finalreport

Project code: **SUGR.403/ B.SGS.0403**

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Date published: **July 2007**

ISBN: **9781741911923**

PUBLISHED BY
Meat & Livestock Australia Limited
Locked Bag 991
NORTH SYDNEY NSW 2059

Reedy Creek Lamb Finishing Project

Executive Summary

Lamb growth rate is one of the key factors influencing the viability of a lamb finishing system and is a key to the Australian Lamb finishing industry as well as on-farm productivity and profitability.

Reedy Creek Lamb Group members have been involved in pasture monitoring in the past, but have not looked at the animal side in the same detail. The group decided to undertake this project to get a benchmark of how their lambs were performing. The project aimed to measure lamb growth rates and identify key inputs and critical success factors for finishing lambs.

The project was run over two years, with several demonstration sites being setup on irrigated finishing systems in the Reedy Creek region. The properties hosting demonstration sites varied between years due to the drought experienced and property sales.

50 lambs on each site were individually identified and monitored during the finishing period. Pastures and soils were also monitored and information recorded on stock and pasture management. Extra data was collected in the second year compared with the first to provide more information and assist in the identification of the likely factors influencing the growth rates of lambs.

When interpreting the results from the project it should be noted that the growth rates recorded across sites are not calculated over the same time period. Also, the growth rates recorded in year 2 are for the tail of the mob (not the whole mob) as the weight of monitored animals was capped to enable more than two weights to be taken before sale.

The project was also run over a difficult period for producers with wide spread drought across the state. The Mid and Lower South East had very much below average rainfall From 1 July -31 Dec 2006 (decile 1) with some areas receiving the lowest rainfall on record.

Average growth rates of lambs from entry until sale ranged from 71 – 283g/day with an average growth rate across sites of 140 g/day in year one and from 56-231g/day with an average across sites of 108g/day in year 2.

Majority of the lambs monitored in both years 1 and 2 grew on average less than 150g/day with 68% and 81% of animals for the respective years.

Feed quality was identified as the most likely factor limiting lamb growth. The majority of pastures only contained 8.7-9.8 MJ ME/kg DM, compared with the lambs nutritional requirements of 11 MJ ME /kg DM. Digestibility was also low ranging from 60.1-76%, compared with a target of 80% digestibility for lambs.

Other factors that may potentially be restricting lamb growth include, pasture quantity, mineral balance in the lambs diet, soil fertility and animal heath.

Identification of ‘actual’ (rather than ‘potential’) factors limiting growth could not be concluded from this project due to the number of variables in the systems monitored. The potential factors identified would need to be explored and trialled further to determine their actual effect.

Based on the information available and the likely factors identified as restricting growth the following critical success factors were identified for finishing lambs:

- High feed quality – provide a high energy and highly digestible diet that meets the nutritional requirements of growing lambs (through pastures and supplements)
- Monitor pastures and livestock – know where your animals and pastures are at so informed and timely decisions can be made
- Animal health - keep on top of health issues such as flystrike and worms

Contents

1 Background

The Reedy Creek Lamb Group have been involved in pasture monitoring in the past, but have not looked at the animal side in the same detail. The group decided to undertake this project to get a benchmark of how their lambs were performing. The project aimed to measure lamb growth rates and identify key inputs and critical success factors for finishing lambs.

2 Project Objectives

- Monitor lamb growth rates during the major finishing period, Dec to April, from varying pasture bases and input systems
- Establish key inputs and critical success factors to finish lambs
- Calculate kilograms of lamb produced per hectare in each system
- Calculate cost of production of lamb finishing systems on irrigation in the Reedy Creek district
- Develop "sustainability efficiency indicators" for the district from the activities and data collected

3 Methodology

3.1 Trial design

2005/06

- Identify key monitoring requirements to assist in identifying the critical success factors for finishing lambs
- Identify cooperating properties to host a trial site
- Each property to individually identify 50 lambs within a mob to be monitored through the trial
- Monitor identified lambs based on the key monitoring requirements developed
- Field day including input from a natural resource management expert to determine sustainability indicators for finishing lambs
- Workshop with a pasture expert to skill up producers in pasture and lamb assessment skills

2006/07

- Individually identify 50 lambs (max weight 37 kg) within a mob and monitor based on the key monitoring requirements identified
- Examine monitoring results to identify critical success factors for finishing lambs

3.2 Monitoring

2005/06

The following measurements were identified as key monitoring requirements for the project

- Lamb growth and grazing days to calculate growth rates
- Stocking rates

- Quantity and quality of feed on offer
- Number of irrigations

2006/07
Following analysis of the first years data it was decided that extra information was required to help identify the likely factors influencing growth rates of lambs. The following data was collected in the second year:

- Lamb weights and grazing days to calculate growth rates
- Food on offer to be assessed on entry and exit of stock in a rotational system and monthly in a set stocked system
- Pasture composition and ground cover to be assessed at the start and end of the trial
- Pasture quality through a feed test and plant tissue test
- Soil quality through a soil test
- Stock management recorded
- Pasture management recorded
- Faecal worm egg counts in March/April 2007 (funded through the MLA/SARDI collaborative research project "Parasite Control in Southern Prime Lamb Production Systems" - AHW.045)

4 Results

The focus of the results is predominantly on the second year of the project as more data was recorded in this year and provides more information to determine possible factors limiting growth. A summary of results can be found in appendix 1.

When analysing these results it must be noted that the growth rates across sites are not calculated over the same time period.

In the second year of the trial the starting weight of tagged lambs to be monitored was capped at 37 kg to enable more weights to be recorded on individual animals. This was due to numerous animals only having 2 weights recorded in year 1 because they reached market weights by the second weighing and were sold. Therefore the weights in year 2 are for the tail of the mob and this needs to be taken into consideration when making comparisons with year 1 growth rates and with average and top performance benchmarks for the industry.

An allowance of 4% of lambs with a negative growth rate (from entry to sale) was made and these figures were removed from the data. A small number of poor doers in a mob can be expected which is not reflective of the rest of the mob.

Adjustments were also made in systems that had cattle and lambs grazing the irrigation area used for the project.

4.1 System description

	site 1	site 2	site 3	site 4	site 5	site 6
Breed	White suffolk/Merino and WS/BL/Mo	Poll Dorset/WSxMo & 1st X	second cross dorset lambs	WS and Dorset x Mo lambs	2nd x LMS borderlester, merino dams, dorset white suffolk sire	
Trial area (ha)	9.4	17	18	30	13.8	13.1
cattle in system	yes	No	No	yes - for short period	yes	yes
Lambing period	June/July & Sept/Oct	July-Sept	July drop	June-August (2 drops)		
Weaning	Sep-16	November	Nov-03	17-Nov		
Grazing system	Rotational	Set stocked	set stocked	set stocked	Rotational	
Irrigation type	Pivot	flood	surface irrigation	surface irrigation	Pivot	
Pasture type	Lucerne/ Chickory/ Plantain	Fescue/ Ryegrass/ white clover / Strawberry clover	advance fescue/ strawberry clover/ Fog grass	Dovey Fescue/ strawberry clover	White clover/ concord ryegrass/ balansa clover and lucerne/ chichory/ cocksfoot	White clover/ ryegrass/ advanced tall fescue/ strawberry clover

Table 1: *Description of the finishing systems monitored in year 2 of the project*

4.2 Lamb growth rates

Average growth rates of lambs from entry until sale ranged from 71 – 283g/day with an average growth rate of 140g/day across sites in year one and from 56-231g/day with an average growth rate of 108g/day in year 2 (figure 1).

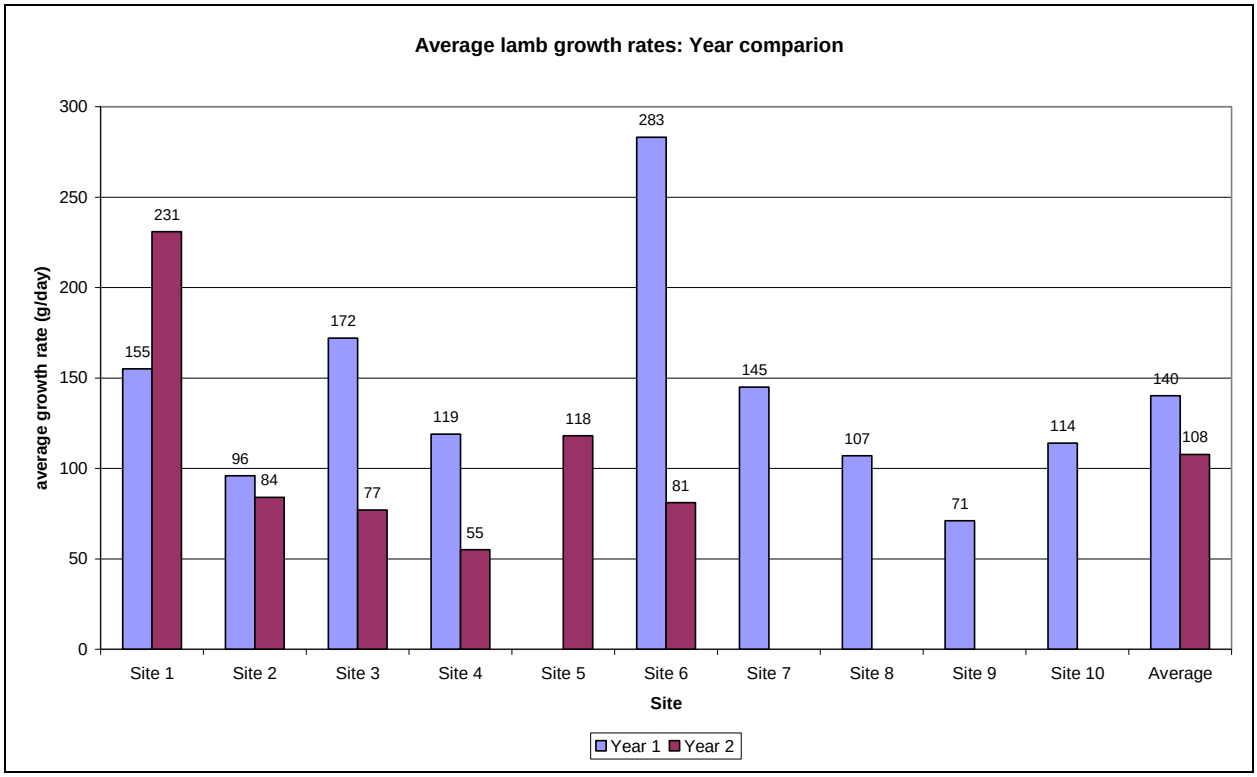


Figure 1: *Average growth rates of lambs on individual sites and across sites for years 1 and 2 of the project*

Growth rates of individual lambs varied greatly both within and across sites. Growth rates of individual animals (entry to sale) in year 1 ranged form 0 - 451 g/day, compared with 5-361 g/day in year 2. Results from year 2 are shown in figure 2.

