Lincoln University Dairy Farm [LUDF]

Focus Day
23 February 2012

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.

LUDF Strategic objective 2011-2015:

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.*

Additional 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 consider the farms full environmental footprint, land requirement, resource use and efficiency in system decision making and reporting
3. To use the best environmental monitoring and irrigation management systems in the development and implementation of practices, that achieve sustainable growth in profit from productivity and protection of the wider environment.
4. To ensure optimal use of all nutrients on farm, including effluent, fertiliser, nutrients imported from supplements and atmospheric nitrogen; through storage where necessary, distribution according to plant needs and retention in the root zone.
5. To continue the environmental monitoring programme and demonstrate technologies and farming practices that will ensure the average annual concentration of nitrate-N in drainage water from below the plant root zone remains below the critical value [16 mg N/L] specified in ECan's proposed regional rule in order for LUDF to remain a 'permitted activity' [Rule WQL20].
6. To store and apply effluent such that there is no significant microbial contamination of the shallow aquifers.
7. To manage pastures and grazing so per hectare energy production is optimised and milkers consume as much metabolisable energy [ME] as practicable.
8. To optimize the use of the farm automation systems and demonstrate / document improved efficiencies and subsequent effect on the business.
9. To achieve industry targets for mating performance within a 10 week mating period, including a 6 week in-calf rate of 79% and 10 week in calf rate greater than 89% i.e. empty rate of less than 11%.
10. To continue to document and measure LUDF's influence on changes to defined management practices on other dairy farms.
11. To ensure specific training is adequate and appropriate to enable staff members to contribute effectively in meeting the objectives of the farm.
12. To operate an efficient and well organised business unit.
13. To generate profit through tight cost control with appropriate re-investment and maintenance of the resources.
14. To create and maintain an effective team environment at policy, management and operational levels.
15. To actively seek labour productivity gains through adoption of technologies and practices that reduces labour requirements or makes the work environment more satisfying.
16. To assist Lincoln University to attract top quality domestic and international students into the New Zealand dairy industry.

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 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

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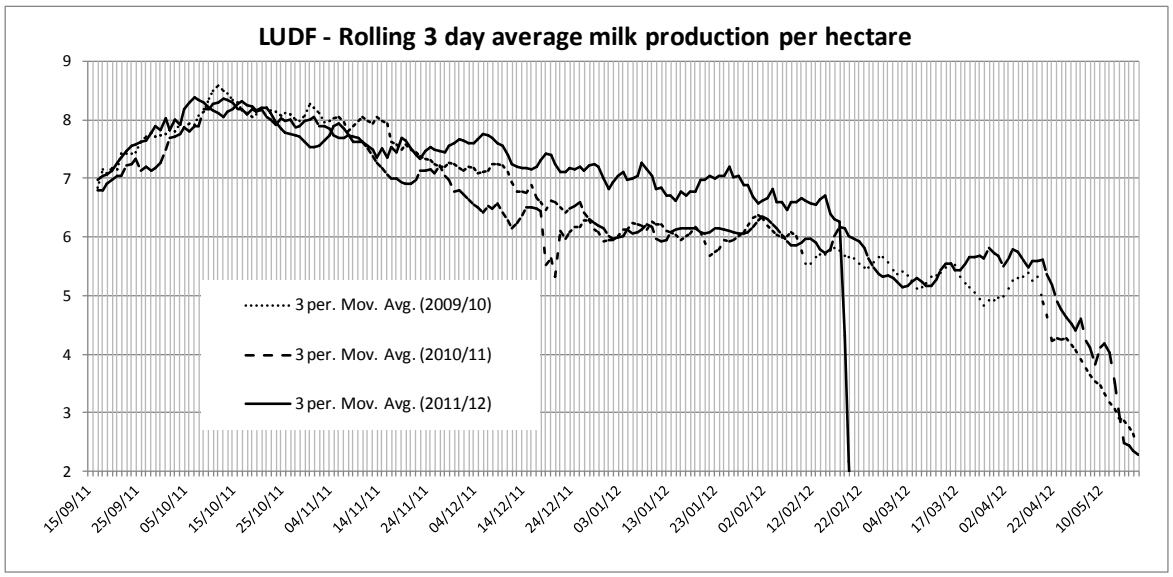
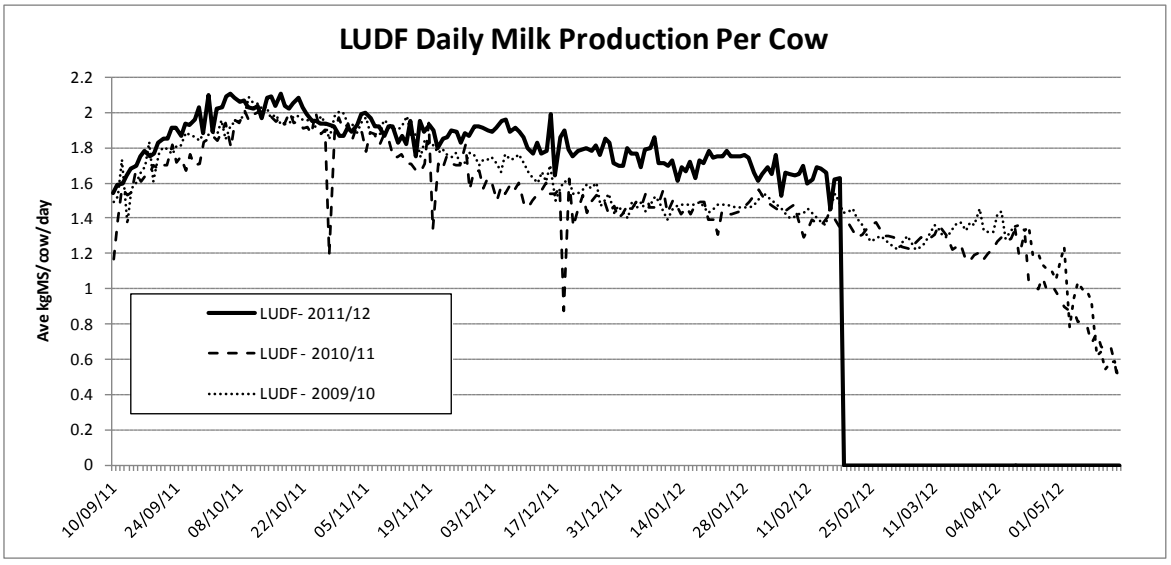
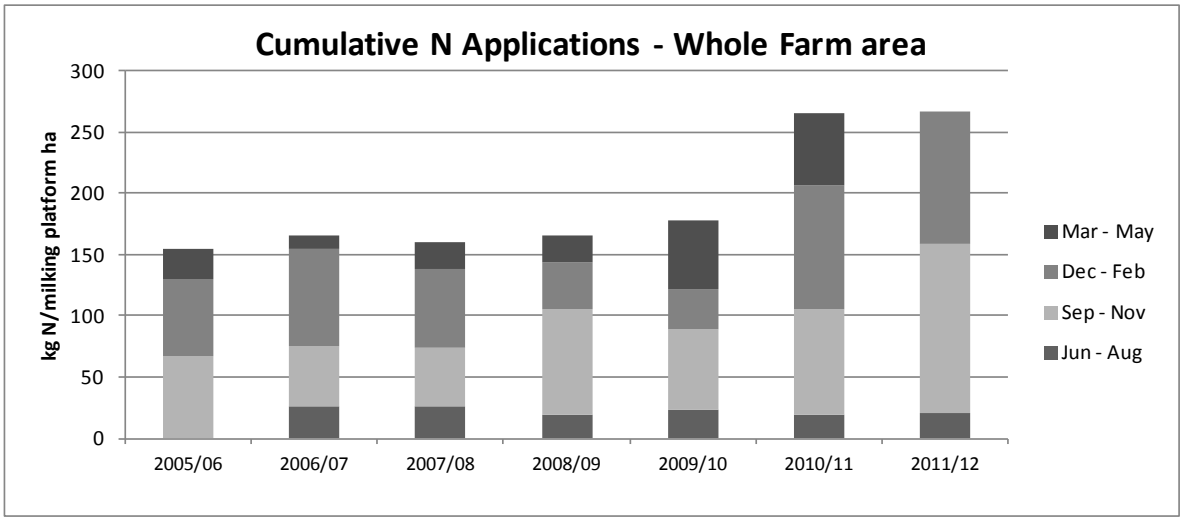
LUDF – Season to date data







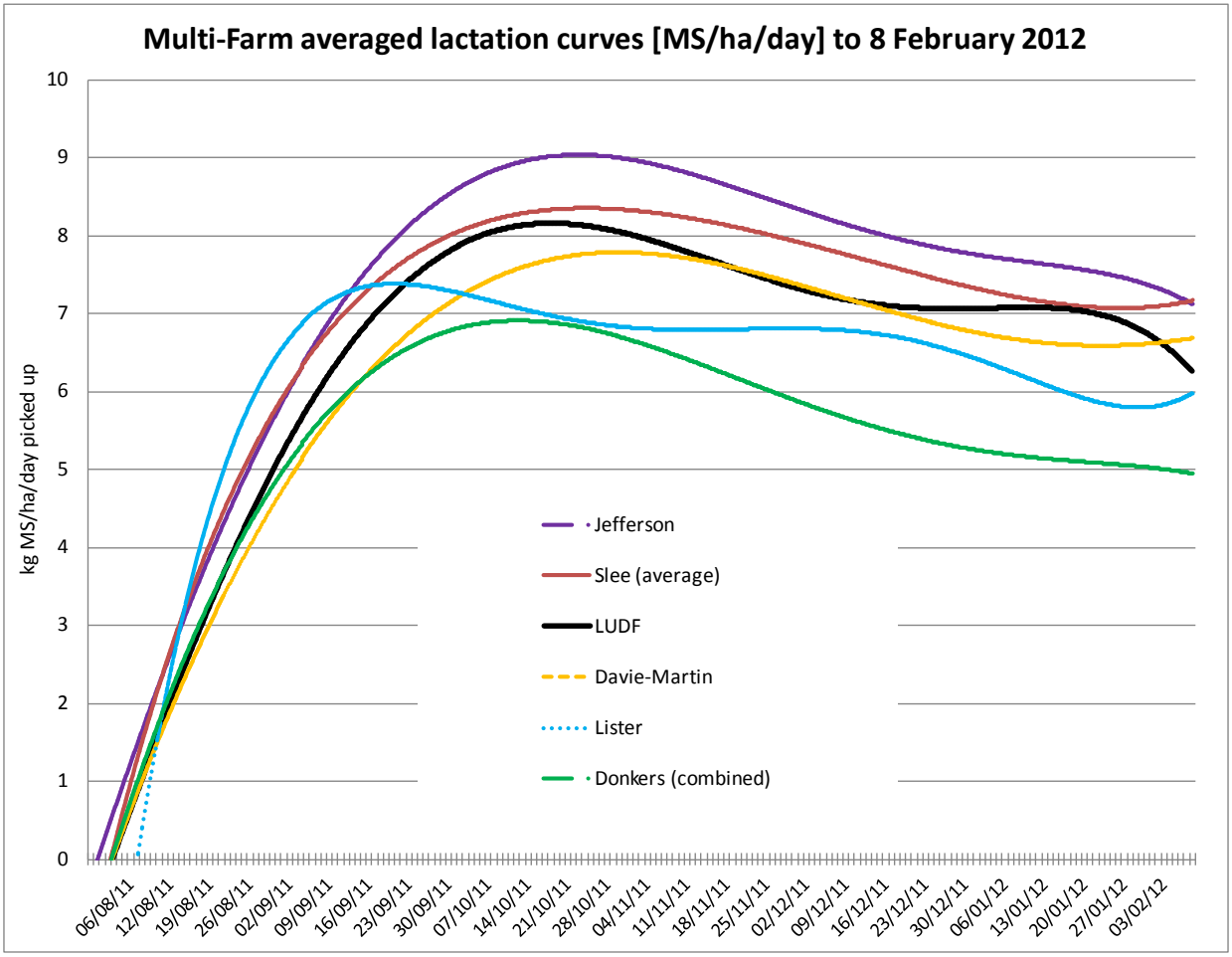
Expenses to Date – LUDF

Lincoln University Dairy Farm [LUDF]	Actual 2012	Budget YTD	Budget 2012	Actual as % Full Budget
Expenses				
Administration	$10,861	$14,397	$24,050	45%
Animal Health	$37,300	$38,117	$55,341	67%
Breeding Expenses	$47,298	$37,605	$43,905	108%
Electricity - Farm	$42,346	$48,853	$19,500	217%
Employment	$127,711	$147,705	$229,494	56%
Grass silage purchase	$69,720	$73,950	$73,950	94%
Silage making & delivery	$11,902	$26,880	$26,880	44%
Replacement grazing & meal	$117,373	$87,123	$133,343	88%
Winter grazing - Herd incl. Freight	$104,132	$94,490	$122,687	85%
Fertiliser & N & GA etc	$148,637	$136,371	$165,741	90%
Freight & Cartage	$4,054	$11,880	$800	507%
Irrigation - all costs			$68,000	0%
Rates & Insurance			$19,020	0%
Re-grassing	$28,577	$26,130	$26,130	109%
Repairs & Maintenance	$47,105	$46,389	$45,500	104%
Shed Expenses excl. Power	$7,379	$6,410	$8,200	90%
Vehicle Expenses	$13,624	$14,252	$20,000	68%
Weed & Pest	$972	$500	$500	194%
Total Expenses	**$818,991**	**$811,052**	**$1,083,041**	**76%**
Expenses /kgMS (budgeted ann. prod)	$2.91	$2.88	$3.85	

