Southland monitor farm project

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Summary

Southland now produces 9% of New Zealand's milksolids. Rapid expansion of the dairy industry has highlighted the scarcity of basic information on pasture growth and quality under dairy farming systems. This paper describes a project to generate information on pasture growth and quality in regions geographically local to, but different to, the Southland Demonstration farm at Wallacetown and on soil types typical for those regions.

Weekly pasture monitoring allows:

- Calculation of average growth rate for the farm
- Ranking of paddocks based on average pasture cover
- Identification of an impending surplus or deficit
- Identification of poor producing paddocks

This information can be used to:

- Plan nitrogen fertiliser applications
- Determine the paddock grazing order for the week
- Assist with decisions around conservation and supplementary feeding
- Target paddocks for renovation
- Modify stocking rate, calving date or drying off policies to match feed supply to demand

Results to date show that growth rate and soil temperature are variable across Southland and West Otago. Growth rates as high as 95 kg DM/ha/day were recorded in November and as low as 0 kg DM/ha/day in January. Southland experienced very dry conditions in Summer 2008 therefore it is important that monitoring continues to build a robust dataset that can be used for long term planning in the region.

Introduction

Southland has seen significant growth in dairy farming over the last 15-20 years and has further potential to increase production due to land availability and affordability for dairy conversion. Southland now produces 9% of New Zealand's milksolids. Rapid expansion of the dairy industry has highlighted the scarcity of basic information on pasture growth and quality

for dairy farms. Such information is critical for annual feed budgeting, farm system setup i.e. calving date, stocking rate and for weekly farm management decisions. In July 2007 a 3-year project, funded by the Ministry of Agriculture and Forestry (MAF) Sustainable Farming Fund, South Island Dairy Event (SIDE), DairyNZ Inc and Ravensdown Ltd, commenced to gather data in a controlled and systematic way. Reliable growth rate information for the region and data on pasture quality changes will give farmers more confidence in making feeding decisions and help them to evaluate the applicability of research from other regions for their situation.

The project

Region selection

Pasture growth and quality data were collected from differing regions and soil types as compared to the Southland Demonstration Farm (Coastal Southland). The following regions were chosen for the monitor farms; Eastern Southland, Central Southland, Northern Southland and West Otago.

Farm selection

For each region, 3 potential monitor farms were identified and the owners contacted. Four monitor farms were selected according to size, location, stocking rate, farming system, record keeping, soil type and willingness of the farmer to use the information generated. Details of the selected farms are provided below and their locations shown in Figure 1. All farms were GPS mapped to determine paddock sizes.

Eastern Southland

Kevin and Debbie Hall, Seaward Downs Gorge Road, Edendale, 143 ha effective, peak milk 460 cows, 3.3 cows/ha, Edendale silt loam, previously wintered on-farm on forage crops now wintering all cows off farm, feed pad for calving, in-shed meal feeding available.

Central Southland

George and Jose van der Poel, Harbour Endowment Rd, Dunearn, 140 ha effective, peak milk 410 cows, 3 cows/ha, 150-180 kg N/ha/annum, Pukemutu soils, winter 160 cows on-farm and adjacent runoff on forage crops, 260 cows off-farm in Blackmount, in-shed meal feeding available.

Northern Southland

Adrian and Isabelle Frei, Mcalister Rd, Riversdale, 137 ha effective, peak milk 290 cows, 2.2 cows/ha, Pukemutu soils, 20 kg fertiliser N/ha/annum, winter on-farm in tunnel houses on

silage, molasses feeding available to milkers, second year conversion from a dairy support block.

West Otago

Dave and Mel Goble, Tapanui-Raes Junction Highway, Tapanui, 139 ha effective, peak milk 339 cows, 3 cows/ha, 170 kg N/ha/annum, Mataura and Waikoikoi soils, winter on-farm on forage crops.

