SOUTHERN DAIRY HUB

Leading Innovation for
Southern farmers' propserity

SOUTHERN DAIRY HUB

March Field Day 2021

Thanks to the team at PGG Wrightson Seeds for supporting us today with Lunch!

PGG Wrightson Seeds

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Visitor Health and Safety Requirements

Entry onto property by permission and appointment only.

Contact either:

General Manager Louise Cook 027 564 5595 or

Farm Manager Charlie McGregor 027 207 6012

All visitors required to sign in and out accepting farm rules

A farm map will be provided showing any general hazards on the farm; the manager will instruct you of any new hazards

General Rules

- Communication – sign in and out
- Children on farm – must be under constant adult supervision and only with express permission of manager
- Reporting – Please notify manager immediately any accidents or near miss events/hazards
- Drive to the conditions – Max speed of 30km/hr 

- Farm bikes – trained operators only, helmet with strap done up **at all times**, never operate if under 16 years' old
- Vehicles – no one to operate farm vehicles without manager's permission
- Water ponds/troughs – Keep a close eye on children around water sources – do not drink from farm taps, troughs, water ways
- In emergency – Please report back to farm manager at Assembly point in front of cowshed
- Fire extinguishers – found in farm houses, dairy shed, vehicles, and woolshed
- No smoking in cowshed, buildings, or vehicles
- Firearms – only with approval of farm manager, must hold current licence

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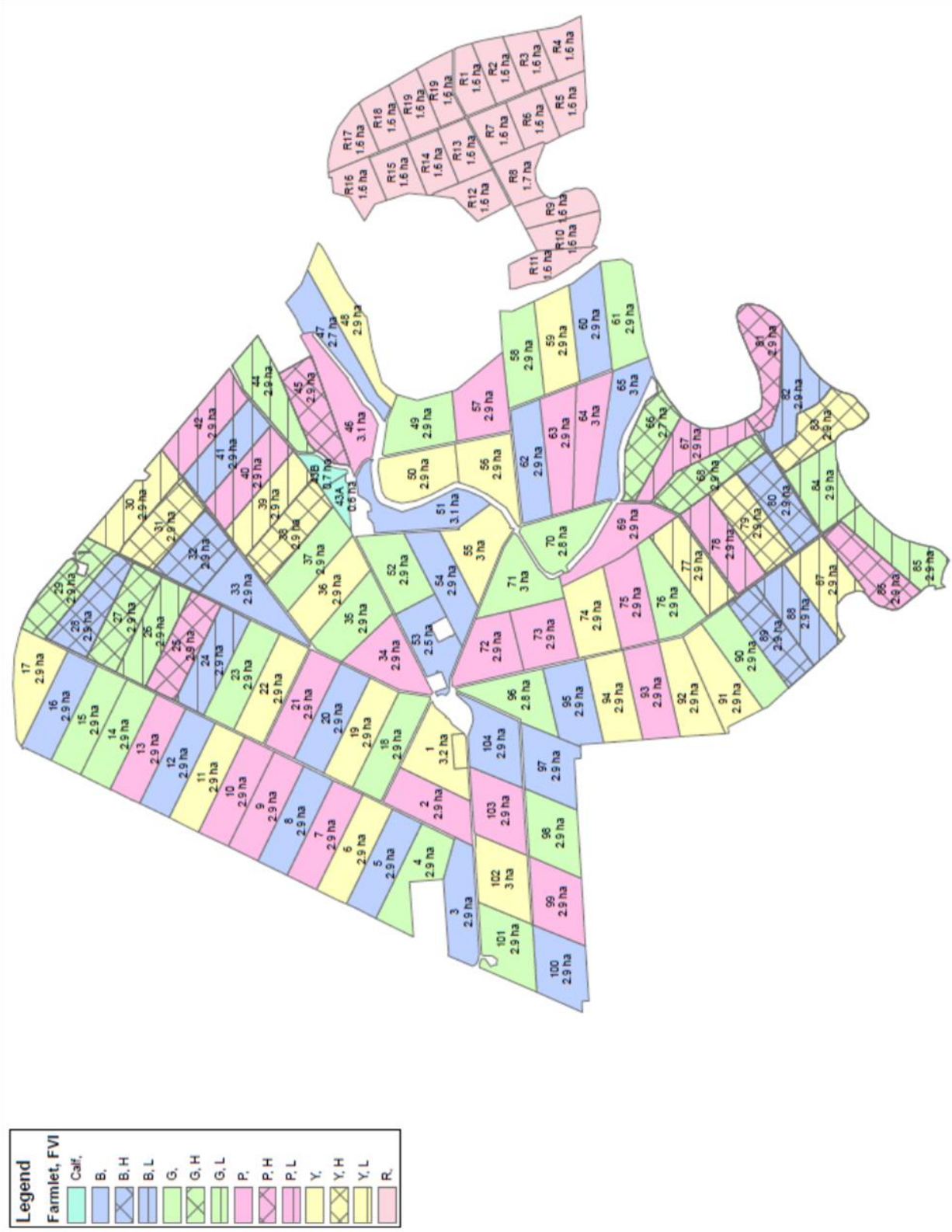
Biosecurity Requirements for Southern Dairy Hub (SDH)

All visitors must comply with the Biosecurity Requirements when visiting the SDH

- All footwear must be disinfected with materials supplied, upon arrival at and departure from the SDH farm site.
- Protective footwear may be borrowed from the SDH upon request, and must be cleaned thoroughly before its return. People wearing inappropriate (or no) footwear will not be allowed onto the SDH premises.
- All visitors are expected to wear clean protective clothing, including wet weather gear if necessary when on the farm(s).
- No farm visits will be allowed, under any circumstances, from anyone within five days of their arrival in New Zealand from Central or South America, any part of Asia or any part of Africa. Further restrictions may be applied at any time, dependent upon international disease status.
- On farm, visiting vehicles must be parked in designated visitor parking areas. Approved vehicles may only access the farm after washing the undercarriage. This may be repeated prior to departure but this is up to the operator concerned.
- SDH retains the right at any time to refuse access to any person or persons deemed not to be complying with these requirements.

Farm Map



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Southern Dairy Hub

SDH Purpose: Leading Innovation for Southern Farmers' prosperity

SDH Fundamental aims:

- To improve the performance and protect the viability of existing dairy farms in the southern South Island.
- To help develop and test new options for dairying in the southern South Island.
- To support the responsible and sustainable growth of dairying in the southern South Island.
- To promote the Dairy Industry Strategy.

SDH, owns the farm and buildings and other infrastructure. For simplicity, a second entity (SDRF): The Southern Demonstration & Research Farm leases these assets and carries out the activities of running a commercial size and scale farm, with all commercial expectations whilst delivering farm systems research information for the Research funders.

SDRF is operating a research farm at the hub, and within that there are strict controls on what can and can't be done within each of the four farmlets we are implementing. Demonstration is by way of comparison between research farmlets. In 2017 farmers told us that having systems with reduced nutrient loss was important for the region. SDRF is currently exploring what happens when you change just the Nitrogen Strategy from 200kg/ha to 50kg/ha of Nitrogen per annum to a paddock, alongside comparing the interaction with either Kale or Fodderbeet as a winter crop.

Research farms are a place where industry can take some risk on behalf of farmers and sometimes, as is currently happening at the Hub, we push the boundaries too far. Being a research farm, we can't always address these negative impacts without compromising the research. So, we follow the process through and record all the farm systems impacts including profit, animal performance and environment.

We are pushing the boundaries, so farmers don't have to. This means farmers can use our research as a springboard and can focus on the refinements required to re-stabilise a system.

SDH Vision: *to be an internationally recognised, innovative and leading centre of excellence for dairy farming, comparative research, and extension*

In 2016 when the lease on the Southern Demonstration Farm ended, Southern farmers and Businesses committed an additional 1.2 million dollars towards establishing a dedicated Southern Dairy Hub (SDH) to facilitate dairying research and extension in the region.

With investment from DairyNZ and AgResearch, the 349ha drystock property at Wallacetown was purchased and converted into what is probably the largest pastoral Agricultural Research facility on the planet. The Southern Dairy Hub is owned by the dairy industry and is here for the good of the dairy industry, particularly for Southern Farmers.

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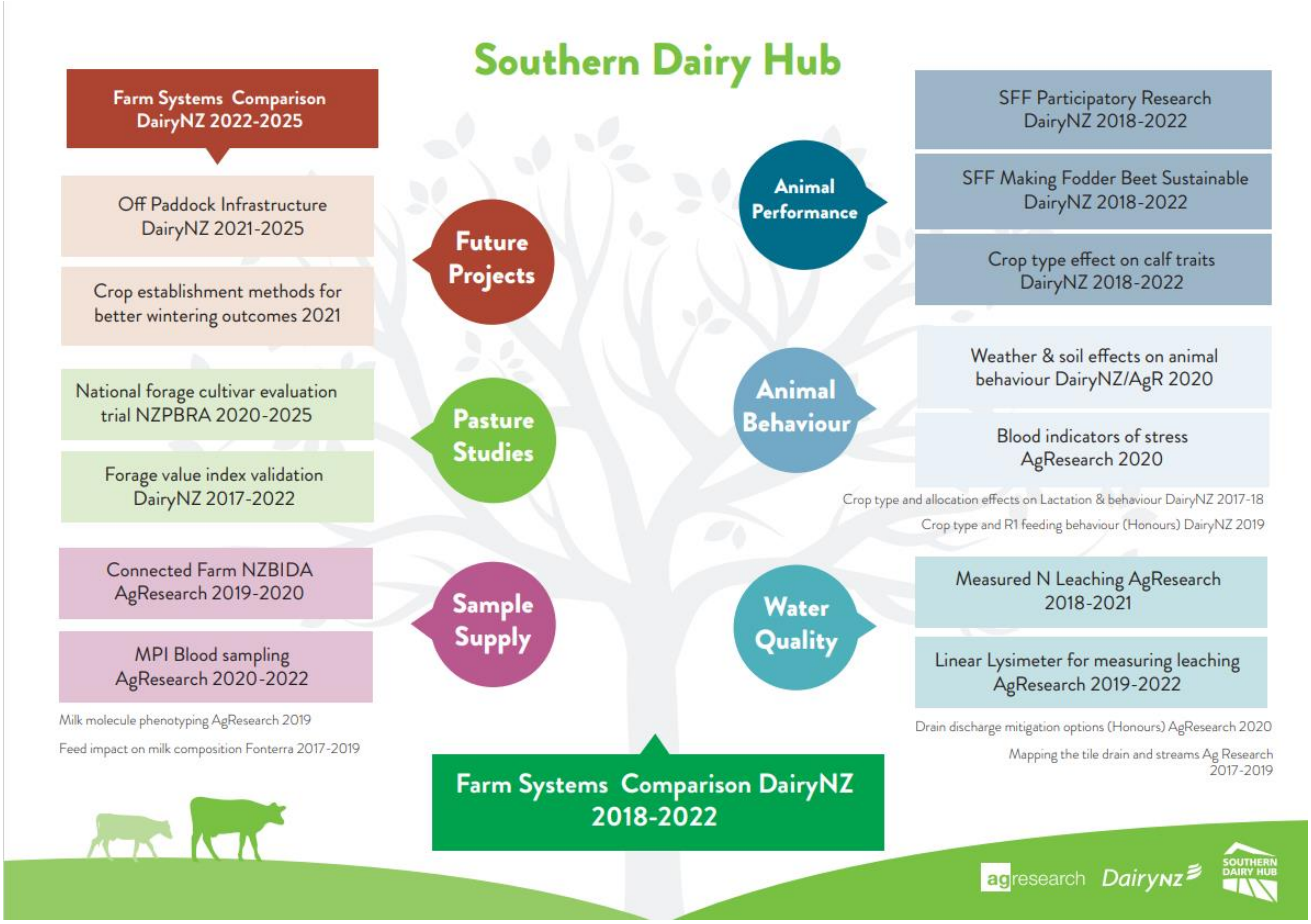
Current Research Activities at SDH

The farm systems comparison funded by DairyNZ forms the base research platform at the Southern Dairy Hub.

