LUDF FOCUS DAY
OCTOBER 2021

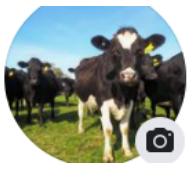
LUDF Spring Update

- **Milking 10 in 7 from day one this season.**
- **Managing spring with 10 in 7.**
- **Farm program targets with changes in milking regime.**
- **Impact on staff, workloads and rosters.**
- **2020/21 Season financial results & 2021/22 Season budget.**

Presentations from Guest Speakers

- **Breeding the ideal LUDF cow, Jack Hooper, LIC**
- **Variable Milking Update Science, Paul Edwards, DairyNZ**
- **The science of Ecotain, how does it work? Glen Judson, Agricom**
- **Successful establishment of Plantain, Fraser Harrison, Agricom**

Lunch Sponsored by:



Lincoln University Dairy Farm (LUDF)
@LUDairyFarm · Dairy Farm

Enquiries: Ph: 03 423 0022 Email: office@siddc.org.nz

Visit the website: **www.siddc.org.nz** for weekly updates on Farm Walk Notes

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LUDF Focus Day

Shands Road, Lincoln

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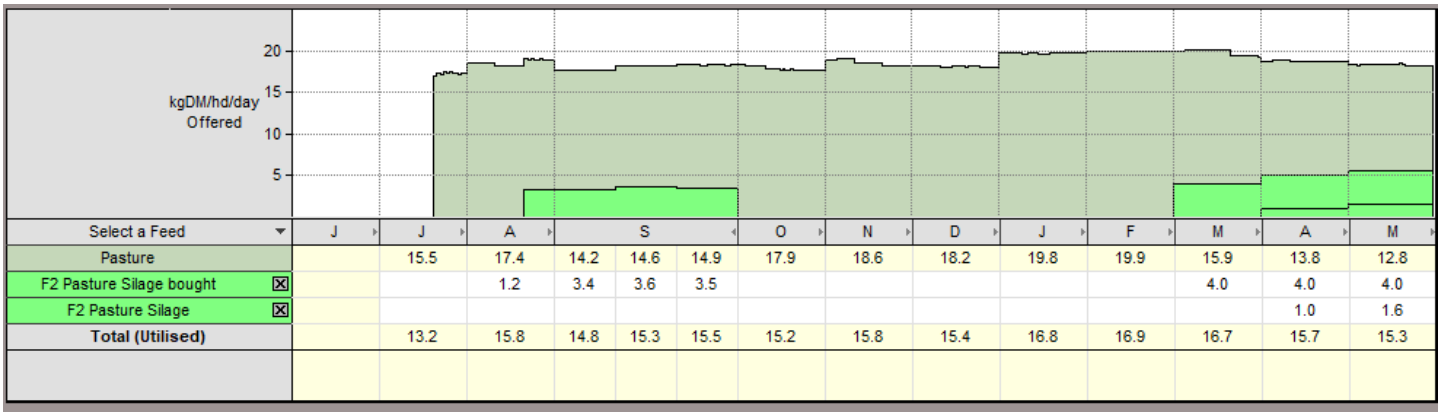
MINISTRY OF HEALTH
MANATŪ HAUORA

Speakers & Contents

LUDF Spring 2021 Update

Pasture, Feeding & Milk Production

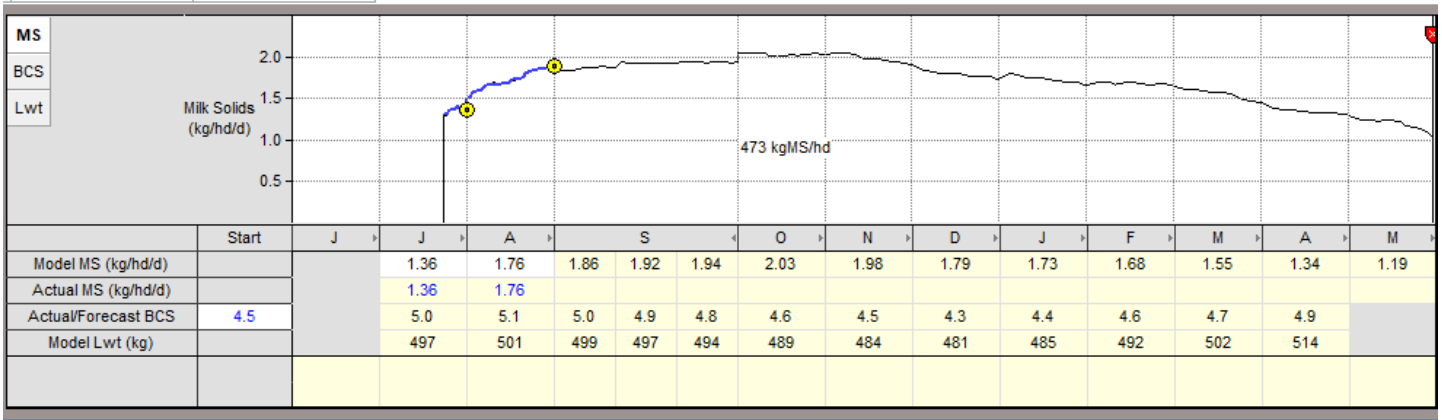
- Really well managed spring feed budget – yet again.
- 1st Round finished approx. 13th Sept. Cover was a bit tight like most of Canterbury. Had to feed 3 kgDM/cow of silage in September, with a peak of 5 kgDM/cow in the last week before the cover kicked away.
- Progibb used this spring to boost grass growth. Appeared to work well.



Select a Feed	J	J	A	S			O	N	D	J	F	M	A	M
Pasture		15.5	17.4	14.2	14.6	14.9	17.9	18.6	18.2	19.8	19.9	15.9	13.8	12.8
F2 Pasture Silage bought ☒			1.2	3.4	3.6	3.5						4.0	4.0	4.0
F2 Pasture Silage ☒													1.0	1.6
Total (Utilised)		13.2	15.8	14.8	15.3	15.5	15.2	15.8	15.4	16.8	16.9	16.7	15.7	15.3

Production for Cows at home

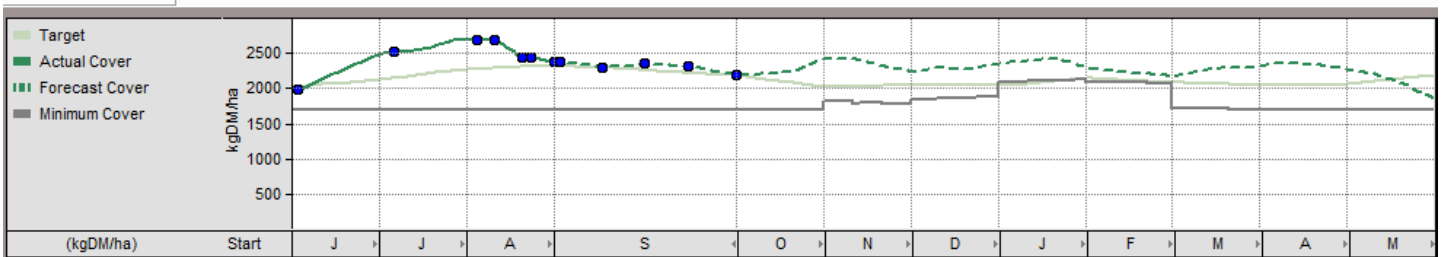
Milk Actuals... | Calibrate Milk...



	Start	J	J	A	S			O	N	D	J	F	M	A	M
Model MS (kg/hd/d)			1.36	1.76	1.86	1.92	1.94	2.03	1.98	1.79	1.73	1.68	1.55	1.34	1.19
Actual MS (kg/hd/d)			1.36	1.76											
Actual/Forecast BCS	4.5		5.0	5.1	5.0	4.9	4.8	4.6	4.5	4.3	4.4	4.6	4.7	4.9	
Model Lwt (kg)			497	501	499	497	494	489	484	481	485	492	502	514	

Pasture Cover for LUDF DSM

Target Range...



(kgDM/ha)	Start	J	J	A	S			O	N	D	J	F	M	A	M
Forecast/Actual	1,987	2,489	2,689	2,370	2,308	2,324	2,190	2,416	2,236	2,355	2,301	2,175	2,310	2,272	1,866
Minimum	926	894	1,346	1,297	1,204	1,255	1,294	1,496	1,786	1,882	2,126	2,076	1,649	1,545	1,491
Potential Growth (kgDM/ha/d)		23.5	16.5	40.6	38.5	50.5	34.0	65.9	78.7	75.0	80.4	67.7	59.8	45.9	31.1

October Feed Budget & Grazing Rules:

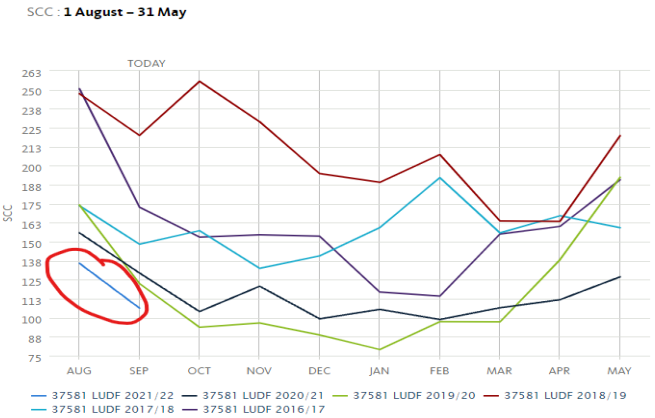
- 558 cows on 162 Ha = 3.4 cows/HA
- @ 2.1 kgMS/cow. Demand = 19.6 kgDM/cow (Feed quality high @ 12.6 MJME)
- Residual = 1,600 kgDM/HA for high performing cows.
- Demand = 68 kgDM/HA.
- Pasture required = demand X round length.
- Fastest Round = 21 days = 1,430 + 1,600 = 3,030 pregrazing (if less silage used to hold round)
- Longest Round = 25 days = 1,700 + 1,600 = 3,300 pregrazing (any more silage mown)

Fertiliser

- 80 Ha pribb / 25 kg/HaN.
- Baalnce 25 kgN as Ammo.

Animal Health

- Cell count tracking at very low levels.
- Variable milking not impacting on SCC/
- 3rd year with no Staph cows. SCC significantly lowe
- Less penicillin required.
- No cows being quarantined.



