SIDDC

South Island Dairying Development Centre

Partners Networking To Advance South Island Dairying

Phone: +64 3 325 3629

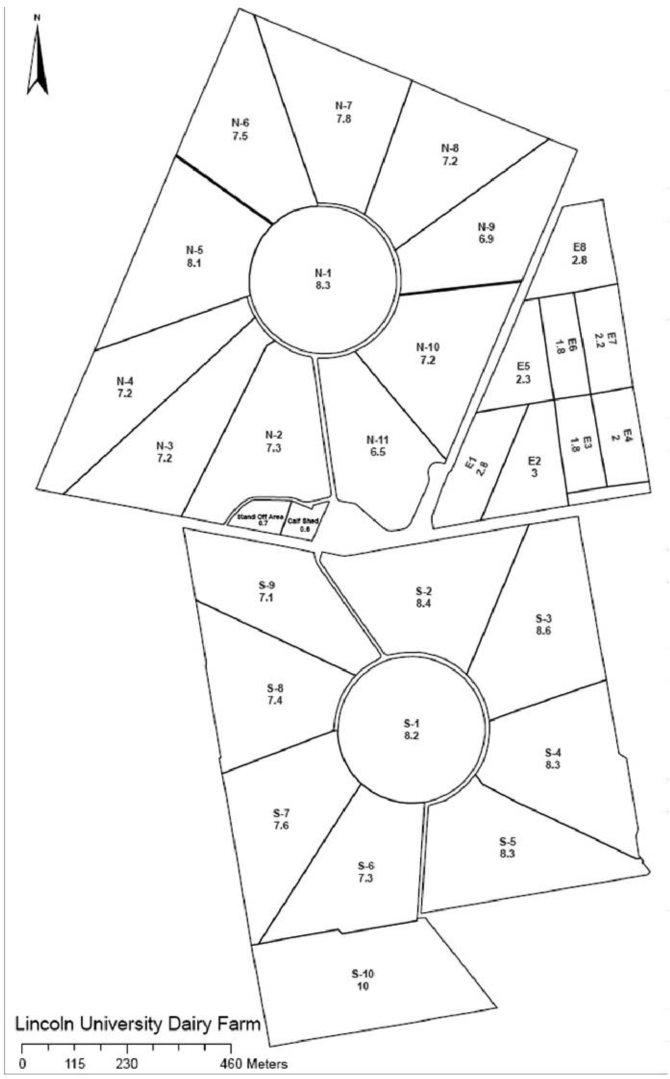
Fax: +64 3 325 3603

Email: office@siddc.org.nz

www.siddc.org.nz

Lincoln University Dairy Farm Focus Day

5 May 2011



Staff

Peter Hancox – Farm Manager
Richard O’Brien – Farm Assistant
Appt Pending – Farm Assistant
Appt Pending – Farm Assistant

LUDF Hazards Notification

1. Children are the responsibility of their parent or guardian
2. Normal hazards associated with a dairy farm
3. Other vehicle traffic on farm roads and races
4. Crossing public roads
5. Underpass may be slippery

Please follow instructions given by event organisers or farm staff

Introduction

The 186 hectare irrigated property, of which 160 hectares is the milking platform, is a former University sheep farm. The spray irrigation system includes two centre pivots, small hand shifted lateral sprinklers, and k-lines. The different soil types on the farm represent most of the common soil types in Canterbury.

Key objectives

1. To develop and demonstrate world-best practice pasture based dairy farming systems and to transfer them to dairy farms throughout the South Island.
2. To operate a joint development centre with SIDDC partners, where the practical application of new technologies can be developed and refined.
3. To use the best environmental monitoring systems to achieve best management practices under irrigation, which ensures that the industry's annual profit from productivity target is achieved in a sustainable way and that the wider environment is protected.
4. To continue the environmental monitoring programme and demonstrate technologies that will ensure that the 3-year rolling average concentration of nitrate-N in drainage water from below the plant root zone remains below the critical value [16 mg N/L] that is specified in ECan's proposed regional rule as requiring reduction [Rule WQL18].
5. To use Environmental Best Practices [including 'eco-n' nitrification inhibitors] to protect the environment, while enhancing profitability.
6. To operate an efficient and well organised business unit.
7. To provide a commercial return exceeding the average weighted cost of capital on annual capital evaluations to Lincoln University.
8. To create and maintain an effective team environment at policy, management and operational levels.
9. To actively seek labour productivity gains through adoption of technologies and practices that reduces labour requirements or makes the work environment more satisfying.
10. To assist Lincoln University to attract top quality domestic and international students into the New Zealand dairy industry.

Specific objectives for the season 2010/11

1. To deliver a Dairy Operating Profit of $6,800/ha and Return on Dairy Assets of approximately 7.9% from a $6.93 payout – [milk price plus dividend] - with budgeted milk solids production of 288,000 kg and Cash Farm Working Expenses of $3.35/kgMS.
2. To improve water use efficiency for better integrating the technologies currently existing on the farm by ensuring useable decision making data is accessible to the farm management in a timely manner.
3. To increase the land area that effluent is applied to so that nutrients are better distributed and there is an increased range of contingency plan options. Also, ensure that nitrate losses are not greater on effluent areas than on non-effluent areas, and that there is no significant microbial contamination of the shallow aquifers.
4. To manage pastures and grazing so milkers consume / harvest as much metabolisable energy [ME] as practicable, with a target of 200 GJ/ha ME. For example, this could be achieved by consuming / harvesting 16t DM/ha with average ME 12.5.
5. To optimize the use of the farm automation system [Protrack] and demonstrate / document improved efficiencies and subsequent effect on the business.
6. To achieve a 6 week in-calf rate of 79% and 10 week in calf rate greater than 89% ie empty rate of less than 11%.
7. To continue to document and measure LUDF's influence on changes to defined management practices on other dairy farms.
8. To ensure specific training is adequate and appropriate to enable staff members to contribute effectively in meeting the objectives of the farm.

Ongoing research

- The effect of fertilisers & other farm inputs on groundwater. 10 groundwater monitoring wells sunk to monitor and manage the effect of fertiliser, grazing, irrigation and effluent inputs over a variety of contrasting soil types.
- Effects of eco-n on nitrate leaching and pasture production.
- Pasture growth rates, pests and weeds monitoring.
- The role of nutrition in lameness in Canterbury.
- Resource Inventory and Greenhouse Gas Footprint

Climate

Men Annual Maximum Temperature	32 °C
Mean Annual Minimum Temperature	4 °C
Average Days of Screen Frost	36 Days per annum
Mean Average Bright Sunshine	2040 Hours per annum
Average Annual Rainfall	666 mm

Farm area

Milking Platform	160 ha
Runoff [East Block]	14 ha

Soil types

	% Milking Platform
Free-draining shallow stony soils (Eyre soils)	5
Deep sandy soils (Paparua and Templeton soils)	45
Imperfectly drained soils (Wakanui soils)	30
Heavy, poorly-drained soils (Temuka soils)	20

Soil test results

Date	pH	P	K	S	Ca	Mg	Na
Dec – 01	5.8	30	11	34	8	23	12
Jul – 02	5.8	31	14	35	9	22	12
Oct – 02	5.9	35	8	29	8	21	12
Jun – 03	6.1	37	12	7	9	23	9
Jun – 04	6.4	37	13	11	9	22	10
Jun – 05	6.1	35	13	10	9	22	8
Jun – 06	6.3	33	15	9	10	27	11
Jun – 07	6.3	39	16	17	10	29	13
Jun – 08	6.1	36	12.4	9	10	29	12
Jun – 09	6.1	32	11	11	9	30	9
Jun - 10	6.0	32	10	6	10	32	10
Target Soil Test	5.8 – 6.2	30 – 40	5 – 8	10 – 12	4 – 5	20+	5 – 50

Soil Reserve K = 4.5 (Target = 0.8 – 1.2)

Fertiliser history

Date	Dressing	N	P	K	S	Mg	Ca
Season 2001/02		200	168	-	130	-	94
Season 2002/03		200	45	-	2	-	90
Season 2003/04		200	45	-	64	-	46
Season 2004/05		200	46	-	47	-	57
Season 2005/06	Non-Effluent	200	48	-	76	-	107
Season 2005/06	Effluent	0	30	-	53	-	67
Season 2006/07	Non-Effluent	200	49	-	89	-	110
Season 2006/07	Effluent	0	20	-	52	-	45
Season 2007/08	Non-effluent	200	44	-	73	-	96
Season 2007/08	North Effluent	12	22	-	37	-	48
Season 2008/09	Non-Effluent	245	53	-	88	-	115
Season 2008/09	North Effluent	0	22	-	37	-	48
Season 2009/10	Non-Effluent	225	45	-	47	-	20
Season 2009/10	Effluent	-	5	-	47	-	20

Pasture

- The milking platform was sown at conversion [March 2001] in a mix of 50/50 Bronsyn/Impact ryegrasses with Aran & Sustain white clovers, and 1kg/ha of Timothy.
- Individual paddocks are monitored weekly, & 12 paddocks [57% of area] have been renovated to maintain pasture performance. Pasture mixes on farm now include: 2 paddocks of Arrow plus Alto perennial ryegrasses, 5 paddocks of Bealey, 2 paddocks of Alto perennial ryegrass and 1 paddock Trojan - all with Kotare/Sustain white clovers.
- Annual Pasture consumption for 04/05 season calculated at 15.9t DM/ha,05/06 -16.1t DM/ha, and 06/07 - 16.4t DM/ha,
- Pasture and Crop Eaten (calculated via DairyBase) - 07/08 – 17.9 tDM/ha, 08/09 – 17.2 tDM/ha, 09/10 – 16.2 tDM/ha.

Irrigation and effluent system

Centre-pivots	127 ha
Long Laterals	24 ha
K-Lines	10 ha
Hard Hose Gun	14 ha
Total irrigated	175 ha
Irrigation System Capacity	5.5 mm/day
Length of basic pivot	402
Well depth	90m

Statistics

- A full rotation completed in 20.8 hours for 5.5 mm [at 100% of maximum speed].
- Average Annual Rainfall = 666 mm. Average irrigation input applies an additional 450 mm. Average Evapotranspiration for Lincoln is 870 mm/year.

Effluent

- Sump capable of holding 33,000 litres and a 300,000 litre enviro saucer.
- 100 mm PVC pipe to base of North Block centre pivot, distribution through pot spray applicators.
- System being developed to also apply effluent on to the South Block and outside the pivot.

Mating programme - Spring 2010

1,000 straws DNA proven Kiwicross [including heifers]. Expecting to rear 200 heifers [5 straws per heifer]. Likely six weeks AB, may use one week short gestation Jersey then follow with Jersey bulls. 10 weeks total mating [herd].

Herd details - February 2011

Breeding Worth (rel%) / Production Worth (rel%)	92 / 49% / 117 / 70%
Average weight / cow (Dec) – Herd monitored walk over weighing	458 kg
Calving start date	8 August 2010
Mid calving date	17 August 2010 (9 days)
Mating start date	25 October 2010
Empty rate (nil induction policy) after 10 weeks mating	13% 2009 [6 weeks in-calf rate 74%]

	2002/03	Average 03/04 - 06/07	2007/08	2008/09	2009/10	2010/11
Total kg/MS supplied	228,420	277,204	278,560	261,423	273,605	
Average kg/MS/cow	381	425	409	384	415	
Average kg/MS/ha	1414	1720	1744	1634	1710	
Farm Working Expenses / kgMS	$2.98	$2.68	$3.37	$3.88	$3.38	
Dairy Operating Profit/ha	$1,164	$2,534	$8284	$2004	$4696	
Payout [excl. levy] $/kg	$4.10	$4.33	$7.87	$5.25	$6.37	
Return on Assets	4.4%	6.18%	14.6	4.8%	7%	

Stock numbers	2002/03	Average 03/04 - 06/07	2007/08	2008/09	2009/10	2010/11
1 July cow numbers	631	675	704	704	685	694
Max. cows milked	604	654	680	683	660	669
Days in milk			263	254	266	
Stocking rate Cow equiv. / ha	3.75	4.05	4.2	4.3	4.13	4.18
Stocking rate Kg liveweight / ha	1,838	1964	2,058	2,107	1,941	1914
Cows wintered off No. Cows / Weeks	500 / 8	515 / 7.8	546 / 9	547 / 7	570 / 9	652 / 8.4
No. Yearlings grazed On / Off	0/118	0/157	0/171	0/200	0/160	0/166
No. Calves grazed On / Off	0/141	0/163	0/200	0/170	0/160	0/194
Est. Pasture Eaten (Dairybase) (tDM/ha)			17.9	17.2	16.2	
Purch. Suppl - fed [kgDM/cow]	550	317	415	342	259	
Made on dairy/platform [kgDM/cow]	0	194	95	64	144	
Applied N / 160 eff. ha			164	200	185	

Staffing & management

Roster System – 8 days on 2 off 8 days on 3 off

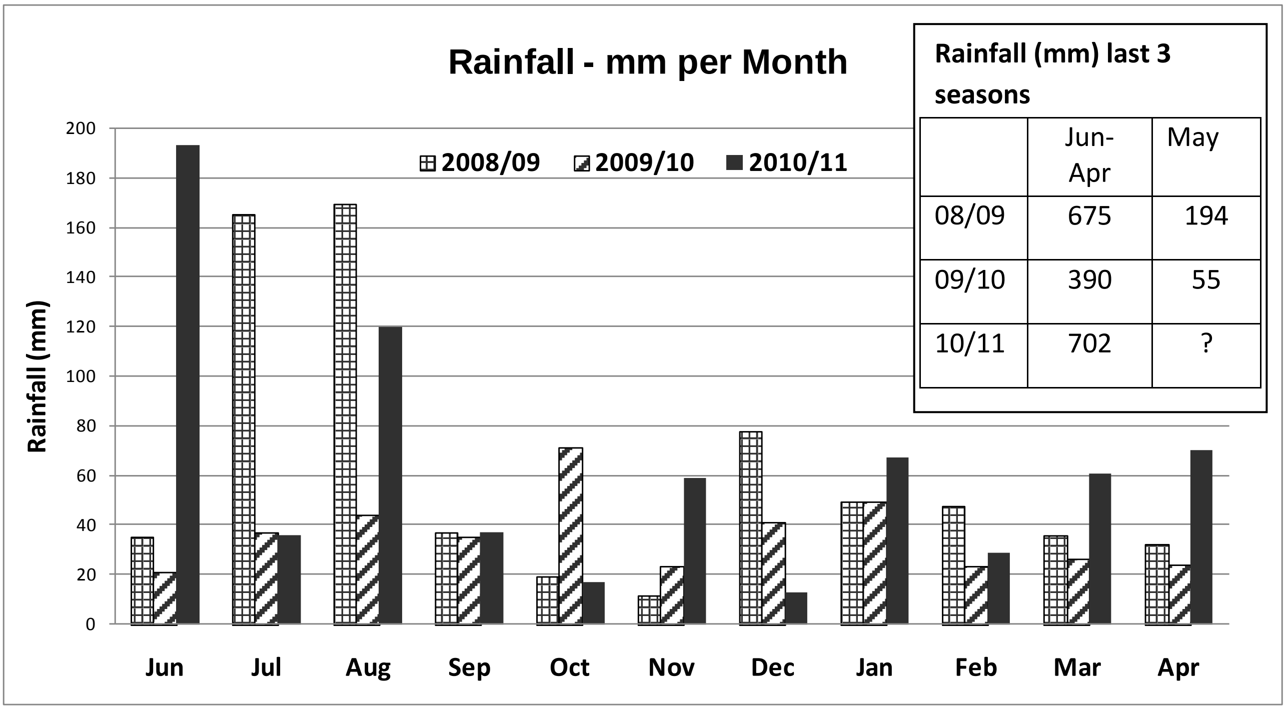
Milking Times – Morning: cups on 5.00 am
– Afternoon: cups on 2.30 pm

Contents

LUDF SEASONAL UPDATE – to end of April 2011

1. PASTURE GROWING CONDITIONS

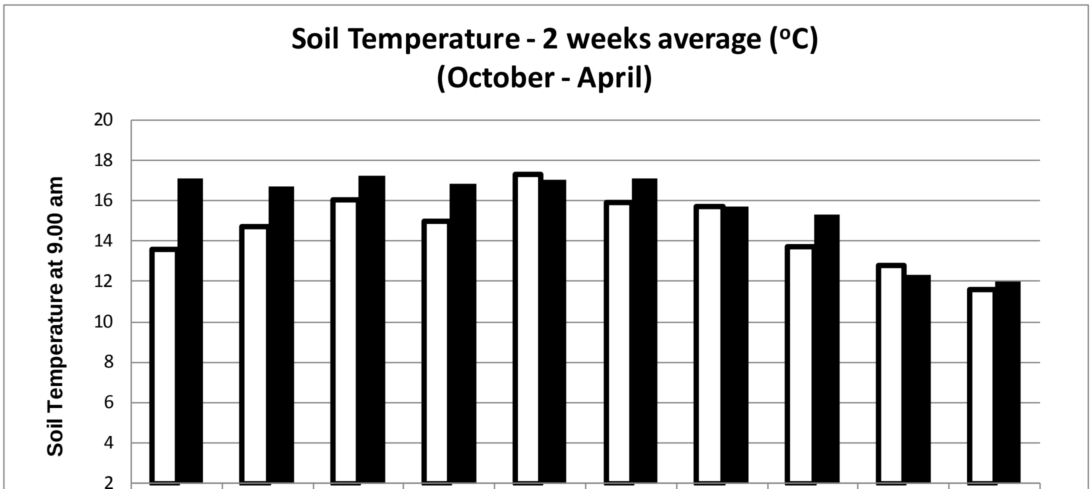
Graph 1: Rainfall (mm)



	Jun-Apr	May
08/09	675	194
09/10	390	55
10/11	702	?

Graph 2: Aquaflex Data – Paddock N7 (April)

Graph 3: Soil Temperature



	Dec 1-15	Dec 15-31	Jan 1-15	Jan 15-31	Feb 1-15	Feb 15 -28	Mar 1-15	Mar 15 -30	April 1-15	Apr 15-30
2009/10	13.6	14.7	16	15	17.3	15.9	15.7	13.7	12.8	11.6
2010/11	17.1	16.7	17.2	16.8	17	17.1	15.7	15.3	12.3	12

Comments:

- This season has been a wetter season compared to last season, especially in early spring and in March-April. Wet weather conditions can represent a real challenge on the farm especially if we have a wet May like in the year 2009.
- The rain events in April have pushed the soil water moisture above field capacity but this has dropped by the end of April
- Soil Temperatures at 9.00 am have been a fraction higher for most of the year compared to 2009/10 season, with big fluctuations in temperatures through the week.

2. PASTURE GROWTH

Graph 4: Pasture Growth Rates

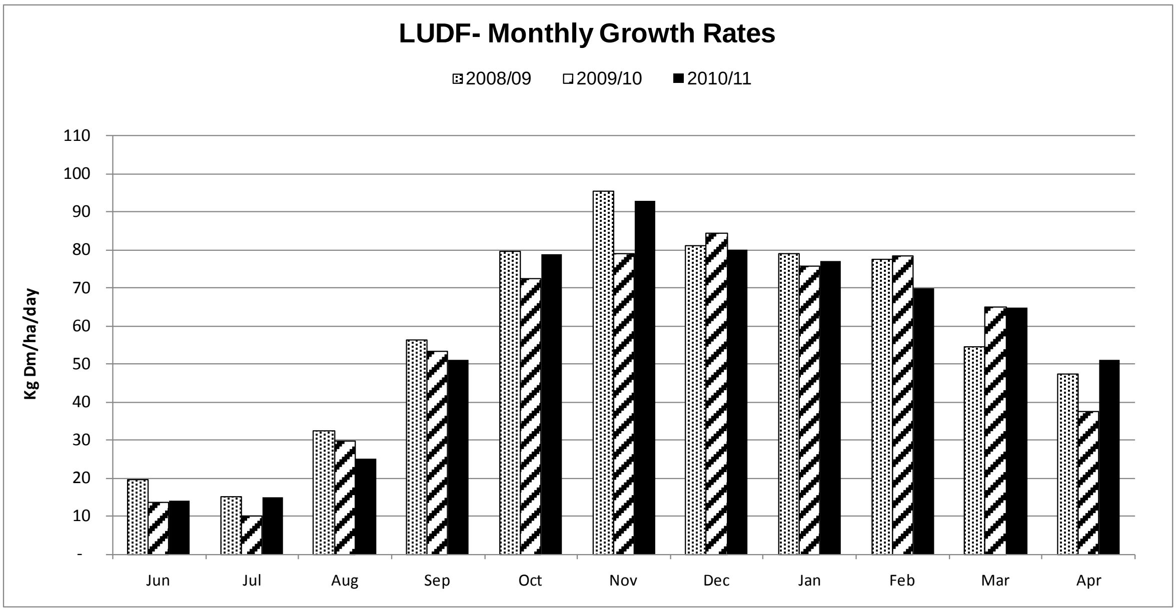


Table 1: Cumulative Pasture Growth (kg DM /Ha)

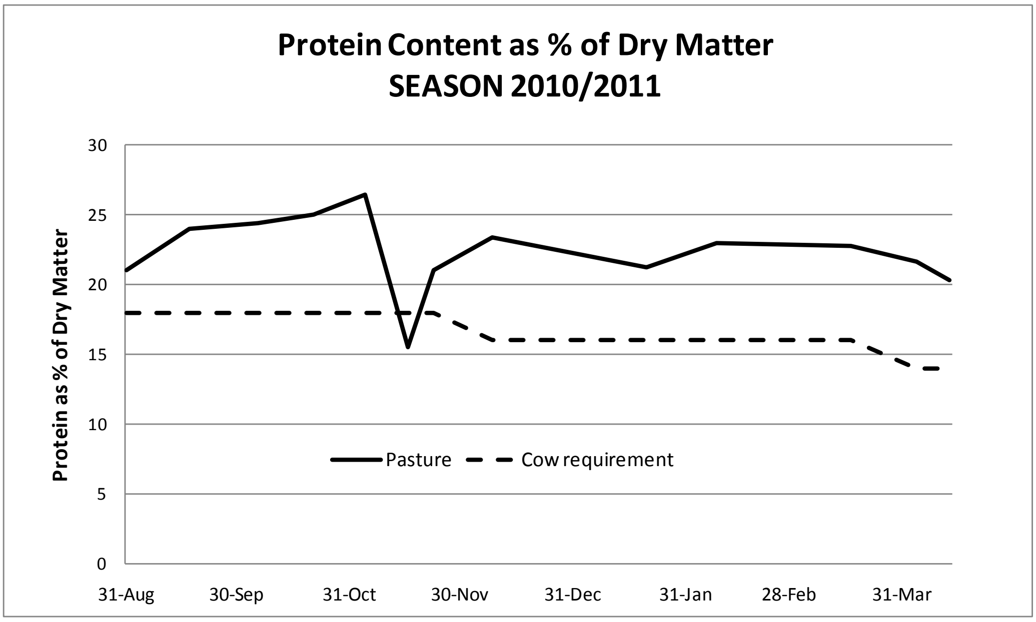
	2005/06	2008/09	2009/10	2010/11
Jun-Jul-Aug	2,402	2,060	1,535	1,660
Sep-Oct-Nov	6,249	7,025	6,223	6,769
Dec-Jan-Feb	6,275	7,138	7,163	6,827
Mar-Apr	3,729	3,115	3,140	3,545
Jun to Apr	**18,555**	**19,337**	**18,160**	**18,801**

Comments:

- Total pasture growth as measured with the rising plate meter at the weekly farm walk has been similar to previous seasons.
- This season the main challenge has been pasture utilization due to wet conditions mainly at the beginning of the season and again a few days in April.
- Despite the early wet period we did not measure a significant reduction in pasture growth compared to other seasons. The treading damaged done in early spring has however been visible all season with more weeds and less dense pastures in some areas.
- The under-sowing done in a few paddocks in early spring has been evident at various points through the season and will have helped reduced the negative effect of the damage. Despite this we cannot quantify its real effect in dry matter grown over the season.