Other research projects led and funded by a number of organisations are using this platform to address key research questions relating to the systems that are being implemented or the issues currently facing dairy farmers in Southern regions.

The current suite of research projects is summarised in the diagram below.



Current Farm Systems Research Comparison

Objective:

1. To test the opportunity for crop choice and nitrogen management to reduce the N footprint 30% and improve profit compared to existing practices.
2. To engage farmers in experimenting on their own farms and building confidence to adapt their management

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***Figure 1**: Pictorial representation of the current farm systems comparison at SDH.*

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SDH Farm System profit comparison

Profit summary for the FY2021 dairy season, including January financial information.

We see the consistent trend of reduction in total revenue and spend on the LI farmlets. The Std Kale farmlet has spent nearly twice as much on feed this year as any of the other farmlets, but some of this is offset with a higher milk payout and the highest production to date.

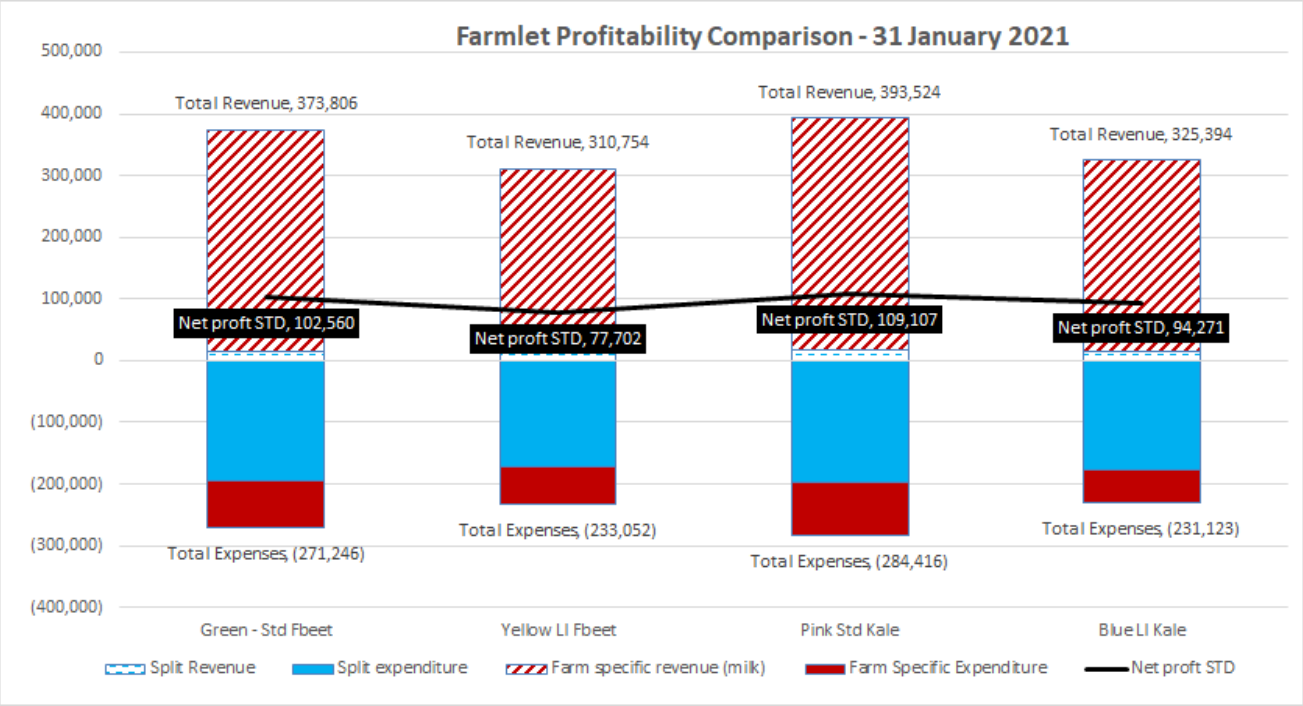

Figure 2: *Draft farmlet profitability comparison till 31 January 2021*

Table 1. Key financial data till 31 January 2021 for each farmlet

Data to 31 January 2021	Pink Std Kale	Blue LI Kale	Green Std FB	Yellow LI FB
Cows milked peak	197	165	195	163
Farmlet eff grass Ha	62.4	63.5	63.6	63.9
kgMS YTD	54,440	45,010	53,259	44,185
kgMS/ha YTD	872	709	837	691
kgMS/cow YTD	276	273	273	271
Net proft STD $/ha	**1,749**	**1,485**	**1,613**	**1,216**
Total Revenue $/ha	6,306	5,124	5,877	4,863
Total Expenses $/ha	4,558	3,640	4,265	3,647
Total Expenses $/kgMS	5.22	5.13	5.09	5.27

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SDH summer 2020 summary

Feed supply and growth rates

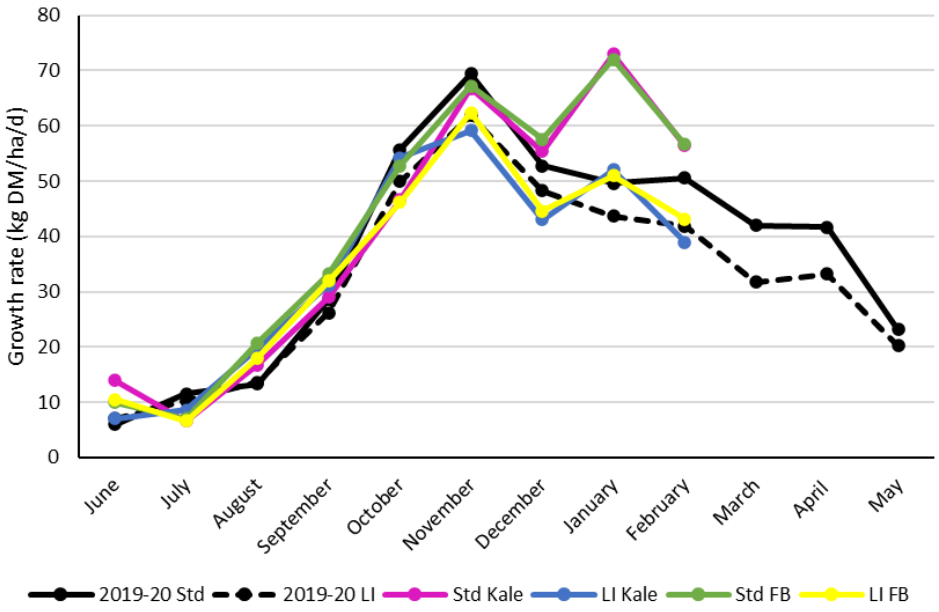

Figure 3: *Average monthly growth rates compared with average Standard and LI growth rates from the 2019-20 season*

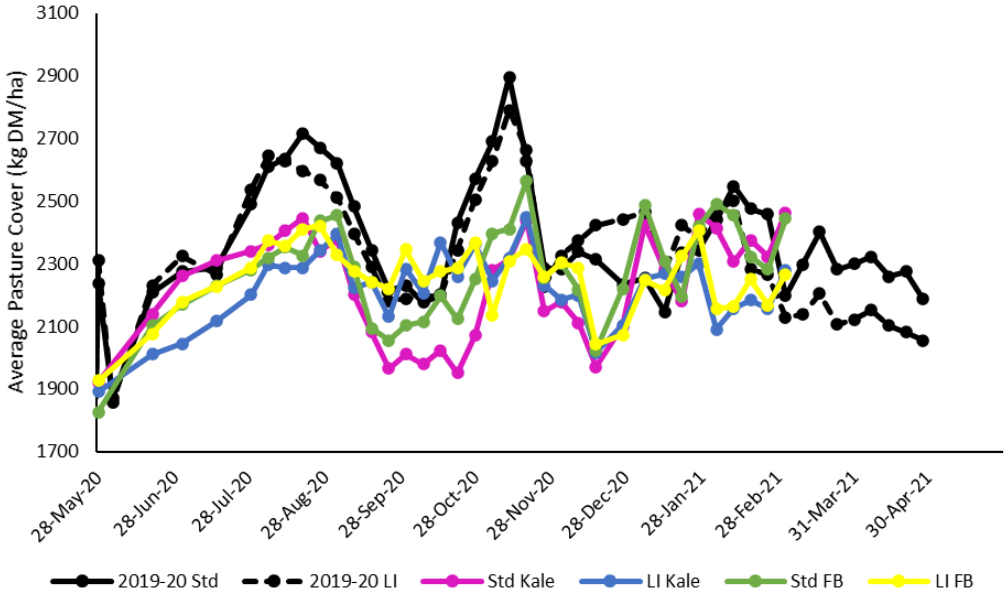

Figure 4: *Average pasture cover (kg DM/ha) compared with average Standard and LI growth rates from the 2019-20 season*

Pasture growth on the Std farmlets (season to date) has averaged 12.3 T DM/ha compared with 10.3 for the LI farmlet. This difference is bigger than the annual difference of 1.6 T DM/ha estimated in the 2019-20 season and the 0.9 T DM/ha difference estimated in the 2018-19 season.

Reproduction

We've compared the herds using the fertility focus reports (LI Kale example below) and collated the data into comparative graphs for easy reference.

This year has seen a clear split in FB vs Kale herds in 6-week in-calf rates, though the overall in-calf rate has closed up with some very active bulls in the last 4 weeks of mating.

