SIDDC

South Island Dairying Development Centre

Partners Networking To Advance South Island Dairying

Lincoln University
Te Whare Wānaka o Aoraki
CHRISTCHURCH • NEW ZEALAND

DairyNZ

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LIC

Plant & Food RESEARCH
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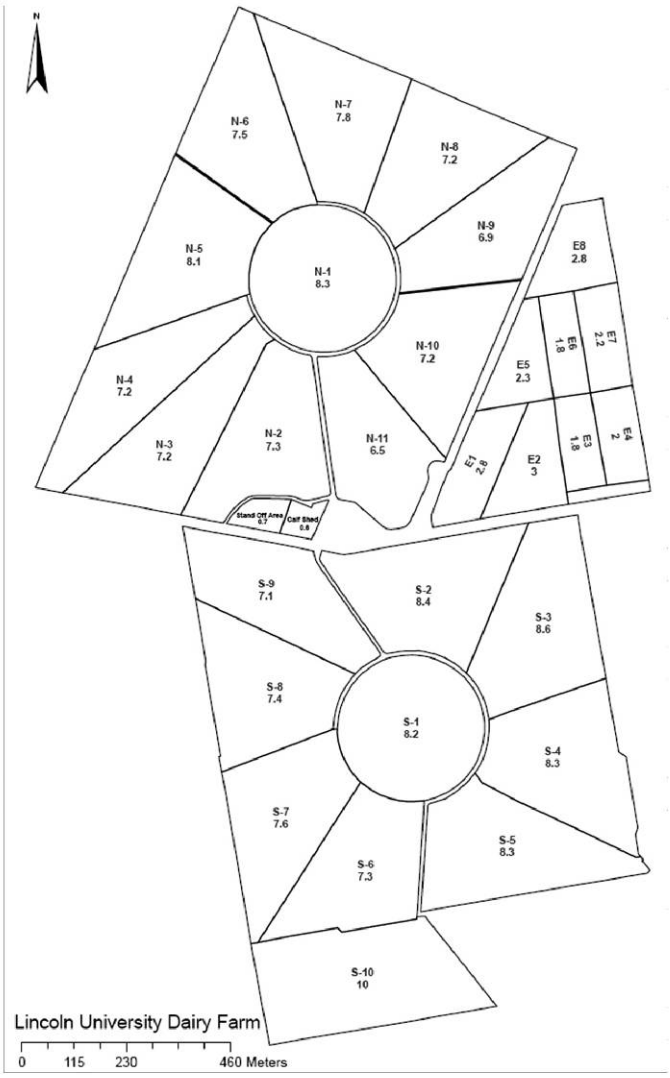
Lincoln University Dairy Farm Focus Day 13 October 2011



Staff

Peter Hancox – Farm Manager
Richard O'Brien – Farm Assistant
Anshul Madan – Farm Assistant
Joshua Grant – 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, was a former University sheep farm until conversion in 2001. 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 milksolids 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

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 2011

950 straws DNA proven Kiwicross [including heifers] plus additional straws short gestation Jersey to AI mate for 6 weeks. Expecting to rear 190 heifers [5 straws per heifer] then follow with Jersey bulls. 10 weeks total mating [herd].

Herd details - October 2011

Breeding Worth (rel%) / Production Worth (rel%)	104/46% 133/56%
Average weight / cow (Dec) – Herd monitored walk over weighing	458 kg [Dec 2010]
Calving start date	3 August 2011
Mid calving date	18 August 2011 (15 days)
Mating start date	25 October 2011
Empty rate (nil induction policy) after 10 weeks mating	14% 2010 [6 weeks in-calf rate 72%]

	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	264,460
Average kg/MS/cow	381	425	409	384	415	395
Average kg/MS/ha	1414	1720	1744	1634	1710	1653
Farm Working Expenses / kgMS	$2.98	$2.68	$3.37	$3.88	$3.38	$3.86
Dairy Operating Profit/ha	$1,164	$2,534	$8,284	$2,004	$4,696	$7,323
Payout [excl. levy] $/kg	$4.10	$4.33	$7.87	$5.25	$6.37	$7.90
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	271
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	463
Made on dairy/platform [kgDM/cow]	0	194	95	64	144	160
Applied N / 160 eff. ha			164	200	185	260

Staffing & management

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

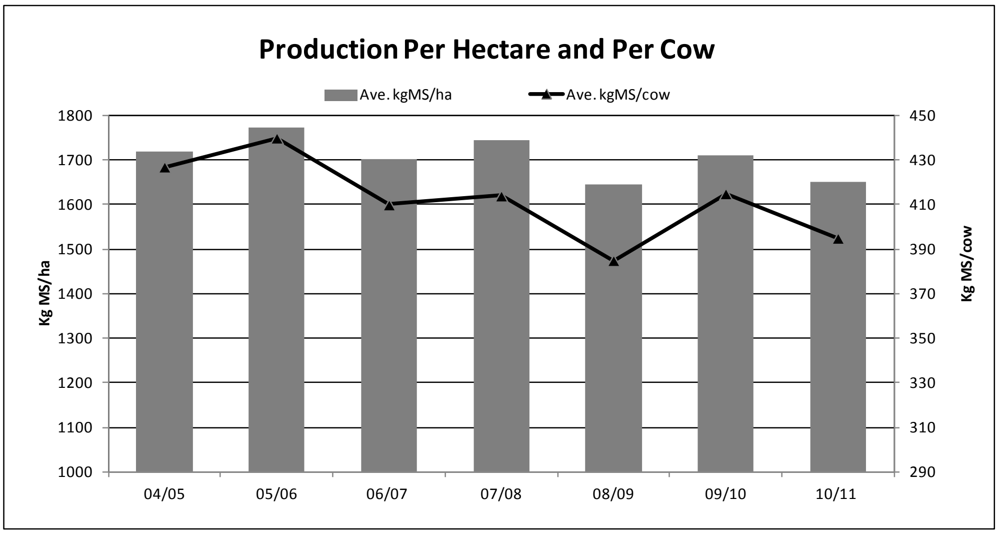
Milking Times – Morning: cups on 5.00 am
– Afternoon: cups on 2.30 pm

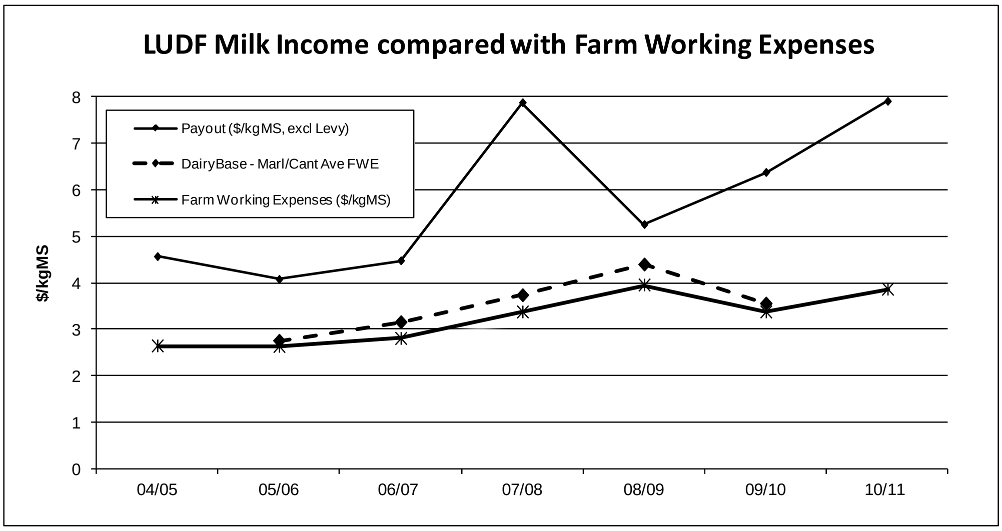
Contents

Precision Dairy Farming at LUDF:
Core Focus 2011-2015

1. Higher productivity
2. More Profit
3. No increase in footprint

Background:
LUDF has (to date) operated a 'simple, grazing residual based' management system which delivered consistent production across multiple seasons. Combined with good cost control this has resulted in a highly profitable dairy system, banking good returns in periods of higher payouts and retaining acceptable profitability in low payout seasons.



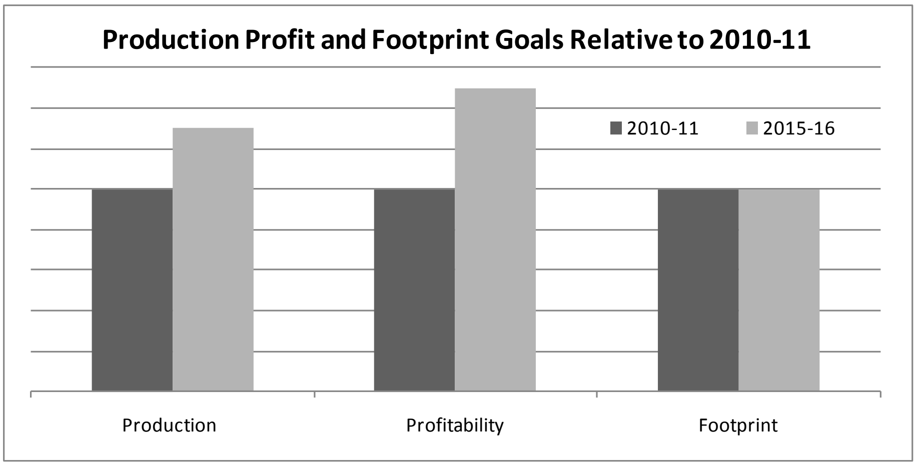


Having successfully demonstrated the practices of this system for a number of years the SIDDC Board reviewed the appropriate use of this farm to advance South Island Dairying. The strategic objective was revised as follows to increase the emphasis on productivity and sustainability by not increasing the farms footprint.

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.*

Graphically the goals can be considered as follows:



Precision Dairying – the Rational

A number of systems and factors were evaluated in response to the farms objective and clear desire from the SIDDC Board and Lincoln University as farm owner, to increase productivity and thus profitability, while holding (or decreasing) the farms impact on the environment.

It was evident the farm was not producing sufficient energy to sustain higher production from the current herd size, requiring additional feed (grown or bought in) or a change in use of the current feeding levels (or both).

Data from NZAEL (Montgomerie, 2010) suggests the continual improvement in genetic gain increases energy demand and production per cow; if feed supply is approximately constant, the impact of genetic gain should result in a reduction of 1 cow per 150 cows per year. For LUDF this equates to 4.4 cows per year or 22 cows over 5 years.

It was also proposed that lowering the stocking rate would potentially lower the footprint, particularly as less cows are wintered and if the farm can lower its replacement rate - operating with a more mature herd so that more of a cows total lifetime feed is directed to milk production.

Modelling suggested the farm should be able to sustain 620 – 645 cows producing 450 – 475 kgMS/cow and 1800 – 1840kgMS/ha from a similar amount of pasture production, and without supplements as less total feed would be required for maintenance with slightly fewer animals. Achieving this may require alternative strategies to maintain pasture quality (a non-negotiable for LUDF), enable higher intake per cow and retain adequate cow condition to avoid premature drying off. Management of first calvers was also identified as critical to ensure adequate intake, production and liveweight gain (growth) would occur.

Additionally, LUDF saw opportunities in this strategy to increase pasture production from the existing platform via more pasture renovation, individual soil testing and fertiliser application, more nitrogen (where pastures would clearly respond to additional nitrogen fertiliser) and on the shoulders of the season, use of Gibberellic Acid to stimulate plant growth.

Increasing pasture renovation from 10% per year to 15% would get the farm on a 7 year renewal cycle to both increase total pasture production and increase pasture quality – available with some of the newer pasture species. The small reduction in herd size would increase surplus pasture enabling more pasture renovation and additional home grown silage – aiding the increase in productivity without increasing the land area required.

The farm also will use additional eco-n, to further minimise losses of nitrogen from the system. Whilst two applications has been shown to effectively reduce nitrogen losses, LUDF wishes to further ensure it retains its N by avoiding risks of N leaching on the shoulders of the drainage season.

Simplicity or Complexity

LUDF's strategy for the initial 10 years developed into a simple, profitable and consistent management system. It produced a high degree of repeatability and minimised risk from payout fluctuations. The new system to increase productivity and profitability without increasing the footprint is deliberately taking some risks to find additional opportunities for further productivity gains.

LUDF's challenge is firstly to show the potential gains from its Precision Dairying strategy, then to find the simple ways to achieve these. Lincoln University and DairyNZ have research underway (in parallel to this strategy) that will answer some aspects of the changes currently being implemented at LUDF.