Staffing

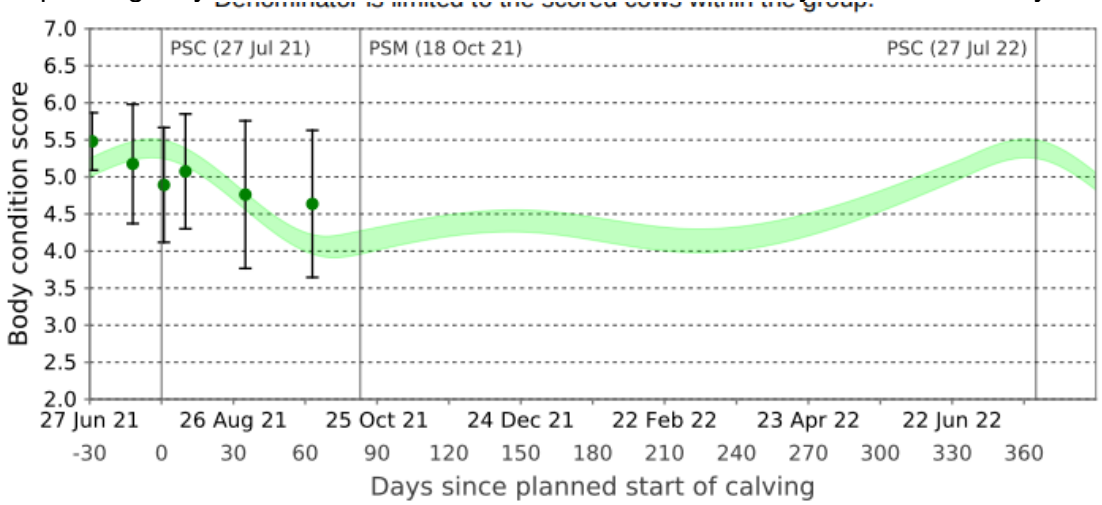
- Winter and Spring 2021 completed with 2 full time staff, Peter & 2IC.
- Short staffed with difficulties in recruiting – like many NZ farms.
- Peak of calving 2-3 casuals used.
- Balance of spring to casual staff used.
- 10 in 7 pushed some work into times suitable for casual staff (students).
- 3rd Staff member starts late October.

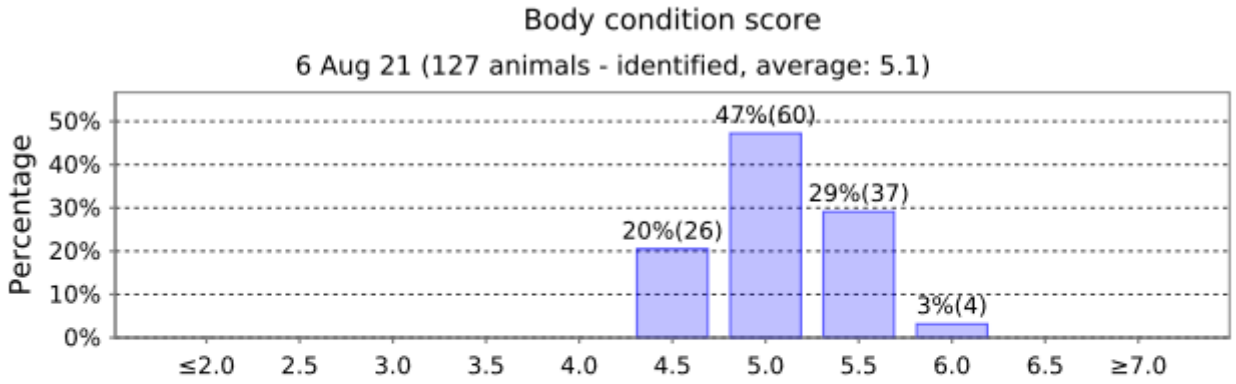
Calf Sales

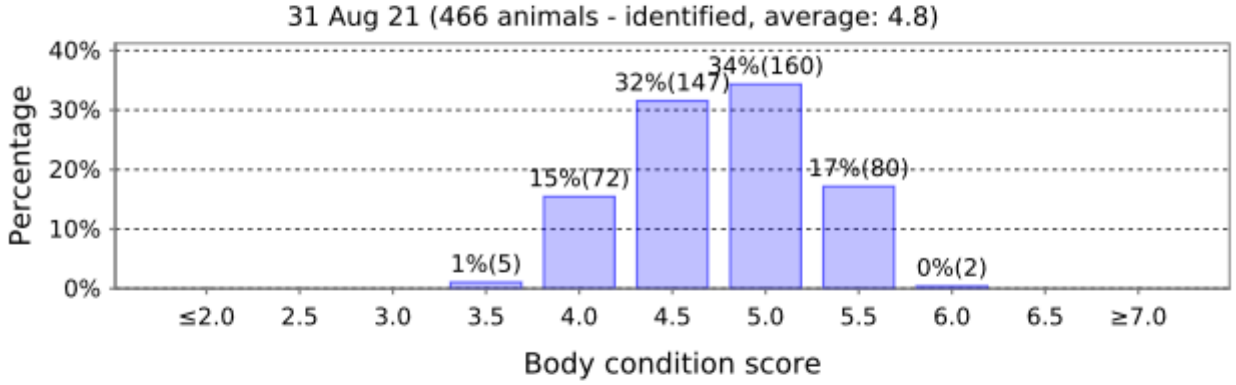
Heifer Calves	196 (surplus 36 to be sold)
Craigmore - angus	50
Angus Calves	39

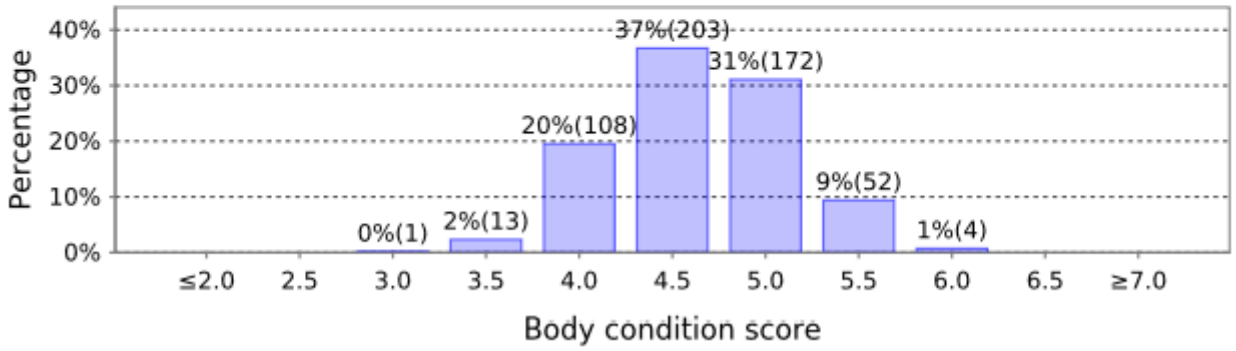
Body Condition Score

Cows responding very well to 10 in 7. Normal condition this time of year 4.3. Currently 4.6.









Mating Prep.

- Cow condition looking very good.
- Mating program in herd similar to last year.
- Continue with angus beef and sell offspring Craigmore and open market.
- Intervention, premating heats, will PG anestrus cows after a scan and CL present.

PSM: 18th October 555 numbered animals

Frozen semen:

- 310 x SGL Angus
- 29 x SGL Dairy (From private storage)

Lincoln University Dairy Farm (BQCY)			
Main Herd	**555 MA cows**		
Week 1	40% of herd to Speckled Park beef low BW cows (190 animals)	30% of the herd to A2 Forward Pack Kiwi XX fresh LLL	30% of the herd to Sexed A2 Kiwi XX fresh LLL
Week 2	Target low BW, plus slow milking speed & udder overall low BVs	Target high BW cows	Target highest BW cows 150 cows on plan
Week 3	190 straws - 18th Oct - 7th Nov	180 cows on plan - 18th Oct - 7th Nov	7 straws/day - 18th Oct – 7th Nov
Week 4	70% SGL Angus Lowest BW cows	30% of the herd to A2 Forward Pack Kiwi XX fresh LLL	
Week 5	190 straws total	High BW cows - returns	
Week 6	8th-28th Nov	8th - 28th Nov (flexible based on NRR%)	
Week 7 - 11	SGL Dairy low BW 160 cows on plan 29th Nov - 2nd Jan		
Yearlings	**160 yearlings**		
week 1 - 13 October		13th Oct Cidr program 40% of yearlings to Forward Pack Kiwi XX = 64 yearlings	13th Oct Cidr program 60% of yearlings to Sexed Kiwi XX LLL = 96 straws
Returns	2nd-5th Nov (returns 20 days later) SGL Dairy (low BW)		

Mating Heifers:

- Heifers will be mated to advance genetic gain and minimize bobby calves.
- Heifers to be CIDR'd. Combination of normal and sexed semen to be used to guarantee higher hiefers.
- Follow up AB 3 weeks after PG with Speckled park to take the pressure off bulls and minimize the potential for empties.

Finances – 202021 Actual

- 556 cows
- Total Production 280,381
- 504 kgMS/cow
- 1,730 kgMS/Ha.
- Cost structure $3.99 / kgMS (Excluding depreciation).
- Cost structure well below previous season. Savings in calf rearing, feed, R&M.