Table 2. Reproductive parameters for each of the farmlets for the 2020-21 season

	Pink STD Kale	Blue LI Kale	Green STD FBeet	Yellow LI FBeet	Farm Average	Farm Numbers
Herd size	**197**	**162**	**196**	**164**	**719**	**719**
% herd submitted to AB	99.5%	98.8%	98.5%	99.4%	98.7%	
% CIDR	7%	7%	10%	9%	8.5%	61
% 3wk Sub rate	92%	91%	85%	93%	90.3%	
% 6 wk IC rate final	74%	74%	68%	70%	71.5%	
Not in-calf rate	7.0%	7.0%	11.0%	9.0%	8.5%	62

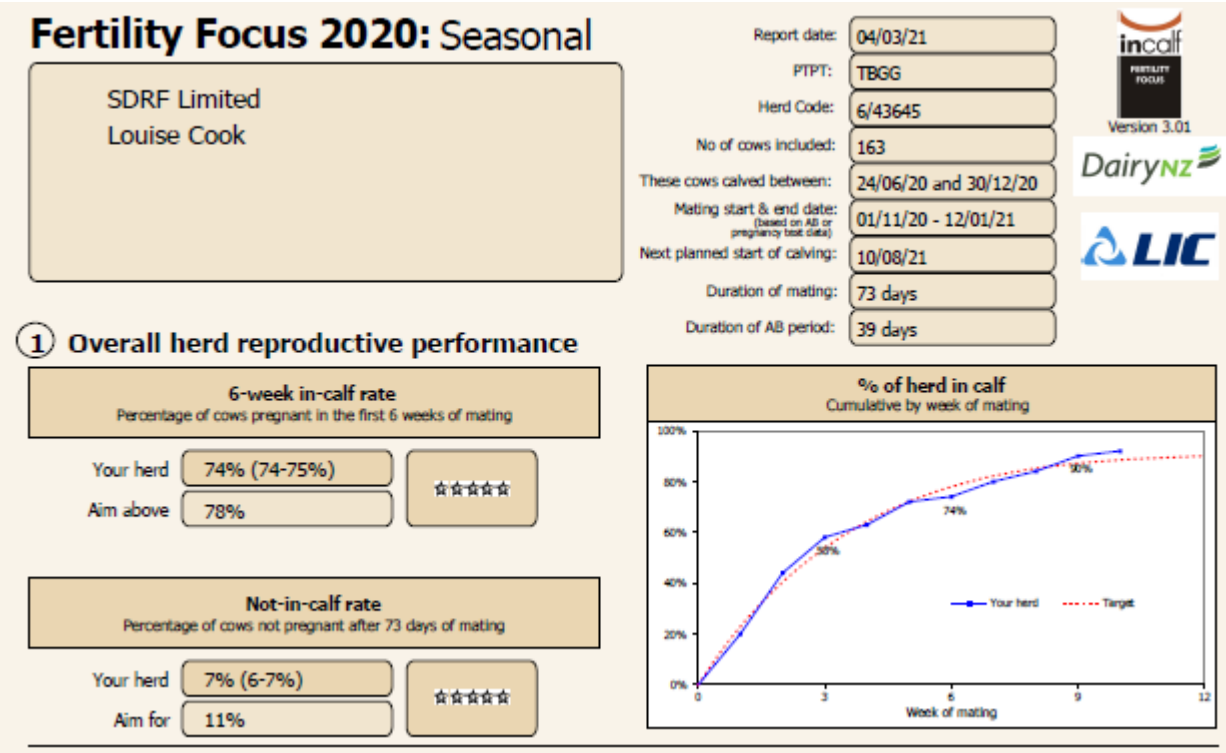

Figure 5: *Fertility focus report for the LI Kale herds for the 2020-21 season*

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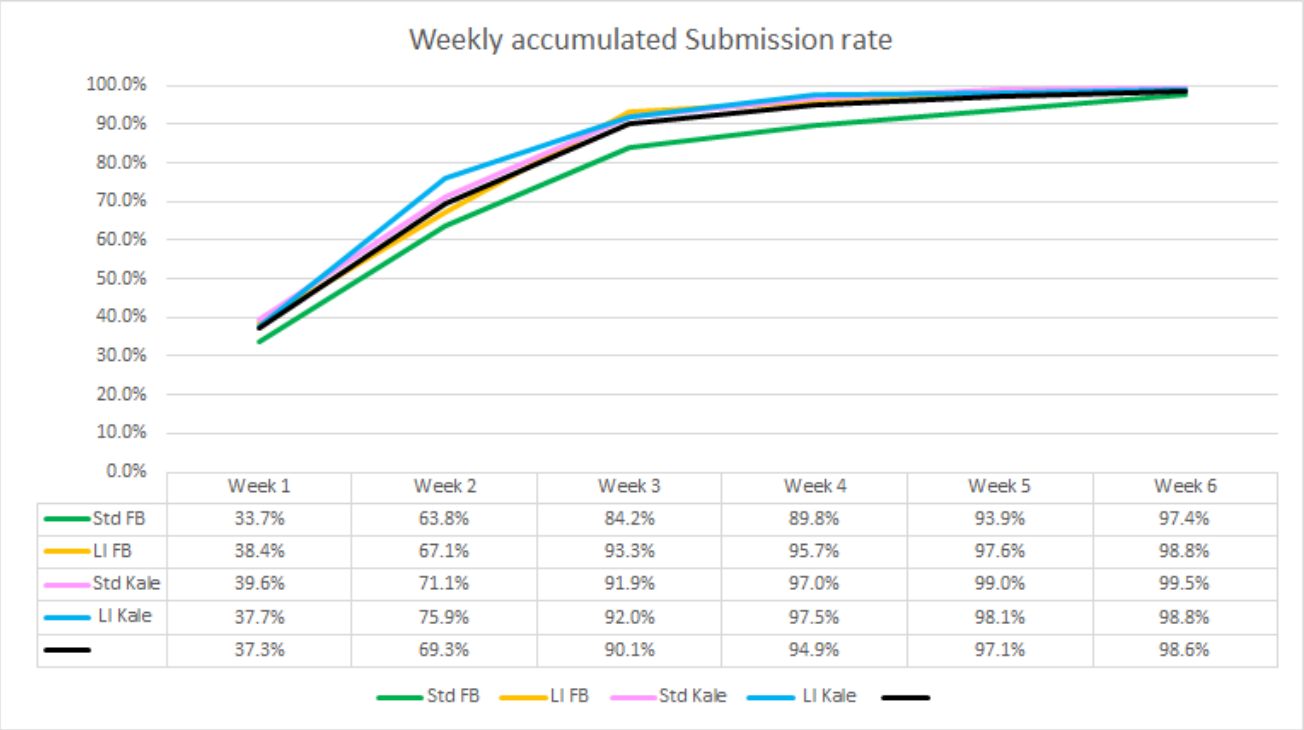

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Std FB	33.7%	63.8%	84.2%	89.8%	93.9%	97.4%
LI FB	38.4%	67.1%	93.3%	95.7%	97.6%	98.8%
Std Kale	39.6%	71.1%	91.9%	97.0%	99.0%	99.5%
LI Kale	37.7%	75.9%	92.0%	97.5%	98.1%	98.8%
	37.3%	69.3%	90.1%	94.9%	97.1%	98.6%

Figure 6: *Weekly accumulated submission rates for the farmlet herds for the 2020-21 season*

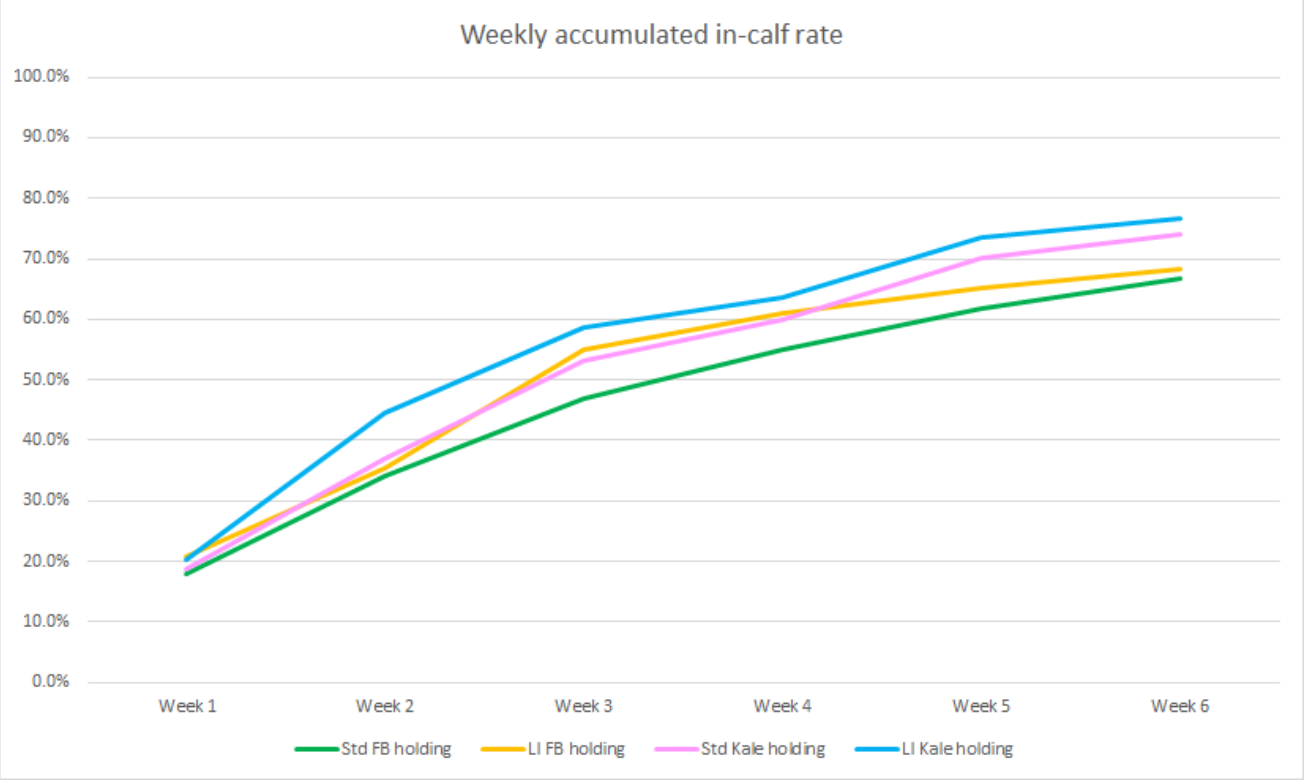

Figure 7: *Weekly accumulated in-calf rate for the farmlet herds for the 2020-21 season*

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Animal Health

Lameness continues to be the major health issue across all the herds however there are differences emerging between the treatments in the number of cases and the affected foot as shown in the Figure 8.

Lameness incidence across the herds ranges from 13% in the LI Kale to 21% in the LI FB with the majority of cases (60-70%) being white line, often with stones in the white line.

The fodder beet farmlets have a much higher incidence of lameness in the back left foot compared to the kale farmlets and there is a higher incidence of lameness in back feet across all herds.