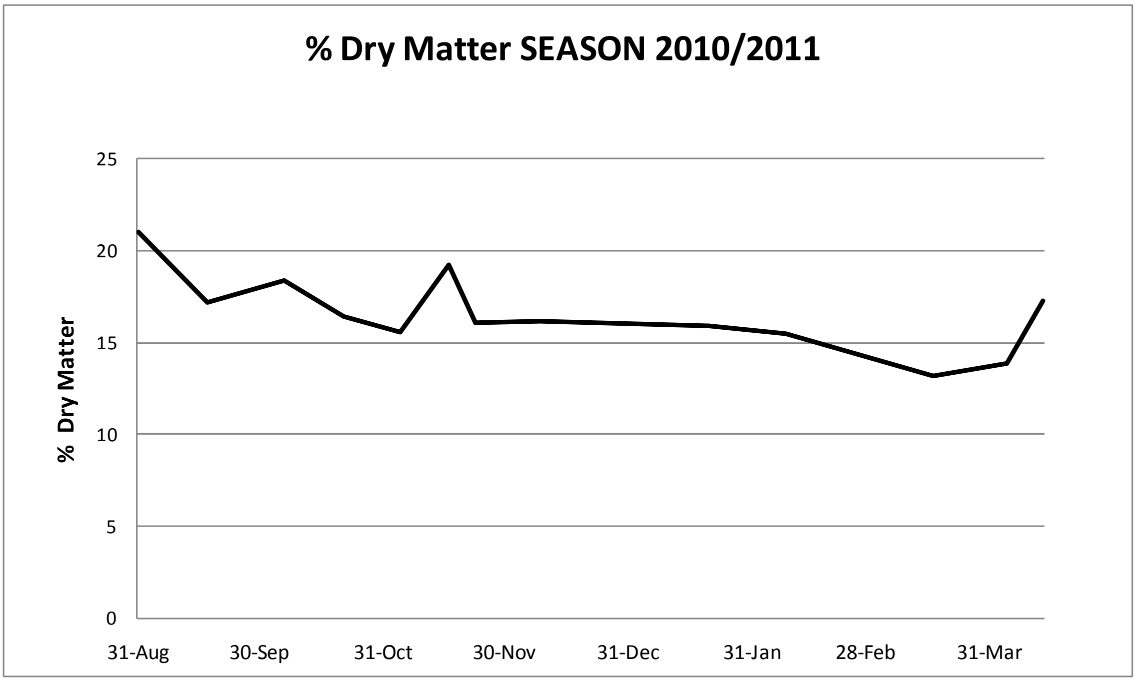
3. PASTURE QUALITY

Graph 5: Protein Content

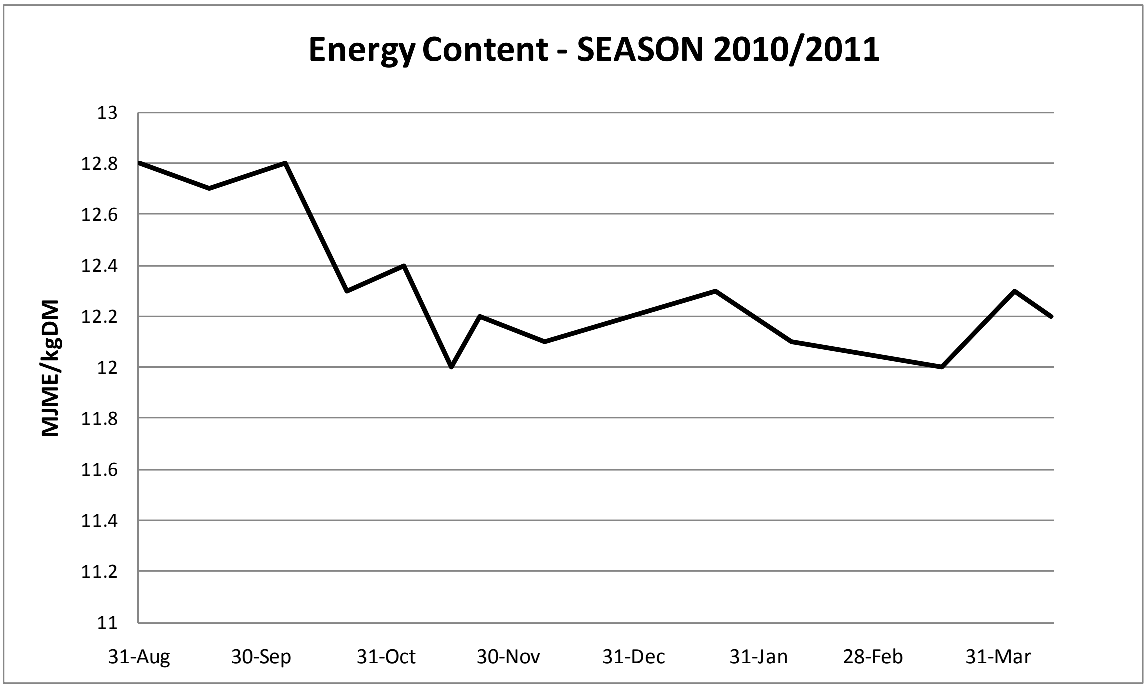


Cow Requirement: Early Lactation – 18%, Mid Lactation - 16%, Late Lactation - 14% (Extracted from "Nutrition guidelines for the high producing dairy cow" Kolver, 2002).

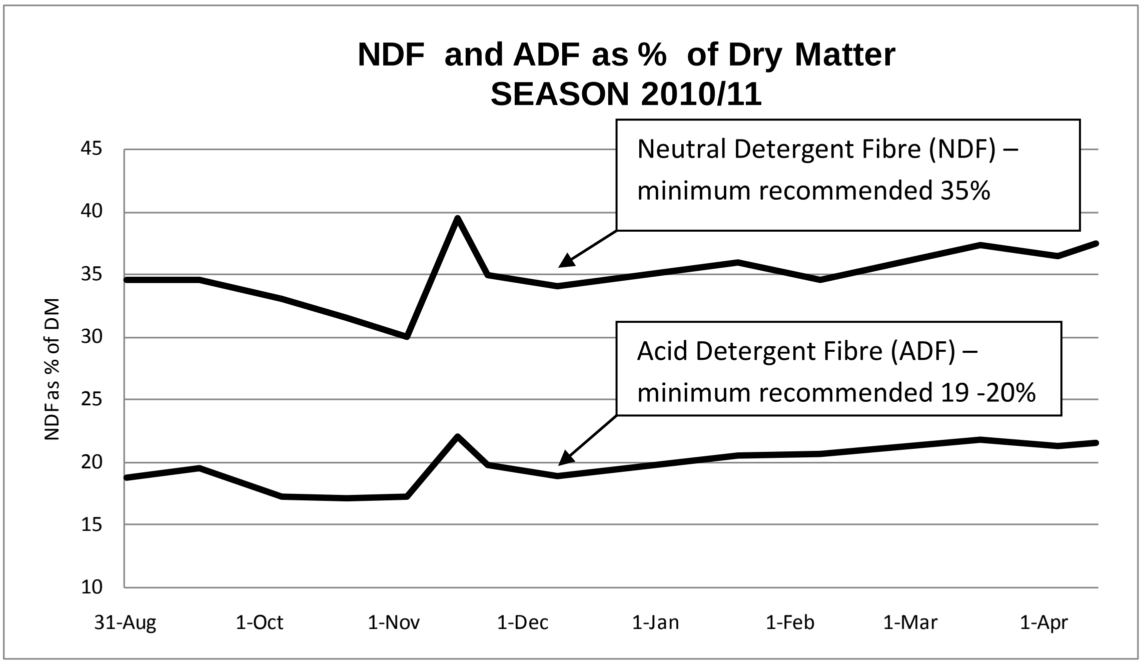
Graph 6: Dry Matter (%)



Graph 7: Energy Content (MJME/kg DM)



Graph 8: Fibre Content



Comments:

- Pasture samples are collected regularly at LUDF (usually every two weeks). The graphs above are based on this information. The samples are collected from 2 paddocks that represent what the cows will be eating during the week. The sample is cut to grazing residuals.

- Protein content (as % of Dry Matter) dropped below cow requirement for one of the weeks the samples were taken.

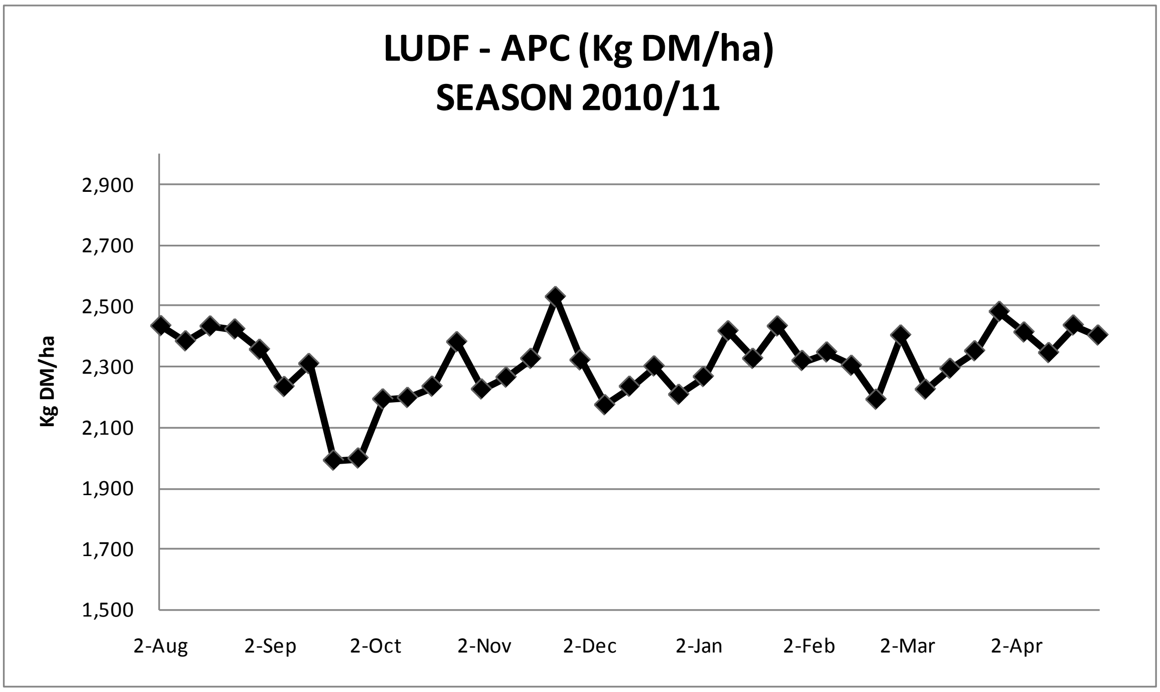
- Low dry matter content in the pasture can affect cow intake (not enough dry matter harvested by the cow). A low % of dry matter can be an issue in early spring when the grass starts growing very fast. This year at LUDF low dry matter % has been an issue in the autumn. As can be seen in the graph dry matter percentage has been below 16% from February to April. It is difficult to quantify the absolute effect of the lower dry matter percentage on intake.

- Metabolizable energy has been above 12 MJME /kg DM in all samples collected this season.

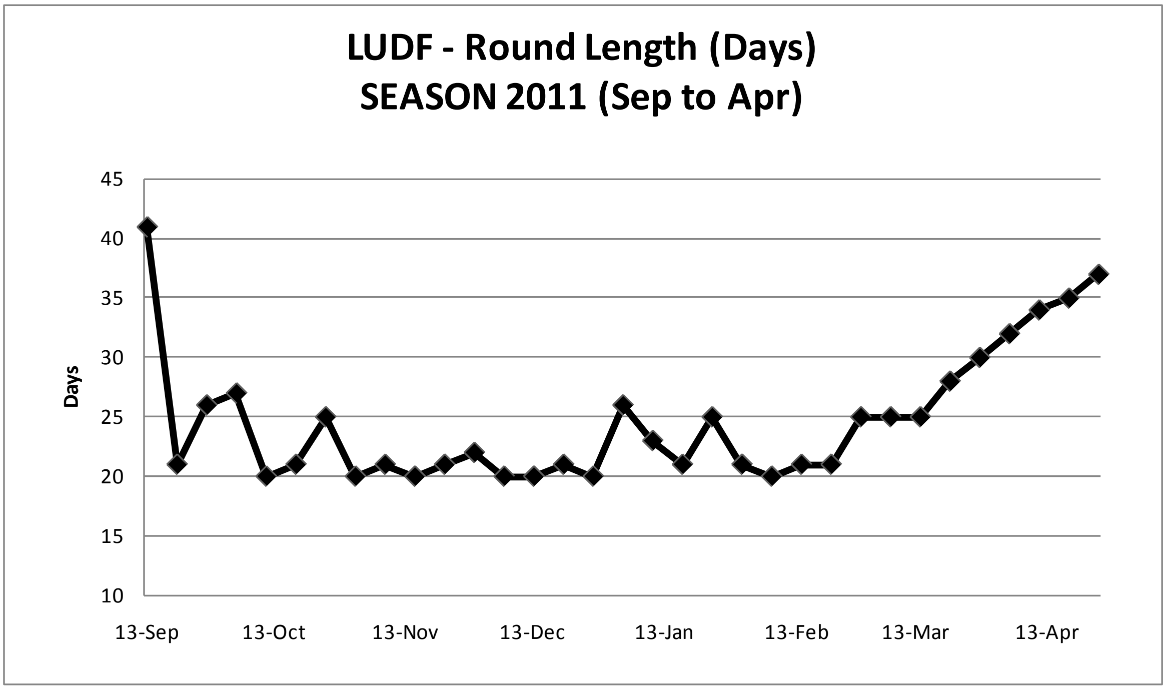
- The herd has had to work harder this year to graze its daily requirement because of the very low clover content in the pastures. See notes on this by David Chapman - Pgs 40-42.

4. PASTURE AND FEED MANAGEMENT

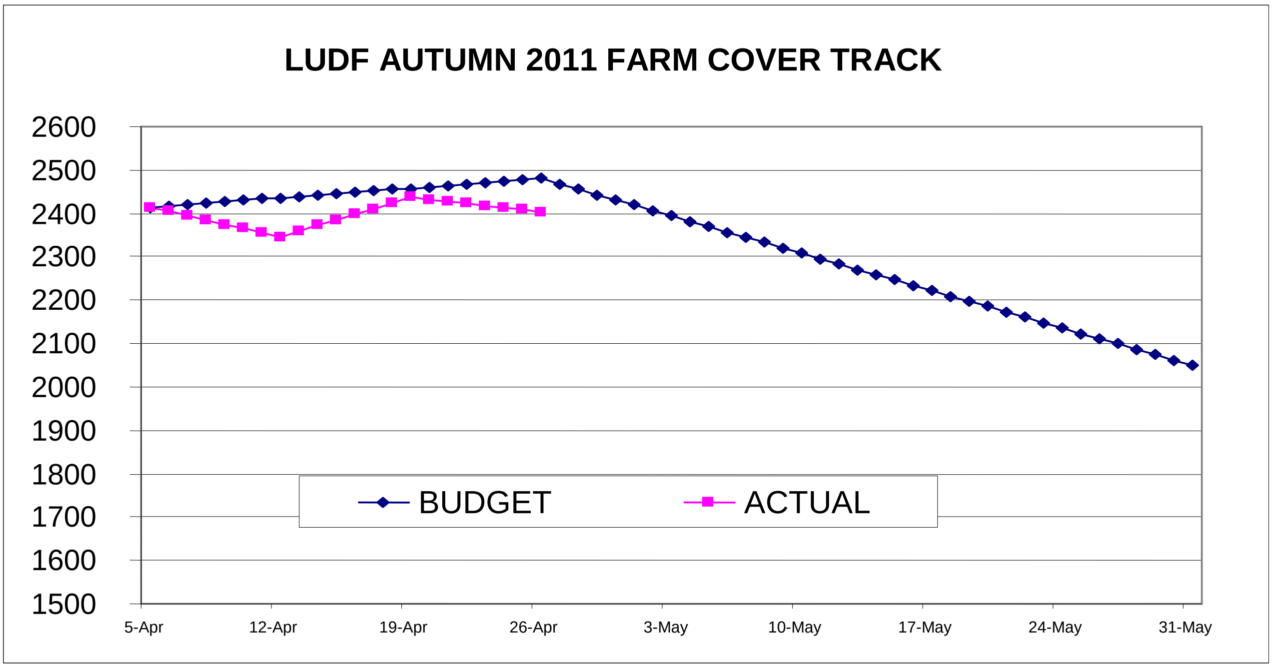
Graph 9: Average Pasture Cover –Season 2010/11 (September to April)



Graph 10: Round Length (days) Season 2010/11

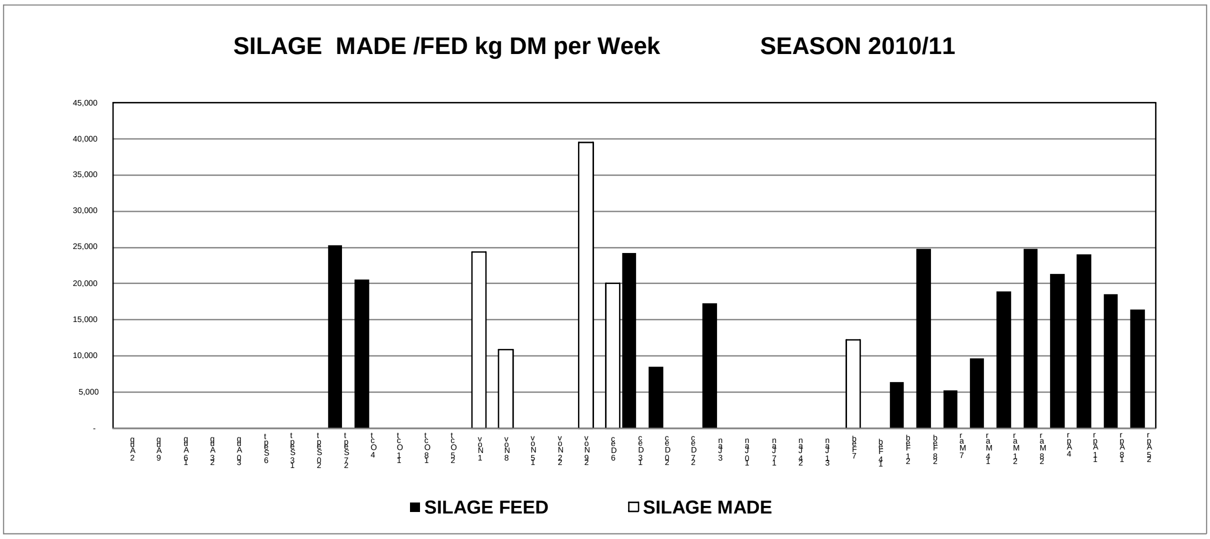


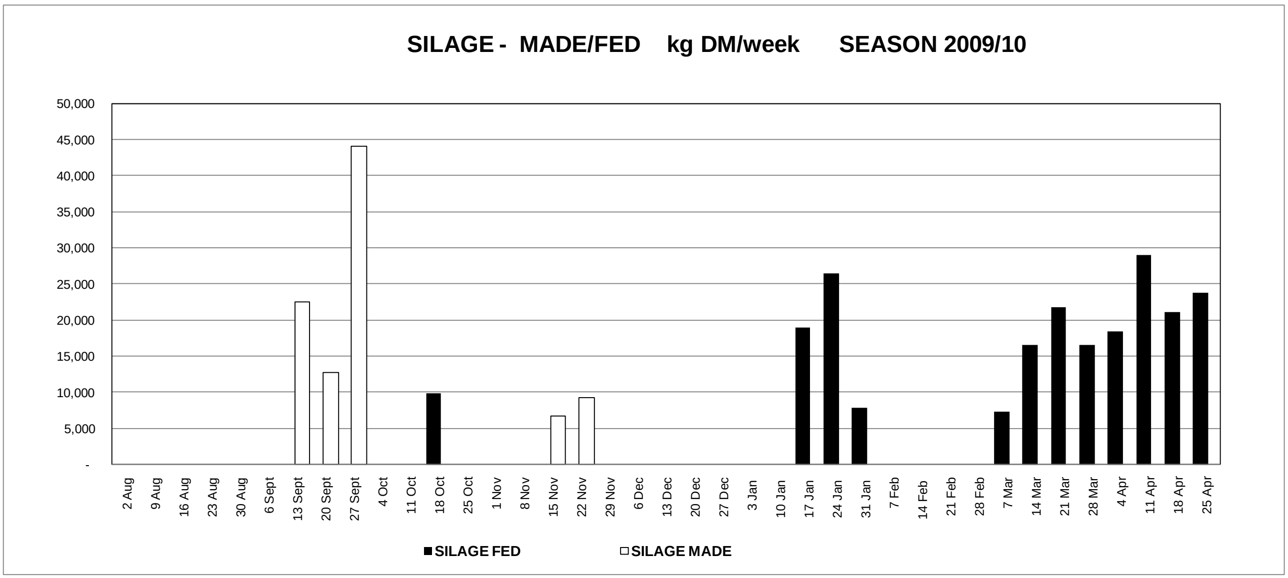
Graph 11: Farm Cover Track (Autumn 2011)



The feed budget done for the remainder of the season has a target average pasture cover as shown in the graphic above. The principle being to increase cover until mid April and then hold that until late April. After that cover will be allowed to decline slowly toward the targeted end-of-May average pasture cover of 2,050 kg DM/ha. This plan will see pre grazing levels of 3,400 kg DM/ha at a grazing interval of 32 - 33 days. Building cover provides an opportunity to milk more days in May if the weather allows.