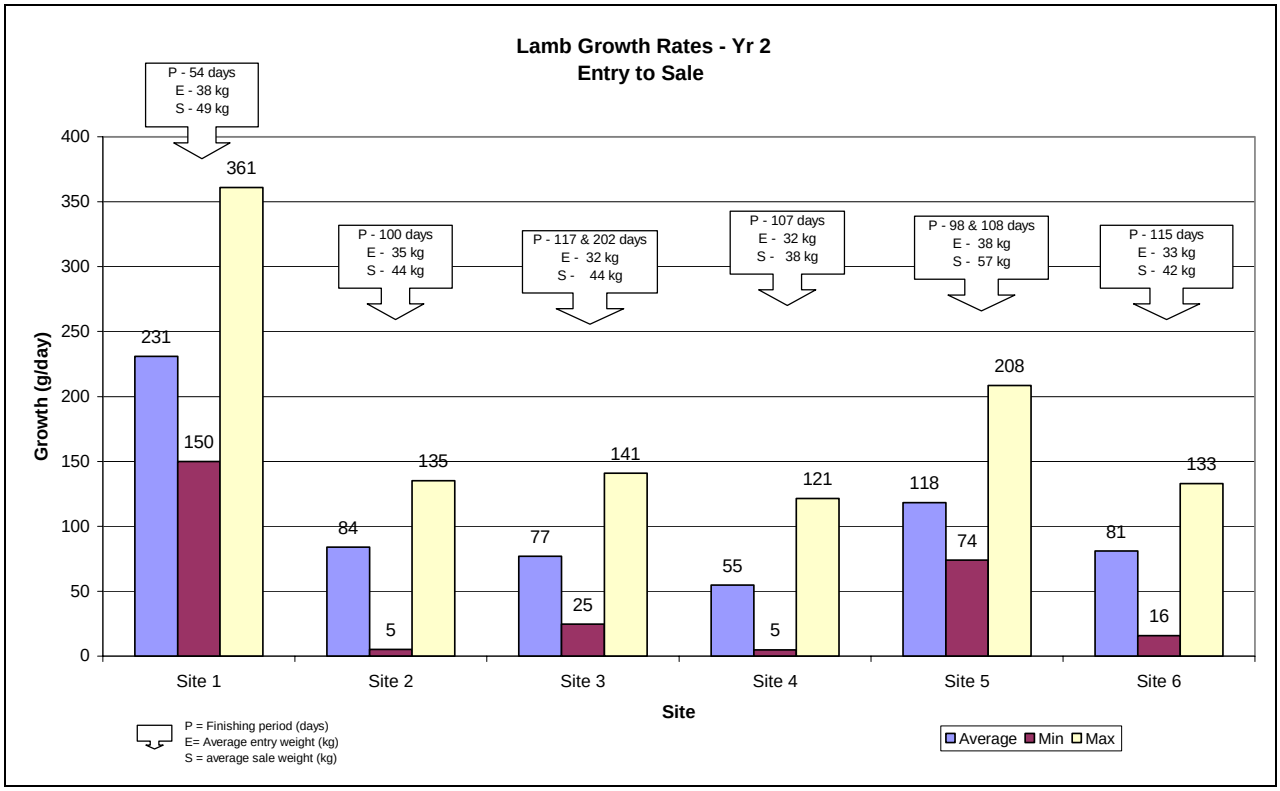


Figure 2: *Average, minimum and maximum growth rates of lambs on individual sites in year 2*

Majority of the lambs monitored in years 1 and 2 grew on average less than 150g/day with 68% and 81% of animals in this growth rate bracket for the respective years. 100% of lambs on four of the six sites monitored in year 2 grew on average at less than 150g/day (figure 3).

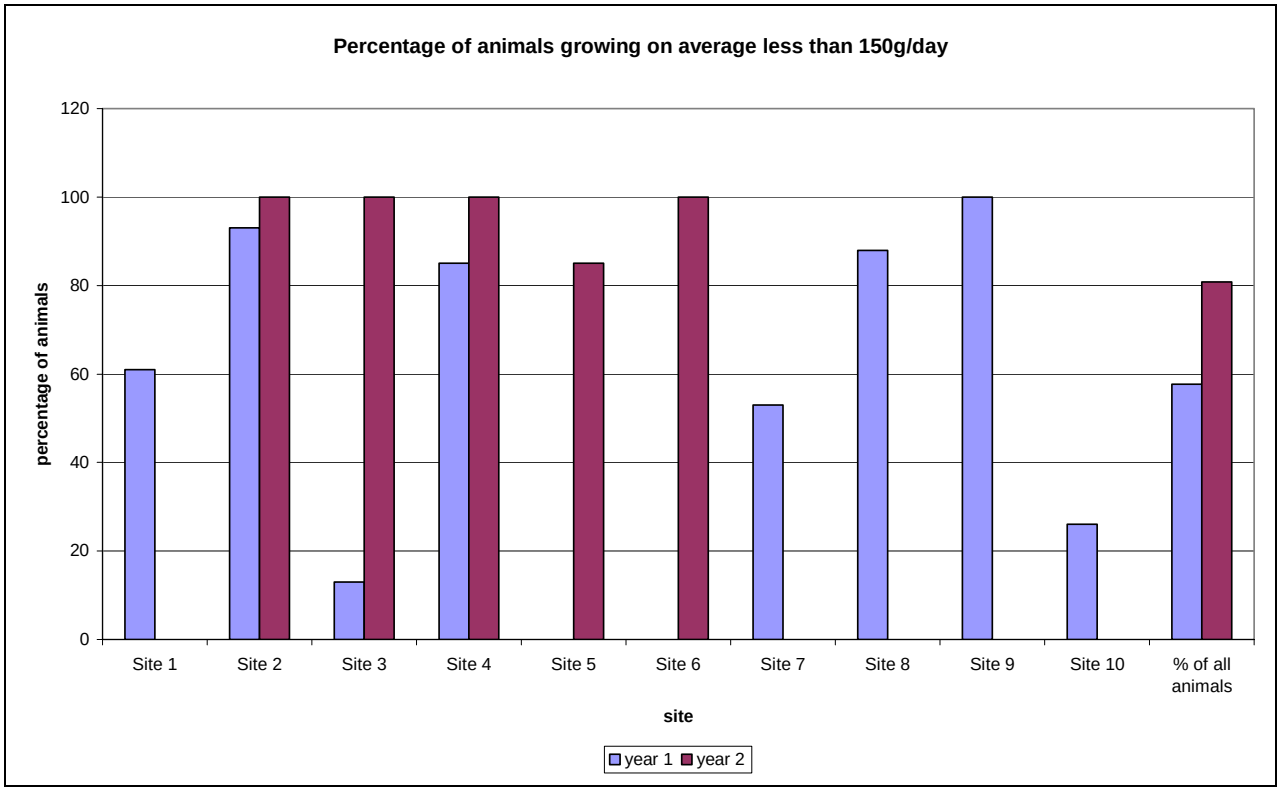


Figure 3: *Percentage of lambs on average growing less than 150g/day from entry to sale* (note: sites monitored in year 1 include sites 1, 2, 3, 4, 6, 7, 8, 9, 10 and sites monitored in year 2 include sites 1-6)

More detailed results for individual sites, including the average, minimum and maximum growth rates for each monitoring period can be seen in appendix 2

4.3 Pastures

FeedTest results from year one (appendix 3) and year 2 (table 2) found that majority of pastures were high in fibre and low in ME and digestibility.

Plant tissue tests in year 2 found majority of pastures to be high in Potassium, Sulphur, Sodium, and Chloride and low in Copper.

	site 1	site 2	site 3	site 3	site 4	site 5	*ideal for LS*
	lucerne/chicory new pasture	tall fescue (veg) clovers (flowers)	Tall fescue	Tall fescue	Dovey tall fescue Strawberry clover	per ryegrass white clover	
date	12/02/2007	9/02/2007	14/12/2006	5/03/2007	13/03/2007	22/01/2007	
Dry Matter (%)	20	26	23	36	39	20	
Crude Protein (%)	30	15	15	14	12	15	***<20***
Fibre NDF (%)	29	58	46	56.8	62	56	***30-40***
Digestibility (%)	76	65	66.2	60.1	64	65	***>80***
Metabilisable Energy (MJ/kg	11.5	9.5	9.8	8.7	9.5	9.5	***>11.5***
Nitrogen %	4.9	2.5	3.9	3.9	2.4	3	***3***
Phosphorus %	0.27	0.26	0.17	0.17	0.19	0.36	***0.35***
Potassium %	2.24	2.02	2.04	2.04	2.05	2.2	***1***
Sulphur %	0.42	0.27	0.37	0.37	0.42		***0.2***
Calcium %	1.84	1.05	0.95	0.95	1.2	0.81	***0.55***
Magnesium %	0.35	0.25	0.27	0.27	0.33	0.22	***0.25***
Sodium %	0.59	0.78	0.66	0.66	0.88	2.8	***0.15***
Chloride %	1.92	2.08	1.73	1.73	1.8	1.3	***0.25***
Copper mg/kg	5.8	6.4	8.3	8.3	10.5	7.4	***10***
Zinc Mg/kg	48.1	25	26.6	26.6	51.2	23	***30***
Manganese Mg/kg	37.7	95	83	83	43.8	23	***25***
Iron Mg/kg	109	1321	130	130	56	73	***na***
Boron Mg/kg	29.8	13.1	15.4	15.4	19.3	14	***na***
Molybdenum	1.88	0.18	0.4	0.4	0.87		***<0.5***

* yellow cells = too low, red cells = too high

Table 2: *FeedTest and plant tissue test results for pastures in year 2*

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
stock entry (kg DM/ha)	2400				2857	
stock exit (kg DM/ha)	917				1000	
set stocked (kg DM/ha)		2416	1170	1233		