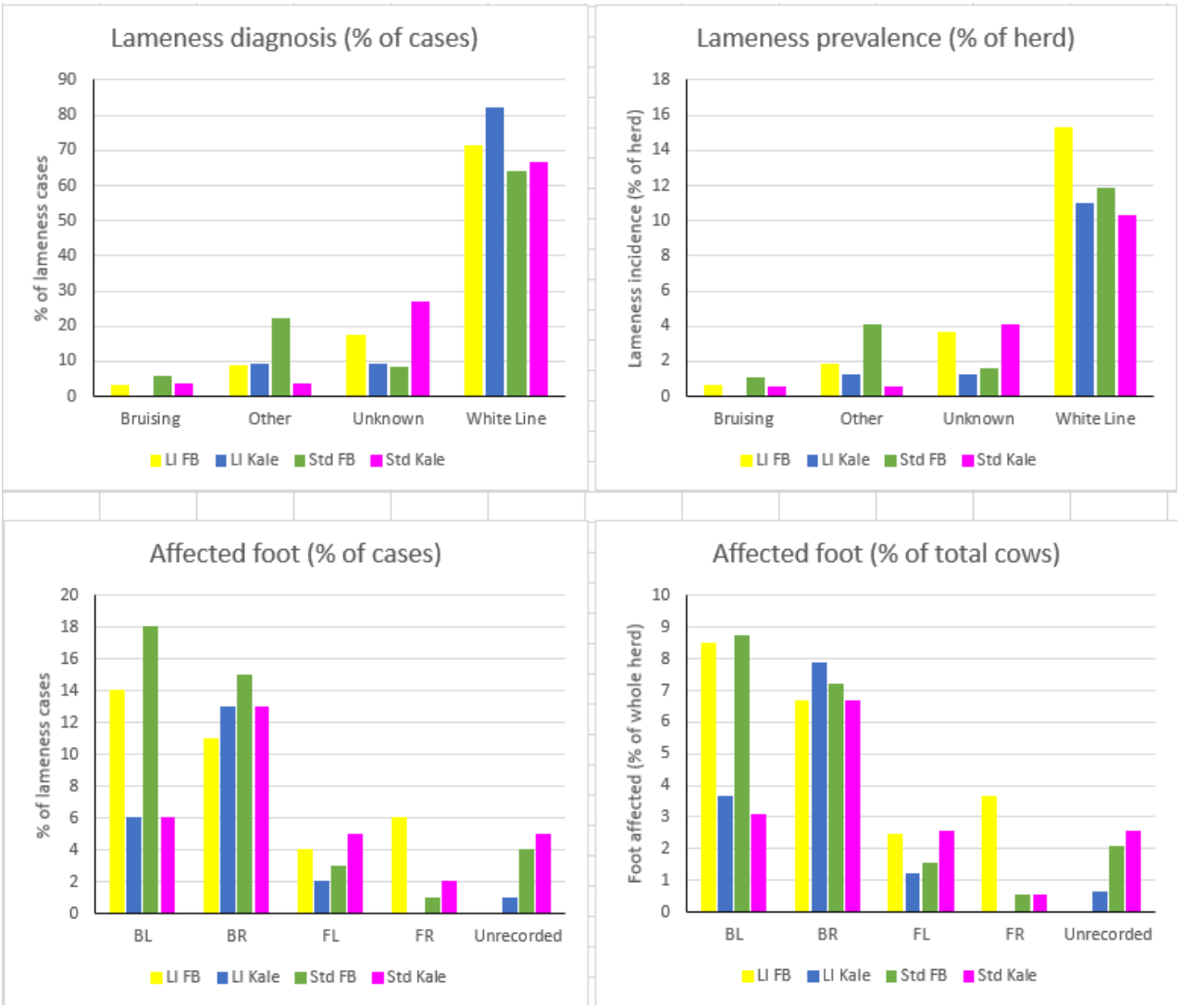

Figure 8: *Lameness incidence, prevalence and affected foot summaries for the farmlets*

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Milk production

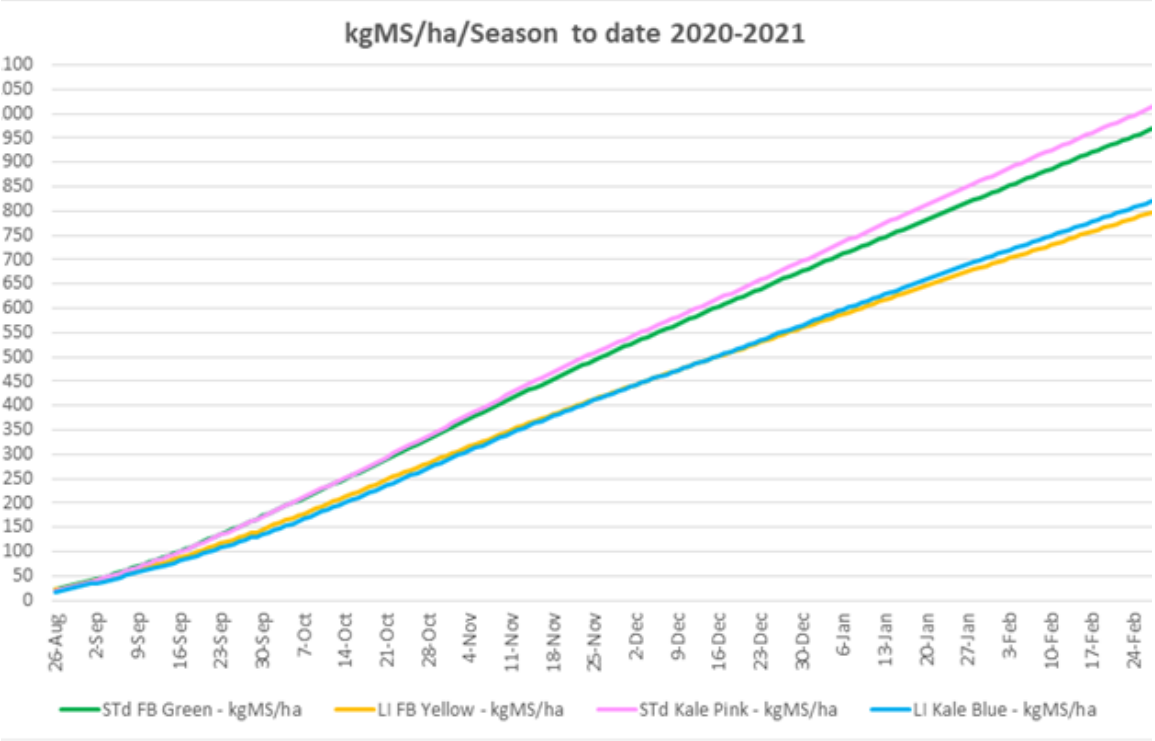

Figure 9: *Estimated cumulative milk solids production for each herd in 2020-21*

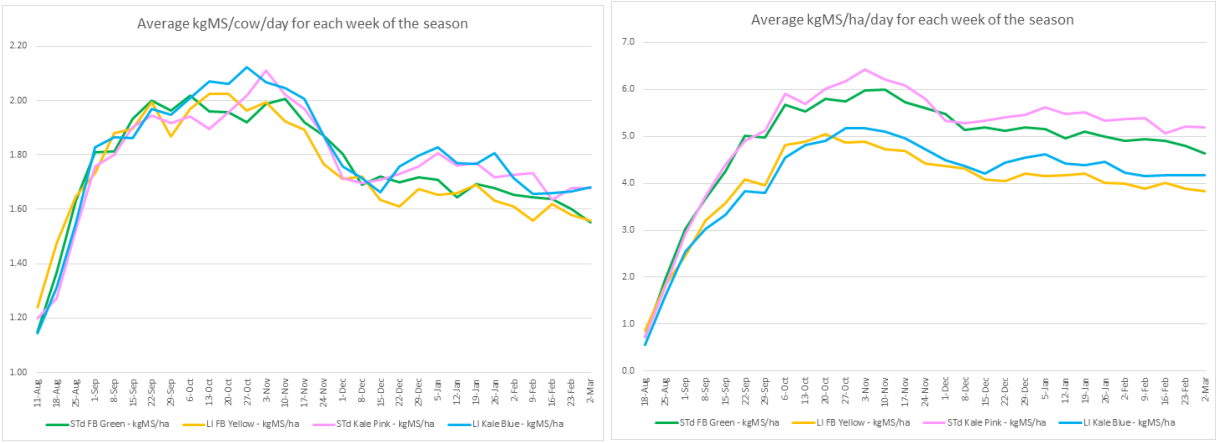

Figure 10: *Weekly milk solids per cow and per hectare production season to date*

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How much mud is too much mud?: Identifying farmer friendly visuals linking soil conditions to animal behaviour

Desired outcome
A suite of farmer friendly visuals linked to lying behaviour and soil conditions in kale and fodder beet crop paddocks.

Project objective
To determine how soil and weather conditions contribute to the risk of reduced lying time in dairy cows wintered on crop

Key soil measurements
Each day Gumboot scores (Figure 12) were measured at 26 sites across the break area. Pugging depth was also measured at each site by recording how far a 30 cm plastic ruler could be pushed into the soil before it met resistance. Photos of the breaks were taken every day from the same positions in the break. If there was any visible liquid (water or urine) pooling in the close vicinity of the sampling site (within half gumboot length), this was scored as 'Yes' for surface water pooling present. An example of surface water pooling is shown in Figure 13.

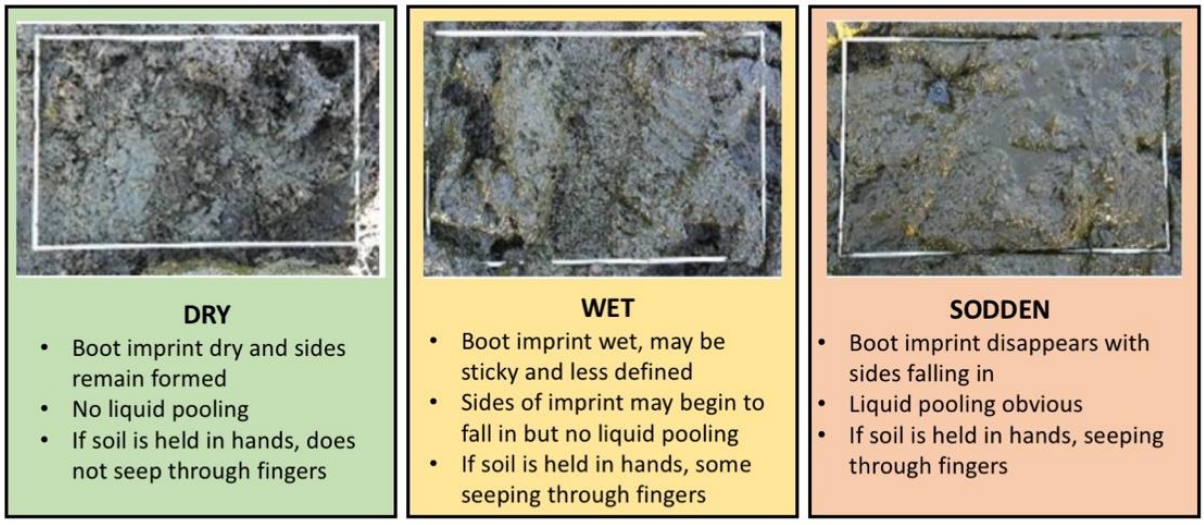

***Figure 11**: Gumboot score categories (from O'Connor 2016).*

***Figure 12**: examples of surface water pooling present at a sampling site*

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Key Messages

Cow lying needs were met on most days, with averages above 8 h/d BUT up to 21% of animals did not achieve an average 8 h/d lying throughout winter (Figure 14)