Graph 12: Silage Fed and Made (Kg DM per week)





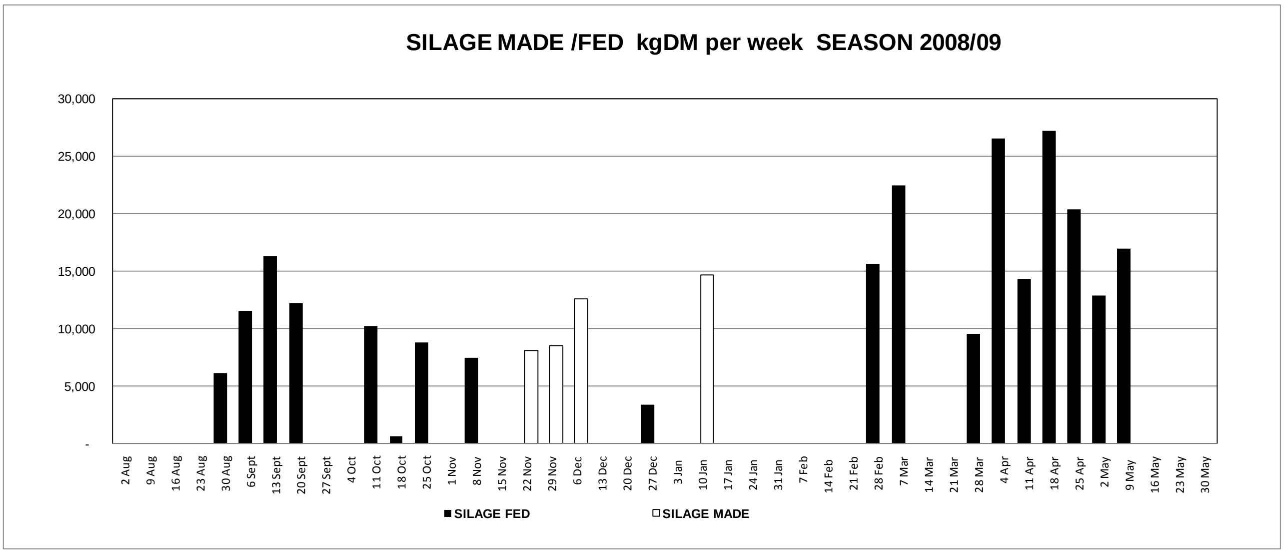


Table 2: Silage Fed /Made to Date (Season 2010/11))

	Fed	Made	Fed – Made
September	25.3	None	25.3
October	20.6	None	20.6
November	None	74.8	-74.8
December	32.9	20 TDM	12.9
January	17.3	12.2	5.1
February	31.4	None	31.4
March	58.9	None	58.9
April	80.6	None	80.6
Total to 26th April	267 399kg DM/cow	107 TDM 159kg DM/cow	160 TDM 239kg DM/cow

Comments:

- In terms of feed management LUDF's aim is to grow and harvest as much high quality pasture (>12 MJME/kg DM) as possible each round taking into account cow performance (both milk production and cow condition), a balancing act between maximizing pasture harvested / ha and cow performance. The main tool used to achieve this is to set the appropriate round length to maximize pasture growth at the different times of the season (e.g. 21 days in the spring time), maintain post grazing residuals at a consistent level throughout the season (around 1,500 kg DM/ha), and offer the cows the right pre-grazing of good quality grass at each grazing.

- The farm stocking rate of 4.2 cows creates a maximum demand of approximately 77 kg DM/ha/day (over the 160 ha milking platform). As growth rates fluctuate significantly weekly decisions to deal with surpluses or deficits are made as they arise. In surplus conditions silage is identified and cut to avoid cows eating high covers (> 3100 kg DM/ha target pre-grazing). It is very hard for cows to properly clean up paddocks that have covers above the necessary pre-grazing. (though the late flowering tetraploids e.g 'Bealy' provide greater tolerance than diploids in this aspect).

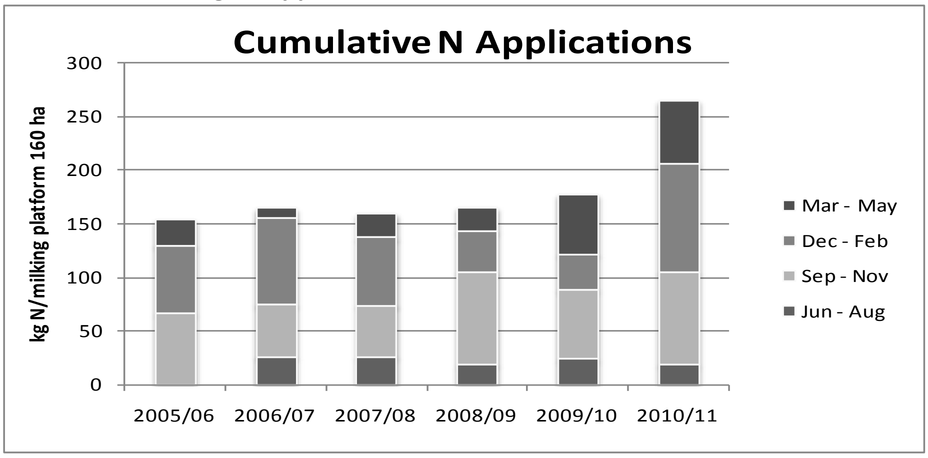
- Similarly feed deficits are dealt with when growing conditions change. In an ideal situation the grass is harvested directly by the cows without interference (cutting silage or feeding out). However, the variability in growth rates means the feed supply is manipulated as necessary taking into account the weather forecast, with decisions reviewed during the week and changes made when required.

- Other alternatives to deal with fluctuating growth rates are:
  - Manipulate round length. This strategy does not allow enough room to move between October - end of February when the targeted round length is 20-23 days. A round length shorter than 20 days at a stocking rate of 4.2 cows/ha could end up in a bigger deficit; alternatively, a round length longer than 23 days would require pre –grazing covers higher than 3300 kg DM/ha which is likely to affect the ability of the cow to harvest the grass and, in some paddocks, pasture quality.
  - Nitrogen use. Changing the nitrogen policy will not influence the immediate supply of grass but will do so in 3-4 weeks time. Nitrogen needs to start / stop well in advance of the deficit / surplus appearing.

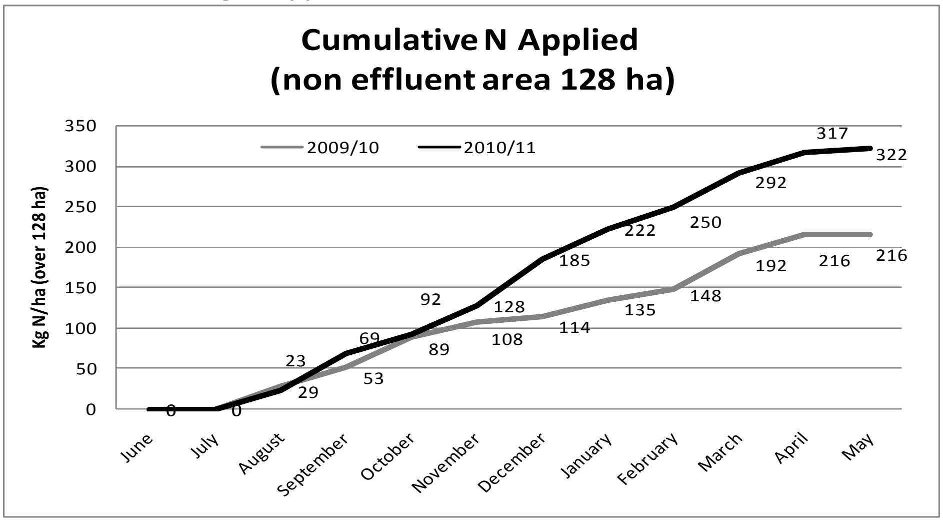
- This season average pasture cover was maintained between 2,150 and 2,350 for most of the season. Round length was above 20 days all season, extending at the beginning of March to 25 days and progressively to 35 days by mid April after that.

5. NITROGEN POLICY

Graph 13: Cumulative Nitrogen Application



Graph 14: Cumulative Nitrogen Application last 2 Seasons



Comments:

- To date 41,280 kg N representing 322 kg N / ha in the non effluent (128 ha) area and 258 kg N /ha in the total area of 160 ha has been applied.
- Compared with previous seasons the extra Nitrogen application has occurred in December and January.
- The policy in the past has been to stop Nitrogen applications when soil temperatures rose above 16°C. The reason for that policy was that at that temperature the soil was providing enough Nitrogen to sustain plant growth.
- Due to the lack of Clover in the pastures this season (and as a consequence less Nitrogen available from this source) it was decided to keep Nitrogen from Urea in the system, with the final application of Nitrogen applied this week.

6. COST/ BENEFIT ANALYSIS OF OWNING A MOWER AT LUDF

Table 3: Cost Analysis

Running and Capital costs of mower			**80 ha**	**Mowed**
Capital cost	$19,000			
Tractor (budget Manual)	$48.00 /hr	32hrs		$1,536
R & M	$10.00 /hr			$320
Staff Time @ 8km/hr	2.5 ha/hr	32hrs	$20 /hr	$640
Interest	8.00%			$1,520
Depreciation	10.00%			$1,900
Total cost of owning and running			**$74/ha**	$5,916
Contract mowing cost	$80.00 /ha			$6,400
Difference between contractors costs and cost of owning and running	Benefit to owning			$484

Table 4 Sensitivity Analysis

Mowing	**Total cost of owning and running the mower**
40ha	$117/ha
60ha	$88/ha
80ha	$74/ha
100ha	$65/ha

Other Points to consider:

Advantages of owning the mower:

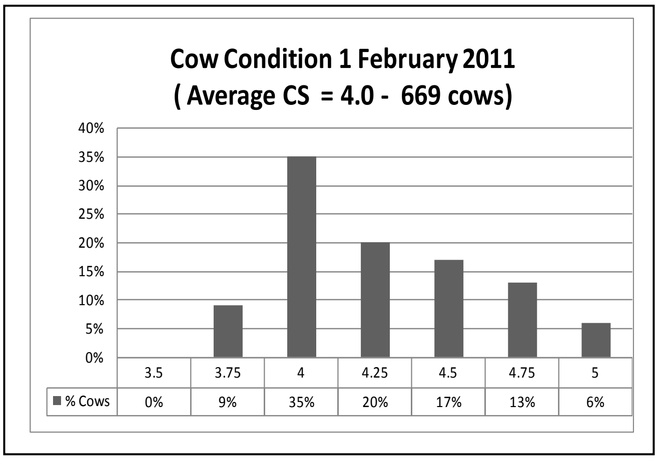
- Additional milk production for improving pasture quality by being able to mow lower
- Extra silage that we are likely to harvest when cutting paddocks lower
- We have regularly seen the gap between feed available and feed harvested into baleage being 300kgDM/ha more when the contractor's larger mowers were used in previous seasons. This has added up to approximately 24t DM
- The additional benefit has been that the residual after mowing has been very close to 7 rising plate meter "clicks". This has made it much easier for the herd to maintain target residuals.

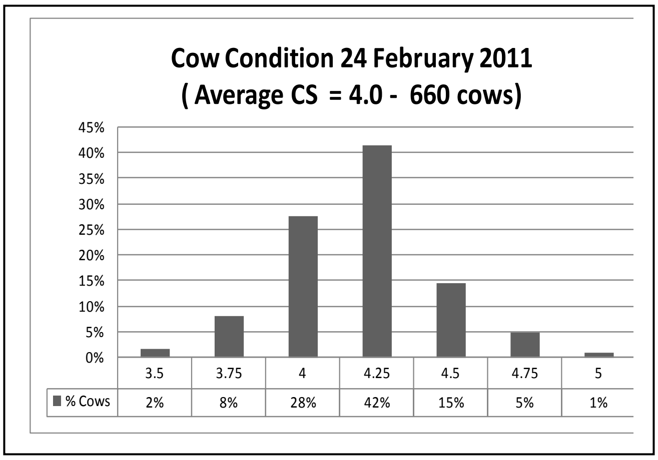
Disadvantages of owning the mower:

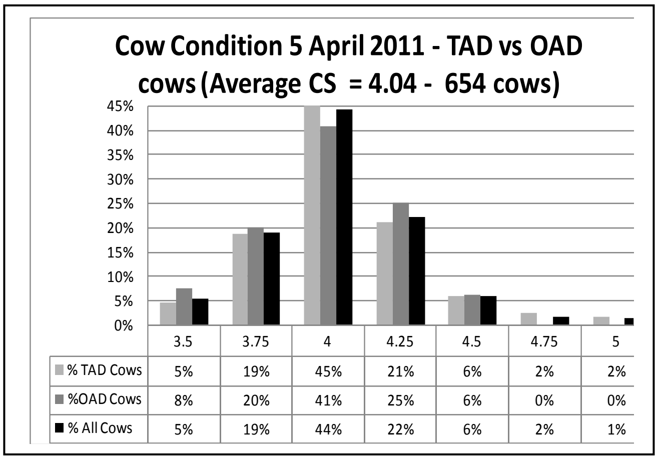
- Staff time: It has not been an issue for us this season but it can compete with staff time to do other activities on the farm
- Temptation to use the mower to correct inappropriate pasture management decisions. Because we have good set policies on farm regarding this it has not been a problem for LUDF.

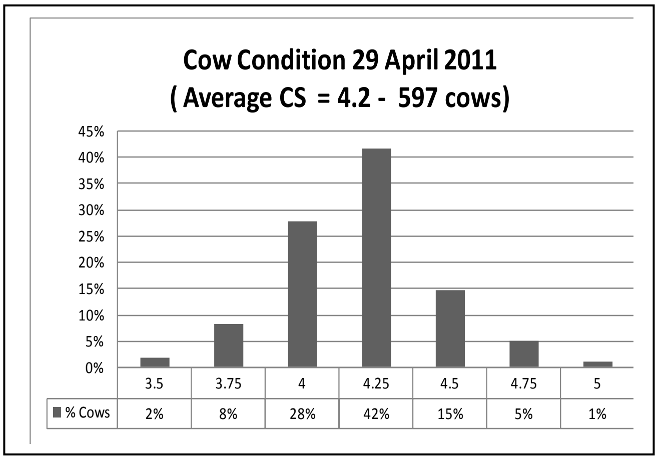
7. COW CONDITION STRATEGY

Graphs 15: Cow Condition Monitoring









LUDF TARGETS

After calving pattern, cow condition at calving is the most important factor affecting reproductive performance. The difference in 1 BC unit at calving has been valued at $40 in terms of benefits in reproduction. There is also an extra 15 kg MS/ BC unit to be harvested in the following season.

For LUDF the target BCS to achieve at calving is:
- Calve mixed age cows at a Condition Score 5 (in at least 90% of the herd)
- Calve Rising 3 year old at Condition Score 5.5
- Less than 10% of the herd below BCS targets
- These cows with lower BCS will not be more than 0.2 BCS below our targets

LUDF – COW CONDITION STRATEGY

In theory, if a dry cow is fed enough during the dry period she could gain 1 BCS in winter. For the crossbred cows (460 kg LW/cow) this means feeding about 4 to 5 kg DM/day on top of their maintenance requirements, plus some allowance for wastage.

However, as seen in many other Canterbury herds, it is very difficult to put on more than ½ a BCS during the winter period. The reasons for this being:

- Cows typically do not gain condition in the month prior to calving - less energy is available for CS gain as the nutritional demand of the calf increases significantly, and daily intake is reduced due to the space taken by the calf.
- Weather conditions in the winter months (e.g. cold and wet) can increase cow demand for maintenance, reducing the energy available for condition gain.
- Feed utilization is a challenge in wet conditions and the budgeted feed available to the cows can be significantly reduced.

Therefore, despite theoretically possible, IT IS RISKY to expect a 1 BCS gain in two months; LUDF does not want to take this risk and has targeted ½ BCS unit during winter.

Our Drying off Decision Rules are based on:

Cows (4 years old and older)

Cow Condition	Dry off time (days before Calving)	Date cow need to be dry off (calving date 1-15 August)	Date cow need to be dry off (calving date 15-30 August)
3.5	100	20 April – 5 May	5-15 May
4	80	10-20 May	20 -30 May
4.5	60	NA	NA

Rising 3 year Old

Cow Condition	Dry off time (days before Calving)	Date cow need to be dry off (calving date 1-15 August)	Date cow need to be dry off (calving date 15-30 August)
3.5	120	1- 15 April	15 -30 April
4	100	20 April -5 May	5-15 May
4.5	80	10-20 May	20 -30 May
5	60	NA	NA

This strategy requires feeding the cows that are being dried off above demand and good quality feed.

A summary of the strategies taken so far follow:

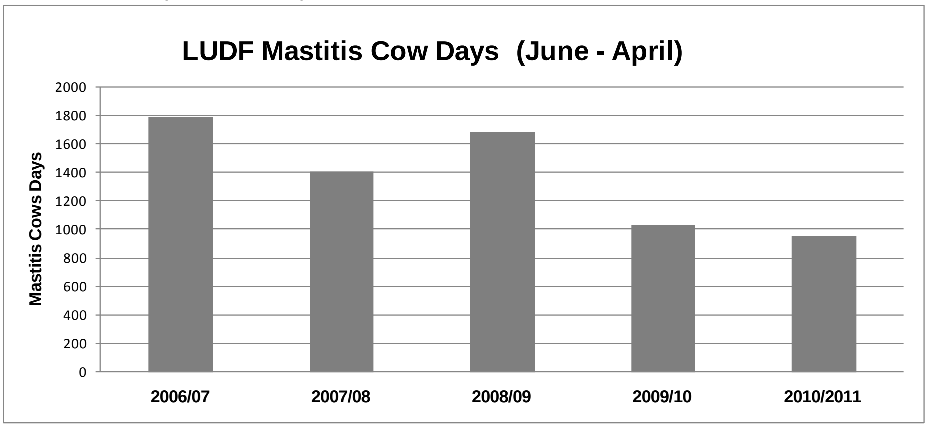
- 1 March: 166 cows with BCS 4 or below (mainly young and early calvers) put on Once a Day Milking
- 22 March: 55 cows with BCS 4 or below and calving in August added to the Once a Day Mob
- 29 March: 35 cows with BCS 4 or below and calving in September put on Once a Day Milking. To date 256 cows are being milked once a day.
- 5 April: Seven 3 year old cows with BCS 3.5 calving in August dried off.
- 17 April: The whole herd put on Once a Day Milking.
- 19 April: 14 cows dried off (to end of April 21 cows have been dried off).

