe/d)	2.4	4.8	na
Average feed residual (kg DM/ewe/d)	0.1	1.3	na
Average estimated intake (kg DM/ewe/d)	2.3	3.5	na

## Discussion

The climatic conditions were exceptionally harsh during the spring on 2009 and summer of 2010. Rainfall during winter failed to refill the soil moisture profile and then during spring (August-December) only 59mm of rainfall was recorded at the farm. Climate records at two stations (St Bathans and Lauder) within 30 km of the farm, but in the next valley, indicated that soil moisture deficit was between 50 and 120 mm, and so would provide very little extra moisture for the lucerne. The soils in the observed areas of the farm were Waenga shallow sandy loams with a topsoil depth of 20-45 cm over gravel with a potential available soil moisture capacity of 80-85 mm, indicating that pastures on these soils were relying totally on rainfall.

The records from the pasture indicate, when intakes are estimated from the final weaning weights of the lambs, that 193 kg of feed (12.5 MJME/kg DM) was required per ewe/lamb pair making a total intake of 773 kg DM/ha, or 13 kg DM grown/mm rainfall. Calculated values of ewe/lamb pair intakes on the lucerne for singles is 2.35 kg DM/d (13 MJME/kg DM), similar to the estimate of 2.3 kg DM/d derived from the

grazing record. This translates into 197 kg DM required per ewe/lamb pair for the spring and a total intake of 1970 kg DM/ha, or 33 kg DM/mm rainfall. The same calculation for the twin mob suggests that intake should have been 3.23 kg DM/d, just slightly lower than the estimate of 3.5 from the grazing record, though the increase in lucerne height may have lowered quality on some occasions, increasing the relative intake to reach the measured liveweight gain. This equates to 271 kg DM (13 MJME/kg DM) per ewe/lamb combination or 1573 kg DM/ha, a growth rate of 26.6 kg DM/mm rainfall. These values do not account for any moisture in the soil, but do demonstrate the large difference between the potential growth from lucerne and pasture in very harsh climatic conditions.

The value of lucerne as a grazing option in spring is clearly evident in this case. The increase in number of lambs sold prime before the onset of the very dry conditions that prevail in this environment mean that less lambs are sold into the highly variable store market, increasing certainty for the farmer. The whole farm analysis of this farm indicates how the feed requirements and feed supply improve with the spring grazing lucerne option.

## **Theme – getting rid of your singles quickly – how fast can they grow on different feed sources**

### **Farmer - Geoff Shaw**

Geoff has most of the farm in lucerne or lucerne mixes. The twins and singles are currently lambing on different parts of the farm, with the aim of tightening them up and beginning a rotation around the lucerne paddocks at tailing. Lambing officially started on September 20<sup>th</sup> and lambs and ewes will be boxed up for tailing at 4 to 5 weeks of age.

One area had 359 Halfbred single bearing ewes stocked at 8/ha with the potential to generate a 6 paddock rotation. Another cohort of 99 ewes with singles was grazed on an area of pasture only. Both areas were grazed with ewes and lambs from lambing onwards, rather than rotations beginning after tailing.

### **Measurements:**

- **Weights** of ewes and lambs at tailing and again at weaning (or when significant management changes occur if the season continues dry),
- **Paddock diary** of ewe and lamb numbers and grazing events (in and out of paddock)
- Opening and closing **forage heights** every time a mob is shifted
- **Animal diary** recording the fate of ewes and lambs from the lucerne and pasture blocks (deaths, date sold, prime/store, and weight)
- **Feed quality and pre and post-grazing forage** measurements mid season

### **Results**

The number of ewes assigned to the Pasture treatment was relatively low and raised the concern of an atypical result for the pasture control due to low stock competition. However, although the lamb growth rates was relatively high for both treatments, the low stocking rate still reflected the issues of using pasture alone during the spring. The lucerne-based group provided 2.6 times more lamb gain per hectare, and nearly 4 times the number of prime lambs by weaning in early December.

Lower feed quality (estimated to be 10.9 MJME/kg DM) in the Pasture control led to an estimated ewe intake of 4.24 kg DM/d which was higher than that on Lucerne which was estimated to be 3.42 kg DM/d at an estimated forage quality of 12.4

MJME/kg DM. This suggests that the original concern of a small mob creating an atypical result may be warranted, though the trade-off between stocking rate and per head performance would have resulted in an estimated lamb growth rate of 300 g/d with an increase in stocking rate to 2.45 ewes/ha. This would have produced a very minor gain of 4 kg/ha extra lamb gain above the 50 kg gain recorded in the table, while reducing lamb weaning weight to approximately 26.8 kg.

The pasture information indicated the severe impact of the dry spring on feed quantity and quality. By mid-November when the pasture composition assessments were done both the pasture and lucerne had significant amounts of dead material.