Budgeted Production	640	cows
	440	kgMS/cow
	1760	kgMS/ha
	281600	kgMS

Multi-Farm Comparison – Season to Date Data

	Donkers	Slee	Davie-Martin	Jefferson	Lister	LUDF
Kg MS/ha to 8-Feb -2012	1037	1332	1200	1399	1180	1254
Peak date	19/10	20/10	30/10	20/10	29/9	16/10
10 day peak average	6.73	8.38	7.51	9.20	7.03	8.20
30 day % decline to 8-Feb-2012	8.2	5.2	5.1	5.6	5.1	4.4
Supplements fed per cow	Barley 52 kg Silage 93 kg	Maize, grass silage, barley 306 kg	PKE 168 kg Silage 72 kg	Barley 337 kg All season Silage 65Kg spring Silage 65 kg summer Maize 47kg spring	Barley 93kg PKE 37kg All in spring	Silage 104 kg
Cows/ha	3.5	4	3.7	4.1	3.8	4
Silage made per ha	98	262	305	186	447	609
N kg/ha	178	128	255	152	197	253
6 wk in-calf	71	79	n/a	79	79	72



Lincoln University Dairy Farm - Farm Walk notes

Tuesday, 21st February 2012

CRITICAL ISSUES FOR THE SHORT TERM

1. **Maintain the intake of the herds above 215MJME to maintain milk production and generate some gain in live weight and body condition score**
2. **Maintain consistent post grazing residuals to ensure pasture quality at the next grazing.**
3. **Monitor average pasture cover and respond to surplus or deficit.**
4. **Use back-fences on all herds whenever paddock grazing takes more than 36 hours.**
5. **Continue Mg supplementation via water system.**
6. **Administer bloat oil through dosatron**

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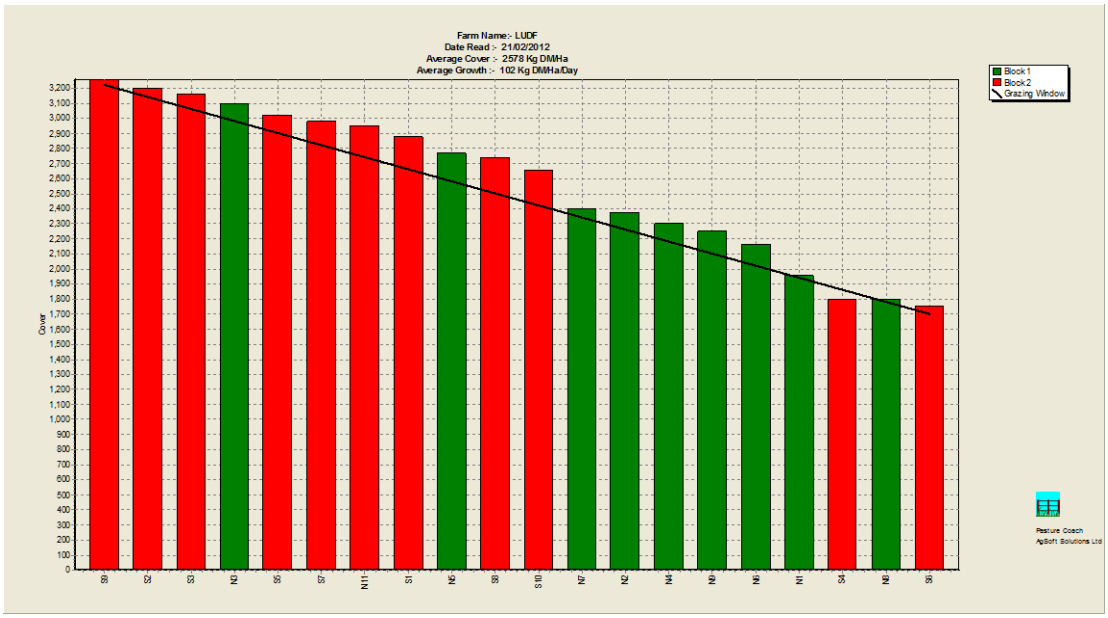
7. There are now 611 cows milking twice a day in the silo. There are 202 cows in the Small herd, now made up from lighter condition cows with expected early calving dates. First calvers have priority but will need to be lighter or early calving to have remained in this herd. The two herds will continue to be managed separately for the remainder of the season.

Growing conditions

8. Pasture growth this week has been 102kg DM/ha day, 70kg DM/ha was recorded last week.
9. Soil temperatures at 9 am have been variable and similar to last week, average of 15.9°C, a little cooler than last week's 16.4°. The weather has been cloudy and cooler than average.
10. We had 11mm rain, irrigation ran for 3 days on North Block and 2.5 days on the South Block. The Aquaflex soil moisture meters indicate that soil moisture levels are now at 30 - 70% of field capacity.

Feeding levels

11. 19.8t DM of high quality silage was fed over the week, equal to 4.5 kg DM/cow/day. This has been sufficient to increase average pasture cover and to hold the round length at 22.5 days [from 22 last week].
12. The walk over weighing indicates that the herd made no weight gain this week.
13. The milkers need about 215 MJME to produce 1.7 kg MS, maintain themselves, and allow for 1 - 3 kg weight gain per week. It would appear that with a drop in milk production this week and no weight gain that intake of energy fell below 200MJME due mostly to the ongoing low Dry Matter levels in the pasture. The silage fed has been of the same quality over the last three weeks.
14. Feed Wedge shows the farm has a surplus of 17t. We have a 22.5 day round and are happy to hold it at that length for now. Silage feeding has stopped but may need to mow pastures in front of the herd to try and wilt feed and help the herds eat enough to get the needed 215MJME



15. Average cover of 2578kgDM/ha, a significant rise from last week's +197kgDM/ha.
16. The third and final paddock for re-grassing N10, sown on 19 January, is now up and has had its post emergence weed spray.
17. 142 ha has been mowed either in front [107ha] or behind [35ha] of the herds so far this season. There has been no mowing this week.
18. 25kg N/ha applied to 41ha.

<u>Mating</u>

19. Our initial 6 week in-calf rate from scanning was 73%. 10 week in-calf rate from scanning was 87%.
20. We had 10 weeks of mating 6 weeks AI and 4 weeks natural mating. 622 cows were mated in 42 days [98.7%]. The herd at the beginning of mating was 635 cows. Submission rate of 88% for the first 3 weeks. No hormone intervention was used.
21. Heifer AB mating finished after 21days, 147 of the 152 top BW heifers were mated. Jersey bulls were removed from the R2s on 15 December.
22. The Heifers were pregnancy tested confirming pregnancies from the first 5 weeks of mating. 158 R2 heifers in calf from 184 currently owned 86%. The final scan showed 6% were not in calf.

LUDF Weekly Report	31-Jan-12	7-Feb-12	14-Feb-12	21-Feb-12
Farm grazing ha (available to milkers)	160	160	160	160
Dry Cows on farm / East block / other	0/0/0	0/0/0	0/0/0	0/0/0
Culls (Includes culls put down & empties)	0	0	0	1
Culls total to date	26	26	26	27
Deaths (Includes cows put down)	0	0	0	0
Deaths total to date	9	9	9	9
Calved Cows available (Peak Number 638…)	623	623	623	622
Treatment / Sick mob total	5	5	3	1
Mastitis clinical treatment	4	0	1	1
Mastitis clinical YTD (target below 64 yr end)	65	65	66	67
Bulk milk SCC (target Ave below 150)	160	137	128	131
Lame new cases	3	2	6	7
Lame year-to-date	91	93	99	106
Lame days YTD (Tgt below 1000 yr end)	969	1018	1074	1130
Other/Colostrum	0/0	0/0	0/0	0/0
Milking twice a day into vat	610	611	611	611
Milking once a day into vat	8	7	9	9
Small herd	202	202	202	202
Main Herd	408	408	410	409
MS/cow/day (Actual kg / Cows into vat only)	1.82	1.71	1.70	1.67
MS/cow to date (total kgs / Peak Cows 640)	300	312	323	335
MS/ha/day (total kgs / ha used	7.03	6.61	6.59	6.48
Herd Average Cond'n Score	4.10	4.10	4.10	4.10
Monitor group LW kg WOW 157 early MA calvers	477	481	486	486
Soil Temp Ave Aquaflex	15.5	15.8	16.4	15.9
Growth Rate (kgDM/ha/day)	81	88	70	100
Plate meter height - ave half-cms	12.5	13.4	13.4	14.8
Ave Pasture Cover (x140 + 500)	2254	2373	2381	2578

LUDF Weekly Report continued	31-Jan-12	7-Feb-12	14-Feb-12	21-Feb-12
Surplus/[deficit] on feed wedge- tonnes	[9.4]t	[3.5t]	[3]	17.5
Pre Grazing cover (ave for week)	3027	2714	3052	3194
Post Grazing cover (ave for week)	1650	1750	1750	1750
highest pre-grazing cover	3282	2900	3140	3240
Area grazed / day (ave for week)	9.99	9.80	7.30	7.10
Grazing Interval	16	16	22	23
Milkers Offered/grazed kg DM pasture	17.0	0.0	13.0	12.0
Estimated intake pasture MJME	215	0	160	146
Milkers offered kg DM Grass silage	0	0	4	5
Silage MJME/cow offered	0	0	44	50
Estimated intake Silage MJME	0	0	44	44
Estimated total intake MJME	215	0	215	190
Target total MJME Offered/eaten (includes 6% waste)	215	215	215	215
Pasture ME (pre grazing sample)	12.7	12.7	12.7	12.1
Pasture % Protein	33.1	30.6	26.0	29.7
Pasture % DM - Concern below 16%	15.3	14.7	26.1	12.9
Pasture % NDF Concern < 33	41.6	49.0	45.7	48.8
Supplements fed to date kg per cow (640 peak)	72.3	103.6	145.6	142.3
Supplements Made Kg DM / ha cumulative	609	609	609	609
Mowed pre or post grazing YTD	142.3	142.3	142.3	142.3
Total area mowed YTD	187.9	187.9	187.9	187.9
Units N applied/ha and % of farm	30units/40%	25units/32%	25units/44%	25units/26%
Kgs N to Date (whole farm)	0	0	0	0
Kgs/ha N to Date (on the NON-effluent area 128ha)	300	302	316	324
Rainfall (mm)	12.4	0.4	5.8	11
Aquaflex topsoil relative to fill point target 60 - 80%	50-80	30-75	20-60	30-70

Precision Paddock Management / Feed Supply

Steve Lee, DairyNZ.

Aim - Growing more energy per hectare, matching production to demand, and maximising quality to support cow intake.

Pasture growth, given adequate water and air, is largely driven by sunlight, plant variety and distribution, and availability of soil nutrients. As we understand it energy from the sun is not limiting, but it does directly affect soil temperature which sets the rate of chemical and biological activity in the soil. We cannot influence sunlight and soil temperature, however understanding temperature is a valuable way of getting an idea of what to expect in terms of growth rates, the likely effect of some actions such as apply urea.

Below [figure 1.] is a graph showing the relationship between pasture growth and soil temperature at LUDF over the previous 3 complete seasons. Pasture growth is strongly driven by soil temperature.

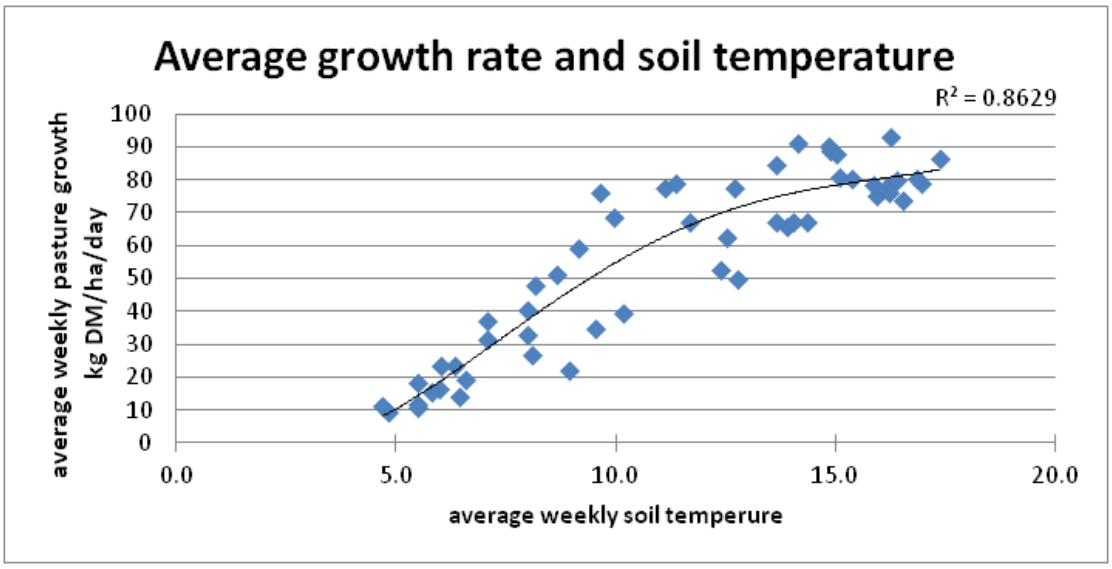


Figure 1.

Given that pasture growth is so heavily influenced by soil temperature, we can glean some understanding of what kind of a season we have had, in an objective way, compared to past years by looking at what has happened to soil temperature this season. Figure 2 indicates that we had a cooler than average spring followed by a fairly average summer in terms of soil temperature. Consequently we can assume that other things being equal we had a poorer than average spring for growing pasture followed by an average summer to date.

