ISSN 0370-2731/2002 Proceedings of the New Zealand Society of Animal Production 62: 44-48

Winter dairy grazing systems: management practices and cow comfort

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ABSTRACT

During winter, it is common practice to move dairy cows to a stand-off area. This project aimed to identify off-pasture management systems on farms and compare cow comfort on a variety of stand-off surfaces. A questionnaire was distributed in several dairying regions. The most common types of stand-off surfaces were concrete, or concrete in combination with another type of system. More farmers using woodchip surfaces reported that their cows laid down than those using concrete. The major health problem identified was lameness, and the majority of farmers believed that a woodchip pad worked best. Lying behaviours of 216 pregnant, non-lactating Friesian cows, on 18 farms in Waikato and Southland were recorded. Waikato cows were stood-off on woodchip pads, concrete and farm races. In Southland, covered and uncovered sawdust pads and crops were used. Cows spent longer ($P<0.05$) lying per day on woodchips (11.3 hrs) than on concrete (2.4 hrs) and races (4.1 hrs). Lying times for cows on covered sawdust pads (10.2 hrs) were not different from those on uncovered pads (11.5 hrs) or crops (11.2 hrs). A properly managed woodchip surface may cause less lameness and provide better opportunities for cows to rest than concrete surfaces or races.

Keywords: dairy cow; winter management; stand-off; lying behaviour; comfort.

INTRODUCTION

In New Zealand, during very wet winter conditions, it is common practice to move dairy cows off pasture to a stand-off area to reduce treading damage to the soil and to conserve pasture. Currently, dairy farmers use a wide variety of facilities, surfaces and management systems for standing off cows during winter. Some use farm races, cow yards, crops or sacrifice paddocks, and others use specially constructed pads, with surfaces such as woodchips or concrete. Cows generally lie down for between 8-14 hrs per day (Krohn & Munksgaard, 1993). Uncomfortable surfaces, such as concrete or extremely muddy conditions, have been shown to reduce the time that cows spend lying down (Haley *et al*., 2001; Fisher *et al*., 2002). Reduced lying behaviour on hard surfaces have been shown to be associated with an increased risk of lameness (Colam-Ainsworth *et al*., 1989). Haley *et al.* (2001) studied the effects of two types of flooring in a tie-stall barn on the behaviour of dairy cows. They found that when cows were housed on mattress flooring they spent significantly more time lying down (12.3 hrs per day) than when they were on a concrete floor (10.4 hrs per day). An experimental study, conducted by Fisher *et al.* (2002), showed that non-pregnant cows lay down for a greater period of time when stood-off on a woodchip pad, than when they were stood-off on a concrete surface, farm race or sacrifice paddock. In addition, cows that were stood off on concrete lost more weight, had a shorter stride length, and had elevated levels of faecal cortisol after four days than cows on other surfaces.

There is little documented information concerning winter management systems on commercial New Zealand dairy farms. Therefore, the first part of this project aimed to determine the types of stand-off systems used by dairy farmers in different dairying regions of New Zealand, how they are managed, and whether there are any animal health problems that may be associated with specific stand-off practices. The second part of the project aimed to compare the effects of six commonly used stand-off surfaces on cow comfort. Therefore, the lying behaviour of dairy cattle was measured during routine winter stand-off procedures on commercial dairy farms in two dairying regions: Waikato and Southland.

MATERIALS AND METHODS

Survey of stand-off practices

A one-page survey questionnaire was distributed to farmers via consulting officers at farmer discussion groups throughout Hawkes Bay, Waikato, Manawatu, Northland and Southland regions. Farmers were asked to answer the following questions:

- What was the total number of cows on the farm, their breed and calving start date?
- What type of stand-off area did they use and what type of shelter, if any, was provided?
- What size was the area, how many cows used it at one time, and how was it maintained?
- Was feed and water provided on the stand-off area?
- Between what dates did the stand-off area get used the most, how many consecutive days was it usually used for and what time of day were cows normally on the area?
- How often did the cows lie down on the area and were there any animal health problems that may be associated with stand-off?
- Did they know of any other types of systems that worked well?