Significant rainfall events deprived cows of the opportunity to lie. **An uncomfortable lying surface is consistent with a 'sodden' gumboot score and significant surface pooling of water**

We cannot control the weather so a risk-based approach to wintering is required. An excellent contingency plan/Plan B will be essential to achieve this

Executing a contingency plan multiple times during winter is not a sustainable future, requiring investigation into alternative wintering options

Public perception and environmental risk are still strong drivers regardless of the animals needs being met

More research is required to profile the risk group of animals within a mob to ensure every animal is fit for winter

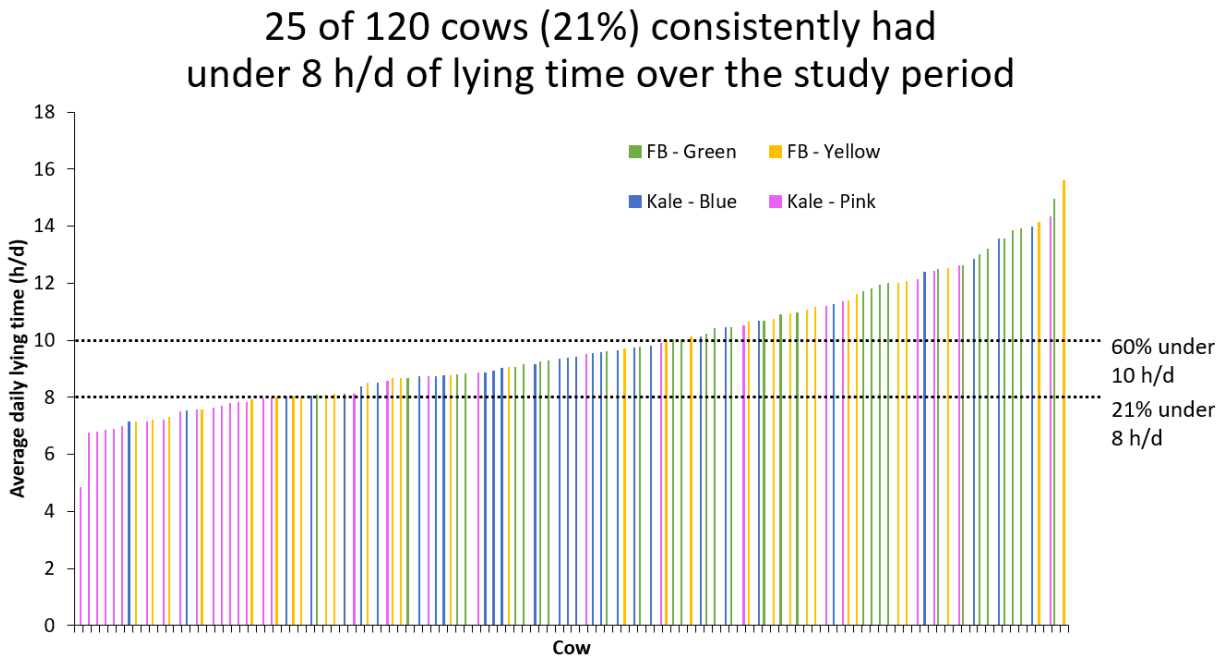

***Figure 13**. Average cow lying time throughout the behaviour study period*

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Paddock and soil conditions promoting high lying times

Figure 14: *Photos representing paddock conditions promoting high lying times*

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Paddock and soil conditions resulting in low lying times

Figure 15: *Photos representing paddock conditions resulting in low lying times*

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Key Findings

Paddock conditions

- There were no differences between fodder beet and kale paddocks for:
  - average pugging depth (7.1 vis5.5 $\pm$ 0.7 cm)
  - percentage of the paddock scored as dry - 64.5 vs 66.3 $\pm$ 6.3%
  - percentage of the paddock scored as wet - 32.8 vs 29.3 $\pm$ 5.2%
  - percent of the paddock scored as sodden - 2.9 vs 4.6 $\pm$ 2.0%
  - percent of the paddock with surface water pooling - 26.9 vs 27.8 $\pm$ 7.8%
- Average soil moisture was greater in fodder beet than in kale paddocks - 9.4 vs 8.9 $\pm$ 0.1%
- average mud depth was closely linked to rainfall events (Figures 16 & 17)

Cow behaviour - general

- paddock location affected the percentage of the herd under 8 h/d of lying.
- all herds averaged at least 8 h/d lying time, but only the Std FB averaged over 10 h/d.
- large individual cow variation in daily lying time: 21% of cows consistently had under 8 h/d lying (Figure 13).
- kale cows spent less time lying during the hours of 0400 to 2000 compared to fodder beet cows (Figure 17).
- fodder beet cows ruminated more during nearly all hours of the day (Figure 17).
- fodder beet cows spent more time active, particularly during the daytime hours of 0800 to 2000 but kale cows were slightly more active from 0300 to 0700 (Figure 17)

Effect of weather on lying behaviour

- Lying time was lower on rainy days and the day after but increased again 2 days after rain (Figure 16)
- Number of daily lying bouts was lower on rainy days and the day after
- Lying bout duration is longer on rainy days but was dependent on temperature
- up to 90% of cows lay for less than 4 h/day following heavy rain and up to 40% did not lie at all for 24 hours but significant variation between paddocks

Effect of paddock conditions on behaviour

- Lying time decreased as the percentage of dry sites decreased and surface water pooling, pugging depth and soil moisture increased (Figure 17)
- There are complex interactions between all paddock measures and weather therefore the measures cannot be considered independently
- Rainfall today, rainfall yesterday, rainfall the day before and temperature were the most significant factors affecting lying time, with percentage of surface water pooling also associated with lying time
- Surface water pooling in more than 17% of the paddock resulted in herd average lying times below 10 h/d & when above 80% average lying time fell below 8 h/day
- Rainfall today and soil moisture had the biggest impact on daily number of lying bouts
- Rainfall today, yesterday and the day before impacted lying bout duration and bout duration increased with increasing soil moisture

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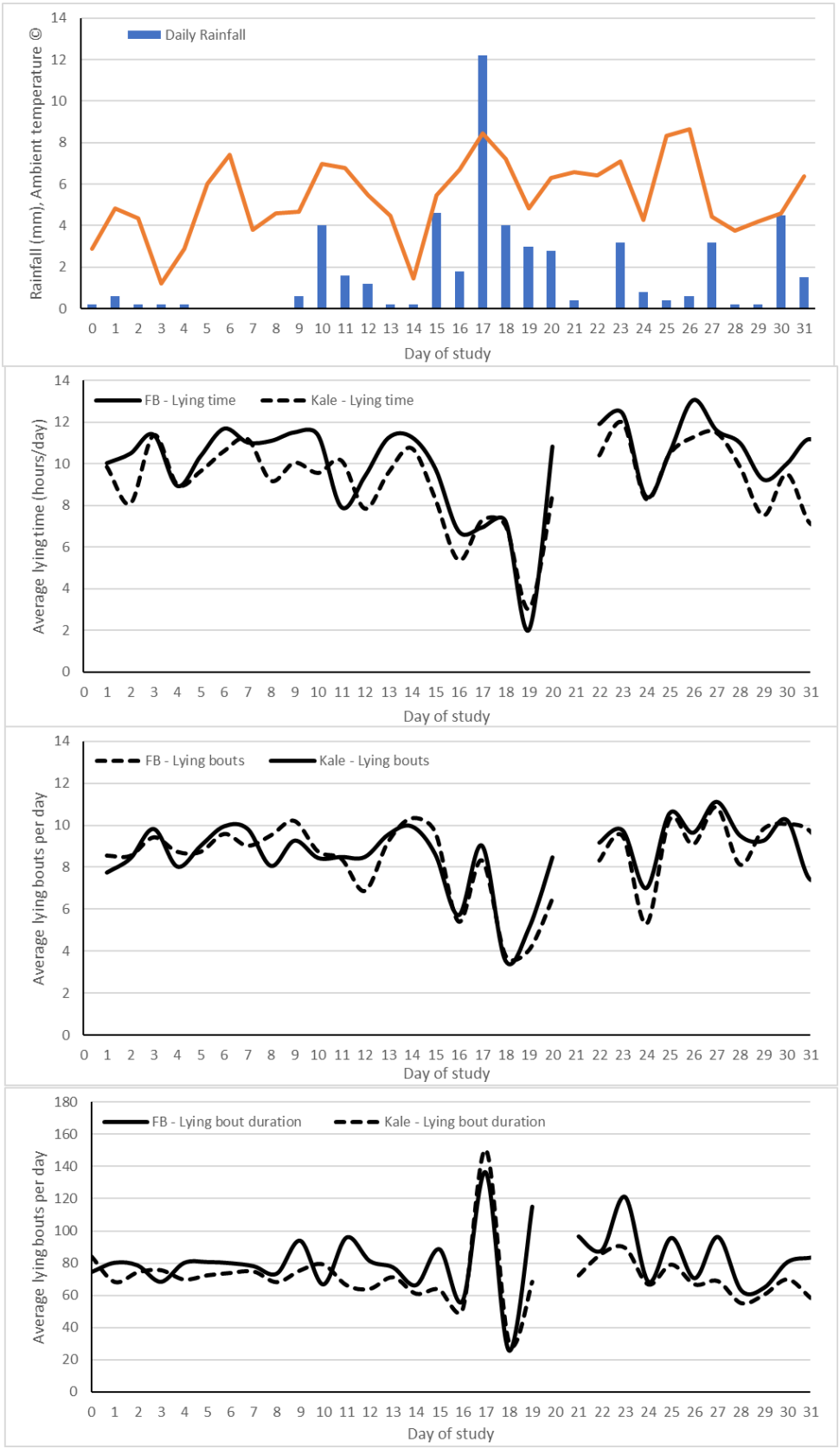

***Figure 16**: Changes in lying behaviours over the study and their relationship with rainfall and ambient temperature – lying time, lying bouts per day, bout duration (min/bout/d).*