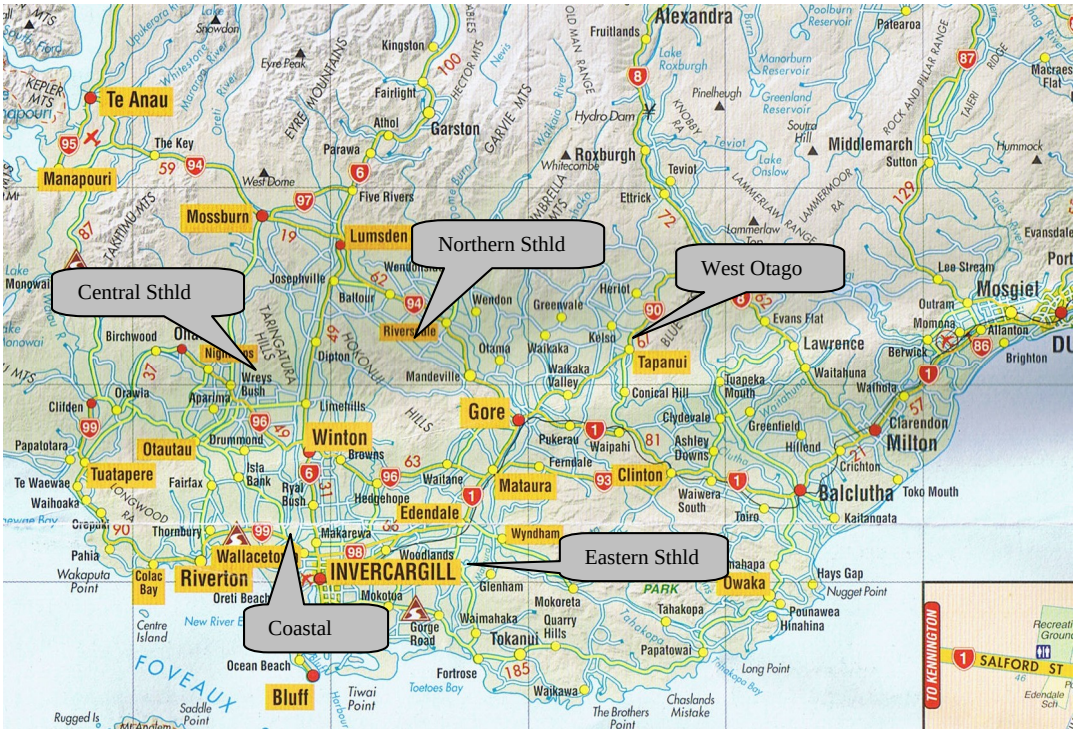

Figure 1: Farm location map for Southland Demonstration farm and monitor farms

Monitoring

Eastern and Central Southland and West Otago commenced monitoring in early September and in Northern Southland in mid October. On Tuesday/Wednesday of each week Noel May (the contractor employed for the project) walked a pre-defined route around each farm recording the average height of pasture in each paddock with the rising plate meter. Fortnightly, two pasture samples were collected to grazing height from the next 2 paddocks to be grazed. These samples were analysed for nutrient composition (NIRS ARL Labs, Ravensdown). The farms recorded the number of cows being milked, milk production, paddocks grazed, effluent or fertilizer applied, paddocks topped or conserved and any supplements that were offered each day. Soil temperature (10 cm) was recorded at 10 am on the day of the farm walk. At the end of each season the annual dry matter production was calculated for each paddock on the farms. Once ranked for dry matter production, the poorest

performing paddocks were soil sampled to determine if performance was related to nutrient levels.

Reporting

The data were entered into the DairyNZ feed wedge computer programme, growth rates calculated and a target demand line inserted on the wedge. The wedge was sent to the farmer within 24 hours along with any pasture quality information. A summary of information from the four monitor farms and the Southland Focus Farm was uploaded onto the SIDDC website on Thursday each week (http://www.siddc.org.nz/SMF.html) and made available to all the local newspapers in the region and Hokonui Gold Farming Show host Jamie McKay.

Results

The results show that there was considerable variation in pasture growth rate (Table 1), soil temperature (Table 2), and pasture quality between the regions.