Finances – 202122 Budget

MRB - Profit Focus
LUDF - 2021/22 Budget

FARM PHYSICAL KPI's	2020/21
Total Production (kgMS)	266,000
Effective Area	160
Cows in Milk	560
Kg Milksolids/ha	1,663
Kg Milksolids/cow	475
Stocking Rate	3.50

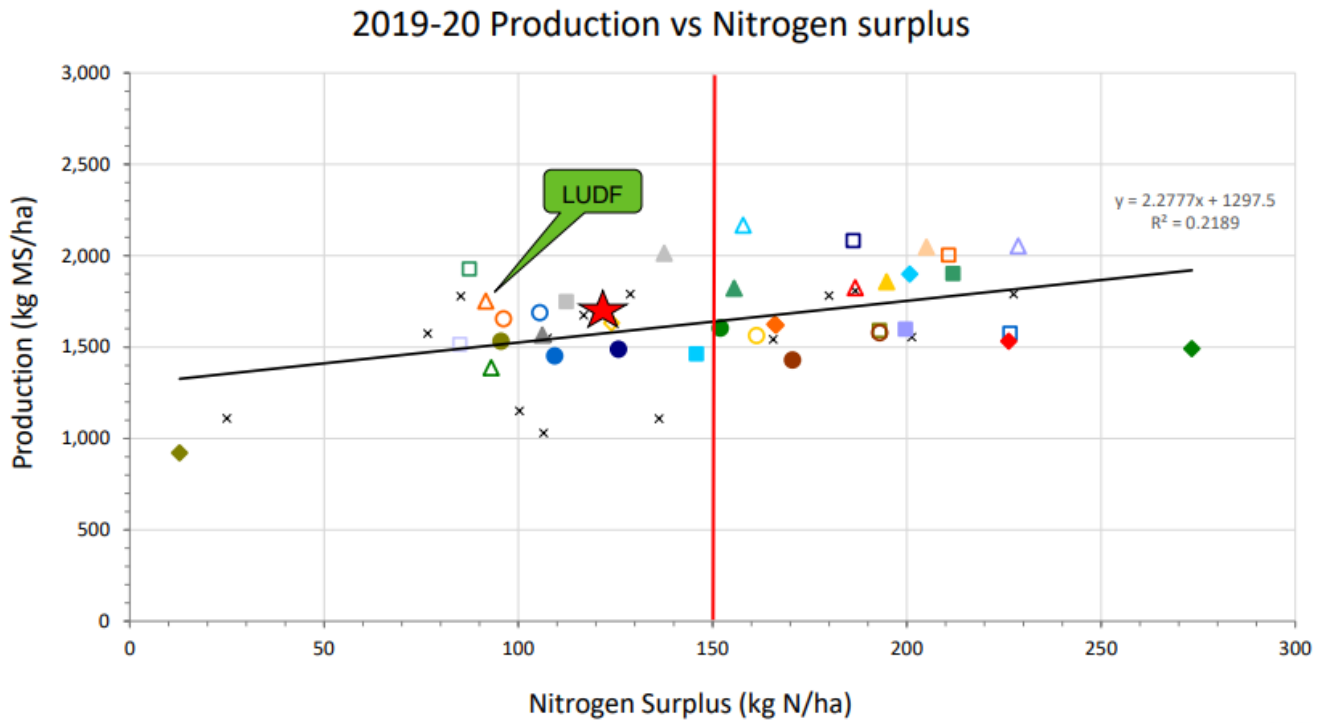
FINANCIAL INDICES	2020/21
Payout (Milk Price)	$ 7.80
Gross Farm Revenue/ha	$ 12,968
Operating Expenses/ha	$ 8,683
Operating Profit (EFS)/ha	$ 4,284
Gross Farm Revenue/Kg MS	$ 8.20
Operating Expenses/Kg MS - Exc	$ 4.22
Operating Profit (EFS)/Kg MS	$ 3.99
Where	
Demonstration Exp.	$ 0.22

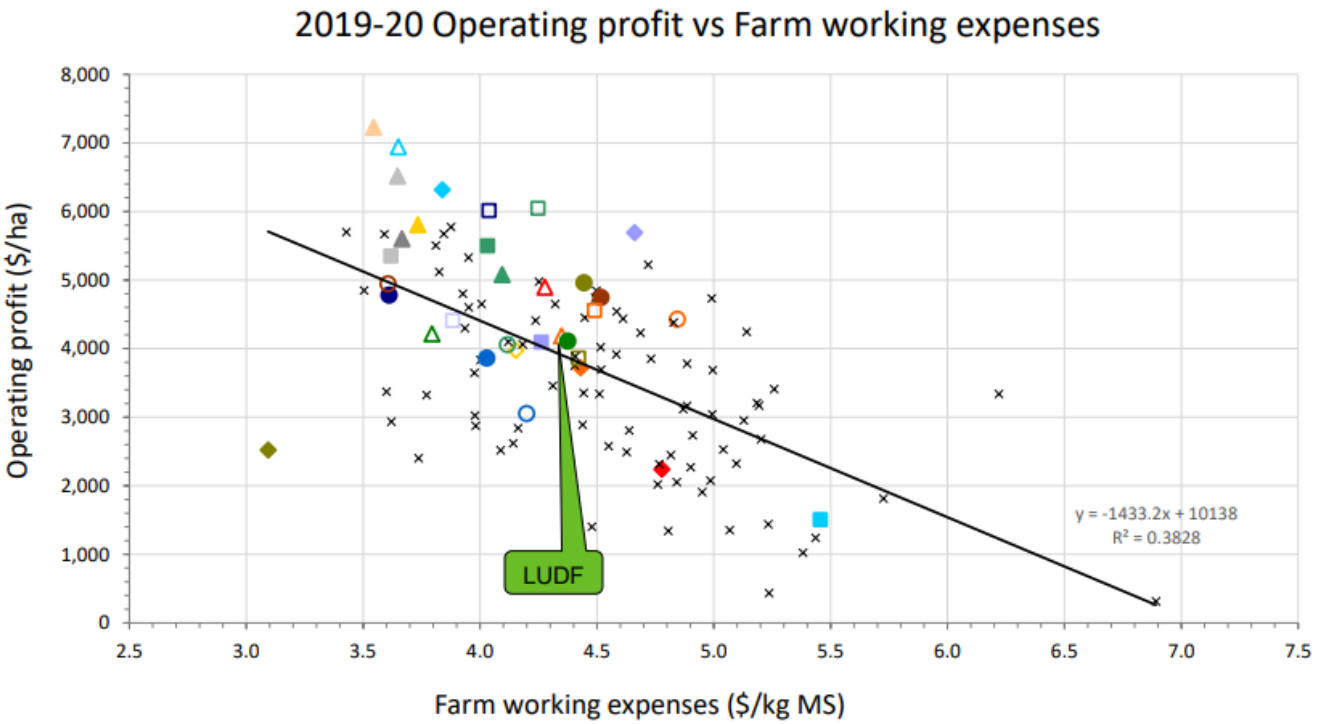
Feeding Levels		
Feed Harvested / Ha	14.50	TDM/Ha
Pasture+fodder Harvested /Cow	4,143	kgDM/cow
Supplement Use	379	kgDM/cow
Total Feed Intake	4,522	kgDM/cow
Response Rate	9.52	kgDM/kgMS

FINANCIAL KPI'S	
Labour (adjusted)	
kgMS per FTE	66,500
$ / cow	477
$ / kgMS	1.00
Animal Health + Breeding	
$ / cow	257
$ / kgMS	0.54
Feed + Grazing (incl lease)	
$ / cow	586
$ / kgMS	1.23
Fertiliser + Nitrogen	
$ / Ha	686
$ / kgMS	0.41
Repairs & Maintenance	
$ / Ha	488
$ / kgMS	0.29
Overheads (Admin, Rates, Ins)	
$ / Ha	206
$ / kgMS	0.12
Vehicles + Fuel	
$ / Ha	113
$ / kgMS	0.07

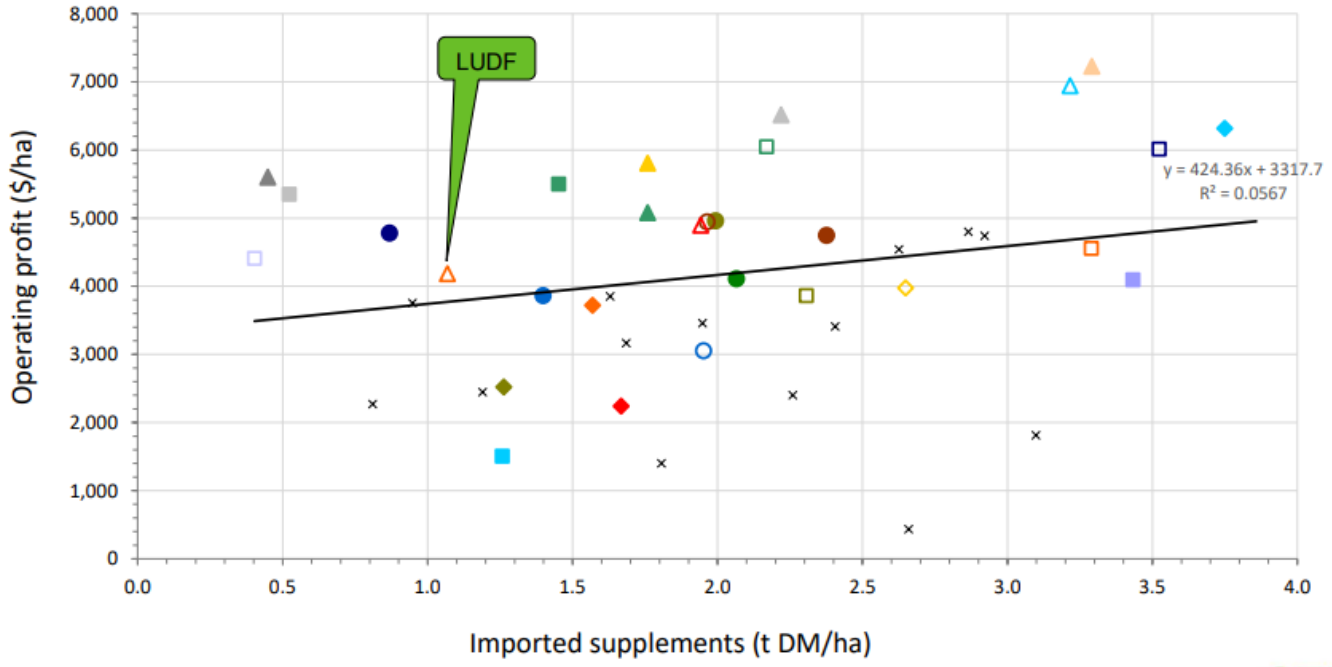
Increased costs structure due lifts in fertiliser prices, grazing. A drop in production lifts the costs ($/kgMS).

