PROCEEDINGS OF

THE ONCE-A-DAY MILKING CONFERENCE

Monday 16th April - Tuesday 17th April 2007
Tempero Centre, LIC, Newstead, Hamilton

agresearch

Lincoln University

dexcel
Partners in profitable dairying™

LIC

Proceedings of The Once-a-Day Milking Conference

Volume 1
Published April 2007

The Once-a-Day Milking Conference Organising Committee:
Peter Gatley (LIC, Hamilton)
Dave Clark (Dexcel, Hamilton)
Dawn Dalley (Dexcel, Lincoln, Christchurch)
Julie Wade-Graham (LIC, Hamilton)

Conference Proceedings Editors: Claire Phyn and Dave Clark (Dexcel, Hamilton)

Cover Design: Raymond Whitley (LIC, Hamilton)

Additional copies of the Proceedings may be purchased from:
The Once-a-Day Milking Conference
c/- LIC
Private Bag 3016
Hamilton

Table of Contents

Conference Papers

Milk Production from Once-a-Day (OAD) Milking

Dave Clark[1], Dawn Dalley[1], Louise Hofmann[1] and Brian Frost[2]

[1]Dexcel Ltd., Private Bag 3221, Hamilton; [2]Farmer, Tauhei, Waikato.

Executive Summary

1. Once-a-day (OAD) milking for a whole lactation decreases milk and milksolids (MS) yield per cow by 20-30% compared with twice-a-day (TAD) milking.
2. Jersey cows have a smaller MS yield loss than Holstein Friesians (20 vs. 30%) when milked OAD for a whole lactation.
3. The negative effects of OAD milking on MS yield per ha can be partially offset in farm systems by adopting higher stocking rates, or by using OAD milking for part-lactation only.
4. OAD milking increases milk fat and protein by 2.8 and 1.5 g/l, respectively; and decreases milk lactose by 1.5 g/l.
5. MS yields of greater than 1200 kg MS/ha/year have been achieved from pasture-only, whole lactation, OAD milking systems using Jerseys or crossbred cows with a breeding worth (BW) of higher than 130.
6. A MS yield of greater than 400 kg MS/cow/year is a feasible target for whole lactation OAD milking systems.

Introduction

Cows on an OAD milking regime produce less milk than those milked TAD. The scale of this loss is an important factor in the profitability of OAD milking, and a barrier to the further adoption of this technology in the New Zealand dairy industry. This paper summarises research on the effects of OAD milking on milk yield and composition; presents the first two years of results from a three-year experiment comparing whole lactation OAD milking with TAD milking until mid-summer, followed by OAD for the remainder of the season; and outlines a case study of a OAD milking farm achieving good MS production per cow from a high-feed input system.

Research on Milk Yield and Composition

Research since 1980 has identified the key effects of OAD milking on milk yield, and these can be summarised as follows:

- OAD milking for a whole lactation decreases milk and MS yield per cow by 20-30% compared with TAD milking.
- Jersey cows have a smaller MS yield loss than Holstein Friesians (20 vs. 30%) when milked OAD for a whole lactation.
- Individual cows vary greatly in their response to OAD milking, and milk loss (%) is unrelated to initial milk yield.
- Heifers are more affected by OAD milking than older cows, but neither age group show any negative effects in their subsequent lactations.
- The negative effects of OAD milking on MS yield can be partially offset in farm systems by adopting high stocking rates, or by using OAD milking for part-lactation only.

The key effects of OAD milking on milk composition can be summarised as follows:

- OAD milking increases milk fat and protein by 2.8 and 1.5 g/l, respectively; and decreases milk lactose by 1.5 g/l (Remond & Pomies, 2005).
- Casein and whey protein concentrations are increased by OAD milking, but casein/whey protein ratio is decreased by about 10% (Davis *et al*., 1999).
- OAD milking increases somatic cell count (SCC), but not the incidence of mastitis.

Many of the minor changes in the composition of OAD milk compared with TAD milk can be explained by the increased permeability of tight junction complexes between mammary epithelial cells under OAD milking. This increased permeability allows components to leak from blood into milk and vice versa. Further information to support these conclusions can be found in reviews by Davis *et al*. (1999), Rémond & Pomiès (2005), Stockdale (2006) and a four-year whole lactation study (Clark *et al*., 2005).

Waimate West Demonstration Farm (WWDF) OAD Milking Trial

Aim
To compare whole lactation OAD milking with part-lactation OAD milking (i.e., TAD milking until mid-summer, followed by OAD milking for the remainder of the season; TAD/OAD) in two farmlet systems using Jersey cows.

Design
On 1 June 2004, two herds of 101 (OAD) or 44 (TAD/OAD) cows were established at the WWDF in Taranaki (Table 1). The stocking rate of the OAD milking herd was set 10% higher (4.4 vs. 4.0 cows/ha) than the TAD/OAD milking herd to allow for the expected lower intakes of the former. The LIC OAD selection index was used to identify and select cows from the herd for each age group that were best suited to OAD milking. These selected animals were milked OAD for the full season, i.e., a whole lactation. The remaining cows were milked TAD until the average TAD/OAD herd production dropped below 1.2 kg MS/ha and then cows were milked OAD to the end of the season. Heifers entering the WWDF herd were also selected using the OAD Index with the top two thirds entering the OAD herd and the remainder entering the TAD/OAD herd. Pasture cover was determined weekly during lactation, and fortnightly while the cows were dry. Daily grazing management for each farmlet was based on this information, and feed quality was determined on a quarterly basis. Milk production was measured on a herd basis daily, using twin vats, and all cows were herd tested, weighed and condition scored monthly.

Table 1. Herd size, stocking rate, planned start of calving date and genetic merit for the WWDF farmlets as at the start of the trial on 1 June 2004, where cows were milked once a day for a full- (OAD) or part- (TAD/OAD) season.

	OAD	TAD/OAD
Number of cows	101	44
Farmlet size (ha)	23.2	11.2
Stocking rate (cows/ha)	4.4	4.0
Planned start of calving	9 July	9 July
Breeding Worth	135	103
LIC OAD Index	1388	1004

Results and Discussion

On average for the two years, the TAD/OAD milking herd produced significantly more MS per cow (12%) and per ha (5%) than the OAD milking herd (Table 2). The OAD milking herd produced milk with a significantly higher fat (+ 0.34% units) and protein concentration (+ 0.26% units) than the TAD/OAD herd (Table 2). Days in milk averaged 267, with no difference between the two treatments.

Table 2. Effect of whole lactation once-a-day (OAD) milking and part-lactation OAD milking (TAD/OAD) on milk yield and composition for the first two years. All comparisons between OAD and TAD/OAD milking are significantly different at ($P<0.001$) for both years, except for days in milk.

Treatment	OAD	TAD/OAD	OAD	TAD/OAD
Year	2004/05	2004/05	2005/06	2005/06
Days in milk	270	270	262	266
Milk yield (kg/cow)	2360	2920	2649	3207
Fat yield (kg/cow)	156	177	163	189
Protein yield (kg/cow)	106	123	120	135
Milksolids (kg/cow)	262	300	272	321
Milksolids (kg/ha)	1142	1179	1182	1261
Fat content (%)	6.72	6.33	6.17	5.90
Protein content (%)	4.57	4.36	4.51	4.20

Table 3. Changes in milksolids yield (kg MS/cow/d) between the various stages of lactation, including around peak lactation, transition from TAD to OAD milking and in late lactation, for cows milked once a day for a full- (OAD) or part- (TAD/OAD) season. Data are presented from the 2005-06 season.

Stage of lactation	OAD	TAD/OAD
Peak – 25 Sep.	1.45	1.85
Post peak – 25 Oct.	1.4	1.6
Transition – 16 Jan.	1.1	1.3
Post transition – 9 Feb.	0.85	0.85
Late lactation – 1 Apr.	0.5	0.5
Late lactation – 30 Apr.	0.7	0.85

The TAD/OAD milking cows had a 28% higher peak MS than OAD milking cows (Table 3). However, one month later the difference was only 14%, indicating the capacity of OAD milking cows to maintain a more even MS yield throughout early lactation. The latter difference was maintained until the transition of TAD cows to OAD milking in mid-January, at this stage their MS yield dropped by 35% in three weeks compared with 23% for the cows that remained on OAD milking. Both herds were affected by poorer pasture quality at this time - but the OAD milking cows to a lesser extent. By 1 April both herds were producing 0.5 kg MS/cow/day and were almost ready to be dried off. Autumn rains led to improved pasture quality and both herds were able to increase MS yield by 40 and 70% for the OAD and TAD/OAD milking cows, respectively. These results support farmer experience that pasture or supplement quality is a key factor in maintaining milk yield in OAD milking cows

through the second half of lactation. When quality feed is available the higher body condition score (BCS) of OAD milking cows (Figure 1) can be used profitably by extending days in milk.

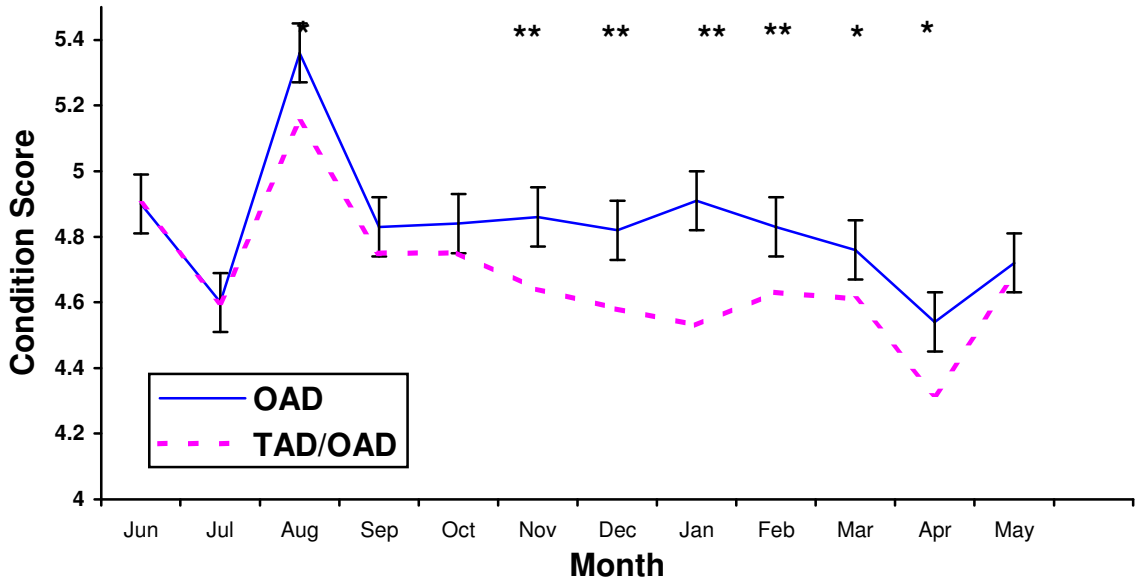


Figure 1. Effect of milking cows once a day for a full- (OAD) or a part- (TAD/OAD) season on average monthly body condition score (BCS). Data are presented for the 2005-06 season. Treatment differences in BCS are shown by *P<0.05, **P<0.01.

Despite the 10% higher stocking rate for the OAD milking herd, cows in this herd had higher BCS by one month post-calving than their TAD/OAD milking counterparts, and this difference continued to exist until a month before drying off (Figure 1). Drying-off decisions ensured that the two herds entered winter with approximately the same BCS.

This research trial has demonstrated that it is possible to produce close to 1200 kg MS per ha by using cows of high genetic merit milked OAD throughout the year, coupled with a moderate (10%) increase in stocking rate. The same yield can be reached by using average genetic merit cows in a TAD/OAD milking system. This trial supports previous research work and farmer experience, with profitable changes in milk composition and excellent BCS for OAD milking cows.

Case Study – A high-feed input OAD milking system

Brian and Bridget Frost farm 74 effective hectares of consolidated peat at Tauhei, north of Hamilton. They progressed from a TAD milking System 5 (25-35% of total feed imported and fed all year round) in 2003/04 to a full OAD milking system 5 by 2005/06 (Table 4). In 2003/04 stocking rate was 4.3 cows/ha, producing 416 kg MS/cow and 1772 kg MS/ha. In 2005/06 stocking rate was 4.9 cows/ha (32% heifers), producing 300 kg MS/cow and 1460 kg MS/ha. MS production per cow and per ha had reduced by 28 and 18%, respectively, with the switch to OAD milking. However, Brian and his consultant, Andrew Goold, were confident that with a lower proportion of heifers, a high BW = 138, a crossbred herd, and high quality feed inputs, the 2006/07 season would see a return to the MS produced per ha under TAD

milking. Table 4 shows a predicted production of 1700 kg MS/ha and 345 kg MS/cow for the 2006/07 season despite a very dry late summer. After allowing for brought-in feed the farm is producing greater than 1200 kg MS/ha/year from pasture grown on-farm.