Changes to LUDF – Expected results

Changes	Expected results	Results to date
Herd Dynamics		
1. Herd size	Increased productivity resulting in increased production per cow, per hectare and in total	Higher production per cow, giving better or same production per hectare
2. Culling to achieve lower herd size	Low producing cows (negative $PW) and high SCC cows were culled	Will be contributing to above
3. Cows with recurring / problem mastitis culled at end of last season	Less milk production lost to mastitis, less infection into rest of herd	Treated 38 cases Mastitis this year compared to 32 at the same point last year. SCC lower than past years
4. Herd Age Structure	Dropping replacement rate from 25-27% (last 2 seasons) to 22% this year should increase total milk production. Last years 2yr–olds were producing about 25% less than MA cows	Not yet quantified in milksolids production – first herd test delayed till 17 October
5. Selective mating based on breed to maintain 'cross bred' animal. Continue use of AI to cover full 6week period. Possible use of short gestation bulls at the end of the mating period	Approx 10% of the herd is F4 or less. Breeding these to Friesian bulls will avoid small progeny from these cows. Short gestation semen can help pull calving date forward 5-7 days	

Feed Production		
6. Soil testing of individual paddocks	Vary fertiliser application according to individual paddock soil test levels, including applying capital fertiliser as required (and reducing maintenance where appropriate)	Whole farm average Olsen P test (last year) was 32. This year's paddock testing gave a range from 23 – 48. Targeted Olsen P is 35-40. Different rates of P fertiliser are being applied to achieve the target. Four paddocks have pH less than 6 and will receive some lime
7. More Nitrogen Fertiliser	LUDF has reliable water, sunshine, fertility and productive pasture species, but was affected by CRW damage last year. As a high yield environment often appearing N limited, additional N has the potential to increase home grown pasture production	Actual application to end September similar to previous years but lower than last year
8. Use of Gibberellic Acid (Express)	Additional pasture production on the shoulders of the season, additional feed from the platform reducing bought in feed	75% of the farm has had an application of Express. The control strip without Express was visible for 2 weeks post application. At grazing estimate was about 300kgDM yield gain
9. Increased Pasture Renovation (from 10% to 15% per year – 10 year cycle to 7 year cycle)	Tetraploid Species have proven to be easier to manage (at higher pre-grazing levels), and give high yields of DM and ME. Increasing pasture renovation potentially allows more energy production and consumption. Also 'direct drill' into existing pasture to patch any areas damaged by pugging, overgrazing etc	First paddock has been sprayed out and should be drilled before the end of October. This is 3-4 weeks earlier than normal. Better spring conditions have only required 2-3 ha of direct drilling this season. Direct drilled N11 with Bealey and Clover to attempt increasing production of this paddock
10. Overdrill clover seed - CRW removed much of the clover on farm last season with buried seed testing indicating little residual clover seed	Clover contribution to the diet restored to pre CRW levels (or similar). Pasture N supply from clover increased	Clover appears to be emerging this season with little apparent CRW effect at present. CRW monitoring last month indicated CRW larval populations remain very low but this is probably a reflection of low levels of white clover.
Feed Management / Feed Offered		
11. Ensure feed offered / intake meets demands	Cows producing over 2kgMS/cow/day require approx. 210 MJME/day – allowing for a small amount of weight loss. Offering less than this reduces milk production or increases loss of condition score Net energy gained from requiring the whole herd to graze the last 100-200kg DM/ha may not benefit productivity. Slower drop from peak milk production leading to more total milk More cows in milk in later part of season (ie avoid early drying off based on low BCS)	Production holding over 2kgMS, BSC acceptable, intake matches expectation / back calculation on feed offered, Pasture quality samples confirm energy concentration Research is underway measuring pasture disappearance during grazing events to aid understanding of the 'cow costs' of grazing

12. Running two herds	• Higher intake (especially in young cows) • less cow condition loss • higher milk production per cow • more days in milk • longer productive life • less time on yard (out of paddock), less stress from large herd dynamics, other cows etc	CS of individual cows shows range of CS better than normally observed at this point The small herd is typically only in the shed for 45 minutes per milking, vs up to 2.5 hours if in a single herd
13. Weekly pasture quality samples / on-farm DM assessment	More frequent and faster analysis will assist allocation of adequate pasture to meet energy demands / and pre-graze mowing if required to increase intake	Weekly quality samples confirm allocation providing adequate energy – confirmed by BCS and milk production
14. Ensure intake acceptable if standing cows off pasture	Grazing time can be severely restricted when standing off to avoid pasture damage. Had planned to feed silage to increase intake	Had very limited time standing off
15. Increased range of tools to achieve grazing residuals (pre-grazing mowing, silage, second herd etc)	Pasture quality and desired intake achieved leading to increased milk production with little additional cost – resulting in overall benefit (not net cost)	Post grazing pasture quality achieved in all but a small number of cases. BCS and production on target
Environmental Management / Footprint Impacts		
16. More Eco-n	To further minimise the farm's impact on the environment, more eco-n will be used. No increase in nitrogen losses even as production per hectare increases.	The eco-n application rate was doubled for the July application Modelling shows no change (July 2011 focus day handout). Data to be collected over time.
17. Less / no increase in purchased feed	Total land area required to support LUDF holds or decreases	Not yet available
18. Fewer cows wintered, less replacements	Lower costs for wintering, replacement grazing, lower environmental footprint due to fewer total animals / higher lifetime productivity per animal	
Other Impacts		
19. Lameness / sore feet	Less time on the yard / less pressure in the races MAY aid lameness	
Profitability		
20. Herd structure, numbers, feed production, feed allocation etc	More milk income Less replacements and less cows wintered (reducing wintering costs and environmental effects from wintering cows) Increased on farm feed production costs Less bought in feed	Season started well, to be reported as season progresses

What's not changing at LUDF:

1. Milk production from pasture:	LUDF is seeking higher production from pasture, through growing more pasture and achieving higher productivity (efficiency) in conversion of pasture to milk
2. Consistent Grazing Residuals:	Consistently grazing to the same residual is well proven contributor to profit. How LUDF achieves a consistent residual may vary, but the focus on consistent grazing residuals does not.
3. Back fencing to minimise over grazing – especially early in the first rotation.	
4. Number of staff on farm	ACR have been installed – allowing one person to milk and the other person previously milking to retrieve the other herd
5. Focus on tight calving period, healthy animals, good farm management etc	

LUDF Seasonal Update   October 2011

Herd management Winter and Spring 2011

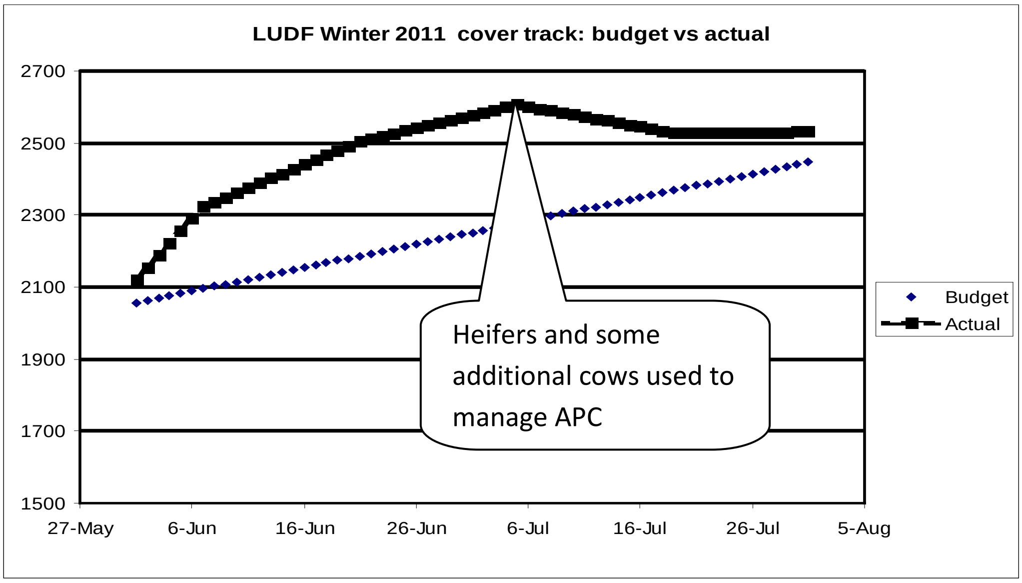
Wintering

Wintering Mobs:

- 55 light cows (began the winter with a BCS range of 4.0 – 4.5), with calving dates before 25th August - They were on the milking platform on grass only grazing to 1500kg DM residual throughout the winter. By the end of winter these were 5.75 – 5.25 though about 15 of these remained below 5.
- 142 R2's – Throughout autumn and until the end of June the R2's were on grass and rape and very well fed (plenty of space and 1600 – 1700 residuals). They came back to the platform in early July and remained there, being offered all they will eat and leaving a 1500kgDM/ha residual. Their CS was 5.5. The weight of these animals was 461kg on 4th July (96% of the weight of the MA herd – compared to an industry target of 90%)
- 179 early calvers (before 25 August) and BCS > 4.25 at drying off; fed on 9kg kale and 2.5kg grass plus straw for most of June and grass from then on. These were comfortably at CS 5 at the beginning of August.
- 199 late calvers (after 25 August) initial CS ranged from 4.25 – 4.75 They were grazing on 11 kg DM Rape + 2 kg Grass Silage + 1.5 kg Straw
- 91 cows that were dried off in late April and early May due to light condition. Fed Rape and Silage - basically all they can eat leaving 1600kgDM residual (no straw) These were in very good condition (min 5.0) by early July and looked very well.

Farm Pasture Cover during winter

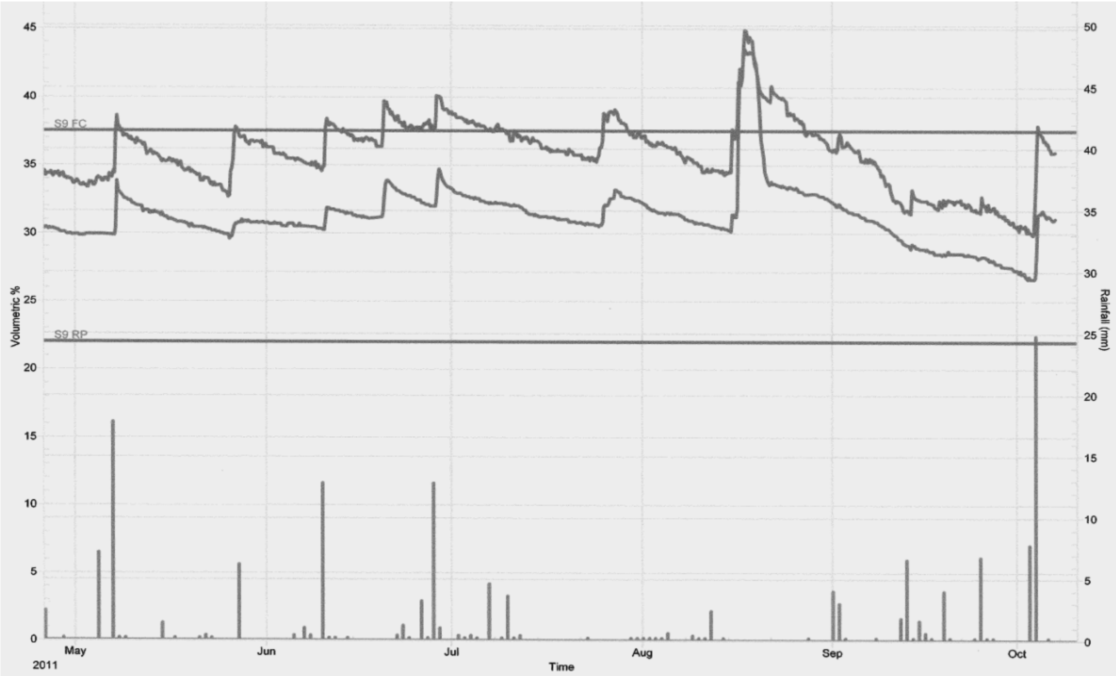
In July we were concerned about increasing pasture cover - significantly beyond the target. Cover was above the target for the end of July. The 2450 target for the end of July has been found to be about the limit of very high quality pasture that can be held on this farm especially if conditions become wet in August. During the last 3 weeks of July we had more cows on the platform than was planned in May. This brought pasture cover back to an acceptable level before calving. Once that was achieved cows were put on East Block and the lease block with principally only springers and calved cows on the platform.



Soil Moisture

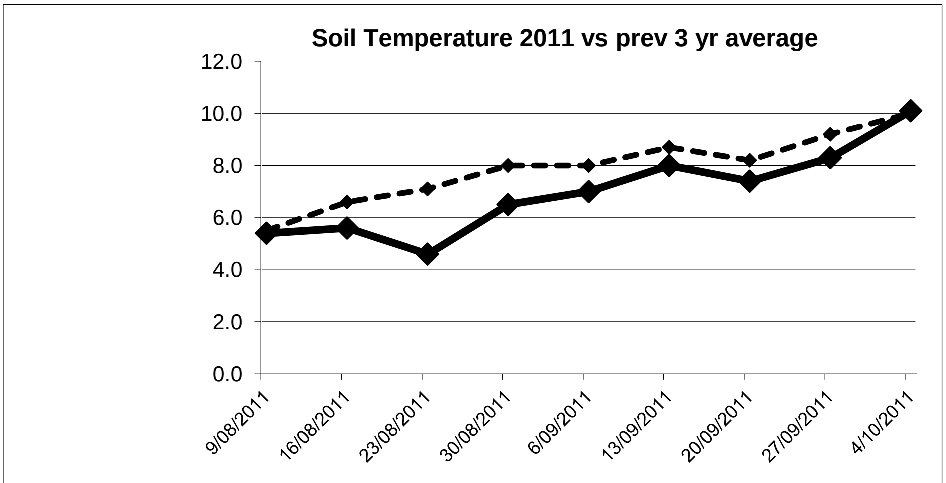
As can be seen from the soil moisture data below, the farm has been able to cope with the relatively small amount of rain that we have had through the last few months, only becoming oversaturated for a limited number of short periods. This has made a huge difference to feed eaten and resulted in only a very small amount of pasture damage.

South Block Soil Moisture levels, Winter – Spring 2011



Soil temperature

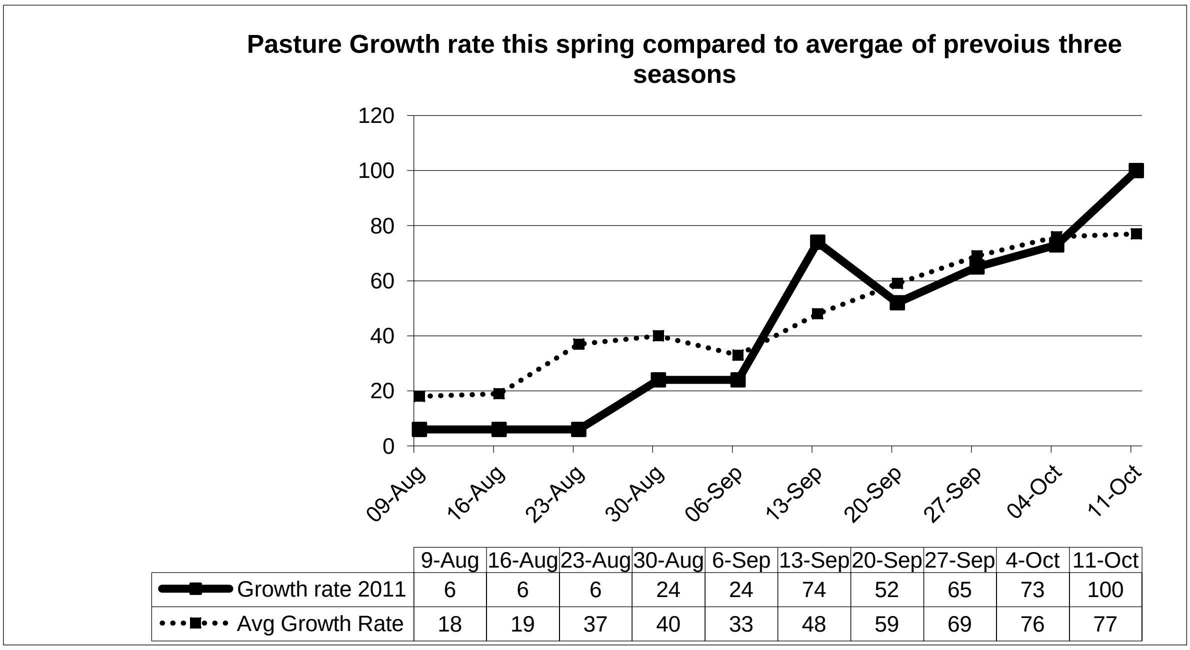
Soil temperature this Spring has been cooler than normal, only catching up to the 3 year average in early October. Early season growth was also slow, after higher than expected winter growth. Despite relatively cool temperatures, pasture growth was average to above average from early September onwards.



