Evaluating dairy wintering systems in Southern New Zealand

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Abstract. The Southern Wintering Systems Initiative is a collaboration between farmers, researchers and extension experts aimed at optimising animal performance and profitability, and reducing the environmental impact of wintering practices. The importance of wintering practices was highlighted in a farmer survey in the region before the initiative started. This survey enabled the project team to tailor the project to the needs of farmers. Monitoring and analysis of technical results have been combined with tool development, enabling farmers to evaluate and optimise their practices. Communicating the aims of the project appeared to be as important as presenting results, in that it raised awareness of the importance of animal welfare and environmental aspects of wintering. The approach of the initiative supported co-learning, and embedding of aims, results and tools in the DairyNZ regional extension programme, reaching a large number of farmers and other stakeholders. The monitor farmers played an important role in this.

Keywords: dairy farming, farm system, radar chart, research, extension, co-development.

Introduction to the Southern Wintering Systems Initiative

In New Zealand's pasture-based, seasonal, milk production systems, winter management of dry dairy cows ('wintering') is critical to success. It impacts on milk production, reproductive performance, the welfare of the cows, and the growth performance of young stock (Dalley 2010). In the southern South Island of New Zealand winter weather and soil conditions result in an absence of plant growth and limit the extent to which pastures can be grazed. Hence, the majority of farmers winter their dry cows away from the pastures of the milking platform, mainly on forage crops. This comes at a cost: wintering stock is one of the biggest financial costs of dairying in this region, making up on average 20-25% of farm working expenses (Cottier 2000; Dalley 2010). Wintering on forage crops is under increasing scrutiny from the New Zealand public due to potential environmental and animal welfare issues, such as phosphorus, sediment and microbial contamination of surface waters (McDowell et al. 2003), nitrate leaching (Monaghan et al. 2007), underfeeding of animals and insufficient shelter resulting in cold stress (Dalley 2011).

Farmers in the southern South Island have been prompted to look more closely at the performance of their wintering systems and are looking for options to improve and balance labour requirements, feed supply, effects on the environment, animal health and welfare, and profitability. The Southern Wintering Systems (SWS) Initiative supports them in this task by identifying, developing and demonstrating good farm management practices across the range of wintering systems currently practiced in the region, and by providing tools to assess current performance and evaluate cost-efficient alternatives which would improve environmental performance and animal welfare (DairyNZ 2013).

This paper describes the approach taken, and an initial evaluation of the benefits and pitfalls of this approach. Technical results such as feed allocation and utilisation, body condition scores, animal lying behaviour and environmental performance were presented in other media (e.g. Chrystal et al. 2012; Dalley et al. 2012a; Dalley et al. 2012b). Some results are presented in this paper for illustrative purposes.

Approach of the Initiative

At first, a farmer network analysis and wintering survey was conducted to document the people in the region, dairy systems in use and farmers' perceptions of the wintering systems they used. The choice of wintering system affects management of feed, manure or effluent, animals and people. Therefore, it was decided that the Initiative required a whole-farm system approach to assess positive and negative consequences of choices, and to develop options to improve performance of the range of systems. A collaboration was started involving people with a wide range of expertise: researchers and developers in farm systems; animal, environmental and social researchers; policy makers (from DairyNZ as well as the regional council; Environment Southland); communication experts; consultants and a core group of six monitor farmers (Webby and Sheath 1991) using different wintering systems. The different wintering systems were grazing of crop, grazing of pasture, uncovered wintering pads, loose housed barn with concrete slatted floor, loose housed deep litter barn and a free-stall barn.

A Logical Framework was developed for the SWS Initiative in a workshop with the team. The overall goal of the Initiative was improving understanding of wintering systems and co-developing options for improvement. Bennett's hierarchy (Bennett 1979) and best practice for extension according to Coutts and Roberts (2003) were used to establish the types of activities that would be required. The chosen activities combined a participatory research approach with development and extension:

- Farmers contributed their expertise in commercial farming practice and their farm systems to investigate, forming a region-wide monitor farm network.
- Researchers contributed theoretical knowledge of a range of disciplines and expertise in research methods to monitor the farm systems and interpret the results.
- Developers made sure existing knowledge and new insights were translated to practical tools for farm management.
- Consultants and communication experts assured communication and extension of the aims of the SWS Initiative and its results.
- Policy makers contributed their knowledge of community expectations and interpreted results to develop proposals for practical and effective regulation.

The collaboration between all parties right from the start of the initiative was distinctive. This approach integrated expertise and experience throughout the duration of the initiative and contributed to co-learning.