Brian's farm management aims to make full use of all pasture before supplements are used, and to use winter grazing-off to support an early calving date of July 4th with a compact calving spread. The high stocking rate allows spring pasture to be fed direct to cows with no pasture silage conserved, little topping, and N fertiliser used at rates up to a maximum of 260 kg N/ha as feed budgets dictate. Turnips are used to provide a high quality summer supplement and to assist re-grassing with perennial ryegrass and tall fescue, the latter being grazed with a 20% shorter round length. This management has led to the MS production curve shown in Figure 2. The much better MS production in the second full year on OAD milking compared with the 2005/06 season can be attributed to higher peak production (1.6 vs. 1.3 kg MS/cow/day), with this advantage continuing through to early March.

The target for the 2008/09 season is 1800 kg MS/ha and 400 kg MS/cow at a stocking rate of 4.5 cows/ha. To meet this target there will be continued emphasis on increasing the TAD milking BW of the herd, an increased use of turnips in late summer and a continuing search for ways to turn BCS into milk towards the end of lactation. To achieve their target of 400 kg MS/cow at 4.5 cows/ha will require peak yields of 1.75 kg MS/cow/day, and producing 0.15 kg MS/cow more per day than currently, from peak to 1 March (when yields should still be 1.2 kg MS/cow per day) through to dry off in mid-May at 0.7 kg MS/cow per day. These are by no means 'soft' targets, but with the combination of high BW cows and sufficient high ME feed they are certainly not impossible. An added incentive to achieve high late lactation production is to avoid the high SCC that can sometimes lead to grading or early drying off of some cows.

Table 4. Actual and target milksolids (MS) production and farm data for 2003/04 – 2008/09 for Brian and Bridget Frost's farm.

	03/04	**04/05**	**05/06**	**06/07**	**07/08 Target**	**08/09 Target**
Max. no. of cows milked	315	319	360 (32% heifers)	364	355	333
Cows/ha	4.26	4.31	4.86	4.92	4.8	4.5
Total MS	131,137	116,151	108,073	126,000*	133,200	133,200
Kg MS/ha	1,772	1,570	1460	1700*	1800	1800
Kg MS/cow	416	364	300	345*	375	400
Once-a-day milking	None	August onwards for 200 young Xbred cows	100% of herd - All Season	100% - All Season	100% - All Season	100% - All Season.
Total brought-in feed (t DM)**	440	540	470	540	440	400
Empty rate (%)	7.6	3.5 for Xbreds, 9.5 Friesians	7	7	5	5
Induced rate (%)	6.5	0	0	0	0	0
CIDR use (%)***	18	3.5 for Xbreds, 7 for older Friesians	10	11.5	10	10

* Full year prediction based on production to 20 March 2007.
** Winter grazing, maize silage, palm kernel extract, and mixed vegetables.
*** Before the planned start of mating.

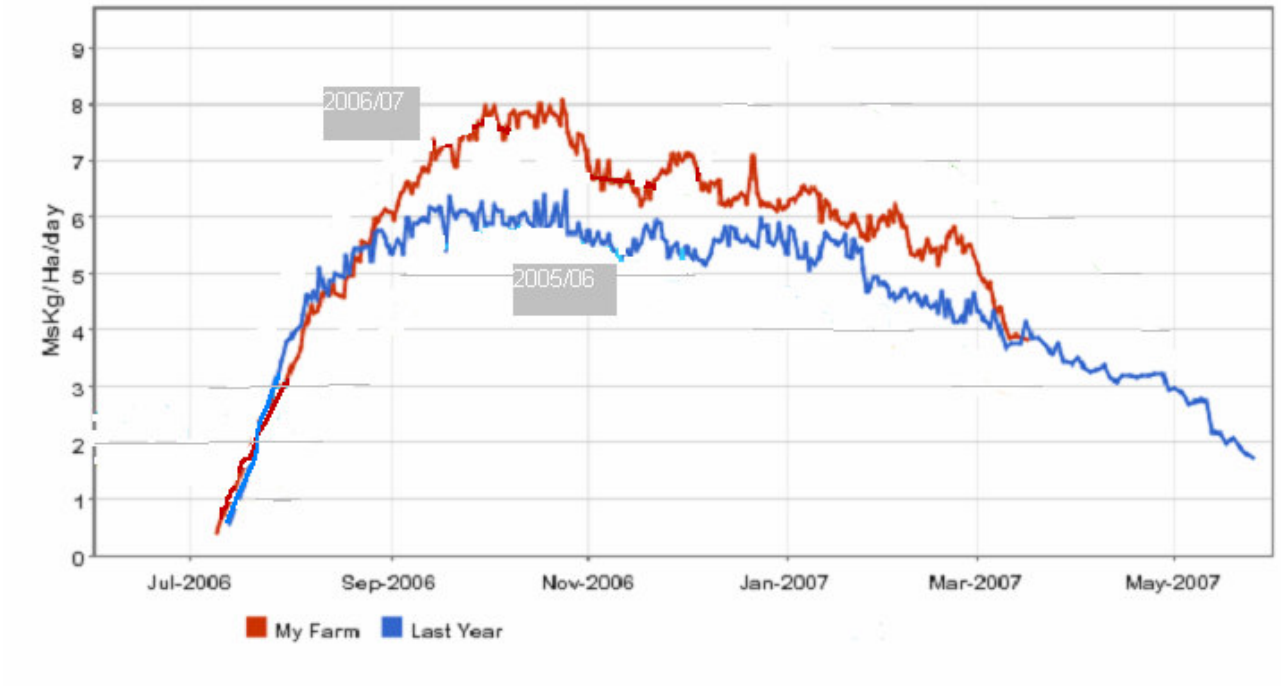


Figure 2. Milksolids production (kg MS/ha/day) on the Frost farm for the 2005/06 and 2006/07 seasons.

Acknowledgements

Thanks to the WWDF Committee for provision of excellent farm and cow resources; Joe Clough (Agriculture New Zealand) for trial co-ordination; Alan and Joanne Mudgway for farm management; Sarah Collis (Dexcel) for technical assistance and Barbara Dow (Dexcel) for statistical analyses. This project is funded by the MAF Sustainable Farming Fund.

References

Clark, D.A.; Phyn, C.V.C.; Tong, M.J.; Collis, S.J.; Dalley, D.E. (2006): A systems comparison of once- versus twice-daily milking of pastured dairy cows. *Journal of Dairy Science, **89*:** 1854-1862.

Davis, S.R.; Farr, V.C.; Stelwagen, K. (1999): Regulation of yield loss and milk composition during once-daily milking: a review. *Livestock Production Science, **59***:77-94.

Rémond, B.; Pomiès, D. (2005): Once-daily milking of dairy cows: a review of recent French experiments. *Animal Research, **54***: 427-442.

Stockdale, C.R. (2006): Influence of milking frequency on the productivity of dairy cows. *Australian Journal of Experimental Agriculture, **46***: 965-974.

Reproductive Performance of Cows Milked Once a Day (OAD)

Dawn Dalley[1], Dave Clark[1] and Neil Bateup[2]

[1]Dexcel Ltd., Private Bag 3221, Hamilton; [2]Farmer, Ohinewai, North Waikato.

Executive Summary

Compared with cows milked twice a day (TAD), cows milked once a day (OAD):

1. Cycle earlier (by up to 8 days)
2. Have higher 3-week submission and pregnancy rates (7% greater)
3. Have fewer days from calving to conception (5 days fewer)
4. Require fewer CIDRs (11% fewer)
5. Have lower empty rates
6. However, poor nutrition in early lactation with cows milked OAD will compromise low empty rates

Research Findings

The initial breed by milking frequency comparison (2000-2004; Clark *et al*., 2006) showed significant improvements in reproductive performance when cows were milked OAD (Table 1). Cows milked OAD had higher 3-week submission rates (SR; +7.3%) and 3-week pregnancy rates (PR; +7.8%) than those milked TAD. Cows milked OAD conceived 3 days earlier, took 5 days less from calving to conception, and used 11% fewer CIDRs than those milked TAD. There was no effect of milking frequency on 3-week conception rate (CR), 6-week SR, CR or PR, days to 1st oestrus or total number of matings per cow.

Table 1. Average CIDR use, 3-week submission rate (SR), conception rate (CR) and pregnancy rate (PR), time of first oestrus and conception, planned start of mating (PSM) to conception, calving to conception and total number of matings for Holstein-Friesian cows milked once a day (FOAD) or twice a day (FTAD) and Jersey cows milked once a day (JOAD) or twice a day (JTAD). Data are the mean of four years. NS = non-significant, SED = standard error of the difference between treatment means.

Item	FOAD	FTAD	JOAD	JTAD	SED	F vs. J	OAD vs. TAD
CIDR use (%)	5.2	23.7	5.9	9.4	3.4	P<0.05	P<0.001
3-week SR (%)	89.7	79.3	94.4	90.1	3.2	P<0.01	P<0.01
3-week CR (%)	46.5	47.3	53.6	44.1	5.9	NS	NS
3-week PR (%)	41.8	37.4	50.4	39.3	5.0	NS	P<0.10
1st oestrus date	2-Oct	2-Oct	29-Sep	24-Sep	2.72	P<0.05	NS
Conception date	5-Nov	7-Nov	2-Nov	7-Nov	1.67	NS	P<0.05
PSM to conception (days)	26.1	28.2	23.8	28.4	1.60	NS	P<0.05
Calving to conception (days)	84.5	87.8	84.6	91.6	2.88	NS	P<0.05
No. matings/cow	1.73	1.72	1.68	1.71	0.1	NS	NS

During spring 2006, an experiment was conducted in Taranaki to investigate the effect of diet quality and metabolisable energy intake on milk production in early lactation. The experiment compared the milk production, energy balance and reproductive performance of cows milked either OAD or TAD from calving, and offered either the standard post-calving diet of pasture plus forage supplement, or this diet supplemented with 5 kg DM/cow/day of a high quality grain supplement, for the first 6 weeks post calving. As the cows calved they were randomly allocated to either OAD or TAD milking groups and either standard or concentrate feeding regimes. Cows calved between 26th July and the 24th August.

Post-partum, anoestrus, interval (PPAI) was determined from milk samples collected twice a week and analysed for progesterone. The results (Table 2) demonstrate that cows milked OAD for the first 6 weeks cycle earlier than those milked TAD, and that offering cereal grain to cows milked OAD does not give any additional benefits. Grain feeding to cows milked TAD decreased PPAI by 3 days.

Table 2. Reproductive cycling information for cows milked once a day (OAD) or twice a day (TAD) and offered either a standard pasture/forage supplement (Std) diet or this diet with concentrates (Conc) during spring. NS = non-significant, PPAI = Post-partum, anoestrus, interval.

	OAD - Std	**OAD - Conc**	**TAD - Std**	**TAD - Conc**	**Significance OAD vs. TAD**
PPAI (days)	30.9	31.4	39.1	36.4	P<0.05
% cycled within 35 days of calving	75	67	50	63	NS
% cycled within 42 days of calving	79	83	66	63	P<0.10
CIDRs used (%)	0	4	8	8	NS

At the Waimate West Demonstration farm (WWDF) a comparison of full-season OAD milking (101 cows, 4.4 Jersey cows/ha) and part-season OAD milking from late January (TAD/OAD; 44 cows, 4.0 Jersey cows/ha) commenced in July 2004. There have been no statistically significant differences in 3-week SR, CR or PR in either the 2004-05 or 2005-06 season, with both herds achieving low empty rates (Table 3). For the current 2006-07 season, the empty rates for the OAD and TAD/OAD herds are 5 and 9%, respectively. However, another 6% of the OAD herd are classified as late calvers. This result is not surprising given the feed pressure that the OAD herd was under through the spring period.

Table 3. Effect of milking cows once a day for a full- (OAD) or part- (TAD/OAD) season on reproductive parameters from 2004 to 2006. SR = submission rate, CR = conception rate, PR = pregnancy rate, PSM = planned start of mating.