Potential pasture growth is a result of a number of interacting environmental and management factors. Soil temperature, soil moisture and solar radiation are key environmental factors with rotation length, average farm cover and nitrogen use being under managerial control. During winter and early spring soil temperature is often the major environmental factor limiting pasture growth. Once soil temperatures exceed 9 °C then soil moisture and solar radiation are key factors. The growth rates measured during summer 2008 were significantly lower than the long-term average rates recorded at the Woodlands research station (Table 1). The lowest recorded growth was 0 kg DM/ha/day in Northern Southland on 30 January and 27 February (Figure 2). Summer 2008 was characterised by lower than average rainfall and consequently low soil moisture levels.

While all farms in the study are targeting 1480-1600 kg DM/ha post-grazing residual some farms grazed lower than this (1200-1300 kg DM/ha) through the summer dry period as a result of very low growth rates, a fast rotation and insufficient supplementary feed. The result was average farm cover falling as low as 1500 kg DM/ha on 2 farms. Proactive supplementary feeding to lengthen the rotation, strategic nitrogen use and adopting a 16 hour milking interval were strategies used by the farms to deal with the dry conditions.

Table 1: Weekly growth rate on the monitor farms and the Southland Demonstration farm since mid August 2007.

Date	Demonstration Farm (Coastal)	Eastern Southland	Central Southland	Northern Southland	West Otago
15 Aug	-3				
22 Aug	30				
29 Aug	9				
5 Sep	40				
12 Sep	35				
19 Sep	37	36	34		22
26 Sep	49	50	47		22
3 Oct	37	34	11		24
10 Oct	54	52	44		46
17 Oct	42	47	30		44
24 Oct	43	41	54	27	51
31 Oct	47	51	53	23	47
7 Nov	63	51	67	53	67
14 Nov	58	56	80	48	56
21 Nov	73	69	83	50	68
28 Nov	57	64	50	26	67
5 Dec	46	71	41	18	29
12 Dec	28	29	13	11	27
19 Dec	44	47	39	25	37
27 Dec	41	45	28	13	61
9 Jan	34	36	21	12	46
16 Jan	35	30	28	10	39
23 Jan	22	27	23	8	19
30 Jan	21	28	12	0	13
6 Feb	28	34	22	12	36
13 Feb	17	22	18	2	24
20 Feb	14	27	9	2	19
27 Feb	10	19	10	0	9
5 Mar	29	35	11	27	25
12 Mar	31	38	18	16	36
19 Mar	32	39	20	18	44
26 Mar	39	41	29	24	38
2 Apr	42	43	40	29	35
9 Apr	38	52	28	17	33
16 Apr	32	36	27	18	25
23 Apr	18	25	25	10	11
30 Apr	27	21	20	18	27
7 May	11	13	7	10	15
14 May	12	12	9	9	9

Table 2: Weekly 10 am soil temperature on the monitor farms and the Southland Demonstration farm since mid August 2007.