The SWS Initiative was launched in 2010 and evolved in three phases:

1. Start-up (2010)
2. Monitoring (2011 and 2012)
3. Co-development (2013).

A variety of research methods was used at each phase, and a selection is described and evaluated below. It was this combination of methods that provided the Initiative with its unique characteristics and results.

A Reference Group was formed, including other farmers, rural professionals and representatives from national government. This group participated in: the monitoring of the wintering systems and practices of the monitor farmers; in the analysis of results; and in the development of decision support tools, and extension and communication materials. Important co-learning occurred around the difficulties the farmers experienced with each particular system and how this influenced their management decisions; balancing the welfare of animals and people, environmental outcomes and profitability inevitably led to trade-offs. Radar charts (Excel 2013) were developed to support communication of these results. The radar charts show how the farms perform against a range of indicators for economic, environmental and social aspects of dairying, with each indicator represented by a separate axis starting from the centre of the chart.

The project team adopted a reflexive monitoring approach to manage the processes and direction of the overall project (Van Mierlo et al. 2010). Reflexive monitoring is conducted during the course of a project to ensure that it interacts with its operating environment. Progress in the Initiative was evaluated by the project team on a near-monthly basis. New activities were incorporated as required ensuring that the Initiative could react to current events and evaluation outcomes and opportunities that arose. Every six months, a full team meeting or event was organised, which included project team members, monitor farmers and members of the Reference Group. Results and progress were evaluated, group surveys conducted and new opportunities identified.

By the end of 2012, interest in wintering systems had increased due to further regulations emerging to limit nutrient losses to the environment. The risk of nutrient loss is greatest in winter when plant growth is minimal and soil water content high, especially where cows are kept on crop. This has led to further discussion about the future of winter-cropping practices and the notion that more data are required to generate robust benchmarks for environmental impact, animal performance and welfare, and economics, across the range of systems being investigated. This, along with the feedback received in the evaluation, was instrumental in developing the concept of Communities of Practice, to be implemented in Phase 3. This phase commenced in May 2013 and will involve more farms representing each wintering system.

Results and evaluation of the approach

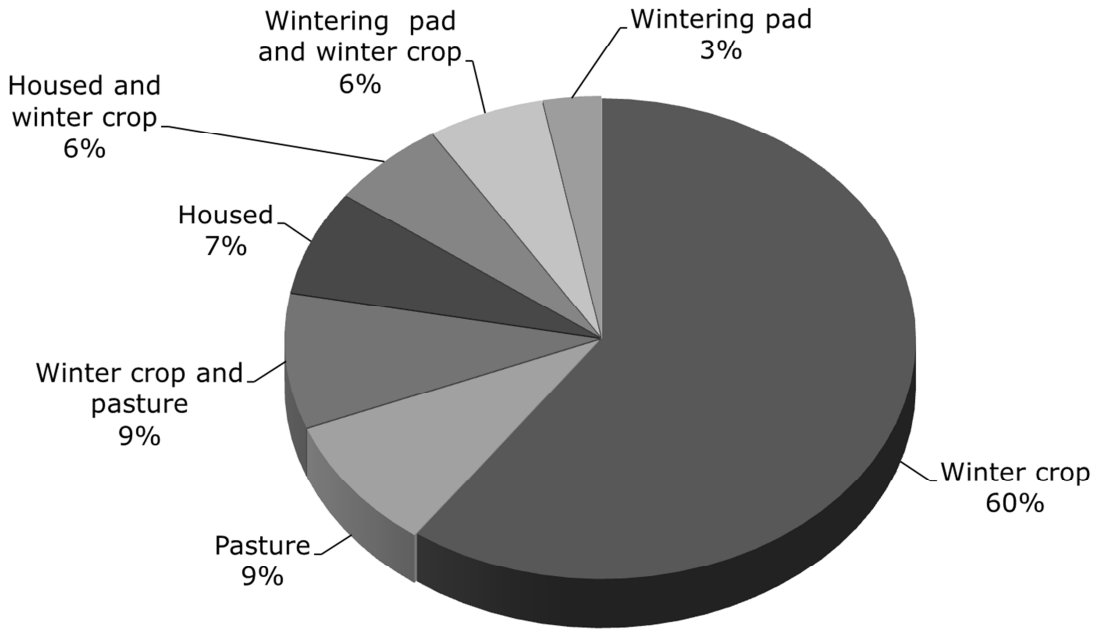
Farmer network analysis and wintering survey