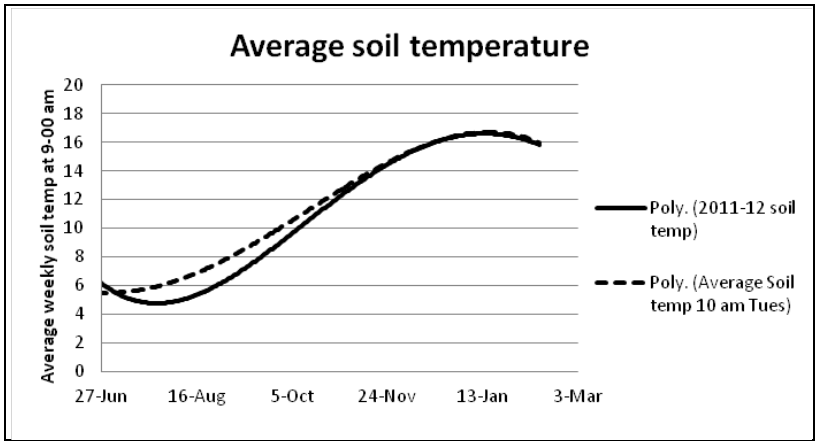


Figure 2.

What have we done in order to make more high quality pasture available to cows, this season?
Things we can influence to some extent are:

- The botanical composition, i.e. the pasture varieties and their population - density and weed population.
- Soil nutrient availability, both in terms of the supply of the level of nutrients available to pasture in the soil and the soil physical properties which can affect the level of nutrient uptake by plants, such as compaction and water logging [lack of air].

At LUDF we set out to measure the important factors relating to the pasture we grow and feed to cows and use the data to make better decisions.

The following five sections give an overview of what we have done this season to grow more and better pasture.

1 Analysis of the impact of past years pasture renewal.

Key Points

- Importance of attention to detail
- paddock selection
- Underlying issues
- Regrassing process
- Pasture management in the 1st 12 months after establishment
- Pasture Coach as tool in pasture Renewal
- use of diploid in "high wear" area

A PROCESS AND ANALYSIS OF PASTURE RENEWAL AT LUDF

Case Study: LUDF Paddock S1, this paddock was renovated in Spring of 2005

The following issues are examined as being major influences and measures of pasture productivity and persistence:

A Soil type and soil related characteristics which may have contributed to the decision to renew the pasture.
Soil type is a mixture of heavier Wakanui loam and Temuka clay loam, natural drainage is imperfect but not as serious a problem as found further South on the property.

B Fertility, before and after pasture renewal. Fertilizer inputs.
Chemical fertility was not seen as being a limiting factor, either before or after renovation.

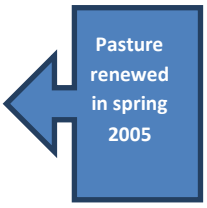
C Irrigation and water stress related issues.
This paddock forms the centre of the Southern centre pivot. The paddock has a moderate water holding capacity (whc) although this may be variable with the Southern end of the paddock [Temuka clay loam] having a low whc.

D Major events e.g. pugging, flooding, pest related issues.
Unknown

E Why was renewal done? [selection process]
The paddock was identified from pasture walk and grazing records as the lowest producing paddock on the farm. The paddock had a lot of brown top, twitch and old Canterbury ryegrass which were not growing well.

F Pasture growth history

Season	[a] S1 MT DM/ha	[b] Whole farm ave MT DM/ha	a/b: S1 performance compared to whole of farm
04/05	16.5	19.2	0.86
05/06	18.9	19.8	0.95
06/07	20.9	20.2	1.03
07/08	22.8	21.6	1.06
08/09	19.2	20.4	0.94
09/10	20.2	19.4	1.04
10/11	18.7	20.4	0.92



G The method and cost of renovation.

The choice of Bealey tetraploid perennial ryegrass was made in an attempt to improve pasture utilization as cows will readily graze this variety to desired low and consistent residuals even when pasture covers are higher as a consequence of delayed grazing, therefore allowing management more leeway to avoid pugging events .

Cost of renovation was:

Activity	*Cost $/ha (Actual cost 2005 $)*
Cultivation, seeding & weed control	*550*
Lost production [est. 5 MTDM/ha]	*1000 [At 20c Kg DM] silage value*
	1550

H The cost – benefit of pasture renovation in this case

Season	Production MT DM/ha	Production change after renovation MT DM/ha	Value [$] of extra production/ha at 40c /kgDM	Renovation effect [percentage change after renovation]
04/05	16.5	-	-	-
05/06	18.9	2.4	960	15%
06/07	20.9	4.9	1960	30%
07/08	22.8	6.3	2520	38%
08/09	22.0	5.5	2200	33%
09/10	20.2	3.7	1480	22%
10/11	18.7	2.2	880	13%

Assuming that pasture production would not have decreased further, and that a value of 40c per kgDM is reasonable for pasture, and without allowing for the cost of funds, this pasture renovation had a payback period of a little over 2 years. It is noticeable that the renovation effect has fallen away in 2010/11. This was identified from pasture walk information, and the paddock was undersown. Indications from data to date are that this has been effective in moving S1's production back up to about average for the farm. The cost of the additional undersowing was approximately $250/ha.

2 Effects of this seasons higher level of pasture renewal on feed supply

- **short term**

As in past years when re-grassing a paddock in late January we have found it a bit of a struggle to feed high producing cows during the latter part of the renovation period. However we would still have had to feed out, even if the paddock had been available to cows. Re-grassing of three paddocks rather than two led to starting re-grassing earlier to ensure that the whole effective area of the farm was available for grazing from the beginning of March as growth rates tend to fall away.

-**longer term**

The decision this year to increase pasture renewal rate to 15% of the farm [from 10%] gives us the opportunity to target some potentially higher producing paddocks on the North Block - enabling us to potentially take a paddock that is producing about 17 MT DM/ha/year up to 22 MT DM/ha/year or greater. It will also allow the older, lower energy / less flexible (from a grazing management perspective) Bronsyn / Impact pastures to be replaced with more productive tetraploids. We know that from past analysis, if we can increase annual DM production by 2 MT/ha/year we have a favourable payback period of around 24 months.

In order to profitably grow as much pasture as possible we need productive persistent pastures, on a farm scale these are characterised by a high average pasture production across the whole farm and a small range from best to worst. Romera and Clark [Figure 3.] showed that on a typical New Zealand dairy farm the range from worst to best is 100% of production, ie. The best paddock grows twice per ha what the worst performer does.

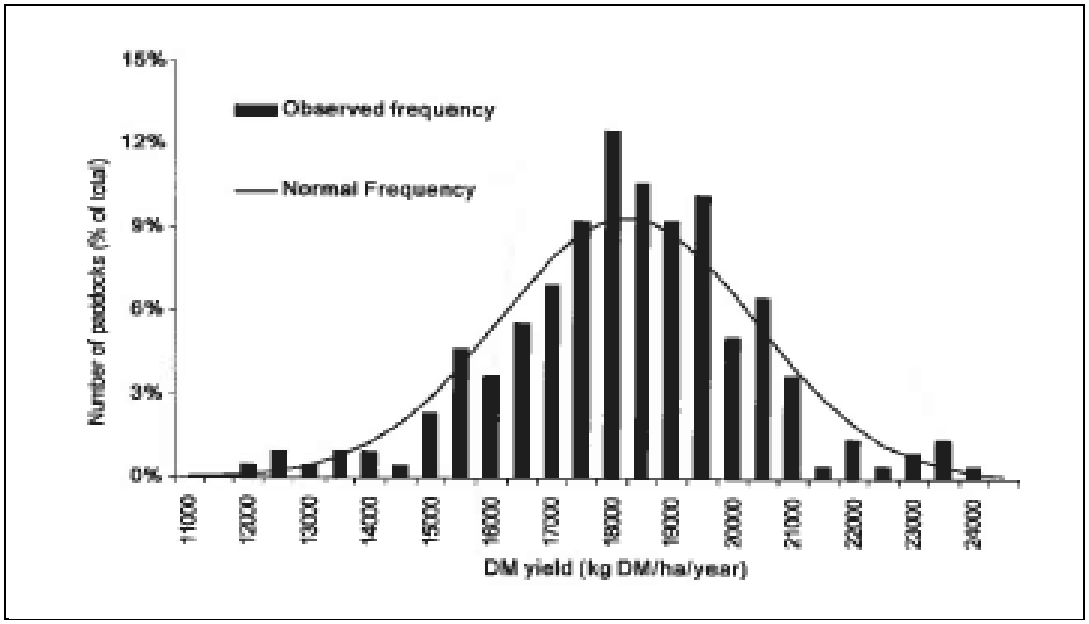


Figure 3. Frequency distribution of annual average production in individual paddocks at No2 Dairy.

At LUDF our range from best to worst is about 5.6 MT DM/ha/year and worst paddocks grow about 75% of the best paddocks. While the range is much tighter than the observations above, our aim is to continue to increase production by smart use of N, eco-n, excellent grazing management, and pasture variety selection. We will continue to concentrate on keeping our pasture production performance in a tight band across the farm.

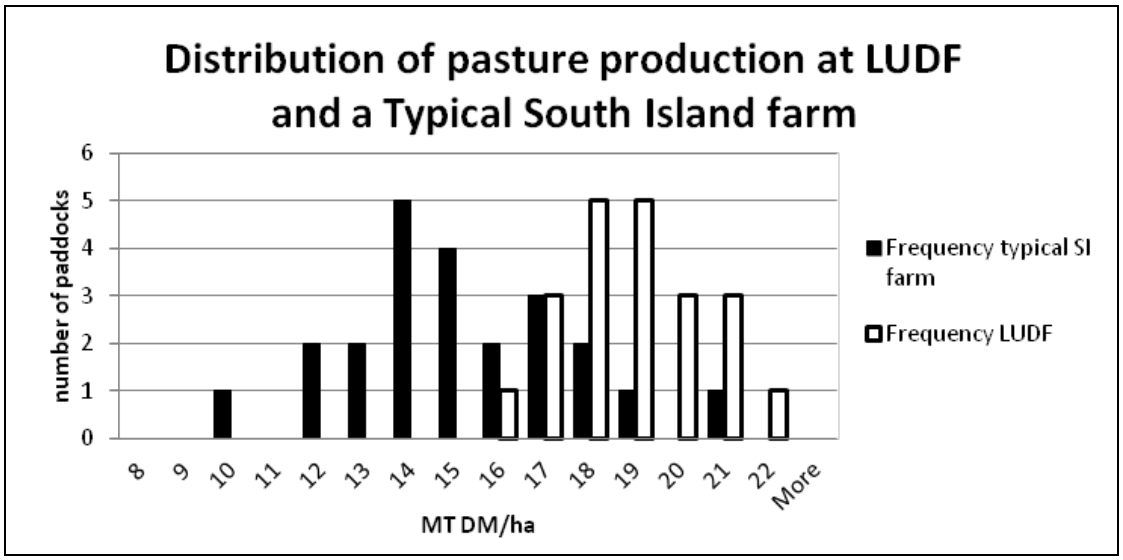


Figure 4.

Pasture renewal is a big part of how LUDF achieves the difference shown in Figure 4. Whilst we are confident that the money spent on this is good value establishing the value proposition for pasture renewal alone is difficult, hence the cultivar trial described below We cannot separate the benefits from: avoiding soil damage, soil fertility, N use, irrigation practice, pasture variety and grazing management.

For LUDF the difference between it and the typical farm [above] represents about 640 MT of DM, in milk solids that about 50000kg.

LUDF MJME/kg DM of pre-grazing pastures

	02/03	03/04	04/05	05/06	06/07
June	11.8	12.3	12.0	12.5	12.6
Oct	10.6	12.3	12.2	12.8	12.9
Dec	11.5	11.5	12.4	11.7	12.4
Feb	11.1	11.8	11.5	12.0	12.0
Average	**11.1**	**12.1**	**12.2**	**12.5**	**12.6**

Figure 5.

It can be difficult to see what improvement has been made in pasture production and quality at LUDF, however, analysis of Pasture quality data from 2002 to 2007, shows a step change in pasture quality in 2003/4 as pasture management improved, followed by a continual increase in pasture quality over time. Figure 5

Pasture yield estimate data of the seasons from 2003/4 to 2009/10 has shown that the trend in increasing pasture production is positive but still vulnerable to seasonal influence. The lighter free draining soils of the North Block increased production by 380 kg DM/ha/yr , the heavier less well drained soils in the middle of the farm increased production by 460 kg DM/ha/yr , and the very heavy very poorly drained soils on the end of the South block increased production by 400 kg DM/ha/yr . Analysis to date indicates that we have reached a plateau, hence a renewed approach to growing and eating more energy.

3 The effects of using gibberellic acid (GA), nitrogen and eco-n.

- **GA**

Given the cool spring that we had, [Figure 6.] we are confident that the GA was a big help in growing more pasture in the first round.