Date	Demonstration Farm (Coastal)	Eastern Southland	Central Southland	Northern Southland	West Otago
15 Aug	3.9				
22 Aug	6.4				
29 Aug	7.6				
5 Sep	4.9				
12 Sep	8				
19 Sep	9.6	8.3	7.5		
26 Sep	10	8.5	7.7		7.7
3 Oct	10.5	9.0	8.8		7.7
10 Oct	10.5	9.2	9.1		9.5
17 Oct	10.5	9.5	9.4		8.2
24 Oct	10.1	8.2	9.5	8.9	8.2
31 Oct	11.7	11.3	12.2	12.4	12.5
7 Nov	11.9	9.0	10.5	10.3	11.2
14 Nov	11.6	10.7	10.3	11.7	10.9
21 Nov	14.4	14.6	17.6	16.1	15.9
28 Nov	15.6	11.3	14.2	15.5	12.0
5 Dec	15.6	14.2	15.9	17.3	18.1
12 Dec	1.9	17.2	15.9	19.1	18.2
19 Dec	14.1	15.8	15.5	16.9	15.5
27 Dec	14.9	13.8	15.2	15.8	13.3
9 Jan	14.1	15.8	15.1	16.9	16.5
16 Jan	14.0	15.3	17.4	16.0	16.3
23 Jan	15.4	17.3	18.7	14.2	14.7
30 Jan	15.5	17.6	17.2	17.5	18.1
6 Feb	14.7	15.0	16.9	16.5	15.5
13 Feb	16.4	16.9	17.3	17.8	17.1
20 Feb	14.0	14.2	15.4	16.4	14.2
27 Feb	14.2	14.2	15.2	15.3	14.9
5 Mar	12.2	13.4	12.8	13.5	13.4
12 Mar	11.0	12.2	12.9	12.5	12.6
19 Mar	11.0	13.2	14.6	16.0	15.6
26 Mar	12.3	14.5	15.2	15.0	14.2
2 Apr	11.5	13.5	13.9	12.4	12.7
9 Apr	11.0	11.9	12.1	12.3	12.1
16 Apr	12.5	11.6	13.3	12.5	12.1
23 Apr	9.4	9.1	9.0	9.6	9.5
30 Apr	0.4	10.6	11.8	10.5	11.2
7 May	6.9	5.4	4.8	5.8	6
14 May	7.7	8.8	8.4	9.1	8.2

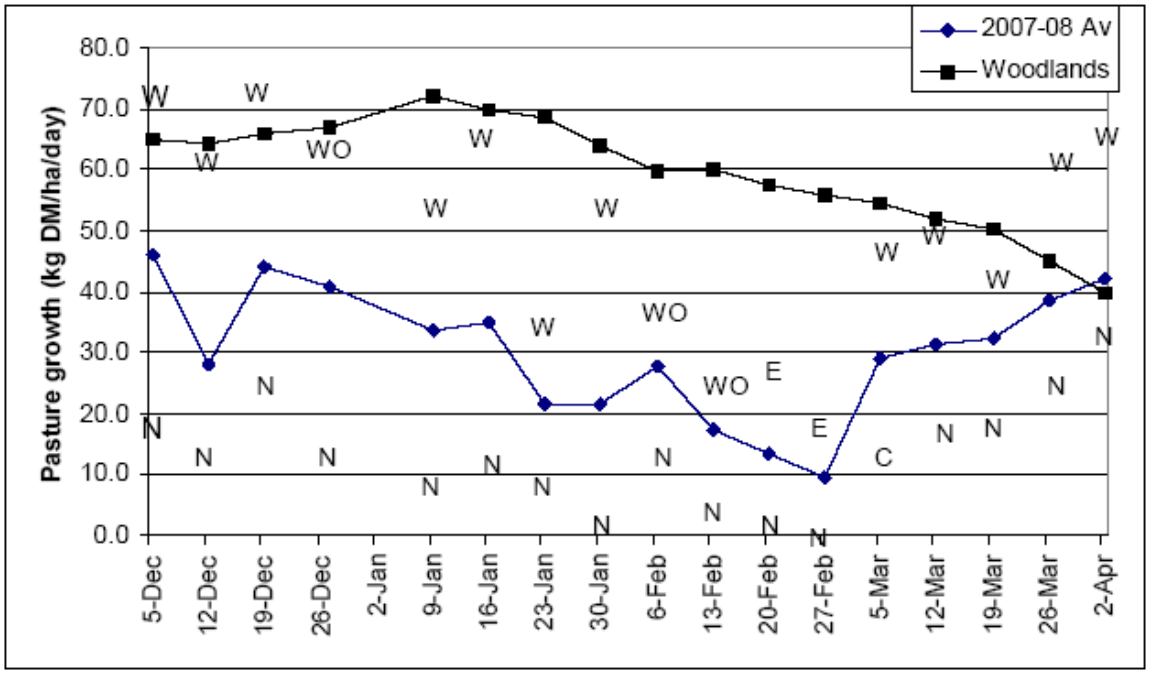

Figure 2: Average weekly growth rate (kg DM/ha/day) on the monitor farms and the Southland Demonstration Farm (2007-08 Av) and Woodlands from 5 December 2007 to 2 April 2008. Letters depict highest and lowest individual growth rate for each week and the region it occurred in (W=Southland Demonstration Farm, E=Eastern Southland, N=Northern Southland, WO=West Otago and C=Central Southland).