In autumn and winter 2010, a survey was conducted with 315 South Otago and Southland farmers representing 204 farms (18% of the total of 872 dairy farms in Southland and 248 in South Otago), using semi-structured questionnaires for 'kitchen-table' interviews (Tarbotton et al. 2012). The farmers were randomly selected from the New Zealand Dairy Industry Levy Database. DairyNZ sent letters to these farmers, introducing DairyNZ and the purpose of the planned on-farm interviews, as well as informing the farmers that a DairyNZ representative would be in contact to make an appointment for this interview. All farmers agreed on participating. The interviews served two purposes:

1. To establish the networks in which farmers were involved, and to identify key individuals (farmers or rural professionals) and institutes in these networks (social network analysis, Cross et al. 2006).
2. To identify southern wintering practices and farmers' experience and expectation of their performance.

Winter management was considered critical or highly important by 43% of the farmers interviewed and another 44% considered it important. The majority of wintering systems were based on grazed forages such as kale, swedes and fodder beet, and silage conserved during the spring and summer (Figure 1). These wintering systems were acknowledged to be attracting increased scrutiny from the regional councils and the public in relation to environmental and animal welfare concerns. Hence, farmers in the region who use grazed forages were feeling increasing pressure to change their wintering systems.

Figure 1. Wintering systems employed on 204 farms in South Otago and Southland in 2010



Farmers were asked on what basis they selected a wintering system. Economic reasons were mentioned most (39%), followed by control and continuity of the operation and feed supply (21%), fit for their area and soil type (19%), and achievement of better cow condition and health (17%). The main areas farmers felt could be improved were crop yield (23%) and soil protection with less mud (12%). While 74% rated their level of satisfaction with the current system as high or very high, 39% were willing or very willing to change their system and 45% had changed their system in the previous five years. The main reasons for change were to protect the environment and the soil, reduced cost, and better control over feeding and cow condition. The main barrier to change was the cost of capital required, mentioned by 61% of farmers.

The results of this survey were crucial to identify people to link to the SWS Initiative. It also directed the project team to develop benchmarks and tools to assist farmers to meet targets for crop yield and cow body condition (DairyNZ 2013).

The DairyNZ regional extension team promoted these tools to farmers. Two years into the project, this team was surveyed using a semi-structured interview to document experiences with the SWS Initiative and canvas ideas for its future activities. They reported a good understanding of the Initiative (average of 5.5 on a scale of 1-7, 1 being nil, 4 moderate and 7 a lot), and rated the information coming from the Initiative as having good value (average 5.8). They had all used some of the messages and tools in their discussion groups or at other events, with the body condition scoring and feed allocation messages viewed as the most useful and having had the highest uptake amongst farmers. For example, a local veterinary service reported a large increase in demand for animal body condition scoring.

The most used tool was the wintering risk assessment. This was not surprising, since this tool had been formally introduced to the regional team for them to use in interviews of host farmers for discussion groups. The data collected were useful for the SWS Initiative and had been actively followed-up by the project team. The regional team rated the farmers' awareness of the Initiative as low (average 2.7) and viewed the approach of the Initiative as only moderately successful (average 4.5); all indicated that uptake by farmers could be improved further. Reasons for the poor awareness included that farmers did not link messages conveyed to tools used in the SWS Initiative, the number of farmers actively involved was too low, and insufficient effort had been made to communicate with a wider group of farmers.

This criticism is puzzling since the project team had documented that they had reached more than 1,500 people directly by presenting results at events, with positive feedback. For example the South Island Dairy Event in 2012 reported that Southern Wintering Systems was the best rated workshop by the highest number of people, and also had the most attendees. It could be that attendees remembered and adopted the messages and tools introduced but without attributing them as outputs of the Initiative. These questions were investigated further in a larger survey of farmers conducted in May 2013. Results were not available at the time of writing this paper.

Monitor farmers

In 2011, the SWS Initiative started monitoring performance of wintering systems on the six commercial farms. The survey had determined the farm systems of most interest and defined key attributes for farm and farmer selection. Fourteen candidates were interviewed in the selection process. Six farms were identified that represented a range of geographical locations, soil types and wintering systems. Farmers selected needed to have good environmental and animal welfare practices and good financial performance. They had to keep good records of their actions and results, and be prepared to have these opened to the wider farming community to assist with the communication goals of the Initiative. The relationship that developed between the regional extension team and the monitor farmers also enhanced the opportunities available to share data and provided locations for extension events (Plate 1).