### Halfbred ewes rearing single lambs

	Grass	Grass/Lucerne
Number of ewes	99	359
Time ewes and lambs on pure lucerne	-	71
Time ewes and lambs on lucerne/cocksfoot mix	-	29
Time ewes and lambs on grass	100	-
Ewe stocking rate at any one time (ewes/ha)	9.7	35.5
Ewe stocking rate over trial (ewes/ha)	2.0	4.9
Average lamb growth rate over trial (g/d)	357	368
Lamb weaning weight (kg)	29.5	30.1
Lamb gain/ha	50	132
Lambs sold prime >33.5 kg (%)	15	23
Lambs sold prime (number/100 ha)	30	113
Lambs sold store (%)	85	77
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Estimated ewe intake (kg DM/d)	4.24	3.42
Estimated forage consumed tailing to weaning (kg DM/ha)	415	821
Pasture		
Pregraze		
Height ave for season (cm)	2.54	7.6
Cover in November (kg DM/ha)	904	2310
Composition (%)		
Grass	28	30
Legume	3	25
Dead	68	42
Postgraze		
Height ave for season (cm)	0.95	0.2
Cover in November (kg DM/ha)	611	1856
Composition (%)		
Grass	30	18
Legume	5	7
Dead	64	73

### Discussion

Again the dry spring was very evident. By the beginning of lambing on the 20<sup>th</sup> September the predicted soil moisture deficit was 120mm of a potential available of 150mm, as recorded at the Ranfurly climate station, approximately 10 km away. However, the Tiroiti fine sandy loam soils in the demonstration area have a topsoil depth (above underlying gravels) of approximately 70cm and an available soil moisture content of approximately 120-130 mm so were therefore at full deficit at the beginning of the observation period. During the measurement period from 20 September to 10 December the rainfall was 57.2 mm at the same station. The growth

of the forages then equates to 7.3 kg DM grown /mm of rainfall for the pasture and 14.4 kg DM grown/mm of rainfall for the lucerne. The number of 'significant' rainfall events, over 10 mm, was also recorded and there were only 3 of these, totalling 35 mm. When this data is used then the potential forage production from pasture was 11.8 kg DM grown/mm and from lucerne was 23.5 kg DM grown/mm.

The low productivity of the lucerne based forage may be due to the fact that much of it was mixed with grass, as a strategy to extend the amount of time that the lucerne may be grazed during the year. Another potential reason may be that the lucerne paddocks were used during lambing and so the lucerne was unable to maximise its potential due the continuous grazing during the first month of its growth.

## **Theme – Growing merino lambs on lucerne grass mixes compared to pasture only.**

### **Farmer - Tom Moore**

Tom currently has 200ha of pure lucerne and 450ha of lucerne mixed with cocksfoot and Tall fescue located on arable land. Wairau and Kaituna are the two lucerne cultivars used on the farm. The pure lucerne is cut solely for hay and silage, while the lucerne mixes are used for lambing and then rotationally grazed over spring and summer. Each year around 50ha of the farm is being converted from grass pastures into lucerne mixes.

The farm winters 8500 Merino ewes, 5000 hoggets and 150 beef breeding cows. 2500 ewes mated to a terminal sire are carried on the arable land and start lambing on 10th September. All of these ewes are sold by January regardless of the season. About 40% of their progeny go directly to the works at weaning. The majority of the Merino flock is run on the hills and starts lambing on 10th October, with most of their progeny carried through the winter.

### **Measurements:**

- **Weights** of ewes and lambs on pure lucerne, lucerne grass blocks and pasture only. Weights taken from each mob at tailing and weaning.
- **Paddock diary** of ewe and lamb numbers and grazing events (in and out of paddock)
- **Animal diary** recording the fate of ewes and lambs from the lucerne and lucerne mix blocks (deaths, date sold, prime/store, and weight)
- Opening and closing **forage height** every time a mob is shifted.
- The botanical composition of the herbage in the pure and mixed lucerne swards.
- **Opening feed** cover assessment on pure lucerne and lucerne mix blocks. The proportion of **grass-to-lucerne** in the mixed swards would also need to be measured.
- **Forage growth** – could be assessed by Tom taking herbage height measurements.
- **Closing feed** cover assessment on pure lucerne and lucerne mix blocks. Again, the proportion of grass-to-lucerne in the mixed swards would need to be measured.
- **Feed quality** comparisons between pure lucerne and lucerne mix blocks at different times of the year.

### **Results**

While the aim was to have the twin-bearing ewes on swards that were predominantly lucerne, this did not turn out to be the case with the ewes with single lambs spending

26% of the time on pure lucerne stands compared to only 19% for the ewes rearing twins. The ewes rearing singles on pastures still spent over half of their time of the lucerne cocksfoot mixes.