Table 3 : *Average food on offer in year 2*

	Start (%)	Finish (%)	Change (%)
Pasture			
Fescue	51	52	1
Ryegrass	25	20	-5
White clover	21	5	-16
Strawberry clover	13	13	0
Advance fescue	15	15	0
Fog	44	44	0
Dovey fescue	80	80	0
Concord ryegrass	50	20	-30
Lucerne	50	10	-40
Chicory	25	10	-15
Coxfoot	25	15	-10
Average	36	26	-10
broad weeds	2	3	1
Annual Grass	8	8	-1
Average	5	5	0
bare ground	1	1	1

Table 4: *Some basic sustainability indicators - Average percentage of food on offer which individual plant species accounted for at the start and end of the monitoring period in year 2 and the average change in composition.*

4.4 Worms

Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
109	117	54 (blue tags)[1] 252 (yellow tags)	266	110	992*

Table 5: *Buld faecal egg counts* (*Trichostongylus/ Osertagia*)

[1] These lambs had been dosed with a slow release suppressive worm control device delivering a B2 (white) drench, albendazole

* Culture confirmed 71% Haemonchus (*Barbers Pole Worm*)

4.5 Soil

		Oliver	Possingham	Fairways	Mutaburra	*ideal*		Wheal
		site 1	site 2	site 3	site 4	*Ideal*		site 5
Texture	Visual	Sand	clay loam	clay	clay			
Free lime	1N HCL	slight	moderate	very high	very high			
pH	water	7.9	8.4	8.1	8.1	***<8.0***		7.4
pH	CaCl2	6.9	7.6	7.6	7.2	***<7.5***		
P	Ext mg/kg	14	37	24	12	***.+45***		
K	Ext mg/kg	30	263	179	346	***.+150***	(bray2) kg/ha	307
S	Ext mg/kg	14	14.8			***.+12***	ppm	76
Org C	%	1.8	3.9	4.8	4.7	***.+2***	colloidal OM%	5.1
CEC	Mequiv/100g	8				***.+15***		
Ca	Mequiv/100g	6 (75%)				***65-75%***	ppm	4797
Mg	Mequiv/100g	1.2 (15%)				***10-15%***	ppm	590
Na	Mequiv/100g	0.7 (9%)				***<6%***	ppm	310
K	Mequiv/100g	0.1 (1%)				***3-8%***	ppm	440
EC (1:5)	dS/m	0.18	0.92	0.63	0.5	***>0.2?***	EC 1:5	0.43
Ece	Ext mg/kg	2.6	3.1	4.1	3.3	***<2***		
Cu	Ext mg/kg	1.5				***.+1***	ppm	0.8
Zn	Ext mg/kg	3.4				***.+2***		8.1
Mn	Ext mg/kg	8.6				***.+20***		41
B	Ext mg/kg	0.4				***.+0.5 & <5***		2.2
Cl	Ext mg/kg	214				***<120 sand, <300 clay***	ppm	
NO3-N	Mg/kg	2				***.+50***	nitrogen kg/ha	101

too high
too low

Table 6: *Soil test results*

4.6 Sale and production data

	site 1	site 2	site 3	site 4	site 5	site 6
Average stocking rate (lambs/ha)	41	23	17	20.9	34	20
Average stocking pressure (lambs/ha)	165	23	17	20.9	117	20
Av. kg lamb produced/ha/day	9.6	1.9	1.3	1.1	4.0	1.6
dressing %	47	47	42	est. 46	46	
Average CW (kg)	22.9	21.4	18.57	est. 17.5	22.4	
Average FS	3	3				

est. = figure estimated based on an average dressing percentage of other sites

Table 7 : *Production and sale data from year 2*

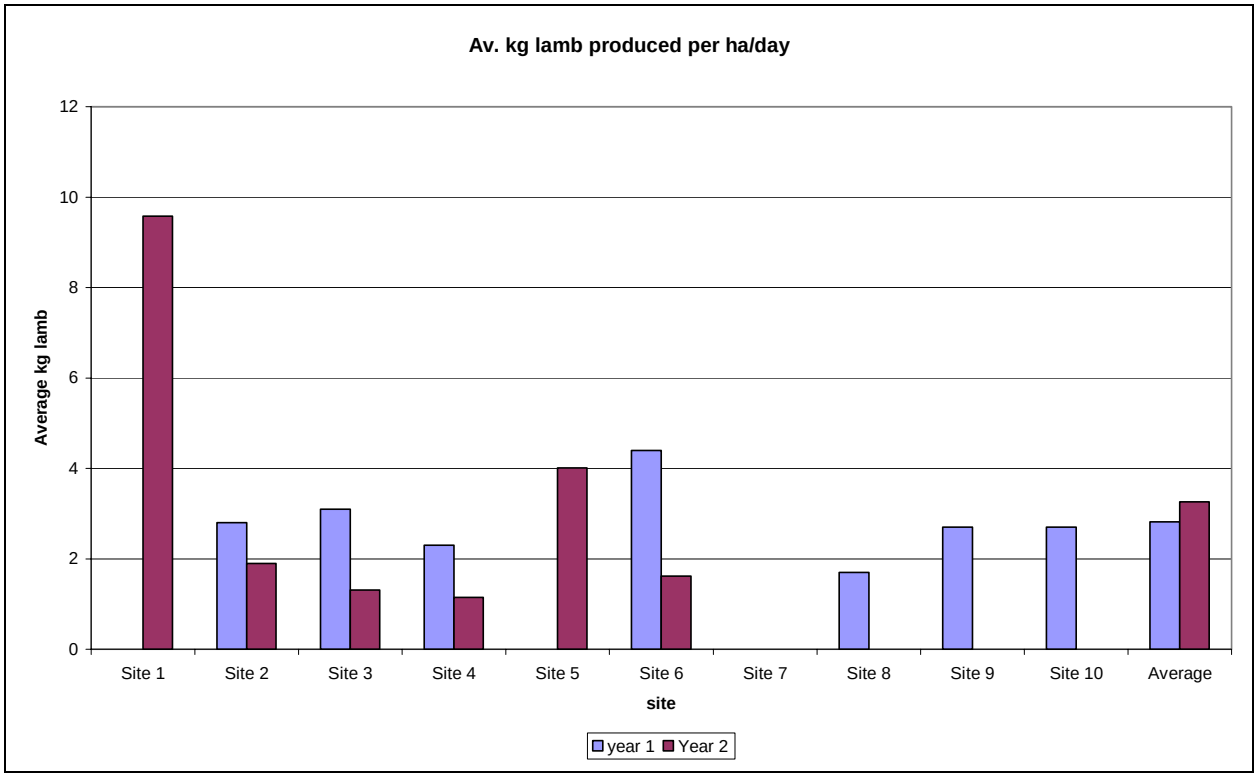


Figure 4: *Average kilograms of lamb produced per hectare per day*

4.7 Cost of production

	site 1	site 2	site 3	site 4	site 5	site 6
Costs ($/head)		$62.13	$71.33	$40.62	$44.25	
Cost ($/kg carcase weight)		$2.90	$3.84	est. $2.32	$1.98	
Average returns per lamb bought		$88.18	$73.95	$61.42	$92.57	
Margin		$26.05	$2.62	$20.80	$48.32	

est. = figure estimated based on an average dressing percentage of other sites

Table 8: *Costs and returns in year 2*

The cost per head figure includes lamb purchase, lamb health, pasture, irrigation and lamb sale costs. This figure was then divided by the average carcase weight to determine cost per kg of carcase weight.

5 Discussion

5.1 All sites

The project was conducted during a tough season with much of the state experiencing a drought in 2006. The Mid and lower South East region received very much below average rainfall from 1 July

06 -31 March 2007 (decile 1) (Bureau of Meteorology). For the same 9 month period in the previous year the region received average rainfall (deciles 3-7).

Overall lamb growth rates across the sites monitored were marginal with average growth rates across all sites of 140g/day in year 1 and 108g/day in year 2. However there were some good performances with an average growth rate of 283g/day on site 6 in year 1 and 231 g/day on site 1 in year 2.

Even though the lambs monitored in year 2 were the tail of the flock and the season experienced was tough, there is still room for improvement with 81% of the lambs monitored growing at less than 150g/day.

The most likely factor limiting lamb growth is feed quality. Lambs require at least 11 MJ ME/kg DM. Feed test results in year 2 revealed that majority of the pastures were well below this, providing only 8.7-9.8 MJ ME/kg DM. Digestibility was also low ranging from 60.1-76%. Feed tests were generally conducted early on in the finishing period, therefore digestibility and energy will have declined further as the finishing period progressed.

Pastures in growth phase 2 (actively growing and between 800 and 2500kg DM/ha) provide the best quality and quantity of pasture for livestock. As plants start to mature they move into phase 3 and quality and growth rates decline.

Some potential strategies that could be explored to better meet the nutritional requirements of lambs and improve growth rates include:

- Regular monitoring of livestock, pastures and soils to understand what is happening in the system.
- Adjust grazing management to maximise the time pastures are in growth phase 2 (actively growing)
- Stop breeding and just finish lambs (buy in feeders)
- Add fertilizer to improve pastures
- Supplementary feed lambs to meet nutritional requirements not met from the pasture
- Change lambing time or target market to better utilise pastures before they mature and significantly decline in quality
- Renovate pastures/change pasture species to improve the nutritional value of the pasture for lambs and to delay maturity

Other factors that may potentially be restricting lamb growth include, pasture quantity, mineral balance in the lambs diet, soil fertility and animal heath.

Plant tissue tests showed pastures to be high and/or low in a number of minerals, however it is not possible to directly relate this back to what is actually available to livestock. This is due to the interactions that occur between certain minerals. For example, high intakes of potassium decreases the absorption of magnesium and high levels of molybdenum and iron reduce the availability of dietary copper.

Balancing minerals in the diet is a complex issue requiring specific diagnosis for individual properties To accurately identify mineral deficiencies and/or toxicities in livestock, tests would need to be conducted on the animals in question (blood test, liver biopsy) in combination with plant tests and

soil tests. Expert advice should be sought to interpret test results and identify the best strategy forward.