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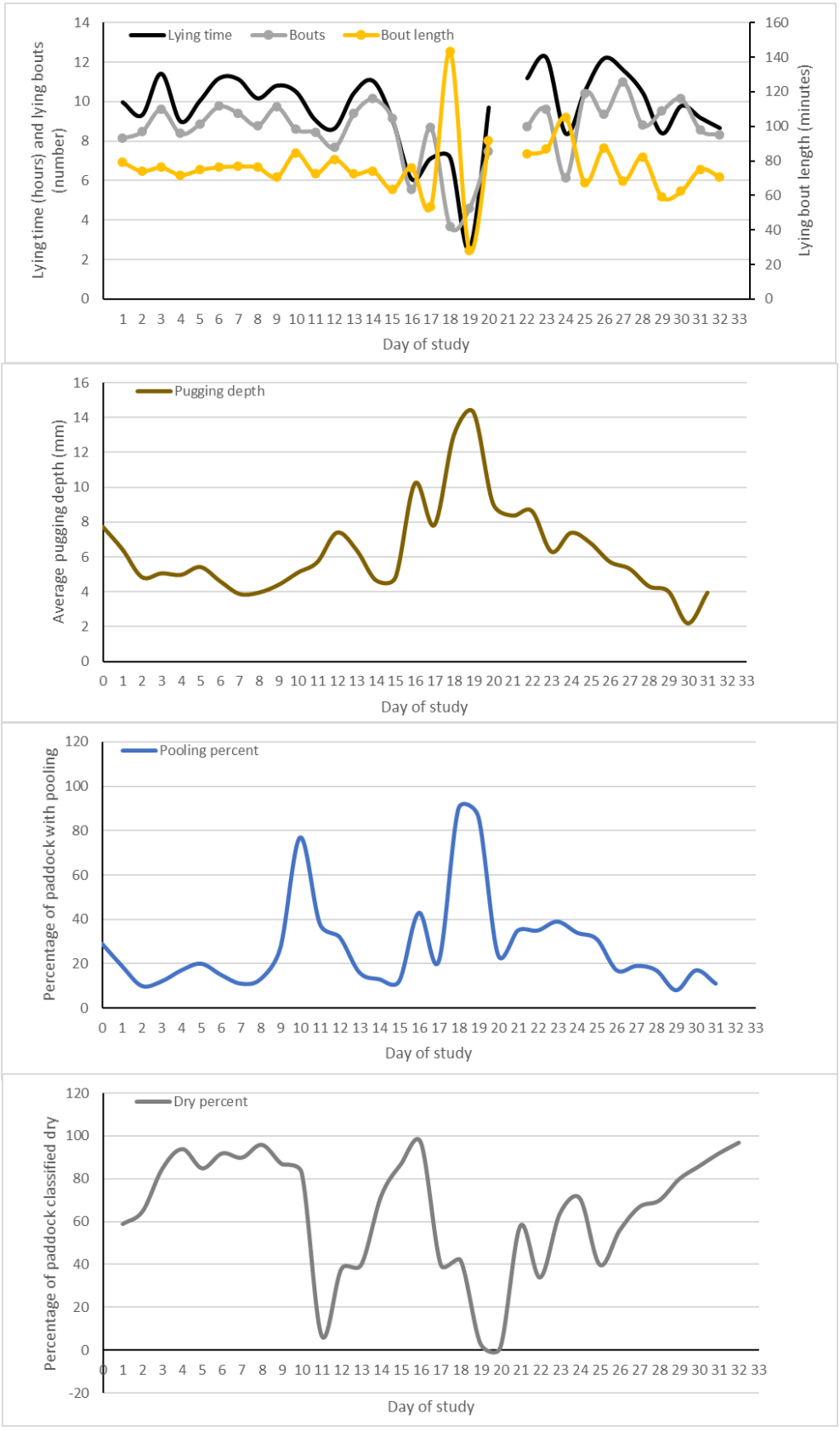

Figure 17: *Changes in lying time over the study and relationship to daily paddock conditions – pugging depth, percentage of paddock with pooling, percentage of the paddock 'dry'*

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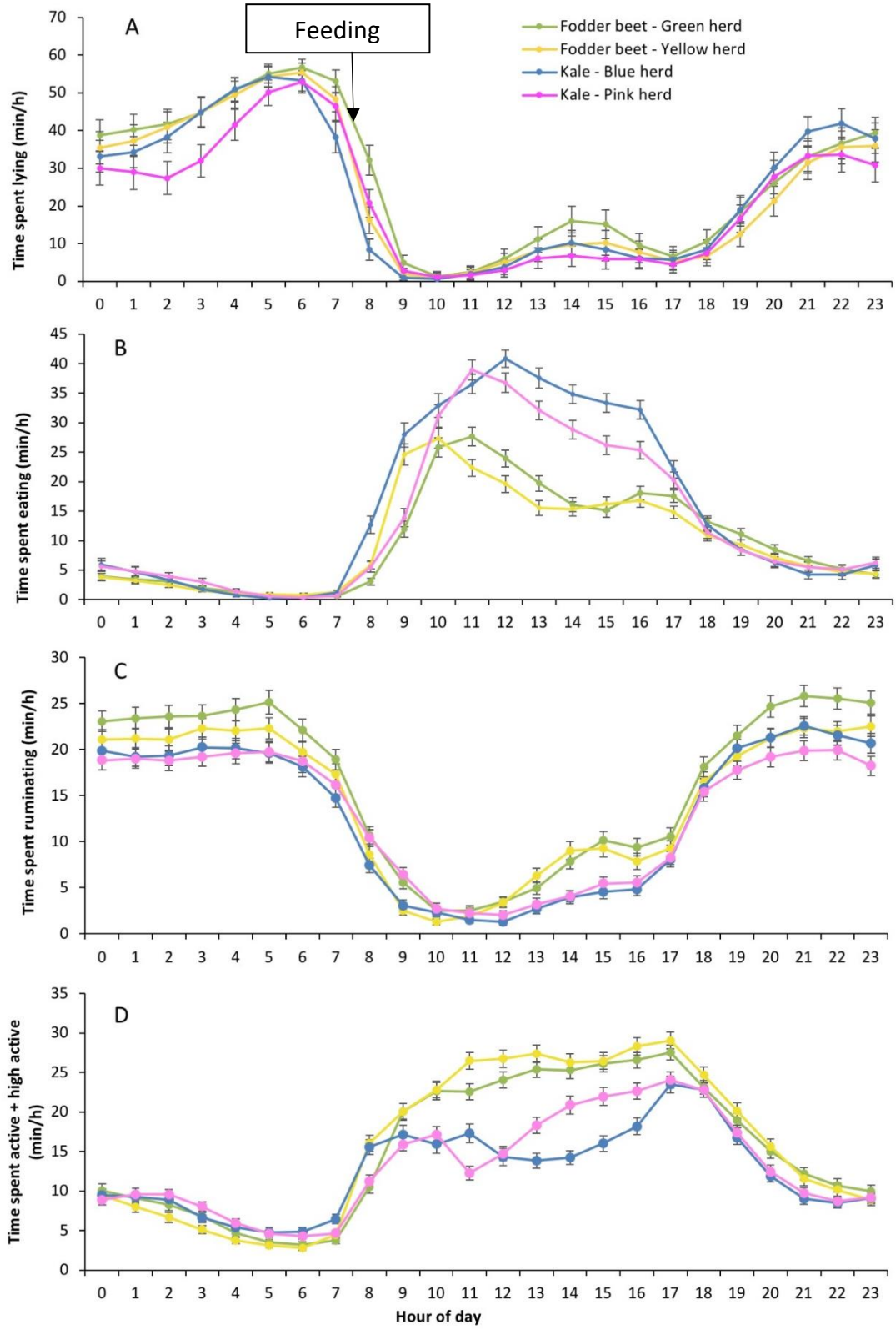

Figure 18: *Diurnal behaviour patterns of cows in each herd. A) Lying time (min/h). B) Eating time (min/h). C) Ruminating time (min/h) and D) Active time, inclusive of high activity (min/h*)

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How much N is lost from crops and pasture at SDH?

The southern region of New Zealand faces a number of challenges around how and where to winter stock. Traditionally, non-lactating in-calf dairy cows have been wintered off pasture on brassica crops. For this reason, autumn- and winter-grazed fodder beet (FB) crops are key to the FB farmlets at the Southern Dairy Hub (SDH), while Kale is the winter feed in the other 2 farmlets. To increase knowledge of the environmental impacts of these grazed forage crops, N leaching losses were measured in selected treatments during 2018, 2019 and 2020 to provide

- Quantitative N leaching data for the crops, soils and climate of SDH.
- N leaching comparisons between:
    - autumn-grazed v lifted FB,
    - winter-grazed kale v winter-grazed FB, and
    - selected pastures on the milking platform.

N leaching measurements from these plots will continue through into winter 2021.

Average N leaching losses for the 3 years of measurements are presented in Figure 19 below. These results show that N leaching under the winter-grazed fodder beet crops was on average only 50% of that under the winter-grazed kale crops, while the autumn harvested FB leached a similar amount to the winter grazed kale.

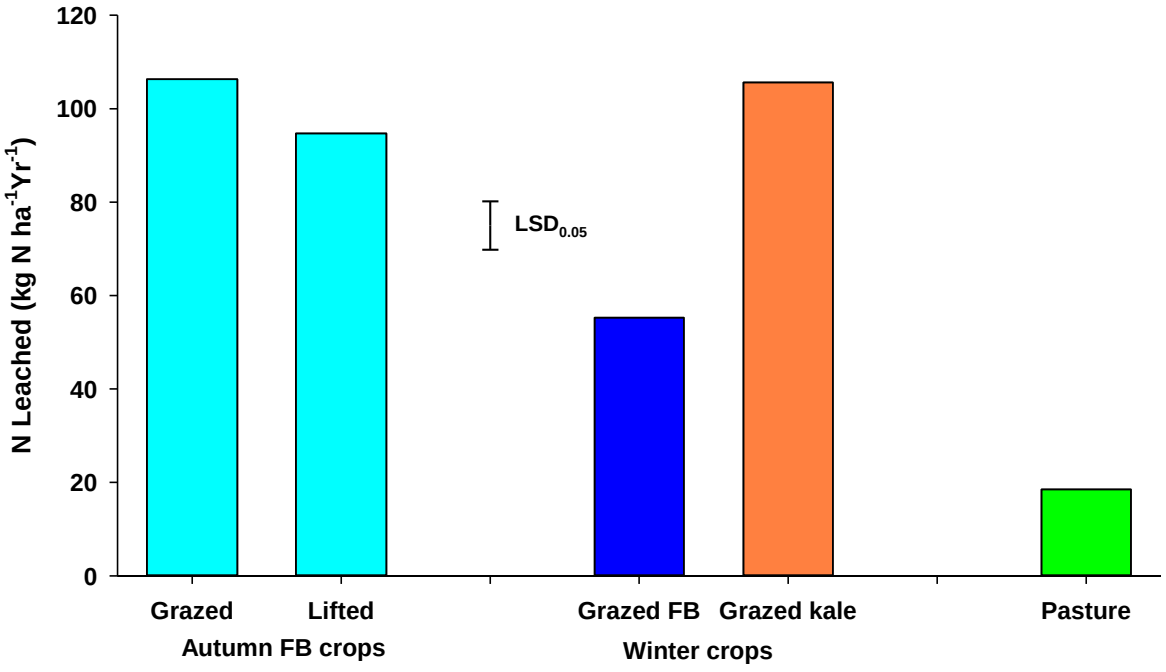

***Figure 19**: Average annual N leaching losses (2018, 2019 and 2020) from autumn-grazed or -lifted FB, and winter-grazed FB or kale treatments. Average N loss from 3 pasture paddocks (Standard farmlet) is also shown (in green). The LSD bar represents a significant difference between the forage crop treatments at a 95% confidence level.*

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Likely N losses per cow wintered were calculated using the yields of the FB and kale treatments, cow daily feed allocations and adjusting the areas required for each crop. These results, shown in Table 3, indicate that using FB as a winter grazing option is likely to result in 60% less N leached per cow wintered.