The calculated intake of ewes rearing singles was 2.7 kg DM/d on lucerne, and 2.2 kg DM/d on pasture due to slightly lower performance of both ewes and lambs and the lower tailing percentage. Therefore total intakes over the 65 day period of 649 kg DM/ha on lucerne and 643 kg DM/ha on lucerne plus pasture were very similar due to the higher stocking rate on the pasture.

Ewes rearing twins on lucerne ate 3.1 kg DM/d, while those on the lucerne and pasture ate 3.08 kg DM/d, resulting in similar amounts of approximately 826 kg DM/ha.

The estimates of forage availability were done by eye by the farmer. While the calibration cuts for post grazing residuals was similar to the farmer estimates, the amount on offer appeared to be overestimated by the farmer. This may have been due to the more open nature of the lucerne grass mixes, making calibration by eye more difficult. The pre and post-grazing measurements clearly show the preference for the lucerne component of the swards and potentially question the benefit of grass for spring grazing.

			Singles		Twins	
			Lucerne	Pasture	Lucerne	Pasture
<b>Summary</b>						
Time ewes and lambs on pure lucerne (%)			26		19	
Time ewes and lambs on lucePlanChic (luce&herbs) (%)			46			
Time ewes and lambs on luceCocFesc (luce&grasses) (%)			28	59	81	100
Time ewes and lambs on grass-based pasture (%)				41		
Ewe live weight at tailing (kg)			57.5	57.5	57.5	51.5
Ewe live weight at weaning (kg)			58.5	58.0	57.5	54.0
Ewe stocking rate at any one time (ewes/ha)			42.1	-	44.5	-
Lambs tailed (%)			91.5	81.5	147.0	146
Ewe stocking rate over trial (ewes/ha)			3.7	4.5	4.1	4.1
Average kg DM on offer (kg/d)			5.5	-	6.5	-
Lamb weight 19 October - tailing (kg)			16.5	16.5	14.0	14.0
Lamb weight 23 December - weighted weaning date (kg)			34.3	33.7	30.8	30.4
Average lamb growth rate over trial (weighted for drafts) (g/d)			274	265	258	252
Lambs sold prime >34.5 kg by 6 Jan (%)			58	64	32	25
Lambs sold store (%)			42	36	68	75
Pastures	Pregraze ave estimate for the season (kg DM/ha)		3089		3311	
	Pregraze measured early December (kg DM/ha)		2029		1343	
	Composition (%)	Grass	38	40		
		Legume	52	45		
		Dead	9	15		
	Postgraze ave est. for the season (kg DM/ha)		1378		1211	
	Postgraze measured early December (kg DM/ha)		1258		1131	
	Composition (%)	Grass	45	58		
		Legume	14	4		
		Dead	38	27		

## **Discussion**

The lamb growth rates recorded here are relatively high for merino ewes though this may be assisted by the use of terminal sires. This approach provided a high proportion of lambs being sold prime by early January, which then released feed and space for ewes and lambs coming down from the hill country for weaning in late January.

The similar outcomes from flocks fed various amounts of lucerne and the relatively similar intakes may have reflected the relatively high amount of lucerne grass mixtures. This mixture approach appears to dilute the impact of lucerne as the grasses are competing with the lucerne for moisture.

The rainfall during the spring (measured at Hawea Flat some 20 km away) was 150 mm. This suggests that the amount of forage actually utilised was only between 4.5 and 5.5 kg DM/mm rainfall. The relatively low amount of pasture utilised suggests that the residual feed left after grazing built up during the spring, diluting the response to rainfall measured in the actual intakes.

The approach of using grass/lucerne mixtures provides a sward that is grass dominant, and uses lucerne as the legume. This approach provides extra feed on the shoulders of the season and more robustness for grazing management from the grass component. However, it appears to significantly dilute the full benefits that can be gained from using lucerne alone, as lamb growth rates are lower and total dry matter production during the spring is reduced, especially when soil moisture is limiting.

## **Conclusions**

The Lucerne for Lambs project has provided a demonstration of different ways to use lucerne in sheep grazing systems. The development of spring rotation guidelines and their demonstration has provided some confidence to the farmers in this programme to apply appropriate stocking rates of ewes and lambs during spring.

The number of lambs that were available for sale direct to the prime market has improved profitability and relieved the pressure on summer pastures. This year was particularly dry in Central Otago, both during spring and the following summer. The options that were provided by grazing lucerne in spring had significant positive flow-on effects on each farm.

Some of the advantages and disadvantages of lucerne alone and lucerne in grass mixtures were highlighted during this study. These included the improved forage growth response to water shown by lucerne, increased stocking rate and lamb growth rates when lucerne is used alone. When sown as a mixture with grass then some of the stocking rate advantages through improved water use efficiency and per head performance advantages are sacrificed as a trade-off for flexible grazing management and early spring and late autumn production.