8. COW WASTAGE and MASTITIS – REVIEW OF THE SEASON

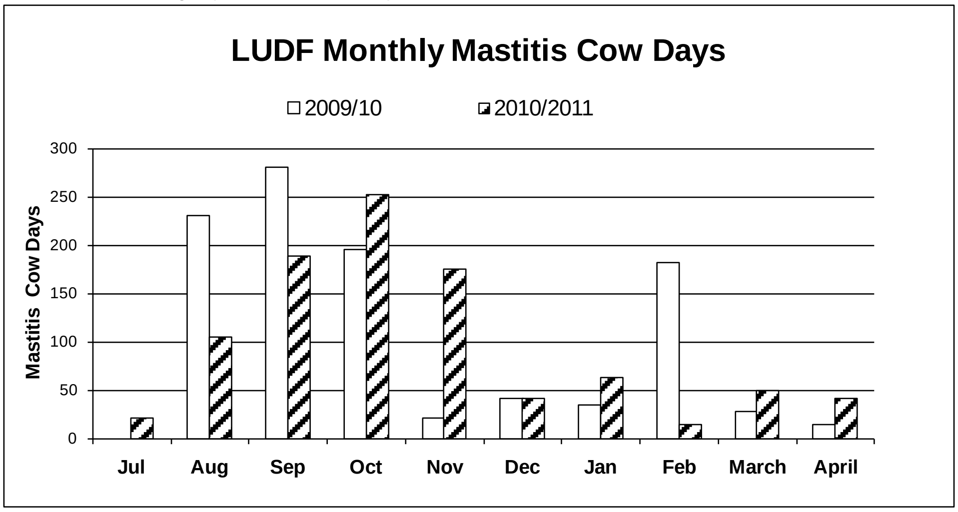
Table 5: Deaths and Culling

	Season 10/11	Season 09/10	Season 08/09
Cows on 1st June	694	688	704
Peak Cows Milked	667	660	680
Death to end December	15	7	8
Early culling to end of December	14	23	18
Cows at 31 December	665	658	678
Total Death (August to end of April)	18	8	10
Total Death % of Peak cows milked	3%	1%	1%
Average Days in milk per cow to end of April	248	249	241

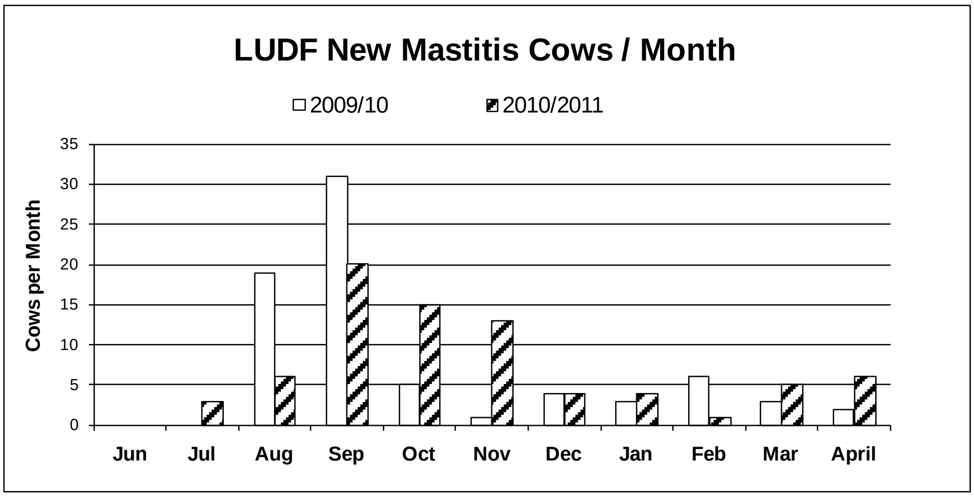
Graph 16: Mastitis Cow Days (June –April)



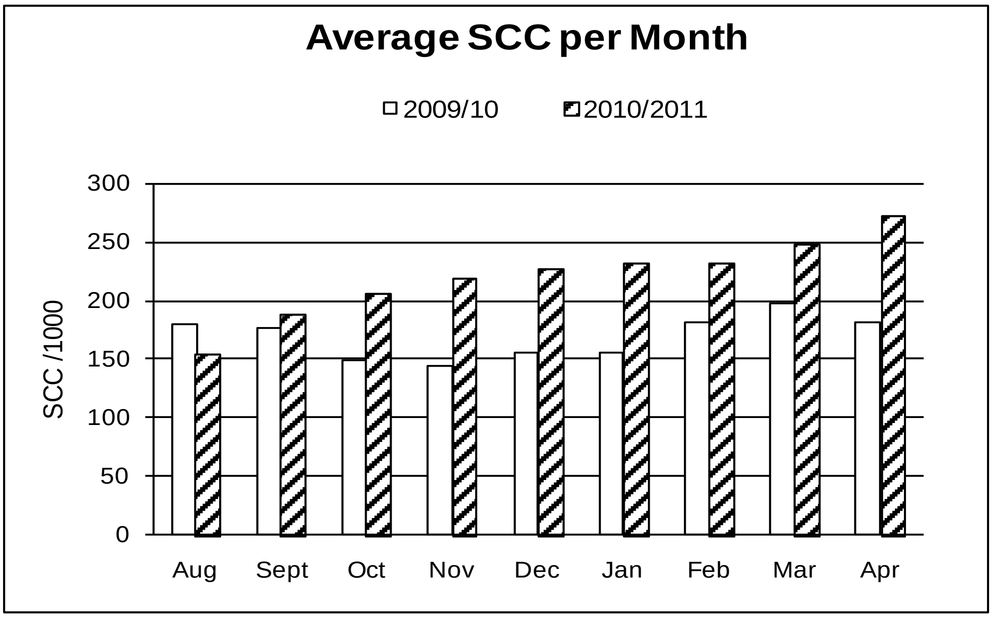
Graph 17: Mastitis Cow Days (last 2 seasons)



Graph 18: Mastitis – New Cases



Graph 19: Average SCC per Month (Last 2 Seasons)



Graph 20: SCC 5-day Average

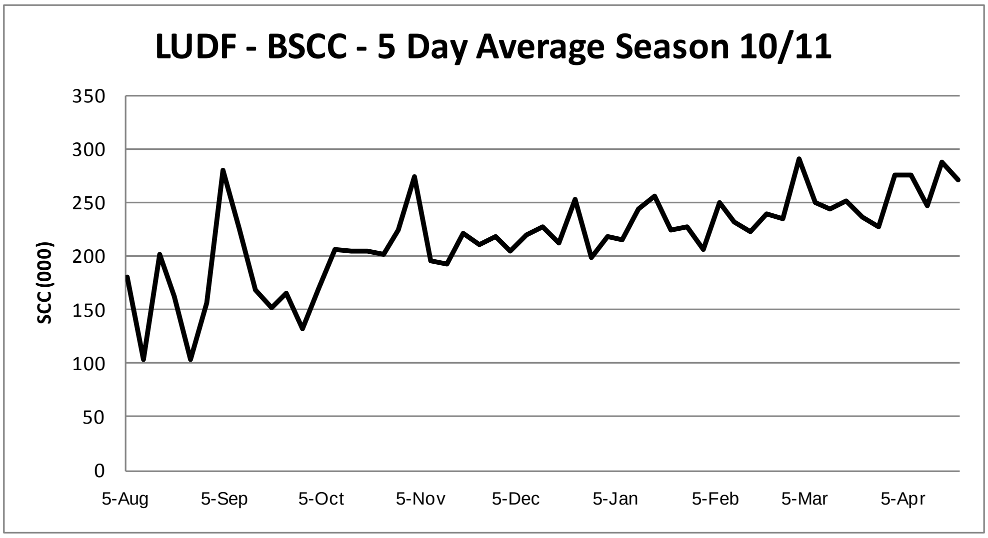


Table 6: Production Losses due to Mastitis (July –April 2011)

	2006/07	2007/08	2008/09	2009/10	2010/11
Cows milking day lost*	1782	1404	1680	1029	952
Average MS lost / day	1.5	1.5	1.5	1.5	1.5
Total MS lost	2,673	2,106	2,520	1,544	1,428

*a cow milking day is every full day that a cow is in the treatment mob and its milk is being withheld from factory supply.

COMMENTS:

This season the herd calved with very low levels of clinical mastitis and bulk milk somatic cell count. The earthquake on September 4 and subsequent interruptions to milking saw the somatic cell count rise through September and peaking by late October. This was very disappointing given the great start to the season. Unhappy with this the team has reviewed all aspects of the milking and mastitis management. A specialist was engaged to review and make recommendations.

- The machine vacuum was checked. This had increased from 42 psi [set during the machine test done Jan 2010] to 46 psi, caused by some dirt in the transducer on the variable speed milk pump.
- Vacuum has since been lowered to 41 psi.
- A hand held teat sprayer has been installed, the strength of our teat spray mix increased, and glycerine added.
- The milk hoses and air hoses have been shortened.
- The pulsation changed to 60-40.
- Replacement rubber seals installed on all clusters
- The clusters are considered perhaps lighter than ideal leading to some cup crawl. Replacement of these is likely when Automatic Cluster removers are added to the plant.
- The milking plant, platform and yard were checked for stray electricity recently. We have responded to the major fault found. See report from Electricity Ashburton Pgs 33-36.

So far little benefit to these changes can be seen.

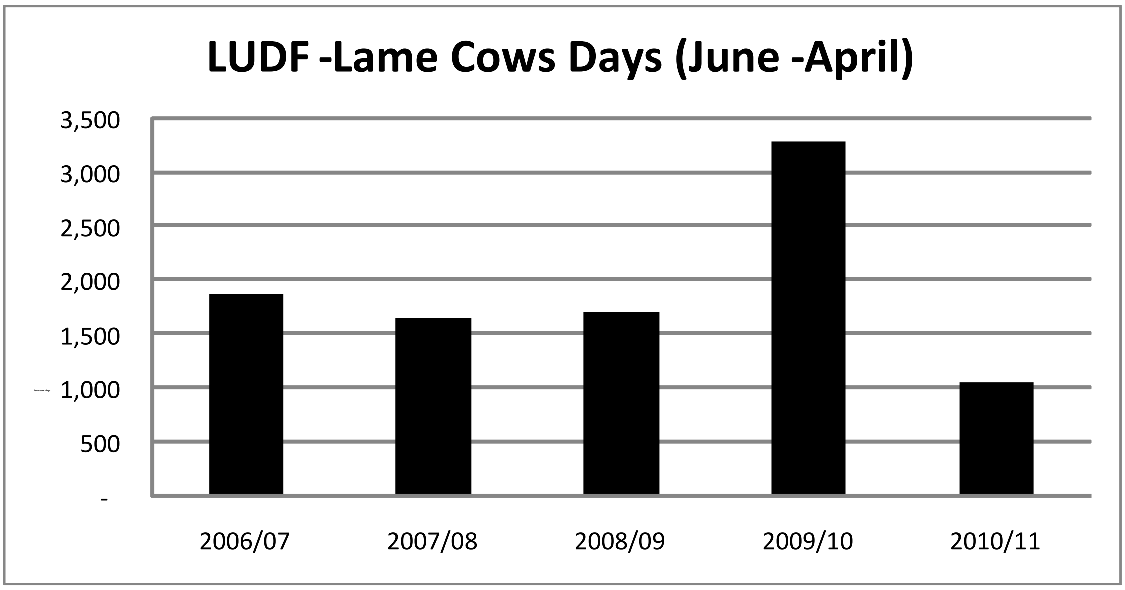
9. LAMENESS – SEASON TO DATE - REVIEW

The number of lame cows and the number of lame cow days has been reduced significantly this season compared to the previous season, despite the wetter weather conditions this spring. To the end of April 82 cows were identified as lame, compared to 152 cows the season before. These numbers include cows that were lame more than once.

Comparing the total lame cow days from June to end of April for both seasons, 2010/2011 had 1,058 compared to 3,183 recorded last season. This is because less cows were lame and also because cows spend less time in the lame mob. From June to April in the 2009/10 season it was 21.5 days (3,183 days /152 cows) compared to 12.8 days this season (1,058 days/82 cows).

The annual lame cow days is calculated by adding the average number of cows in the lame mob every week multiplied by 7. This number would count cows that have been lame more than once.

Graph 21: Lame Cow Days



Graph 22: Monthly Lame Cow Days

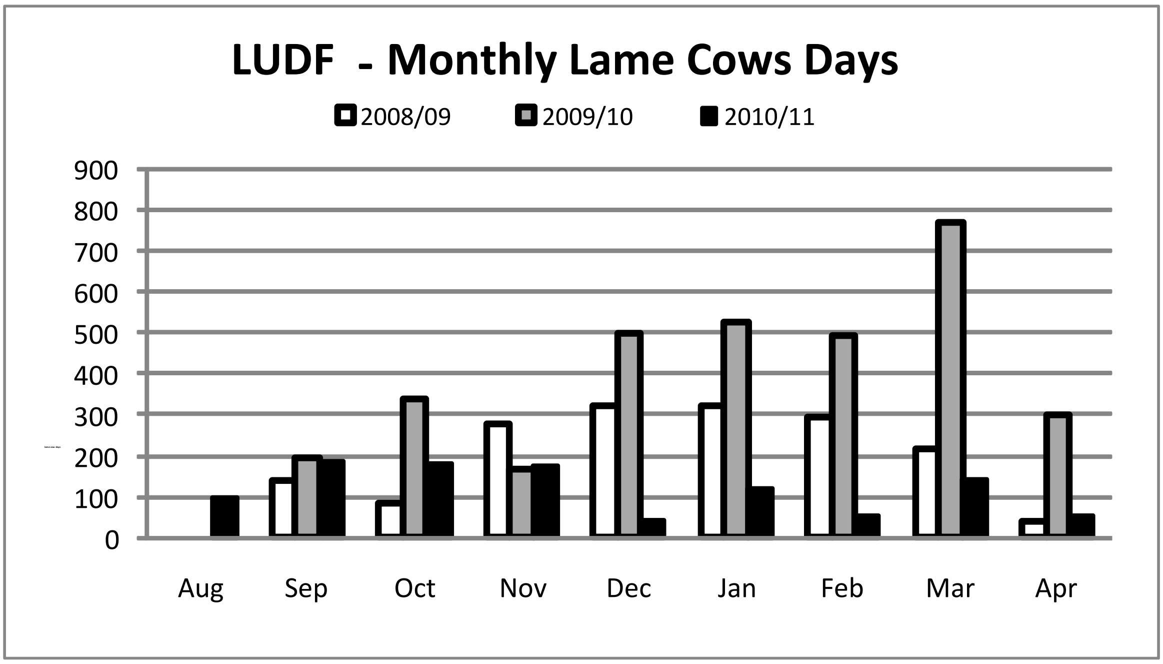


Table 7: Comparison June – January

June to January	Season 2009/10	Season 2010/2011
• Which Foot?	Front Left (15%) Front Right (9%) Back Left (45%) Back Right (34%) More than one feet (3%)	Front Left (14%) Front Right (5%) Back Left (31%) Back Right (46%) More than one feet (1%)
• What did they have?	No. Cows WHITE LINE 31 BRUISING 7 INTERDIGITAL LESSION 3 SOLE PENETRATION 29 FOOTROOT 24 Total 94	No. Cows WHITE LINE 16 BRUISING 0 INTERDIGITAL LESSION 1 SOLE PENETRATION 21 FOOTROOT 3 Total 57
• How were the cows treated?	72 cows were Trimmed 29 cows had Excenel 1 Cows Depocillin 11 Shoe fitted	41 cows were Trimmed 13 cows had Excenel 3 Cows Depocillin 16 Shoe fitted

June to May	Season 2009/10	Season 2010/2011
• Which Foot?	Front Left (13%) Front Right (7%) Back Left (45%) Back Right (38%) More than one feet (3%)	Front Left (14%) Front Right (6%) Back Left (33%) Back Right (46%) More than one feet (1%)
• What did they have?	No. Cows WHITE LINE 63 BRUISING 7 INTERDIGITAL LESSION 3 SOLE PENETRATION 40 FOOTROOT 39 Total 152	No. Cows WHITE LINE 24 BRUISING 0 INTERDIGITAL LESSION 1 SOLE PENETRATION 31 FOOTROOT 25 Total 81
• How were the cows treated?	155 cows were Trim 40 cows had Excenel 2 Cows Depocillin 13 Shoe fitted	82 cows were Trim 13 cows had Excenel 5 Cows Depocillin 29 Shoe fitted

POSSIBLE CAUSES OF LAMENESS IDENTIFIED AT LUDF

- The sharp right hand turn from the underpass to the yard
- Cow flow on underpass
- Dampness of underpass at some times of the year (could explain high incidence of Footrot)
- The state of the South Lane
- Cows pressure in the yard
- Cows have taken a long time to recover

Table 8: Main Changes this Season

Changes	Cost	Comment
Recap south lane	$13,240	Has reduced the amount of stones coming onto the concrete and consequently the amount of stones being found in the cow's feet. This has had an impact on reducing lameness.
Change layout of the underpass to avoid sharp corner to the yard	$635	To date has helped with the flow of the cows going through the underpass.
Top Gate – a variable speed drive allowing very slow forward and fast backward movement	$1,322	Slowing down the top gate has probably given the best return. The amount of white line cases which are mostly caused by cow pressure in the yard has been halved.
Earlier identification of lame cows	Staff time and input	Continue to encourage staff to identify lame cows early. This is talked about weekly at staff meetings.
More staff training to prevent, identify and treat lame cows		Ongoing training as required. Half day spent with local vet.
Review treatment policy to reduce time cows take to recover	Staff time and input	Recheck all lame cows every Monday morning to speed up there recovery. Apply shoes to speed up recovery and get back into herd faster.

KEY LESSONS LEARNED

- Biggest contribution to lameness was staff using top gate as it was designed to be used. Slowing this down to approximately ¼ of its speed going forward has resulted in less lameness.
- Top gate and south lane entrance were only completed at the end of October. Further reductions in lameness across the rest of the season and also into next season are expected.

10. REPRODUCTION REVIEW OF THE SEASON

1. The herd was tail painted and heats recorded on 23 September. By 25 October 73% of the herd (492) had cycled.
2. By the PSM 85 cows had not cycled and had calved more than 42 days.
3. No hormonal intervention with non-cycling cows this year.
4. 591 cows inseminated in 3 weeks (28 cows /day). First week 207 cows mated (29.5 cows/day); second week 185 cows inseminated (26.4 cows/day); and the third week 199 cows (28.4 cows/day) inseminated. 87% 3-weeks submission rate (583 cows) was achieved with 53% of them holding.
5. To the end of AB 631 cows had been mated.
6. 72 out of 166 heifers confirmed in calf to date (43%) to the synchrony and AB programme.
7. The bulls were with the heifers for 9 weeks, and with the cows for 10 weeks ending 4 January.
8. The herd was pregnancy tested on the 10th of January to identify cows in calf after six weeks of mating. The number judged to be in calf was 485, against the herd of 669 cows at the start of mating this is 72%.
9. Final Pregnancy test confirmed 585 cows pregnant in 10 weeks of mating (87% on 670 cows).

REPRODUCTIVE PERFORMANCE

LUDF - Progress to Date in Calving and Mating

SEASON	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11
Days to mid Point * (all herd)	22	23	14	12	16	15	9**	16
Days to mid Point* (MA cows)	22	23	22	16	22	18	15	18
4 week calving rate	63	61	69	72	66	70	81	77
% Cows still to calve 1 month PSM	17	12	12.6	9	7	6.3	3.6	8
% Cows treated as Anoestrus	36.7	24.3	14.5	17	8	23	0	0
Mating Period (weeks) Cows			15	16	15	10	10	10
AB Period (weeks) cows			10	8	6	10	6	5.3
Mating Period (weeks) Heifer			8.5	10	8	8	8	8
AB Period (days) Heifers			3	3	3	3	0	1
Heifer synchrony	Yes	yes	yes	yes	yes	yes	No	yes
6-Weeks In calf rate (%)			65	67	66	67	74%***	72%
% EMPTY Cows	17	20.5	16	14	14	20	13	13
% EMPTY R2				6	2	5	14	8

*Days to mid point is to Plan Start of Calving of the main herd
** Days to mid point for the whole herd is 9 days since heifers started calving 14 days before the cows
*** First year this information is available

11. LUDF WINTERING TARGETS AND PRINCIPLES

A summary

The details from previous seasons can be seen by reading through Farm Walk notes for the period, or the Focus Day handouts for July 2009 and 2010, both available on the SIDDC website www.siddc.org.nz .

Targets

1. First and second calving cows to be at or above 5.5 Body Condition Score (BCS) at calving.
2. All mixed age cows to be at or above 5.0 BCS.
3. All cows calving before 20 August to be at the above targets by July 7th.

Methods used to achieve this

1. Drying off according to the rules above (Cow Condition Strategy) and in the current Farm Walk notes.
2. Dried off cows fed very well as soon as possible after drying off.
3. Cows wintered in both condition and calving date groups.
4. **First and second calvers will be wintered on pasture** supported by small volumes of hay or silage. (rape/turnips and grass would be OK).

5. **Early calving cows judged to be at risk** in any way (condition, recent mastitis or sore foot) will also be wintered **on pasture**. These cows have remained on the platform in most seasons eating to 1500kgDM residuals on pasture alone.

6. Mixed age cows calving in the first 3 weeks will be wintered in a separate group and fed **brassica** (Kale is OK) some grass on a runoff paddock and straw.

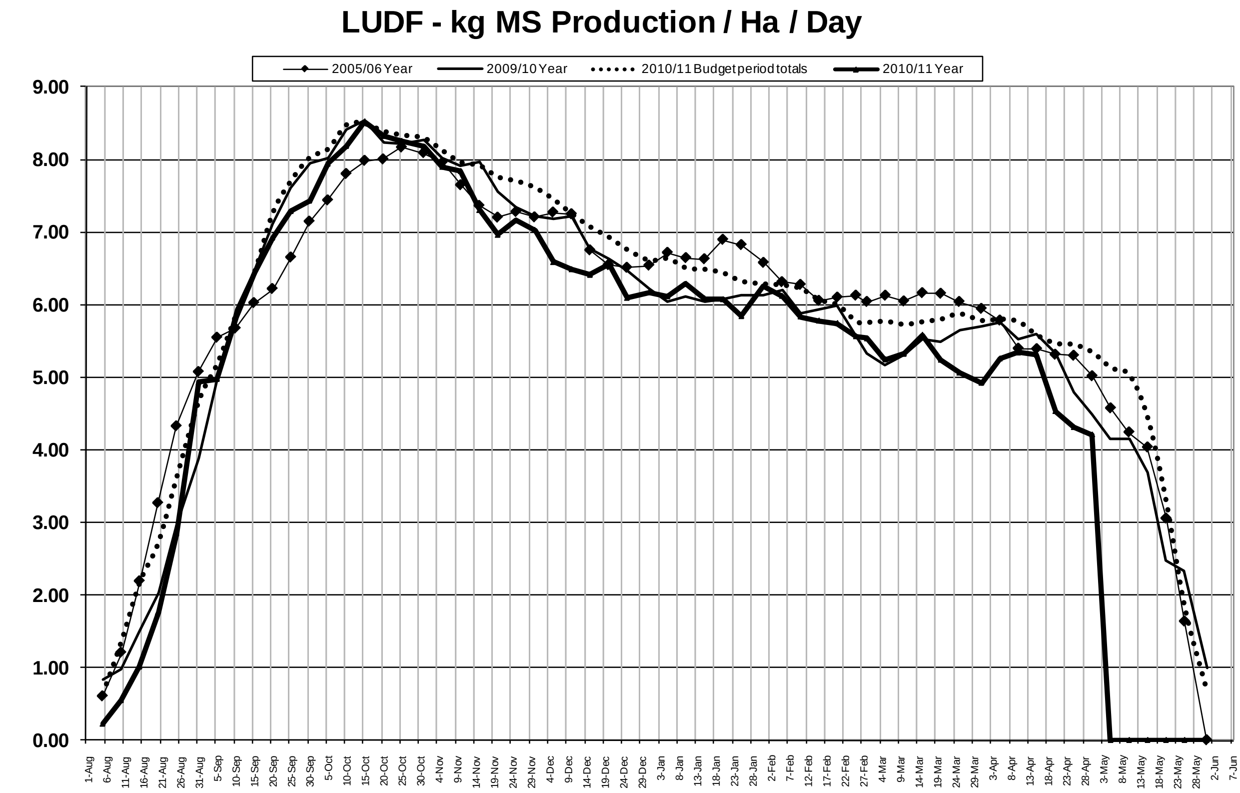
7. Mixed age cows **calving later can be fed kale** plus straw diet if that is all that can be arranged. Some grass every day being preferred.