On-farm behaviour observations

The study was carried out just before spring calving (July-August) on 18 commercial dairy farms, nine in the Waikato area and nine in Southland. A total of 216 pregnant, non-lactating Holstein-Friesian cows (12 per farm), ranging in age from three to nine years old were observed. Most cows were within 2-3 weeks of calving. The cows were observed as focal animals within their normal herds under routine winter management procedures on each farm. In the Waikato, there were three

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farms with concrete pads, three with specially constructed woodchip pads and three that used a farm race to stand off cows. In Southland, there were three farms with covered sawdust pads, three with uncovered sawdust pads, and three that used winter crops to stand cows off pasture. On the covered and uncovered sawdust pads in Southland, except for one farm, cows were retained on the pads for 24 hrs per day for 4-5 months from late Autumn until early Spring, and fed on adjoining concrete feed areas where self-fed silage and water was available *ad libitum*. On the Waikato farms, cows were stood off pasture for an average of 18 hrs per day and let out to graze, with access to water, for an average of 6 hrs per day. The time of day that the cows were stood off and the duration of stand-off was dependent on the weather and the condition of the paddock after grazing.

On each farm, the lying behaviour of 12 cows was recorded on one occasion. Tail paint was used to mark the hindquarters and a coloured collar was placed around the neck to allow the identification of each individual. The cows were then released back into the herd, and observations commenced after allowing cows to settle (approx. 30 min). The behaviour of each cow was recorded by scan sampling every 10 min (Martin & Bateson, 1986). The behaviour of each cow was categorised according to whether it was standing or lying. During the hours of darkness, a single floodlight (75 W) was used to light the area and a spotlight was used to identify individuals. Such spotlights were used as part of the normal farm procedure when monitoring the cows at night during calving.

In Southland, because the cows were managed continuously on the stand-off area, the observation periods were exactly 24 hrs, however, for the Waikato, because the cows were managed partly on stand-off and partly at pasture, the observation periods for four of the nine farms ranged from 19 to 20.5 hrs, because the farmer decided not to return the cows to stand-off due to improvements in the weather. The observation periods for the remaining five Waikato farms, two woodchip, one concrete and two races, were exactly 24 hrs.

Data analysis

From the survey responses, data for each farm were entered into a database (Excel, version 9.0). Stand-off pads with sawdust, bark, woodchip or post peeling surfaces were categorised as woodchip pads. The data was tabulated as a percentage of the responses to each question and are reported in this form. From the on-farm behaviour observations, scan samples were used to calculate the lying time for each focal cow on each farm. These values were then analysed by ANOVA within region, with the effect of stand-off surface tested against between-farm variation.

RESULTS

Survey questionnaire

A total of 100 responses were received, mainly from Waikato (33%), Northland (29%) and Southland (21%) regions. Most of the farms had a herd size of 200 to 400 cows (52%), 25% of respondents had over 400 cows and 23% had less than 200 cows. The majority of the farms started calving in July (62%) and August (32%), and most herds contained Holstein-Friesian cows (64%) and Friesian-Jersey crosses (51%), while some herds contained Jersey cows (26%). Table 1 shows that most farmers used a concrete area or a combination of concrete and another type of system, and few respondents used limestone pads, crops or wintering barns. More farmers used races and sacrifice paddocks in combination with other types of systems rather than using them alone, and 13% had no winter stand-off system in place (Table 1).

TABLE 1: The types of stand-off systems used by respondents to the survey of farm stand-off practices.