Table 3. N leaching losses from winter-grazed crops (average of 3 years of data).

	Kale	Fodder beet
N leached kg per ha per year	106	55
N leached kg per cow wintered	5.6	2.0

Using the losses calculated by Overseer for the pasture areas of the milking platform combined with the measured N losses from the winter crop areas, it is possible to estimate the total N losses from each of the 4 farmlets. These results, presented in Figure 20, indicated that the change in fertiliser N inputs resulted in about 22% less N leached. Similarly changing from kale to fodder beet as the winter crop lowered N leaching losses by about 16%. The low impact (N) FB treatment leached 34% less than the standard kale farmlet.

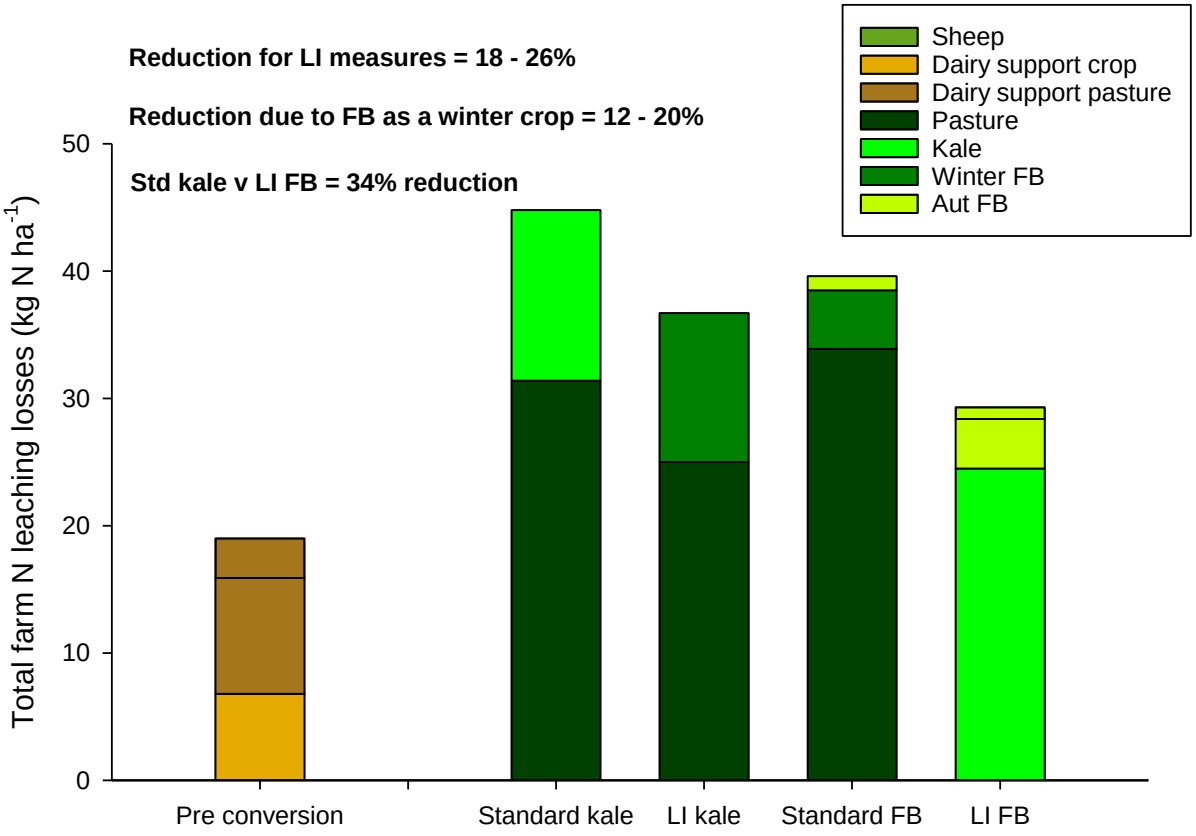


Figure 20: *Comparison of the calculated and measured N losses pre conversion and from the four farmlets. Note that the low impact (LI) treatments indicate lower N inputs.*

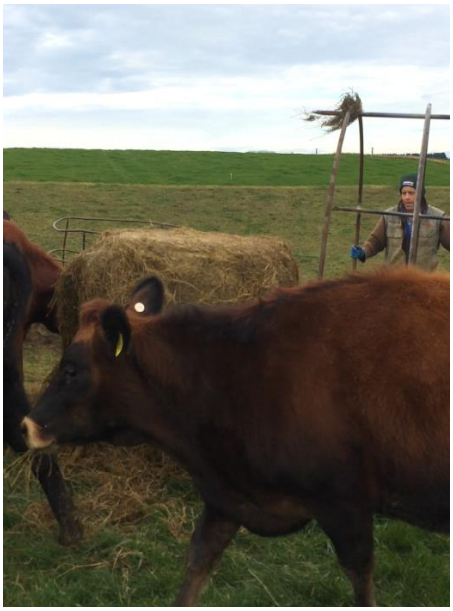
Summary

- Autumn grazing of FB resulted in significantly greater N leaching losses than observed for winter-grazed fodder beet. Differences are likely due to two effects:
    - Timing: removal of plant cover and deposition of urinary N in autumn increases the potential for N loss in subsequent drainage, because no N is captured by plant growth; and
    - Animal N intake: slightly less plant N was consumed by the herd that grazed the winter crop of FB. Urinary N returns would thus also be reduced, leading to lower N leaching losses.
- Leaching losses from winter-grazed kale were greater than estimated for winter-grazed FB.
- Leaching losses of N from autumn-lifted FB were relatively large, and similar to losses from winter-grazed FB. This was unexpected and may be due to high mineralisation of soil N following the dry summer of 2018.
- Measured losses of N from the pasture paddocks were relatively low, and similar to modelled expectations.
- Lower N inputs resulted in 16 to 24% lower N leaching losses while changing from kale to fodder beet lowered N leaching losses by 12 to 20%.

Guest farmer speakers: Different wintering types

Nigel and Mandy Johnston: Baleage wintering

Nigel and Mandy winter 480 cows on their 175ha effective dairy farm. For the last 3 years they have intensively wintered with bales on grass paddocks only and were hoping to continue with this as it works well for them.



Strategy:

- Bales are stacked along the fence line in dry weather (summer) and stacked with round faces out for easy plastic removal
- Offer 10kgDM/cow/day = 30 cows/bale = 8 bales for 120 cows for 2 days
- Open bales, remove all plastic, and place out once a week
- Start winter with 4 x 120 cow mobs – R2, fat and late calving, R3 and early calving, middle age and calving
- In late July draft into expected calf sire mob for easy springer management

Good Management Practises (GMP)

- There is a high stocking rate so back fences and temporary troughs are critical
- Able to leave swales un-grazed to control sediment loss until cultivation time

Benefits:

- No transition issues
- Good biosecurity due to wintering at home and no transport costs
- Brought in fertility through baleage
- Lower kg DM required due to utilisation of baleage in rings

- Breaks can be shifted less frequently; every second day shifts compared with previously shifting twice daily
- Easy to adjust mob sizes and draft as required as all stock are on the dairy farm
- Can allocate paddock and bale quality to appropriate mob
- Baleage has no Wild turnip, Glucosinolate or Velvet leaf issues
- Can buy good value bales and store for future years. Surplus bales can be put over fence and carried forward for next year

Considerations

- High water demand: big troughs, high flow, easy release couplings required
- As mentioned with GMP, they run a high stocking rate so back fences and temporary troughs are critical

Plan B

- It is easy to add bales and increase area as a plan B option if bad weather is forecast

Cost

- If $80/bale delivered for a 300 kgDM bale and feeding 10 kgDM/day = $18.66 + re-grassing + labour + tractor = $23/week grazing cost

Wintering History

2021	**1500 bales + 12 ha budget**
2020	1590 bales + 16ha grass (less large swale areas approx. 2ha)
2019	1550 bales + 12ha grass
2018	1250 bales + 8ha grass
2017	1160 bales + 9ha grass
2016	1150 bales + 8ha fodder beet + 8ha grass
2015	1550 bales + 8ha fodder beet + 8ha grass + 3ha swedes off farm
2014	1150 bales + 11ha HT swedes + 4ha grass + 12ha kale off farm

Peter and Emma Hammond: Strip grazing fodder beet

Peter and Emma feed fodder beet on free-draining soils using a strip grazing technique. A strip of grass area is provided alongside the fodder beet crop, for use as a Plan B option during wet conditions, making it unique to a traditional fodder beet wintering system.

Strategy

- To grow enough winter crop sustainably to have happy well-fed cows, to mitigate as much soil damage as practical
- 15ha is put aside for wintering, made up of FB and grass strips
- Mob sizes are split into 110 – 120 cows. They are split mobs by age/BCS and then have a draft up in mid-July into calving mobs
- It takes about 16 days to transition onto beet starting with 2kgs/DM crop/cow/day
- The ratio of crop to supplement is 60:40 totalling targeting 16kg DM/cow/day. Cows are fed baleage/hay and minerals are added through the dosatron as selenium and Mg late July onwards.
- Fences are shifted once daily unless there's a weather bomb. Portable troughs are moved when the back fences moved which are done by area or weather

Good Management Practises

- They always have good management practises at the forefront of what they do; critical source areas are identified around creeks and where Peter thinks water will lie e.g. in hollows
- There is a team meeting prior to the start of winter and then regularly catchups to discuss stock feed amounts and stock health

Benefits:

- Observation from last year would say there was less pugging damage to paddock, very easy for baleage placement, easier to set up and move portable troughs

Considerations

- We have changed time on square metre because of high yielding crops, so we can still maximise crop yields and protect soil structure
- We only started implementing the FB: grass strip wintering last year, tweaks for this year are decreasing the % of grass area from 40% to 25% and having all crop paddocks with grass strips in them.
- Issues we have encountered have been with paddock layout

Plan B

- Our plan B option is using the grass strips to give cows more area with high pasture cover during bad weather events

Maurice and Suzanne Hanning (Bristol Dairies): Swedes and FB

The Hannings have wintered their cows on the platform for the past 9 years. They changed to on farm wintering to avoid trucking cows, have more control over their health and wellbeing, and to include cropping in their re-grassing program.
The use of crops allows a double spray and any subsurface drainage maintenance required doesn't wreck the existing pasture.

Their objective is to winter 520 mixed age cows for an average of 80 days and have them come out of the winter in good nick.