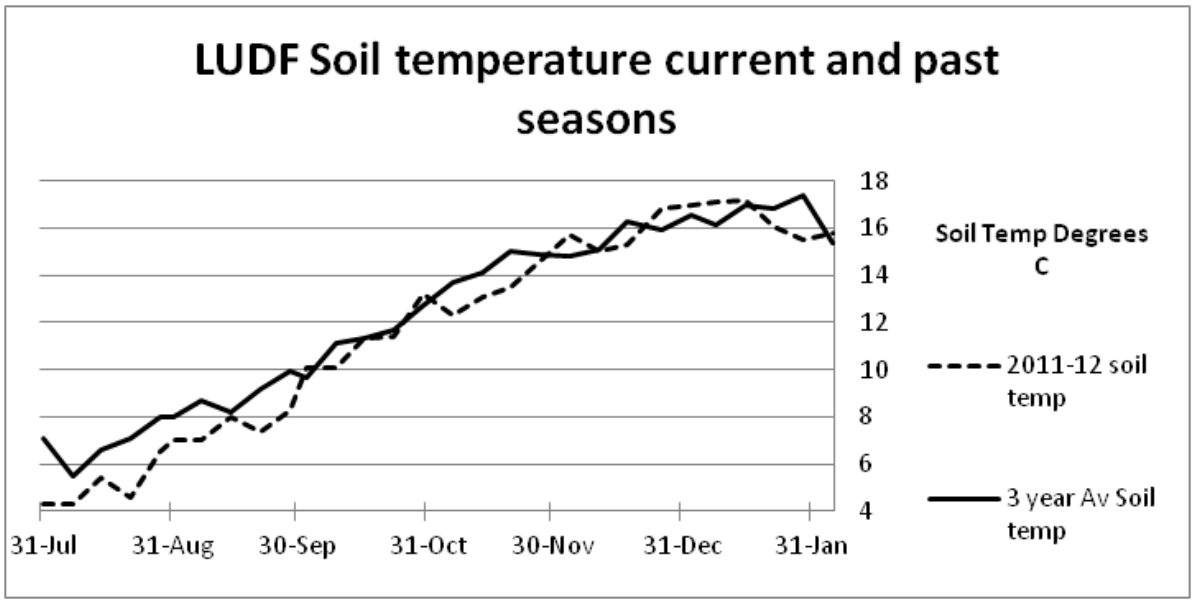


Figure 6.

Figure 7. shows how we were able to very quickly boost growth rates above the seasonal norm in early to mid September as the effect of GA kicked in, despite having cooler than average soils through till the beginning of October.

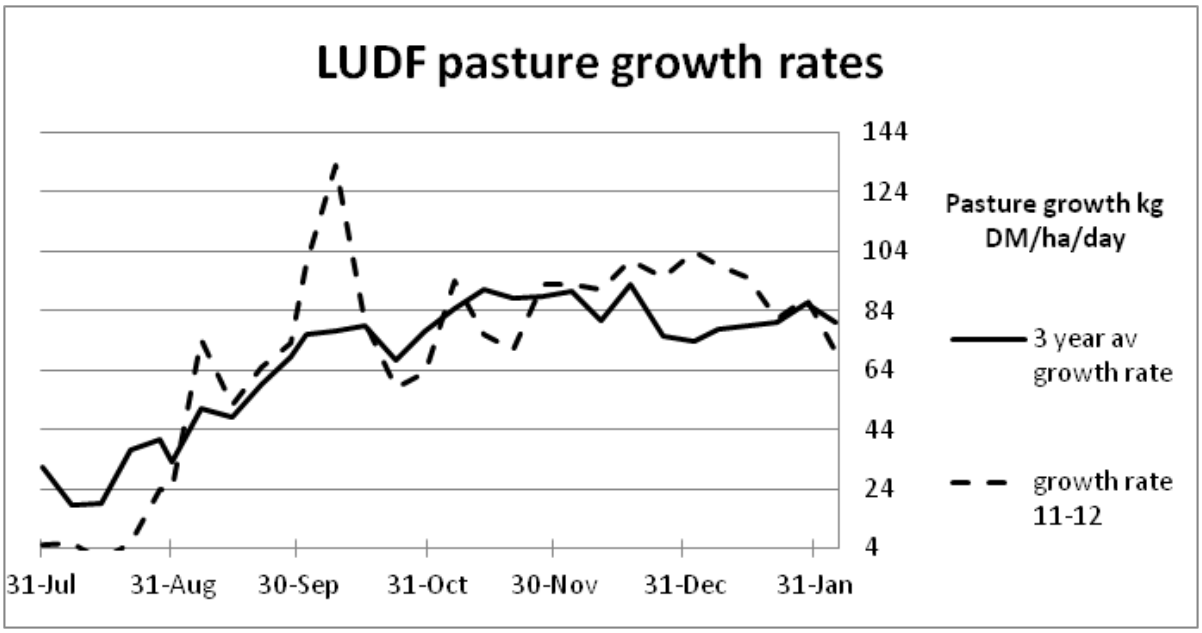


Figure 7.

Date	Gibberellic Acid area applied (ha)	2011/12 Growth Rate kgDM/ha/day)	3 year average growth rate	Ave Pasture Cover (x140 + 500)
05-Jul-11		17	11	2672
12-Jul-11		0	11	0
19-Jul-11		13	23	2529
26-Jul-11		13	14	Snow
02-Aug-11		5	31	2533
09-Aug-11		6	18	2460
16-Aug-11			19	2356
23-Aug-11		6	37	2252
30-Aug-11	7	24	40	2176
06-Sep-11	16	24	33	2082
13-Sep-11	32.7	74	51	2414
20-Sep-11	31.3	52	48	2370
27-Sep-11	24.2	65	59	2354
04-Oct-11	14.5	73	69	2400
11-Oct-11	42.8	100	76	2616
18-Oct-11	33.09	133	77	3028
25-Oct-11		80	79	2499
01-Nov-11	24.1	58	67	2254
08-Nov-11		63	77	2135

Figure 8.

- **Nitrogen use, where has all the N gone?**

So far this season to date we have used 253kg N/ha across the whole farm, by mid-February in previous seasons we had used: 112kg N/ha in 2009-10, and 190kg N/ha in 2010-11.

The step up in N use in 2010 -11 was in order to compensate for lost N from the system as a consequence of the clover root weevil infestation which all but destroyed clover production, and N-fixation at LUDF.

The second step up this season is intended to grow more pasture, recognising LUDF is in a high yield environment and can give a good response at these higher rates. The extra N is applied in summer during the peak of pasture growth. We are confident that with eco-n and high pasture utilisation the farm will not being creating a nutrient load outside our target of no increase in the total N footprint of the farm and support land..

- **Eco-n this season**

This season we have used 50% more eco-n to compensate for the extra N applied and subsequent excretion of N in urine as a result of more pasture being eaten. This helps to ensure that this N is retained in the soil for plant use.

4 The mower as a pasture management tool

Whilst there is no doubt that we lose some pasture when we mow – as small fine leaves fall to the ground and are not eaten and some material is destroyed by the action of the mower, work from Ireland, currently in press suggests that mowing can, if done well, have a positive effect on pasture production over the season, largely by overcoming some of the negative effects of treading and plant pulling.

We are confident that using the mower as part of a deliberate focus on achieving cow intake has helped the LUDF herd to eat more and gain more weight than in any other season.

Our observations have been:

- Need to be pro-active, in the period after the first round ends and the farm gets close to being in surplus. It is necessary to focus on high quality pasture offered especially in the spring when we are trying to maximise cow intake. We had a period where, due to uncertain weather, we were not able to make silage to contain surplus. In future we will look at forcing the round length down and managing cover by using the mower earlier, and if necessary mowing in front of cows and accepting a slightly lower level of pasture utilization in order to achieve a greater target [pasture quality going forward].
- Disciplined approach is required, we have mown somewhere between 14 and 20% of pasture produced this season, depending on when you start and stop measuring. Mowing is expensive in itself, so we must ensure that it results in a greater value in terms of increased production . It should only be done when it is clearly the best option. When a paddock is grazed Peter makes a note if for one reason or another it has not hit the target residual or he feels it will be challenging to get to residual at the next grazing. This paddock will then go on the list and be mown next time.
- Pre mowing mass is not negotiable, leaving a paddock to a very high cover [over our 2900 – 3100 kg DM/ha pre-grazing target] and then mowing it and expecting a good outcome does not work. The mower is a management tool and we are in the business of producing milk solids from pasture, not making silage. Mowing in front of cows removes some of their ability to select pasture, so offering them long rank pasture with brown dead material in the base reduces their ability to maximise intake. We also experienced that regrowth rates from very long paddocks mown was slow.
- Good attention to detail in the setting up and use of the mower to get a good residual is important. Keeping blades sharp and visually checking that the mower is leaving an even low residual with no scalping is important to get a good base to grow from and graze next time. We found that using a plate meter was useful and a plated residual of 1560 kg DM/ha worked well.

5 Pests

- Update on Clover Root Weevil – comments from Mark McNeil, AgResearch:

My general observation is that clover is reappearing in paddock N1 after what was a pretty lean period. N11 did appear to have improved since I last walked through the paddock although I have thought that in the past 12 months, the % clover was generally better relative to other paddocks.

Perhaps as a consequence of the improvement in white clover, in each paddock I collected 40 odd CRW. I still have to dissect them to find out the level of parasitism

- A new pest?

LUDF's management team have noticed scattered pulling of pasture in some paddocks. It is shallow and the tufts are small, but neighbouring tillers will generally pull out easily when tested. We are unsure what the pest is.

Marks comments on this were:
I had a look at N11 where there does appear to be extensive pulling of small clumps of vegetation. My general observation, at least in the area I was standing in, was that in the affected areas, the pasture growth was suppressed. I had a dig around (4 spade squares) but could not find anything that would immediately explain the pulling. As soon as I get the opportunity, I will go out with Richard Townsend (AgR) and get his opinion on the cause. It looks like porina damage but the timing is not what I would expect. There is also root aphid present but it will not be having that level of effect.

Ryegrass cultivar trial in N10

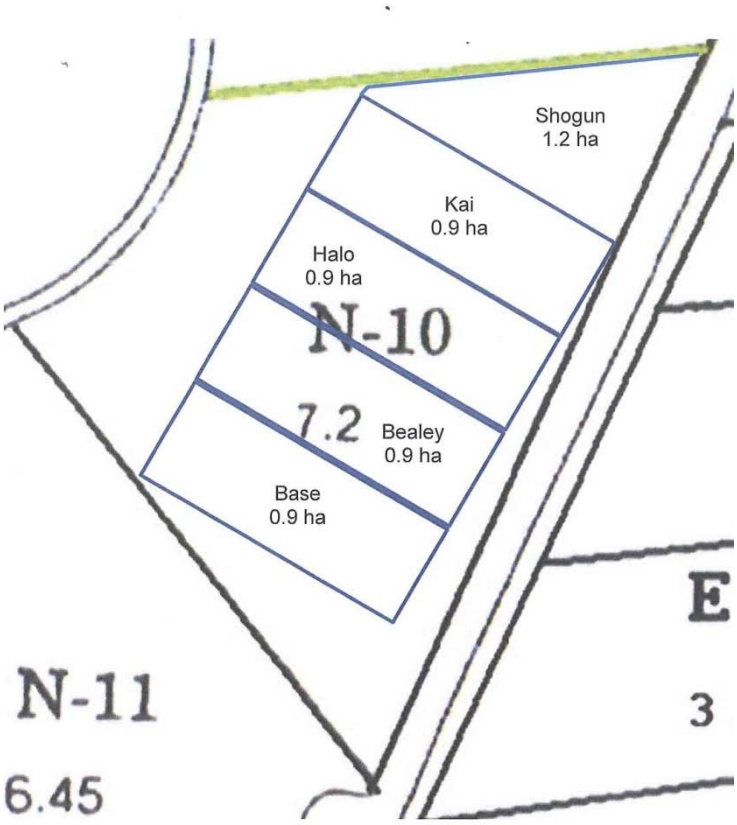
Dr David Chapman, DairyNZ

Background

DairyNZ and the New Zealand Plant Breeders Research Association (NZPBRA) are jointly developing a Forage Value index system for ranking perennial ryegrass cultivars according to their estimated economic value to dairy farm businesses in different regions of New Zealand. To begin with, this system will rely on dry matter yield data for ryegrass cultivars from small, replicated, pure species plots conducted under the National Forage Variety Trial (NFVT) programme operated by NZPBRA. In practice, however, farmers sow perennial ryegrass with clover, and manage their pastures differently. The Forage Value system must produce information that is applicable to commercial dairy farms, therefore we need to compare, and adjust as required, the cultivar rankings from the NFVT plots with rankings observed in farmers paddocks. Hence, a pilot trial is being conducted in 2012, on 3 farms in the South Island and 3 in the North Island. Paddock N10 on LUDF was selected for one of these trials.

What is being done?

Blocks of five different tetraploid perennial ryegrass cultivars were sown in N10 on 18th January 2012, in the layout shown below. The pasture cover on each of these blocks will be measured using the rising plate meter during the normal, weekly paddock walk conducted at LUDF. Periodically, we will also measure other features of the pastures, for example ground cover, and grass/clover composition. Measurements will run for a minimum of 3 years.



How will the information be used?

The five cultivars will be ranked according to their seasonal and annual dry matter yield. The rankings will be compared to rankings from NFVT plots. In the case of the LUDF trial, the NFVT data will be drawn from trials conducted in the Lincoln area (eg at Lincoln University, or Kimihia). During the pilot study, a small-plot trial conducted under the same management as the NFVT system will be set up at one of the South Island and one of the North Island farm sites, comparing just the cultivars included in the paddock trials at those farms. This will mean we can 'strap together' very tightly the results from the two trial methods and get a good handle on how the rankings compare.

What will farmers see as a result?