	9-Aug	16-Aug	23-Aug	30-Aug	6-Sep	13-Sep	20-Sep	27-Sep	4-Oct
Soil Temp 2011	5.4	5.6	4.6	6.5	7.0	8.0	7.4	8.3	10.1
Soil Temp Avg	5.5	6.6	7.1	8	8	8.7	8.2	9.2	10

Pasture Growth

Spring has been colder than in recent seasons. Soil temperature readings significantly lower than the 3 year average. Pasture growth has mirrored this.



	9-Aug	16-Aug	23-Aug	30-Aug	6-Sep	13-Sep	20-Sep	27-Sep	4-Oct	11-Oct
Growth rate 2011	6	6	6	24	24	74	52	65	73	100
Avg Growth Rate	18	19	37	40	33	48	59	69	76	77

Quality

Pasture has been very similar to previous seasons. ME remaining above 12.6 throughout August and September. See Data sheets for details (page 23-25)

Herd Management during Calving

There was no expectation that much change was needed except that

1. At as early as reasonably possible the second herd (small herd) would be setup
2. Standing off guidelines were reset to avoid long (more then12 hours) periods of time spent by the herds standing on the concrete yard without being fed.
3. The team also decided to return to the practice of using the first paddock on the list for regrassing as an area to feed silage when soil conditions required it.
4. Also if feed became trampled it would be left for a subsequent grazing rather than ensuring every grazing during the first round was down to 7 rising plate meter clicks.

July was a dry month and as has been reported above, cows were in excellent condition and health as calving approached.

August was also drier than last year by a great deal. A small snow event early in the month and a significant snow (recorded as 58mm of moisture) over the 17th and 18th was followed by a seriously cold week of southerly wind. As can be seen in the soil moisture record the soils did not remain saturated for many days.

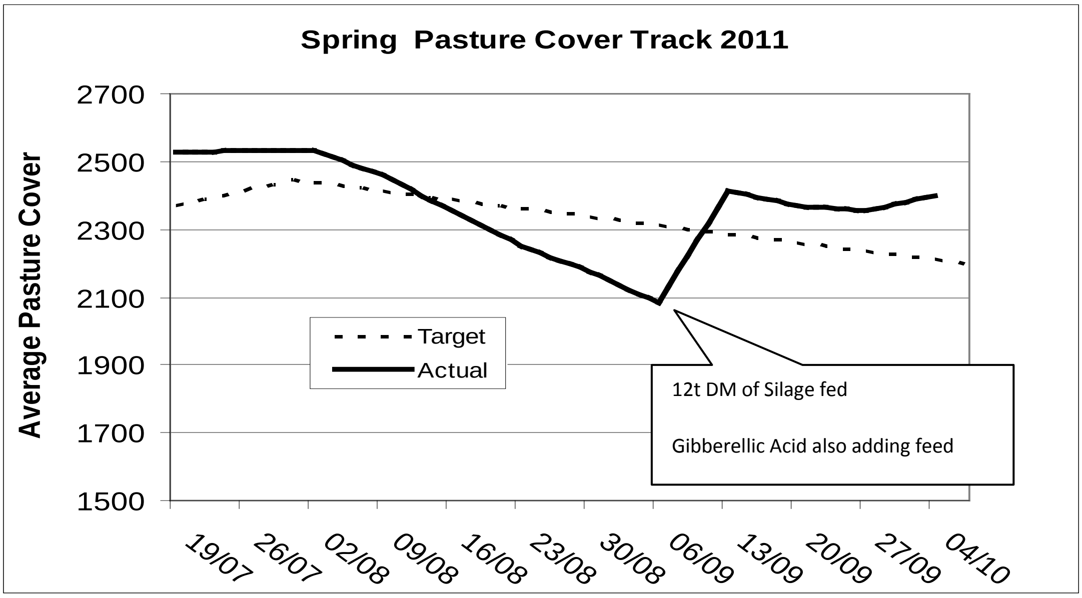
Feed management

The first calvers were very restless as they began calving and would not settle to single day size breaks. To help settle them and keep them eating they were allowed 2 – 3 day breaks and were allowed to leave above normal residuals. This practice only continued for a few days into the herd calving at which time dry enough soil and mature cows plus time settled the young cows. The few hectares that were treated in this way were grazed early in the second round or with the springers in later August. This avoided any subsequent problems with pasture quality.

The milkers were also allowed to leave higher residuals in the wet, as planned, and these areas too have not left a large area to deal with. As cows settled to milking and feed eaten per day increased cows and first calvers have been cleaning up very well.

The second (small) herd was set up during the first week in September. It may be a week earlier than that next year (closer to half the herd calved) but this season commissioning of the automatic cup removers and associated automation made it difficult to add the additional task sooner.

The small herd consists primarily of young and smaller cows but is not a fixed group. Cows will be moved between herds over the season to keep the lightest condition cows in the small herd.



Late Winter Support Land (non-platform feed sources)

Use of feed from the 13ha East block (pasture) and the 10ha lease block (Greenfeed oats and grass) remain important tools for LUDF. Neither area can have milking cows, instead these areas provide strategic spring feed, calf rearing areas and high quality silage for the platform. These areas were used as required to manage cover on the platform and when soils are wet to avoid as much as possible pugging platform pastures. In the wettest period after the snows all but the calved cows were off the platform.

When soils were very wet and during and after snow the milkers were stood off on the very sheltered back part of the yard. They were held after milking for about 3 hours in the morning and about an hour at night. About half paddock S8 was used to feed silage to assist with ensuring cows had as close to a full feed as could be managed without using additional paddock areas.

LUDF has used Once a Day milking of colostrum cows for a number of seasons. This strategy reduces stress on these just calved cows and provides more time for other herd and farm management tasks at a very busy time. When a weather event like snow and very wet soils occurs there is a possibility to hold the cows in the colostrum herd a little longer. This strategy was not used this August because snow was clearing quickly and the wet soil period was likely to be relatively short given the drying wind that followed the snow and following rain.

Summary

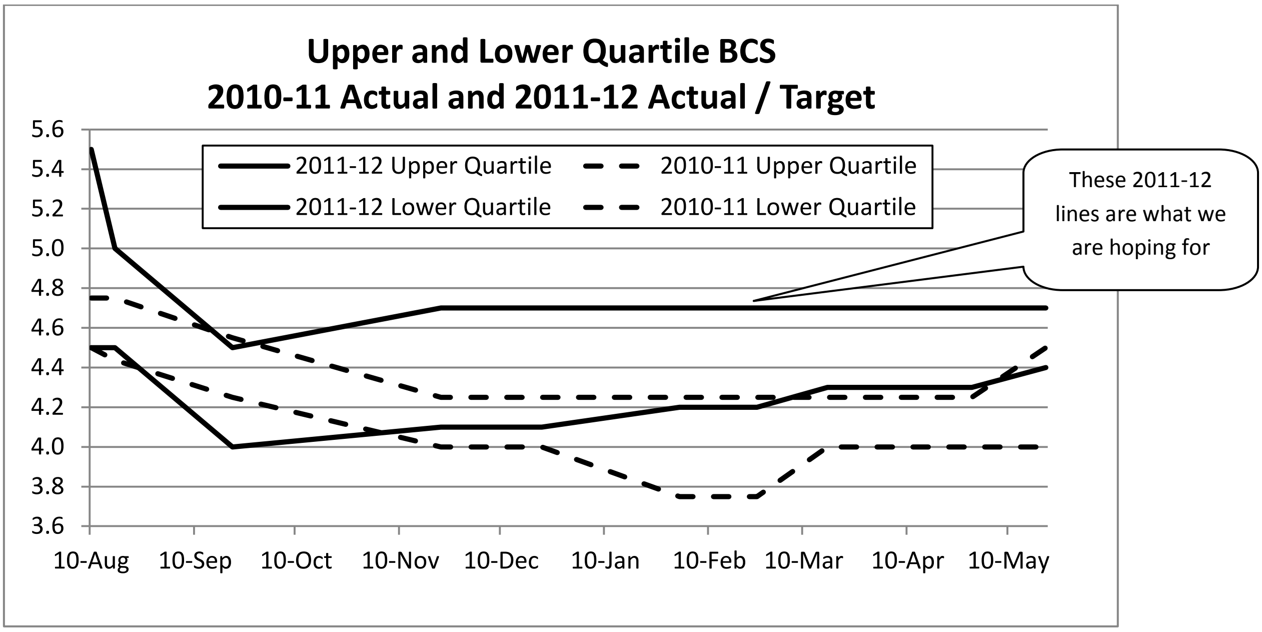
The season has started very well for LUDF. The herd is in OK condition and appears to only be losing small amounts of weight. Calving pattern was on target and milk production is ahead of budget. Significant high quality surplus feed is about to be harvested for later support to milk production.

Cow Body Condition

BCS actual vs target, BCS change this season

Last year even the best conditioned cows did not reach nadir [lowest BCS point] until December and the bulk of the herd continued to lose condition through until February. The apparent causes off this are a very difficult Spring when cows were frequently stood off, followed by a summer when, in spite of adequate feed offered, cows intake failed to be enough.

The consequences were less than target reproductive performance [6 week in-calf rate and empty rate], and disappointing MS production as characterised by a large, sustained fall from peak production. This year, as the target track shows, we are determined to get the cows to be in positive energy balance for mating and to keep their pasture intake high and consistent.



Notes:

- The 21 Sept data for 2010 is estimated as we didn't CS between Aug and Nov.
- For 2011, the small herd [mainly heifers] data has been used for 21 Sept – assuming if these targets are met for the small herd, we should be achieving what we need from the main herd.
- The numbers of cows contributing to the data is those cows in milk which skews the data at either end of the season.
- For this exercise we have not included averages because we are concerned about the range the whole herd falls in and dealing with minimum targets.

The cost of using the mowing as an aid to pasture management

The mower is our second instrument of pasture management, after cows. It appears that even with good machine maintenance and careful mowing we must accept a DM loss to the system of about 300 kg DM/ha every time we mow a paddock.

With regard to the effect of mowing either before or after grazing, Kolver [1999] found that compared with standing pasture, measured before mowing, mown and wilted pasture had a

- higher DM content (by an average of 7.5% units during spring and summer (P<0.001)),
- lower ME content (by 0.6 MJ E/kg DM),
- lower IVD (by 4% units) and NSC content (by 1.5% units), and
- higher NDF content (by 2% units).

Compared with the control, mowing before grazing did not change ME content in spring, but increased pasture quality by an average of 0.2 MJ ME/kg DM during summer. Topping pasture after grazing consistently increased the quality of pasture by 0.6 MJ ME/kg DM during spring and summer. This work was carried out in a trial which used the mowing all season, our challenge is to keep the mower in the shed and only use it when it will be more beneficial [i.e. profitable] than getting cows to achieve the residual. We expect that this might happen about 6 times over the season [excluding silage making], we will "tag" paddocks which have an issue such as intense heading, history of difficulty for cows to clean up, and then monitor them close to grazing.

Using Gibberellic Acid [GA]

When LUDF considered a programme for using GA we worked backwards from the time when the GA grown pasture would be eaten. The important consideration was that there needed to be enough pasture accumulated on the treated paddock to get it to the desired pre-grazing cover within 30 days of application. To graze in a window of 3 – 4 weeks post application we needed to have accumulated pasture at an average of at least 45 kg DM/ha/day.

On this basis we could look at starting applying GA about 33 days [allowing 3 - 5 days between grazing and application] before 21 September, this came out as the 20th August as a start date. This would give us confidence that we would at least achieve our desired pre-graze of 3000 kg DM/ha. In the end, we commenced application on 27th August after the snow had cleared and the ground had dried out.