	04/05		05/06	
	OAD	**TAD/OAD**	**OAD**	**TAD/OAD**
3-week SR (%)	85	91	95	88
3-week CR (%)	68	79	72	73
3-week PR (%)	57	71	67	64
PR at pregnancy diagnosis (%)	96	96	96	93
PSM to conception (days)	22	25	17.5	20
Calving to conception (days)	84	85	83	84

Analysis of the WWDF calving information has identified that after 2 years of full season OAD milking the mean calving date of the herd has advanced by 7 days, despite no changes in mating start date or the length of the mating period (Table 4). Anecdotal evidence from farmers and more recent research results suggest that cows milked OAD all season cycle earlier and have stronger heats. The 2005-06 season has also seen a reduction in days to conception for the TAD/OAD herd, possibly reflecting an improvement in body condition score of these animals in early lactation.

Table 4. Changes in days from the planned start of mating (PSM) to conception and the mean calving date from 2003 to 2006 when herds are milked once a day for a full- (OAD) or part- (TAD/OAD) season.

	03/04		04/05		05/06	
	OAD	**TAD/OAD**	**OAD**	**TAD/OAD**	**OAD**	**TAD/OAD**
PSM to conception (days)	-	-	22	25	17.5	20
Mean calving date	2 Aug	2 Aug	31 Jul	4 Aug	27 Jul	30 Jul

LIC (P. Gatley, pers. comm.) have analysed the SR data of 26,000 heifers milked OAD during the 2004-05 season and compared this to the SR data for heifers milked TAD in the same season. Heifers milked OAD had a 10% higher SR than those milked TAD (Figure 1), a similar result to that observed in the Taranaki experiments. Holstein-Friesian heifers showed the greatest improvement in SR with OAD milking, however, they had the lowest SR when milked TAD.

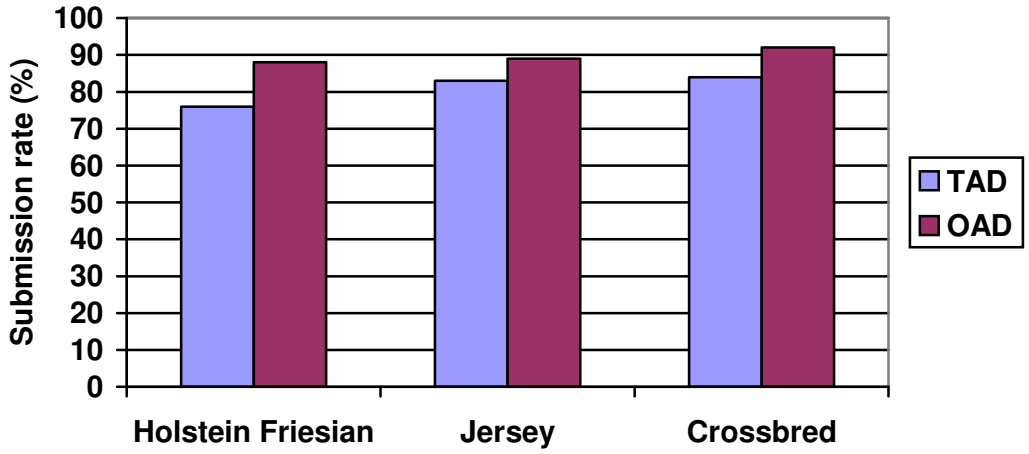


Figure 1. Submission rate for heifers in the national herd milked either twice a day (TAD) or once a day (OAD) during the 2004-2005 season (P. Gatley, LIC, pers. comm.).

Farmer Case Study

Neil and Eileen Bateup are commercial dairy farmers who adopted OAD milking, as Neil had always been concerned that there was too much wastage of high genetic merit, young cows. He believes modern cows are bred to milk, as opposed to looking after themselves, which was manifesting itself as unacceptable empty rates (approximately 10% in 2 and 3 year olds), with 2 year olds often being dried off by the end of February in very thin condition to prepare them for calving the following year. Neil adopted OAD milking for his 2 and 3 year old animals for two years (2002-04), following which he adopted OAD milking for his whole herd. In the 2002-03 season Neil and Eileen had 210, 2 and 3 year old cows. Thirty more 2 year olds were purchased to lift the stocking rate of this herd by 15% and OAD milking began. The OAD milking herd are milked TAD for the 4-5 day colostrum period and then milked in the morning after the TAD herd. They graze the paddocks furthest from the dairy with the remaining 430 TAD cows kept closer.

In all years there have been no CIDRs or inductions used. Cows are artificially bred (AB) for 4 weeks followed by bulls for a further 6.5 weeks giving a total mating period of 10.5 weeks. Kamars are used for heat detection and cows are only checked during the morning milking, no heat detection is done in the paddock.

Neil observed significant improvements in reproductive performance when his 2 & 3 years olds were milked OAD (Table 5; Dalley & Bateup, 2004). Since adopting OAD milking for his entire herd, the high SR (Table 6) and consequently, increased numbers of early, in-calf, AB mated cows, has allowed for more selection pressure on which calves are selected for rearing. Neil has only mated the top 80% of his herd to AB Jersey, the rest being mated to beef sires or short gestation length sires. The replacement rate reared has so far been 20%, which has enabled an increase in herd size as young yearlings are now grazed off and a reasonable level of culling on production (or suitability for OAD milking) has occurred.

The 2006-07 season has seen a rise in the empty rate of the whole herd (Table 6). The vet suspected BVD, however, a subsequent milk test has ruled this out. When the mating data were analysed, half the empty cows were mated to AB and had not

shown any subsequent heats prior to scanning. Like many parts of the country, spring 2006 on the Bateup farm followed a cold wet winter, with consequently lower than desired average pasture cover on the farm. Feed continued to be tight throughout late winter and spring. Neil's mating results suggest that even with OAD milking, good feeding is still required to get good mating results. The fact that half the empty cows showed no heats following their first mating suggests that these animals became anoestrus.

Table 5. Reproductive performance of once-a-day (OAD) and twice-a-day (TAD) milking herds at the Bateup farm for the 02/03 and 03/04 seasons (from Dalley & Bateup, 2004). SR = submission rate.

	02/03		03/04	
	OAD	**TAD**	**OAD**	**TAD**
3-week SR (%)	98.7	88.0	97	85
Empty rate (%)	3	7.6	3.6	8.9

Table 6. Reproductive performance of 2 year olds and the whole herd at the Bateup farm for the 04/05, 05/06 and 06/07 seasons when all cows were milked once a day (OAD). SR = submission rate.

	04/05		05/06		06/07	
	2 yr olds	**All cows**	**2 yr olds**	**All cows**	**2 yr olds**	**All cows**
3-week SR (%)	93	92	94	90	95.5	92
4-week SR (%)	-	97	-	94	-	97
6-week SR (%)	-	99	-	98.5	-	99
Empty rate (%)	3	4	3	5	3	9

Conclusions

The research results, together with industry performance data, has indicated that OAD milking can increase 3-week SR, reduce the time from calving to first oestrus (PPAI) and reduce empty rates. However, like other aspects of OAD milking attention to detail is important, and good levels of feeding in early lactation are required to achieve the observed benefits.

References

Clark, D.A.; Phyn C.V.C.; Tong, M.J.; Collis, S. J.; Dalley, D.E. (2006): A systems comparison of once- versus twice-daily miking of pastured dairy cows. *Journal of Dairy Science, **89***: 1854-1862.

Dalley, D.E.; Bateup, N. (2004): Once a day: Is it opportunity knocking. *Proceedings of the 2nd Dairy3 Conference*, April 2004, Rotorua, ***2***: 1-6.

Does Once-a-Day (OAD) Milking Improve Animal Welfare?

Cassandra Tucker[1, 3], Dawn Dalley[2], Paul Kendall[1] and Dave Clark[2]

[1]AgResearch Ltd., Private Bag 3123, Hamilton; [2]Dexcel Ltd., Private Bag 3221, Hamilton; [3]University of California, Animal Science Department, Davis, USA.

Executive Summary

1. Once-a-day (OAD) milking causes slight shifts in the timing and amount of grazing.
2. Cows milked OAD spend more time lying down, but lie in similar positions compared to cows milked TAD.
3. OAD milking may cause an increase in lameness in peak lactation, but may reduce it by mid-lactation.
4. Cows milked OAD have lower body temperature than cows milked twice a day (TAD).
5. The evidence suggests that OAD milking improves animal welfare, especially later in lactation.

Introduction

There are concerns that cows milked only once daily may experience discomfort due to full udders, especially in early lactation. We conducted two studies to answer questions about the effect of OAD milking on animal welfare. We looked at two ways to use OAD milking: full season - from the time of calving, and part season - with a transition from TAD milking to OAD milking at mid-lactation in January.

Research Findings

Does OAD milking cause udder distension?

Yes and no. By peak lactation (50 days in milk), there is no difference in udder firmness or number of cows leaking milk when they come into the shed. In January, however, cows undergoing the transition from TAD milking to OAD milking had firmer udders and were more likely to leak milk than cows milked OAD or TAD from calving. This difference lasted about a week after the switch to OAD milking.

Does OAD milking change behaviour?

Behaviour did not change in any way that indicates that cows milked OAD are uncomfortable. Cows milked OAD spend less time grazing overall, especially at peak lactation. This result makes sense given that these cows produce less milk and likely have lower metabolic requirements. The pattern of grazing also changed with OAD milking. All cows began the afternoon grazing activity around the same time as the afternoon milking (Figure 1). However, when cows were milked TAD, this grazing activity was interrupted by milking. Cows milked TAD increased their grazing activity immediately following the return from afternoon milking (Figures 1 and 2). It is also interesting to note that cows were much more likely to graze at night in spring (Figure 1) than in summer (Figure 2).

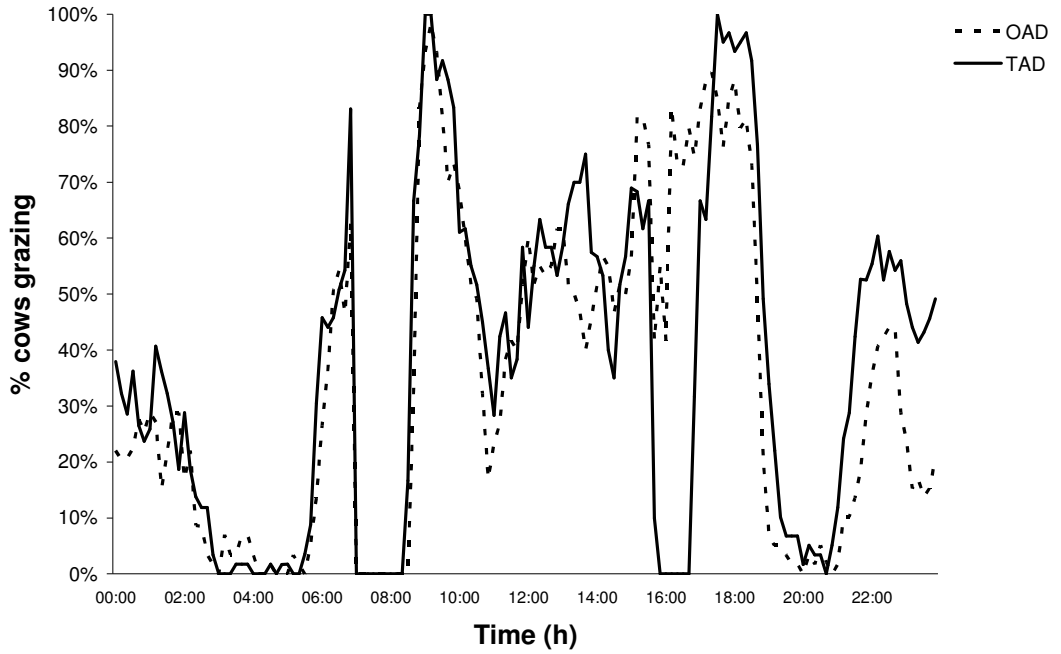


Figure 1. Percentage of cows grazing over a 24-h period at peak lactation (September). Cows were milked either once a day (OAD; dashed line) or twice a day (TAD; solid line) from the time of calving. From Tucker *et al*. (2007).