Stand-off type	Percentage of Responses
Concrete	16
Concrete & Wintering Barn	1
Concrete & Woodchip Pad	10
Concrete & Limestone	2
Concrete & Other	1
Concrete & Sacrifice Paddock	4
Woodchip Pads	10
Woodchip Pad as well as a Limestone Pad	1
Race	3
Race & Concrete	9
Race & Concrete & Sacrifice Paddock	2
Race & Concrete & Woodchip Pad	1
Race & Concrete & Wintering Barn	1
Race & Sacrifice Paddock	3
Sacrifice Paddock	4
Sacrifice Paddock & Other	1
Sacrifice Paddock & Limestone Pad	1
Limestone Pad	3
Wintering Barn	3
Wintering barn & Other	1
Crops	3

Table 2 presents data for responses by region, management and animal health, in relation to the main types of stand-off area used. For most stand-off areas, no shelter was provided or they had partial sides, and few had a roof covering (Table 2). Most woodchip pads and sacrifice paddocks used in combination with another system provided more area per cow (6 to 15m^2) than most concrete areas (3m^2). Most farmers started using their stand off area during May (26%) or June (52%) and finished using it during August (33%) or September (38%). The majority of farmers used the stand-off area for a minimum of 1 day and a maximum of 2 to 7 consecutive days, and of those that used the area for more than 50 consecutive days, most had woodchip surfaces (Table 2). The time of day that most of the farmers stood their cows off pasture was between 12:00 p.m. and 6:00 p.m. (70%), and most turned their cows out to pasture between 6:00 a.m. and 12:00 p.m. (82%). Overall, 64% of farmers stood their cows off for 17 to 23 hrs per day. More farmers that had a woodchip pad reported that their cows lay down a lot on the stand-off area, compared to those that used a concrete surface (Table 2). The major health problem associated with stand-off was lameness. All the farmers with a concrete surface that reported health problems had cases of lameness, compared with 71% of farmers using concrete in combination with another system and 25% using woodchip pads. Mastitis was the major health problem reported on farms using woodchip pads. Eighty-five percent of the farmers believed that a

TABLE 2: Percentage of responses from six different types of stand-off systems used on commercial dairy farms. Data within sub-group columns total 100%.

		Surface (%)						Overall % of responses
		Concrete	Concrete combination	Woodchip	Woodchip combination	Race combination	Sacrifice paddock combination	
Region	Hawkes Bay	6	0	0	0	13	27	8
	Manawatu	0	7	0	0	6	9	9
	Northland	31	30	20	25	19	27	29
	Southland	6	7	40	33	13	9	21
	Waikato	56	56	40	42	50	27	33
Shelter	None	54	50	22	25	53	50	42
	Partial sides	31	27	44	33	33	40	35
	Roof and partial sides	0	0	0	8	0	0	1
	Roof and sides	0	12	0	25	7	0	10
	Roof	0	0	0	0	0	0	1
	Wall	15	12	33	8	7	10	11
Area (m^2)/cow	<3	40	39	0	30	40	25	20
	3 to 6	30	0	13	0	0	0	14
	6 to 15	20	46	75	60	40	38	41
	15 to 30	10	8	13	10	0	13	14
	30+	0	8	0	0	20	25	11
Feed provided	Yes	36	28	40	67	36	36	51
	No	64	72	60	33	64	64	49
Water provided	Yes	60	62	80	92	47	64	69
	No	40	39	20	8	53	36	31
Total time on pad (hrs)/24 hrs	<10	0	4	0	0	0	10	3
	10 to 16	33	12	38	0	23	30	17
	17 to 23	67	68	50	50	69	60	64
	24	0	0	13	50	8	0	17
Min No. of consecutive days	1	75	50	57	30	40	67	56
	2 to 7	25	45	29	40	50	22	33
	20 to 70	0	5	14	30	10	11	11
Max. No. of consecutive days	2 to 7	50	63	22	50	67	67	47
	10 to 20	25	21	33	0	22	11	23
	25 to 45	17	16	22	10	11	22	12
	50+	8	0	22	40	0	0	18
Lie down	A lot	7	8	40	46	21	27	24
	Sometimes	47	46	40	36	43	36	45
	Seldom	27	38	20	9	29	36	23
	Never	20	8	0	9	7	0	7
Health problems	Yes	47	64	67	58	69	70	51
	No	53	36	33	42	31	30	49
	Lameness	100	71	25	50	89	71	71
	Mastitis	0	14	75	50	0	14	20
	Lameness and mastitis	0	14	0	0	11	14	9

specially constructed pad worked well, and 66% of them specified a pad with a woodchip or sawdust surface.