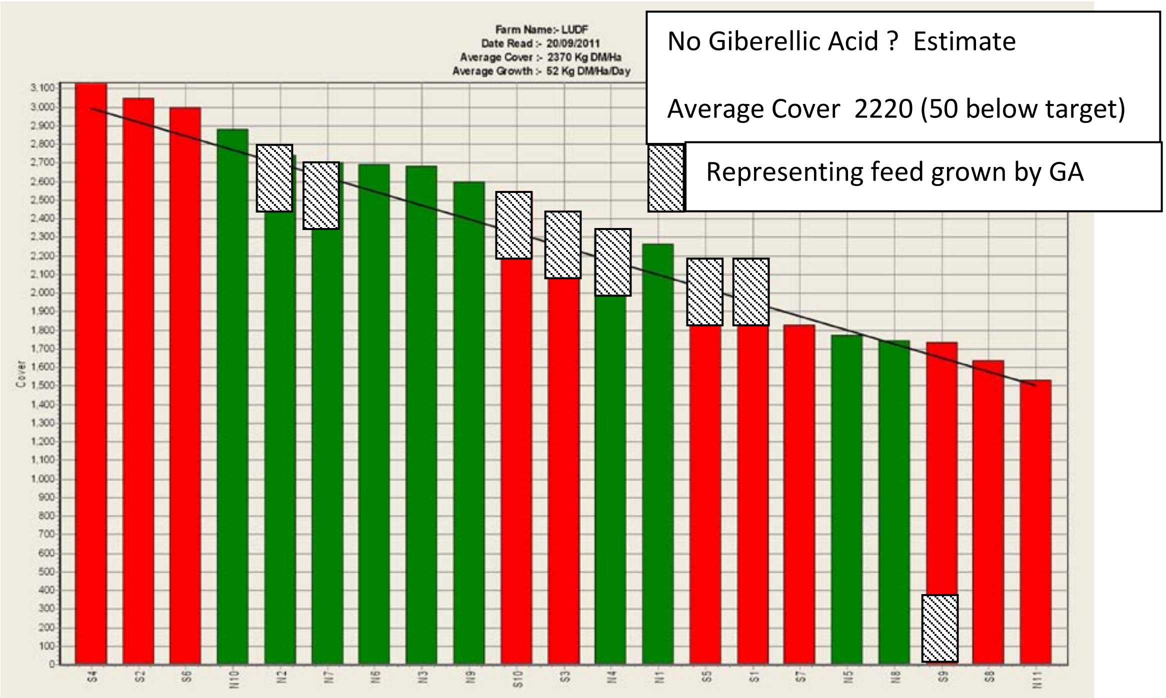
	Pasture growth – 3 year average kg DM/ha/day	Historical average for previous five weeks
07-Aug	18	
14-Aug	19	
21-Aug	37	
28-Aug	40	
07-Sep	51	36
14-Sep	48	42
21-Sep	59	46
28-Sep	69	52
02-Oct	76	61
09-Oct	77	66
16-Oct	79	72

The contribution of Giberellic Acid to September 20th

The situation at the beginning of the second grazing round is shown in the feed wedge from September 20th below. At that stage 8 paddocks (64.6ha) had GA applied long enough to be having a significant effect on the feed supply. One paddock S9 had GA applied on 27th Aug and had been grazed by the 20th of September.

The paddocks with GA applied all had a shorter grazing interval than paddocks that GA had not been applied to.

The applications had generated a comfortable surplus as opposed to a slightly concerning deficit that would have been the situation otherwise.



Additional use

Management team decided to continue using GA for 2 – 3 week period after the feed supply demand has balanced.

1. This has allowed an earlier and safer date for the first paddock to be sprayed out for re-grassing.
2. It will generate a very high quality (pre seed head) pasture surplus that will be made into baleage for use to support milk production later this season or early next. The effect of this is to replace feed that would otherwise have been purchased into the feed supply and also uses applied Nitrogen more efficiently generating a higher response per kg of applied N. (it will help the farm increase feed supply from its land area, without increasing the land mass required to support the farm – the footprint objective)

Advice? Follow the label instructions:

Below are some notes drawn from a variety of sources, designed to answer some frequently asked questions that have come up during farm walks or when discussing the farms programme this season.

What is the cost: benefit of using GA?

Cost of product is $11 per ha plus application - approximately $24/ha = $35/ha.

We are confident that the cows are managing to eat an extra 300kg DM/ha on GA applied paddocks. This is in line with trial results and given what the cows and average cover are doing seems reasonable.

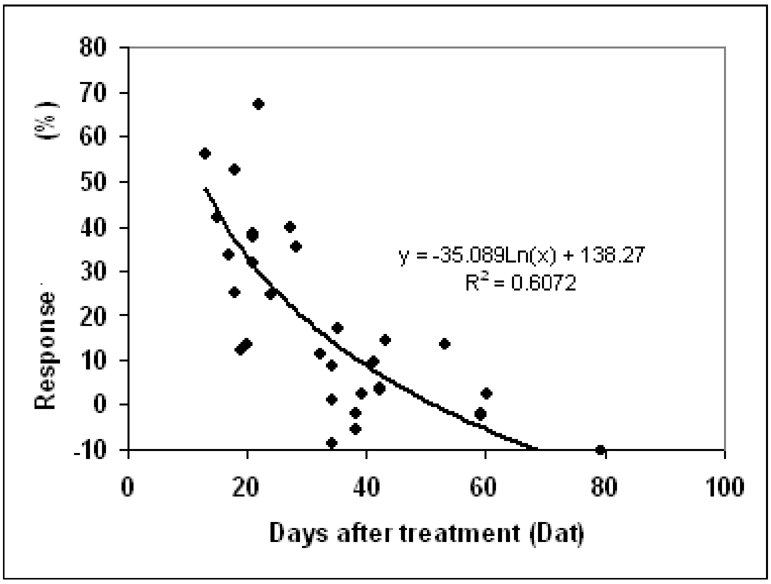
At this rate the cost to LUDF is $0.12 /kg DM.

On this basis we have decided to continue application over a further 100 ha to give a total area applied of 226 ha. There are 2 reasons driving this decision:

1. often the farm goes into pasture deficit in late October [average growth rate for the week ending 23 Oct for the last 3 years is 67 kg DM/ha, which is below demand].
2. we are prepared to use any surplus for silage as it appears to be a cheaper option than purchasing standing grass for silage this season.

Duration of effect?

It has been shown that the response to GA declines over time, and that generally after 40 – 50 days the response declines to 0. Effectively, this means that in spring there is a window to use the product where you can graze on an approximately 20 to 35 day round.



Why apply within 5 days of grazing?
This is not well understood, but some data suggest that by day 6 after grazing, the decline in response is significant. However it is possible that other factors may also be influential, such as the pasture residual post grazing. It is possible that better responses may occur when grazing residuals are very low, and may be worse when residuals are high and or very unevenly distributed [clumpy].

Long term effect of using GA?
Negative effects have been seen when using high rates [60 – 160 g/ha active ingredient compared to a normal single application of 20gms], however measurements over time [99 days] have shown some variation [positive and negative compared to untreated pasture] but the cumulative response is positive.

There has been some trial results showing some effects on tillering and root growth, however much of this information is based on using very high rates of GA. Given adequate soil nutrients and not exceeding the label directions on the maximum numbers of applications, we feel that there is no real danger of affecting future pasture production or persistence. Making sure that the plant is well supplied with N seems to be a key tactic for overcoming any tendency of GA to reduce grass tillering.

Effect of repeated applications?
Small frequent applications are fine. Don't apply more than 6 times per year or more than twice consecutively.

Effect on Pasture quality?
Generally GA has not been seen to measurably change the balance of grass, clover and weeds. Similarly no change in the nutritional value of pasture has been measured. Weed growth however is also enhanced (eg Docks).

Will LUDF be using GA in the autumn or late summer?

It is the intention to use GA towards the end of the season; however the details of how it will be applied to ensure we capture the benefit on a lengthening rotation are still to be determined.

Lincoln University Dairy Farm - Farm Walk notes

Tuesday, 11th October 2011

CRITICAL ISSUES FOR THE SHORT TERM

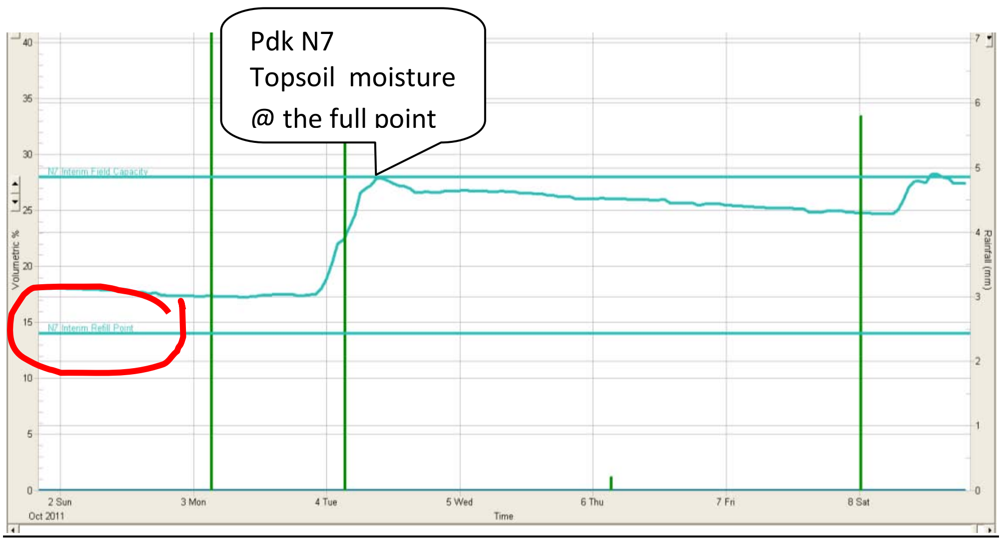
1. **Monitor average pasture cover and respond to surplus or deficit.**
2. **Maintain post grazing residuals of 7 - 8 clicks as ground conditions will allow.**
3. **Use back-fences on all herds whenever paddock grazing takes more than 36 hours.**
4. **Continue Mg supplementation via water system.**
5. **Observe and record pre-mating heats**

COMMENT

6. There are now 613 cows milking twice a day in the silo. There are 198 cows in the Small herd, mainly first calvers and 4 – 4.5 condition score MA cows, and 415 in the main herd. The two herds will be managed separately for the remainder of the season. The composition of the first herd will change as MA light cows from the main herd become lower in condition than cows in the herd already. It is expected that the first herd will not get many more than 200 cows in it.

<u>Growing conditions</u>

7. Pasture growth this last week has been 100 kg DM/ha day
8. Soil temperatures at 9 am for the week have been about the same as last week averaging 10.1°C.
9. 10 - 15 mm rain has been fallen this week (Accurate data not avail). The soils were drying slowly and irrigation equipment had been trialled, in readiness to start watering as soon as the Aquaflex readings drop close to refill points. The Aquaflex graphic below for the lightest soil on the farm showing that the moment to begin irrigation was very close until rain fell last week and again this week with the result that the irrigation can remain turned off.



<u>Calving</u>

10. There are 3 cows left to calve, these are grazing on the platform.

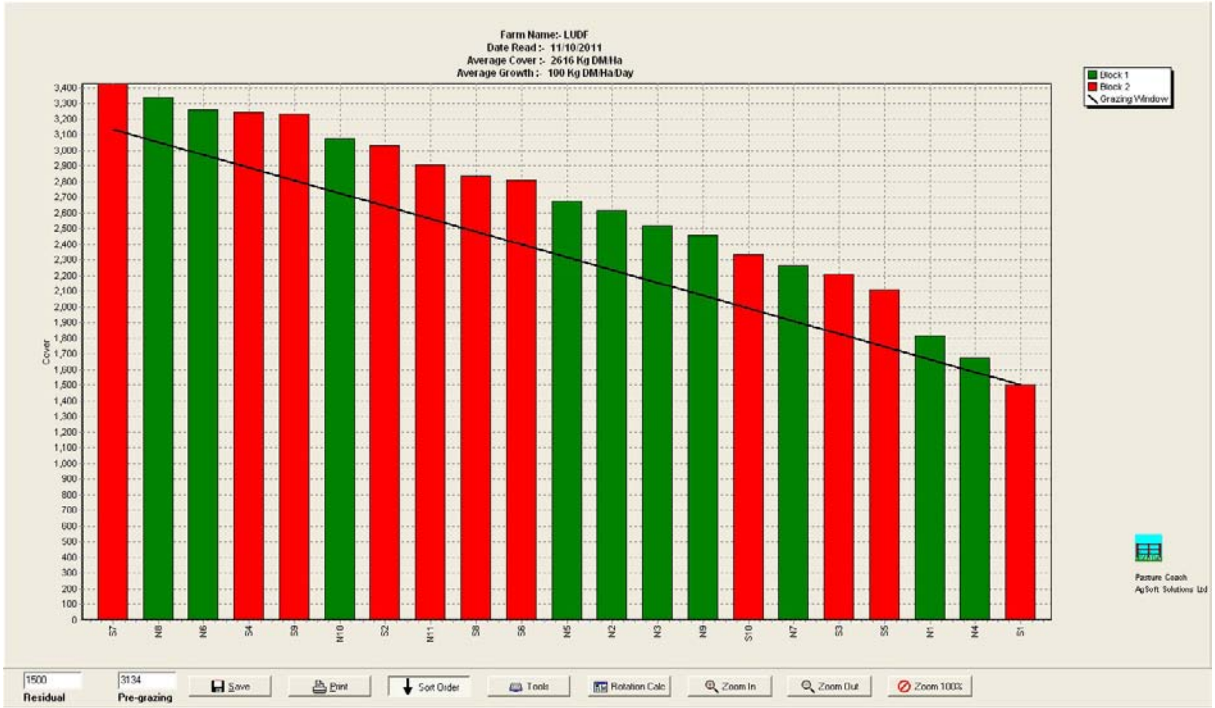
<u>Feeding levels</u>

11. No silage has been required during the week. Grazing interval which was expected to drop has risen slightly to 28 days as have pre grazing levels (now at 3218 kgDM/ha) only very slightly from 27days to 26.6days and pre grazing levels at 3122kgDM/ha on average and average post grazing at 1500kgDM/ha

12. The walk over weighing indicates that the cows have not lost liveweight this last week.

13. The milkers need about 224 MJME to produce 2.16 kg MS, maintain themselves, and allow for no weight loss. Our estimate is that the overall herd is eating about 18.1 kgDM of 12.4 MJME pasture per day.

14. Feed Wedge



15. Average cover 2616kgDM/ha remains above target. The feed wedge has a surplus of 50t. Of note also is that the grazing interval has not come down closer to a targeted 20 – 23 days. The feed situation means that even with Paddock S8 out for regrassing additional feed will need to be removed from the supply. Two paddocks 16ha will be cut for silage this week.

16. This week 73ha had 40kgN/ha applied. Gibberellic acid was applied to 42.8 ha. We expect to continue applying gibberellic acid for the time being to generate competitively priced surplus, high quality feed.

<u>Preparation for mating</u>

18. By the end of 6 weeks calving there were 568 cows calved which is 88% of the peak herd [640] against a target of 87%.