The results of the survey were also used to determine the range of performance indicators to be used for the on-farm monitoring programme. These included indicators of environmental impact (Chrystal et al. 2012), animal welfare (Verkerk et al. 2006; Hill et al. 2009), feed quantity, quality and utilisation, and financial performance (Dalley et al. 2012a). Results were presented in various media, e.g. at conferences (Chrystal et al. 2012; Dalley et al. 2012a; Dalley et al. 2012b; Dalley et al. 2013) during extension activities by the regional extension team (field days, bus tours for groups, farmer discussion groups, etc.), and in meetings with Environment Southland (the regional council; e.g. Dalley 2013).

All participating farmers identified that the most valuable aspect of involvement in the project for them was having access to the monitoring information. The extent to which this information was used to change practices on the monitor farms was associated with how long they had been using their particular wintering system. Some had already 'ironed out a lot of hiccups' before involvement in the project; but all farmers had examples where they had used the information to improve their wintering outcomes (e.g. Dalley et al. 2013). The farmers also enjoyed the collegial aspects of inclusion in the project with its opportunities to compare practices and management strategies. A common comment was that they obtained a lot of value from direct access to technical experts. They had found it easy having visitors on their properties and had enjoyed those interactions. Preparation for these visits with the regional extension team or other project team members was also highly appreciated.

Plate 1. The monitor farmers play an important role in the communication of aims and results of the Southern Wintering Systems Initiative

The project team learned that the approach and results of the SWS Initiative improved understanding of the complexity of wintering systems, giving context to the disciplinary work done in other research projects. It assisted the development and extension of tools and rules for good management practice and provided input into new policy. DairyNZ is now adopting similar approaches in new projects, with teams including a variety of research disciplines, development, extension, farmers and/or other stakeholders.

Some opportunities for improvement were also identified: develop a clear plan of what needs to be recorded on-farm before starting; do not request monitoring that is too detailed and not feasible for a farmer to achieve; make sure results rapidly come back to the farmers.

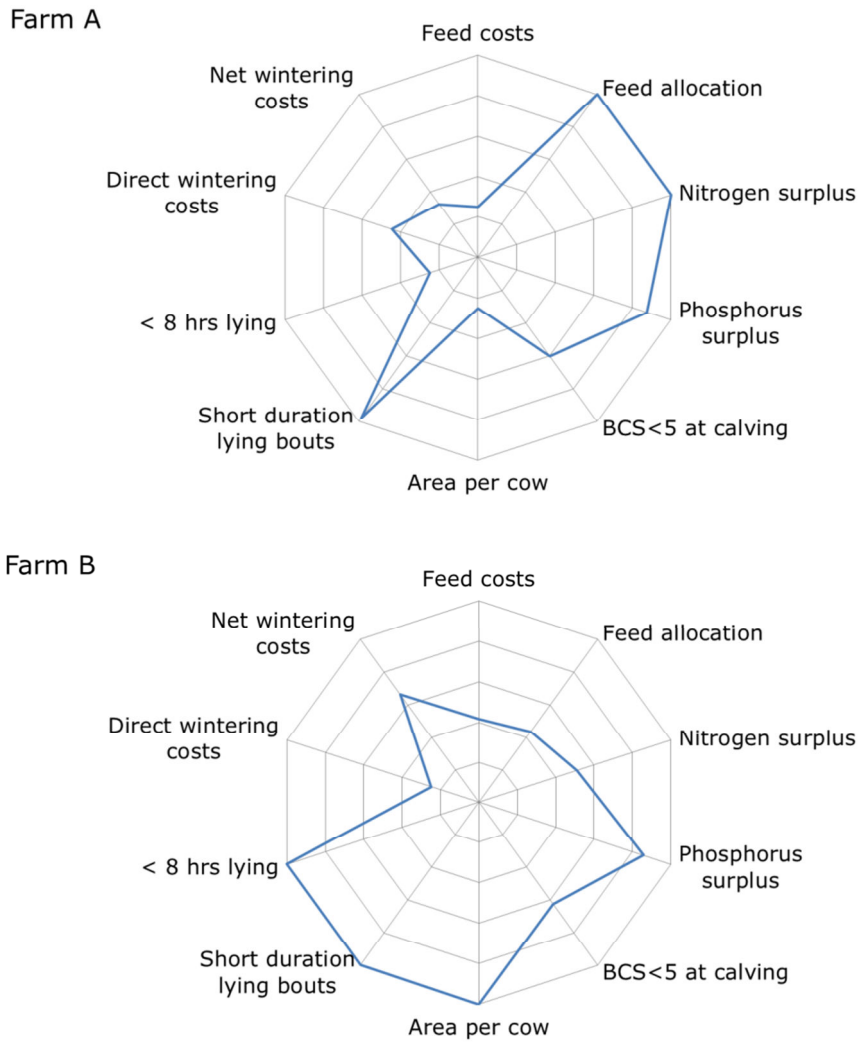
Radar charts to evaluate farm results

The radar charts were generated by ranking the farms for each performance indicator, with the lowest value from the study rated as 25% performance, and the best rated as 100% performance (Figure 2). The radar charts enabled discussion of the indicators chosen to represent system performance, and illustrated trade-offs. In many cases, improvement in one performance parameter would result in negative effects on another; for example, offering more feed to improve cow condition would increase the feed costs, or measures taken to reduced nitrate leaching would increase the net wintering costs.