Pasture quality was variable between farms and also between months. Timing of nitrogen fertiliser applications and post grazing residual were two factors that influenced pasture quality on the farms. Average crude protein concentration was highest in October and lowest viz. 22% in December (Figure 3). Only 6% of the samples collected recorded crude protein concentrations below 20%, however, 31% of samples were greater than 30% crude protein. Maximum dietary protein requirement for lactating cows is approximately 20%, indicating that a large percentage of the samples collected were supplying excess dietary protein. In contrast to crude protein, fibre (NDF and ADF) concentrations were lowest in October and peaked in December (Figure 3). The highest NDF recorded was 58% on a dry summer pasture in Northern Southland. Soluble sugar (water soluble carbohydrate) concentrations were highest in November (16.6%) and lowest in January (9.6%). The average dry matter percentage of the pasture increased steadily from 14% in October to 22% in February then declined to 15% in April.

There was a strong negative correlation (R^2 = 0.64) between NDF concentration and estimated metabolisable energy such that for every percentage unit increase in NDF concentration, ME declined by 0.1 MJ/kg DM. Grazing management had a strong influence on

fibre content and therefore quality. In this regard, if post-grazing residuals are allowed to increase through late spring, more plants will enter the reproductive phase with the consequence being declining pasture quality. Crude protein concentration in pasture is influenced by the amount of nitrogen fertiliser applied, pasture composition and growth stage of the plant. The northern Southland farm, that applies minimal chemical nitrogen (N) fertiliser (20-30 units N/ha/annum), averaged 25% crude protein compared with 28% for the central Southland farm that applied 143 units of nitrogen until mid May. Interestingly, the range in pasture crude protein concentration between the farms in the 2007-08 season was similar viz. 18 to 34 % crude protein. The variation within a farm was seasonally based**.** There was no correlation between pasture mass/height and quality, as indicated by the predicted metabolisable energy content.