12. LUDF CULLING GUIDELINES MAY 2011

This autumn there is an unusual situation occurring for LUDF in that the number of cows likely to be wintered has been reduced by 35. This has made it possible to cull some cows that would otherwise have been retained.

Priorities

1. <u>Unsound cows</u>
   a. Injured feet or legs unlikely to recover over winter.
   b. Udder support such that post calving next spring the cow will not be able to be managed satisfactorily.
2. <u>History of clinical mastitis</u>
   a. 61 cows have had an infection this season, one cow that had mastitis three times has been culled.
   b. 2 cows had a recurrent infection later in the season - both have been culled.
   c. 5 cows had infections that did not clear up with a course of antibiotic. Two of these have been culled.
   d. The remainder will remain unless culled for another reason.
3. <u>Cows with a background of high Somatic Cells at herd Test</u>
   That is, in this and previous seasons but not having a clinical infection this season.
   6 – 10 cows will be culled for this reason.
4. <u>Production - Low $PW</u>
   The remainder of the culls will be coming from cows with the lowest $PW's in the herd. The group selected will have a $PW very close to $PW = 0. A few young cows with negative $PW with early calving dates next season and apparent above average current production will be retained. It is intended that these few cows will be mated to Hereford.


LUDF - kg MS Production / Ha / Day
2005/06 Year
2009/10 Year
2010/11 Budget period totals
2010/11 Year
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1-Aug
6-Aug
11-Aug
16-Aug
21-Aug
26-Aug
31-Aug
5-Sep
10-Sep
15-Sep
20-Sep
25-Sep
30-Sep
5-Oct
10-Oct
15-Oct
20-Oct
25-Oct
30-Oct
4-Nov
9-Nov
14-Nov
19-Nov
24-Nov
29-Nov
4-Dec
9-Dec
14-Dec
19-Dec
24-Dec
29-Dec
3-Jan
8-Jan
13-Jan
18-Jan
23-Jan
28-Jan
2-Feb
7-Feb
12-Feb
17-Feb
22-Feb
27-Feb
4-Mar
9-Mar
14-Mar
19-Mar
24-Mar
29-Mar
3-Apr
8-Apr
13-Apr
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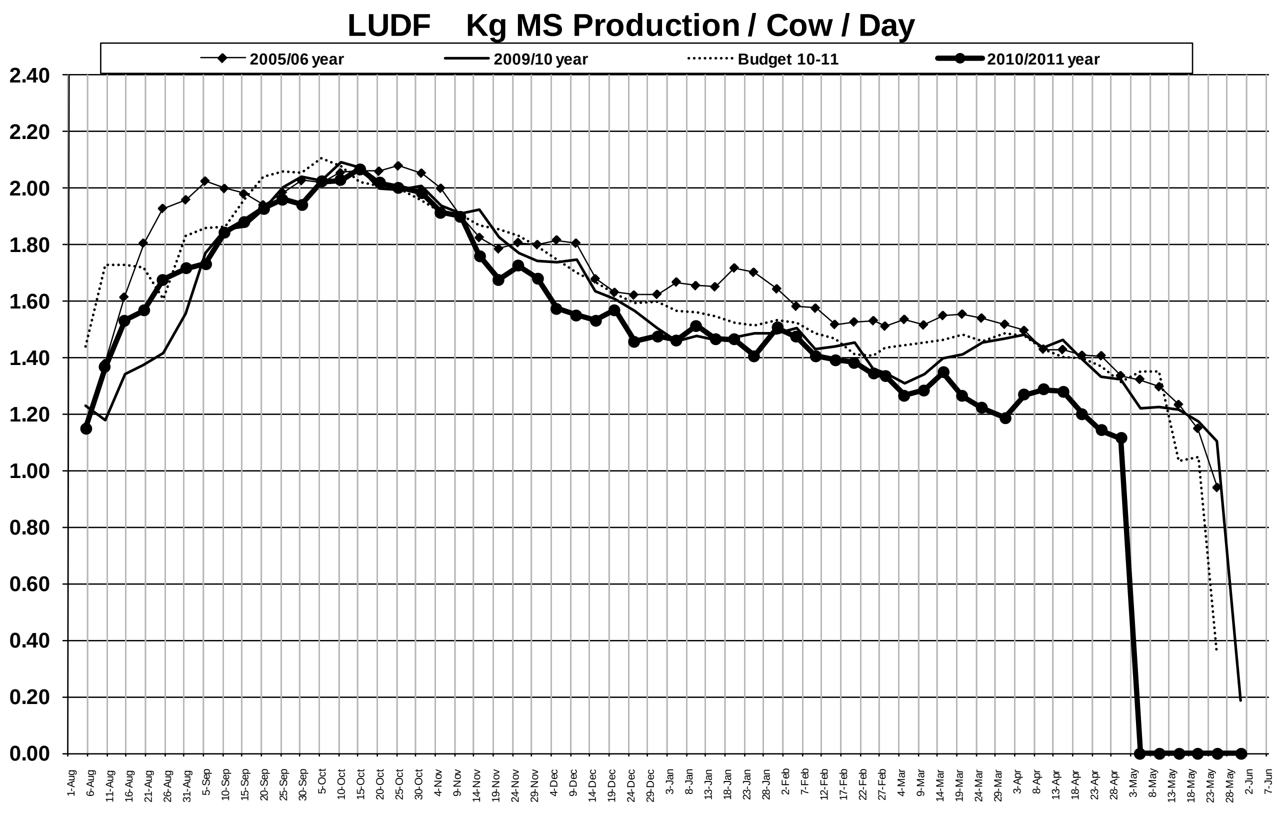
3-May
8-May
13-May
18-May
23-May
28-May
2-Jun
7-Jun


LUDF Kg MS Production / Cow / Day
2005/06 year
2009/10 year
Budget 10-11
2010/2011 year
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1-Aug
6-Aug
11-Aug
16-Aug
21-Aug
26-Aug
31-Aug
5-Sep
10-Sep
15-Sep
20-Sep
25-Sep
30-Sep
5-Oct
10-Oct
15-Oct
20-Oct
25-Oct
30-Oct
4-Nov
9-Nov
14-Nov
19-Nov
24-Nov
29-Nov
4-Dec
9-Dec
14-Dec
19-Dec
24-Dec
29-Dec
3-Jan
8-Jan
13-Jan
18-Jan
23-Jan
28-Jan
2-Feb
7-Feb
12-Feb
17-Feb
22-Feb
27-Feb
4-Mar
9-Mar
14-Mar
19-Mar
24-Mar
29-Mar
3-Apr
8-Apr
13-Apr
18-Apr
23-Apr
28-Apr
3-May
8-May
13-May
18-May
23-May
28-May
2-Jun
7-Jun

Fertility Focus 2010: Seasonal

Lincoln University
C/O The Manager (University Dairy Fa
PO Box 94
Lincoln University Lincoln 7647

Report date:	01/04/11
PTPT:	BQCY
Herd Code:	6/114
No of cows included:	680
These cows calved between:	17/06/10 and 23/12/10
Mating start & stop date: (estimated from AI or rectal pregnancy test data)	25/10/10 - 04/01/11
Planned start of calving:	03/08/11

incalf FERTILITY FOCUS
Version 1.0

DairyNZ

LIC

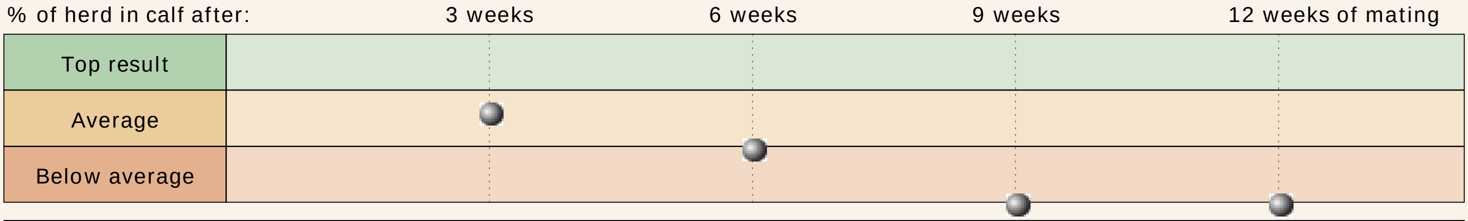
1 Overall herd reproductive performance

6-week in-calf rate
Percentage of cows pregnant in the first 6 weeks of mating

Your herd	67% (67-70%)	☆
Aim above	78%	

Empty rate
Percentage of cows not pregnant after 11 weeks of mating

Your herd	14% (12-15%)	☆
Aim for	6%	



2 Drivers of the 6-week in-calf rate

3-week submission rate
% of cows that were inseminated in the first 3 weeks of mating

Your herd	87%	☆☆☆
Aim above	90%	

Non-return rate
% of inseminations that were not followed by a return to heat

Your herd		
Aim above		

Conception rate
% of inseminations that resulted in a confirmed pregnancy

Your herd	53%	☆☆☆
Aim above	60%	

3 Key indicators to areas for improvement

Calving pattern of first calvers
Well managed heifers get in calf quickly and calve early.

Calved by	Week 3	Week 6
Your herd	81%	93%
Aim above	75%	92%
	☆☆☆☆☆	☆☆☆☆☆

Calving pattern of whole herd
Did late calvers reduce in-calf rates?

Calved by	Week 3	Week 6	Week 9
Your herd	57%	86%	97%
Aim above	60%	87%	98%
	☆☆☆☆☆	☆☆☆☆☆	☆☆☆☆☆

Pre-mating heats
A high % of well managed cows will cycle before the start of mating.

Your herd	73%	☆☆☆
Aim above	85%	

3-week submission rate of first calvers
Well managed heifers cycle early

Your herd	88%	☆☆☆☆☆
Aim above	90%	

Heat detection
A high % of early-calved mature cows should be inseminated in the first 3 weeks of mating.

Your herd	90%	☆☆☆
Aim above	95%	

Non-cycling cows
Treated non-cyclers get in calf earlier.

Treated	By PSM	Wks 1-3	Wks 4-6
Your herd	0%	0%	0%

Rating	What does it tell me?	What should I do?
☆☆☆☆☆	Top result	Ideal - keep up the good work!
☆☆☆	Average	Getting there - focus on getting the details right.
☆	Below average	Plenty of room to improve - seek professional advice.
	No result	Not enough information provided - seek help with records.

Performance after week 6
If you ran bulls after week 6 of mating, empty rate helps assess bull performance.

	Empty rate	
Your herd	14%	Seek advice
Expected	8%	

Behind Your Detailed Fertility Focus Report

Version 1.0

Report period: Cows calved between 17/06/10 and 23/12/10.
This was the most recent period with sufficient herd records that enabled an analysis to be completed.

Calving system: Seasonal
Your herd has been classified as seasonally calving because most calvings occurred in a single batch lasting less than 21 weeks.

Level of analysis: Detailed.
Your good record keeping means a detailed analysis was possible for your herd.

Report date:	01/04/11
PTPT:	BQCY
Herd Code:	6/114
Calvings up to this date requested for analysis:	01/04/11
No of cows included:	680
These cows calved between:	17/06/10 and 23/12/10
Mating start & stop date: (estimated from AI or rectal pregnancy test data)	25/10/10 - 04/01/11

Part A) Herd records cross check

Check that the herd records in the table are complete and correct.

2010/11	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total
No. of calvings		61	449	144	35								689
No. of AI matings					227	641							868
No. of aged preg tests								496	187				683
No. of non-aged preg tests								2					2
No. of cows culled or died			9	8	2	8	9	11	1				48

Part B) Notes on the calculations

Use the following notes to see how your results were calculated.

1 Overall herd reproductive performance

6-week in-calf rate

Your report has been based on the mating and pregnancy test results you supplied. The ACTUAL 6 week in-calf rate is shown for your herd.

Empty rate

The empty rate reported was based on the results of pregnancy testing. The range provides the lowest and highest likely estimate.

2 Drivers of the 6-week in-calf rate

3-week submission rate

677 cows had calving dates in the required range and 87% of these were submitted during the first 21 days of mating.

Non-return rate (1-24 days)

Non-return rate is not calculated when pregnancy test results provide an accurate estimate of conception rate.

Conception rate

839 eligible inseminations were used in calculating your herd's conception rate.

3 Key indicators to areas for improvement

Calving pattern of first calvers

161 cows with eligible calving dates were recorded as calving at less than 34 months of age. The calving pattern of first calvers was calculated from their records.

Calving pattern of whole herd

689 cows had calving dates that were eligible for this report.

3-week submission rate of first calvers

161 first calvers had calving dates in the required range and 88% of these were submitted during the first 21 days of mating.

Heat detection

242 cows at least 4 years old at calving had calved at least 8 weeks before planned start of mating and 90% of these were submitted during the first 21 days of mating.

Pre-mating heats

677 cows had calving dates in the required range and 492 of these had a pre-mating heat recorded.

Non-cycling cows

No cows were identified as being treated for non-cycling. If you did treat non-cycling cows, please supply records to ensure those cows are identified.

Performance after week 6

Your herd's empty rate and 6-week in-calf rate were used to determine the success of your herd's mating program after the first six weeks. If bulls were used after week 6 of mating, this gives an assessment of how well they got cows in calf.

Induced cows

No cows were identified as having induced calvings. If you did induce cows, please ensure that they are all identified.

Reproductive performance at LUDF and among 16 case-study herds[§] during 2009/10 and 2010/11 from InCalf *Fertility Focus* reports

[§]Case-study herds are located in the Oamaru and Winton regions. As with LUDF, they are involved with the 'Improving reproductive performance in large herds study'.

Performance indicator	Industry Targets	LUDF 2009	LUDF 2010	Case-study average 2009 (herd range)	Case-study average 2010 (herd range)
Overall performance					
6-wk in-calf rate (%)	78	74	67	63.8 (43-74)	63.8 (53-80)
Empty rate (%)	5-8	13	14	14.0 (7-31)*	13.3 (8-19)
Weeks mated	-	10.5	10.1	13.9 (11-16)	13.8 (11-19)
Drivers of overall performance					
3-wk submission rate (SR, %)	90	90	87	78.1 (63-92)	82.3 (69-93)
Non-return rate (%)	65	-	57	60.0 (54-70)*	54.5 (39-69)
Conception rate (CR, %)	60	57	53	46.3 (43-55)*	48.2 (35-63)
Managerial factors					
Heifers calved by Wk 3	75	92	81	68.8 (43-92)	74.1 (39-91)
Heifers calved by Wk 6	92	99	93	89.8 (73-98)	92.5 (75-98)
Whole herd calved by Wk 3	60	68	57	58.8 (46-75)	59.2 (43-77)
Whole herd calved by Wk 6	87	92	86	85.1 (72-100)	85.3 (76-95)
Whole herd calved by Wk 9	98	100	97	96.2 (89-100)	97.5 (94-100)
3-wk SR of heifers	90	93	87	79.6 (59-94)	83.2 (69-93)
Heat detection	95	89	90	84.1 (70-94)	86.1 (69-94)
Pre-mating heats (%)	85	90	73	-*	43 (40-46)*
Treated non-cyclers by PSM*	-	0	0	18.5 (13-24)*	18.9 (0-47)*
Treated non-cyclers in wks 1-3*	-	0	0	15.0 (14-16)*	8.6 (0-25)*
Performance gap >wk 6	-	5	6	7.0 (6-8)*	6.3 (1-10)

*Incomplete records

Reproductive performance at LUDF has improved substantially since its establishment (See SIDE paper) and although gains are still desirable, the level of performance being achieved is comparable or better when benchmarked against other herd datasets. This is especially so when considering that LUDF has a zero-induction policy, mates for 10 weeks only and hasn't used treatments for non-cycling cows in the last two years. One key factor in LUDFs improvement has been to establish and maintain a tight calving pattern; served well with an earlier start for heifers. Heat detection performance has also played an important part in achieving a high submission rate with acceptable conception rates.

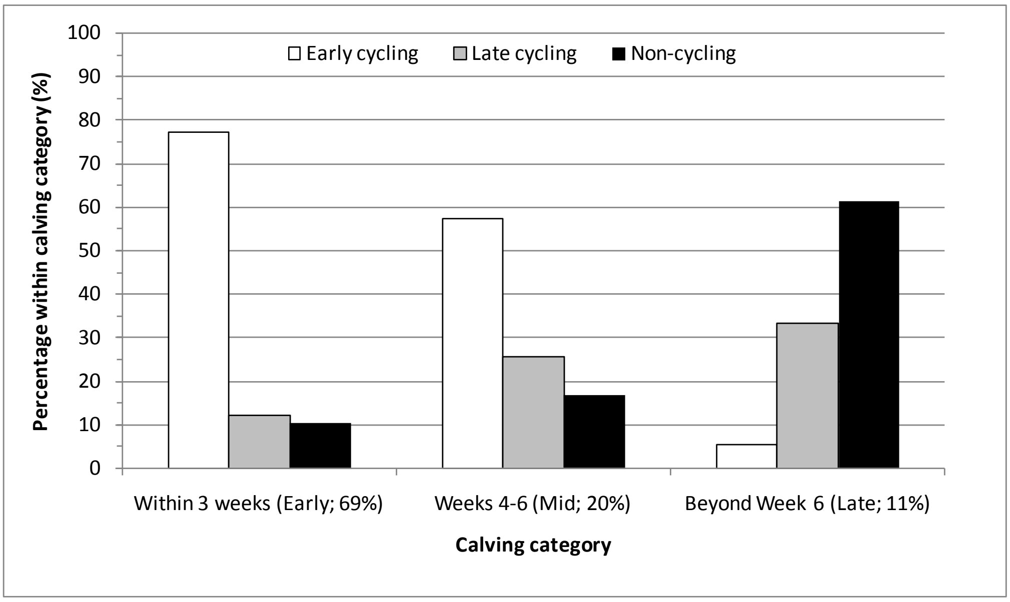


Figure 1. Cows (and heifers) that calve within the first 3 weeks at LUDF are much more likely to be having fertile cycles by the PSM than later calving groups.

Fig. 1 demonstrates that cows and heifers that calved in the first 3 weeks were not only less likely to be non-cyclers, they were also more likely to have been cycling for some time before mating started. The progesterone profiling trial done at LUDF last mating allowed us to differentiate between these early and late cyclers.

Early cyclers were more fertile than those that started cycling just before mating (late cyclers). Non-cyclers performed the worst of all. Reproductive outcomes of cycling status at the Planned Start of Mating (PSM) date are presented in the table below.

	Non-cycling	Late cycling	Early cycling
Number	116	116	434
% of herd	17.4	17.4	65.2
Calving to PSM (d)	46 ± 22	56 ± 18	69 ± 13
3-wk submission rate (%)	65.5	90.5	94.2
1st AB conception rate (%)	38.5	46.8	56.6
2nd AB conception rate (%)	48.5	53.9	52.8
6-wk in-calf rate (%)	53.1	69.6	76.4
Empty rate (%)	23.0	12.2	10.0

The 3-wk submission rate and conception rate to first AB increased incrementally from the non-cycling to early cycling states (see table). This effect translated to a similar pattern for the 6-wk in-calf rate, while the empty rate was lower. The conception rate to second AB was not different, probably because the non- and late cyclers had heats that were as fertile as the early cyclers by the time they were inseminated as returns.

Progesterone profiling showed that visual heat detection during the LUDF 2010 mating was performed to a high standard. Briefly, 90% of cows that the progesterone data said should have been in heat were inseminated (sensitivity = 90%). In addition, progesterone data supported 95% of all the inseminations performed (success rate = 95%).

Progesterone profiling also showed that all 2-7 d returns were because the first AB was performed at the wrong time (Fig. 2); 8-17 d returns were a mix of genuine short cycles and mistaken heats; normal length returns were mostly genuine return intervals, as were all of the longer 25-38 d return intervals. The latter result indicates prolonged luteal phase abnormalities, possibly as a result of early embryonic death (i.e. the cow did conceive but lost the pregnancy soon after), but there were only 8 cows in this category.

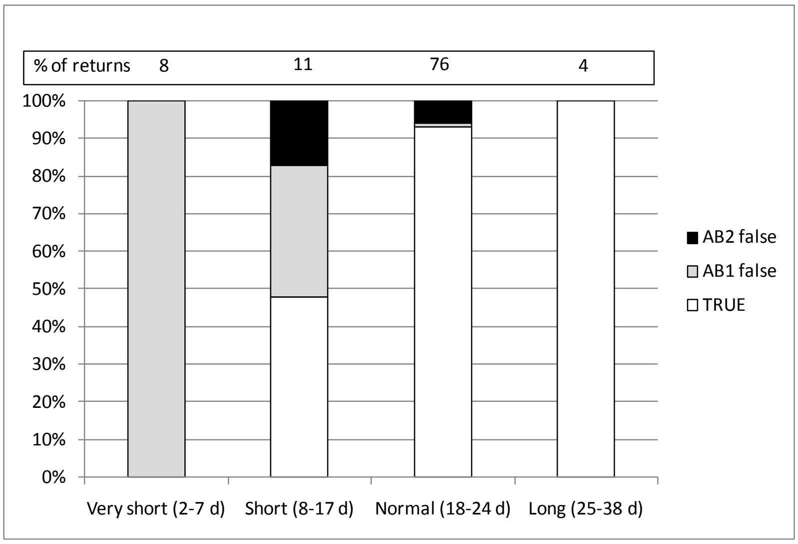


Figure 2. The proportion of return intervals to first AB (n = 202) and progesterone based diagnosis of whether these intervals were 'true', or falsely generated with a mistaken heat at the first or return insemination.