Strategy

- Crops:
  - Swedes
    - 1.5ha Major Plus
    - 2ha Seed Force experimental variety
    - 16ha Clutha Gold
  - Fodder Beet
    - 9.5ha Brigadier
    - 0.5ha Seed Force Fodder Beet Trial varieties
- Mobs:
  - Mixed age cows
    - Cows are split into 4 calving mobs of 130 at dry off and wintered in these mobs.
    - Any animal not performing on crop is immediately removed from the crop and wintered on grass.

- Planned start of calving is August 10. Mating information plus visual observation when yarding for Rotavirus vaccination is used to draft springers.
- Mating was 6 weeks for replacements, 3 weeks short gestation Hereford and 3 weeks short gestation crossbred. Late calvers and any non-milking animals tidy up any leftover crop at the end of winter.

  - R2's
    - Heifers are grazed in one mob of 150
    - Springer drafts occur at the same time as vaccinating for Rotavirus using udder development and scanning information
  - R1's
    - 160 Calves are grazed in one mob. These can also be used to tidy up left over crop until they show signs of cutting their teeth.

- Ratio of crop/supplement:
  - Baleage is placed out on crop in advance @ 3bales per day per break.
  - Baleage is unwrapped once per week so all plastic can be easily picked up and recycled.
  - Hay is put out once per week to each mob as needed. If there is leftover in the feeders in the evening, they're getting enough. If not, more hay is added to the break.
  - Swedes: one 4ha paddock will feed 130 cows for 60days assuming a 14t crop @ 7kg/cow/day of crop and 3 bales of baleage + stored hay if required. Total offered 14-15kg/cow. Minerals are offered as a loose lick - Nutritechs Dry Cow Mix as per label.
  - Fodder Beet: one 4ha paddock will feed 130 cows for 80 days assuming an 18t crop @ 7kg/cow/day of crop and 3 bales of baleage + stored hay and/or straw for added fibre as needed. Total offered 14-15kg/cow. Minerals are offered as a loose lick – Nutritechs Fodder Beet Base as per label.

- In Paddock Management:
  - Feed fences are shifted twice per day. In the morning, all the daily allocation baleage and hay is fed and half of the crop.
  - Mineral bins, water troughs and back fences are moved up every morning.
  - In the afternoon, the remainder of the crop is fed and cows are carefully assessed. Any baleage or hay feeders that are empty are moved over for the following morning. If all supplement is eaten, the daily allocation is adjusted with hay so there is left over in the evening but everything is eaten by morning.

- Staff training:
  - The Hannings and farm team all shift the stock together every morning until transitioning of cows is complete and a routine is settled into.
  - After two weeks or so, they may split up into teams of two and work from either end of the farm, meeting up in the middle once everything has been fed.

- Only one or two people do the afternoon shift. The whole team work together once per week to unwrap the baleage and pack the wrap into recycling bags.

Good Management Practises

- Hilly paddocks are grazed from the top down
- Grass buffers are left around critical source areas and swales are left rank and not ploughed.
- Crop paddocks often have grass paddocks on either side to capture any run-off.
- Back fences and portable troughs
- Recycling wrap

Plan B

- During inclement weather, animals are shifted more often and extra balage or hay fed.
- Move to a more suitable paddock for a period and come back when conditions improve
- Feed area is about 10m wide from back fence to feed fence in dry conditions. This is widened to 15m in wet periods with animals moved on frequently and out of the pugged area as quickly as possible. Feed face is 100-120 m long.

Wintering history/ reasoning for current practices

- The Hannings started wintering the cows at home when they acquired the neighbouring block of land. This allowed full control over how the cows were wintered and allowed them to dry off when it was appropriate, not when trucks were available. It also allowed them to monitor stock closely and make adjustments accordingly.
- As they re-grass 10% of the farm per year, it allows them to get a double spray in to help control weeds. Paddocks in need of re-grassing are identified through monitoring of DM produced, compaction and prevalence of weeds.
- No major changes in winter management over the years but constant tweaking.

Changes made over time

- Back fence closer now closer and shifted up a lot more regularly.
- Introduction of fodder beet as a second crop allowed them to have less area under cultivation. However, using fodder beet has had its risks and they have needed to learn to transition cows properly with plenty of hay and straw.
- Reduced winter mob size from 200-260 to 130.
- Subdivide the crop paddocks in half or thirds with a temporary fence. This prevents stock from walking back and forth but still gives them the efficiency of moving a lot of animals in a short space of time.
- Unwrapping the baleage once a week makes the management of the plastic wrap much easier. All plastic is picked up and packed at the time leaving only the netting wrap to be collected daily.

Do different cropping techniques matter?

Hedgehope/Makarewa Catchment Group: Alternative crop establishment methods for better wintering outcomes

Farmer Commitment

The initial concept for the project resulted from an experiment conducted at SDH in winter 2020 investigating grazing behaviour and soil surface conditions with the aim of developing farmer friendly visuals to identify paddock conditions that resulted in compromised animal welfare and to try and understand the implications of the Essential Freshwater pugging regulations on winter cropping in Southland. During discussions at a SDH farmer reference group meeting the idea of investigating alternative crop establishment options at SDH was proposed.

The Hedgehope Makarewa Catchment Group were very keen to work with the SDH and extend this trial work onto commercial farms as it meets their goal of using science to understand their catchment and develop practical solutions. It also provides tools and skills to help their community (one of their key communication objectives), as well as meeting other goals of collaborating with stakeholders, and helping to raise awareness and understanding of new regulations and opportunities.

We are still looking for farms to be involved so let us know if you are keen!!

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Objectives of the project

To test whether utilising alternative crop establishment methods to conventional cultivation (e.g. direct drilling, strip tillage, air seeding, precision drilling etc), for fodder beet, swedes and kale, improves soil structure and strength, thereby reducing pugging and improving animal welfare during winter grazing.

Project description

Workstream 1 will be conducted in selected paddocks on 6-8 commercial farms across the region. In spring 2020 a number of farmers established split paddock crop establishment comparisons and our plan is to monitor these during winter 2021

Workstream 2 will be conducted at the Southern Dairy Hub (SDH), where in spring 2020 two pasture paddocks were selected and one has been sown into fodder beet, the other into kale. For the fodder beet, the paddock was split in half and one third of each half of the paddock has been established using strip tillage, direct drilling or conventional cultivation. For the kale, half the paddock the paddock has been established using direct drilling, and the other half using conventional cultivation.

During winter 2021 the different establishment methods will be grazed simultaneously to remove weather conditions as a confounding factor in the results. The duration of the comparison will be dependent on final crop yields and mob sizes but the aim is for 4- 6 weeks of monitoring.

To determine whether there are any differences between the establishment methods for each crop, the following measurements are proposed:

- Crop yields prior to the commencement of grazing in each treatment area and once during the grazing period
- Crop utilisation from each establishment method during the grazing period
- Crop quality at each yield measurement
- Pugging depth of each treatment during grazing – daily (SDH) or weekly across the area grazed in the previous 7 days' (commercial farms)
- Soil physical properties pre-grazing, post-grazing and when back in pasture/next crop if applicable
    - Bulk density
    - Penotrometer (compaction)
    - Infiltration rate
- Soil conditions during grazing
    - Gumboot score
    - Pugging depth
- Lying observations – area of the paddock/treatment cows are lying on first thing in the morning
- Climate conditions – rainfall and soil temperature
- Economics - costs, returns and gross margins for each establishment method

The Farm

Farm Area
Milking platform: 309 ha
Support Block: 39 ha
Unproductive land: 2 ha

Milking infrastructure
60 bale rotary dairy with DeLaval plant and Delpro Herd Management software
Automatic cup removers and on-platform teat spray, Automatic drafting and weighing
Greenwash on the backing gate

Climate
Mean Annual Maximum Temperature - 17.7 ºC
Mean Annual Minimum Temperature - 5.4 ºC
Average Annual Soil Temperature – 11.0 ºC
Average Annual Rainfall – 785.4 mm

Soil Types
Table 4: Soil types, locations and characteristics on farm

Soil type	Location	Characteristics
Edendale	Top terrace	Well drained, high WHC, seldom dries out
Pukemutu	Through centre of farm	Poorly drained due to sub surface pan between 600 and 900 mm deep. Vulnerable to waterlogging.
Pukemutu/ Makarewa	Bottom terrace	
Makarewa		Poor aeration during wet periods due to poor sub surface drainage and slow permeability. Severely vulnerable to waterlogging in wet periods.

Staffing and management
Roster System – Year-round 8 on 2 off, 8 on 3 off
Milking Times – cups on at 5 am / 2.30 pm

Effluent System
Two receiving ponds with weeping walls, leading into a storage pond. Effluent applied by travelling irrigator. Solids cleared out November 2018. Some effluent applied by umbilical system in March 2019. Greenwash on the backing gate

Herd Details – October 2020

Table 5: BW and PW as of 28 February 2021

		BW	PW
Pink – Std Kale	**Cows (195)**	116	144
Blue – LI Kale	**Cows (160)**	118	148
Green - Std FB	**Cows (193)**	113	129
Yellow – LI Kale	**Cows (158)**	127	158
Grouped	**Youngstock**	156	175

Mating Programme Spring 2021

The Southern Dairy Hub herd will use LIC semen over our herd this year, utilising a combination of the genomically tested bulls in the Forward Pack and the A2:A2 semen to open up options for our Research or supply in future years.

Mating Plans:

- Mating for the herd begins November 1st, for PSC August 10 2021.
- Our 720 MA cows – will be mated to mostly crossbred semen, some Friesian and a little Jersey as we try to breed to a consistent F10 Crossbred herd.
- Short gestation (SG) Hereford semen used over identified culls.
- After 5.5 weeks of AB 14 Jersey-Cross bulls with the herd for 5 weeks.
- R2s – Will begin mating October 26th, run with Yearling Jersey Bulls for 9 weeks.

Southern Hub Nero S2F, our contract calf selected to trial in the LIC Bull Team

Pastures

220 ha (71%) of the milking platform was resown at conversion in 2017.

Of this 160 ha was fully cultivated, 43 ha direct drilled and 17 ha undersown with annual; ~46.4 ha was sown in 5 star FVI pastures, and ~46.4 ha in 1 star FVI pastures.

The following cultivars were used across the remainder of the farm: Prospect, Excess, Rely and Platform.

Wintering

All mixed age cows and rising 2-yr olds wintered on kale or fodder beet on the milking platform
All rising 1-yr olds wintered on kale or fodder beet on the support block

Crop and Grass 2021

Item	Methods	Cultivars
Winter Kale sown for 2021	Direct drilled and conventional	Firefly KALE Cleancrop™ Brassica System
Fodder Beet 2021 winter	Conventional cultivation and alternatives experimented	Jamon Fodder Beet
Crop to Grass Spring 2021	Conventional cultivation	Platform PERENNIAL RYEGRASS performance bred® Base TETRAPLOID PERENNIAL RYEGRASS performance bred®

The Southern Dairy Hub Gratefully acknowledges the donations of our foundation sponsors and pledges, we are here with their support, and to support them in the future.

We would also like to recognise and thank the businesses who continue to support us, specifically:

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