Dairy Base Comparison – 2019/20

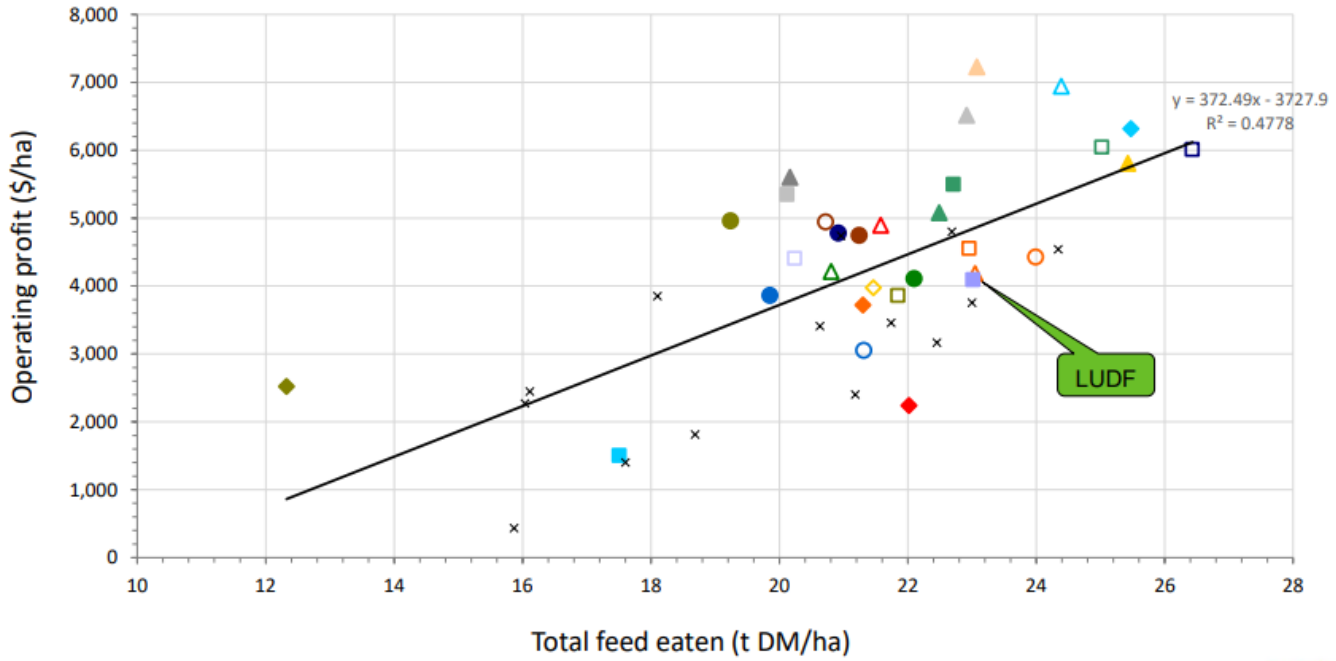




2019-20 Operating profit vs Imported supplements



2019-20 Operating profit vs Total feed eaten



Breeding the Ideal LUDF Cow

LUDF/SIDDC Focus Day
5th – 7th October 2021

Executive Summary

Imagine milking a herd a herd like your few best cows – that is what breeding will deliver in the next 10 years. Breeding Worth (BW) will contain the traits necessary for efficient and profitable cows for future New Zealand farming systems. With technologies available in animal breeding to rapidly improve the rates of genetic gain, it is also becomes increasingly important to check that management systems for the herd are in place that allow for the benefits of genetic gain to be fully captured in lifetime productivity

Herd Improvement and the Farm System (LUDF)

LUDF wishes to farm a herd of commercially efficient dairy cows whose level of production and efficiency is consistent with the LUDF objectives. It is desirable that the herd is genetically highly indexed and representative of the cows that will be milked in the South Island to enable effective demonstration of leading farm and herd management systems.

LUDF Breeding Programme (2003 – current)

The breeding programme focus has been on improving the efficiency of milksolids production. Over this time frame the herds genetic ability to produce milksolids has increased by 36kg MS and at the same time there has been a reduction of liveweight of approximately 20kgs per cow. This genetic contribution has been enhanced by the benefits that hybrid vigour contribute to the herd (see later note)

A glimpse at LUDF (14th September 2021)

BW 155/52
PW 184/53
Recorded Ancestry 100%

Table 1 – LUDF Breed Mix
On average the herd could be considered F10 (62.5% F genes)

Breed Mix	Cows	R2s
Ayrshire	0.45 %	0.12 %
Friesian	61.37 %	59.45 %
Jersey	37.42 %	40.20 %
Animal Count	565	160

Table 2 – LUDF Breeding Values

Production BVs	Cows	R2s
BW	155.43	209.88
Fat (kgs)	18.73	27.39
Protein (kgs)	18.04	22.28
Volume (ltrs)	223.3	251.35
Liveweight (kgs)	-0.33	2.36
Fertility (%)	0.84	1.36
Somatic cell (score)	-0.02	0.03
Residual survival (days)	91.95	107.53
Body condition score	0.04	0.07

The productive merit of the herd will be determined not only by its genetic merit but also by its age structure and management (including milking regime)

Table 3
Herd Age Profile (percentage cows in each age grouping)

	LUDF			*Modelled Replacement Rates/Age Structure	
Age	14/09/2021	6/12/2020	4/12/2019		
2 year old	27.2%	25.0%	17.0%	15%	18.8%
3 year old	16.4%	12.9%	26.5%	13.9%	16.2%
4 – 8 year old	51.1%	57.0%	50.6%	54.8%	53%
Nine+ year old	5.3%	5.0%	5.9%	16.3%	12%

**Potential benefits of low replacement rate for dairy herd production and profit*
*N. LOPEZ-VILLALOBOS and C. W. HOLMES**

Note – lower replacement rates may allow for less culling on production when that can be exercised however the impact can be compensated for in part by the more intense selection of dams to breed the replacements

With a herd that increases in age or shifts more cows into the 4-8year old age group the genetic merit of the younger animals will be noticeably higher than that of the herd and yearling matings will become a more critical path in the breeding programme especially so when capturing new traits in BW

Improving survival of two and three year olds through reducing the not incalf rate, leads to a higher proportion of older cows milked. In these age groups aspects of udder conformation, udder health, teat placement and milking speed play a bigger part in culling decisions

My observations in Canterbury with many herds would suggest that the proportion of cows 9+ in the modelling would be too high when we consider, reproductive performance and animal health limitations eg lameness and mastitis susceptibility within larger herds

Table 4
Two and three year old production as a percentage of mature cow production

Age	2020 – 2021 Dairy Season (Herd Test calculated to 12/4/2021			2019 – 2020 Dairy Season (Herd Test calculated to 26/3/2020		
	Kg MS	% of 4-8 yr old production	DIM (diff from 4-8 yr old)	Kg MS	% of 4-8 yr old production	DIM (diff from 4-8 yr old
2 year old	367	70%	+2	354	72%	+7
3 year old	442	84%	-5	416	84.5%	-3
4-8 year old	525	-	-	492	-	-

Note

1. December Herd Test ratios by age are consistent with those for the season's total production
2. Younger cows in the herd are producing less than expected when close to target pre calving liveweights are attained – challenges to energy balance will affect both production and reproduction

Table 5

Two and three year old production expressed as a percentage of mature cow production for different milking regimes

	Milking Regime (all season)		
Age	TAD	Variable (10/7 – 3/2)	OAD**
2 year old	73 - 76%	?*	65 – 70%
3 year old	85 – 90%	?*	80 – 84%
4-8 year old	100%	100%	100%

*Trials will determine this percentage and will be dependent on both breed and production levels
** Estimates from herd records examined over recent years

In modelling by the above authors the following is assumed under TAD, Lactation 1 – 75%, Lactation 2 - 88%, Lactation 3 – 95%, Lactations 4-7 100%, Lactations 8-9 - 90%
Under OAD cows may not reach mature production equivalent until a lactation later than their TAD counterparts – the system is more dependent on lower replacement rates

Two key ingredients are needed to make once-a day-milking (OAD) a success…..,
Dr Nicolas Lopez-Villalobos, Professor of Dairy Cattle Breeding and Genetics at Massey University, says at Massey Dairy 1, they are lucky to have both.
"To be successful at OAD, you have to have a good manager and good cows," he says.

Herd Improvement – It's a long game

While breeding our cow of the future, this springs matings will result in a 5 year old cow calving in 2027, it is important that the cow is in a management system that maximises her potential.
Herd Improvement must be put into a farm system. The value of good genetics linked to farm goals and profitability

Future herd considerations summarised

- Produce efficiently a large quantity of high value milk solids of known quality from home grown feed (BW)
- Improved fertility breeding values (Note fertility breeding value is only one component of improving reproduction)
- Good health status and more disease resistant. More consistent BCS throughout season
- Improved longevity – capture mature age group productive ability
- Easy care

    - Hybrid Vigour
    - Polled
- Desirable conformation to handle increased productivity or reduced milking intervals
    - OAD index
    - Udder conformation
    - Milking speed

- Low environmental footprint
    - Methane Trial (LIC & CRV)
    - Carbon
    - Nitrogen
- Resilient to external challenges – eg Climate variation/heat tolerance
    - Slick gene
- DNA profiled, fully event recorded and have complete movement traceability
- Suitability of dam to breed a dairy beef calf
    - Wagyu, Angus etc
- More uniformity to improve potential benefits of automation and sensors

For new traits of interest, that potentially affect a herd's profitability to be included in BW – firstly science has to be able to measure the impact accurately and develop a breeding value (heritability) along with an economic value for trait.
Inclusion of new traits especially those that relate to an animals impact on the environment or health and welfare will lead to a more balanced future BW.
Your breeding programme will deliver these new traits of importance through BW and/or possibly sub - indices
Other traits such as "polled" will be a yes/no in the same way as A2 currently is

Breeding Worth (BW)

Breeding worth is an evolving index.
In 1996 when BW first became an animal evaluation measure only 5 traits were include: milkfat, protein, volume, liveweight and residual survival.
Today 8 traits are in BW with fertility included in 2001, somatic cell score in 2004 and body condition score in 2015.
As more traits have been included in BW milksolids production contributes less to the overall index, originally around 75% and now down to approximately 50% of the weighting

The recent NBO review surveys by NZAEL and subsequent feedback from the industry will lead to changes in BW in the coming months.