Figure 1 presents data relating to the provision of feed and water at stand-off. Of farmers that stood-off cows for 17 to 23 hrs, 43% did not provide access to water.

On-farm behaviour observations

Table 3 presents the total lying times for each stand-off type. In the Waikato, cows spent longer lying per day on woodchip pads than cows on concrete and races. In Southland, the lying times for cows on the covered sawdust pads were not different from those on uncovered sawdust pads or crops. There was considerable variability in lying times, within surface type, between farms using concrete and races.

DISCUSSION

The survey results confirm that New Zealand dairy farmers use a wide range of stand-off practices during winter. Rather than using a single type of stand-off area, many of the farmers used a combination of systems with different surfaces, but most used a concrete surface, a woodchip pad, or concrete in combination with another system. Stand-off periods are dependent on the weather and the condition of the paddocks, but most of the farmers moved their cows off pasture during the afternoon and

FIGURE 1, The percentage of survey respondents that provided feed and water on the stand-off area in relation to the total hrs per day that cows were stood-off.

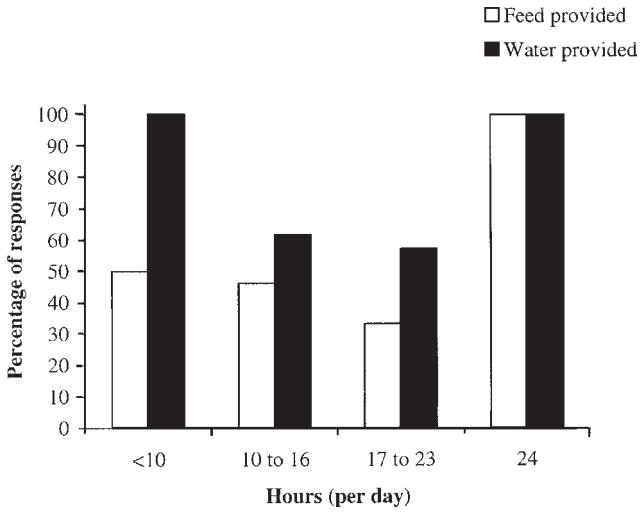

TABLE 3. The effects of surface type on cow lying behaviour in Waikato (A) and Southland (B).

Stand-off type	Farm	Total Lying (hrs)				
		Mean	Min	Max	Overall mean	Pooled s.e.d.
A. Waikato						
Woodchip	**1**	11.47	10.7	12.2		
	2	10.40	8.8	11.7		
	3	12.13	11.2	13.7		
					11.33[a]	
Concrete	**4**	1.85	0.2	5.5		
	5	0.07	0.0	0.5		
	6	5.40	2.0	8.7		
					2.44[b]	
Race	**7**	0.60	0.0	2.7		
	8	2.24	1.3	4.8		
	9	9.39	5.8	11.8		
					4.07[b]	**2.58**
B. Southland						
Covered sawdust pad	**1**	7.86	4.0	14.8		
	2	11.14	6.3	15.3		
	3	11.47	5.7	16.7		
					10.16	
Uncovered sawdust pad	**4**	11.04	9.2	12.5		
	5	12.71	10.0	15.0		
	6	10.68	6.5	13.7		
					11.48	
Crops	**7**	11.67	10.5	14.2		
	8	11.30	9.8	13.3		
	9	10.53	8.3	13.2		
					11.17	**1.10**

[ab] Within region, overall means with a different superscript are significantly different ($p<0.05$).

turned them out the following morning, after a 17- to 23-hr stand-off period. Forty three percent of the farmers that stood their cows off for 17 to 23 hrs did not provide cows with access to water during stand-off. The Code of Recommendations and Minimum Standards for the Welfare of Dairy Cattle (Animal Welfare Advisory Committee, 1992) stated that cattle should be provided with fresh water at all times. Many stand-off areas were reported to have no shelter. Guidelines for stand-off facilities published by the dairy industry advisory service recommend that shelter be provided around the stand-off area to protect cows from prevailing winds and reduce wind-chill (Anonymous, 1998). There is some evidence to suggest that a lack of shelter may have an effect on productivity. Holmes *et al.* (1978) found that growing cattle provided with shelter from wind and rain had greater liveweight gains over 2 yrs than cattle with no shelter. Further research may be required to investigate the effects of shelter on cow comfort during stand-off management.