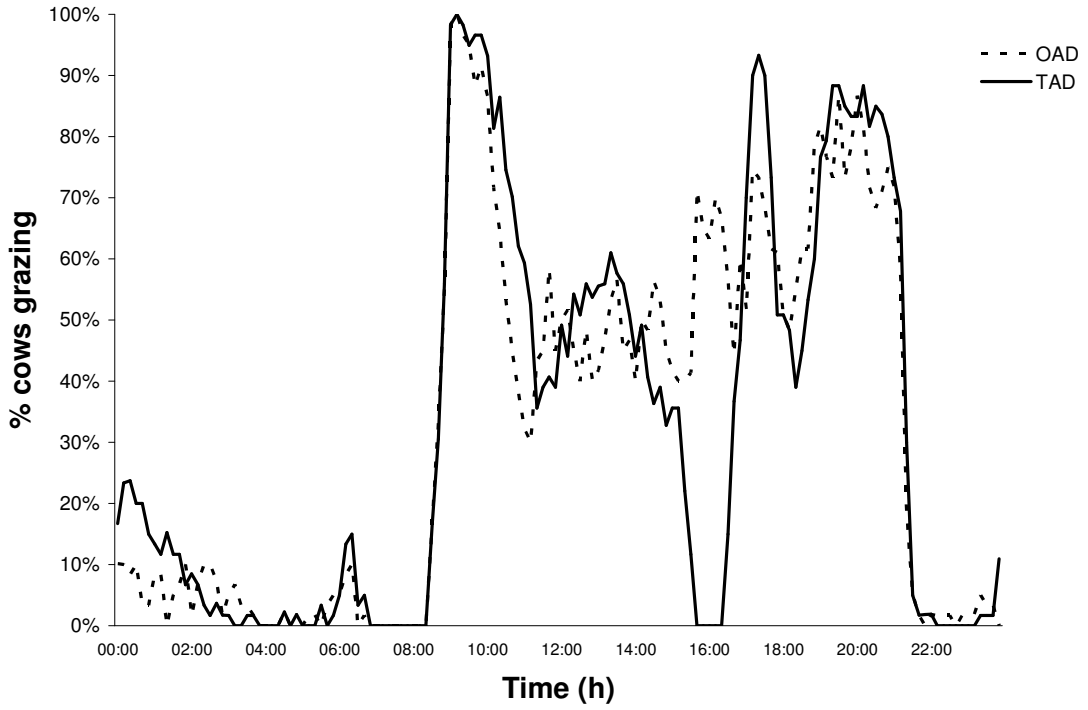


Figure 2. Percentage of cows grazing over a 24-h period at mid-lactation (January). Cows were milked either once a day (OAD; dashed line) or twice a day (TAD; solid line) from the time of calving. From Tucker *et al*. (2007).

Cows milked OAD spent 1.5 hours more per day lying down at peak lactation than cows milked TAD. We also looked at the postures of cows while they were lying down. We predicted that if cows were uncomfortable, they would lie with their hind legs away from the udder. However, there were no differences in lying postures at peak or mid-lactation.

Cows with painful teat injuries are more likely to kick while being milked. At peak lactation, cows were just as likely to kick in the shed, regardless of whether they were milked OAD or TAD.

Does OAD milking affect lameness?

At peak lactation, Irish researchers have found that cows milked OAD were more likely to be lame (Gleeson *et al.*, 2007). Cows were more likely to swing the hind legs out at this time, indicating that there was some discomfort around the udder. Under NZ conditions, we did not find any differences in stride length between cows milked OAD or TAD at peak lactation. However, we would need to look at more than 40 cows to fully answer this question.

Cows with healthier hooves take longer strides than lame cows. At mid-lactation, cows milked OAD took slightly longer strides than cows milked TAD, under NZ conditions. Irish researchers have also found that cows milked OAD are less likely to be lame and have sole lesions later in lactation. OAD milking likely reduces hoof wear and the susceptibility of cows to lameness after early lactation.

Does OAD milking reduce heat stress?

Yes, it is very likely that OAD milking reduces heat stress in cows. Cows' body temperature peaks in the afternoon, when the weather is warmest. When cows are only milked in the morning, their body temperature is lower and they do not have the same rise in body temperature as cows milked TAD (Figure 3). Many factors may contribute to lower body temperatures in cows milked OAD, including lower heat production because of less feed intake and not walking to the shed in the afternoon.

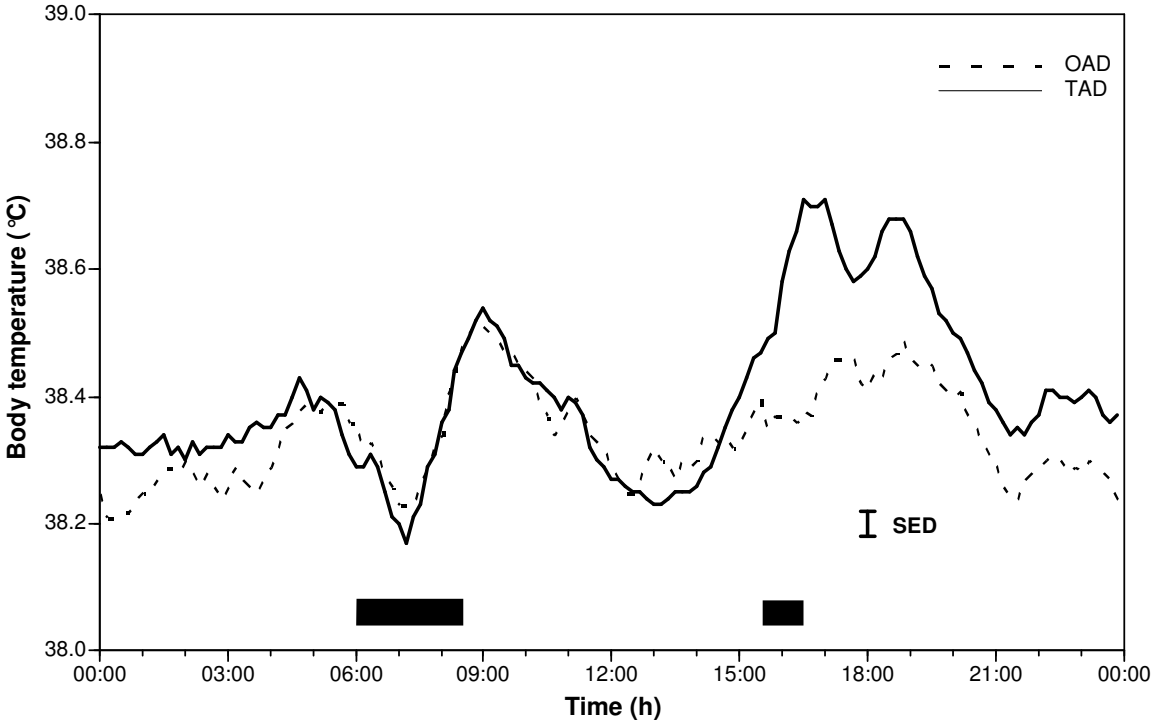


Figure 3. Body temperature (°C) over a 24-h period of cows milked once a day (OAD; dashed line) or twice a day (TAD; solid line) at mid-lactation (January). The solid black bars show when the cows were milked.

Conclusions

So, does OAD milking improve animal welfare?

Yes, the evidence suggests that OAD milking improves animal welfare, especially later in lactation. There is still some concern that cows milked OAD from calving may experience discomfort in the first few weeks of lactation, but further research is required to understand more about that time period. Switching to OAD milking in January provides many benefits, including reduced risk of heat stress and lameness.

References

Gleeson, D.E.; O'Brian, B.; Boyle, L.; Earley, B. (2007): Effect of milking frequency and nutritional level on aspects of the health and welfare of dairy cows. *Animal, **1:***125-132.

Tucker, C.B.; Dalley, D.E.; Burke, J.-L.K.; Clark, D.A. (2007): Milking cows once daily influences behaviour and udder firmness at peak and mid lactation. *Journal of Dairy Science, **90***:1692-1703.

3 Milkings in 2 Days

Brent Boyce

FarmWise Consultant –LIC, Nelson & Marlborough

Introduction and History

The main aim of this paper is to give a practical overview of milking 3 times in 2 days (3 in 2). I will also endeavour to discuss the pros and cons of using this regime.

The first significant origins of 3 in 2 started in the 1970's and 80's. The two most common 3 in 2 milking regimes were 16-hour and 18-hour milking, respectively. The main reasons for reducing milking frequency from four times in 48 hours to three times were similar to today's reasons: cow condition, feed and feet problems, climatic challenges, farm logistics, high somatic cell counts (SCC), staff problems, and unable to use once-a-day (OAD) milking as an emergency measure.

Very few farmers went to these 16- or 18-hour milking regimes from first choice – often they were forced into it due to the challenges experienced. After the challenge was mastered, the farmers usually went back to the traditional twice-a-day (TAD) milking regime.

So why didn't these farmers continue milking on these regimes? The main reason I have found is that the hours were just non-compatible with the people. So basically, these regimes were relegated to an emergency option, only used when OAD milking wasn't practical.

The Evolution of 3 in 2

The resurgence to the current 3 in 2 milking regime started in Nelson and Marlborough in January 2001. Peter and Niki Brooks of Murchison started the 2000 season as per normal on TAD milking, but then switched to the 16-hour regime in November 2000. Farms in the district were experiencing severe feet problems with their dairy cows, as a consequence of continual heavy rainfall events. The Brooks' had used 16-hour milking as an emergency option in the past, and were quite familiar with it. They were practising the traditional 16-hour times of 5.30am and 9.30pm on day one, and 1.30pm the following day. Like everyone else who had spent considerable time milking at these hours they were finding it quite inconvenient.

At this stage, we investigated the possibility of altering the milking time splits. On TAD milking, the Brooks' had milked at 5.30am and 3.30pm – a typical 14/10 hour split. So we thought – hey if we can have such big variances on TAD milking, what can we do with a reduced milking frequency regime? So we changed the times - keeping the morning milking at 5.30am, and brought the night in to 7.30pm, and the day milking to 11.30am.

These split of hours became the new name for this milking regime, as it quickly became known locally as 14/16/18. Of course 14/16/18 milking quickly drove Fonterra and Westland, and the LIC Herd Testers absolutely nuts. Trying to schedule tanker pickups and herd testing accurately around 14/16/18 was a very hot topic for the first two seasons.

The popularity of the system and the hours have grown, and up to 30% of the districts suppliers can now be found milking on 3 in 2 from Christmas onwards. Furthermore, it has now slowly spread throughout the country. Of course, once the first farmers found that the hours could be manipulated further, we had to change the name from 14/16/18 to what it is today – known simply as 3 in 2.

Full Season Use of 3 in 2

It is important to note here, that during the last 10 seasons, I have only known two properties in my region that have milked on a 16-hour milking regime for the whole season. Neither farmer was originally my client. As such, I was only able to help them from halfway through the season (*immediately* altering the milking times to the less rigid 3 in 2 regime).

Production wise, these properties peaked lower, e.g., 1.7 kg milksolids (MS)/cow/day vs. 2.0 kg MS/cow/day on TAD milking. They also had a flatter lactation curve, typically around 7% rate of decline from peak; compared with the 9-10% they experienced on TAD milking. Total production was down 5-10% on their previous TAD milking seasons. These results, however, need to be considered in light of the fact that these two farms went onto 16-hour milking for the whole season because they had to. What they would have produced on TAD milking can only be guessed.

Four seasons ago, a client of mine went onto 3 in 2 at the start of artificial insemination (AI) - they had their own AI technician. I felt it would be too early (in terms of the udder holding capacity of cows at peak lactation) and so it proved, as the cows peaked at only 1.7 kg MS/cow/day compared with 1.9 kg MS/cow/day on TAD milking during the previous year. That experience gave us an indication of when it is too early to change over from TAD milking to 3 in 2 milking. Since then, the end of AI (late November - early December) is considered the earliest time, when the change over will have a minimal effect on milk production.

Would I recommend milking on 3 in 2 for a whole season? Yes, if I had the opportunity to set things up properly. It would depend totally on farm logistics and the exploration of all options. I believe that 3 in 2 is one way of tackling pressure situations, and it can be successfully used as part of the solution package. I am completely comfortable recommending 3 in 2 as a normal part of the milking season, particularly from the end of AI onwards.

How to Use 3 in 2

The vast majority of my local 3 in 2 farmers start their 3 in 2 milking programme any time from the end of AI, to mid-January. Lets make an example:

- A 100 ha property milking 300 cows. It has 50 two-ha paddocks, and you typically graze two paddocks (4 ha) per day. During peak growth you manage to get down to an 18 or 20 day round by dropping out 10 to 14 paddocks for silage.

- It's now coming up to Christmas, and you are back on a 25 day round with the silage paddocks well and truly back in. So what about going to a 30+ day round for summer? On a standard TAD milking farm – you would simply feed

half a paddock of grass for the day feed, and one whole paddock of grass for the night feed – giving a 33 day round.

- If you are going to change to 3 in 2, simply go to *one paddock per milking*. It is as simple as that. You can go straight onto a 33 day round. Note that there are now no tapes to shift right through summer and early autumn. The simplest point about feeding like this is that the size of feeds stays the same at 2 ha per milking – dead easy for adding in supplements if required.