BW in both its current and future format is about an animals "lifetime efficiency" rather than its "production efficiency"

Breeding Companies who align with the National Breeding Objective will deliver the appropriate genetics through BW to maximise your future herd's profitability. Capturing the full benefits delivered also relies on a good understanding of herd records and good management systems in place to exploit the potential benefits

Future Herd

Historically when considering the LUDF herd there are two considerations that have received close attention and with the future herd in mind they remain important, along with a third aspect relating to reduced milking intervals

1. Liveweight and production efficiency in grazing systems
2. Hybrid Vigour
3. Suitability for the milking system

<u>Liveweight and production efficiency in grazing systems</u>

Best described in an extract from this paper

Resilient farming systems –surviving volatility

John Roche[1] & Brendan Horan[2]

- 1Animal Science, DairyNZ, Hamilton, New Zealand 2Animal and Grassland Research and Innovation Centre, Teagasc, Moorepark, Fermoy, Co. Cork, Ireland

……resilient farm systems should maximise the use of grazed pasture and limit planned supplement purchases to no more than 0.5 t DM/cow. We also established that a crossbred cow of high BW was the most efficient cow for a grazing system. In addition to BW and crossbreeding, however, we believe that cows should average no more than 500 kg live weight, with, arguably, no advantage to cows greater than 550 kg live weight in the herd. The relationship between cow live weight and DM intake in a grazing system is not linear. Intake increases with cow live weight up to about 500 kg, but the factors regulating grazing behaviour limit further increases in DM intake with increasing cow size in a largely pasture-based diet. Although bigger cows can eat more total DM intake and, therefore, may have some value in systems feeding higher amounts of supplement, justifying these cows in this way ***leads*** to the greater use of supplements, which, we believe, undermines the resilience of the system.

Hybrid Vigour

Hybrid vigour has the potential to add value to a breeding programme – it is the one thing that does come free.
From Bill Montgomerie NZAEL, Crosses and Ticks publication (2005)
Table 6**:** Percentage performance improvement of first cross
Holstein-Friesian x Jersey cows in NZ caused by hybrid vigour

Trait	**Impact of hybrid vigour**
Milkfat	+ 4.7%
Protein	+ 4.6%
Milk volume	+ 4.2%
Liveweight	+ 2.1%
Cow fertility*	+5.2%
Somatic cell count	- 4.1% (favourable)
Days of herd life	+ 13.5% (~220 days)

* Number of cows re-calving in first 42 days of calving period

A significant production advantage from a smaller increase in liveweight with an associated improvement in reproduction and health traits when compared with the average of the parent breeds.

Table 7
Later Crosses and Hybrid Vigour

Hybrid vigour or heterosis is strongest in the first cross between pure breeds and its effect is diminished, although still important with subsequent crossing. Table 7 shows the impact of mating different breeds or crossbreeds with each other on heterosis. A first cross cow (F8J8) mated to a Holstein - Friesian sire (F16J0) will still retain 50% of the hybrid vigour and the benefits listed earlier.

	Dam (breed 16ths)				
Sire (breed 16ths)	F16J0	F12J4	F8J8	F4J12	F0J16
F0J16	100	75	50	25	0
F4J12	75	63	50	38	25
F8J8	50	50	50	50	50
F12J4	25	38	50	63	75
F16J0	0	25	50	75	100

Suitability for the Milking System

Under reduced milking intervals conformation traits such as front teat placement, udder conformation and speed of milking (all with heritabilities 20 -25%) increase in importance given the additional yields when compared with twice a day milking. Cows not suitable in these traits would not be mated for dairy replacements. Mating yearlings, sexed semen and reduced replacement rates allow for some selection pressure to be applied.

Breed Choices – LUDF herd

The LUDF herd has evolved from a Friesian herd supplying town milk to a herd which on average is F10 and within a narrow breed mix range. Following analysis over a number of years these types of cows seemed best to suit the LUDF system.
However with the advent of a variable milking regime consideration on one hand could be given to increasing slightly the proportion of “jersey genes”. Certainly beneficial at the OAD end of the scale when improvements in solids yield and not increases in volume are sought. However on the other hand with strategies around reduced bobby calves, suitability as dam to produce a marketable dairy beef calf is compromised

My recommendation would be to stay in the F9 – F10 range or alternatively in liveweight terms breeding a cow with a mature liveweight of approximately 500 kg (breeding value for liveweight of 0)

Summary

From the DairyNZ website 23rd September 2021

On average, milk solids production has increased by about 50kg/cow over the past ten years. It is estimated that around 40% of those production gains are a direct result of farmer’s commitment to genetic improvement.

The average BW increase in this period for crossbred herds was 9.9 BW per year

However that is the last 10 years – Today with better information and herd analysis tools, the increased application of genomics, rapidly improving bull teams, improvements to replacement dam selection with yearling matings and the use of sexed semen will see leading herds such as LUDF gain genetically at approximately $20 BW, double the rate of the last 10 years.

Given these rates of genetic gain – the very best few cows in your herd are your herd of the future (10 years). Imagine milking a herd like them – what will this mean for farm management?

Jack Hooper
Contractor to LIC

Flexible milking

Paul Edwards
Senior scientist – Farm systems
Lincoln

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SIDE 22 June 2021

Funded by Sustainable Farming Fund
Ministry for Primary Industries
Manatū Ahu Matua

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Why flexible milking?

Can we adapt milking intervals to improve workplace attractiveness?

- Hours
  - Approx. 50% of time is spent milking
- Flexibility
  - Milking times influence structure of the day

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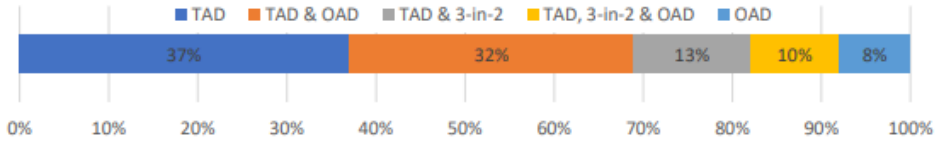
Use of milking frequency

- >5400 Fonterra farms with a complete season of vat telemetry in 20/21
- Used each milking frequency for at least 4 weeks



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Background to 3-in-2

- OAD is a suitable for many farms but harder to justify for others
- Already being used successfully in mid-late lactation
- Farmers were asking us the question:
  - "Can 3-in-2 play a greater role in our farm systems?"
- Limited research available, only studies were in 1978 and 1985

10-19-19 h 11-18.5-18.5 h

This led to a 3-year SFF project "Flexible Milking" with the aim of:

- Increasing confidence to adopt, optimise, and support the use of 3-in-2 milking

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Test system effects with farmlets

- TAD: 6am, 4pm (10-14)
- 3in2: 5am, 5pm, 11am (12-18-18)
- Stocking rate 3.5 cows/ha (29 cows/herd, 31% heifers)
- Lincoln University Research Dairy Farm

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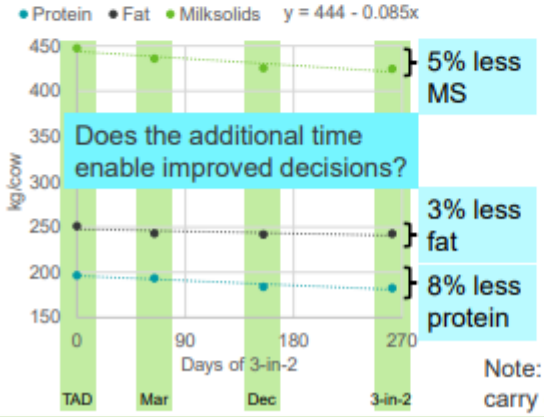
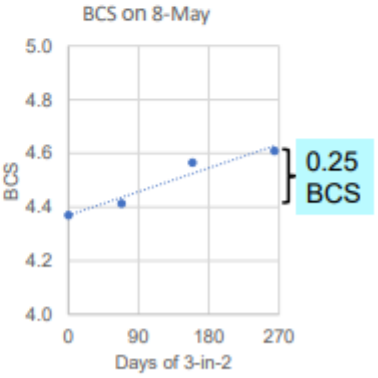
Key farmlet results





Note: 1 year study, 31% heifers and no carry over effects

How much flexibility?

- 12-18-18 can still make for a long day
  - 5am 5pm 11am
- Is it the number of milkings per day, or the timing of them that affects production?

Plenty of options

TAD 10-14 h interval

e.g. 5am and 3pm

- Conventional

TAD 8-16 h interval

e.g. 6am and 2pm

- Later start or earlier finish (+)
- Can mean less done in a day (-)
- Large volume of milk to harvest in the morning = need good milking routine

3in2

- Could use flexible staff e.g. outsource a milking (+)
- Less consistency e.g. between days and weeks (-)
- 25% fewer milkings (+)

10in7 (3in2 - OAD weekend)

- OAD weekends (+)
- Consistent weeks (+)
- 29% fewer milkings (+)

OAD

- Milk any time during the day (+)
- Increases pool of people available (+)

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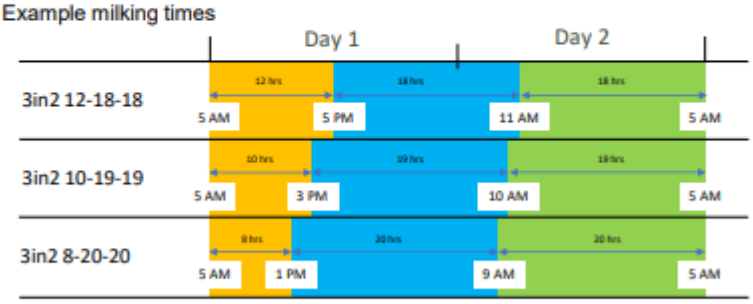
Test with component experiment

- Herds of 40 cows
- 2× 6-week experiments
- 34 and 146 DIM (spring and summer)
- Grazed side-by-side in same paddock

Example milking times



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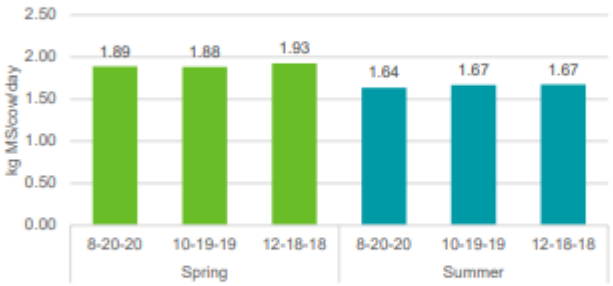
Results



- No significant differences between groups
- Possible to use more attractive 3-in-2 milking times

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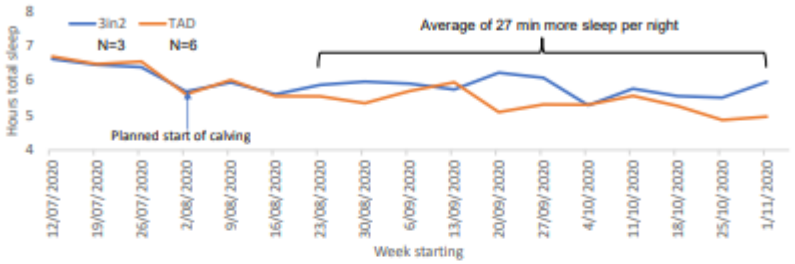
Benefits for people?