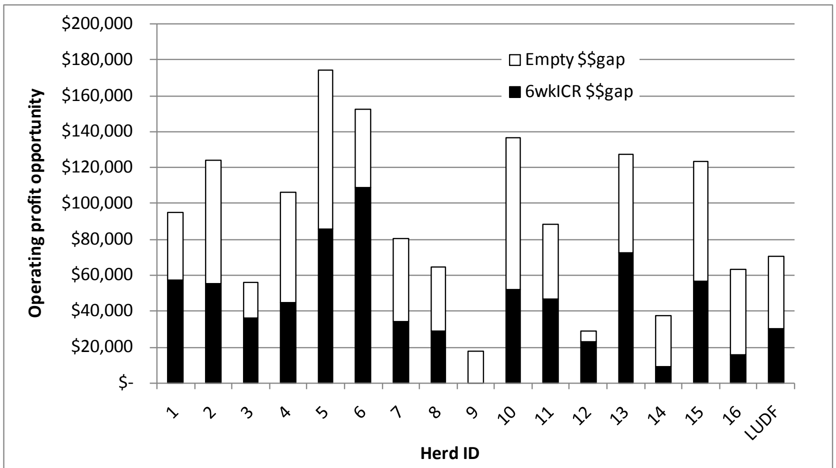


Figure 3. The InCalf estimates of operating profit opportunity if the 6-week in-calf rate and empty rate gaps between observed and industry target were closed, for 16 case-study herds and LUDF. Note that these figures don't account for costs of closing reproductive gaps, which need to be factored into actions for improving reproductive performance.

In large herds, the economic consequence of poor reproductive amounts to a 6-figure $$ opportunity loss (Fig. 3). How does your herd measure up? If you're not satisfied with your herd's performance and you are struggling to work out what your Fertility Focus report is saying, then seek help from an InCalf trained adviser (www.dairy.nz.co/incalf).

LUDF Budget 2010-11 Update

Lincoln University Dairy Farm		Budget				Predicted Actual 10 - 11			03/05/2011
Year ending May 31		160.0ha			2010 - 11			Difference	
Milk production		**Milksolids**		**1,810/ha**	**287,971**	**268,660**	**1,679/ha**	**19,311 kgms**	
Cows			660cows	4.15/ha	436/cow	667cows	402 /cow	35 /cow	
Staff	3.70	FTE's	178cows/FTE		77,830ms/FTE				
Income					$/kgMS	$/kgMS		$ change	
Milksoilds	$6.60/kgms	92%	1,900,609		*6.60*	*7.50*	2,014,950	114,341	6%
Dividend	$0.33/kgms	4%	91,740		*0.32*	*0.30*	83,400	- 8,340	-10%
Surplus dairy stock		1%	26,000		*0.09*	*0.53*	143,194	117,194	82%
Other stock sales		3%	58,813		*0.20*	*0.09*	24,838	- 33,975	-137%
		100%	**2,077,162**		***7.21***	***8.43***	**2,266,382**	**189,220**	**8%**
Stock Purchases			21,600				52,700	31,100	59%
Gross Farm Revenue			**2,055,562**	**12,920/ha**			**2,213,682**	**158,120**	**7%**
Expenses				$/cow	**2010 - 11** $/kgMS	**2010 - 11** $/kgMS	**Actual** $	$ change in expense	% change in expense
Administration			23,650	35.8	**0.08**	**0.08**	20,156	-3,494	-15%
Animal Health			45,636	69.1	**0.16**	**0.21**	56,597	10,961	24%
Breeding Expenses			37,434	56.7	**0.13**	**0.15**	41,437	4,003	11%
Electricity-farm			18,500	28.0	**0.06**	**0.07**	20,078	1,578	9%
Employment			198,276	300.4	**0.69**	**0.77**	206,125	7,849	4%
Grass silage purchased	300 kgDM/cow		65,340	99.0	**0.23**	**0.20**	54,253	-11,087	-17%
Silage making & delivery			17,183	26.0	**0.06**	**0.04**	12,014	-5,169	-30%
Replacement grazing & meal			120,878	183.1	**0.42**	**0.43**	116,154	-4,724	-4%
Winter grazing - Herd			125,355	189.9	**0.44**	**0.60**	161,021	35,666	28%
Nitrogen and EcoN			78,140	118.4	**0.27**	**0.31**	83,740	5,600	7%
Fertiliser & Lime			36,355	55.1	**0.13**	**0.11**	28,703	-7,652	-21%
Freight & Cartage			400	0.6	**0.00**	**0.00**	48	-352	-88%
Irrigation - All Costs			66,333	100.5	**0.23**	**0.21**	56,794	-9,539	-14%
Rates & Insurance			16,262	24.6	**0.06**	**0.06**	16,262	0	0%
Cropping			-	0.0	**-**	**0.00**		0	
Regrassing			15,040	22.8	**0.05**	**0.08**	22,641	7,601	51%
Repairs & Maintenance			52,500	79.5	**0.18**	**0.19**	51,331	-1,169	-2%
Shed Expenses excld power			8,200	12.4	**0.03**	**0.03**	7,041	-1,159	-14%
Vehicle Expenses			20,300	30.8	**0.07**	**0.07**	19,712	-588	-3%
Weed & Pest			300	0.5	**0.00**	**0.01**	1,490	1,190	397%
Accommodation allowance		3 houses	20,000	30.3	**0.07**	**0.07**	20,000	0	0%
Cash Farm Working Expenses			**966,082**	**1,464**	**3.35**	**3.71**	**995,597**	**29,515**	**3%**
Depreciation est			**117,500**		***0.41***	**0.41**	**110,000**		**-6%**
Total Operating Expenses			**1,083,582**		***3.76***	**4.12**	**1,105,597**		**2%**
Dairy Operating Profit			**971,980**	**1,473**	**3.38**	**4.12**	**1,108,085**	**- 136,105**	**14%**
DOP per ha			**6,109/ha**				**6,965/ha**	**- 855**	**14%**
Cash Operating Surplus			**1,089,480**		**3.78**	**4.53**	**1,218,085**	**- 128,605**	**12%**
Cash Surplus/ha			**6,848/ha**				**7,542/ha**		**10%**
				Budget	**2010 - 11**	**2010 - 11**	**May prediction**		

Electricity Ashburton

19th April 2011
Ref: 10/7 BR: BR
Lincoln University Dairy Farm

Dear Sirs

During my visit to your cowshed # 37581 I took the following voltage readings.

From the mains earth spike to:

	Volts	**Volts Transient**
Ground Outside		40.0 Electric fence leakage
Milk Room Floor		>>1.0 Electric fence leakage
Vat		4 & 5 Electric fence leakage
Milk Lift Pumps	OK	
Vacuum Pumps		60.8 VSD Noise
Plate Coolers	OK (off)	1.0 Electric fence leakage
Drench Pump	NA	
Drench	NA	
Drench Nozzle	NA	
Tit spray	0.5 (off)	
Tit spray nozzle	0.4	
Wash down Pump	OK	
Sludge Pump	OK	
Water Pump	OK	
Platform		0.964 VSD Noise
Pipe Work		1.0 Electric fence leakage
Exit Pipe Work		1.0 Electric fence leakage
Pipe Work	OK	
Backing Gate	OK	
Top Gate	OK	
Chains motor	OK	
Hot water Cylinders	OK (off)	1.0 Electric fence leakage

Step Voltages: 1m -1.5m apart

Across yard	0.2-10.0
Lead into Shed	10.0
Outside rail to floor	0.2-10.0
Where cows stand	OK
Where you stand	OK
Back rails to breast rail	NA
Lead into herringbone ramp	NA
Lead on to platform ramp	0.2-0.6 Electric fence leakage

The earth mass, as a whole, is used for the return paths of electrical currents. There are two main apparatus on a farm to utilise the earth as a return path. One being the main supply transformer, for parallel earth return from the main switchboard to the transformer neutral. The other being the electric fence unit (EFU) that relies totally on the earth mass as the return path back to the EFU from all the hot wire shocks, shorts and faults.

When this return current is flowing back to the units it will take the path of least resistance (the easiest path). If this return current encounters a piece of pipe work or concrete, the current may flow through it or them, if they are of lower resistance than the earth mass under or about them.

This current flow, at a joint or junction will produce a voltage across it. To alleviate this voltage, the different concrete slabs or pieces of pipe must be electrically bonded together to provide an uninterrupted return path to the supply unit. Additional bonding may be required from this bonded mass to the earth mass as a whole to prevent large "step voltages".

When conductors supplying power, run parallel to another conducting material (one that will allow power to flow), a voltage is induced into this material. Overhead power lines induce small voltages into the surrounding fences and earth mass. These voltages may be present in concrete water troughs.

High currents (as when an electric motor is starting), flowing through conductors that are running parallel to metal pipes, tantalised timber or other conducting material can and do induce transient voltages into these materials. For example if wiring to a pump is run on tantalised timber or pipe, when the motor is starting, a transient voltage will be induced into the pipe or timber. These transient voltages can be transmitted along to the stalls via the pipe or timber. Any suitably earthed material will be at a different voltage to this transient spike. If a cow completes a circuit between these two different points, this voltage will be applied to the cow resulting in a shocking experience for the cow.

Constant electric shocks to the cows result in numerous negative effects on the following: (i) milk production, (ii) physical condition, (iii) reproductive capabilities of the stock.

The integrity of the electrical system has to be maintained "shock free". There are three inputs:

i) The Supply Authority "Electricity Ashburton"(in Mid Canterbury) is responsible for the transformer.

ii) Registered electricians only are permitted to connect or alter permanent and fixed wiring.

iii) The owner/operator sees to the installation of the electric fence unit and responds to any change in animal behaviour that indicates voltage leakage.

NOTE: The Electrical Wiring Regulations specify that any electric fence unit earth may not be installed closer than ten metres from any protective earthing electrode.

Not more than one electric fence unit shall be connected to any electric fence.

Every electric fence system of conductors shall be so installed so that it is not liable to come into contact with any power or communication apparatus or wiring.

By careful bonding of all conducting and semi-conducting material eg. pipe framing, plumbing pipes and fixtures, concrete reinforcing mesh etc., stray voltages may be kept to a minimum. Unfortunately electric fence spikes and motor starting transients require extra ordinary amounts of earthing that satisfactory bonding becomes uneconomical and practically impossible. Therefore it becomes necessary to prevent rather than cure the problem. The electric fence spike may be cured by installing a battery backed up timer to switch off the fence unit whilst the cows are in transit to and from and during the milking. An additional portable unit may be required to keep other stock (eg. calves) fenced. To cure the motor transient spike problem turn all motors on before milking and leave them on (eg. waste water rather than have the pump switching on then off then on then off etc.).

Hydraulic motors on backing gates have no associated transient spikes. It is impossible to adequately insulate electric chains on backing gates so do not use them. In a rotary milking shed the platform motor should be stopped as infrequently as possible. To achieve this careful selection of gearing is required, or the installation of a clutch may be necessary.

The selection and installation of cabling for motors that stop and start throughout milking or that vary speed throughout milking should be done in conjunction with cable manufactures recommendations. For example if the milk lift pump motor starter supplier installs three core plus screen cable between the controller and the motor they want the electrician to also use similar type of wiring.

Remember 10% of your cows will feel a 0.36 volt shock.

<u>Problem Areas</u>

The manner in the electric return power, albeit shorts, faults and or shocks, is coming to the dairy shed metal-works.
The partially earthed bails rump rail.
The ineffectively earthed platform.
The way your variable speed drives have been connected to the motors.
The not-quite earthed yards pipe-works.

<u>Suggestions</u>

Shoot the electric fence energisers! Well at least ensure that the mains electric fence unit is turned off whilst the cows are in transit to and from and during milking. There are two easy ways of doing this

i) By purchasing a digital plug in timer with a battery backup (no need to reset the timer when the power goes off)

ii) By shifting the unit to the dairy and having your electrician wire a 3-pin plug through the vacuum pump starter so that when the starter is ON the fence unit is OFF.

As to your top gate unit, I humbly suggest it is WAY TOO BIG; 1 Joule of energy is capable of electrifying 10kM's of hotwire. The insulators on your top gate are all leaking way, way, way too much. This leakage power goes down into the ground and steel works. The same steel works the cows are being milked on. Ouch. Weld a 10mm bolt to the bail pipe work. Have your electrician run a 25mm flexible welding / battery cable (the more strands the better) from the switchboard to this new bolt to effectively earth out the bail area pipe works. When finished paint over the bolt and wire to prevent air getting at the connection that will cause rust to form. The 7 stranded 16mm existing earth wire is not good enough. I took it off the steel beam where it is now, cleaned up the joint then reassembled it; I only had a minimal improvement.

To the rump rail upright please weld a strip of 20mmX5mm flat galvanised steel. Run it down the wall, across the floor and through the platform skirt. We can now bend it up and weld it to the skirt support box section steel. This (the box section steel) is now our connection point to the main earth. Take the photos I left to your engineer and have them make at least three of the sliding earths. They can be fitted to the pedestals opposite each other and then have their welding cables bolted back to the box section steel. The power that used to flow from the platform to the vat via feet, teats and milk will now flow through the brass sliding connection, its welding cable through the box section steel across the floor through the rump rail and back to the switchboard through our new welding cable. This may be the long way round but it will be easier for the power to flow so it will go that way.

Now Peter the real PC one for Brian Please get and electrician to reconnect your variable speed drives just the way the book says. The stipulations / statements from the manufacturer are in their booklet for a very good reason, IF they are not adhered to there will be radiated noise problems.

Your cows are feeling this problem. With your vacuum pump you need an EMC gland at the motor and a saddle clamp at the starter / drive end. The platform drives are a bit trickier. ***ONE*** *way would be to fit a lockable isolator (complete with padlock, to fulfil the regulations) before the starter and shift the overloads right up to the bottom of the starter, all in the switchboard. Run the screened cabling from the overload units straight to the motors. Connect the motors with the EMC glands. Scrape the paint from the switchboard back panel and use copper clamp saddles just below the over-load units. The protective earth wire (10mm or at least twice as big as the phase conductors) can be run along side of the screened cabling but connected to the earth bar in the switchboard and motor frame just as per the norm.*

SOME electricians have difficulty in separating what is a protective earth (one that will blow the fuse if there is a fault) and a radio frequency screen (the copper woven braid that goes round the wire, {like your TV co-ax screen})

There is a new “code of practice” just being published worth a quick look, here is the link,
http://www.rsm.govt.nz/cms/pdf-library/policy-and-planning/current-projects/emc-cop-for-power-drive-systems-14-december-2010.pdf

Get your electrician to approach the drive manufacturer and ask of them how to quieten down their drives.

Yours faithfully

Brian Rickard
ELECTRICAL INSPECTOR

Where has the Clover Gone?

LUDF has normally observed good levels of clover in the pastures – anecdotally in the vicinity of 25-35% of the sward through the summer. This clover has contributed both high quality feed and (as in the Nutrient Budget that follows) provides additional nitrogen via fixation.

The clover content in the pastures at LUDF this season has been almost non-existent, although some clover is now reappearing in 'ungrazed' areas such as the area surrounding the soil pit (grazed until March 2009 then fenced and mown). Monitoring of Clover Root Weevil adults showed low levels in the 2009/10 summer, followed by rapidly increasing numbers this spring.

The following material is a combination of input from Dr Dave Chapman, DairyNZ, Dr Ants Roberts, Ravensdown, Mark McNeil, AgResearch, Graham Kerr, Agriseeds and the LUDF management team.

Clover Root Weevil - North Island experience

What is the clover root weevil?

The adult is a speckled brown weevil, up to 6 mm long, that lives for two months or more. It is a nocturnal feeder that hides at the base of the pasture during the day. Adults and larvae are present in the pasture all year round.

In spring adults emerge from mid-October through to mid-December, and in autumn they emerge from February until April.

A single female may lay up to 3000 eggs in good soil moisture conditions, but in dry conditions far fewer eggs are laid and there is a very small larval summer/autumn generation.

Adults feed only on clovers, particularly white clover. They prefer seedlings and so disrupt natural regeneration of clover. Adult feeding leaves distinctive U-shaped notches on clover leaflets. The larvae severely damage clover nodules, roots and stolons, and so reduce N fixation and plant reserves, and induce root diseases. Thus, the poor old clover gets a double whammy above and below ground. Severe damage causes loss of clover from pastures, but more commonly clover persists with less vigour and fewer nodules.

In the North Island, the initial CRW attack resulted in almost a complete loss of white clover in pastures. This lasted 2-3 seasons, before clover returned.

White clover levels in the Waikato where CRW have been for over 10 years now appear more consistent, but at lower levels than before CRW. This situation is helped by the release of the parasitoid wasp.

The affects of CRW in Canterbury will likely be different - with irrigation and hence much more reliable clover growth year to year.

Managing clover-based pastures in CRW-affected areas reduce stress on clover:

Strong white clover can better tolerate, and recover from, CRW attack, so good grazing management is important. CRW attack makes the clover more fragile, so avoid trampling, pugging and overgrazing to assist clover survival.

White clover doesn't like shading and is sensitive to direct UV radiation on its stolons, so recommended grazing strategies include:

Consistent grazing during spring and summer:

- Aim for good post-grazing residuals (1480 kg DM/ha or 7 RPM units); and
- Identify surplus cover early and cut for silage to prevent clover being swamped by grasses.

N fertiliser use:

If white clover is lost from a pasture, extra N fertiliser will be required to compensate for the loss of fixed N from white clover. As a minimum, applying N fertiliser at rates of 20-30 kg N/ha in spring may improve the vigour of both clover and grass, increase clover persistence in summer and enable an autumn recovery of clover if the summer generation of larvae is small.

Pasture renovation:

The following are options for establishing highly productive pastures in CRW areas:

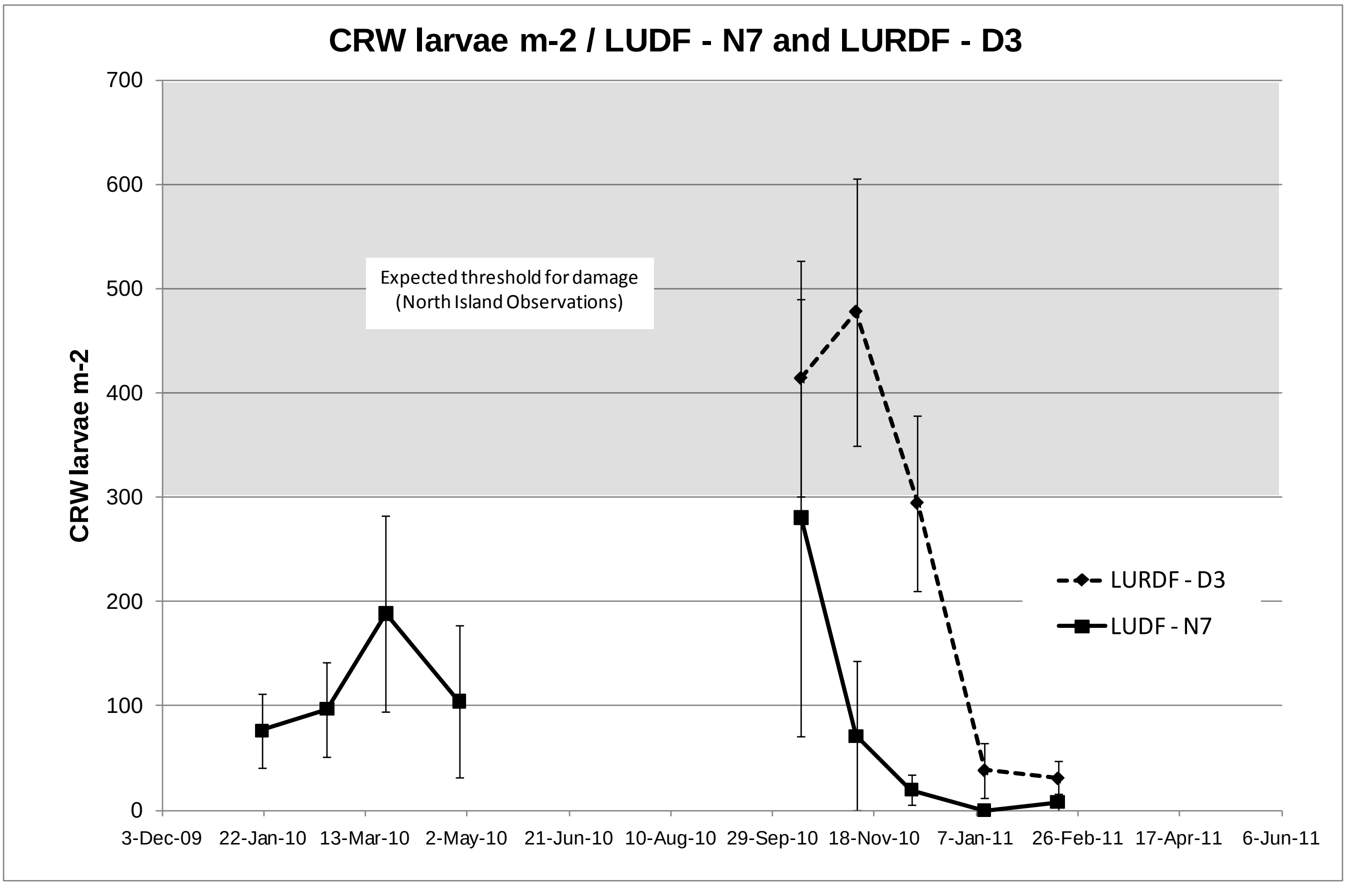
1. Cultivation following herbicide spraying – This will reduce adult numbers in the paddock but only reduces larvae numbers by about 60 per cent, so that while clover will establish well, seedling roots and nodules will soon be attacked.
2. Selective removal of clover from pastures – Three months before sowing apply Dicamba or Versatill. This will reduce larval numbers by 95 per cent, and after three months new pastures can be sown after cultivation or by direct drilling after herbicide.
3. Reduce adult numbers with insecticide – Lorsban 750 WG is registered for use against CRW and works well against high adult populations but does not kill existing larvae.
4. Three month fallow – A fallow period between herbicide spraying and sowing new pasture prevents damage as both adults and larvae are gone.
5. Summer crop – Rotate the worst affected areas through a summer crop such as a forage maize or brassica. This will remove many damaging pasture pests, including clover root weevil, nematodes and plant diseases, from the soil and enables the establishment of vigorous healthy pastures.
6. Use highly stoloniferous medium, or medium-large leaved clovers in your seed mix [rather than large leaved types]. They are more tolerant of CRW feeding.

   Barrier strips created by spraying with insecticide along fence lines will not prevent re-infestation as adult weevils can fly in during the following spring.