Firstly, the pilot study will tell us how feasible it will be to expand the on-farm trialling onto a much larger number of farms across New Zealand, and what commitments would be required of farmers who are willing to participate in a national evaluation network. Some level of step-up to more farms is likely in 2013, so farmers may expect to see calls for expression of interest to participate in late 2012/early 2013.

Secondly, the Forage Value system is to be launched in May 2012, at which point farmers and advisers will be able to visit a web site which will publish ranking information for perennial ryegrass cultivars and have access to paper based outputs which contain seasonal performance values for dry matter production. The purpose of the Forage Value system is to support farmer decisions regarding the best cultivar, or cultivars, to use on their farms, taking into account their seasonal and total annual yield, nutritive value, and persistence. The on-farm data will be used to relate cultivar performance as measured in the NFVT plots to what can be expected on farm. Initially, Forage Value information will be available only for perennial ryegrass cultivars, and will be dominated by rankings for dry matter yield. Over time, rankings will account for new information on persistence and nutritive value of perennial ryegrass, and will also be available for other pasture species.

More information:

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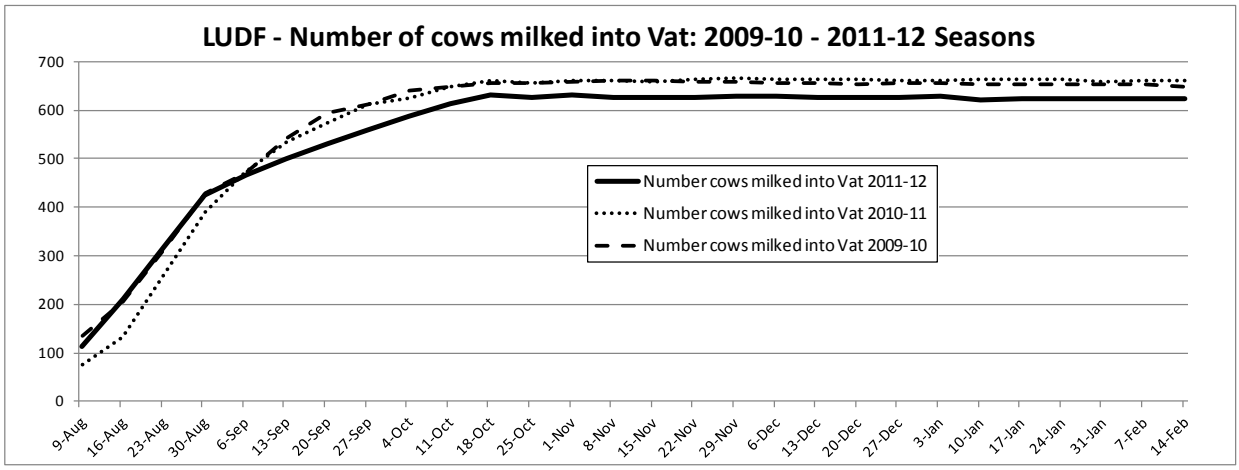
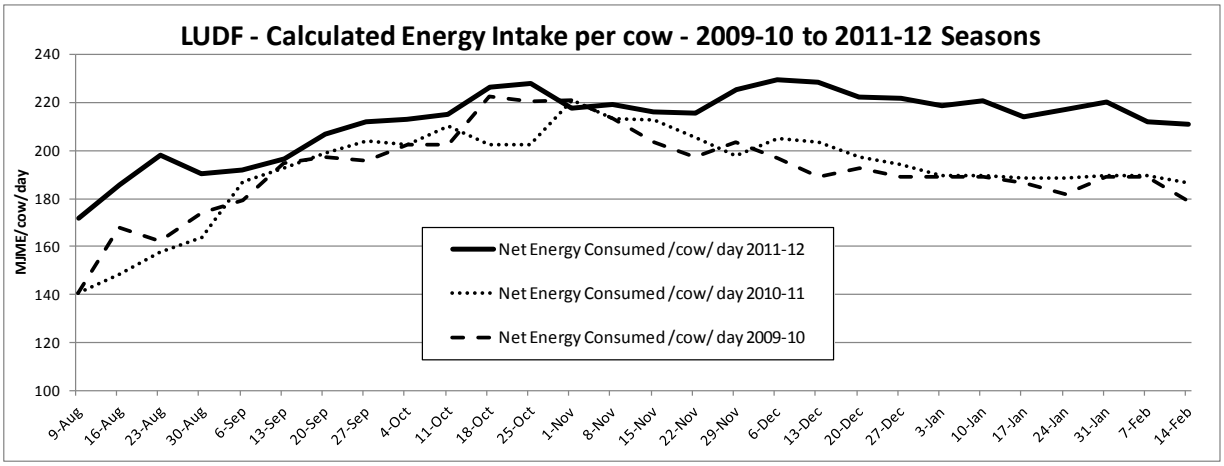
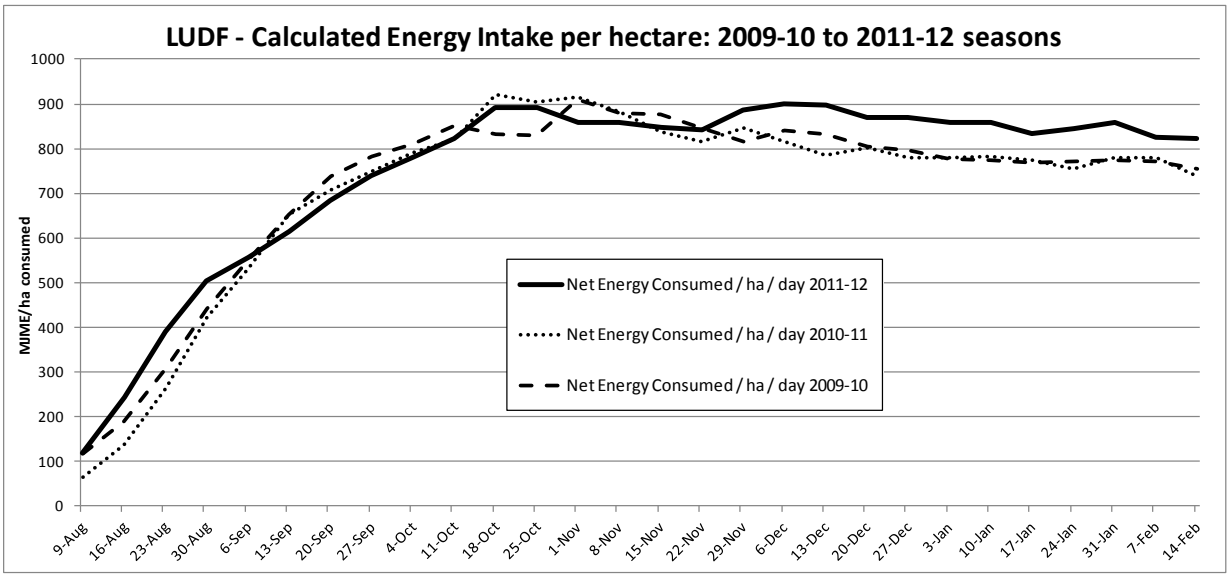
David Chapman david.chapman@dairynz.co.nz
Graham Kerr gkerr@agriseeds.co.nz

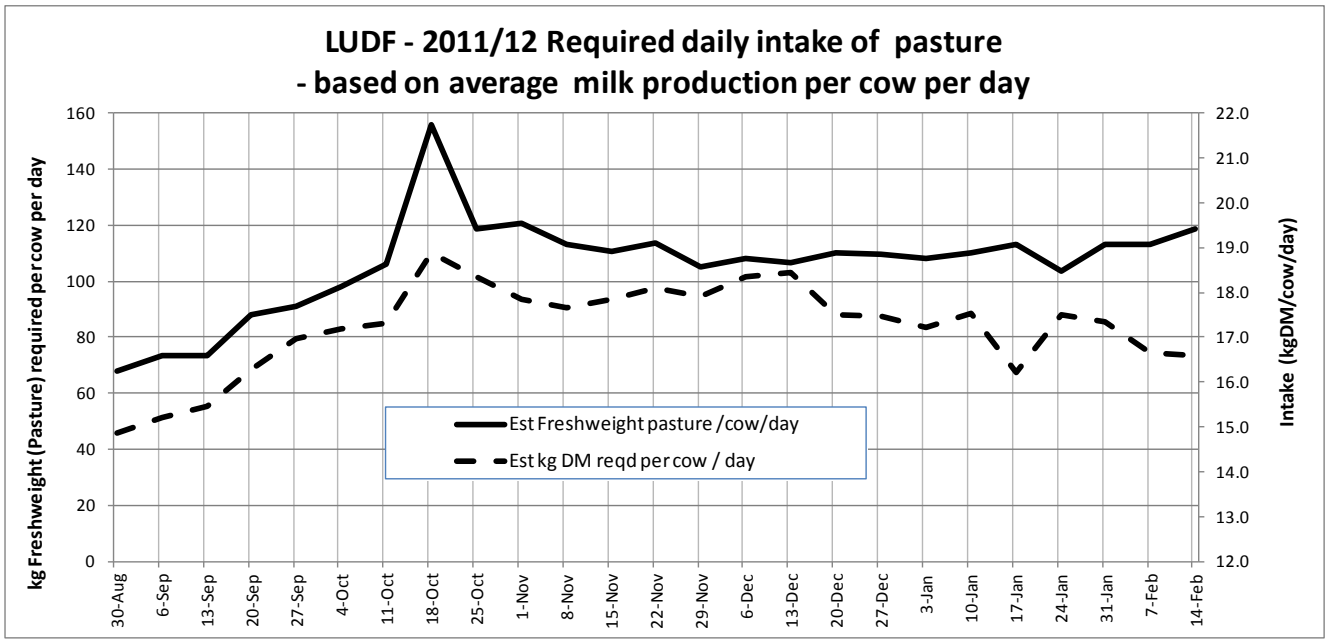
Precision Grazing Management / Focussing on Intake