- So what about if you grow summer turnips and you want to go to 3 in 2 and a 30+ day round? Simply feed the turnips after the morning milking on day one, and before the noon milking on day two. This makes the turnips available at a similar time each day.

When to milk? I usually suggest that you milk at whatever time you would normally milk in the morning. Say any time between 4.30am and 6 am. During the heat of the summer, milk between 7 and 7.30pm at night, and between 11.30am and 1pm for the noon milking the next day. Be flexible. If you are going out on Friday night, milk the cows at 6.00pm if you need to – then say at 11am the next day, just to crib a bit of time from the earlier milking the night before. The important thing is to be flexible – the cows can cope if you can.

A very important note - when the nights start drawing in through March, ease the night milking back by half an hour every 2-3 weeks. By the end of April, my clients are usually milking at 6pm at night, and by the end of May at about 5pm at night.

For those people that are doing the evening milking, ideally they should be finished their day's work on farm by 1.00pm. They should then have the afternoon off till the start of the evening milking. Those staff members that aren't doing the evening milking can work to say, 5pm. These hours are very, very, important for staff and management morale and sustainability. Everyone gets to sleep in the next day. I would suggest that you work an 8 to 5 day on the second day. All my farmers say that they are able to complete a lot more work under the 3 in 2 regime than what they normally can with TAD milking.

Note that some people cannot handle 3 in 2. If it isn't going to work, don't force it.

Pros and Cons of 3 in 2

The biggest *disadvantage* of 3 in 2 for *people* is the milking times. Inversely – the biggest *advantage* of 3 in 2 for the *cows* are the milking times. But for people, the evening milkings are still a pain, as they can cut into social time. It does require more organisation - that is the main downside. During the heat of the summer though, a 7pm milking can be very enjoyable. And remember – the evening milking is only every second evening. This is the price for everyone enjoying the sleep-in on the second day. The best thing with 3 in 2 is that you can work office hours every second day right to the end of the season.

The big points that are improved by using 3 in 2 from Christmas onwards are heat, meat, feet and teat. By milking early in the morning and in the cool of the evening, and having the cows back in the paddock before it gets too hot in the second afternoon; you reduce the heat stress on the cows during summer (heat). They also spend more time resting and eating – giving more opportunity to maintain condition

(meat), and hold milk production (teat). And of course they have reduced their walking by 25% (feet).

Expenses wise, two of my regular 3 in 2 clients are in a benchmarking group with 9 other farmers under similar farming conditions. They are placed 1st and 2nd for profitability in this group. Their milksolids production per cow and per ha is at the upper end of this group as well. From their results, and from my other clients on 3 in 2, I have reached some informal conclusions on what is happening.

- The cows have always ended the season in good order when on 3 in 2 – better than they have traditionally achieved on TAD milking for the whole season. Farmers have nearly always done the same or more production for the whole season when they have gone to 3 in 2 post-Christmas (seasonal fluctuations notwithstanding). All farmers on 3 in 2 have found that they can milk nearly every single cow right to the last day. It is likely that the increased days in milk for more of the cows have been one of the main drivers for improved production.

- A number of farmers have commented that their calving spreads have tightened and that their in-calf rates have improved compared to when they were on TAD milking. Whether this is a result of the 3 in 2 milking regime is an unknown, but the farmers concerned are convinced of it. From a long-term point of view, the farmer's opinion that their cows' reproductive performance has improved will also have an impact on profitability.

- Farmers have also found that they have not had to buy in or feed out as much extra dry matter in the autumn period in order to put weight back on cows going into the winter. In general, we have also figured a shed cost saving on power etc. of $1/cow/month, e.g., 300 cows on 3 in 2 for five months can save $1,500.

Going to 3 in 2 around Christmas usually means that there is no negative effect on SCC. Cows can usually hold the same amount of milk after 5 months of lactation (when they are changed to 3 in 2), that they were holding for a typical 15/9 hour split when they were on TAD milking. I actually get quite frustrated at a typical afternoon milking in the middle of summer when the cows walk all that way in the heat to give 5 or 6 litres – by waiting till when the udder is full a few hours later you can certainly beat the attack of the slack sack!

To help answer a lot of our questions on 3 in 2 milking, we need to look forward to the full utilisation of DairyBase by farmers. The different farming and milking regimes can then objectively be dissected, measured and compared on all aspects of production and performance.

3 in 2 in the Future

Farmers will continue to evolve their systems to better suit staff, the environment, and the logistics they work under. OAD, TAD, and 3 in 2 milking systems will all have their roles to play – every farm and farmer is different, and it is our role to help them optimise the system they wish to utilise in their business.

A simple system that a couple of my clients have been using for the last two seasons may well be a pointer to the future. They are using a combination of all three systems:

- They spend the first round (40 to 50 days) on OAD milking. This makes for an easy start to calving – people and cows thrive not just survive.
- At the end of the first round, they go onto 3 in 2 in their 50 paddocks, and feed one paddock per milking – making for an approx. 30 day round until feed supply comes away. At this stage, the break fences are put away for the season.
- As soon as supply equals demand, the herd then goes on to TAD milking, utilising an 18-25 day round (depending on growth, silage and turnips etc.). They stay on TAD milking until the end of AI, or till Christmas.
- At this stage they go onto 3 in 2 with an approx. 30 day round. They continue on 3 in 2 until the last round in mid-April.
- Then they go onto OAD milking until the very last pick up, utilising a 50 day round.
- They will milk 432 times for the season, not the 602 times on TAD milking, with production the same or better than what they achieved on TAD milking.

Note that these farmers have kept at *a paddock per milking* since September. They have specifically adjusted round length to match milk harvest timings and lactation production. Simple, productive, and profitable dairy farming.

So this year, give the cows, yourself and your staff a break. Ask them if they are keen (you usually find they all want the sleep in – but don't want to do the Friday or Saturday night milkings!). Ease things off slowly, and match round length to milking frequency.

Social Impacts of Once-a-Day (OAD) Milking

Rupert Tipples[1], Nona Verwoerd[1], Denise Bewsell[2], Dawn Dalley[3], Dave & Doug Turner[4]

[1]Lincoln University, Christchurch, [2]AgResearch Ltd., Lincoln, Christchurch, [3]Dexcel Ltd., Private Bag 3221, Hamilton; [4]Farmers, Rakaia Island Dairies.

Executive summary

1. The key factors motivating farmers to adopt once-a-day (OAD) milking are:
    a. Herd expansion,
    b. Time needed to build capital,
    c. Labour management,
    d. Feed shortfalls, and
    e. Herd health and management factors
2. Employer advantages
    a. Reduction in staff turnover, absenteeism, sick leave and accidents
    b. Staff work faster, take more responsibility and combine jobs in effective ways under OAD milking
    c. Opportunity to restructure the staffing arrangements and develop new strategies
    d. Extending the working life of dairy farmers
3. Employee advantages
    a. Shorter or more acceptable working hours,
    b. Enhancement of family life,
    c. Prospect of a more balanced lifestyle

Introduction

OAD milking has been the subject of research for several decades because it is an effective means of reducing the daily time involved in milking. OAD milking changes the whole working day, freeing up afternoons and evenings and allowing weekends off for the cost of one contracted milking. However, individual cows milked OAD for short periods could lose, on average, 19% of milk yield compared with those milked twice-a-day (TAD) (Davis *et al*., 1999). Given this, farmers were understandably reluctant to try OAD milking throughout the whole lactation. However the increasing popularity of this system in New Zealand has challenged this thinking. As there was little information identifying what motivated farmers to adopt OAD milking, and the implications of doing this, research was needed. In this paper we outline the results of two studies. In the first, the key factors motivating farmers to adopt OAD milking were explored. In the second study, the social implications of OAD milking were investigated.

Research Findings

Study 1: Why milk OAD?

We interviewed 21 dairy farmers across New Zealand who were milking OAD. Based on the information gathered, we found the key factors motivating farmers to adopt OAD milking were:

- Herd expansion,
- Time needed to build capital,
- Labour management,
- Feed shortfalls, and
- Herd health and management factors

Using this information farmers were able to be classified into six segments.

Segment 1 – Transitional OAD

Farmers in this segment had switched to OAD milking to assist in managing the transition to a larger dairy farm. Farmers in segment 1 were developing their farm by expanding herd numbers and/or acquiring more land. This had put some strain on current farm resources. For example, the shed maybe too small to cope with larger cow numbers on TAD milking, the races may need to be upgraded, and extra employees may be needed to help manage the development. However, these farmers were also trying to increase profit so they could invest in developing infrastructure. Farmers in this segment may not be permanent adopters of OAD milking.

Segment 2 – Avoiding capital expenditure

Farmers in segment 2 were similar to those in segment 1 because they were limited by resources and infrastructure. However, they did not wish to invest in upgrading the farm facilities for various reasons. These farmers had decided to switch permanently to OAD milking in order to manage with a smaller shed, no extra employees and with other existing infrastructure.

Segment 3 – Decreasing own labour

Farmers in segment 3 wanted to reduce their own labour input. This could be because they wanted more time with their family, or to cope with health problems. Farmers in this segment are often called lifestyle OAD milkers.

Segment 4 – Increasing flexibility

Farmers in segment 4 were similar to farmers in segment 3 in that they wanted to manage their labour requirements differently. However, they saw OAD milking as a chance to be more flexible with both their own and employed labour. Farmers in this segment were able to reallocate labour to other jobs on the farm at busy times.

Segment 5 – Feed shortfall

Farmers in segment 5 had adopted OAD milking to manage shortfalls in feed. These farmers were using OAD milking at the start and end of the season. They milked TAD when they were able to fully feed their cows. Farmers in this segment could also use OAD milking as a tool to manage other feed shortfalls experienced during the year. Farmers in this segment tended to be opportunistic adopters of OAD milking

Segment 6 – Herd management

Finally farmers in segment 6 had switched to milking OAD to help manage their herd. Farmers in this segment may want to improve the condition of a herd, manage health issues or may not want to walk cows a significant distance TAD.

Study 2: What happens when you milk OAD?

Formal and informal interviews on OAD milking were conducted with 6 farmers who employed staff. Two farmers were milking OAD; two were milking TAD but were considering change, and two were milking TAD and had no intention of changing. In addition, 8 workers on dairy farms were interviewed, and several wives and partners of men involved in dairy farming.

Some factors impinging on OAD milking from the point of view of the employer

Number and level of staff needed

Farmers who are already milking OAD discussed the pressure from staff to change from TAD to OAD milking. The working day was made shorter, although wages and staffing levels were left unchanged. One employer noted that during the first year of OAD milking profit went down, however, staff turnover went down to zero. Absenteeism, sick leave and accidents dropped dramatically. Another farmer mentioned that staff worked faster, took more responsibility and combined jobs in effective ways under OAD milking. Time for training was also identified as a positive. OAD milking meant there was time to get the staff together for an hour or two each week for training.

Tapping into new sources of labour

When transferring from TAD to OAD milking, there is an opportunity to restructure the staffing arrangements and develop new strategies. For example, one employer separated his staff into two groups. Members of the first group came on-farm only to milk and were paid contract wages. The second group performed other farm jobs, preferring the variety and stimulus of general farming jobs. This strategy enabled the employer to tap into a pool of local women who were willing to work while their children were at school. OAD milking may produce access to a new source of labour not previously available or utilized.

Extending the working life of farmers

Some respondents mentioned that local farmers, who would normally have been starting to think about retirement, had switched to OAD milking and reduced their herds, as an intermediate stage between full employment and full retirement. This left them with a home, a familiar and structured lifestyle, status and goals, but also gave them a good few hours of free time each day and made the working load much lighter. If such a pattern were to become a general trend, the New Zealand dairy industry might greatly benefit from the experience and production afforded by such farmers, who would otherwise have been lost to the industry.

Some factors impinging on OAD milking from the point of view of the employee or farm worker

Entering the dairying labour market

If OAD milking is offered, the work environment changes dramatically. Shorter or more acceptable working hours, enhancement of family life, and the prospect of a more balanced lifestyle, may offset a possible drop in income. Every farm worker interviewed showed a strong interest in this aspect of OAD milking.

Choosing between OAD and TAD milking

Interviews with farm workers showed that OAD milking is a very topical subject and is being hotly debated. Some cynicism was voiced about the prospect of OAD milking ever taking off, but every worker consulted said that they would love to have a more balanced lifestyle. When asked whether they would take a drop in income in return for shorter working hours there was some hesitation, but several workers pointed out that many of their friends had left the dairy industry and gone elsewhere to work for lower wages in return for “normal” working hours.