19. Cows have been Metri-checked on 8th September and as a result 19 cows were treated.

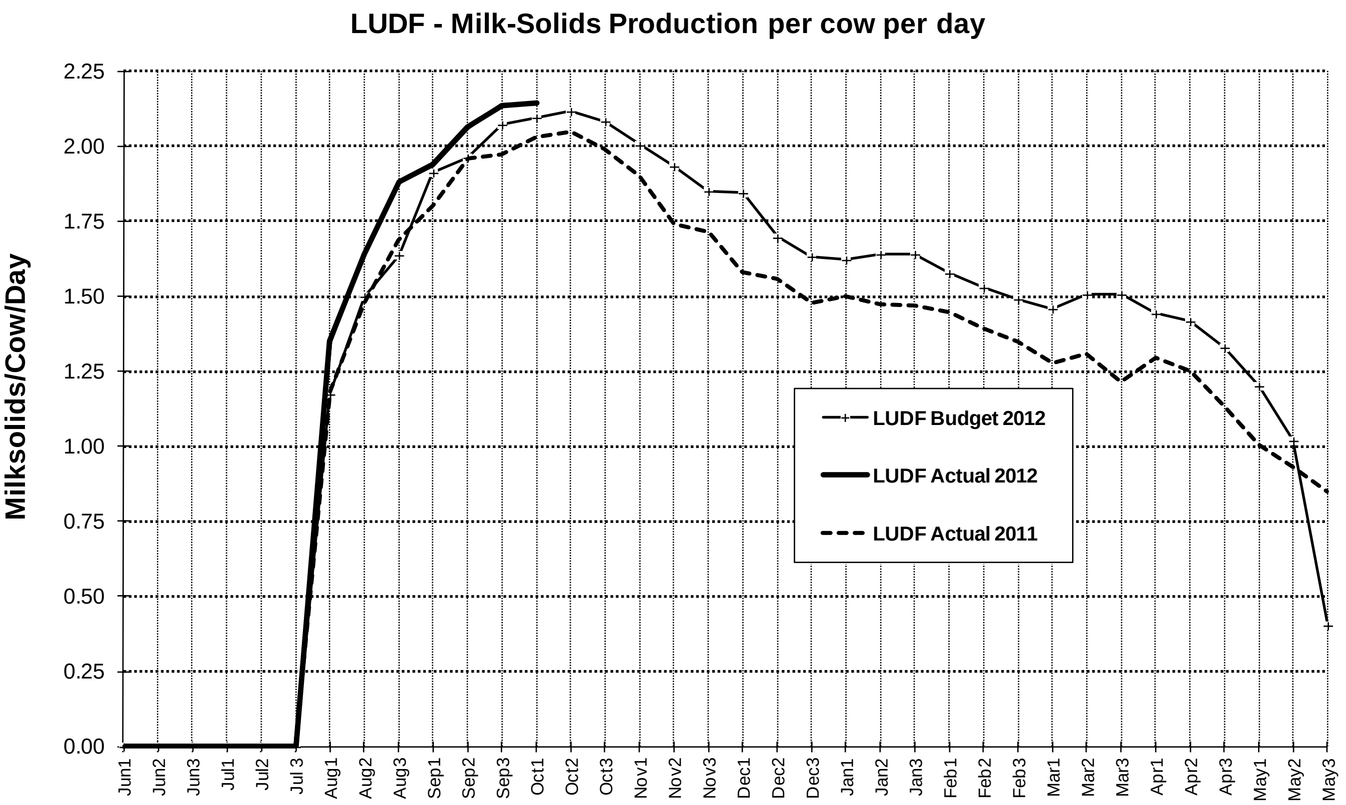
20. All cows have been tail painted to enable monitoring of pre mating heats.

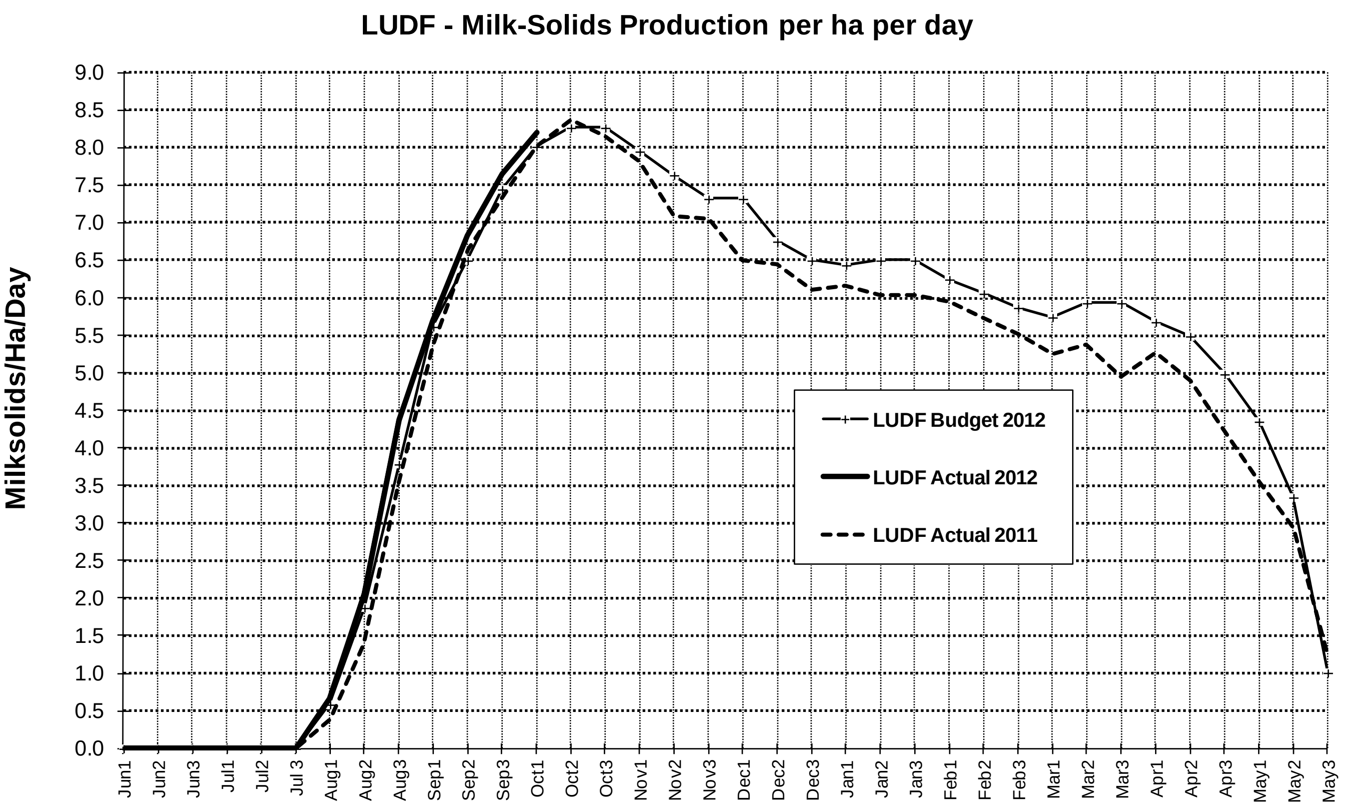
21. Jersey bulls have been purchased [7 weeks ago] they have been tested and vaccinated for BVD. They were selected on scrotal circumference in addition to the usual mating suitability criteria. They are currently at grazing being well fed.

22. The herd was vaccinated for BVD on 3rd October. So far we have had 2 clear bulk milk tests for BVD which covered the first 2/3 of the herd to calve.

23. Pre mating heats recorded this week were 206. This represents a 3 week rate of 96%.

24. The rising 2 year heifers AB mating will begin 15th October.


LUDF - Milk-Solids Production per cow per day
Milksolids/Cow/Day
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Jun1 Jun2 Jun3 Jul1 Jul2 Jul 3 Aug1 Aug2 Aug3 Sep1 Sep2 Sep3 Oct1 Oct2 Oct3 Nov1 Nov2 Nov3 Dec1 Dec2 Dec3 Jan1 Jan2 Jan3 Feb1 Feb2 Feb3 Mar1 Mar2 Mar3 Apr1 Apr2 Apr3 May1 May2 May3
LUDF Budget 2012
LUDF Actual 2012
LUDF Actual 2011


LUDF - Milk-Solids Production per ha per day
Milksolids/Ha/Day
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Jun1 Jun2 Jun3 Jul1 Jul2 Jul 3 Aug1 Aug2 Aug3 Sep1 Sep2 Sep3 Oct1 Oct2 Oct3 Nov1 Nov2 Nov3 Dec1 Dec2 Dec3 Jan1 Jan2 Jan3 Feb1 Feb2 Feb3 Mar1 Mar2 Mar3 Apr1 Apr2 Apr3 May1 May2 May3
LUDF Budget 2012
LUDF Actual 2012
LUDF Actual 2011

LUDF Weekly report	20-Sep-11	27-Sep-11	4-Oct-11	11-Oct-11
Farm grazing ha (available to milkers)	160	160	160	160
Dry Cows on farm / East blk / other	0/61/0	37/0/0	14/0/0	3/0/0
Culls (Includes culls put down & empties)	0	0	0	5
Culls total to date	16	16	16	21
Deaths (Includes cows put down)	2	0	0	1
Deaths total to date	4	4	4	5
Calved Cows available (Peak Number 640…)	584	605	628	636
Treatment / Sick mob total	0	6	2	4
Mastitis clinical treatment	1	4	0	2
Mastitis clinical YTD (tgt below 64 yr end)	34	38	38	40
Bulk milk SCC (tgt Avg below 150)	146	147	116	129
Lame new cases	2	4	0	3
Lame ytd	6	10	10	13
Lame days YTD (Tgt below 1000 yr end)	42	70	91	133
Other/Colostrum	0/23	0/19	0/19	0/16
Milking twice a day into vat	530	559	587	612
Milking once a day into vat	0	0	0	0
Small herd	170	170	172	198
Main Herd	378	389	415	414
MS/cow/day (Actual kg / Cows into vat only)	2.05	2.12	2.14	2.16
MS/cow to date (total kgs / Peak Cows 640)	47	60	74	88
MS/ha/day (total kgs / ha used	6.80	7.42	7.84	8.26
Herd Average Cond'n Score	4.55	4.55	0.00	0.00
Monitor group LW kg WOW 157 early MA calvers	460	458	456	456
Soil Temp Ave Aquaflex	7.4	8.3	10.1	10.1
Growth Rate (kgDM/ha/day)	52	65	73	100
Plate meter height - ave half-cms	13.4	13.2	13.6	15.1
Ave Pasture Cover (x140 + 500)	2370	2354	2400	2616
Surplus/[deficit] on feed wedge- tonnes	17	21	30	50
Pre Grazing cover (ave for week)	3003	3042	3122	3218
Post Grazing cover (ave for week)	1480	1550	1480	1500
Highest pre-grazing cover	3200	3100	3400	3300
Area grazed / day (ave for week)	5.20	5.90	6.00	5.70
Grazing Interval	31	27	27	28
Milkers Offered/grazed kg DM pasture	16.8	17.0	17.4	18.1
Estimated intake pasture MJME	211	211	217	224
Milkers offered kg DM Grass silage	0	0	0	0
Silage MJME/cow offered	0	0	0	0
Estimated intake Silage MJME	0	0	0	0
Estimated total intake MJME	211	211	0	0
Tgt total MJME Offered/eaten (incls 6% waste)	215	216	218	224
Pasture ME (pre grazing sample)	12.7	12.7	12.5	12.4
Pasture % Protein	18.3	24.2	25.2	21.8
Pasture % DM - Concern below 16%	21.0	18.5	18.6	17.5
Pasture % NDF Concern < 33	37.1	31.3	34.4	38.0
Supplements fed to date kg per cow (640 peak)	27.4	27.4	27.4	27.4
Units N applied/ha and % of farm	36units/32%	36units/20%	0	40units/45%
Kgs/ha N to Date (on NON-effluent area 128ha)	39	52	52	89
Rainfall (mm)	10.2	11.8	32	6.6
Aquaflex topsoil ave reading tgt 33 -38	35-32	39-33	39-35	0

LUDF Weekly Report - August	02-Aug-	09-Aug-11	16-Aug-11	23-Aug-11	30-Aug-11
Farm grazing ha (available to milkers)	160	160	160	160	160
Dry Cows on farm / East blk / other	208/0/45	126/00/364	00/240/114	00/265/00	180/00/00
Culls (Includes culls put down & empties)	0	0	1	0	0
Culls total to date	1	1	2	2	2
Deaths (Includes cows put down)	0	0	1	0	0
Deaths total to date	0	0	1	1	1
Calved Cows available (Peak Number 640...)	90	187	310	401	484
Treatment / Sick mob total	2	3	6	5	10
Mastitis clinical treatment	2	1	6	1	7
Mastitis clinical YTD (tgt below 64 yr end)	7	8	14	15	22
Bulk milk SCC (tgt Avg below 150)	NA	103	201	190	133
Lame new cases	0	0	0	0	1
Lame ytd	2	2	2	2	3
Lame days YTD (Tgt below 1000 yr end)	NA	NA	NA	NA	7
Other/Colostrum	0/22	0/60	0/78	0/80	0/28
Milking twice a day into vat	66	112	210	316	425
Milking once a day into vat	0	0	0	0	0
Small herd	Nil	Nil	Nil	Nil	Nil
Main Herd	0	0	0	0	0
MS/cow/day (Actual kg / Cows into vat only)	0.00	1.60	1.78	1.94	1.84
MS/cow to date (total kgs / Peak Cows 640)	0	1	3	8	16
MS/ha/day (total kgs / ha used	0.00	0.80	1.62	3.45	4.40
Herd Average Cond'n Score	0.00	0.00	5.10	5.10	4.75
Monitor group LW kg WOW 157 early MA calvers	0	0	474	467	464
Soil Temp Avg Aquaflex	4.3	0.0	5.4	4.6	6.5
Growth Rate (kgDM/ha/day)	5	6	0	6	24
Plate meter height - ave half-cms	14.6	17.5	0.0	12.5	12.0
Ave Pasture Cover (x140 + 500)	2533	2460	0	2252	2176
Surplus/[deficit] on feed wedge- tonnes	12	1.2	0	-35	-28
Pre Grazing cover (ave for week)	3700	3700	0	3500	3533
Post Grazing cover (ave for week)	1700	1600	0	1650	1500
highest pregrazing cover	3700	3900	0	3775	3650
Area grazed / day (ave for week)	0.82	1.70	2.60	2.60	3.00
Grazing Interval	195	94	62	62	53
Milkers Offered/grazed kg DM pasture	11.8	11.8	0.0	14.0	12.8
Estimated intake pasture MJME	147	147	0	175	160
Milkers offered kg DM Grass silage	0	0	0	0	0
Silage MJME/cow offered	0	0	0	0	0
Estimated intake Silage MJME	0	0	0	0	0
Estimated total intake MJME	147	147	0	175	160
Target total MJME Offered/eaten (includes 6% waste)	147	147	0	190	190
Pasture ME (pre grazing sample)	0.0	0.0	0.0	0.0	12.8
Pasture % Protein	0.0	0.0	0.0	0.0	16.8
Pasture % DM - Concern below 16%	0.0	0.0	0.0	0.0	20.2
Pasture % NDF Concern < 33	0.0	0.0	0.0	0.0	35.8
Supplements fed to date kg per cow (640 peak)	0.0	0.0	0.0	0.0	0.0
Supplements Made Kg DM / ha cummulative	0	0	0	0	0
Units N applied/ha and % of farm	0	0	0	0	36units/56%
Kgs/ha N to Date (on the NON-effluent area 128ha)	0	0	0	0	20
Rainfall (mm)	0	0.4	3	57.8	0
Aquaflex topsoil avg reading tgt 33 -38	38-44	36-41	37-47	33-44	39-37