- Small pilot study using sleep rings, 3 adjacent farms



- Also some evidence of better quality sleep

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Can we adapt milking intervals to improve workplace attractiveness?

- ✓ Many flexible milking options available
- ✓ Farmlet results look encouraging for full season
- ✓ More attractive 3in2 milking times possible
- ✓ Understand the 'why'
- ✓ Plan in advance

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VARIABLE MILKING PLAN

For the 2021/22 season, LUDF will be implementing a “Variable Milking” Program. Variable milking is a departure from our traditional twice a day milking (5 am and 2 pm) to a more flexible milking regime that will suit both cows and people. Recent science and research, Dairy NZ confirms that cows drop by 5% when on a variable milking regime. It also shows that the timing of milking does not impact cow production, cows have great flexibility on milking time.

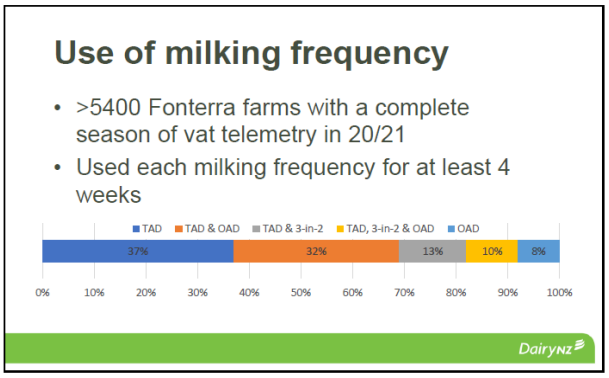
A variable milking program aims to improve animal welfare outcomes, less lame cows, improved cow condition and vigour of cows. A higher level of staff wellbeing with improved rosters, less early starts and more condensed work loads allowing for more personal and family time. LUDF plans to achieve these improved outcomes without impacting profitability.

10 in 7 milking Routine

Monday	5.00am	2.30pm	9.5 hours
Tuesday	8.30am		18 hours
Wednesday	5.00am	2.30pm	9.5 hours
Thursday	8.30am		18 hours
Friday	5.00am	2.30pm	9.5 hours
Saturday	11.30am		21 hours
Sunday	8.30am		21.5 hours

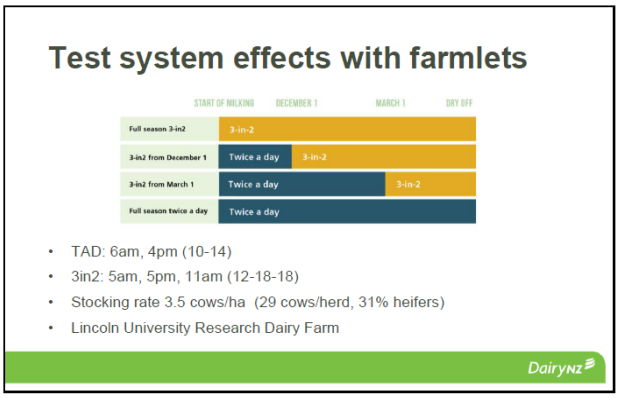
1. Variable Milking Research – Dairy NZ

Many NZ dairy farms have been practicing variable milking for part of the season. The motivations of farmers have been to take the pressure off cows, people and the pasture demand. To confirm the impact of variable milking on milk production and cow welfare outcomes, Paul Edwards, Dairy NZ completed research and Lincoln University Dairy Research Unit.

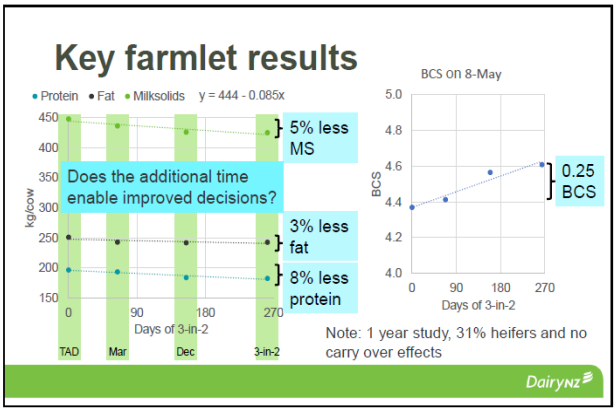


A variable research trial was completed based on three start dates for variable milking. Day 1 of lactation, 1st December and 1st March. A control comparison of Twice a day milking (TAD) was included with cows milking the full season on TAD,

The research concluded that cows will drop 5% from the day that the farmer commences variable milking.



Most of this drop comes in the form of a drop in protein production. Cow condition at the close of the season was 0.25 CS better for full season variable milking. The response in cow condition was linear from the time you started variable milking, eg, mid season = 0.125 CS better.



The research also completed a 6 week trail to confirm the impact of the time between milking on per cow production. The initial concept of variable milking was to milk the cows 8-20-20 hours apart, resulting in some antisocial milking times. The research concluded that Milk period had no significant difference on milk production which gives us greater flexibility on milking time and staff rosters.

Anticipated impact on LUDF –

Farmax Dairy Modelling

- Cow numbers to stay the same.
- Variable milking to commence from day 1.
- Lactation curve projected a 5% drop. Production was dropped from 494 kgMS/cow to 471 kgMS/cow. (274,600 to 270,600 kgMS).
- Culled as per current policy to keep N leaching low.
- Maintained Nitrogen fertiliser at 160 kg/Ha nitrogen.
- Cut silage in spring / early summer to maintain quality, Fed silage back in autumn
- Total Production dropped by 11,800 kgMSh.

Impact on Inputs, resources and finances

- Decreased petrol and motorbike R&M by 25%.
- Decreased power consumption by 13 % with less running time of shed.
- Cost of cleaning shed and plant dropped by 25 %.
- Winter feed requirements dropped by $1.80 / wk as cows 0.23 CS fatter at the close of the season. This is based on $0.29 / kgDM. This will even up/negate the impact on CS on the following mating.
- Lameness, TAD 12%. Var 0%. Will increase in per cow. If $40 / cow for treatment (excluding milk). Decreases animal health spend by $4.80 / per cow.

Changes in Human Resource

- 3.5 FTE's on farm. 50 % of workload in milking. 19 % less time in milking.
- 0.33 FTE Drop in workload. Including house, @ $65,000 PA. $19,500.

FARMAX YOUR ADVANTAGE Dairy 8.0.2.11

Compare Physical Summary

Jun 20 - May 21

Category	Description	LUDF DSM 202021 Revised Mar	LUDF DSM Variable Full Season 2021	LUDF DSM Variable Low Stock	
Farm	Effective Area	160	160	160	ha
	Stocking Rate	3.5	3.6	3.5	cows/ha
	Potential Pasture Growth	18.6	18.6	18.6	t DM/ha
	Nitrogen Use per total ha	161	161	161	kg N/ha
	Feed Conversion Efficiency (eaten)	10.6	11.1	11.0	kg DM eaten/kg MS
Herd	Cow Numbers (1st July)	556	575	556	cows
	Peak Cows Milked	556	575	556	cows
	Days in Milk	280	279	281	days
	Avg. BCS at calving	5.1	5.1	5.1	BCS
	Liveweight per total ha	1,641	1,727	1,669	kg/ha
Production	Milk Solids total	274,684	270,612	262,827	kg
(to Factory)	Milk Solids per total ha	1,717	1,691	1,643	kg/ha
	Milk Solids per cow	494	471	473	kg/cow
	Peak Milk Solids production	2.30	2.18	2.18	kg/cow/day
	Milk Solids as % of live weight	104.6	97.9	98.4	%
Feeding	Pasture Eaten per cow *	4.2	4.1	4.2	t DM/cow
	Supplements Eaten per cow *	0.3	0.4	0.3	t DM/cow
	Off-farm Grazing Eaten per cow *	0.7	0.7	0.7	t DM/cow
	Total Feed Eaten per cow *	5.2	5.2	5.2	t DM/cow
Diagnostics	Pasture Eaten per total ha	14.7	14.9	14.6	t DM/ha
	Supplements Eaten per total ha	1.4	1.6	1.3	t DM/ha
	Off-farm Grazing Eaten per total ha	4.5	4.6	4.5	t DM/ha
	Total Feed Eaten per total ha	20.5	21.1	20.4	t DM/ha
	Supplements and Grazing / Feed Eaten *	19.9	20.8	19.7	%
	Bought Feed / Feed Eaten *	9.1	10.5	8.3	%

NB. Previous versions of this report used a different area definition.