The possibility of a more balanced lifestyle
At present, the hours worked on dairy farms vary from employer to employer and sometimes changes from summer to winter. During calving very long hours and a general lack of sleep are norms. It is not unusual for farm workers to start their day at 4 a.m. and to work, with a break after lunch, till 7 p.m. This means that workers only see their families in daylight hours during weekends off, usually every second week or so. However, workers and their wives/partners report a huge improvement in their lives with a change to OAD milking. They talk about taking part in sport (particularly after daylight saving starts), reading the occasional newspaper, and having time to socialise.

Farmer Case Study – Rakaia Island Dairies

David & Margaret and Doug & Helen Turner of Rakaia Island Dairies adopted OAD milking in July 2004 as a strategy to increase milksolids production per ha from their 1550 ha farm at the mouth of the Rakaia River. Milking off the runoff meant they required more cows to improve pasture utilization, however, they were reluctant to invest more capital with a 4th milking shed so introduced OAD milking. At the changeover an additional 1400 heifers were introduced to the herds over night but staff were still expected to work a normal eight-hour day.

Morning milking starts at 6 am on all three farms. Prior to adopting OAD milking commenced at 4.45 am. At peak lactation milkings take between 7 and 7.5 hours, reducing to 6 hours in late lactation. There are 7 people per 1700 cows and currently they are achieving 80 000 kg MS per person. By comparison, the Turner Bros TAD milking farm at Woodstock achieves 76000 kg MS per person. Following milking, staff continue with other duties until the end of the business day around 5 pm. By comparison, staff on the Turner Bros TAD milking farm at Woodstock start milking at 5 am and then again at 2 pm and finish around 5.30 pm. Staff in the OAD milking system have an hour off for breakfast and duties are split between getting the cows in and milking to avoid boredom. At Woodstock, staff have a longer break in the middle of the day. While staff on both sites work similar hours per day, the day is longer on the TAD farm because of the earlier start. Staff on both farms work an eight on – two off roster, although there is some flexibility for special events.

Staff turnover on the farm is low. The farm currently employs 24 staff of which only 2 are planning on leaving at the end of the 2006-07 season. One is returning to the Ukraine and the second is moving from his current 2IC position with Rakaia Island Dairies to a management position on another farm. The scale of the operation allows promotion from within. Attracting and retaining staff was not an issue when the farm milked TAD as Doug and David pride themselves on their staff relations. Staff are provided with a well-equipped staff room that includes Sky television and a barbeque area.

Staff work on average 55 hours per week and one of the advantages that OAD milking brings is that the staff are not sitting on bikes following cows to the dairy in the heat of the day. In the afternoons staff are doing odd jobs around the farm, which increases the diversity of the roles and avoids the grind of the afternoon milking. Doug and David believe that the staff aren't as tired with OAD milking and they have very few sick days. With the cows being "happier" and healthier on OAD this has a positive impact on staff morale. Another advantage of OAD milking is that if there is a breakdown at milking it doesn't impact on time spent with family in the evenings. The staff also have more time for hobbies and social activities, e.g., dinner and

movies, as they aren't under as much pressure to get home early for the early morning milkings experienced with TAD milking. Whether they can attribute the current baby boom on the Island to OAD milking is still being debated!!

The key to the success of this system is the management of the long milkings. Two people milk the first 2 herds, and then a second pair comes in for the next two herds. Managing the long milkings could be achieved two different ways:

- A small shed with a large enough team of staff to allow the milkings to be split between two teams of staff – Rakaia Island model.
- A large shed with quicker overall milkings, but with a smaller team of staff doing all of the milking.

Implications and Conclusions

The considerable benefits from switching to OAD milking were highlighted in both studies. Given the segments identified, case studies need to be developed that reflect the motivations or goals of farmers adopting OAD milking. In particular, stories that reflect short-term adoption of OAD milking to develop the farm are important (segment 1).

OAD milking is unlikely to resolve all employment, recruitment and retention problems currently facing dairy farmers. However, the significant benefits of OAD milking indicate a potential benefit to the industry that merits further research.

References

Tipples, R.; Verwoerd, N. (2006): Social impacts of once-a-day milking. *Primary Industry Management,* ***9***: 37-39

Davis, S.R.; Farr, V.C.; Stelwagen, K. (1999): Regulation of yield loss and milk composition during once daily milking: a review. *Livestock Production Science,* ***59***:77-94.

Mastitis, Somatic Cell Counts, Animal Health and Once-a-Day (OAD) Milking

Dawn Dalley[1], Jane Lacy-Hulbert[1], Dave Turner[2] and Doug Turner[2]

[1]Dexcel Ltd., Private Bag 3221, Hamilton; [2]Farmers, Rakaia Island Dairies.

Executive Summary

1. Milking once a day (OAD) does not by itself increase the risk of mastitis
2. Cows milked OAD tend to show more clear visible signs of clinical mastitis
3. Cows milked OAD have a somatic cell count (SCC) that can be twice as high as cows milked twice a day (TAD), especially in later lactation
4. Switching from TAD to OAD milking will require some planning and an increased focus on mastitis detection
5. Ensure a good degree of teat coverage with teat sanitiser and use dry cow antibiotic therapy at the end of lactation to reduce the existing infection levels and lower the risk of calving with mastitis
6. Treat clinical mastitis as for a cow being milked TAD, but avoid antibiotics requiring 12-hourly treatment
7. Ensure cows are well milked out at every milking

Introduction

Farmers contemplating a long-term switch from TAD to OAD milking are able to plan for an estimated 15-20% drop in milk yields. Strategies such as increasing the stocking rate or using the LIC OAD selection index are options for mitigating some of the milk yield losses associated with OAD milking. However, there have been conflicting reports of the effects of OAD milking on milk somatic cell count (SCC) and very few studies have looked at the infection status of cows exposed to OAD milking. The previous OAD milking trial conducted in Taranaki provides a realistic demonstration of the long-term effects of OAD milking on milk quality. By determining the bacteriological status of individual quarters at regular intervals, the study also allowed the effects of mastitis on milk SCC to be disentangled from that of OAD milking. The study showed that the incidence of new infections at calving and drying off were similar between the two milking frequencies. This was true for infections caused by both major pathogens, such as *Streptococcus uberis* and *Staphylococcus aureus,* and for minor pathogens, such as coagulase negative staphylococci or *Corynebacterium bovis*. Other results from this four-year study have helped to answer several frequently asked questions, as detailed in the following section.

Research Findings

Are cows milked OAD more at risk of developing mastitis?

Cows milked OAD or TAD are at a similar level of risk for developing new infections. That is, milking OAD does not by itself increase the risk of mastitis. However, cows milked OAD tend to show more clear visible signs of clinical mastitis.

Do cows milked OAD have a higher SCC?

Research shows that cows milked OAD have an individual SCC that can be twice as high as cows milked TAD (Lacy-Hulbert *et al*., 2005). This relationship holds true for cows that are uninfected, or cows that have a sub-clinical infection, as well as for

cows that have had clinical mastitis. This difference starts to show once cows have moved beyond peak lactation (weeks 6-8 after calving) and remains until the end of lactation. Figure 1 shows an example of this relationship for uninfected cows during the 2003-04 season.

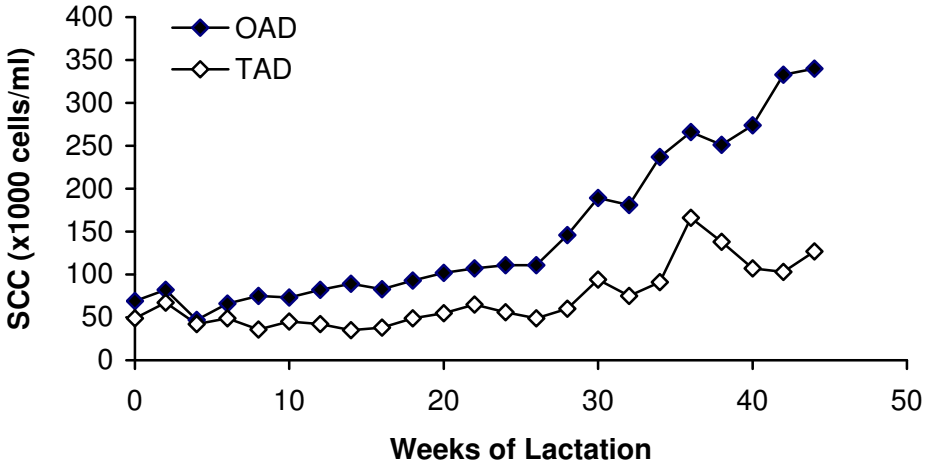


Figure 1. Variation in individual cow SCC over the 2003-04 season, for uninfected cows milked either once a day (OAD) or twice a day (TAD) for a whole lactation.

While research results showed elevated SCC with OAD milking, this has not always been the case on commercial farms. In several instances farms have observed a decrease in SCC when OAD milking has been adopted. This drop in SCC may be attributed to better management of mastitis and individual high SCC cows by farmers, and in some cases, a reduction in the stress levels of the cows through less walking and less time spent on laneways and in cow yards.

What impact does milking OAD have on the bulk milk tank SCC (BMSCC)?
There are likely to be greater increases in BMSCC during the second half of lactation, which may require high SCC cows to be dried off early.

What changes can I expect when switching from TAD to OAD milking?
Switching from TAD to OAD milking will require some planning and an increased focus on mastitis detection. If the switch is made during lactation, the BMSCC will need to be able to accommodate a short-term increase in BMSCC, usually in the order of a doubling. This spike will calm down within a few days, but some cows may also develop clinical mastitis in this time.

In the long term, a switch to OAD milking will require dedicated attention to mastitis detection and treatment. OAD milking tends to magnify and expose deficiencies in mastitis management practices. Managing the BMSCC proactively, particularly in the second half of lactation, will be required in order to meet milk quality requirements.

The Waimate West Demonstration Farm (WWDF) comparison has provided valuable information on the impact of full- and part-season OAD milking on average BMSCC (Table 1) and trends in BMSCC throughout the season (Figures 2 and 3). While the average BMSCC rose slightly in the second year of the trial (2005-06 season) the OAD milking herd was below the district average for all but 3 pickups during the season (Figure 2). The BMSCC can be very sensitive to undetected cases of clinical mastitis, as depicted by the spike in cell count in late October in Figure 2. For the part-season OAD milking herd (Figure 3) the switch to OAD milking in late January

was followed by a period of higher and more variable BMSCC than the previous month and cell count rose slowly till the end of the season. Dry cow therapy in all years has been administered according to the SAMM plan.

Table 1. Average bulk milk SCC (cells/ml) for the last season (2003-04) on twice-a-day (TAD) milking, and the first 2 seasons (2004-06) with full- or part-season once-a-day (OAD) milking at the WWDF.

	2003-04	2004-05	2005-06
TAD	185 866	-	-
TAD/OAD	-	181 885	208 972
OAD	-	173 854	197 307

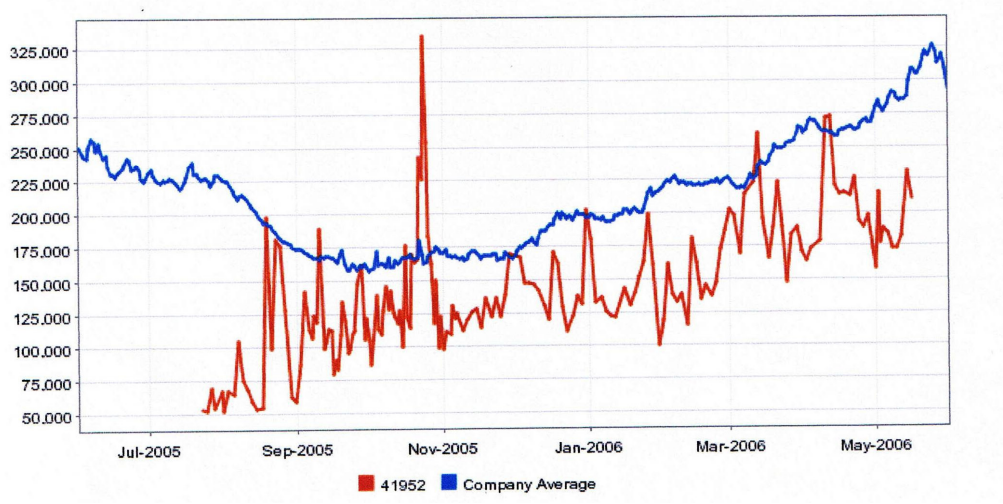


Figure 2. Bulk milk SCC (cells/ml) for the full-season once-a-day (OAD) milking herd at the WWDF during the 2005-06 season, compared with the dairy company average.