LUDF Weekly report - September	06-Sep-11	13-Sep-11	20-Sep-11	27-Sep-11
Farm grazing ha (available to milkers)	160	160	160	160
Dry Cows on farm / East blk / other	0/140/0	0/113/0	0/61/0	37/0/0
Culls (Includes culls put down & empties)	6	8	0	0
Culls total to date	8	16	16	16
Deaths (Includes cows put down)	1	0	2	0
Deaths total to date	2	2	4	4
Calved Cows available (Peak Number 640…)	506	539	584	605
Treatment / Sick mob total	7	7	0	6
Mastitis clinical treatment	4	7	1	4
Mastitis clinical YTD (tgt below 64 yr end)	26	33	34	38
Bulk milk SCC (tgt Avg below 150)	182	137	146	147
Lame new cases	0	1	2	4
Lame ytd	3	4	6	10
Lame days YTD (Tgt below 1000 yr end)	14	21	42	70
Other/Colostrum	0/24	0/31	0/23	0/19
Milking twice a day into vat	465	501	530	559
Milking once a day into vat	0	0	0	0
Small herd	165	168	170	170
Main Herd	300	333	378	389
MS/cow/day (Actual kg / Cows into vat only)	1.86	1.92	2.05	2.12
MS/cow to date (total kgs / Peak Cows 640)	25	35	47	60
MS/ha/day (total kgs / ha used	5.30	6.00	6.80	7.42
Herd Average Cond'n Score	4.60	4.60	4.55	4.55
Monitor group LW kg WOW 157 early MA calvers	462	467	460	458
Soil Temp Avg Aquaflex	7.0	8.0	7.4	8.3
Growth Rate (kgDM/ha/day)	24	74	52	65
Plate meter height - ave half-cms	11.3	13.7	13.4	13.2
Ave Pasture Cover (x140 + 500)	2082	2414	2370	2354
Surplus/[defict] on feed wedge- tonnes	-34	32	17	21
Pre Grazing cover (ave for week)	3110	2863	3003	3042
Post Grazing cover (ave for week)	1550	1480	1480	1550
highest pregrazing cover	3600	2900	3200	3100
Area grazed / day (ave for week)	3.60	4.40	5.20	5.90
Grazing Interval	44	36	31	27
Milkers Offered/grazed kg DM pasture	0.0	0.0	16.8	17.0
Estimated intake pasture MJME	0	0	211	211
Milkers offered kg DM Grass silage	4	4	0	0
Silage MJME/cow offered	46	50	0	0
Estimated intake Silage MJME	39	43	0	0
Estimated total intake MJME	0	0	211	211
Target total MJME Offered/eaten (includes 6% waste)	0	0	215	216
Pasture ME (pre grazing sample)	12.8	12.6	12.7	12.7
Pasture % Protein	18.0	19.8	18.3	24.2
Pasture % DM - Concern below 16%	21.8	20.7	21.0	18.5
Pasture % NDF Concern < 33	35.3	33.8	37.1	31.3
Supplements fed to date kg per cow (640 peak)	9.3	25.1	27.4	27.4
Supplements Made Kg DM / ha cummulative	0	0	0	0
Units N applied/ha and % of farm	36units/15%	0	36units/32%	36units/20%
Kgs N to Date (whole farm)	0	0	0	0
Kgs/ha N to Date (on the NON-effluent area 128ha)	25	25	39	52
Rainfall (mm)	8.6	0	10.2	11.8
Aquaflex topsoil avg reading tgt 33 -38	38-36	35-31	35-32	39-33

Whole Paddock sampling – does it pay?

Mike White – ARL

Fertiliser applications historically have being relatively 'uniform' in rate and type such that soil fertility could be expected to be uniform across the farm. In reality this is never the situation for many reasons including soil type, topography, animal behaviour, paddock history, and fertiliser spreading patterns. With current costs of fertiliser relative to farm returns, pasture performance in relation to soil fertility should be maximised as the most economic use of fertiliser dollars. This can be achieved by quantifying the variability of soil fertility across the whole farm, by soil testing all or many more paddocks than usual, so that differential rates of fertiliser/lime can be applied. This will allow either increased productivity in low fertility areas where appropriate and financial savings where less or no fertiliser may be required.

LUDF soil fertility status

The milking platform has been sampled regularly in the past to monitor fertility and formulate the fertiliser programme. Since 2003 this has involved annual soil testing of 10 out of the 21 paddocks. The average soil test results for this period are shown below.

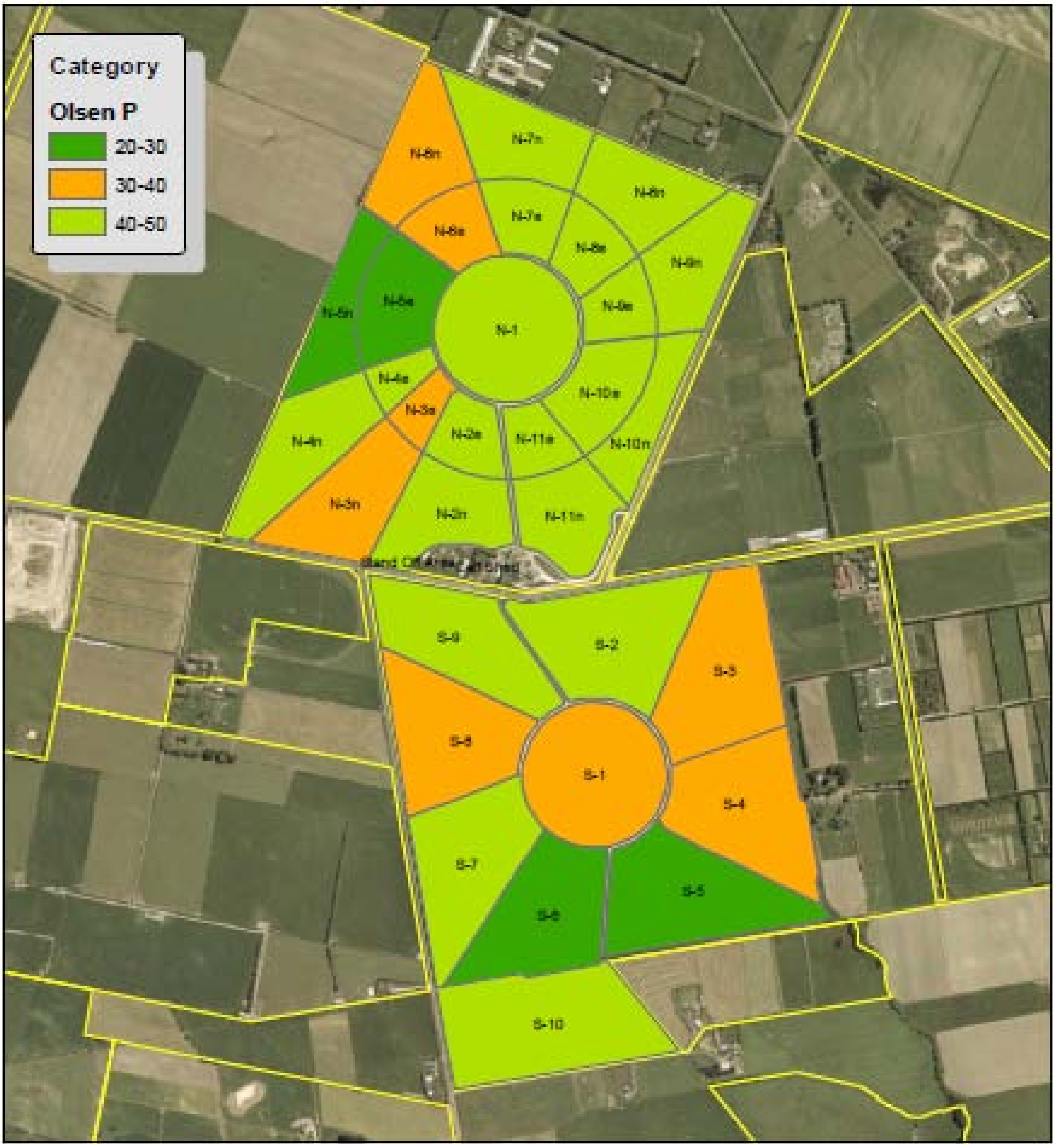
Date	pH	Olsen P	Quick test K	Sulphate
Dec-01	5.8	30	11	34
Jul-02	5.8	31	14	35
Oct-02	5.9	35	8	29
Jun-03	6.1	37	12	7
Jun-04	6.4	37	13	11
Jun-05	6.1	35	13	10
Jun-06	6.3	33	15	9
Jun-07	6.3	39	16	17
Jun-08	6.1	36	12	9
Jun-09	6.1	32	11	11
Jun-10	6	32	10	6

With the aim to maximise pasture performance the variability of soil fertility across the whole farm was quantified by soil testing all paddocks at the end of June 2011 and sent to ARL for analysis. Below is the average across all 21 paddocks on milking platform sampled in 2011.

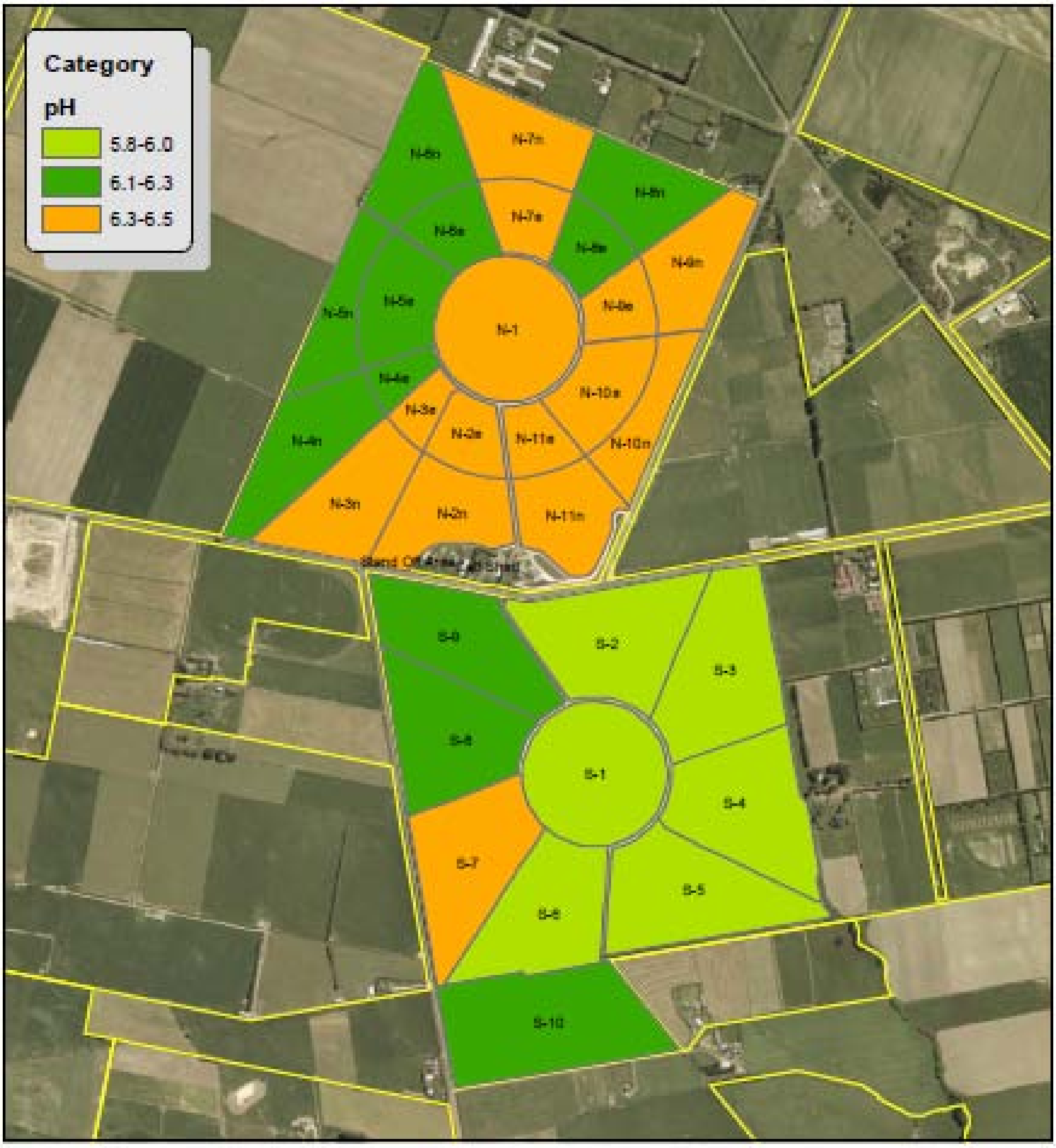
Date	pH	Olsen P	Quick test K	Sulphate
Jun-11	6.2	39	8	12

The results of primary interest, phosphorus and pH are graphically summarised below showing the range in fertility on the milking platform.