On most properties worm egg counts were low to moderate, indicating reasonable worm control. Indications from AHW.045 are that at these levels the cost of additional treatment is generally not justified with lambs being sold before worm numbers increase to significantly affect lamb production. However, ongoing contamination of pastures throughout autumn could be responsible for dangerous levels of worms being able to infect sheep following the first substantial rains.

On one farm (site 6) the worm egg count was greatly elevated relative to the other properties. Barbers Pole Worm comprised 71% of the larvae cultured from faeces, emphasising the importance of individual farm examinations for worm infections.

In general, however, the nutrition of lambs is likely to be a greater constraint to production than infections with internal parasites.

Majority of the soils monitored contained high salt and low phosphorus levels. Soil health and fertility is important as plants rely on the soil to get majority of the essential nutrients required for growth. Availability and absorption of nutrients by the plant is influenced by a number of factors including soil structure and texture, biological activity in the soil, the nutrients present and the interactions that occur between nutrients.

The issues and factors identified as impacting on lamb growth are only ‘potential’ causes based on the information available. ‘Actual’ growth factors restricting growth could not be determined in this project due to the number of variables involved in the systems monitored. Potential factors would need to be explored and trialled further to determine their actual effect.

Ensuring lambs nutritional requirements are being met should be the first step towards improving growth rates as this is likely to have the biggest impact. Then start to look at and fiddling with other influencing factors.

Regular monitoring of livestock, pastures and soils is important to know how they are performing and were there may be gaps in the system. This information can then be used to make informed and timely decisions resulting in both short and long-term changes in the system.

Soil health (soil test), changes in pasture composition and the persistence of desirable pasture species as well as the percentage of bare ground are some good basic indicators for environmental sustainability. Pastures monitored were dominant in improved pasture species and low in weeds. Pastures had zero or minimal bare ground, even at low food on offer.

Lamb production was compared across sites by the kilograms of lamb produced per hectare per day. This was due to fluctuations in the number of lambs grazing the irrigation area during the project, with multiple sale dates and new lambs entering the system. Production ranged from 1.1 – 9.6 kg of lamb/ha/day and is driven by stocking rate and lamb growth rates.

Knowing cost of production is important to determine the margins of a business. If you do not know what it costs to produce a product you do not know what price is required to make a positive margin. Information gathered and generated from calculating cost of production, provides a basis for

decision making. It enables producers to identify what is pulling their business down and identify where resources can be utilised better and/or aspects of the business that can be improved.

Cost of production has been acknowledged as an important issue. However for many it is a hard issue to make a start on. This is due to uncertainty of where and how to start, current record systems making it difficult to locate the required data, and low confidence in working with figures.

5.2 Site 1 (year 2)

Good growth rates were achieved in the second year with lambs growing at an average of 231 g/day and the best performing lamb growing at 361g/day. However it should be noted that the finishing period on this site was only 54 days compared with 98-202 days for lambs on the other sites.

Energy levels of the pasture was good at the start of the finishing period with 11.5 MJ ME/kg DM, however protein levels were high.

Copper levels in the pasture were low and Molybdenum, Potassium and Sulphur high. Phosphorus and Potassium levels in the soils were also identified as being low which could be impacting on pasture production and availability of these nutrients to the plant and animals.

Summary of potential factors restricting lamb growth:
- Pasture quality
- Mineral balance in lambs diet

5.3 Site 2 (year 2)

High growth rates of 240g/day and higher were achieved for individual monitoring periods, however there were also some negative growth rates in excess of -200g/day. For each monitoring period there were more than 85% of lambs growing at less then 150g/day.

The impact of fly strike was significant within the monitoring animals with 9 out of the 50 lambs monitored affected.

Pasture quality is likely to be a key issue with low ME (9.5 MJ/kg DM) and low digestibility (65%). While the pasture was high in fibre (58%) the lambs appeared to be seeking roughage as they were eating the dry feed on the edge of the irrigation bay. Hay was fed out once this dry feed had been eaten.

Pastures were also high in Potassium and low in copper.

Summary of potential factors restricting lamb growth:
- Pasture quality
- Lamb health – flystrike
- Mineral balance in lambs diet

5.4 Site 3 (year 2)

Good individual performers were achieved with growth rates of 196 and 258 g/day. Growth rates declined at each monitoring period, with lambs only growing at 20g/day on average between days 118 and 202. In the first monitoring period there were only 26% of animals growing at less than 150g/day, however for the following 3 monitoring periods this increased to 88% and higher.

Pasture quality is likely to be an issue with low ME (9.8 MJ/kg DM), low digestibility (66.2%) and high fibre (46%). Pastures were also low in phosphorus and copper and high in potassium and sulphur. The ryegrass in the pasture was highlighted as being ready to be replaced.

Soils were low in phosphorus.

Summary of potential factors restricting lamb growth:
- Pasture quality
- Pasture quantity (food on offer)
- Soil fertility
- Mineral balance in lambs diet

5.5 Site 4 (year 2)

Majority of lambs had poor growth rates with 96%+ of lambs growing at less than 150g/day for each monitoring period.

Food on offer may be a limiting factor with less than 1500kg DM/ha on average available during the finishing period. Irrigation water was an issue on this site which is run from an artesian source. This resulted in only half the irrigation area being watered.

Pasture quality is also an issue with low ME (9.5 MJ/kg DM), low digestibility (64%) and high fibre (62%). The pasture was also low in phosphorus and copper and high in potassium and sulphur.

Soil fertility is also low, particularly in phosphorus

Worm levels may have had an impact on growth rates

Summary of potential factors restricting lamb growth:
- Pasture quality
- Quantity of pasture (food on offer)
- Soil fertility
- Lamb health – worms
- Mineral balance in lambs diet

5.6 Site 5 – (year 2)

Good growth rates (average 194g/day) were achieved in the first monitoring period. However growth rates dropped considerably over the second (50 g/day average) and third (-182 g/day average) monitoring periods before picking up again in the last with average growth rates of 177 g/day.

Lambs were removed from the irrigated pasture during monitoring period 3 as they were loosing too much weight and put onto a dry pasture. The percentage of animals growing at less than 150g/day for monitoring periods 1, 2, 3 and 4 were 24%, 78% 82% and 0% respectively.

It is likely that pasture quality is restricting lamb growth with only 9.5 MJ ME/kgDM and low digestibility (64%). Pastures were also high in Potassium, Sodium and Chloride and and low in Copper and Zinc

Worms may be a factor. A drench was given early in the last monitoring period when growth rates picked up.

The need for later maturing pasture varieties was identified as the pasture (ryegrass) went up to head.

Summary of potential factors restricting lamb growth:

- Pasture quality
- Lamb health – worms
- Mineral balance in lambs diet

5.7 Site 6 (year 2)

Good growth rates were achieved in some individual animals with growth rates of 209 and 189 g/day, however there were 92%+ of lambs during each monitoring period with growth rates of less than 150 g/day.

Worms were a key problem with faecal eggs counts of 992 eggs per gram.

Pasture results were not provided for this site.

Summary of potential factors restricting lamb growth:

- Lamb health – worms

6 Success in Achieving Objectives

6.1 Monitor lamb growth rates

Lamb growth rates were monitored over two major finishing periods across varying pasture bases and input systems. Properties hosting a monitoring site varied between years due to the drought experienced.

Lamb body weights were recorded for

- 9 sites in the 2005/06 finishing period with an average growth rate of 140 g/day
- 6 sites in the 2006/07 finishing period with an average growth rate of 108 g/day
- With 5 sites being monitored in both years

6.2 Establish key inputs and critical success factors

Potential factors limiting lamb growth were identified for each of the sites (refer to section 5), however exact causes could not be determined to due to the variables in the systems.

Critical success factors identified for finishing lambs:

1. ***High feed quality*** – Provide a high energy and highly digestible diet that meets the nutritional requirements of growing lambs. Strategies may include:
    a. Grazing management
    b. Changing time of lambing or target market so lambs are finished earlier
    c. Stop breeding and just finish lambs (buy in feeders)
    d. Add fertilizer to improve pastures
    e. Supplementary feed lambs (i.e. feeder in the paddock with lupins)
    f. Renovate pastures/ change pasture species to improve the nutritional value of the pasture for lambs/delay maturity

2. ***Monitor pastures and livestock*** - Know where your animals and pastures are at so informed and timely decisions can be made.
    a. Pastures – food on offer, FeedTest, soil test
    b. Livestock - identify a monitoring group, lamb weights, worms

3. ***Animal health*** - keeping on top of health issues
    a. Worms (nutrition is often a greater constraint)
    b. Mineral balance (is very complex)

6.3 Calculate kilograms of lamb produced

Due to variations between systems and the fluctuation in lamb numbers during the monitoring period production was compared on an average kg of lamb produced per ha per day.

Production varied from 1.1 kg lamb produced /ha/day (average) to 9.6 kg lamb produced /ha/day (average). Hence, for an average finishing period of say 100 days average production would range from 110 – 960 kg of lamb (live weight) /ha.

6.4 Calculate cost of production

Site hosts participated in a MLA Cost of Production Workshop, however there was no system developed to just handle the irrigation finishing component of the whole business. This made calculating cost of production more complex than originally anticipated.

A standard template was developed to calculate the costs, returns and margins for the irrigation finishing system in year 2. Costs ranged from $40.62/head to $71.33 per head, returns per lamb bought ranged from $61.42 to $92.57 and margins from $2.62 to $48.32.

A basic cost of production ($/kg carcase weight) figure was calculated by dividing the cost per head figure by the average carcase weight. Cost of production ranged form $1.98 – $3.84.

6.5 Develop Sustainability efficiency indicators

Profitability is a key component of a sustainable lamb finishing system and is driven by price, volume of product produced and costs.

Profit/ha = Price x Volume or yield/ha – costs

While producers can, to a degree improve the price received for a product (i.e. through quality control and time of marketing), the greatest impact on profitability can be made by focussing on the kgs of lamb produced and the cost structures within the business which they have greater control over.

Key indicators for profit include:

- ***Increased kg lamb produced per hectare*** - driven by stocking rate and turnoff weight.
  Increasing both the stocking rate and turnoff weight may not necessarily be the most profitable option. The best balance for an individual system will depend on the level which the system is currently operating at and the costs associated with changing stocking rate and/or turnoff weight.
- ***cost of production*** – driven by fixed and variable costs
  The easiest way to reduce costs is to spread the fixed costs across more product produced and in particular more stock numbers per labour unit.