FARMAX YOUR ADVANTAGE
Dairy 8.0.2.11

Compare Forecast Profit and Loss

Jun 20 - May 21

			LUDF DSM	LUDF DSM	
			Variable Full Season 2021	202021 Revised Mar	Difference
Revenue	Stock	Net Milk Sales - this season	1,809,097	1,830,199	21,103
		Net Milk Sales - last season	0	0	0
		Net Milk Sales - dividend	0	0	0
		Net Livestock Sales	92,685	87,388	-5,297
		Contract Grazing	0	0	0
		Change in Livestock Value	0	0	0
		Total	**1,901,782**	**1,917,587**	15,805
	Crop & Feed	Capital Value Change	0	3,200	3,200
		Total	0	3,200	3,200
	Total Revenue		**1,901,782**	**1,920,787**	19,005
Expenses	Wages	Wages	140,000	160,080	20,080
		Management Wage	46,920	46,920	0
	Stock	Animal Health	71,489	71,760	271
		Breeding	28,550	27,600	-950
		Farm Dairy	8,280	9,936	1,656
		Electricity	19,985	22,356	2,371
	Feed/Crop	Pasture Conserved	0	3,200	3,200
		Feed Crop	3,780	3,780	0
		Bought Feed	83,614	74,415	-9,200
		Calf Feed	3,639	3,514	-125
	Grazing	Grazing	271,363	272,558	1,195
	Other Farm Working	Fertiliser (Excl. N)	35,680	35,680	0
		Nitrogen	42,400	42,400	0
		Irrigation	64,000	64,000	0
		Weed & Pest Control	3,840	3,840	0
		Vehicle Expenses	11,200	12,800	1,600
		Fuel	11,200	12,800	1,600
		R&M Land/Buildings	59,200	59,200	0
		Freight & Cartage	1,600	1,600	0
	Overheads	Administration Expenses	24,000	24,000	0
		Insurance	16,000	16,000	0
		ACC Levies	4,800	4,800	0
		Rates	12,800	12,800	0
	Total Farm Working Expenses		**964,340**	**986,039**	21,698
	Depreciation		0	0	0
	Total Farm Expenses		**964,340**	**986,039**	21,698
Economic Farm Surplus (EFS)			**937,442**	**934,748**	-2,693
Farm Profit before Tax			**937,442**	**934,748**	-2,693
Farm Profit per ha before Tax			**5,859**	**5,842**	-17

EFS is a measure of farm business profitability independent of ownership or funding, used to compare performance between farms.

EFS should include an adjustment for unpaid family labour and management. This can be added to the expense database as management wage.

10 in 7 lessons learned to date

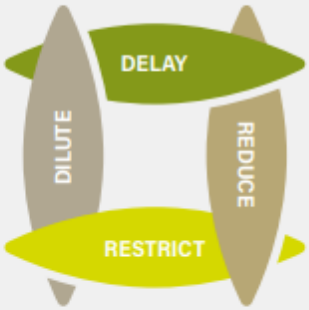
This has been a challenging spring for the team at LUDF.

1. Very wet start to calving.
2. Heifers came home 2 weeks early.
3. To date we have had only 2 full time staff members and relief help.

Starting the 10 in 7

- The cows got used to the routine very quickly with minimal disruption.
- At the start of calving, it did cause some difficulties with workflow.
    - Calf rearing and when to feed the calved to have warm fresh colostrum available to them.
        - We had to invest in a milk warmer and feed them at 10am every day.
- We struggled to get a good routine on the day where we only milked once at the start but as we passed the halfway point this became easier.
- The heifers were a challenge on the larger milking gap at the beginning as the cups slipped off on a regular basis and have now come right.
- As we have gone through calving it has started to make some real differences to the farm.
- Cow flow is now fantastic with cows wanting to be milked this has led to a few changes.
    - We are using a Batt latch to bring in the cows every morning.
    - Cows are in the yard in the mornings waiting to be milked.
    - We are seeing less lameness now as cows are doing less walking and most of the walking is voluntary.

    - Body condition is currently sitting at 4.6 BSC.
    - We have a large number of cows cycling now.
    - We are not seeing any difficulty with pasture management and are hitting our residuals daily.
- People
- The staff are getting into the routine now.
    - It has managed to keep hours worked down over calving 50 to 60 per week.
    - The milking once a day over the weekends has a positive effect on the team.



1. DILUTE

Increased urine volume. Reduced N concentration.
Ecotain environmental plantain increases the volume of urine animals produce, which means the N being excreted is in a more dilute form, resulting in a reduced N load in the urine patch.

2. REDUCE

Reduced total N in urine. Reduced N concentration.
Ecotain reduces the amount of dietary N which is excreted in urine, compared with ryegrass. This reduces the amount of N released into the soil via the urine patch.

3. DELAY

Slow release from ammonium state. Greater plant uptake.
In urine patches from animals grazing **Ecotain**, the conversion from ammonium to nitrate is delayed. Slower conversion allows plants a greater opportunity to uptake N, significantly reducing the potential for leaching.

4. RESTRICT

Restricts nitrification rate in soil. Reduced N leaching.
The presence of **Ecotain** plants in the soil reduces nitrification, likely through the effect of a biological nitrification inhibitor.

An Environmental Breakthrough in Nitrogen Mitigation

THE POWER OF 4

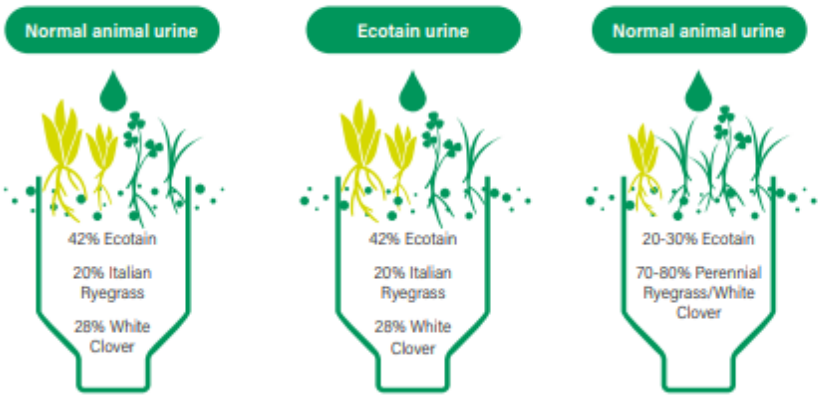
Ecotain® environmental plantain has been shown to reduce nitrogen leaching from the urine patch. Lincoln University lysimeter studies showed a reduction in nitrogen leaching by 89% from the urine patch compared with ryegrass and white clover. The diagram to the left demonstrates the four mechanisms working together.

ENVIRONMENTAL FUNCTIONALITY

Research has demonstrated that not all plantains (current cultivars or breeding lines) are capable of reducing nitrate leaching from the urine patch through the four mechanisms that **Ecotain** can – dilute, reduce, delay and restrict. In all other agronomic aspects as well as environmental, **Ecotain** is an excellent example of a high quality, productive forage plantain.

Figure 15 represents the outcome of a lysimeter study which demonstrated a 45% reduction in leaching when urine from animals grazing normal pasture (ryegrass/clover) was applied to an **Ecotain** mix. This is the RESTRICT function at work. When urine from animals grazing the Ecotain mix was applied to the same sward, a reduction in leaching of 89% was recorded*, this second lysimeter demonstrates all four mechanisms working together. The third lysimeter demonstrated a 74% reduction in leaching when urine from animals grazing normal pasture was applied to a mix containing just 20-30% **Ecotain**. This suggests that moderate rates of **Ecotain** can be extremely effective at reducing N leaching.

Figure 15. Nitrate leaching reductions using different urine and pasture mix treatments from lysimeter research



45% less leaching* *(Woods, 2017 used with permission)*

89% less leaching* *(Woods, 2017 used with permission)*

74% less leaching* *(Carlton et al, 2018)*

GRAZING PLANTAIN PLAN

LUDF (Lincoln University Dairy Farm) adopted a low foot print farm program approach in 2015. This farm program has been refined over subsequent seasons delivering high per cow production with a grass based farm program with minimal supplement use. Nitrogen use is moderate at 135 – 170 kg/Ha nitrogen. Current overseer modelling suggests nitrogen losses to leaching of 35 kg/Ha nitrogen. Further drops in nitrogen leaching with decreasing the farm program intensity are likely to quickly erode the farms profitability as the feed harvested by cows will decline.

Plantain represents an opportunity for LUDF to drop the nitrogen leaching while maintaining current farm performance and profitability. The research on plantain highlights that a significant reduction in nitrogen leaching is achievable at cow intakes of 30% plantain or higher. Overseer modelling suggests this will drop nitrogen leaching from 35 to 26 kg/Ha of nitrogen.

LUDF will embark on a planting program of plantain to achieve 30%+ intakes of plantain by planting swards of plantain at least 10% of the farm every year.

LUDF has sown plantain in the regrassing program for the past 5 plus years. The aggressive growth of ryegrass has outcompeted the plantain at LUDF. We also experienced a very heavy weed burden , especially with dock. In recent years we have had failures with the regrassing, and have had too abandoned the use of plantain so we can use herbicides to tidy up the weed burden. We note the use of Dicamba is now registered for dock establishment in new pasture.

The research on plantain highlights that a significant reduction and nitrogen leaching is achieve able this cow intakes are 30% plantain or higher. To achieve these intakes at LUDF while maintaining plantain plants, we suggest a pure plantain sward will be required. We have modelled 30 % of the farm being in plantain as a pure crop. Then re-grassed. This will ensure that 30%+ of plantain will be in the diet. We note in the research, intakes were variable due to weed burden and the challenges of pasture management and allocation.

Research completed by Omar Al-Marashdeh at Ashley Deane was used in the Farmax Dairy model to assess the impact on the farm program incorporating plantain. Key points noted in Omar's research that have been applied to the Farmax Dairy model:

- The growth rate of plantain is the same as pasture. This was confirmed in the with back calculations of cow dietary requirements (demand) less supplement fed in each trial and also with the use of plate meters .
- Protein levels of plantain are the same as pasture
- 150 KG/HA of nitrogen was used on the low input replicates which is similar to LUDF. The response to nitrogen for plantain was similar to that of ryegrass,
- Growth rates were maintained for two years at Ashley Deane with plantain.

Research on the persistence of plantain is limited. The Ashley Deane work shows that the production was maintained over 2 years. For the modeling we have assumed a three year life of the crop. It has been noted by agronomists that plantain last 4 years when well treated and grazed with no treading damage. We have modelled drilling tetraploid pasture into the crop we should last another further three to five years. Further research well no doubt show us how long plantain or persist the future years.

Farmax Modelling

The baseline Farmax dairy model is the 2020/21 season, revised 30th March. Adjustments made to this model to assess the impact of plantain:

- Regrassing pushed out to March for best results with plantain.
- Nitrogen eased in the late spring, more used in the autumn to cover the regrassing.
- Total nitrogen use is similar.
- Extra silage needed in the autumn to cover the regrassing area. Less was used in the spring due to regrassing time. Total used for the season is the same.