Phosphorus: The objective is to lift Olsen P status to 40 (Target for high producing dairy farms). This objective means there is an opportunity to apply capital phosphate to 58 of the 160 hectares to achieve this target.



Soil acidity: All paddocks are at or above the optimum soil pH of 5.8-6.0 so no capital lime is required. Blocks S1-S6 would benefit from maintenance lime application.



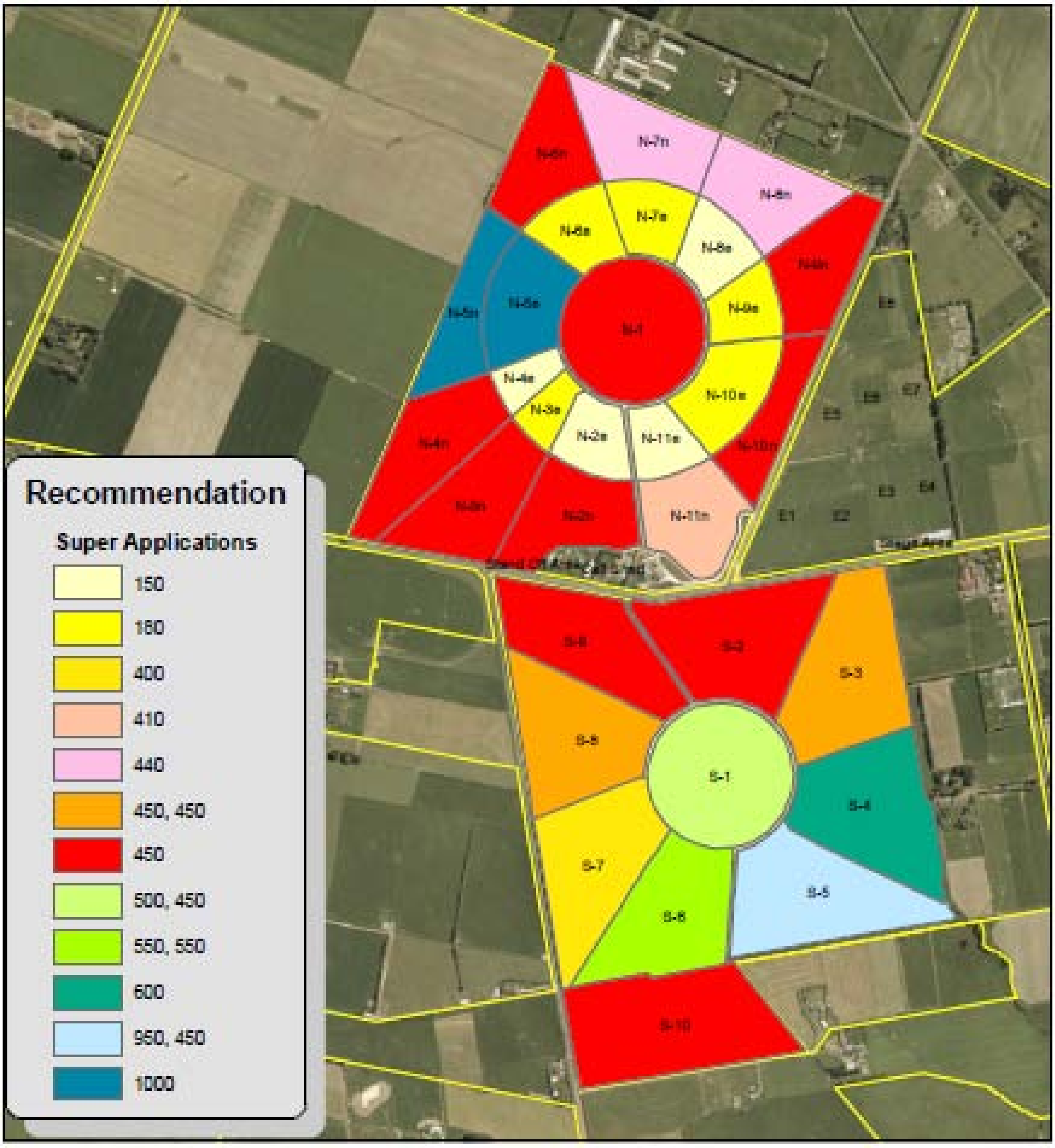
Sulphur: A range of sulphur status is evident. Sulphate levels are below, at or above the target optimum of 10-12 for sedimentary soils. The organic sulphur status (a measure of sulphur that is held in the organic fraction of the soil) is below the target optimum of 15-20 for sedimentary soils. This is not expected for the sedimentary soil types which cover the farm. The practical implications are that nutrient inputs (e.g. effluent) should aim to apply a minimum of 25 Kg/ha of sulphur to overcome seasonal deficiencies in pasture.

Soil potassium: Not shown as all above the recommended level of 5-8 which again is to be expected given that the LUDF soils have formed from parent material rich in potassium.

2011 Fertiliser programme

Key points:

- Differential application through Spreading Canterbury aimed at achieving an Olsen P of above 40, hence the most appropriate and cost effective fertiliser is superphosphate.
- The application of superphosphate and effluent will meet the requirements for sulphur across the milking platform.
- Application will differentiate across the north block to recognise input of P and S in the effluent.
- Higher capital superphosphate on two Sth block paddocks split into two applications due to desire to be setting an example for environmental stewardship in more prone situations.



Is it economic?

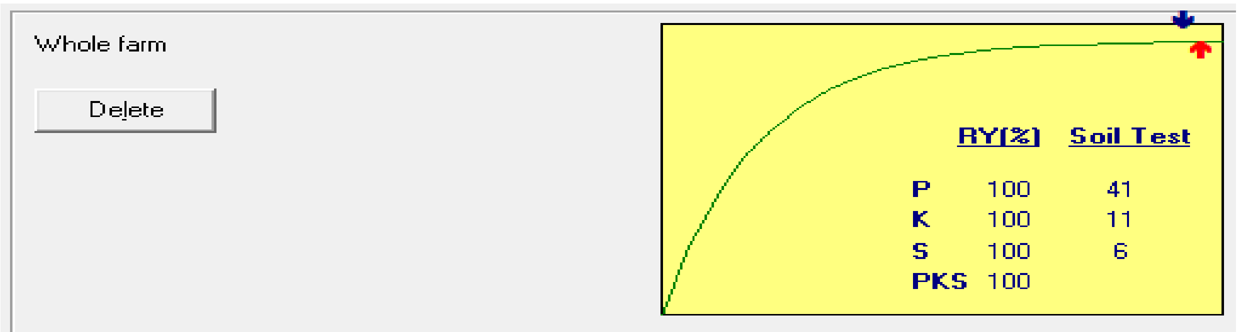
The overall fertiliser spend for P and S is $32,000, comprising $22,000 of maintenance fertiliser, which would have been applied under a conventional programme and $10,000 of capital fertiliser recommended as a result of the intensive soil sampling. Is the additional $10,000 economic?

'Econometric' analysis through Overseer was used to determine the addition financial value of the capital fertiliser.

Senario: Target raising the Olsen P for the three paddocks (N5, S5, S6) or 26 ha with lowest Olsen P values (< 30) to the target Olsen P of 40.

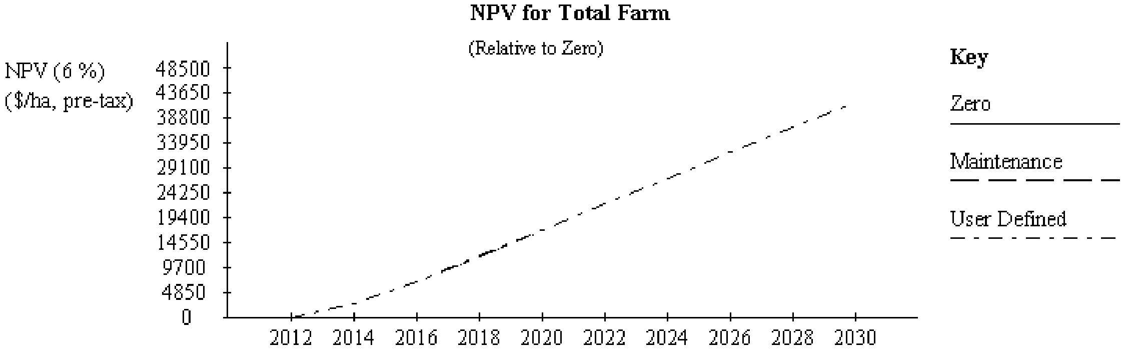
Land Details	Maintenance Blk	Low P Blk	
Block Area	133	26	(ha)
Rainfall	622	622	(mm)
Irrigation	500	500	(mm)
Soil Group	Sedimentary	Sedimentary	
Topography	Flat	Flat	
Start OlsenP	41	26	
Organic S Test	6	6	
Quick Test K	12	12	

Stock Details	
Stock Class	Friesian
Stocking Rate	4
Milk Production	1825
Milk Price	7
Variable Cost	400.00
Gross Margin	2793.75
Stock Value	2000.00



(kg/ha)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Phosphorus	68	58	58	58	58	58	58	58	58	58

- Whole farm average optimum becomes Olsen P of 41
- Requires capital on 26 ha and maintenance on the rest (134ha)
- Thus, most of farm already at or above optimum



NPV (6 %)	Block	Scenario	2012	2014	2016	2018	2020	2022	2024	2026	2028	2030
($/ha, pre-tax)	Farm Total	Zero	-	-	-	-	-	-	-	-	-	-
(Relative to Zero)	Farm Total	Maintenance	59	2662	7048	11935	16925	22030	27070	32104	37050	41817
	Farm Total	User Defined	68	2696	7107	12016	17027	22083	27144	32200	37165	41949

Answer: - yes it pays.

The NPV per hectare (user defined) relates to the option of applying capital fertiliser and returns a modest increase in NPV from 2012 which increases with time (@$7/kg MS) above that of a fertiliser maintenance programme with both been significantly higher that when fertiliser is not applied at all. This indicates a $9/ha return for lifting the Olsen P from 26 to 40 for the lowest 3 paddocks on farm.

Opportunities for the future

Resample all paddocks including effluent blocks to accurately monitor the effect of this year's differential application.

Further opportunities to save fertiliser spend by applying less than maintenance on high Olsen P paddocks.

Excerpts from the Canterbury Region Dairy Report 2010-2011 Season

Report No. R11/52
ISBN: 978-1-927161-85-2
Web version: 978-1-927161-86-9

The full report is available from the Environment Canterbury website (www.ecan.govt.nz)

Compliance monitoring site inspections

All inspections were carried out without prior warning, in line with nationally agreed procedures. At the time of compliance monitoring site inspections, efforts were made to contact the senior person on site, such as the farm manager or consent holder.

While on-site, information was collected on the peak number of cows milked during the dairy season, the number of hectares used for dairy effluent disposal, whether the dairy effluent storage pond was sealed, and how regularly the travelling irrigator was relocated.

The inspection of the dairy effluent disposal system included, but was not limited to:

- Inspection of the dairy yard and associated channels to ensure that dairy effluent was not being washed into unlined areas or surface water bodies;
- Inspection of the dairy effluent storage system for evidence of sump overflows (recent and historical);
- A clear demonstration that the effluent pond is adequately sealed. It is common for a resource consent to require the consent holder to obtain a registered engineers report as proof that the pond is adequately sealed;
- Inspection of the dairy effluent disposal area to assess the dairy effluent application rate (by walking the dairy effluent disposal area);
- Inspection for any dairy effluent ponding on the soil surface;
- Inspection to ensure that the appropriate buffer distances were being maintained between bores, soak holes and waterways;
- Inspection of the dairy effluent pipeline for any obvious breaks or leaks.

Resource consent compliance was assessed by the Resource Management Officer while on-site and each resource consent condition was graded according to the level of compliance.

The main compliance grades are as follows:

- Grade 1 – Fully compliant
- Grade 2 – Minor non-compliance
- Grade 3 – Significant non-compliance
- Grade 4 – Major non-compliance

Figures 1-4 are examples of Grade 1 to Grade 4 compliance for ponding.

Figure 1, Grade 1 - fully compliant

Figure 2, Grade 2 - minor non-compliance

Figure 3, Grade 3 - significant non-compliance

Figure 4, Grade 4 - major non-compliance

Resource Consent-Based Compliance Overview

Table 1, Initial inspection resource consent-based compliance results 2010-2011

Resource Consent-Based Compliance						
Grade	Total		Permitted activity		Resource consent	
Number of dairy farms monitored	917		120		797	
Overall Grade 1, full compliance	595	64.9%	85	70.8%	510	64.0%
Overall Grade 2, minor non-compliance	233	25.4%	27	22.5%	206	25.8%
Overall Grade 3 or 4, significant/major non-compliance	89	9.7%	8	6.7%	81	10.2%

Figure 5 shows the percentage of consents and permitted activities that have achieved full compliance over the past five dairy seasons.