Environmental factors are also important for long-term sustainability.

Healthy soils are important to drive higher pasture productivity as well as providing environmental benefits. Soil health is s a combination of the physical structure of the soil, the level of biological activity in the soil, and the content and availability of nutrients in the soil.

A workshop was held with Glen Bailey, Land Management Consultant, Rural Solutions SA to discus soil sustainability indicators including:

- Soil pH
- Rootzone depth
- Colour
- Strucutre

- Texture
- Cation exchange capacity
- Available nutrients
- Free lime
- pH
- salinity
- Organic matter

Records of outcomes from this workshop were unfortunately lost with the change over of project coordinator. However the following sustainability measures were included in the second year monitoring requirements for the project:

- Soil tests – to assess soil health
- Pasture composition – to assess persistence of desirable pasture species
- Ground cover – to assess the risk of erosion

7 Benefits

7.1 Group benefits

Benefits identified by participants involved in the project include:

- Identification of factors limiting production and key profit drivers
- Highlighted the importance of weighing animals to know where they are at
- Highlighted the importance of testing pastures
- Highlighted the importance of fertilizer use and testing soils
- Improved computer skills (recording data)
- Exposure to cost of production

8 Conclusions and Recommendations

Lamb growth rate is one of the key factors driving profit in a finishing system. The higher the growth rates the quicker lambs can be turned off, and the less feed they eat to reach target weight.

Growth rates can be influenced by a number of factors which vary across properties. With many variables it is impossible to develop a simple strategy to increase lamb growth rates that is suited to all situations.

The key is to get a handle on the factors that are most likely restricting growth in your system. This can be achieved through regular monitoring of livestock, pastures and soils. Some further exploration may be required through expert advice or simple on-farms trials of treatment and control to pin-point the exact cause/s of poor growth.

Once the factors limiting growth have been identified strategies can be developed and trialled to determine the most cost effective option for increasing growth rates in the production system.

Critical success factors identified by the group for finishing lambs include:

1. ***High feed quality*** – Provide a high energy and highly digestible diet that meets the nutritional requirements of growing lambs. Strategies may include:
    a. Grazing management
    b. Changing time of lambing or target market so lambs are finished earlier
    c. Stop breeding and just finish lambs (buy in feeders)
    d. Add fertilizer to improve pastures
    e. Supplementary feed lambs (i.e. feeder in the paddock with lupins)
    f. Renovate pastures/ change pasture species to improve the nutritional value of the pasture for lambs/delay maturity

2. ***Monitor pastures and livestock*** - Know where your animals and pastures are at so informed and timely decisions can be made.
    a. Pastures – food on offer, FeedTest, soil test
    b. Livestock - identify a monitoring group, lamb weights, worms

3. ***Animal health*** - keeping on top of health issues
    a. Worms (nutrition is often a greater constraint)
    b. Fly strike
    c. Mineral balance (is very complex)

Meeting the nutritional requirements of lambs (particularly energy and protein requirements) is likely to achieve the biggest improvements in lamb growth. Once correct nutrition has been achieved other factors limiting growth can be explored and strategies put in place to manage them.

Possible next steps for the group and/or individuals could include:

- Developing a ME curve for pastures to determine when and how quickly ME levels of the pasture drop below lamb nutritional requirements (i.e. conduct a feedtest every 2-3 weeks over 4 months)
- Explore and trial strategies to meet lamb nutritional requirements (pastures, supplement, time of finishing)
- Learn more about figures and cost of production
- Learn more about the key profit drivers in the system

9 Project activities and coverage

9.1 Reedy creek group and project activities

The Reedy Creek group have met on a number of occasions to discuss the project, develop skills for the project and to discuss and increase their knowledge on topics and issues associated with the project. A number of workshops were also opened up to the wider community.

The project coordinator changed part way through the project due to a change of staff.

Project coordinator: Kate Dowler, Rural Solutions SA

5/12/05 ***Introduction to project*** - Trial concept and outcomes presented and discussed and host sites were selected for the project,

12/12/05 ***Identify monitoring requirements of project*** – Project discussion on what needed to be done and by who. Identification of what monitoring needs to take place with some skill development in the basics of pasture assessment and animal assessment.

11/1/06 ***Pasture quality and quantity assessment workshop*** – Further develop skills in pasture assessment and lamb assessment particularly for producers hosting a site as the skills were required for monitoring and data collection for the project

19/5/06 ***Soil sustainability indicators and lamb growth rates field day*** – Presentation of preliminary results from the project and discussion. Looked at sustainability indicators for the region including

- Assessing soil health
- Accounting for site variability
- Soil processes - what changes are taking place
- Sources and movement of nutrients

15/8/06 ***Worm control and management workshop*** – Information workshop covering nutrition, prime lamb systems v merino, irrigated pastures not as dangerous as perceived, cleaning paddocks, testing, pasture management.

28/8/06 ***Cost of production workshop*** – information and exercises on cost of production and how to calculate cost of production.

Project Coordinator: Heidi Goers, Rural Solutions SA

11/12/06 **Project review meeting** – Presentation of results from the first finishing period with discussion and interpretation of results. Discussion on what needed to be improved and/or changed for the second finishing period. Monitoring requirements for 2006/07.

1/8/07 ***Discussion of results*** – Meeting with project site hosts to discuss the results and key learnings from the project

24/8/07 **Final field day -** Results from the project were presented to the wider community as part of the Mid South East Irrigators Association AGM.

9.2 Communications

Internal communications regarding the project include:

- Meeting notices and summaries before and after workshops and field days
- Newsletters on progress of trial and project related information

Media on the project includes:

- Article in the SA Lamb Newsletter - Vol 36, February 2006

Field day

- Presentation of project outcomes at the Mid South East Irrigators Association AGM

