CONFERENCE PAPER[1]

Demonstration farms and technology transfer: the case of the Lincoln University dairy farm

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ABSTRACT

In 2001, Lincoln University and six commercial, education and research partners established a 161 hectare dairy farm (milking platform) and formed the South Island Dairy Development Centre (SIDDC) to demonstrate 'best practice' for South Island dairy farmers. In 2008, to assess the impact of the Lincoln University Dairy Farm (LUDF), a survey was sent to 622 farmers located in the LUDF extension catchment. Responses totalled 146 (24% response rate). The mean age of respondents was 45 years with 77% having some form of tertiary education. Respondents had higher milksolids production per cow (419 kg) and per hectare (1441 kg) than the Canterbury averages (381kg and 1224kg respectively). Most respondents (86%) identified themselves as using moderate levels of supplementary feeding (Systems 2, 3, 4).

Nearly 70% of respondents attended at least one focus day (field day) over a three year period. Most attended to learn about grazing and animal management, to benchmark against the LUDF from a production and financial standpoint, and to learn about environmental management. Focus day attendees had larger operations and higher levels of productivity than those who never attended. Over 68% of respondents visited the farm website each year, with some visiting more than 30 times, but mainly to view benchmarking data rather than to learn about new technologies

Of the technologies promoted by the LUDF, 82% of farmers had adopted low grazing residuals and 74% had re-grassed paddocks based on monitoring. Lower numbers had adopted synchronisation of heifers to calve a week before the main herd (29%), aggressive hormone intervention for non-cycling (42%) and a nil induction policy (36%). Over 70% felt that the adoption of some of the LUDF technologies had made their farm management easier. Twenty three farmers were willing to place an economic value on the adoption of LUDF practices. These ranged from NZ$50,000[3] per year to NZ$1,000,000 per year.

It is concluded that a demonstration farm with clearly defined extension messages can be effective at achieving farmer adoption and that adoption is high for messages where farmers see clear economic advantages, and that farmers obtain information from a wide variety of sources.

KEYWORDS: **D**airy demonstration farm, technology transfer, farmer adoption

Introduction

The number of dairy farms in the North and South Canterbury regions of New Zealand (NZ) grew from 247 to 689, between the 1988–89 season and the 2006–07 season; cow numbers grew from 81,014 to 467,061 during this period (LIC 1988/89 & 2006/07).

In 2001, Lincoln University converted a 185 hectare (ha) dry land sheep property to an irrigated dairy farm with a milking platform of 161 ha. At this same time the South Island Dairying Development Centre (SIDDC) was formed consisting of six commercial, education and research partners. Management of the Lincoln University Dairy Farm (LUDF) was delegated to SIDDC with the aim of fostering best practice to South Island dairy farmers. Since formation, a number of management techniques have been trialled and results reported at focus days (field days), in the media and via the www.siddc.org.nz website. Financial data and benchmarks have been provided for the use of the industry. The LUDF had hosted over 13,000 visitors through to the end of 2008. Focus days are typically attended by between 200 to 400 farmers and other agribusiness personnel.

The farm runs a high stocking rate system with over 4 cows/ha, producing between 1,700 to 1,800 kg of milk solids (ms) per hectare from a low input system. In the 2005/06 season, this resulted in the harvesting of

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[2] Agricultural Management Group, Lincoln University.

[3] Approximate currency conversions at 13 July 2011: 1 NZ$ is equivalent to US$0.83 and £0.52.

approximately 16t dry matter (dm) of pasture per ha and an operating profit of NZ$2,240[4]/ha at a NZ$4/kg ms payout. This compared favourably with the industry's 'Dairy Base' benchmarks which showed an average operating profit of NZ$1,406 for the Marlborough/Canterbury areas (personal communication, van Bysterveldt and Christie 2006[5]).

The key objectives for the LUDF as listed on its website (SIDDC 2007) were:

1. To develop and demonstrate world-best practice in dairy farm systems and to transfer them to dairy farms throughout the South Island;
2. To operate as a joint research centre with DairyNZ[6], where the practical application of new technologies and on-farm forage production systems can be tested and developed;
3. To use the best environmental monitoring systems to achieve best management practices under irrigation, which ensure that the industry's 4% productivity gain target is achieved in a sustainable way and that the wider environment is protected;
4. To continue the environmental monitoring programme and demonstrate technologies that will ensure that the 3-year rolling average concentration on nitrate-N in drainage water from below the plant root zone remains below the critical value (16mg N/L) that is specified in Environment Canterbury's (ECan) proposed regional rule as requiring reduction (Rule WQL18);
5. To operate an efficient and well organised business unit.
6. To provide a commercial return on adjusted capital value to Lincoln University, and a defined benefit to each of the stakeholders;
7. To create and maintain an effective team environment at policy, management and operational levels;
8. To assist Lincoln University to attract top quality domestic and international students into the New Zealand dairy industry.

In June of 2008, a postal survey was conducted of dairy farmers in the LUDF's catchment area. The objective of the survey was to determine the demographics of farmers in the area and to gauge whether farmers had adopted the technologies demonstrated by the LUDF.