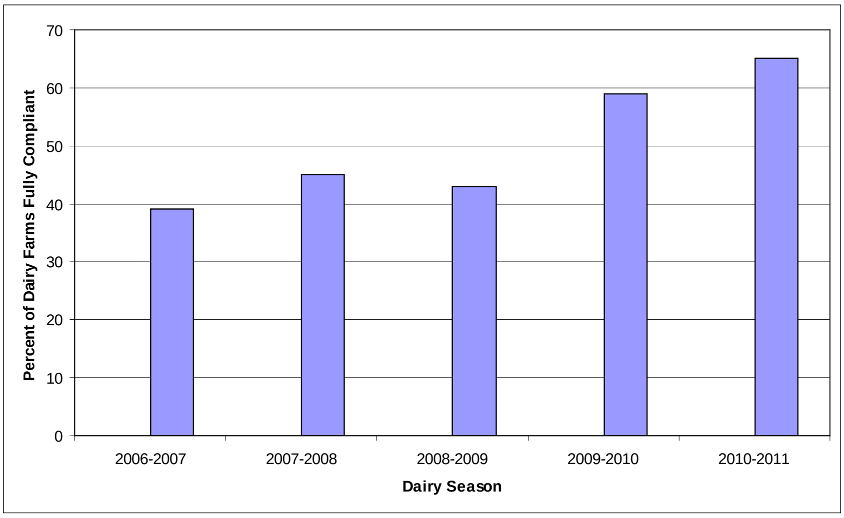


Figure 5, Fully compliant dairy farms 2006-2011

Condition-based compliance results

In total, 95.0% of all conditions were being fully complied with based on the results of the initial compliance monitoring site inspections. In comparison, 94.1% of conditions were fully compliant the previous season and 72.7% of conditions were fully complied with during the 2008-2009 dairy season. Condition-based compliance data are shown in Table 2.

Table 2, Initial inspection condition-based compliance results 2010-2011

Condition-based compliance			
Conditions	**Total**	**Permitted activity**	**Resource consent**
Total number monitored	10,137	742	9,395
Number graded fully compliant	9,633	686	8,947
Percentage graded fully compliant	95.0%	92.5%	95.2%
Number graded non-compliant	504	56	448
Percentage graded non-compliant	5.0%	7.5%	4.8%

Best practices – As noted by Resource Management Officers

Actions to improve dairy effluent compliance, as noted by Resource Management Officers during compliance visits, included the following.

In the shed

- Storm water was diverted from the dairy effluent disposal system;
- The yard was wetted down prior to milking and scrapers were used prior to hosing down to reduce the volume of wash down water required;
- All concreted areas were sufficiently bunded to contain dairy effluent.

Sumps and storage systems

- All channels, sumps, pipes and storage facilities were sealed and well maintained.
- The stone trap was cleaned out regularly, the solids were placed on a concrete pad to dry and any liquid was able to run back into the stone trap. Alternatively the material was spread to land while complying with the buffer distances between waterways, bores and soak holes.
- Adequate storage capacity was available to allow for dairy effluent irrigation to be deferred at times when soil moisture levels were too high to irrigate.
- Storage facilities were maintained with sufficient freeboard to ensure storage was available when required.

Dairy effluent disposal

- Dairy effluent irrigators were set up correctly and applied dairy effluent at the lowest rate possible, taking into consideration soil type, topography and soil moisture, to ensure that ponding, dairy effluent runoff and pasture damage did not occur;
- The irrigator was checked regularly to ensure that it was operating correctly and would not come to the end of a run while discharging;
- Disposal occurred only when soil conditions were suitable. This required adequate on-site storage;
- Where a travelling irrigator was used, the hose was laid out properly to minimise drag on the irrigator;
- Sensitive areas such as bores, waterways and soak holes were identified and the appropriate buffer distances were maintained;
- The dairy effluent application rate was measured routinely to ensure that the application rate did not exceed the maximum holding capacity specified by the resource consent;
- The dairy effluent application area was sufficient to maintain nitrogen application rates from effluent below 200 kg/ha/year and dairy effluent was applied evenly over this area. (Note that the area may need to be larger to keep potassium levels within the optimum range);
- A nutrient budget was prepared and adhered to.

Management

- A management plan was developed and implemented. It was displayed in a prominent place in the dairy shed, along with a copy of the resource consent;
- Staff responsibilities were clearly defined and staff were adequately trained in how systems operated;
- The equipment was maintained regularly as recommended by the manufacturer;
- Contingency measures were in place in the event of equipment failure such as a spare pump and contact details for a vacuum tanker operator;
- A pre-season check was undertaken to ensure that the dairy effluent disposal system was adequate for the coming dairy season's herd size and that all consent requirements were being complied with;
- Where dairy effluent was injected into irrigation water that was connected to a ground or surface water source, either a reduced pressure zone backflow preventer or an air gap was installed to avoid backflow of dairy effluent into the water source.

Further information

For further guidance on dairy effluent disposal best practice, refer to '*A Guide to Managing Farm Dairy effluent – Canterbury*'. This provides detailed information on best practice management techniques and is available from Environment Canterbury's Customer Services (phone 0800 EC INFO), or can be downloaded from www.dairynz.co.nz.

Common non-compliance issues

Dairy effluent ponding

Most dairy farms (99%) use spray irrigation to dispose of dairy effluent. As in previous dairy seasons, the main problem with this method of disposal is the over-application of dairy effluent, causing ponding on the soil surface.

This can be caused by a variety of factors including failure to shift the irrigator regularly, insufficient area being used for disposal, equipment failure such as pipe breakages or pump failure, inadequate system capacity or lack of sufficient dairy effluent storage, which results in dairy effluent disposal occurring when soil moisture levels are already high.

Overall 232 (25.4%) farms inspected showed some level of dairy effluent ponding during the 2010-2011 dairy season.

Causes of significant and major non-compliance

Of the 504 consent conditions graded as non-compliant in the 2010-2011 season (Table 2 above), 127 were graded 3 (Significant non-compliance) and five were graded 10 (Enforcement action taken). An analysis of the causes of these non-compliances is shown below in Table 3.

Table 3 Causes of significant consent condition non-compliance

Cause of non-compliance	Number of Conditions
Ponding	84 (63.6%)
Application depth / water holding capacity exceeded	17 (12.9%)
Herd size exceeded – second year requesting change to consent	7 (5.3%)
Effluent storage overflow	6 (4.5%)
Discharge outside disposal field	4 (3.0%)
Discharge within minimum distance to buffer zones	3 (2.3%)
Effluent storage inappropriate	2 (1.5%)
No backflow prevention test – second year information requested	2 (1.5%)
No test results for pond integrity - second year information requested	2 (1.5%)
Solids stored off pad	2 (1.5%)
No management plan submitted - second year information requested	1 (0.8%)
Old consent not surrendered - second year information requested	1 (0.8%)
Run off from stockyard	1 (0.8%)

These 132 significant non-compliances occurred on 89 farms (see Table 1). With many consents there are conditions relating to both ponding of effluent and the application depth or water-holding capacity of the soil. In such cases an incidence of significant ponding could result in both conditions being graded as significantly non-compliant. In the cases of administrative non-compliance, these conditions are only graded as significantly non-compliant where the issue has not been resolved for at least the second consecutive season.

Comparison with previous monitoring seasons

The results for the 2010-2011 dairy season showed an improvement over the previous four monitoring seasons and in comparison to the previous year, for minor non-compliance. Part of the improvement can be attributed to the continued efforts by the dairy industry and Environment Canterbury to improve compliance.

The levels of consent-based compliance continued to show improvement in the increase in full compliance and reduction in minor non-compliance. Compared with the 2009-2010 season, full compliance increased from 58.7% to 64.9% and minor non-compliance decreased from 32.9% to 25.4%. However, the level of significant non-compliance did not improve, increasing from 8.4% to 9.7% between the 2009-2010 and 2010-2011 seasons. This will be one of the areas of focus for the forthcoming season.

Figure 6 illustrates the trend in dairy effluent compliance for the past five seasons. This shows an improvement in full compliance, from 39.6% in 2006-2007 to 64.9% in 2010-2011, an improvement in minor non-compliance from 42.7% in 2006-2007 to 25.4% in 2010-2011 and an improvement in significant non-compliance from 20.0% in 2007-2008 to 9.7% in 2010-2011. Over the past five seasons, the number of dairy farms in Canterbury increased by 47.8%, from 623 to 921.

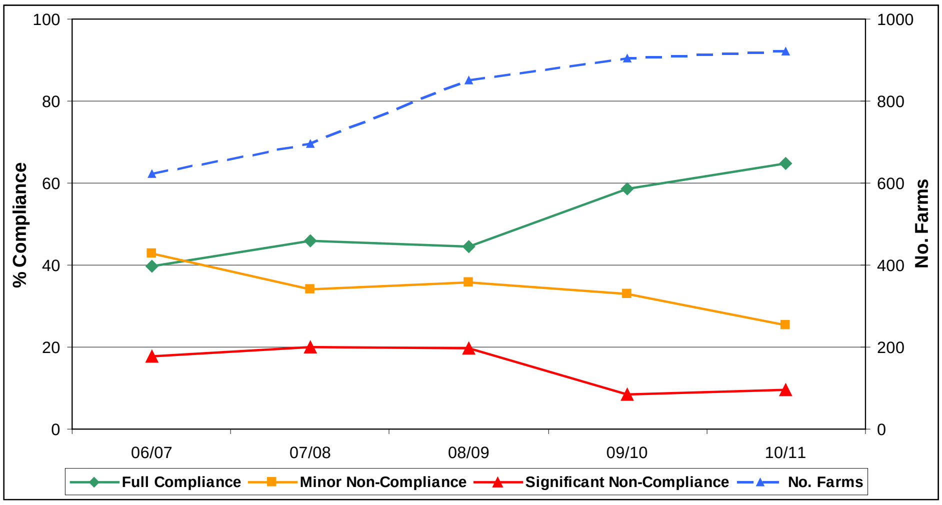


Figure 6 Dairy Effluent Compliance Levels 2006-2011.

Requirements of the Operative Regional Plan

Following the Natural Resources Regional Plan becoming operative from 11 June 2011, there are now new rules that affect dairy farming activities, on all existing and proposed new dairy farm operations in Canterbury. A summary of all the new rules associated with managing dairy effluent, including key points of the rule conditions, are listed below.

The nature of dairy farm storage and discharge activities means these rules relate closely to each other. Where resource consent is required for discharges covered by any of the permitted rules, the discharge consent required by rule WQL25 will generally include all the different activities into the one consent. It should also be noted that for all rules relating to permitted activities, resource consent is required if compliance with the basic conditions of the rule cannot be met, with existing dairy farms required to make application by 11 December 2011.

The full conditions identify the requirements and are available on-line[1] and advice is available from Environment Canterbury's Customer Services Section. Environment Canterbury and the Canterbury Dairy Effluent Group are carrying out educational and advisory initiatives to help the dairy farming community with the transition to an operative plan. There may also be requirements under other, catchment specific, regional plans - advice is available from Environment Canterbury's Customer Services Section.

Rule WQL25: Discharge of animal effluent onto land.

The discharge of effluent from dairy yard effluent collection and storage systems must be authorised by resource consent. This now includes smaller dairy farms previously authorised by the permitted activity rules of the Transitional Regional Plan. Farmers operating by this previous authority need to make application for resource consent by 11 December 2011 to be able to continue their activity.

Rule WQL23: Discharge of solid dairy waste and vegetative material containing animal solids from holding pads and barns, onto land.

The discharge of this solid material is allowed as a permitted activity, subject to conditions including maintaining buffer zones from waterways, bores, soak holes, sensitive areas and when soil moisture conditions do not exceed field capacity,

Rule WQL24: Use of land for a stockholding area.

The use of a stockholding area is a permitted activity subject to conditions including the base of any stockholding area being made of impervious material, and effluent from cows standing on the pad, along with any washdown water and rainwater, being disposed and discharged from an authorised collection and storage system (see WQL25 above).

[1] http://ecan.govt.nz/publications/Plans/nrrp-chapter-4-operative-110611.pdf
http://ecan.govt.nz/publications/Plans/nrrp-chapter-3-operative-no-maps-110611.pdf

Rule WQL26: Storage of dairy effluent.

The storage of dairy effluent is allowed as a permitted activity, subject to conditions including the storage facility holding a minimum of three days effluent (including rainwater), the facility being made of, or lined with material than ensures any seepage is no more than one millimetre per day; and the storage facility being located outside buffer zones to waterways, bores and land prone to flood. Storage ponds which cannot hold three days effluent (including rainwater) or which are greater than 1500 m^3 in size, or cannot comply with other conditions of the rule will require resource consent.

Rule WQL27: Storage of solid dairy effluent and decomposing vegetative material containing dairy effluent.

Storage of solid dairy effluent and decomposing vegetative material containing dairy effluent is a permitted activity, subject to the material being stored on an impervious surface with seepage no more than one millimetre per day and the facility is located outside buffer zones to waterways, bores, drinking and supply bores.

Rule AQL63: Discharge of odour or particles to air from storage of animal waste

The discharge of odour and particles into the air from the storage of effluent is a permitted activity provided the facility was established prior to 1 June 2002 and other conditions are met.

If the storage facility was not established prior to this time, or other conditions are not met, consent is required under Rule AQL69. Generally this will be included on the consent issued under Rule WQL25.

Rule AQL65: Discharge of odour and liquid particles into the air from the discharge of effluent to land.

The discharge of odour and liquid particles into the air from the discharge of effluent to land is a permitted activity subject to any odour not being offensive or objectionable beyond the property boundary and spray drift is contained within the property boundary where the discharge is made. A record of all discharges is to be maintained, detailing where the discharges were made, the volume of the discharge and wind direction.

The above rules relate directly to the discharge and storage of dairy cow effluent. The newly operative plan also contains other rules affecting dairy farms in Canterbury relating to stock access to waterways and the use of offal pits.

Rule WQL21: Stock access to water ways.

From 11 June 2012, discharges to water or disturbances to beds and banks will be prohibited by intensively farmed livestock or by cattle, farmed deer and farmed pigs in areas of significant fish spawning, on beds of identified spring fed plains rivers or within one kilometre upstream of identified freshwater bathing and public drinking water supply.

Prior to 11 June 2012 the discharge of contaminants into water in rivers, lakes, or wetlands from access by livestock in or near water or disturbances by livestock the beds of rivers, lakes and wetlands is permitted subject to the access not resulting in significant adverse effects, such as discoloration of water, damage to the banks and beds and an abundance of effluent discharged by the livestock.

Rule WQL22: Use of offal pits

The discharge of dead animals, animal parts and refuse into land is a permitted subject to pits being developed according to base conditions including maintenance of buffer zones to surface water and groundwater aquifers

Rule AQL67: Discharge of odour from offal pits

The discharge to air of odour from the disposal and decay of dead livestock in offal pits as a permitted activity provided all the conditions of the permitted rule are complied with, including the odour not being offensive or objectionable beyond the property boundary.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