Clover Root Weevil – LUDF

- Clover root weevil (CRW), *Sitona lepidus*, was first detected on the Lincoln University Dairy Farm in late 2008, and regular monitoring commenced in May 2009.
- CRW adults are present all year round. New generation CRW adults emerge from November onwards, peak in late February, then decline over winter as age-related mortality occurs.
- The damaging CRW larvae appear to peak in late winter-spring and again in autumn (see graph below). This suggests there are two CRW generations per year, as in the North Island. Over winter, adults continue to lay eggs whenever it's warm enough, so larval numbers build-up, only moving through to the pupal stage when soil temperatures are warm enough. They then emerge as adults in late spring.
- North Island data have shown that typical winter larval population levels of 300 larvae m^{-2} can reduce Waikato white clover yields by 35% (1000kg DM/ha) annually, with greatest losses occurring in spring.
- CRW flights can occur from mid-December through to April. This means it is difficult to control the adult stage with insecticides, as chemicals only provide short term control before reinvasion of pasture occurs.
- CRW larval populations at LUDF had only reached moderate levels by winter 2010, though they have since built up quickly.

- In relation to the rapid decline in white clover observed at LUDF, larval feeding damage would have compounded other problems, such as giving entry to root diseases during a wet winter. When combined with the pressure of animal grazing, larval feeding could have contributed to the clover loss.
- CRW adult populations on the farm have increased since monitoring commenced, but are still small compared to peaks of over 100 adults m^{-2} observed in Waikato prior to biocontrol.
- The CRW biocontrol agent *Microctonus aethiopoides* has been released in Canterbury, both at Rotherham and Rakaia Island, where the detected CRW populations were big enough to support early releases. Establishment has been confirmed at Rotherham, but not yet at Rakaia Island.
- AgResearch will make an additional biocontrol release in the vicinity of Lincoln in early 2011, unless sampling shows its arrival through natural dispersal from Rakaia Island is imminent.
- Monitoring on the farm will be conducted throughout 2011 with larvae and adults sampled at regular intervals. This will provide important information on biology and management of CRW in Canterbury.



CRW larval densities measured in paddock N7 – LUDF and D3 - LURDF (Research Dairy Farm). Larval numbers build-up over winter to peak in spring. Error bars represent the 95% confidence interval.

Where has the clover gone at LUDF? Ryegrass, competition, grazing and nitrogen

David Chapman, Principal Scientist, DairyNZ, Lincoln

Background:

Why is it so hard to keep a high proportion of white clover in our dairy pastures? The benefits of white clover are well known: it offers excellent quality feed for milking cows, grows better in summer when ryegrass often struggles even when there is plenty of water, and (because it is a legume) it can fix some 'free' nitrogen from the air.

For these reasons, we've traditionally considered that having 30% of thereabouts of total annual pasture production coming from clover to be a good thing. However, it is now difficult to find pastures on NZ dairy farms, including LUDF, with that amount of clover. Why?

To address this, we should draw some comparisons between clover and perennial ryegrass, because these two species are almost always sown together in new pasture. While the ryegrass/white clover pasture is our 'ideal' mixture, the reality is that the ryegrass and clover plants are in constant competition with each other for the things that all plant species need in order to grow: light, water and nutrients. The winner of this competition will eventually dominate the pasture. The way cows graze the pastures, and the way we manage the pastures, influences the competitive advantage of the respective species, and therefore the pasture composition.

When we review what is known about the **competitive ability** of ryegrass and white clover, the score card looks something like this:

Competition for light:	Winner = ryegrass, loser = clover
Competition for water:	About even (perhaps a slight edge to ryegrass)
Competition for nitrogen:	Winner = clover (it fixes its own N) ***but N fertiliser negates this***
Competition for P and K:	Winner = ryegrass, loser = clover

Therefore, 'home-ground' advantage for white clover is on soils that are low in N but high in phosphorus (P) and potassium (K), where pastures are kept short all the time so the grass does not 'shade out' the clover, and no N fertiliser is used. How often do we come across these situations?

The **grazing behaviour** of cows on clover and grass also tells us a lot about the way the battle between the species plays out. If given a free choice between eating as much clover as they would like or as much ryegrass as they would like, cows almost always take about 70% of their daily intake from the clover, and 30% from the grass. That is, they ***prefer*** clover, but will not eat ***only*** clover. They always eat some grass too, even though they cannot eat as much grass as clover in a day, and the grass is (to our way of thinking anyway) of lower quality than the clover.

This tells us that cows **do not** graze in ways that would maximise their daily energy intake: if this was their motivation, they wouldn't eat any grass at all, only clover. The grass obviously adds something of value to the diet from the cows perspective – possibly fibre, which (among other things) helps temper the amount of ammonia building up in the rumen when the high protein content of the clover is digested. Ammonia has to be removed as urea in the urine, which uses up energy and concentrates the N in the urine hence potentially increasing nitrate leaching from soils.

If there is a high proportion of clover in the pasture, this will more closely match the natural grazing preference of cows, increase their intake (particularly their energy intake), and increase milk solids. Grass dominant pastures may require cows to graze for longer to obtain their daily energy requirement, and could compromise our ability to maintain intakes and desired round length if grass quality is particularly poor.

Implications for LUDF?

What might this all mean for a farm like LUDF where the low clover content in pastures (estimated to be less than 10% of dry matter this year) is causing concern?

There is no doubt that the soils and climate of LUDF can support good clover growth. The graph in Figure 1 contains results from 2002-03, and shows clover content peaking at 60% of pasture dry matter in summer in the control treatment (no N fertiliser applied). Interestingly, the effects of N fertiliser were already apparent, in the grasses ability to suppress some clover growth where additional N fertiliser was available.

Trials conducted at Ruakura by Sharon Harris and Dave Clark in the mid 1990's showed that the optimal amount of clover in the diet of cows for high milk solids production is around 50% of DM. This would only be achievable with zero N fertiliser, which would reduce total pasture growth. Clark and Harris looked at this trade-off between clover content, total pasture yield and pasture quality using a farm system model. They estimated the operating profit for a farm consuming 16 t DM/ha per year with 20% white clover as a baseline, then worked out how much more, or less, the total pasture yield would need to be to give the same operating profit if clover content fell below, or rose above, 20%. The results are in Figure 2. If clover content fell to 10%, then total pasture yield needed to increase by 15% to compensate for the loss of pasture quality and hold the same operating profit: that is, another 1.8 t DM/ha consumed was required. Assuming an extra 10 kg of pasture DM is consumed for every kg of N fertiliser applied, this is the equivalent of 180 kg N fertiliser per hectare. Figure 1 shows that this would cause the clover content to fall further.

LUDF has used about 200 kg N/ha in recent years and this theoretically is one factor holding clover content back to 10% or less of annual dry matter. Visual observations however (at least until this time last year) indicated late spring / summer clover content was probably in the region of 20-40%. LUDF's use of N will, however, produce more total dry matter and give more control over seasonal pasture growth compared to a system with less N and more clover. But it may not produce more total milk solids.

What can be done about this?

The information above provides good reasons for having a strong clover presence in the pasture, but can we have our cake (clover) and eat it too? Not easily, if we grow ryegrass and clover together, use a lot of N fertiliser, and place a high premium on late winter – early spring feed (this is when clover growth rates are quite sluggish). Sowing a mix of both medium- and large-leaf clover cultivars known for their high plant density should give the clover plants a better foothold in the pasture. Keep P levels in the soil up, and watch pH levels (low pH is more harmful to clover than ryegrass). Don't take silage from a 'good clover' paddock. Don't expect too much!

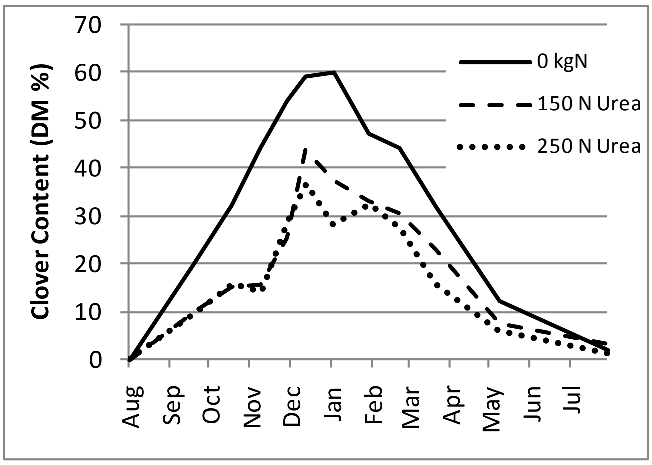


Figure 1: Percent clover in pastures at LUDF in 2002-03, with different N fertiliser treatments

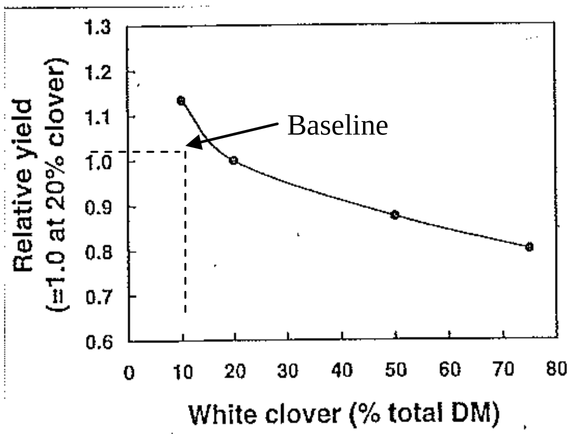


Figure 2: Change in total pasture yield needed (on left-hand axis) to maintain operating profit when clover comprises between 10 and 70% of pasture dry matter

Summary score card: Ryegrass and Clover

	Ryegrass	**Clover**	Comments
			Advantage to clover
How quickly can cows eat each species?	100	~160	This is the relative short-term intake rate, if eating either pure ryegrass or pure clover, i.e. cows can consume clover 60% faster than ryegrass during meal bouts.
How much dry matter will cows eat per day?	100	~ 120	This is the relative ***daily intake***, if eating a diet of pure ryegrass or pure white clover i.e. cows eating clover eat about 20% more dry matter per day.
How does the quality compare?	100	~ 110	This is the relative ***digestibility*** of the two species – i.e. clover is on average about 10% better than ryegrass, ***but*** ryegrass fluctuates a lot more during the year than clover.
How much milk will they produce?	100	~ 130	This is the relative ***milk solids*** per day, if eating a diet of pure ryegrass or pure white clover, i.e. cows eating clover produce about 30% more milk solids per day.
			Deuce
Which do cows prefer?	30%	70%	This is the % of their daily intake ***if*** offered a free choice between them. Good for clover because it reflects the cows view of 'quality' (they have a clear partial preference for clover); bad for clover because ***cows will graze it harder than ryegrass, if they have a choice.***
			Advantage to ryegrass
How much leaf is lost when cows graze?	Most – but some remains	Virtually all	Depends on grazing residual, but ***ryegrass generally has a head start in regrowth***. Even more so if cows actively select for the clover.
How do they respond to N fertiliser?	***Strongly***	***Not at all***	Head start + N = trouble for clover.
How well do they compete for light?	Strongly	Moderately	Head start + N + tall pastures = extra trouble for clover.

Simplified Nutrient Budget

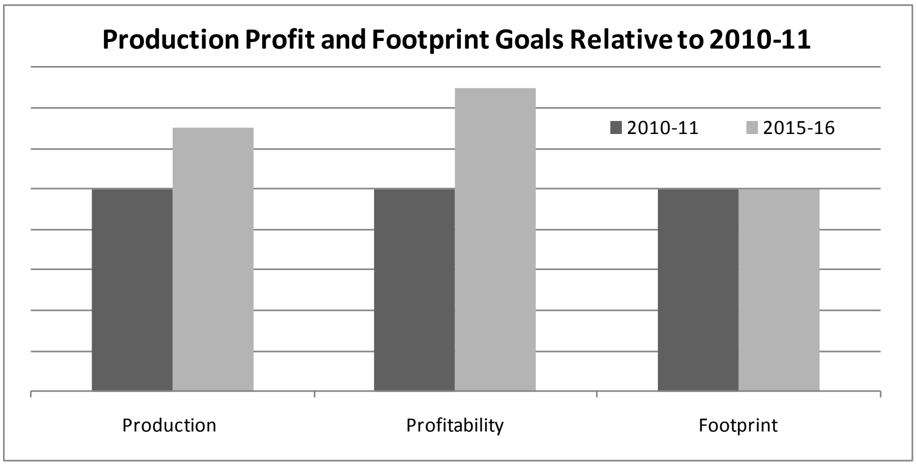
	2010/11 Plan	**2009/10 Plan**	**2009/10 – Actual**	**2008/09 Actual**	**2007/08 Actual**
Inputs					
Fertiliser	249	175	185	175	163
Atmospheric / Clover N	76	108	121	131	139
Irrigation	13	13	13	13	13
Supplements	48	42	18	18	44
Outputs					
Product	126	122	120	120	125
Atmospheric	94	69	101	74	80
Leaching /Runoff	22	17	38	18	26
Immobilisation	144	130	78	128	128

Precision Dairy Farming at LUDF – the focus for 2011 – 2015

The revised strategic objective of LUDF for 2011-2015 is:

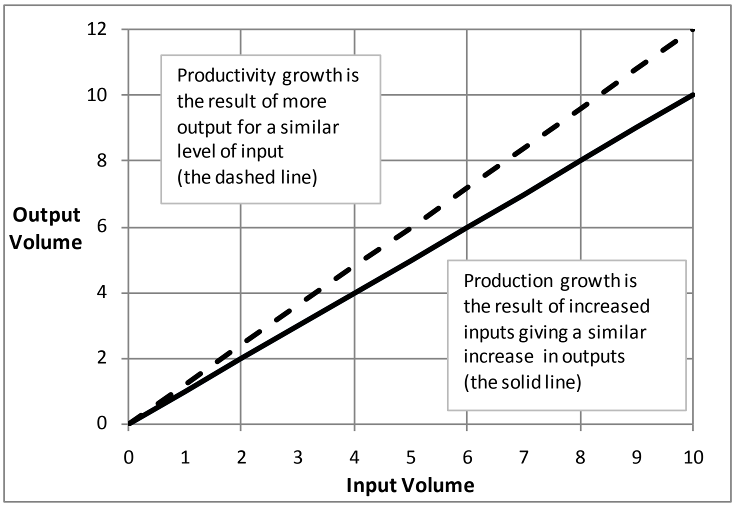
"To maximise sustainable profit embracing the whole farm system through:

- *increasing productivity;*
- *without increasing the farm's total environmental footprint;*
- *while operating within definable and acceptable animal welfare targets; and*
- *remaining relevant to Canterbury (and South Island) dairy farmers by demonstrating practices achievable by leading and progressive farmers.*
- *LUDF is to accept a higher level of risk (than may be acceptable to many farmers) in the initial or transition phase of this project.*



Some Definitions:

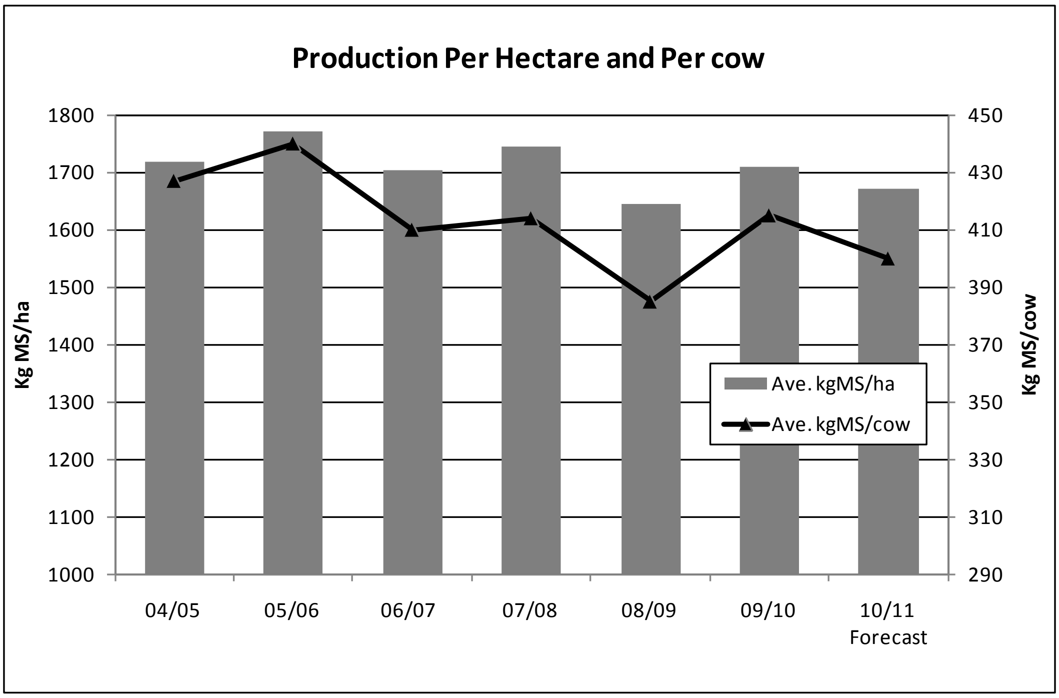
- **Sustainable Profit:** Profit that can be consistently achieved over both the short and medium term. Implies appropriate level of expenditure occurs in all areas of the farm to maintain the farm assets and its future productivity, and ensure appropriate environmental protection / mitigation is occurring.
- **Productivity:** Ratio of output from a given level of input. Increasing productivity implies increased output for a given level of input.



- **Footprint:** At the widest level could include water and nutrient use efficiency; total land area for replacements, wintering, supplements etc; greenhouse gas emissions; nitrate leaching, etc.
- **Animal Welfare Targets:** The Animal Welfare (Dairy Cattle) Code of Welfare 2010 identifies 20 minimum standards, while the dairy industry has developed 'good animal husbandry guidelines for dairy cattle'. The emphasis for LUDF is achieving best practice. For more information on both the code of welfare and best practice guidelines visit www.dairynz.co.nz.

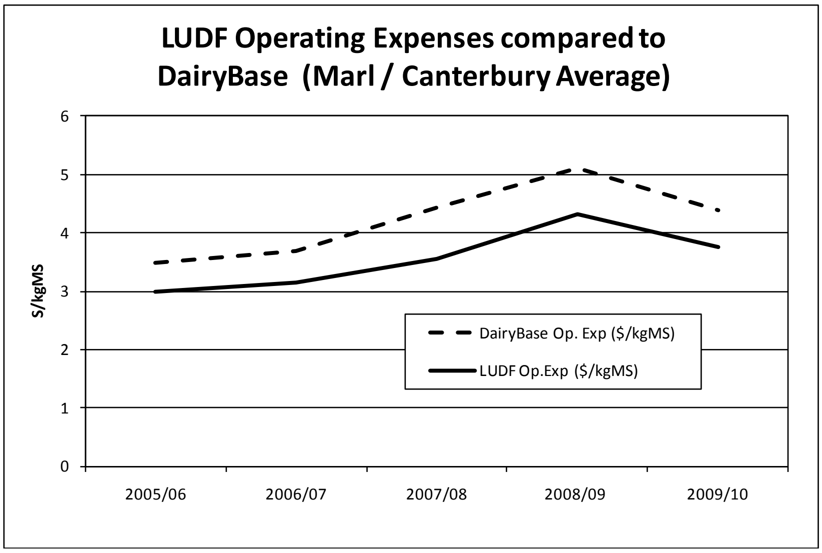
Historical production per hectare and per cow at LUDF

While production at LUDF has averaged approximately 1700kgMS/ha/year over the past seven seasons, production per cow has fluctuated from 385-440 kgMS/cow, reflecting a number of factors including stocking rate and the conscious decision in 2008/09 season not to feed autumn silage at the payout / cost of silage at that time.



Cost Control - Farm Working Expenses at LUDF

The farming system to date at LUDF has been primarily a simple, reliable pasture based system producing predictable profits through good cost control and a degree of dilution of costs through high production. It has primarily delivered results that place it within the top 1-2% of dairy farms in both high and low payout seasons. The comparison of Farm Working Expenses (FWE) between LUDF and the Marlborough / Canterbury DairyBase average indicates LUDF operates the farm at a lower cost than the average of the farms contributing to DairyBase. (Note the number of farms in the DairyBase dataset below ranged from 20-90).

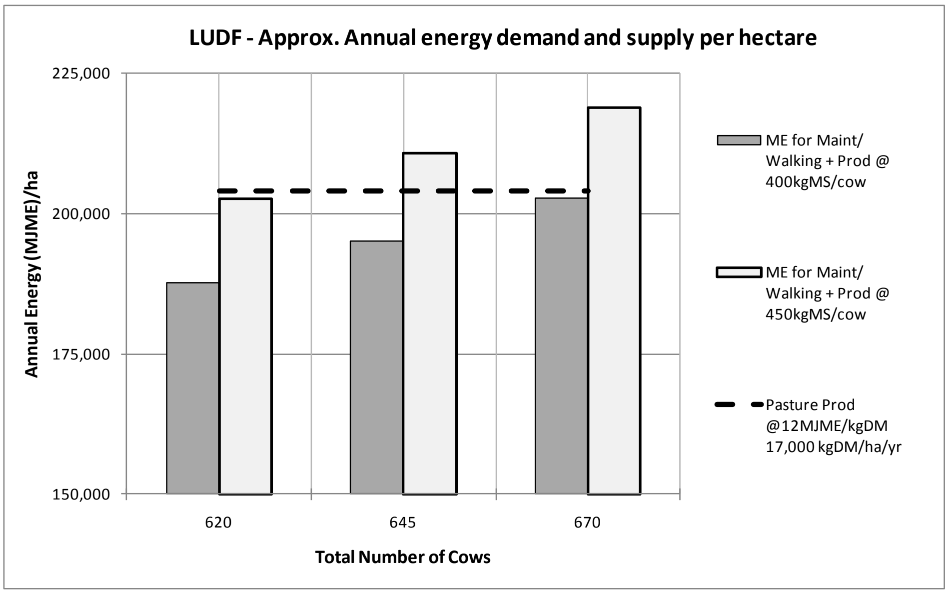


Calculating possible milk production from available energy at LUDF

The graph below considers the pasture supply at LUDF expressed in mega-joules energy per ha (MJME/ha) and the amount of energy required for total cow numbers ranging from 620 – 670 cows, at 400kgMS/cow or 450 kgMS/cow.