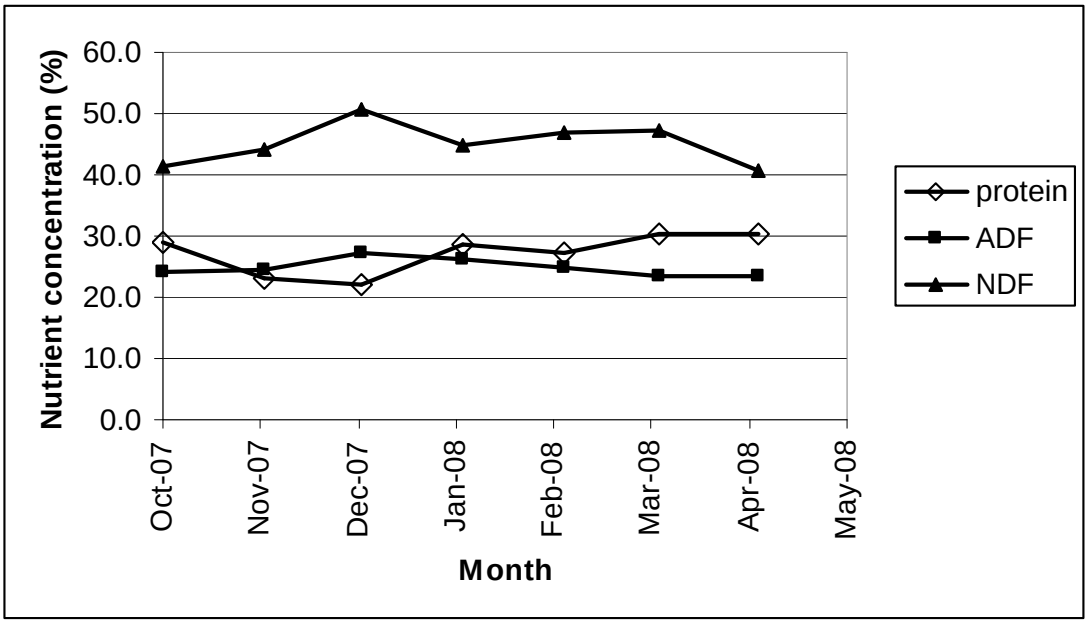

Figure 3: Average concentration of crude protein, neutral detergent fibre (NDF) and acid detergent fibre (ADF) in pasture samples collected from the Southland monitor farm project from October 2007 to March 2008.

Farmer Case Study – George and Jose van der Poel

Farm Background

The 180 ha flat property has been owned by George and Jose for 7 years. The property, divided by Harbour Endowment Rd, is run as a milking platform (140 ha) with adjacent runoff (40 ha). Cows are wintered on the runoff and milking platform. Approximately half the farm has been regrassed in the last 5 years. An in-shed feeding system allows grain to be offered throughout lactation if required. Additional supplements include ensiled surplus pasture and cereal silage that is sown into the brassica crop paddocks in spring. The property is run by George and Jose with one fulltime worker, Henry, and relief milkers. The philosophy of the farm is to: grow and utilise as much feed as possible in an environmentally friendly and sustainable way while trying to fully fed the cows. Happy cows = Happy owners!!!

Reason for being involved in the project

George previously did regular farm walks, however being a self-contained unit he felt he knew the farm well enough to manage without the regular information and had other tasks that took priority over the weekly farm walk. With a smaller team he was able to manage by only planning for the next 1-2 days. George felt that his involvement in the project was an opportunity to give something back to the industry. The project team chose George and Jose as they were high performing dairy farmers with local knowledge and enthusiasm for the industry. The interest was to see if some basic pasture quantity and quality information could add to the operation.

Use of the data

George primarily uses the feed wedge information to cross check with his knowledge of the paddocks and plan his grazing in advance. There are paddocks where local knowledge helps put the plate data into perspective, e.g. paddock 25 that never gets chewed out properly so always appears to have more grass than actually available. This demonstrates the importance of combining plate meter information with knowledge of the paddocks and not taking all the numbers at face value. George has used the data to identify an impending surplus and dropped paddocks out for conservation. The information has been used less to manage inclusion or removal of supplementary feeding or rotation length modification this season. In hindsight George felt that the farm would have benefited from adopting a longer round length through the summer period. This would have maintained a higher average pasture cover and may have resulted in a faster recovery of growth rates once rain feel and soil moisture levels rose.

The annual pasture growth from each paddock will identify paddocks that are performing at a lower level relative to the rest of the farm. Since some cows are wintered on the milking

platform these paddocks could be targeted for renovation if it is pasture species that are holding back production. Alternatively the poorer performing paddocks may require drainage, additional nutrients or a soil structure problem rectified. George cannot wait until this information is available!

Value of the information for Southland

The relative infancy of the project means that the information being generated is of most value to others through benchmarking the situation on their farm with others. Farmers are generally not good at discussing what is happening on their farm, as they are often busy dealing with seasonal issues. Having access to independent information provides peace of mind that maybe they aren't doing things that are wrong and there are regions/farms out there that are facing similar issues. This was especially relevant this year when growth declined to very low levels during summer.

In the longer term George believes the information will have great value for Southland as it will allow farmers in different regions to make more informed decisions around stocking rate and calving date as they will better be able to predict feed supply and match this with demand.

Conclusions

The information generated from the project will be particularly important in the next couple of years as new dairy conversions start production. For new entrants to the dairy industry or recent arrivals to Southland the pasture growth and quality information will give farmers a better appreciation of the local conditions enabling them to make more informed decisions around stocking rate, calving date, culling policies and dry off dates.

Acknowledgements

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