Depicting system performance in this way illustrates the difficulties of balancing multiple objectives, trying to avoid any unintended negative consequences that might rise from changing only one aspect of the system. One aim for the future is to be able to plot individual farm performance against industry-agreed benchmarks for performance indicators. Since no agreed benchmarks exist for many indicators, these will need to be developed along with minimum standards that all farms might be expected to achieve.

Evaluation of the radar charts by participating farmers and industry groups has been mixed. Some found the charts difficult to interpret, but others had no difficulty and indicated that they liked the visual aspect. Presentation of the charts evoked the discussion the project team sought on the choice of indicators, the scale of the axes and the relative weighting and balance of the indicators. Comments from farmers included: 'the charts emphasise that there are more areas to target', and they were 'quite a good tool to show this'. For other participants (researchers, policy makers, the regional extension team), the charts emphasised the complexity of farm systems, and the challenges farmers face to achieve good performance on all aspects of wintering. The monitor farmers expressed a strong view that, while they personally understood that all wintering systems have positive and negative aspects, they wanted more solid conclusions and more communication of the results to other farmers.

Figure 2. Radar charts depicting wintering performance of two monitor farms from the Southern Wintering Systems Initiative, winter 2011



Communities of Practice – a co-development approach

Phase 3 of the Initiative has been developed to address some of the aforementioned concerns and will facilitate development of a Community of Practice (Wenger 1998) around each monitor farmer. Key characteristics of each Community of Practice will be that: (1) the members are all involved with the same wintering system as the monitor farm in that particular Community of Practice, (2) the environment will support learning to co-develop best-practice rules for the various systems, and (3) outcomes will be translated into 'tips & tricks' and decision support tools relevant to the particular practice.

The monitor farmers have responded positively to this proposal; apart from addressing their concerns, it will also give them more specific feedback about their individual systems. Plans for the conduct of the Communities of Practice have been developed incorporating collection and exchange of data and experiences of all participating farmers, scenario studies and co-development of options to improve performance. The participating farmers and the regional extension team prepared a list of potential participants and these people were invited to participate. Because the project team aimed to collect data from the participating farms, it was decided to keep the initial invitation limited to approximately eight farmers per group to stay within the budget and time available.

The Communities of Practice will be facilitated actively for approximately half a year, or four meetings, after which progress will again be evaluated. This activity will support further learning from the approaches taken in the SWS Initiative and consolidate best practices in this methodology for research, development and extension.

Conclusions

This project has provided some key lessons about the ways in which research, development, extension and practice can be integrated to advance understanding and improvement in an area of critical importance to dairying in southern regions in New Zealand. The approach used was central to the success of this integration and the project outcomes. Important features of this were: (1) an extensive farmer survey at the beginning of the project provided understanding of current practices and criteria farmers used to assess the success of their systems; this proved important to achieve high interest in the project and high relevance of lessons learned; (2) careful selection of monitor farmers supported research and extension; they were respected by their peers, willing to learn from the monitoring programme (e.g. prepared to change practice), and engaged actively in communication; (3) the monitor data provided insights into the business of the monitor farmers; this gave the opportunity for interaction between farmers, researchers, consultants and policy makers, assisted co-learning of wintering systems and improved understanding of the issues the farmers were dealing with; (4) the use of radar charts stimulated the discussion about the diverse factors that need to be balanced when managing a southern wintering system.

The first years of the SWS Initiative have successfully engaged a large and diverse team of people including the monitor farmers, researchers, developers, the regional extension team, policy makers and other rural professionals and farmers in the region. It was successful in generating data useful for extension and communication, and in developing and implementing new tools. However, nearly all involved felt that a better uptake could be achieved provided a wider group of farmers could be engaged. Consequently the Initiative has evolved to facilitate Communities of Practice. This also should enable greater involvement of the regional extension team. Furthermore, data collection from a larger group of farmers will increase the power of messages extended by the Initiative.

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