10 Appendices

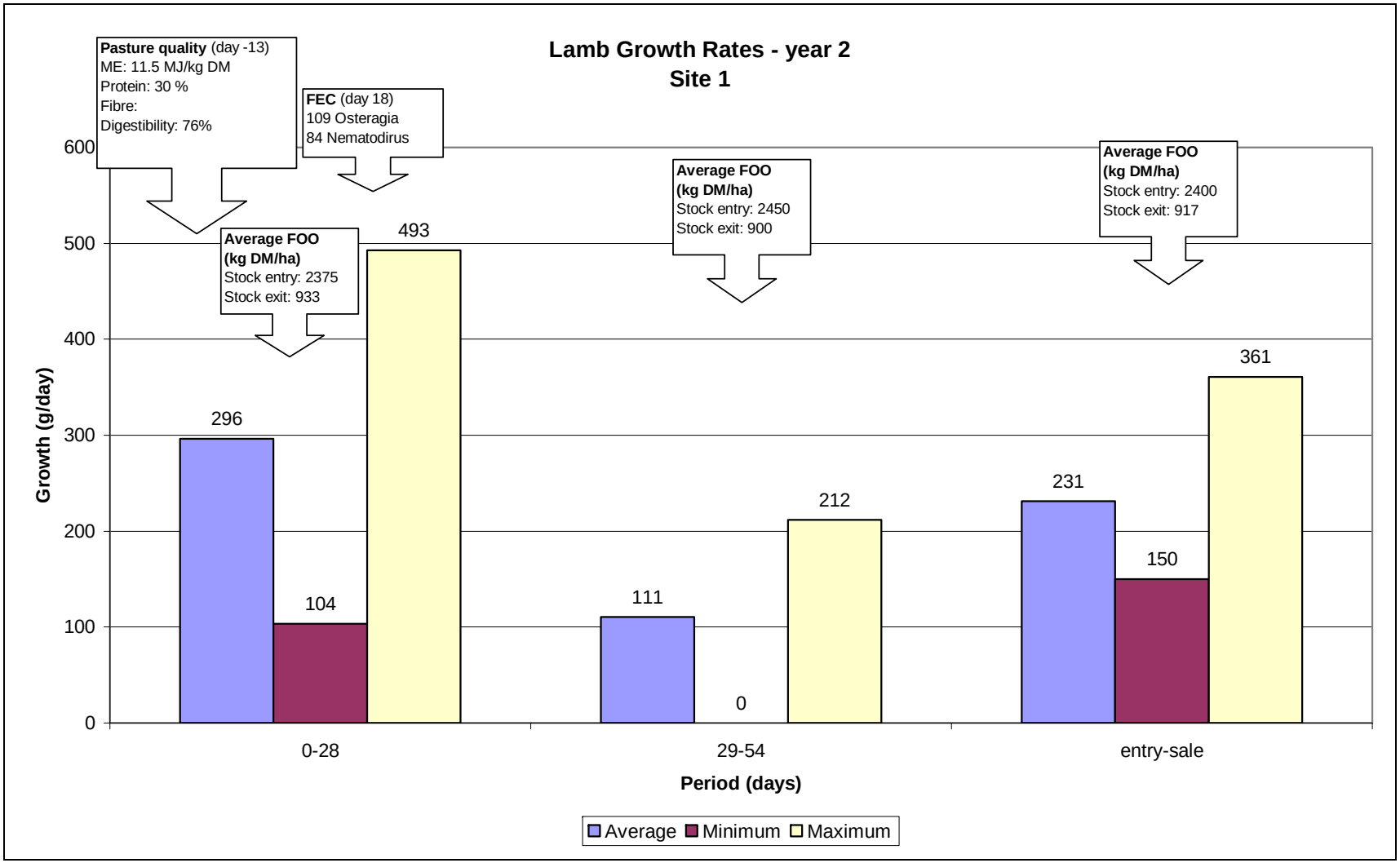
10.1 Appendix 1: Summary of results

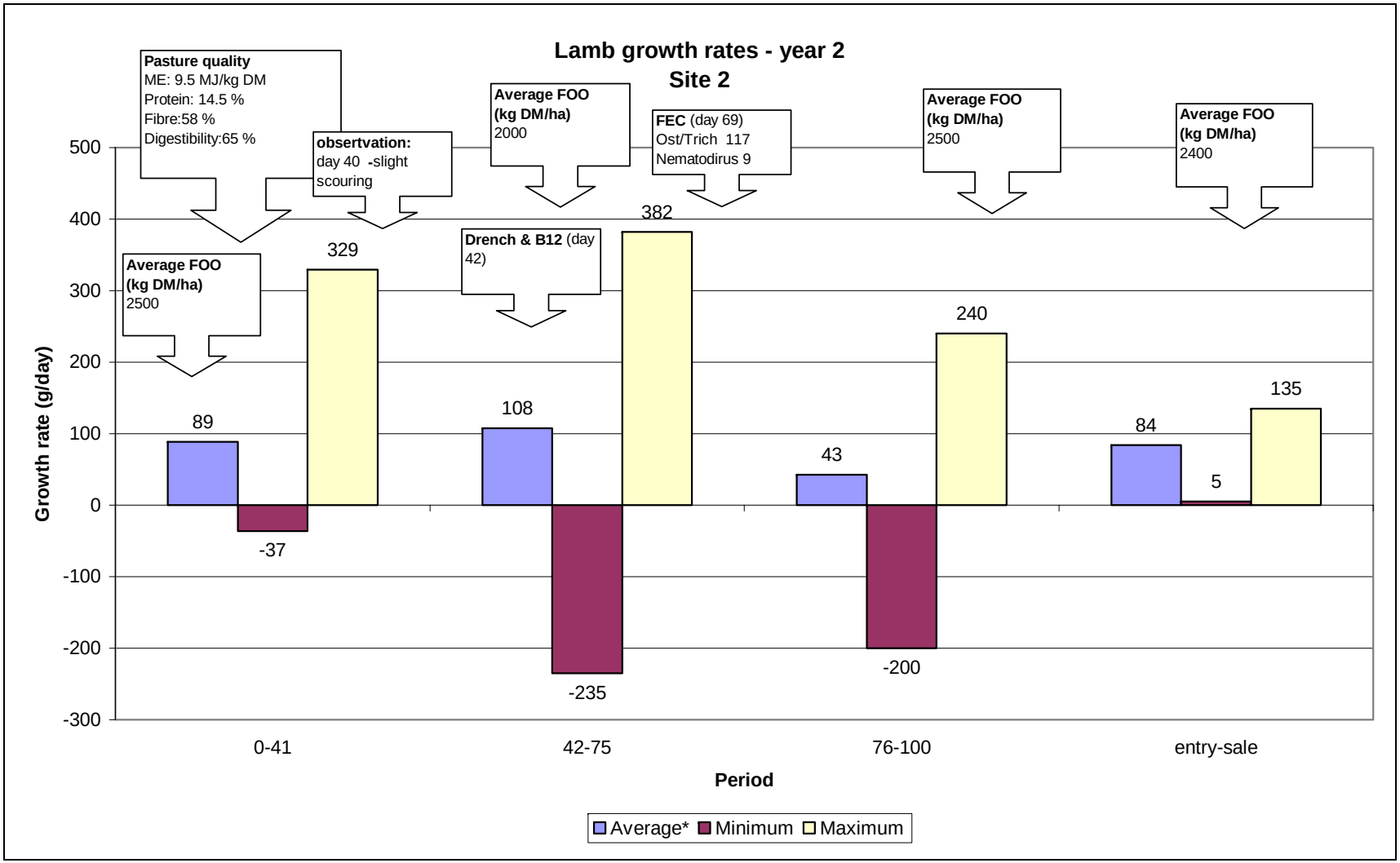
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
GROWTH RATES						
Start date	15-Feb-07	3-Jan-07	7-Dec	29-Dec	17-Jan	19-Mar
Finish date	10-Apr-07	13-Apr-07	17-Jun	15-Jun	4-May	12-Jul
Finishing period (days)	54	100	202 (11 at 117days)	107	108 (5 at 98 days)	115
Average starting weight (kg)	38	35	32	32	38	33
Average sale weight (kg LW)	49	44	45	38	57	42
Average growth rate (g/day)	231	84	77	55	118	81
STOCKING RATE/PRESSURE						
Average stocking rate (lambs/ha)	41	23	17	20.9	34	20
Average stocking pressure (lambs/ha)	165	23	17	20.9	117	20
SALE & PRODUCTION DATA						
Av. kg lamb produced/ha/day *	9.6	1.9	1.3	1.1	4.0	1.6
dressing %	47	47	42	est. 46	46	
Average CW (kg)	22.9	21.4	18.57	est. 17.5	22.4	
Average FS	3	3				
COST OF PRODUCTION						
Costs ($/head)		$62.13	$71.33	$40.62	$44.25	
Cost ($/kg carcase weight)		$2.90	$3.84	est. $2.32	$1.98	
Average returns per lamb bought		$88.18	$73.95	$61.42	$92.57	
Margin		$26.05	$2.62	$20.80	$48.32	
FEC						
eggs/gram	Osteragia 109,	Trich/Ost 117	Trich/ost 54 (yellow tags) 252 (blue tags)	266 (Bulk count)	Trich/ Ost 110,	992 barbers pole
average Food on Offer						
stock entry (kg DM/ha)	2400				2857	
stock exit (kg DM/ha)	917				1000	
set stocked (kg DM/ha)		2416	1170	1233		
average % change across paddocks in pasture composition						
Pasture specieis		-0.20%	0	0	-23%	
Weeds		0	0	0		
Bare ground		1				

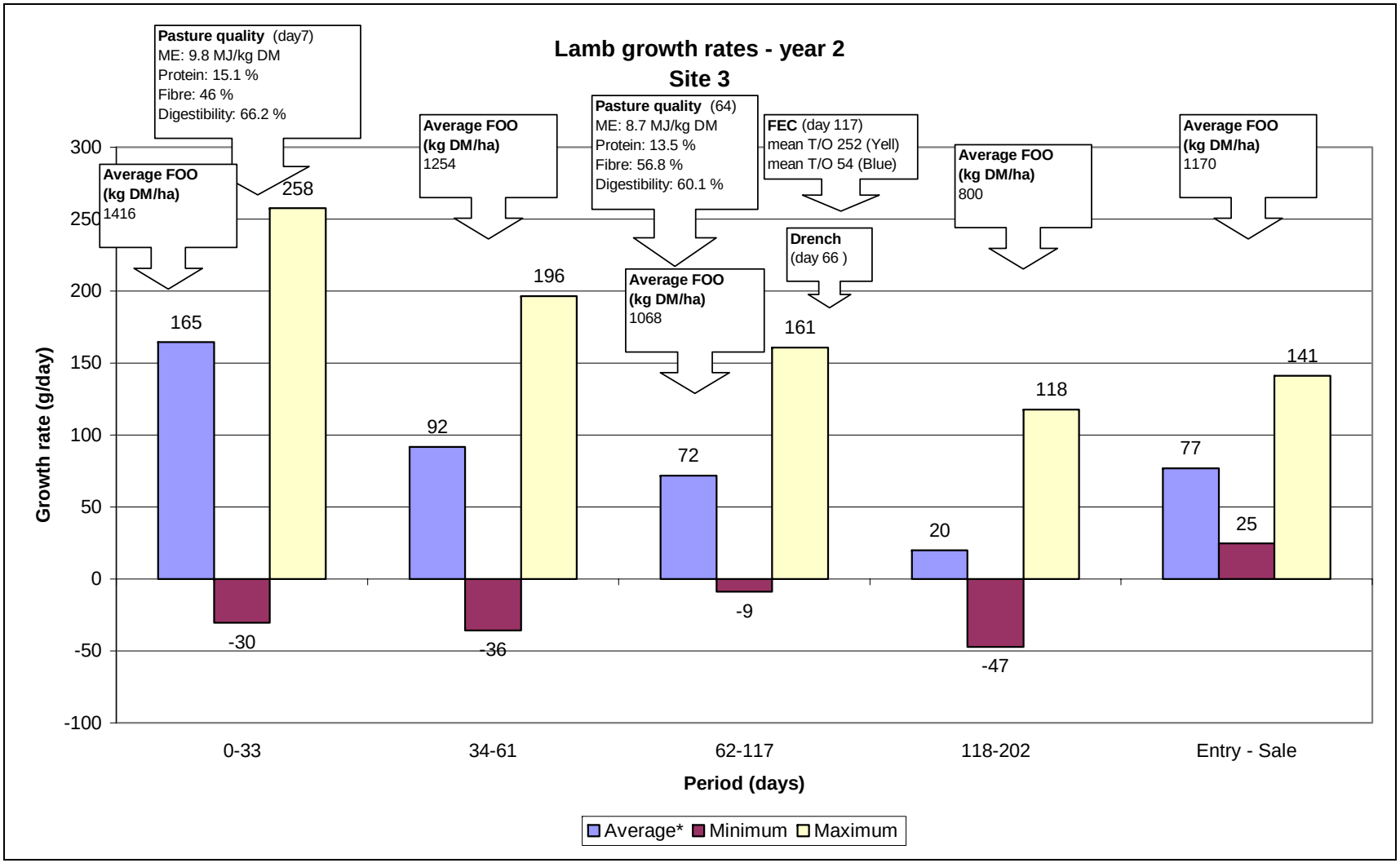
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
SITE DETAILS						
Breed	White suffolk/Merino and WS/BL/Mo	Poll Dorset/WSxMo & 1st X	second cross dorset lambs	WS and Dorset x Mo lambs	2nd x LMS borderlester, merino dams, dorset white suffolk sire	
Trial area (ha)	9.4	17	18	30	13.8	13.1
cattle in system	yes	No		yes - for short period	yes	yes
Lambing period	June/July & Sept/Oct	July-Sept	July drop	June-August (2 drops)		
Weaning	Sep-16	November	Nov-03	17-Nov		
Grazing system	Rotational	Set stocked	set stocked	set stocked	Rotational	
Irrigation type	Pivot	flood	surface irrigation	surface irrigation	Pivot	
Pasture type	Lucerne/ Chickory/ Plantain	Fescue/ Ryegrass/ white clover / Strawberry clover	advance fescue/ strawberry clover/ Fog grass	Dovey Fescue/ strawberry clover	White clover/ concord ryegrass/ balansa clover and lucerne/ chichory/ cocksfoot	White clover/ ryegrass/ advanced tall fescue/ strawberry clover
pasture management						
fertilizer	super/potash 2in1 September & Feb	Sept - DAP	Sept - Super/urea mix	Mar - super	Mar - urea	
		Jan - Super	Feb - plain super		Apr - urea	
			super/potash			
lamb management						
Vaccination	**July** - Glanvac and scabby mouth; **Sept & Dec** - Glanvac	Aug & Sep - Glanvac3	**Aug** - glanvac, scanda & scabi guard; **Nov** - glanvac	**Aug & Sept**- glanvac, scabi guard; **Oct & Nov** - second vacc		
Vitamins and minerals	Sept & Dec- B12	Aug, Sept & Feb - Vit B12	Nov - glanvac		Jan - B12; copper and cobolt in trough	
Drench	July & Dec - Virbac Combi/Amec	Nov & Feb - cydectin	**Dec** - abamectin and BZ capsule (lambs 1-25); **Marc** - abamectin (lambs 1-20)	**Aug** - scanda; **Dec & Mar** - Abamectin	Mar - Levamasole	
other				Nov - shearing		