The horizontal, dashed line is the pasture supply assuming 12 MJME/kgDM and 17,000 kgDM/ha. This line shows a pasture supply of this level will not support production of greater than 400kgMS/cow with a stocking rate of 670 cows. At the left hand side of the graph, the same volume of pasture will theoretically produce 450kgMS/cow at the reduced stocking rate of 620 cows. The calculations are simplistic, accounting for maintenance, walking and production, but not CS loss / regain, seasonality of supply or losses associated with harvesting and feeding silage, or pregnancy (though this is a small impact for the first 6 months of pregnancy).

LUDF wants to increase productivity to increase production and profit. Assuming higher per cow production can increase productivity and therefore profit, the farm either needs to grow and or import additional feed, or lower the stocking rate to redirect some feed from maintenance to milk production. LUDF intends both increasing its supply of 'home grown feed' thus raising the horizontal line of pasture supply, and also improve the productivity or efficiency of feed conversion into milk.



Precision Dairy Farming – Key aspects of the proposed system

The following points outline the proposed system being planned for LUDF for 2011-2015. It began as an opportunity highlighted by Linear Programming (computer modelling based on optimisation of resources and minimisation of constraints) and has subsequently been evaluated and discussed with key scientists and staff within SIDDC, South Island farmers and interested parties. The proposal is still under development and presented here as part of the development and feedback process before the SIDDC Board will determine the strategy for next year.

1. Profitability remains the goal, productivity is the emphasis to increase production, dilute costs and achieve the sought after increase in profit.
2. Stocking rate may provide room for greater optimisation at LUDF to use as much of the available pasture (from the milking platform) for milk production and as little as required for maintenance, growth and condition score gain. Calculations suggest 5-10% fewer cows (with the current feed supply) could give increased production per cow and increase production per hectare.
3. Continual improvement in the genetic gain of the average herd in NZ suggests if feed supply is approximately static, farms should reduce herd size by 1 cow per 150 cows per year. For LUDF, this means about 4.5 cows per year, over 5 years is 22 cows less than we had, all other aspects remaining the same.
4. Previous research at varying stocking rates shows while stocking rate is important, how the system is managed is of greater importance to overall profitability. Lower stocking rate systems require greater skill in pasture monitoring to maintain quality and achieve high intakes, and thus production per cow. Increased attention to detail, moving from management of averages to consideration of the range and minimum targets will form a key part of LUDF's change in strategy to optimise stocking rate and increase productivity.
5. In particular consideration will be given to running multiple herds to target groups of animals by age group or condition score that may need more emphasis while others (such as mature cows) may be able to tolerate a greater range of conditions. Examples could be to improve CS, reproductive performance and cow survival through reducing pressure on younger or subordinate cows.
6. Herd structure will change, including increasing the age spread, to give higher lifetime productivity, reducing the rearing costs and feed required for young stock. High rates of replacement animals entering the herd reduce total productivity due to their lower first year performance.
7. Animal selection for 2011-12 and beyond is considering BW and PW, age, calving date and SCC to retain those animals most likely to contribute high milk production to LUDF.
8. Liveweight targets are required for all animals from weaning onwards and the farm management will consider minimum targets are adhered to, rather than averages. All mature cows wintered need to achieve CS of 5.0 – 5.5 and all R2 and R3 animals need to calve at 5.5 – 5.8 CS. The intention is to limit the amount of 'lactation feed' from the platform required for growth or CS gain by ensuring animals calve at appropriate condition score and percentage of mature liveweight.
9. LUDF has proven it can produce high levels of high quality pasture. Further increases in quantity are sought – without decreasing quality – through more attention to fertiliser inputs, increased pasture renovation (including stitching into weaker areas within paddocks), variable irrigation etc – a precision agriculture focus to increasing pasture production.
10. New strategies may be needed to accommodate spring surpluses and the changes in pasture dynamics that naturally decrease pasture quality – to ensure total energy intakes are achieved and future quality maintained.

11. A consequence of the slightly lower stocking rate is potentially a longer period when the farm is growing more pasture than it needs, opening the window for more pasture renovation to increase the rate of pasture renewal (15% per year rather than 10%, or 7 year rather than 10 year cycle)
12. The re-grassing programme will consider strategic use of diploids and tetraploids, flowering date and species. Paddocks to be re-grassed will be based on highest potential to increase energy yield, rather than necessarily the lowest performing paddocks.
13. Increased use of mitigation tools including eco-n will assist retention of nutrients for future pasture production and thus efficiency / production gains.
14. Discussion on the likely risks and appropriate mitigation strategies are being developed such as overcoming the traditional 'spring dip' observed at LUDF and replicated in modelling as likely to be a result of reduced total energy intake.
15. Other aspects: This proposal is seeking feedback from interested farmers and industry personnel to continue refining the refinement identified above. Feedback is likely via the LUDF farm walk notes on the SIDDC website during the season; in the interim, please provide feedback directly to SIDDC or via any of the SIDDC partners staff.

Possible Production, Expenses and Profit at 645 and 620 cows:

	2010-11	**Option 1**	**Option 2**
Number of cows	**669**	**645**	**625**
Stocking Rate	4.18	4.03	3.91
Decrease in Stocking Rate		3.6%	6.6%
Production per cow	402 kgMS	450 kgMS	475 kgMS
Production per hectare	1680/ha	1815/ha	1840/ha
Increase in Milk Production per ha		135/ha	162/ha
		8.0%	9.6%
December average cow LWT	458	470	480
Liveweight per ha (est)	1915	1895	1875
Comparative Stocking Rate (kgLWT/t DM) will therefore be similar			
Total FWE	$996,000	$1,041,000	$1,028,000
Dairy Operating Profit	$1,186,000	$1,292,000	$1,334,000
Profit Increase		$106,000	$148,000
		8.9%	12.5%

Note – if FWE can be held, profit increase of $150-180,000 available, or 12-15% increase from 10-11.

Other points of note:

1. The farms total environmental footprint is also a key component of the revised system at LUDF. Research to be conducted through P21 over the next 5 years will aid the calculation of the farms historical wintering footprint and footprint over this period, enabling comparison with the footprint under precision dairying. It is expected that the number of cows wintered is likely to be a key driver in the total winter footprint, hence holding or reducing the total stock required should hold or lower the farms winter footprint. Footprint calculations will also be required for the replacements and any additional feed (including grass silage) purchased for LUDF.
2. Protecting the pasture base through wet periods will become an even greater focus for achieving the productivity goals. A slightly smaller herd will provide a little more tolerance when standing off on the available yard space.

3. Average Liveweight is expected to increase a little over time, but the farm is not anticipating running 'big cows'. Part of the increase is reflecting the desire to increase lifetime productivity and thus have a more mature spread of cows within the herd.
4. Total farm costs should be lower as fewer cows are run, but initial budgeting has increased costs by around 5% to allow for more regrassing and additional fertiliser.
5. LUDF has identified a number of areas that will need to change to implement this system. It won't be easy, but it should be achievable. The first task for LUDF is to show it is achievable, and then to find the simple ways of doing this for other farmers to replicate.
6. Small teams of people with key areas of knowledge will focus on aspects such as maintaining pasture quality and residual management, appropriate feeding strategies for young and light cows, target liveweights, re-grassing policy, fertiliser use and mitigation etc.
7. It is in large part moving away from managing the herd based on averages and a single herd aspect, to running multiple herds and ensuring minimum targets are adhered to. For example, minimum condition score at calving, with a tight spread of condition scores, achieving minimum targets for youngstock at critical periods and on entry to the herd.
8. More control is likely over cow condition, feeding levels and pasture residuals with split herds but will require more staff time in the paddock. This is likely to be achieved by automating cups off in the shed (ACR), a common use of technology in many cowsheds, but not one in place to date at LUDF. These come with a cost (as well as other benefits), and become an example of the consequential expenditure of changing farm systems.

Lincoln University Dairy Farm - Farm Walk notes

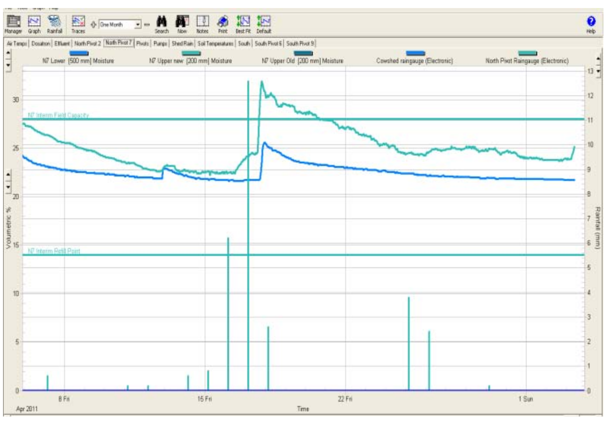
Tuesday, 3rd May 2011

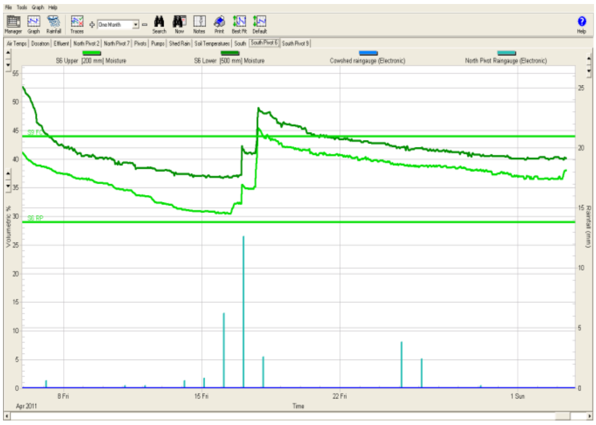
CRITICAL ISSUES FOR THE SHORT TERM

1. **Keep grazing residuals to the desired 7 - 8 clicks**
2. **Continue Mg supplementation**
3. **Closely observe milking cows for mastitis**
4. **Maintain round length above 34 days**
5. **Monitor BCS and act accordingly to achieve the targets**
6. **Track actual & budget average pasture cover**

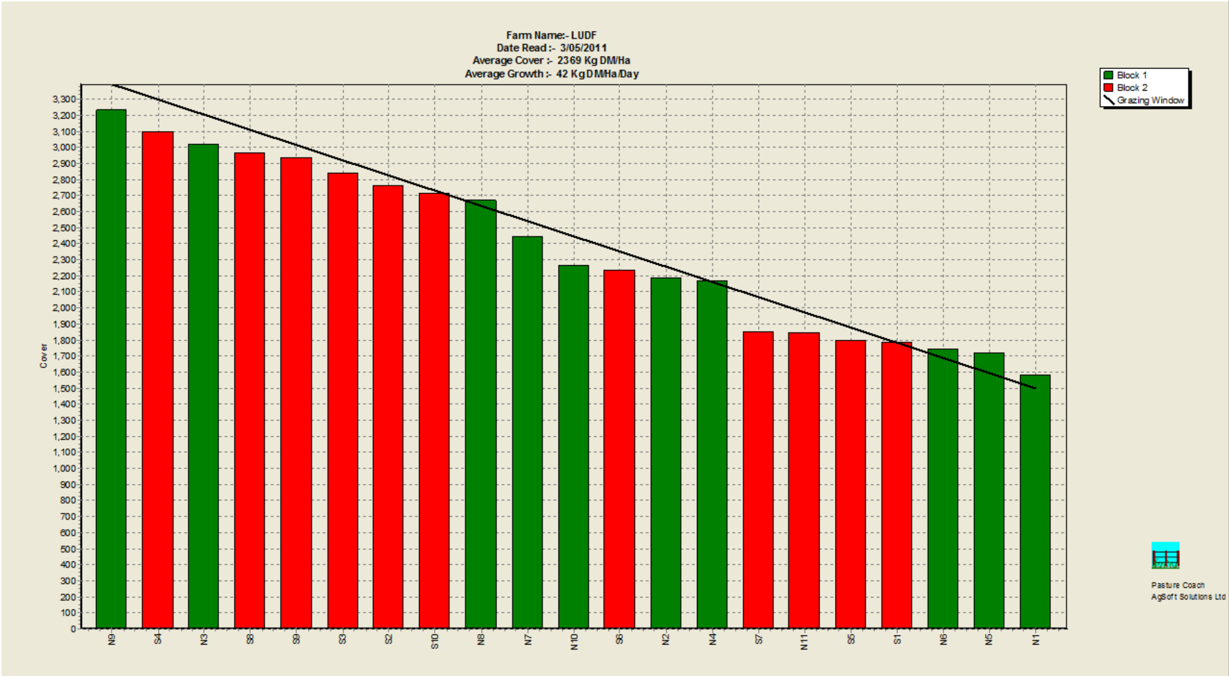
Summary of Key Factors affecting Grazing Management & Animal Performance

1. Average soil temperature at 9.00 am this week was 9.8°C with a range 8 – 12, significantly lower than the 11.3°C last week.
2. There has been 1 mm of rain over the weekend and a bit more last night. Irrigation has now finished for the season.
3. Soil moisture levels have been dropping over the last week.
4. North Block – Paddock N7 South Block – Paddock S6





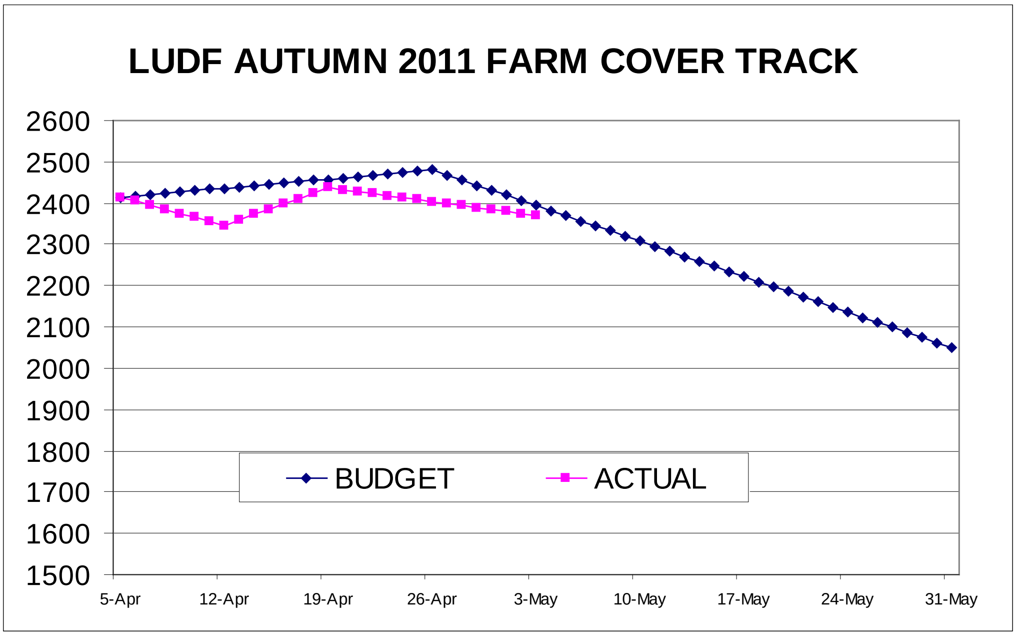
5. PASTURE GROWTH was 42 kg DM/ha/day, last week 48 kg DM/ha/day.
6. Average PASTURE COVER was measured at kg 2,369 DM/ha, last week 2,404 kg DM/ha.
7. This morning 558 cows were milked into the vat. The whole herd has been milked once a day for 17 days now.
8. Including all groups of cows, 32 ha was grazed for the week, an average of 4.5 ha/day or 35 day round.
9. This week 19.9t DM of silage (average of 4.9 kg DM of silage/cow/day) was fed. Season to date 291t DM (440 kg DM/cow). This includes the silage cut on the milking platform as well (107 TDM).
10. Today's feed Wedge:



The target line in the wedge reflects the pre-grazing target of 3,392 kg DM/ha and a post grazing of 1,500 kg DM/ha, which is the pre-grazing needed to feed the cows considering the stocking rate of 3.5 cows/ha (558 cows/160 ha), cows eating 15.5 kg DM/cow/day and a rotation length of 35 days. This Feed Wedge has 11 T DM deficit.

10. Grass Silage will be fed as required this week. Round length and post–grazing residuals will dictate the amount of grass silage required to maintain the round above 34 days.

11. The feed budget for the remainder of the season has a target average pasture cover as shown in the graphic below. The principle was to increase cover until mid April and then hold that until early May when cover will then be allowed to decline slowly toward the targeted end-of-May average pasture cover of 2,050 kg DM/ha. This plan will see pre-grazing levels of 3,400 kg DM/ha at a grazing interval of 32-33 days. Building cover provides an opportunity to milk more days in May if the weather allows.



12. This week 39 cows (36 light cows following our drying off criteria below, and 3 lame ones) were dried off. Season to date 46 cows have been culled and another 60 cows dried off.
13. There are still 58 empty cows in the herd. Assuming they are costing us about $4.95 per cow/day ($0.33 per kg DM x 15 kg DM), they have to produce above 0.66 / kg MS to pay for their feed. Herd test data information confirms that these cows are producing above this level.
14. The condition of the herd has been regularly monitored this season, the most recent assessment was done on 29 April with an average BCS of 4.2.
15. Some cows have been dried off (according to our plan below) and the whole herd has been on once a day milking for at least 17 days now. Production per cow dropped from 1.29 to 1.13 during that period and the average SCC for the week has been about 40,000 higher than the average the previous week.
16. Cow condition will be assessed again this week and we will continue to use our drying off decision rules as presented below.
17. Our Drying off Decision Rules are based on the following:

Cows (4 years old and older)

Cow Condition	**Dry off time (days before Calving)**	**Date cow need to be dried off (calving date 1-15 August)**	**Date cow need to be dried off (calving date 15-30 August)**
3.5	100	20 April – 5 May	5-15 May
4	80	10-20 May	20 -30 May
4.5	60	NA	NA

Rising 3 year Old

Cow Condition	**Dry off time (days before Calving)**	**Date cow need to be dried off (calving date 1-15 August)**	**Date cow need to be dried off (calving date 15-30 August)**
3.5	120	1-15 April	15-30 April
4	100	20 April -5 May	5-15 May
4.5	80	10-20 May	20 -30 May
5	60	NA	NA

This strategy requires feeding the cows that are being dried off above demand and with quality feed.

18. Now in the fifth round of Urea, with the final application towards the end of this week. Season to date 318 kg N per ha over the non effluent area (128 ha), equivalent to 258 kg N/ha across the whole of the milking platform (160 ha) has been applied.
19. Eco-n application started three weeks ago and will continue until finishing the whole farm in about two weeks time.
20. 1 new lame cow this week with 75 lame cows since calving started on 20 July.
21. One new case of clinical Mastitis, season to date 78 cows treated for Mastitis.
22. SCC has been 270 - 287,000 this week. All cows are currently having one quarter stripped each milking to check for mastitis.
23. Production this week was 1.13 kg MS/cow/day (1.15kg MS/cow last week) and 4.11 kg MS/ha/day (4.32kg MS/ha last week).

Next farm walk will be on **Tuesday, 10th May 2011, at 9.00 am.**

Weekly Dataset from Lincoln University Dairy Farm

Date (Totals at end of period)	29-Mar-11	5-Apr-11	12-Apr-11	19-Apr-11	26-Apr-11
Total Cows Wintered (July 1st Total)	694	694	694	694	694
Farm grazing ha (available to milkers)	160	160	160	160	160
Dry Cows on farm / East block / other	0/0/0	0/0/0	0/7/4	0/21/0	0/21/1
Culls (Includes culls put down & empties)	0	0	11	10	11
Culls total to date	18	18	29	39	50
Deaths (Includes cows put down)	0	0	1	0	0
Deaths total to date	15	15	16	16	16
Calved Cows available (Peak Number 680…)	659	659	636	616	605
Treatment / Sick mob total	3	2	1	1	4
lame, mastitis, other, colostrums	3/2/1/0	2/0/0/0	1/1/0/0	1/1/0/0	4/4/1/0
Milking twice a day into vat	404	409	393	0	0
Milking once a day into vat	252	248	241	615	600
Total Cows Milked into vat	656	657	634	615	600
Days in Milk actual cow days/Peak Cows	220	227	233	240	246
MS/cow/day (Actual kg / Cows into vat only)	1.20	1.2	1.3	1.25	1.14
MS/cow to date (total kgs / Peak Cows 680)	342	350	359	367	375
MS/ha/day (total kgs / Total ha used - eg 161.5ha)	4.93	5.1	5.3	4.8	4.28
MS/ha to date (total kg / Total ha used)	1420	1456	1493	1527	1557
Herd Average Condition Score		4			
Whole Herd LW (kgs)	479	485	488	479	479
Soil Temp Tues 10.00am 10cm	14.3	12.9	11.7	12.7	11.3
Growth Rate (kgDM/ha/day)	62	60	49	56	48
Plate meter height - ave half-cms	14.1	13.6	13.2	13.8	13.6
Ave Pasture Cover (x140 + 500)	2482	2414	2346	2437	2404
Pre Grazing cover (ave for week)	3094	3297	3434	3413	3349
Post Grazing cover (ave for week)	1550	1500	1500	1550	1550
Highest pre-grazing cover	3350	3350	3500	3484	3600
Area grazed / day (ave for week)	5.4	4.95	4.70	4.60	4.30
Grazing Interval	30	32	34	35	37
Pasture ME (pre grazing sample)			12.3	12.2	
Pasture % Protein			20.6	20.3	
Pasture % DM			13.9	17.2	
Pasture % NDF			36.6	37.4	
Supplements Type	Grass Silage	Grass Silage	Grass Silage	Grass Silage	Grass Silage
Supplements fed kg DM/cow/day in paddock	5.4	4.6	5.2	4.0	3.9
Supplements fed to date kg per cow (680 peak)	285.4	317.4	353.0	371.6	388.1
Supplements Made Kg DM / ha cumulative	670	670	670	670	670
Units N applied/ha and % of farm	0	30units13%	30units14%	30units21%	30units15%
Kgs/ha N to Date (on the NON-effluent area 133ha)	283	292	300	310	317
Rainfall (mm)	35	41	0.8	23	5
ET Weekly Soil & Science readings (mm)					
Days irrigated each week	0	0	0	0	0
Irrigation mm applied per week	0	0	0	0	0
Stock Water Consumed litres / cow / day	40	42	29	17	27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