Overall, lameness was the major health problem reported to be associated with stand-off practices, however, more farmers using concrete reported cases of lameness than those using other surfaces or those using a combination of different systems. This may be due to the hardness of the concrete surface (Colam-Ainsworth *et al.*, 1989; Singh *et al.*, 1993). In the survey, farms using woodchip pads were reported to have more cases of mastitis than other surfaces. This may be caused by cows lying in wet, soiled conditions, especially if the pad is not well managed. Woodchip pads were reported to work very well compared to other systems, however, their effectiveness is dependent on good management (e.g., preventing overcrowding) and regular maintenance, which involves scraping off the old surface and replacing it with new woodchips (Anonymous, 1998). The reported space allowances per cow for farms with wood chip pads complied with recommendations, which suggest a stocking density of 5 to 6 m^2 per cow for short-term use and 9 to 10 m^2 per cow for long-term use (Anonymous, 1998).

Farmers with woodchip pads reported that their cows lay down more than farmers using other surfaces, epecially in comparison to those using concrete. This was consistent with findings from the on-farm behaviour observations. In Waikato, cows that were stood-off on woodchip pads had significantly longer lying times than cows on races and concrete surfaces. The average lying time recorded for cows on woodchip pads (11.3 hrs) was similar to lying times recorded for cows at pasture (10.3 hrs) (Singh *et al.*, 1993). In comparison, lying times recorded on concrete surfaces and races were well below normal lying times at pasture, which suggests that the resting behaviour for cows on these surfaces was sub-optimal. In Southland, cow lying times on covered and uncovered sawdust pads and crops were all similar to lying times recorded on woodchip pads in Waikato, and were long enough to obtain sufficient rest over the 24-hr period. Although crop paddocks can become very muddy, the cows were observed to lie close to the crop itself, where the surface was drier than the rest of the paddock, and may have been more comfortable to lie on.

The on-farm observation results are consistent with previous findings obtained during an experimental stand-off study by Fisher *et al.* (2002). They found that cows spent longer lying on a woodchip pad per day (11.9 hrs) than they did on a concrete yard (7 hrs), a race (5.7 hrs) or a muddy sacrifice paddock (6.9 hrs). The average lying times recorded on commercial farms were lower than those

on the race and the concrete surface in Fisher *et al*.'s (2002) study. However, in the on-farm study, there was considerable variability between farms that used either races or concrete. The variability between farms using races may be due to the condition of the race surface and how muddy the surface was on the different farms. Lying behaviour on the races or the concrete may also be dependent on the total number of days for which the cows were stood-off. Cows may be reluctant to lie down on less-comfortable surfaces at the start of stand-off, but become more inclined to lie down after they have become fatigued a few days later. In comparison, in Southland, lying times for cows on crops and sawdust pads were more consistent. This may be because cows are held on the areas throughout most of the winter for 24 hrs per day, and, therefore, they may become more familiar with their surroundings and adapt to lying on the surface.

In conclusion, the results from the survey suggest that a properly managed woodchip or sawdust surface works best and may reduce the risk of lameness. From the on-farm observations, the lying times for cows on concrete and races were sub-optimal, and crops and woodchip pads provided better opportunities for cows to rest. Concrete or races may be more suitable if they are used in combination with other systems, such as a woodchip surface.

ACKNOWLEDGEMENTS

The authors would like to thank the technical staff at AgResearch and Anna Bayly, Mike Bramley, Katrina Crook and John Simmonds, consulting officers from Dexcel, for their assistance in the conduct of this study. We are also grateful to the farmers that responded to the questionnaire and to those that allowed observations to be conducted on their farms, and Dave Duganzich from AgResearch for carrying out the statistical analyses. This study was funded by the New Zealand Dairy Board Global Programme for Animal Health and Welfare.

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