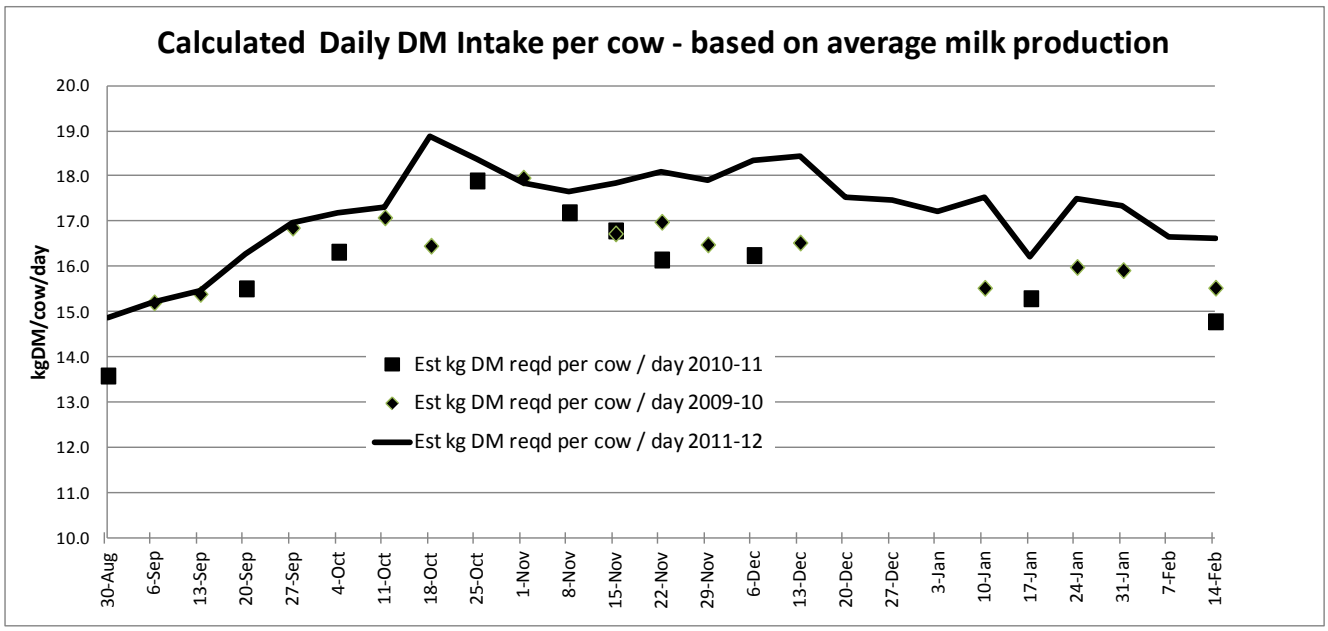


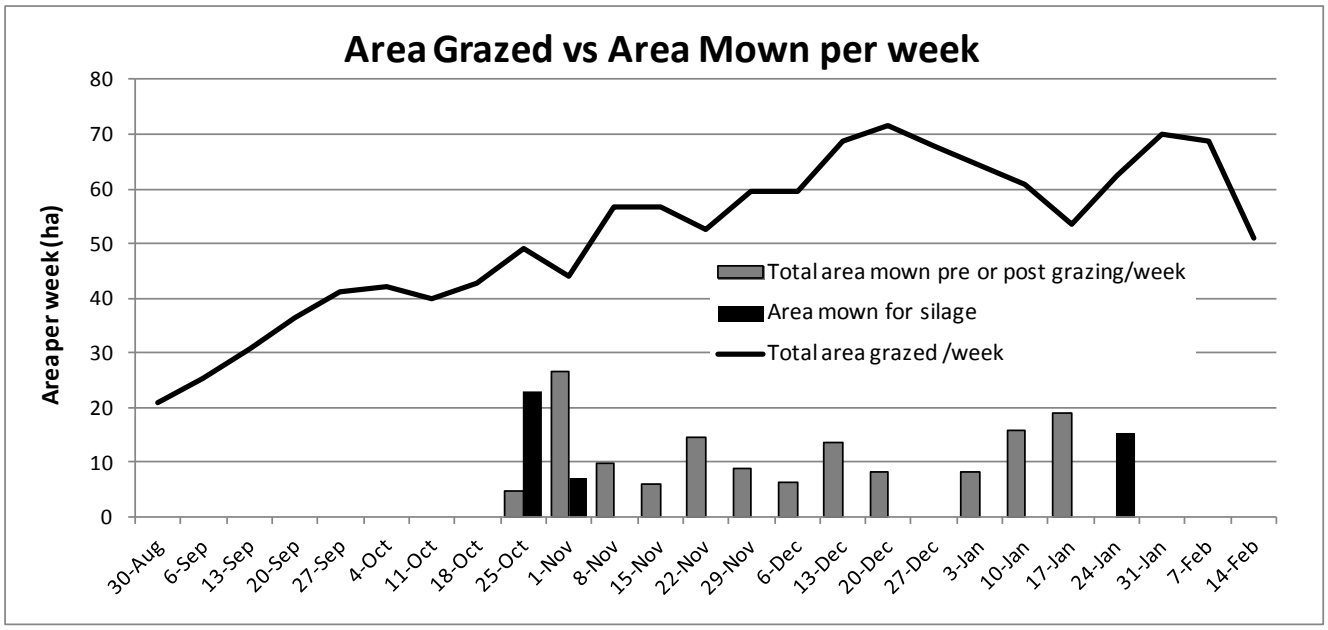


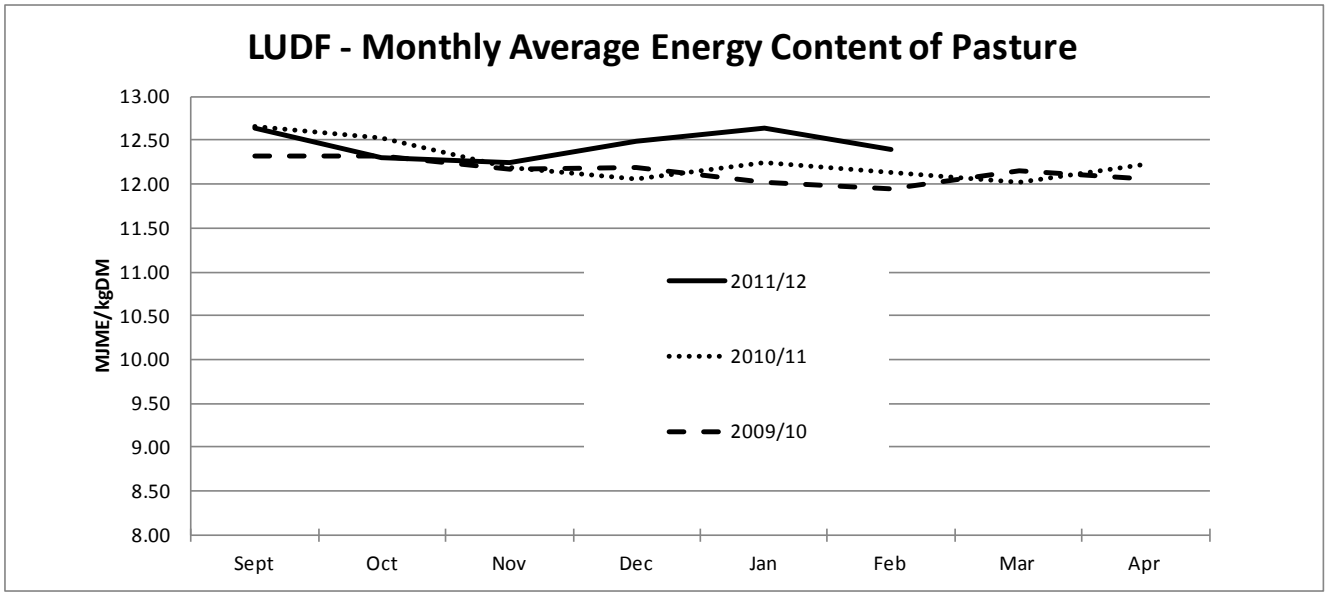


Note Energy Intake per cow or per hectare calculated using values from DairyNZ (Facts and Figures) or available online, including consideration of energy required for milk production, maintenance and walking and adjusted for either energy supplied from weight loss or required for weight gain.







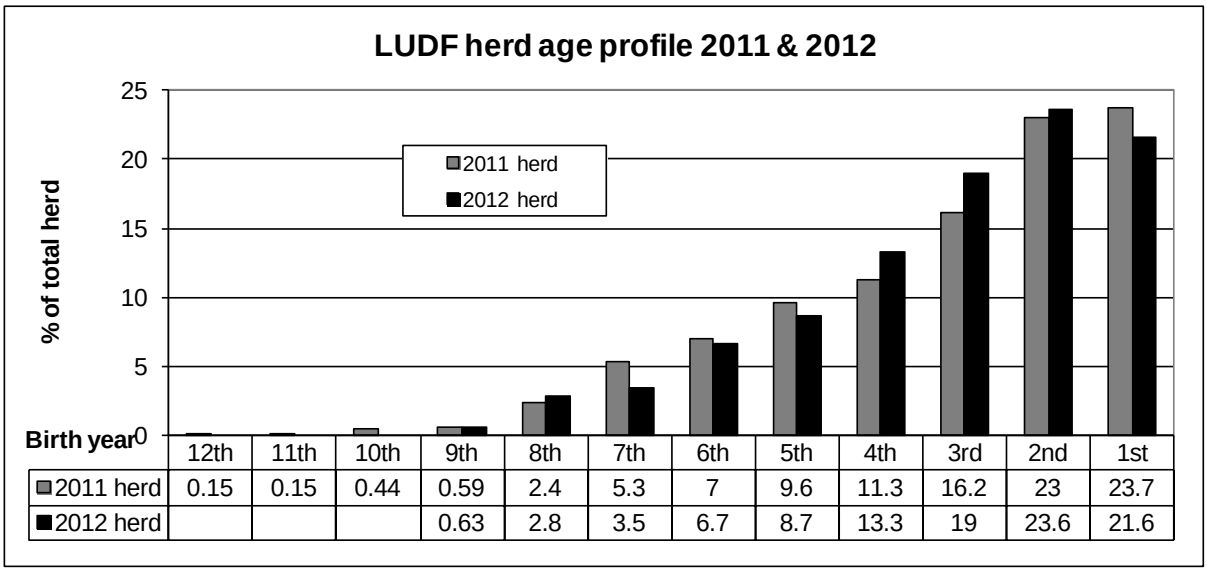


Footnote: Data is average of samples analysed in any given calendar month. The number of samples supplied varies per month and between years and is therefore indicative of likely energy content in the pasture. Samples are cut to estimated grazing height to reflect quality of pasture consumed (rather than total available).

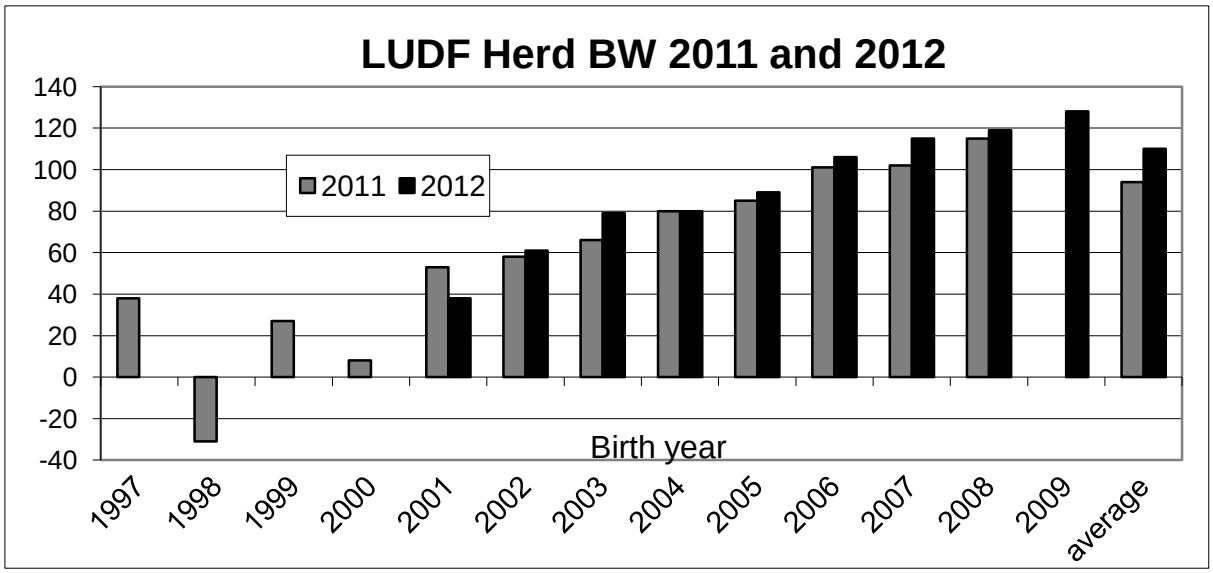
Precision Animal Management / Cow focus

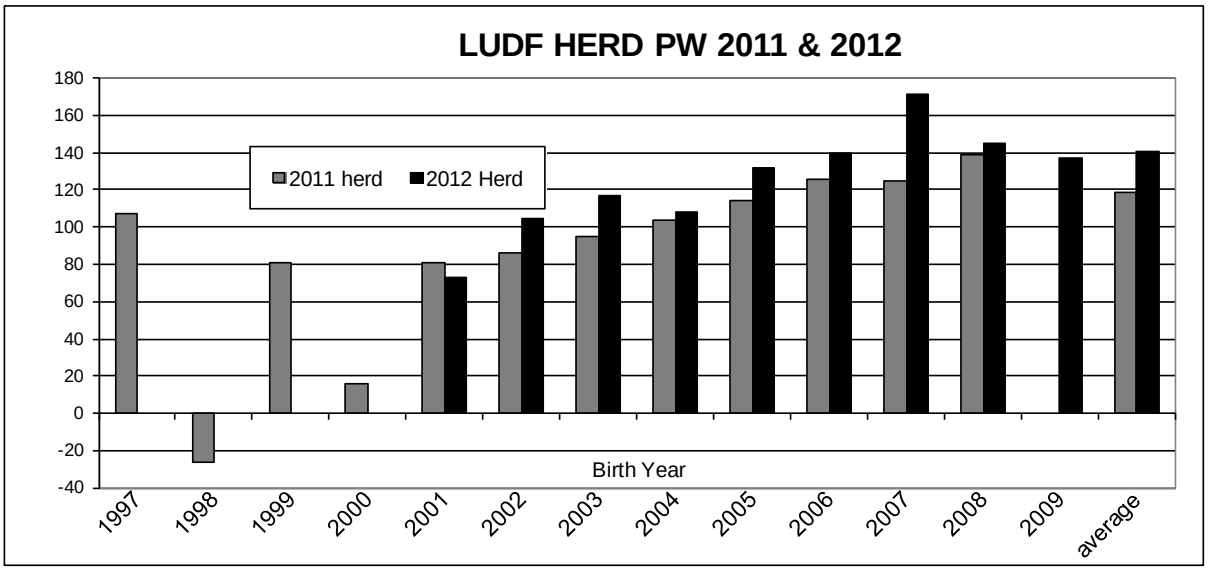
Herd Structure Composition

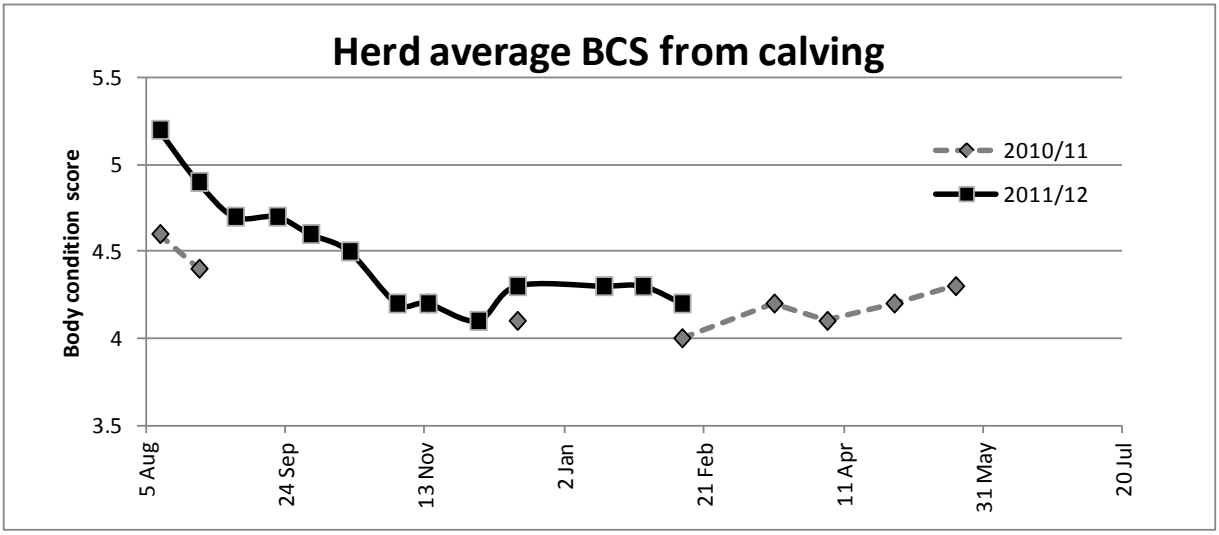
	2010/11	2011/12
Peak milk numbers	680	640
No. herds	1	2
Age distribution (years)	2-13	2 - 10
Average age (years)	4.2	4.0
% 2 & 3 year olds	42	40
BW	94	109