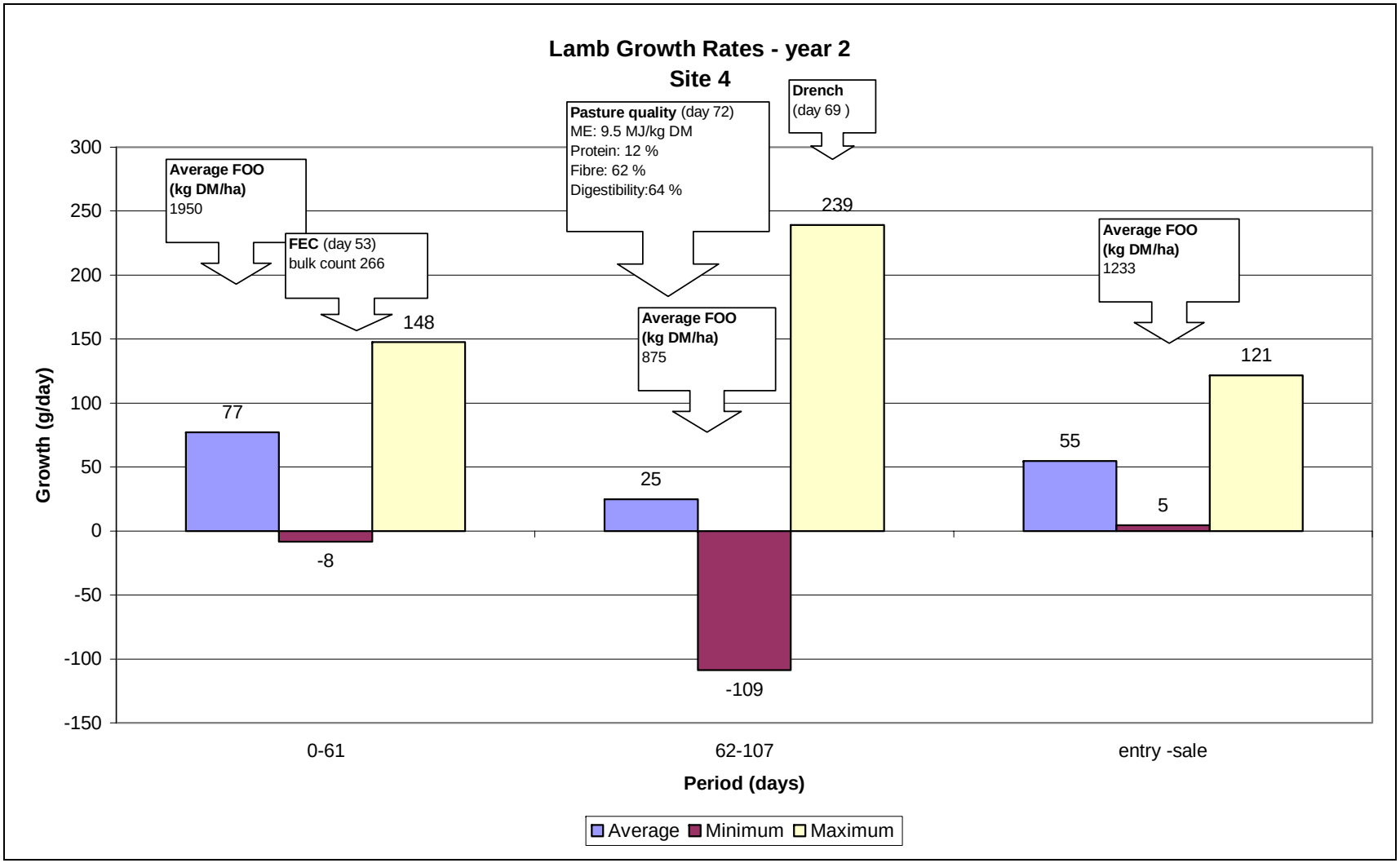
* calculation = average growth rate of lambs (kg/day) x average number of lambs per average ha grazed in the trial
** site 5 - lambs removed from irrigation for 10 days onto dry lucerne
est. = figure estimated based on an average dressing percnetage of other sites

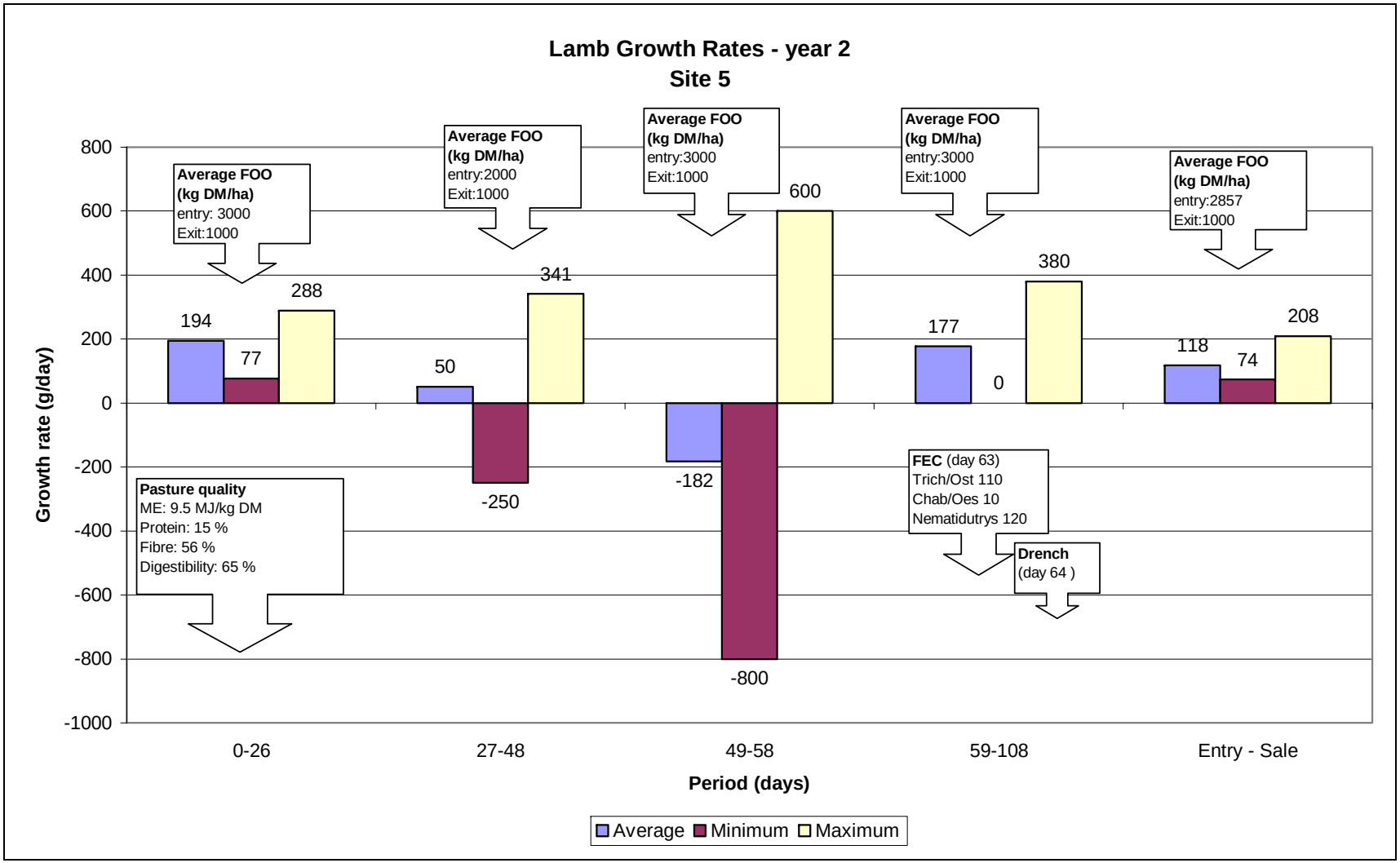
10.2 Appendix 2: Detailed growth rate data for individual sites