Methodology

The Livestock Improvement Corporation (LIC) provided a mailing list of dairy farmers in the prescribed areas. Nearly all farmers deal with the LIC in terms of herd testing, herd recording and/or artificial insemination of their herds. Initially 689 contacts were identified by the LIC; however this was reduced to 622 through the elimination of multiple ownership farms. A four page questionnaire was prepared by SIDDC and staff from the Agricultural Management Group at Lincoln University. The questionnaire was reviewed by Consulting Officers and Business Managers from DairyNZ and a select group of dairy farmers. The Human Ethics Committee of Lincoln University reviewed the proposal and approval was granted on June 16, 2008.

A total of 146 responses were received by August 1, 2008 (24%). The data was analysed by staff in the Agricultural Management Group of Lincoln University using the software SPPS 15. Reported correlations are significant at $p<.05$ unless denoted otherwise.

Results

Demographics

The majority of respondents identified themselves as Owner/Operators (73%), with 50/50 Sharemilkers constituting 17% (a system where the sharemilker owns the cows) and the balance farm managers. A large proportion (43 %) had attended University, with a further 24% receiving training after high school through Polytechnics or the Agriculture Industry Training Organization. The mean age was 45 years and 81% lived within 150 kilometres of the LUDF.

The farmers' milking platform ranged from 50 hectares to 1,400 hectares, with 239 hectares being the mean. Cows milked ranged from 130 to 5,000, with a mean of 611. The average cow as estimated by farmers weighed 480 kg, which would indicate that the majority of herds were tending towards Friesians. However, 38% of farmers believed that their cows weighed less than 400 kg which indicates that these herds have a Jersey base.

Production per cow averaged 419 kg ms and the farms produced 1,441 kg ms per ha. An average for the areas derived from LIC 2006–07 statistics, shows production of 381 kg ms per cow and 1,224 kg ms per ha.

In New Zealand it is common to classify farm intensity according to the levels of supplements imported to the property (Dairy NZ 2010, p. 5) during the milking season (not including feed or grazing for young stock). Most farmers (35%) felt they were running a system 3 farm (10% to 20% imported feed). As farm systems intensified from system 1 (no imported feed) to system 5 (25–55% imported feed), the farms milked more cows, produced more ms per cow and more ms/ha. As systems intensified, farmers were less likely to attend LUDF Focus Days to learn about grazing and animal management techniques.

The number of cows milked and hectares farmed were both significantly correlated with level of education and the number of cows milked and hectares farmed. Age and lower educational achievements were both negatively correlated with ms/ha. Ms/ha increased with herd size.

When asked to rate seven possible reasons for farming from 1 (very important) to 5 (not at all important), the highest rated were "cash profit" and "being their own boss" (Table 1).

Those farming for capital gain had a significant negative correlation with the aesthetic side of farming (lifestyle, quality stock, good place for a family).

The majority of respondents (68%) used the services of a professional consultant.

[4] xxxxxx

[5] Adrian van Bysterveldt was the DairyNZ Business Developer assigned to the LUDF and Richard Christie was the Business Manager of SIDDC

[6] DairyNZ is the industry good research and extension body in New Zealand

Table 1: Reasons for farming (percentage of respondents)

	1	2	3	4	5	Mean rating
Cash profit	64	27	7	2	0	1.47
Own boss	61	27	8	4	1	1.57
Lifestyle	43	35	17	3	2	1.85
Family	47	30	15	7	1	1.85
Quality stock	42	35	19	3	1	1.86
Working outside	39	30	23	6	3	2.03
Capital gain	36	29	31	2	3	2.08

1= highly important, 5 = not at all important

Awareness of the messages of the LUDF

For the purpose of the survey, staff associated with SIDDC identified a number of messages that they felt had been stressed by the LUDF in its extension activities. Farmers were asked to identify awareness of these messages by indicting 'yes or no' (Table 2).

Table 2: Percentage of farmers indicating awareness of LUDF extension messages

Low grazing residuals	89%
Pasture monitoring	80%
Nutrient and environmental management	64%
Irrigation monitoring	47%
Re-grassing of pastures based on monitoring	41%
Use of reproductive technologies (treating anoestrus cows, synchronizing heifers	34%
Once a day milking during calving	21%
Once a day calf feeding	9%

Farmer's interaction with the LUDF and other sources of information

An analysis of LUDF focus day attendance over three seasons (Table 3) showed that in each season over 30% of respondents did not attend any focus days. A very small percentage attended all four focus days in a season.

Of those participating in Focus Days, 80% indicated that they attended to learn about farming with low grazing residuals, 79% to learn how the LUDF is performing, 76% to compare their farms to the LUDF, 65% to learn about environmental management at the LUDF, 61% to learn about the latest animal management techniques, 58% for the financial information provided, 36% to meet other farmers and have a day off of the farm and 13% to meet agri-business personnel.

Table 4 analyzes information from those who had attended the focus days at least once over the three years versus those who had not attended the focus days. Dairy farmers attending had larger farms, milked more cows and had higher levels of production.