Category	Description	LUDF DSM 202021 Revised Mar	LUDF DSM Plantain 2021 Rev	Difference	
Farm	Effective Area	160	160	0	ha
	Stocking Rate	3.5	3.5	0.0	cows/ha
	Comparative Stocking Rate	76.0	75.9	-0.1	kg Lwt/t DM offered
	Potential Pasture Growth	18.6	18.6	0.0	t DM/ha
	Nitrogen Use per total ha	161	154	-7	kg N/ha
	Feed Conversion Efficiency (offered)	12.6	12.6	0.0	kg DM offered/kg MS
Herd	Cow Numbers (1st July)	556	556	0	cows
	Peak Cows Milked	556	556	0	cows
	Days in Milk	280	280	0	days
	Avg. BCS at calving	5.1	5.1	0.0	BCS
	Liveweight per total ha	1,641	1,641	0	kg/ha
Production	Milk Solids total	274,684	274,851	167	kg
(to Factory)	Milk Solids per total ha	1,717	1,718	1	kg/ha
	Milk Solids per cow	494	494	0	kg/cow
	Peak Milk Solids production	2.30	2.30	0.00	kg/cow/day
	Milk Solids as % of live weight	104.6	104.7	0.0	%
Feeding	Pasture Offered per cow *	4.9	5.0	0.0	t DM/cow
	Supplements Offered per cow *	0.4	0.4	0.0	t DM/cow
	Off-farm Grazing Offered per cow *	0.9	0.9	0.0	t DM/cow
	Total Feed Offered per cow *	6.2	6.2	0.0	t DM/cow
	Pasture Offered per total ha	17.3	17.3	0.0	t DM/ha
	Supplements Offered per total ha	1.7	1.6	0.0	t DM/ha
	Off-farm Grazing Offered per total ha	5.3	5.5	0.2	t DM/ha
	Total Feed Offered per total ha	24.2	24.4	0.2	t DM/ha
	Supplements and Grazing / Feed Offered *	20.4	20.4	0.1	%
	Bought Feed / Feed Offered *	9.6	10.0	0.4	%

			LUDF DSM 202021 Revised Mar	LUDF DSM Plantain 2021 Rev	Difference
Revenue	Stock	Net Milk Sales - this season	1,830,450	1,831,563	1,113
		Net Livestock Sales	87,388	87,513	126
		Total	1,917,838	1,919,077	1,239
	Crop & Feed	Capital Value Change	-3,200	0	3,200
		Total	-3,200	0	3,200
	Total Revenue		**1,914,638**	**1,919,077**	4,439
Expenses	Wages	Wages	160,080	160,080	0
		Management Wage	46,920	46,920	0
	Stock	Animal Health	71,760	71,760	0
		Breeding	27,600	27,600	0
		Farm Dairy	9,936	9,936	0
		Electricity	22,356	22,356	0
	Feed/Crop	Feed Crop	8,640	14,640	6,000
		Bought Feed	69,789	74,765	4,976
		Calf Feed	3,514	3,514	0
	Grazing	Grazing	272,558	272,558	0
	Other Farm Working	Fertiliser (Excl. N)	35,680	35,680	0
		Nitrogen	42,400	40,643	-1,758
		Irrigation	64,000	64,000	0
		Weed & Pest Control	3,840	3,840	0
		Vehicle Expenses	12,800	12,800	0
		Fuel	12,800	12,800	0
		R&M Land/Buildings	59,200	59,200	0
		Freight & Cartage	1,600	1,600	0
	Overheads	Administration Expenses	24,000	24,000	0
		Insurance	16,000	16,000	0
		ACC Levies	4,800	4,800	0
		Rates	12,800	12,800	0
	Total Farm Working Expenses		**983,073**	**992,292**	9,219
	Depreciation		0	0	0
	Total Farm Expenses		**983,073**	**992,292**	9,219
Economic Farm Surplus (EFS)			**931,565**	**926,785**	-4,780
Farm Profit before Tax			**931,565**	**926,785**	-4,780
Farm Profit per ha before Tax			**5,822**	**5,792**	-30

Planting Program

The target is to plant 10% of the farm a year in plantain every year. Planting of the crop will be in approximately 8 Ha areas (depending on paddock size). The first paddock planted as soon as pasture growth exceeds demand (approx. 15th October). The 2nd paddock will be planted as soon as the 1st paddock is contributing to the feed growth on farm, (2,000 kgDM/Ha or higher). The planting program:

1. Paddock Selection, avoid the high Dock population paddocks.
2. Soil temperatures, 10 degrees and rising.
3. Spray paddocks with high rates of Glyphosate (5 l/Ha) + 900 mls Starraine Extra + pulse.
4. 2 week plant back.
5. 2 l/Ha Glyphosate the day of planting.
    - Direct Drill:

      Ecotain plantain 10 kg/Ha

      Medium leaf White clover 2 kg/HA

      Slug bait used if high risk / Trash evidence of slugs with slug board placed after first spray.
    - Herbicide to tidy up Dock seedlings, @ 4-6 true leaf plantain.

      Dicamba 400 mls/Ha “Kamba 750 Nufarm”

      28 day plant back.

      IF dicamba used, will be prepared to re-establish clover.

      Or T-Max (not preferred) – last resort, also good for Californian thistles.

      1 Year plant back for clover.

    - Graze when plant is established and not pulling.

Agronomy for LUDF supported by Agricom.

Planting Plan

- Aiming for 30% of daily diet.

1st 3 years.

- Will plant 10% of farm as pure sward pa.
- Another 3-5%. 2-3 paddocks

Pure stand, may not get the plant effect from plantain to the plant’s full potential (science to be confirmed).

- Will plant 13-15 % of farm per annumn in plantain / clover.
- IF lasts 3 years, will be 40-45 % of farm in plantain/clover, which should guarantee the 30%.

End of 3 years. Will review, ease back on planting area based on composition of plantain/clover mix and persistence of sward.

Grazing Plan

The aim is to get in excess of 30 % of the cows diet in plantain to achieve the environmental outcomes from Ecotain. With 10% of the farm being planted every year, this will take three seasons to get cows upto 30% of their intake. The grazing plan will require approximately 8 hours a day for cows to be in the plantain paddock. This is compounded with variable milking and 10 in 8 milking frequencies. Based on cows being 2 hours in the cowshed, the times available are:

T**AD Days.** When cows are milking on TAD days, they will need to be given a small break, straight after/during milking and then moved to the plantain paddock after the shed is washed up and sorted.

OAD Days. Will be fed immediately after milking.

Will use a back latch, and train cows to take pressure off the staff demands.
Plantain is high in Calcium – will need to be wary of springers near plantain.
Will take feed analysis samples. Confirm.
Cows will drink less from troughs – Watch the dosetron.

Feeding Frequency:

Season 1. Plantain to be fed during the week days only. Week ends with less staff plantain to be avoided. 10 % = 1.9 kgDM/day. Gut adjustment demands should be minimal. 15% (2.7 kgDM/day) is just acceptable to change the diet without impacting the rumen.
When 20 % (3.6 kgDM/cow/day) of the farm established in plaintain, for consistency of feeding and rumen function, cows to be fed on a daily basis.

Additional costs:

Cost of Planting Plaintain

Glyphosate (high rate with docks) 5 l/Ha + spray + adj = $70/Ha	$ 70
Cost of seed $20.99 / kg. 10 kg/Ha + 2 kg/Ha White Clover @ 15/kg.	$240
Dicamba 400 mls/Ha = $40/Ha + spray = $65/Ha	$ 65
Drill	$110
TOTAL	$485

Plantain Direct Drilled with Tetraploid Grass + 2 kg clover. Expect to last 5 years

20 kg Grass + 3 kg clover	$320
Drill	$110
TOTAL	$430

Physical Steps

- Plant 10 to 15 % of the farm per year for 3 seasons.
- Confirm how long it takes for cows to eat 30% of their diet in plantain, it will hopefully be less than 8 hours.
- Establish a grazing routine and program with minimal risk to cow well being and health. Especially dietary nutritional aspects and bloat.
- Dissects of the plantain stands completed to determine the ratio of plantain and clover.
- Manage the plantain sward for optimum growth, utilisation by cows and feed quality.
- Ensure that the plantain survives for at least 3 years.

Key Milestones

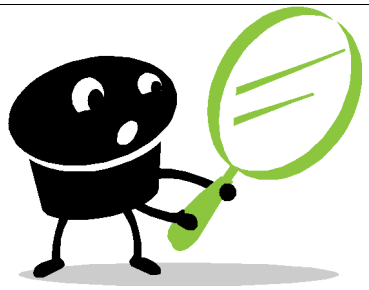
- By March, 2023, 20 % of the farm successfully established in plantain with cows continuously grazing.
- March 2024, 30 % of the farm successfully established in plantain with cows continuously grazing.
- Plantain stands still contributing to growth and supply of feed in Spring 2024. Stands are direct drilled into grass. Plaintain in these pastures surviving and contributing to maintain a 30%+ intake for cows.
- Clover will be established and part of the diet in the plantain stands. These stands when drilled in grass will need to contribute to cows intakes if a 30%+ intake is going to be achieved.

Welcome to Lincoln University Dairy Farm (LUDF).

The farm is a fully operational, commercial dairy farm with a number of potential hazards for both visitors and staff. Many of the potential hazards cannot be eliminated while also providing access to visitors therefore all staff and visitors MUST watch for potential hazards and act with caution.

Hazard Summary: Look, think, act.

The following chart provides a reminder of the types of hazards at LUDF. Watch for these and any other hazards that may be on farm today.

People: • Uninformed / ill prepared visitors may be the greatest risk	**Animals:** • **You are in their space**	**Milking shed:** • Moving rotary platform • Confined animals • Chemicals
Eyes / Ears: • Water / oil / milk / chemical splashes • Welding flashes • Loud machinery		**Touch:** • Hot / cold surfaces, hot water, chemical burns • Electric fences – treat them as high voltage power sources
On farm machinery and tools • Chainsaws, hand tools etc. generate noise, fragments	**Potential slips / trips:** • Uneven surfaces occur across the farm • Fences • Drains • Underpass • Effluent pond	**Vehicles:** • Contractors and farm equipment – **act as though they can't see you** – keep out of their way • Centre Pivot takes precedence over your plan

ARE YOU TRAINED FOR WHAT YOU ARE ABOUT TO DO? If not, STOP.
If you are uncertain how you should act or proceed, stop and contact the farm manager, other farm staff or your host.

By entering this farm, you are acknowledging your receipt of this hazard summary, and your agreement to take personal responsibility to watch out for potential hazards, and act in such a manner as to protect yourself and any others also on-farm.