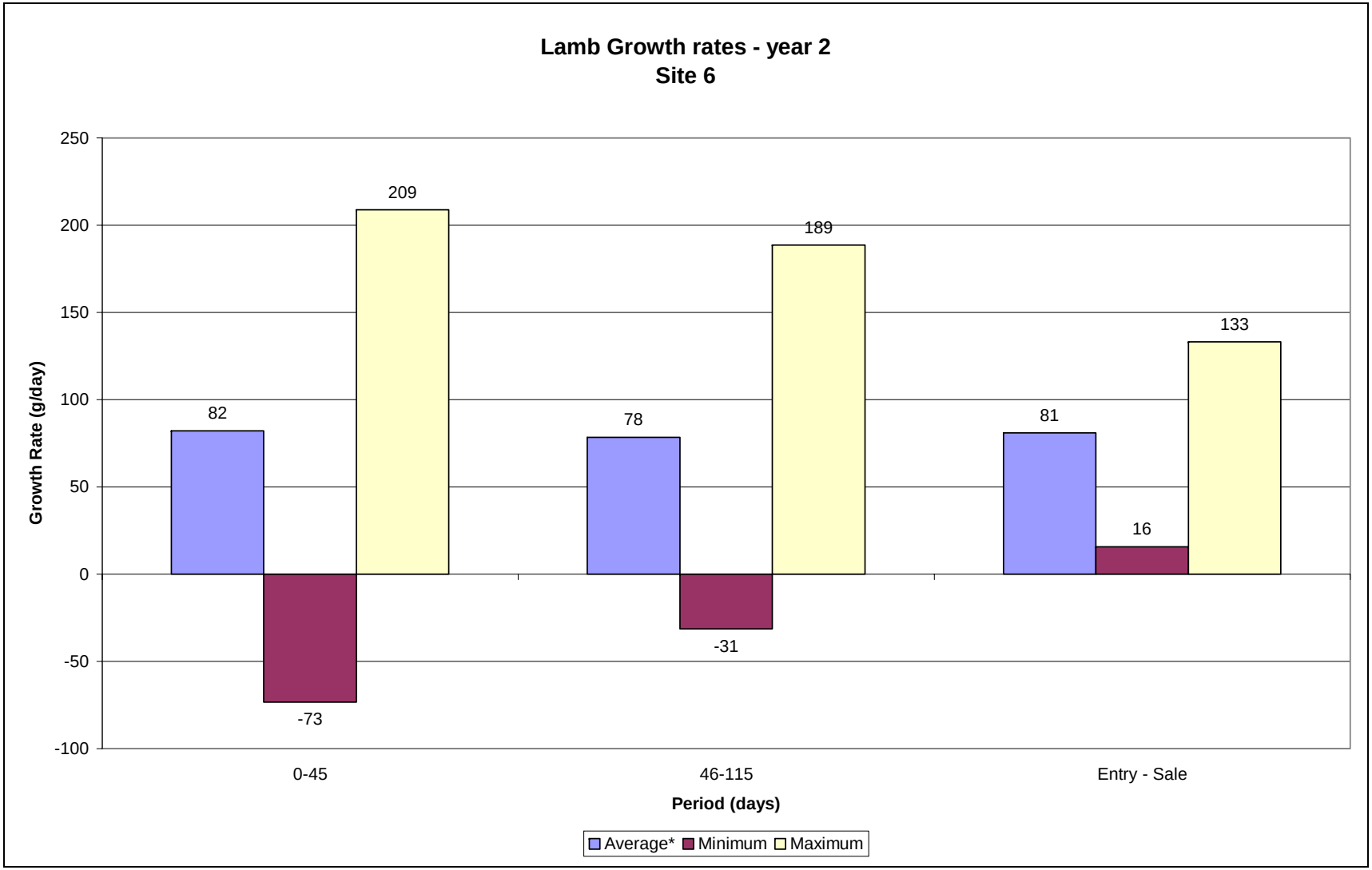



Lamb growth rates - year 2
Site 2
Pasture quality
ME: 9.5 MJ/kg DM
Protein: 14.5 %
Fibre:58 %
Digestibility:65 %
obsertvation:
day 40 -slight scouring
Average FOO (kg DM/ha) 2000
FEC (day 69)
Ost/Trich 117
Nematodirus 9
Average FOO (kg DM/ha) 2500
Average FOO (kg DM/ha) 2400
Average FOO (kg DM/ha) 2500
Drench & B12 (day 42)
Growth rate (g/day)
500
400
300
200
100
0
-100
-200
-300
89
-37
329
108
-235
382
43
-200
240
84
5
135
0-41
42-75
76-100
entry-sale
Period
Average*
Minimum
Maximum


Lamb growth rates - year 2
Site 3
Pasture quality (day7)
ME: 9.8 MJ/kg DM
Protein: 15.1 %
Fibre: 46 %
Digestibility: 66.2 %
Average FOO (kg DM/ha) 1416
Average FOO (kg DM/ha) 1254
Pasture quality (64)
ME: 8.7 MJ/kg DM
Protein: 13.5 %
Fibre: 56.8 %
Digestibility: 60.1 %
FEC (day 117)
mean T/O 252 (Yell)
mean T/O 54 (Blue)
Average FOO (kg DM/ha) 800
Average FOO (kg DM/ha) 1170
Drench (day 66)
Average FOO (kg DM/ha) 1068
Growth rate (g/day)
300
250
200
150
100
50
0
-50
-100
165
-30
258
92
-36
196
72
-9
161
20
-47
118
77
25
141
0-33
34-61
62-117
118-202
Entry - Sale
Period (days)
Average*
Minimum
Maximum


Lamb Growth Rates - year 2
Site 4
Average FOO
(kg DM/ha)
1950
FEC (day 53)
bulk count 266
Pasture quality (day 72)
ME: 9.5 MJ/kg DM
Protein: 12 %
Fibre: 62 %
Digestibility:64 %
Drench
(day 69)
Average FOO
(kg DM/ha)
875
Average FOO
(kg DM/ha)
1233
300
250
200
150
100
50
0
-50
-100
-150
Growth (g/day)
77
-8
148
25
-109
239
55
5
121
0-61
62-107
entry -sale
Period (days)
Average
Minimum
Maximum


Lamb Growth Rates - year 2
Site 5
Growth rate (g/day)
800
600
400
200
0
-200
-400
-600
-800
-1000
Average FOO (kg DM/ha) entry: 3000 Exit:1000
Average FOO (kg DM/ha) entry:2000 Exit:1000
Average FOO (kg DM/ha) entry:3000 Exit:1000
Average FOO (kg DM/ha) entry:3000 Exit:1000
Average FOO (kg DM/ha) entry:2857 Exit:1000
194
77
288
50
-250
341
-182
-800
600
177
0
380
118
74
208
Pasture quality
ME: 9.5 MJ/kg DM
Protein: 15 %
Fibre: 56 %
Digestibility: 65 %
FEC (day 63)
Trich/Ost 110
Chab/Oes 10
Nematidutrys 120
Drench
(day 64)
0-26
27-48
49-58
59-108
Entry - Sale
Period (days)
Average
Minimum
Maximum


Lamb Growth rates - year 2
Site 6
Growth Rate (g/day)
250
200
150
100
50
0
-50
-100
82
209
78
189
81
16
133
-73
-31
0-45
46-115
Entry - Sale
Period (days)
Average*
Minimum
Maximum

10.3 Appendix 3: Feed and plant tissue test results from year 1

Reedy Creek Lamb Finishing Project

Pasture samples collected February 2006. Plant mineral analysis by SASPAS Loxton – using CSBP lab in Perth
Feed test samples – pasture plucked to about (1000 kg/ha??) residual DM. Analysis by Feed Test lab, Hamilton.

Interpretation - Tim Prance ph 8552 8058 fax 8552 8501 prance.tim@saugov.sa.gov.au

Plant analysis results - ideal levels are given to optimise **livestock** productivity.

Paddock			**Site 2**	**Site 10**	**Site 8**	**Site 3**	**Site 7**	**Site 1 (south)**	**Site 1 (north)**
Pasture type			Tall fescue	Lucerne	??	??	??	Lucerne/ chicory/ plantain	Rape/forage Sorghum /millet
Date sampled			14/2/06	2/2/06	20/3/06	20/2/06	10/2/06	23/2/06	23/2/06
Pasture on offer	Kg/ha DM		??	??	??	??	??	??	??
	Units	***Ideal for livestock***							
P	%	***0.35***	0.4	0.6					
N	%	***3.0***	3.4	4.4					
K	%	***1.0***	2.4	1.9					
S	%	***0.2***	0.3	0.4					
Ca	%	***0.55***	1.2	2.6					
Mg	%	***0.25***	0.3	0.4					
Na	%	***0.15***	0.6	0.3					
Cl	%	***0.25***	1.4	0.6					
Cu	Mg/kg	***10***	49	135					
Zn	Mg/kg	***30***	48	61					
Mn	Mg/kg	***25***	149	241					
B	Mg/kg	***na for animals***	17	39					
Fe	Mg/kg	***na for animals***	781	176					

Grass tetany ratio (K/Ca+Mg)	cmol/kg	***<2.2***	0.7	0.3					
Dry Matter (DM)	%		22	18	25	29	22	14	14
Crude protein	%	***< 20***	21	28	19	15	23	32	24
Digestible DM (DMD)	%	***+ 80***	71	76	69	63	70	74	82
ME	MJ/kg DM	***+ 11.5***	10.6	11.4	10.3	9.2	10.5	11.1	12.5
Neutral detergent fibre (NDF)	%	***30 - 40***	48	23	48	55	44	32	29

Comments

Would be helpful to know kg/ha pasture on offer at time of sampling + approximately how much was removed for the sample eg top 500 kg/ha, 1000 kg/ha etc
Also pasture type for sites 8, 3 & 7

More plant analysis results would be useful

For those I have received, there are some interesting results + it is good to have contrasting pastures – lucerne vs tall fescue

Copper levels in both the pastures are extremely high and I would be concerned about a possible copper toxicity, especially the lucerne.
I **suggest liver Cu be undertaken on a cross section of lambs** during slaughter – eg 10 lambs/group
P and S levels area OK.
Potassium levels are quite high at site 2 for a grass pasture, but marginal at site 10 keeping in mind that **over 2.4%** is considered ideal for lucerne growth (the 1% in the table is for livestock).
Grass tetany ratios are all acceptable ie K not out of balance with Ca and Mg.
Calcium levels in pastures are OK – certainly not low. **Magnesium** looks spot on .Ca and Mg seem to be in balance for both pastures
Sodium and Chloride levels are quite high, especially on site 2 – effect on livestock? I can't comment at this time – Ian Carmichael may have a comment. I would need to have a crack at a dietary anion/cation balance (DCAB), which I can do.
Boron levels in plants seems OK – I would have thought 20 mg/kg would be adequate.
Zinc is OK, as is **Manganese –** although Manganese is well in excess. I am not aware of manganese toxicity occurring with animals.

Crude Protein. Mostly OK, except site 3 is low. I would not consider them excessive, except that they may be high relative to ME. The lucerne sample is high – I wonder how this ties in with high chloride and sodium levels? I will comment further when I have done a DCAB.
NDF (soluble fibre) levels are all high (except for the lucerne and rape)**,** which would have a negative impact on lamb intake. Potential intake as a % LW = 120/NDF, so lamb intake on a pasture with an NDF of 48% would be 2.5% LW – well below genetic potential.
In addition, as NDF increases, ME drops. High NDF is due to rank growth, especially tall fescue. Lucerne has the reverse problem - too low an NDF - although Italian ryegrass sown into the lucerne pasture can help to keep NDF up high enough to provide adequate fibre in the diet.
ME (and DMD) levels – all are low except for the lucerne and rape. I have had well-managed old tall fescue pastures with a ME of 11.7 which is really excellent, so it can be done!.
Rank growth will cause both a high NDF (and low ME), whilst dead (uneaten leaves) will result in a low ME.
In summary – good information – but we need more samples especially for mineral analysis.