Not used	32%
1–10 times	42%
11–20 times	8%
20–30 times	4%
more than 30 times	15%

SIDDC operates a website which provides information on the operation of the LUDF, including the weekly farm walks, data collected and financial performance. Farmers indicated that their usage of the website during a year was as follows:

Although there was a positive correlation to attendance at field days and use of the website, those visiting the website did not do so to learn about the LUDF messages, but rather to monitor how the farm was performing.

Respondents were asked to rate seven sources of information for their contribution to the farmers learning about new technology and innovations using a scale from 1 (very important) to 5 (not at all important) (Table 5). All sources were rated highly except for sales representatives.

Have farmers adopted the messages?

Low grazing residuals as practiced by the LUDF have been adopted by 82% of respondents, although 15% of

Table 3: Attendance at LUDF Focus Days (percentage attending number of days)

year	0	1 day	2 days	3 days	4 days	Mean
2005–06	32	23	20	18	6	1.4
2006–07	35	19	24	20	2	1.4
2007–08	37	32	19	8	4	1.1

Table 4: Demographic and production levels of farmers attending and not attending LUDF Focus Days

	Ha farmed	Cow numbers	Ms/cow	Ms/ha
Non-attenders (n=29)	211	686	401	1,370
Attenders (n=113)	247	856	422	1,454
Difference	+36 ha	+170 cows	+21 kg ms/cow	+84 ms/ha
	P<.20	P<.08	P<.03	P<.17

Table 5: Farmers rating of sources of information (percentages).

Source	Responses (n)	Percentage for each rating level					Mean Rating
		1	2	3	4	5	
Demo. farms	135	33	40	20	4	4	2.09
DairyNZ	136	32	44	17	1	7	2.10
Other farmers	134	31	36	26	6	1	2.10
Media	135	31	31	26	7	5	2.25
Consultants	138	28	38	17	9	9	2.36
Conferences	131	22	33	31	10	5	2.44
Sales reps.	131	5	16	24	20	36	3.69

1= highly important, 5= not at all important

the survey respondents said that they had always followed this technique. Ten respondents did not follow the practice as they felt that their cows would not be fully fed.

Re-grassing based on the measurement of poor performing paddocks had been adopted by 74% of respondents; however 25% of respondents included as adopters reported that they had always re-grassed. It appeared from the answers provided, that the question may have been mis-read as "Do you re-grass", rather than "Do you re-grass based on the measurement of poor performing paddocks.

The policy of synchronizing heifers to calve one week before the herd had only been adopted by 29%. Those who had adopted the process did so to get heifer calving finished early and to give heifers more time to cycle. The main reason for not adopting was that heifers are grazed off the property and it was considered too difficult to operate a synchronisation programme, although a number reported that they did "not believe in the practice". There were positive correlations between synchronizing heifers to calve early, those who use the website and those who use consultants.

In regards to the use of hormone technology to treat non-cycling cows, 42% follow the LUDF aggressive intervention system while 58% did not. Of those following the system, nearly 50% of farmers reported that they did so to maximize cycling, conception rates and/or condense calving. Of those not following the practice, 10% of farmers said it was too expensive, 27% did not believe in the practice, 14% felt that they achieved good reproductive results through "breeding and feeding", 14% used other methods such as once-a-day (OAD) milking, teaser bulls, etc. and 6% said that they do not have a reproductive problem in their herd.

The LUDF nil induction policy had been adopted by 36%, with the remainder continuing to use inductions as a tool. Of those adopting nil induction, 39% did so because they were philosophically opposed for animal welfare reasons. Those inducing said that they used the practice to "tidy up" the calving interval, grow herd numbers and reduce cow wastage. A number of share-milkers pointed out that they needed to induce, as sharemilkers consider cows their wealth.

Twenty three farmers were willing to put an economic value on the adoption of the LUDF practices. These farmers felt that they had increased income from between NZ$50,000 and NZ$1,000,000 through the adoption of the various technologies.

When asked whether the adoption of LUDF technologies had made farming easier or harder, 70% felt that it had made management easier with most of the comments supporting low grazing residuals and pasture monitoring. A number of those who said it made management more difficult also commented that it was worth the effort.

Discussion and Conclusions

Given the overall response rate of 24% to the mail out, some caution is appropriate in drawing conclusions relating to the total population of Canterbury dairy farmers. However, it is clear that those who did respond can be characterised as, in general, well educated high performing farmers who have a strong focus on cash returns and who access information from diverse sources. Amongst those information sources, the LUDF, Dairy NZ events and 'other farmers' all rated highly. Focus days and the use of the SIDDC website are complementary information sources with 68% using each. Whereas the focus days are used primarily for appraisal of appropriate technologies, the website is used primarily for ongoing benchmarking of performance, particularly relating to pasture management. Farmers are discriminating in their adoption of technology, with adoption being high for technologies that are seen as giving clear economic payoffs. Farmers who responded to the survey have larger farms, higher production per cow and higher production per hectare that industry averages for Canterbury and of those who responded; farmers who attend at least some focus days have larger farms, higher milk production per cow and higher production per hectare than non-attendees.

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