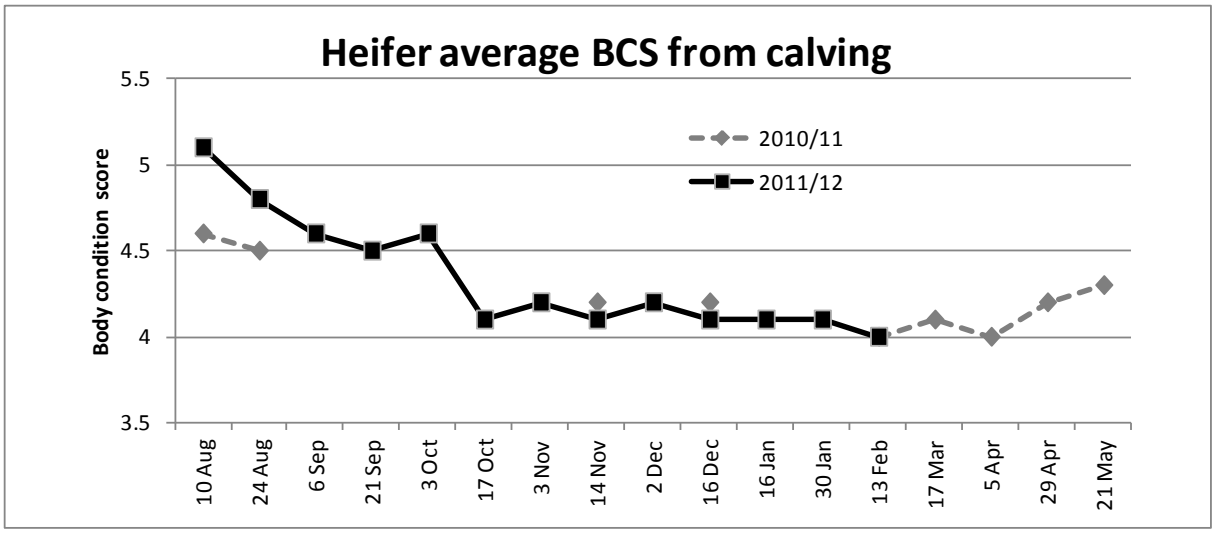


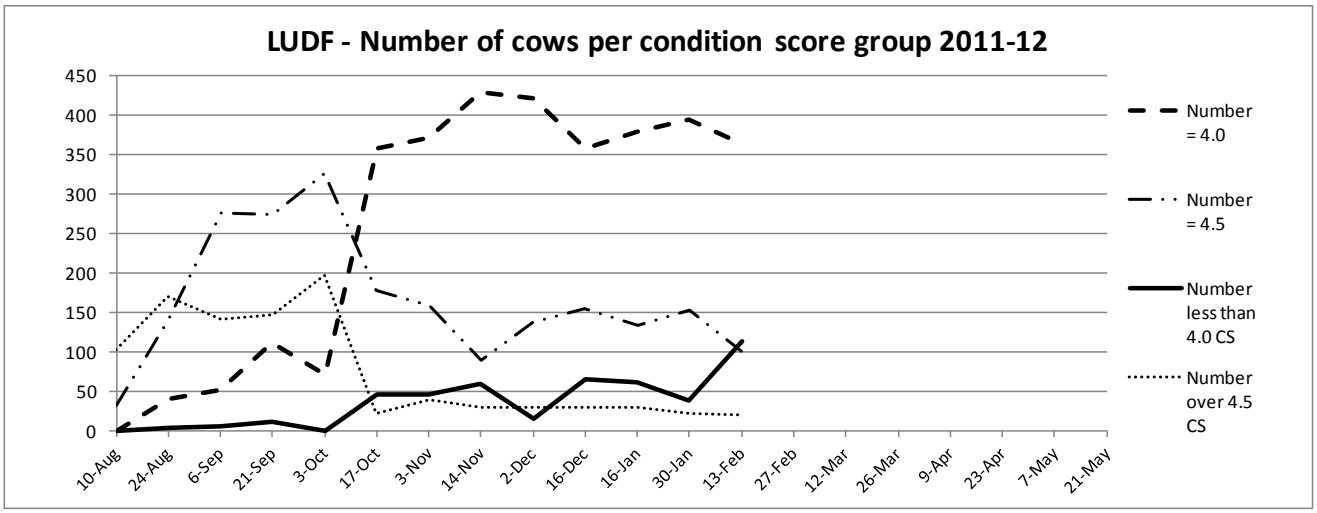
Birth year	12th	11th	10th	9th	8th	7th	6th	5th	4th	3rd	2nd	1st
2011 herd	0.15	0.15	0.44	0.59	2.4	5.3	7	9.6	11.3	16.2	23	23.7
2012 herd				0.63	2.8	3.5	6.7	8.7	13.3	19	23.6	21.6