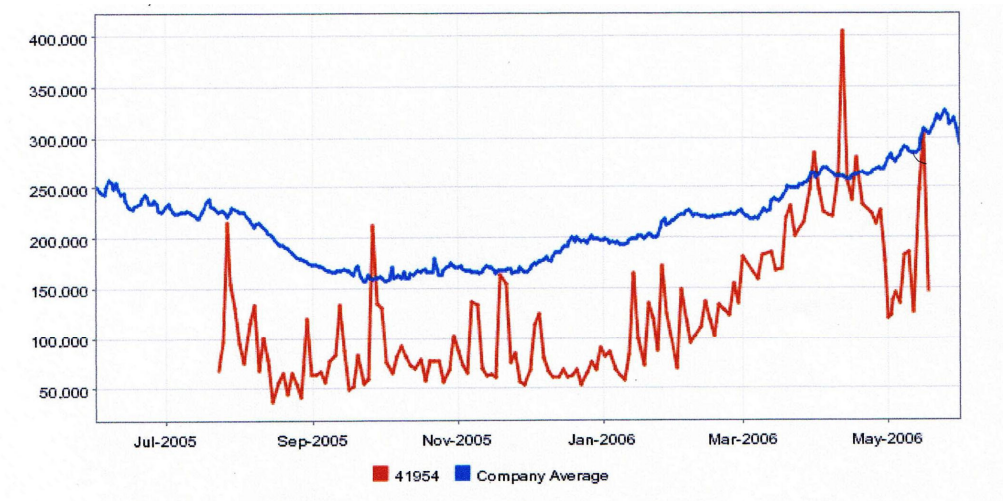


Figure 3. Bulk milk SCC (cells/ml) for the part-season once-a-day (OAD) milking herd at the WWDF during the 2005-06 season, compared with the dairy company average.

How do I manage and prevent mastitis on OAD milking?
Using teat spraying during lactation and improving the degree of teat coverage with teat sanitiser will reduce the risk of bacterial contamination on the teat end and, therefore, reduce the risk of mastitis.

The use of dry cow antibiotic therapy at the end of lactation will reduce the existing levels of infection and lower the risk of calving with mastitis in the following season. Starting the next season with a "clean slate" should make mastitis detection and treatment more manageable.

How do I detect and treat mastitis on OAD milking?
Cows with sub-clinical mastitis are a major contributor of somatic cells to the BMSCC. Detection via regular herd testing and use of SCC information will be an important tool for keeping SCC levels within appropriate levels. Cows with a high SCC should be checked for mastitis by stripping out the foremilk and examining for visual signs, or by using the rapid mastitis test (RMT), or by testing foremilk conductivity. Advice on sub-clinical treatment options should be sought from the veterinarian.

Treat clinical mastitis as for a cow being milked TAD. Antibiotic treatments with 12-hr treatment intervals should be avoided; they require extra labour and should be applied after milk removal only. As milk is removed from the udder only once daily there may be slight changes in the withholding periods required when using lactating antibiotic therapy. The veterinarian will be able to advise. No research has been conducted on antibiotic residue levels in milk from cows milked OAD.

Farmer case study – Rakaia Island Dairies

Rakaia Island Dairies adopted OAD milking in July 2004. They were acutely aware of the potential SCC issues associated with OAD milking, but have been very pleased with the SCC levels achieved. For herd 37463 (one third of the milk supplied), the average SCC for the last season on TAD milking was 172 285 cells/ml (Figure 4). This had increased to 202 235 cells/ml during the second season on OAD milking (Figure 5). In general, the farm has observed higher SCC at the end of the season with the Jersey herds compared with the Friesian and Crossbred herds. They have experienced no problems with curing mastitis. For cows with multiple infected quarters in spring they use Mastacillin, a practice they also adopted when milking TAD. Oxytocin is used on heifers holding their milk to ensure that all animals are completely milked out in early lactation.

One issue that has arisen with the adoption of OAD milking is an increase in the incidence of black mastitis. In their first season of OAD milking 12-15 cows out of 5000 developed black mastitis. This compares with 1-2 cases annually with TAD milking. Most of the cases occur in cows that have held their milk while in oestrus. While the incidence seems static it is an important health issue associated with OAD milking.

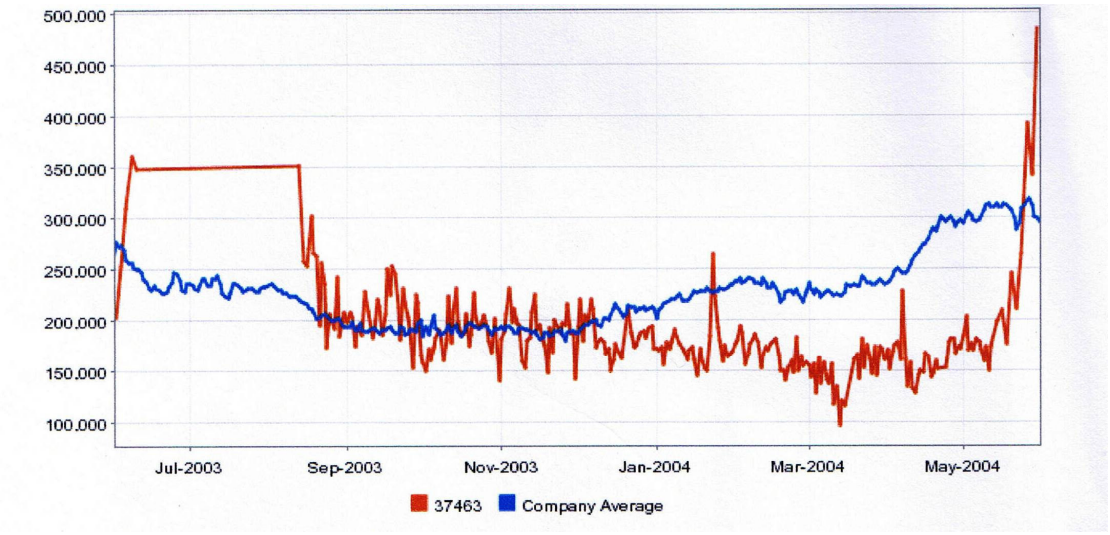


Figure 4. Bulk milk SCC (cells/ml) for herd 37463 at Rakaia Island during the final season on twice-a-day (TAD) milking, compared with the dairy company average.

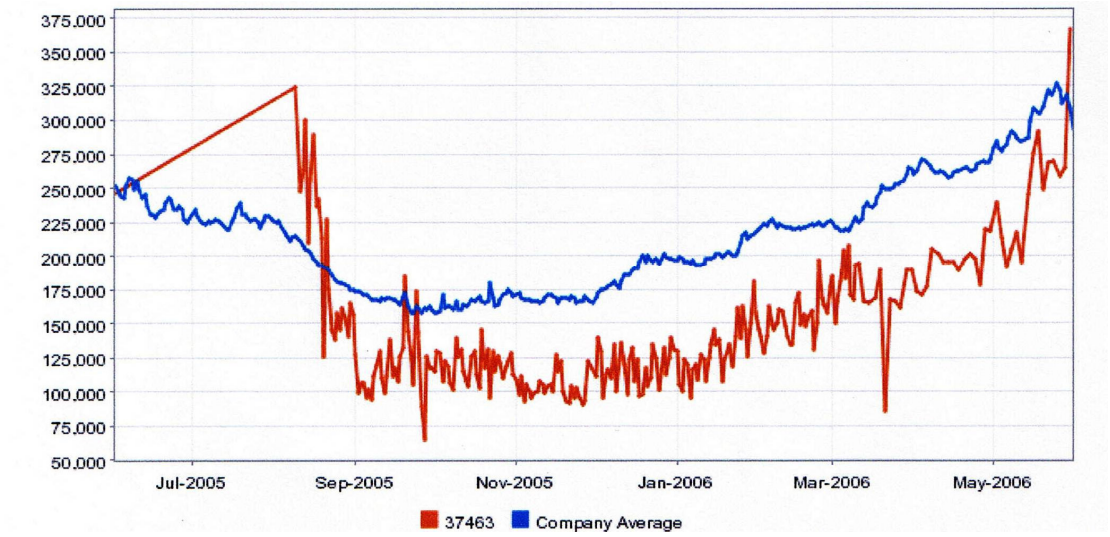


Figure 5. Bulk milk SCC (cells/ml) for herd 37463 at Rakaia Island during the second season on once-a-day (OAD) milking, compared with the dairy company average.

The farm now experiences a lower incidence of milk fever at calving which they attribute to cows being in better pre-calving condition. Magnesium supplementation has remained the same and milking cow minerals are used over the transition period.

Lameness has been almost eliminated with the adoption of OAD milking. On TAD milking the prevalence of lameness was very much dependent on the track conditions, however, at peak lactation it was not uncommon to have 40-50 cows out of 1200 in the lame mob. The annual incidence of lameness on TAD milking was about 5%. A manager recently had the dilemma of what to do with the 1 lame cow in the herd!! On TAD milking the cows were often reluctant to leave the shed and wouldn't go onto the yards. Consequently, more force was required to get them moving to the paddock. This is not an issue with OAD milking.

On TAD milking the farm spent 15.6 c/kg milksolids (MS) on animal health. This has reduced to 13.3 c/kg MS in the second season of OAD milking. Therefore, provided good mastitis management is in place, OAD milking can potentially reduce animal health problems and their associated costs.

References

Lacy-Hulbert, S.J.; Dalley, D.E.; Clark, D.A. (2005): The effects of once a day milking on mastitis and somatic cell count. *Proceedings of the New Zealand Society of Animal Production, **65***: 137-142.

Can You Make Money Milking Once a Day (OAD)?

Ryan Anderle[1] and Dawn Dalley[2]

[1]LIC Farmwise, Otorohanga, [2]Dexcel, Lincoln, Christchurch.

Executive Summary

1. The financial accounts from 22 farmers throughout New Zealand that had switched from twice-a-day (TAD) to once-a-day (OAD) milking were collected and analysed.
2. On average, Farm Working Expenses (FWE) decreased by 25.5% ($520 per ha and $72,800 per farm) upon switching to OAD milking.
3. On average, milksolids (MS) yield decreased by 5.6% (54 kg MS/ha and 7535 kg MS per farm) upon switching to OAD milking.
4. A case-study farm showed that expenditure on wages, supplements and animal health decreased by 30, 22 and 13% respectively when cows were milked OAD.
5. Farmers switching to OAD milking for lifestyle reasons tended to make lower financial gains than those seeking further farm development.

Introduction

While OAD milking has demonstrated clear advantages over TAD milking with regards to reproductive performance, cow condition, animal health and welfare, and offers social benefits to staff on these farms, the burning question is "But can we still make money when milking OAD?" Before the study reported here, the only economic analysis was the generation of economic farm surplus (EFS) information using the production data from the Waimate West Demonstration farm (WWDF) where cows were milked OAD all season or for part of the season. The limitation of that analysis was that assumptions had to be made on the changes in FWE when the farm system changed as actual financial accounts for the farm could not be used.

In November 2006, LIC and Dexcel started collecting OAD milking information and financial accounts from commercial farms throughout New Zealand who had adopted OAD milking. In each instance the last set of accounts for TAD milking and all subsequent years on OAD milking were collected. Using the DairyBase format and categories, summary financial information has been generated. Because of changes in cow numbers, and the obvious constraints the fluctuating herd sizes would place on the results, the comparisons have been made on a per hectare and per kg MS basis. The farm sizes have generally remained constant through the TAD/OAD milking transition and, therefore, become the most accurate measure of financial performance. Using a per kg MS measurement is an effective farm efficiency/performance indicator which most farmers are able to relate to and benchmark against.

The farms surveyed were all milking OAD for the full season; however, they fell into several of the market segments that had been identified in an earlier Dexcel/AgResearch study. Some had adopted OAD milking for labour management, whereas for others it enabled them to expand their herd or avoid investing in a new dairy. In analysing the data it appears that the motivating reason for adopting OAD

milking does have an impact on the financial success of the change. For those farmers who adopted OAD milking to free up their time, they tended to have minimal changes to stocking rate or other farm practices and consequently, the financial gains were not as great as those seeking further farm development. More often than not this group were owner/operators on smaller farms who had been milking cows for a long time. Those who made the change as a result of trying to step forward and push the boundaries have seen a dramatically different outcome.

Financial survey of OAD milking farms

In total, financial accounts were collected from 22 farms. The breakdown and summary information for these operations are presented in Table 1.

Table 1. Regional distribution, farm and herd sizes and number of years on once-a-day (OAD) milking of survey farms.