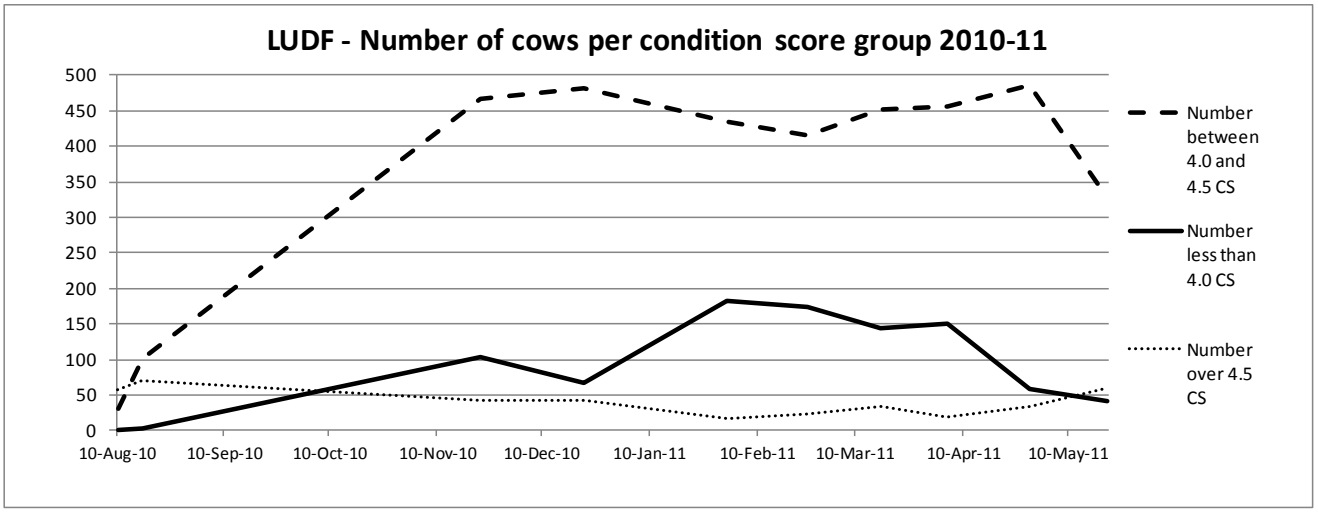


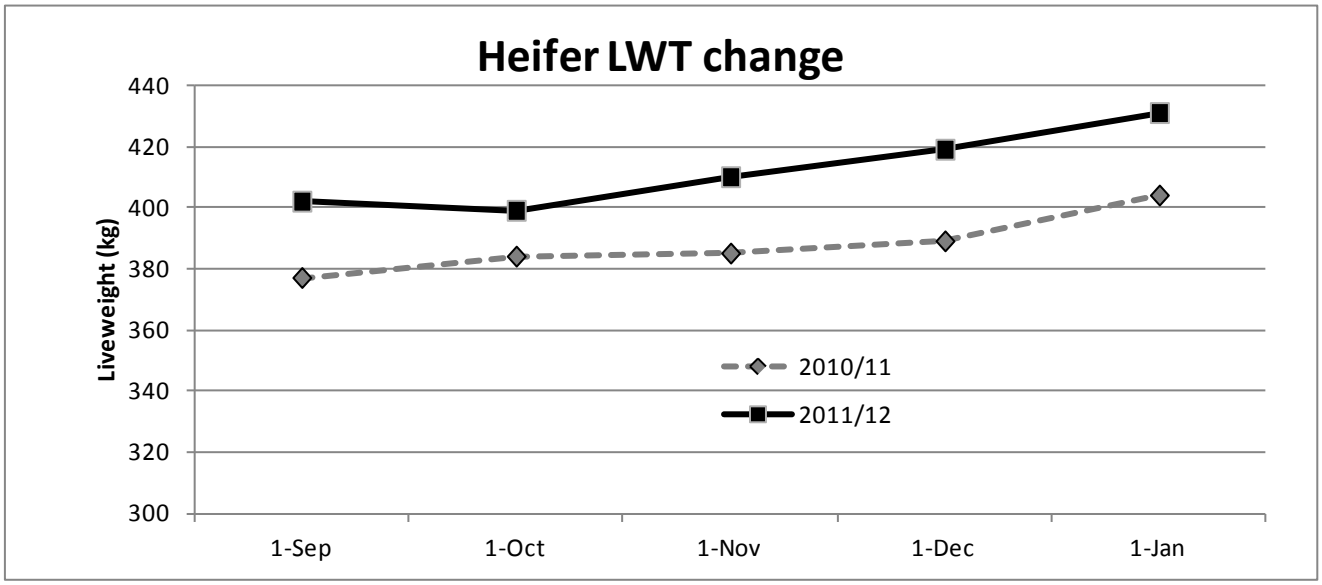


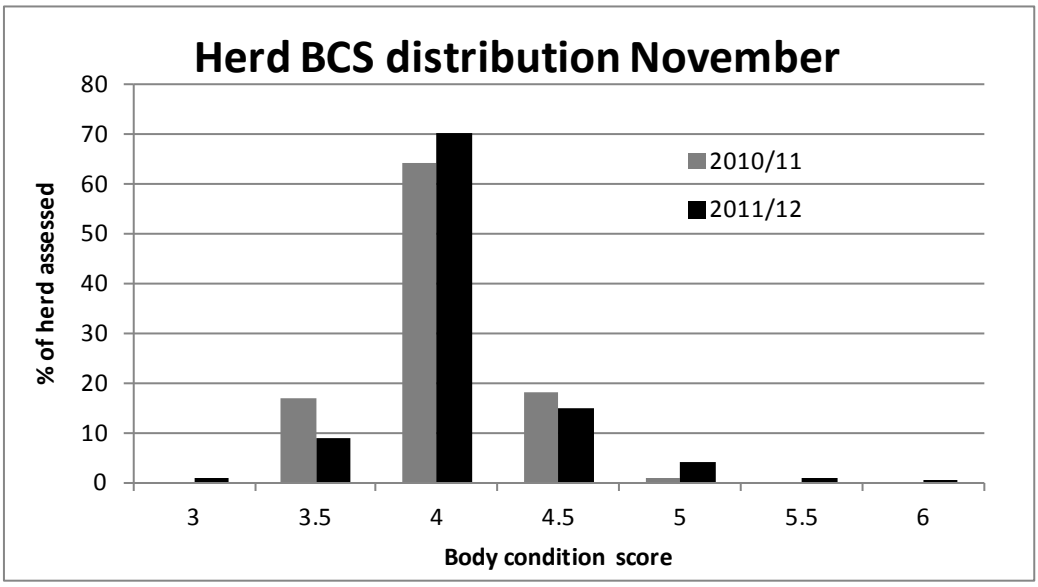


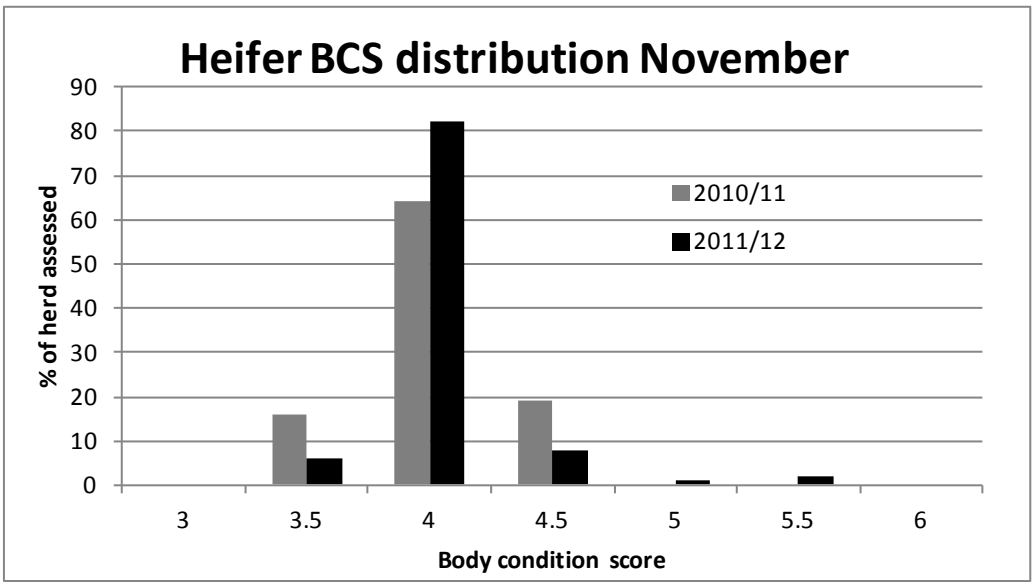


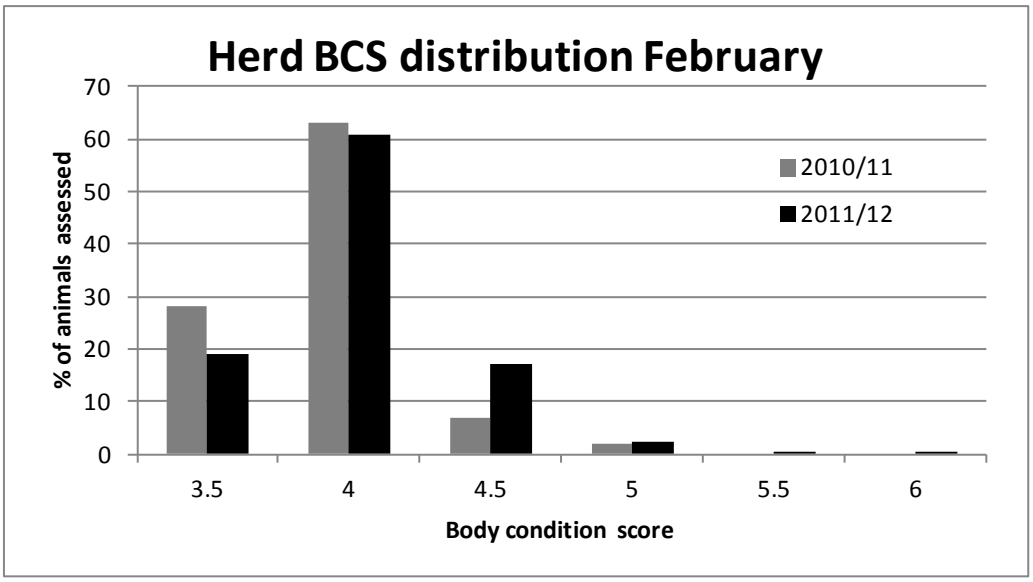

LUDF - Number of cows per condition score group 2011-12
450
400
350
300
250
200
150
100
50
0
10-Aug
24-Aug
6-Sep
21-Sep
3-Oct
17-Oct
3-Nov
14-Nov
2-Dec
16-Dec
16-Jan
30-Jan
13-Feb
27-Feb
12-Mar
26-Mar
9-Apr
23-Apr
7-May
21-May
Number = 4.0
Number = 4.5
Number less than 4.0 CS
Number over 4.5 CS

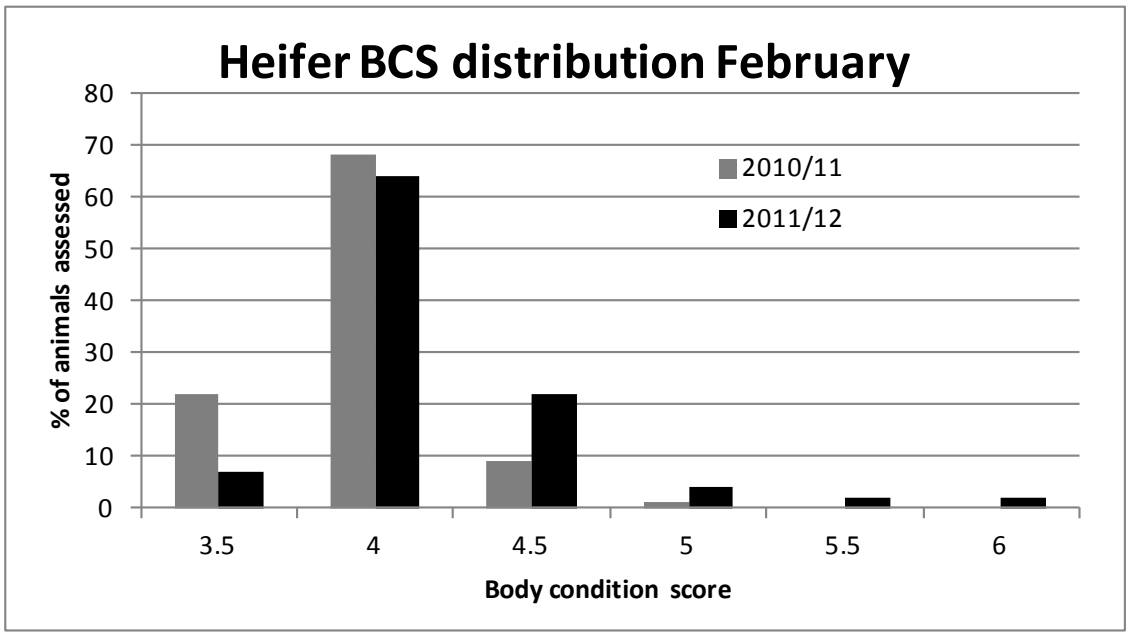

LUDF - Number of cows per condition score group 2010-11
500
450
400
350
300
250
200
150
100
50
0
10-Aug-10
10-Sep-10
10-Oct-10
10-Nov-10
10-Dec-10
10-Jan-11
10-Feb-11
10-Mar-11
10-Apr-11
10-May-11
Number between 4.0 and 4.5 CS
Number less than 4.0 CS
Number over 4.5 CS


Heifer LWT change
Liveweight (kg)
440
420
400
380
360
340
320
300
1-Sep
1-Oct
1-Nov
1-Dec
1-Jan
2010/11
2011/12









Impact of change on heifer BCS

	2010/11	2011/12
September LW (kg)	377	402
Pre mating av. BCS	-	4.5
% less than 4.0 BCS	-	5
Mid Nov av. BCS	4.2	4.2
% less than 4.0 BCS	16	6
Feb av. BCS	4.0	4.2
% less than 4.0 BCS	22	7

Impact of change on heifer production and reproduction

20 November production	**2010/11**	**2011/12**
Heifers (kg MS/cow/day)	1.32	1.97
Herd ave (kg MS/cow/day)	1.83	2.14
Difference	-28%	-8%
Not pregnant (%)	13.8	10.8
6 week in-calf rate	84	80

Benefits of Management Changes

- Observed
  - Lower empty rate in rising 3 year olds
  - Less animals below BCS 4 at mating and mid February
  - Improved milk production in November - relative to herd average
- Anticipated
  - Potential to milk more cows longer into autumn providing feed supply is OK
  - Improved performance in 3 year olds next season as grown out better

Key learning's so far

- Value of individual cow BCS relative to herd averages for proactive management
  - Identifying at risk cows early
  - Reducing the range in herd BCS
  - Strategic use of the feed on hand
- Importance of capturing the right information to analyse the impact of management changes

Effect of splitting herd on feed offered, grazing residuals, targets etc.

Management Comments from Peter Hancox – LUDF Farm Manager:

Paddock Choice

Where two paddocks of differing quality are available for next grazing, offer 'easier harvested' pasture to small herd. This would normally be pasture of 'better quality' – i.e. lower pre-graze than main herd. Small herd not grazed in S10 – paddock size and time to graze meant this was better for big herd. Some paddocks were grazed only with the main herd, some only with the small herd, and the rest were grazed with either, commonly alternating as follows:

Small Herd ⟶ Pre-graze Mow and Main herd ⟶ Small Herd ⟶ Main Herd ⟶

Paddocks	Herd
S4, S10, N6, N7, N9	Main herd
S9, N2, N11	Small herd

Break fences / Moving Cows:

Small herd – break fences used most of time and some back fencing – where more than 36 hrs in paddock and paddock layout allows. Typically allocated more than plating suggested they needed.

Main herd – used only to get round out – to get to 20 day round (and make difference up with Silage).

Main herd – typically 36 hour breaks, though the actual move might occur between 24 and 30 hours. It was observed that as more was offered, more was eaten – and getting to reasonable residual. When plenty of pasture was available, (growth rate recorded as higher than demand) and round length as planned, the feed wedge often suggested there was a 'surplus' yet cows continued to consume weekly growth with APC holding week to week. While round length was holding, cows allocated whole paddock – even when theoretically enough for 36 hrs without a fence

Residuals:

Cows moved on behaviour not residuals. LUDF wanted cows continuously eating. Knowing mowing can be used if required, a greater tolerance on residuals was used. This year there was some tolerance to 'waste grass' to feed cows – vs previously the farm used grass, but 'wasted cows' or days in milk. The focus this year was more on even grazed pasture rather than decked pasture.

If higher residuals occurred from small herd this grazing – next grazing occurred with the main herd and /or mowing pre /post grazing with main herd. Only mowed for both herds when wanting increase DM% to lift intake of fresh pasture. Most mowing was pre-graze – and mostly for the main herd – but still as the result of previous grazing.

Grazing residuals – big herd - mostly looking for a reasonable clean out –with help mower pre or post. Small herd – more lenient on getting to residuals - but occasionally same as main herd. Difference was typically 250kgDM/ha between herds but better pastures offered to small herd – ie Bealey etc vs Bronsyn / Impact – meant still good in base. Also – as small herd typically into paddocks mown last time was easier for them to get to residual anyway.

Continued to check regularly – move as need – not just on basis of available growth from farm walk – considered cow response – as wanted to feed the cows. LUDF believes it lost some production due to low DM% - cows not consuming enough energy on a daily basis.

The main herd now has all MT and late calvers (as below) – it will be this herd that will be used to clean up if required.

Intake Targets:
Both herds – typically same offered, though expected small herd consume a little less, and offered easier harvested pasture. Eg target 17 for herd – including 17 small herd but expecting eat 15-16 –– vs main herd allocate 17 and expect 17 eaten.

Liveweight:
Weight gain has occurred in the herd – seen general increase both herds. Whole herd average is now 480 - 485 kg vs 460 in Sept. This compares to the average whole herd liveweight of around 470kgs/cow this time last year.

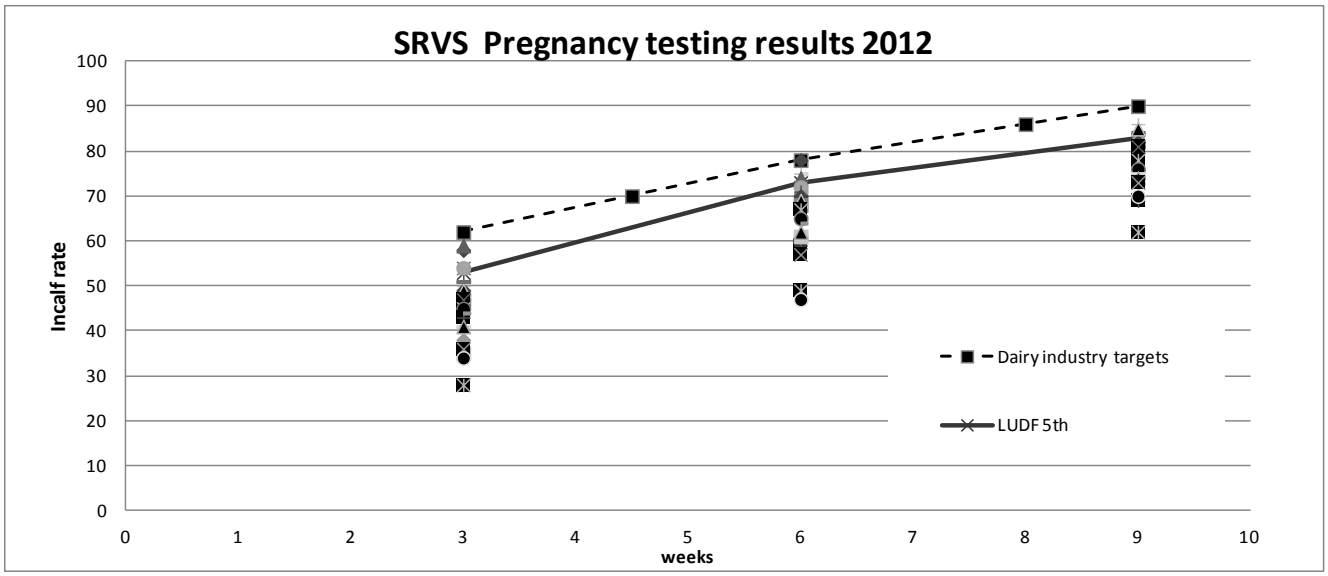
Focus for the rest of the season:
Expectation similar focus– to keep feeding them...

Small Herd makeup – calving to 16 Jan, 16 Jan to dry off:
Small herd started 6th September – in hindsight could have started in 20th August. Numbers increased to 230 cows, comprising all 2yr old heifers and lowest CS cows of any age. Small increase over mating based on CS.

At 16 January, makeup changed to all 2yr calving in August, total 200 cows, comprising Aug calving and light CS. (ie below 4.2) Unless 2 yr old, any September calver irrespective of CS is in main herd.

If segregated cows based on first 6 weeks of calving the small herd would be 240 cows, whereas the farm wanted 200 max. It determined it was more beneficial for the cows in the small herd if the herd is not too big.

Time in cowshed (or not grazing) appears very significant for this herd – in terms of increased opportunity for grazing – most days, the small herd is only out of paddock for 1 hr for each milking (mostly 40-50 minutes in cow shed). Of interest, there are hardly any lame cows in small herd – though normally don't get lameness in heifers.



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.