	No. of Farms	Farm size (ha)	No. of cows	Years on OAD
Canterbury	4	239	875	4
West Coast	2	85	183	2
Waikato	5	94	265	3
Bay of Plenty	4	125	295	4
Taranaki	3	130	416	3
Northland	4	144	353	3

On average, FWE on the survey farms decreased from $262 200 on TAD milking to $212 433 on OAD milking, an approximate drop of 19%. This comparison was made between OAD milking systems in the 2005-06 season, and TAD milking systems from, on average, three years ago. Were all expenses to have remained the same, it would be an accurate representation. However, this is obviously not the case, and "The Economic Survey Of New Zealand Dairy Farmers 2004 – 2005" shows that the FWE (including vehicle expenses) have increased in the past few years (Table 2), compared with the average FWE figures for the 22 OAD milking survey farms (Table 3).

Table 2. National average Farm Working Expenses (FWE; $/ha).

	2003 - 2004	2004 – 2005	2005 - 2006
FWE ($/ha)	1835	1959	2037*

*2005-06 season figures were unavailable, so were estimated by adjusting for 4% inflation.

Note that the 2005-06 season figure in Table 2 is an amount based on the 2004-05 season figure inflated at 4% which was New Zealand inflation rate for that year (the actual figure for the 2005-06 year was unavailable at the time of the study).

Table 3. Average Farm Working Expenses (FWE; $/ha) for the 22 once-a-day (OAD) milking survey farms.

	2005 – 2006
FWE ($/ha)	1517

Taking into account the average farm size of the survey participants the OAD milking farmers previously had a TAD milking FWE of $1872/ha ($262 200/140 ha) for the 2003-04 season. This is broadly consistent with the findings of "The Economic Survey Of New Zealand Dairy Farmers 2004 – 2005" (Table 2). The savings that the OAD milking farmers have made, when benchmarked against the inflated 2004-05 figures (i.e., 2005-06), is $520/ha or a total reduction of about 25.5% on their FWE. The FWE for TAD and OAD milking systems are broken down as shown in Table 4.

Table 4. Itemised Farm Working Expenses (FWE) per ha and per kg milksolids (MS) for average of once-a-day (OAD) milking survey farms and national average twice-a-day (TAD) milking farms.

Farm Working Expenses	Ave. OAD ($/ha)	Ave. National ($/ha)	Ave. OAD ($/kg MS)	Ave. National ($/kg MS)
Animal Health	150.85	162.24	0.17	0.18
Herd Improvement	62.82	83.20	0.07	0.09
Dairy Shed	20.38	63.44	0.02	0.07
Light, power & heating	53.57	86.32	0.06	0.09
Sundry & Freight	19.31	24.96	0.02	0.03
Weed & Pest control	16.84	22.88	0.02	0.02
Wages & Salaries	328.16	433.68	0.36	0.49
Pasture & Supplements*	512.31	613.60	0.57	0.69
Fertiliser & Lime	266.27	390	0.29	0.44
Farm Vehicle	86.87	140.4	0.10	0.16

*Includes hay, silage, meal, cropping pasture renovation, grazing and contractor costs.

At the other end of the scale, the farm income, which is driven by milk production, is affected as shown in Table 5. On average, a production decrease of around 5.6% or 7535 kg MS over the season occurred (this being the difference between the average TAD milking production and the average OAD milking production of the study participants). At a $4.15 payout this equates to $31 270 less income. The average production of the study participants, while on a TAD milking system, was 959 kg MS/ha. This compares to the average production for 2005-06, while operating under an OAD milking system, of 906 kg MS/ha.

Another benefit was significant increases in cattle sales revenue, in some instances as much as a 100% increase.

Table 5. Change in farm milksolids production when switching from twice-a-day (TAD) to once-a-day (OAD) milking (based on the average survey farm of 140 ha).

	TAD	OAD
Farm milksolids (kg)	134320	126785

Farmer Case Study – John Saywell and family

John and his family have been farming at Geraldine for 10 years. The district has higher average rainfall than most of the Canterbury plains, but summer and autumn can be significantly affected by low rainfall and poor growth conditions. The farm system has gone through a number changes in recent years from a total milked area of 330 ha milking 1,030 cows TAD to the current 730 cows being milked OAD on 230 ha. OAD milking commenced during the early spring of 2004. In the previous season 50:50 sharemilking was used, and 620 cows were milked OAD from October. The switch to OAD milking also coincided with the relinquishing of a 100 ha adjoining lease block. Of the current 230 ha, half is owned and the other half leased, and only 20 ha can be irrigated. However, it is not a very efficient irrigation system.

Target production of 1000 kg MS/ha for the 2006-07 season is a very good level of production for any semi-irrigated, mostly pasture-based, system in this region. Indeed, many of the Border Strip irrigated farms in mid-Canterbury do not easily get above this mark. John falls into the avoiding capital expenditure segment of the OAD milking case study analysis. The 30 aside herringbone dairy is a limiting factor for a TAD milking system. Since a large proportion of the milking land is leased it was unwise to invest in a new or significantly altered dairy and the housing that would be needed to run an efficient TAD milking system. To manage the potential feed shortages in the summer with limited irrigation, 12 ha of summer turnips are grown. In addition, approximately 200 kg/cow/season, or less than 5% of the total diet, is supplied as Proliq. John believes this is an important contributor to daily ME intake, thus maintaining intake and contributing to a very smooth, flat, milk production curve.

Table 6. Summary financial data for the Saywell property for the 2003, 2005 and 2006 financial years. EFS = economic farm surplus.

	2003	**2005**	**2006**	**Change (%)**
Average cows milked (ACM)	1030	710	720	
Milking frequency	TAD	OAD all season	OAD all season	
MS per ACM (kg/cow)	329	290	299	-9.0
Stocking rate (cows/ha)	3.12	3.38	3.13	
Farm Working Expenses (FWE) $/ha	3246	2492	2610	-20
Farm Working Expenses $/kg MS	3.16	2.55	2.79	-11.7
Expenses ($/kg MS)				
Wages	0.81	0.58	0.57	-30
Fertiliser	0.27	0.33	0.28	+3
Stockfeed	1.39	0.96	1.08	-22
Animal Health	0.15	0.08	0.13	-13
Livestock Improvement	0.08	0.14	0.13	+63
Repairs and Maintenance	0.09	0.29	0.22	+140
Vehicles	0.10	0.07	0.08	-20
EFS $/ha (Gross Farm income – FWE)	1307	2122	2049	
Farm profit ($/ha after interest & depreciation)	76	1161	1133	

John has seen a marked change in his financial position since adopting OAD milking, as depicted by the increase in his EFS (Table 6). Data for 2003-04 has been omitted, as a 50:50 sharemilker was operating the farm during this season.

FWE have declined from $3.16/kg MS on TAD milking to $2.79/kg MS for the most recent season on OAD milking. The average MS payment in the 2005-06 season was $4.39/kg MS, which included milk supplied under a previous winter quota. An additional 6c/kg MS equivalent was received from colostrum supply. FWE as a percentage of gross farm income in the 2005-06 season were 56%, which according to the accountant (Alexander and Associates) is 'quite acceptable' as at the present MS payout many of their clients are around 60-65%. Interest and/or rent payments represented 18% of gross farm income or 90c/kg MS production. The overall cost of production per kg MS produced and sold, i.e., FWE plus interest, rent and depreciation, is $3.77 which is 15-20c less than Alexander and Associates practice average. While the costs of livestock improvement, and repairs and maintenance, have increased significantly per kg MS under OAD milking, their contribution to total FWE is significantly less than wages, animal health and stockfeed where large cost savings have been made.

While annual milk production figures (299 kg MS/cow and 936 kg MS/ha) are relatively low for Canterbury, other advantages of OAD milking certainly offset these. The areas where large gains have been made are:

- Net profit
- Interest return on total farm capital employed
- MS margin
- Overall cost of production
- EFS per ha

In his report for the 2005-06 set of accounts the accountant made the following statement, which I think sums up the success of the Saywell change to OAD milking

"The improvement in profitability in the 2005 and 2006 years, compared with the profitability in the three years prior to that is enormous, that is, there is an improvement in profitability of about $200,000 or more in the last two years."

Conclusions

OAD milking has been around for a while, and will continue to have a strong following for years to come. Like so many dairying systems, there will always be farms, and farmers, that are more suited to an OAD milking system and those that better fit other operations. One thing is certain, however, those who make the move to OAD milking for the right reasons, and with a proactive approach, should see significant benefits. It's here to stay, and, financially, it's working!

Strategic Use of Once-a-Day (OAD) Milking

George Reveley

LIC FarmWise, Christchurch.

Introduction

An unexpected spin-off of the successful adoption of once-a-day (OAD) milking systems has been a greater use of, and experimentation with, using OAD milking at all times of the lactation. The current strategic uses of OAD milking are as follows:

1. During the colostrum period of 4 – 5 days
2. During the first four to six weeks of lactation
3. Anytime feed supply becomes inadequate for twice-a-day (TAD) milking
4. For lame cows for as long as it takes them to recover
5. For the whole season in only part of the herd, especially young cows
6. During the second half of the season
7. For various lengths of time at the end of lactation as feed supply declines

In this brief paper I will highlight the key uses of part-season, OAD milking strategies. I aim to highlight what we know and what we do not know about these strategies.

OAD Milking Strategies

1. During the colostrum period of 4 – 5 days

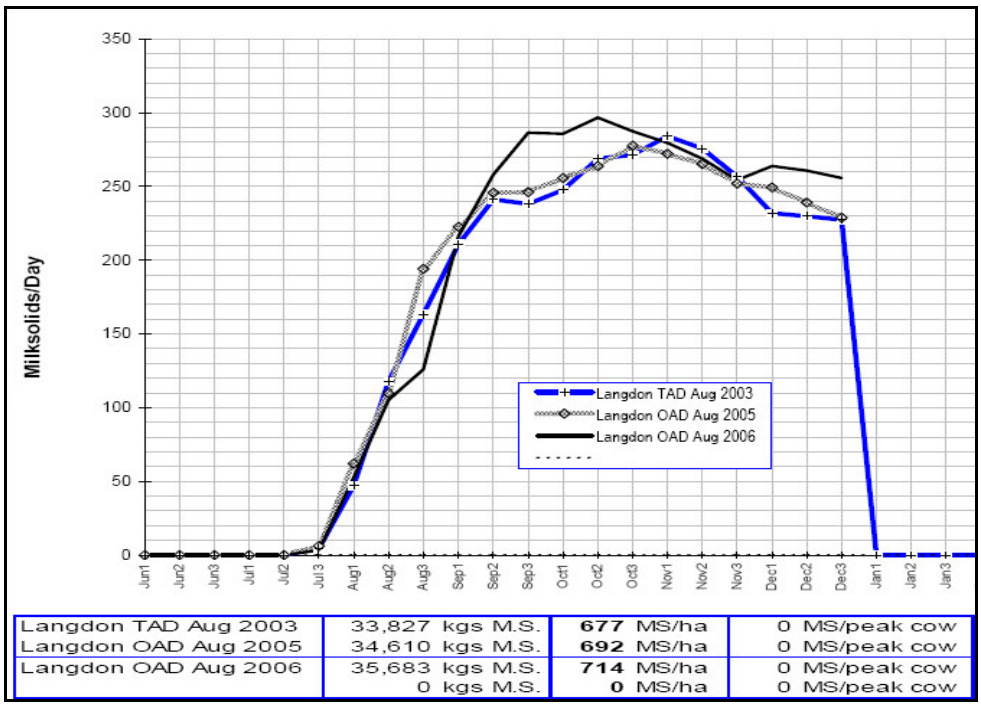
- Yield of colostrum is lower.
- Mastitis appears to clear at a very similar rate to cows milked TAD.
- Lactation peak appears unaffected.
- People have more time to manage all cows.
- The Lincoln University Dairy Farm used this strategy successfully this season, and intends to repeat it.

2. During the first four to six weeks of lactation

OAD milking has a major benefit for calving management, especially for one and two people teams. Cows lose less weight and feed demand is somewhat reduced, therefore less supplement or pasture is required. Peak and seasonal milk production is lowered by the amount that is lost directly during the period of OAD milking. Farmer experience has shown that peak milk production is affected very little at the farm/per cow level with production being much as expected compared with neighbouring farms. The data from Grant and Helen Langdon's farm (Hawera) shows that on a farm scale it is difficult to measure the milk production loss (Figure 1). They have not milked TAD at the beginning of each of the last four years. Farm and herd size has remained the same throughout.

Figure 1 shows the farm milksolids (MS) production per day in three of these seasons:

- 2003 - when the herd was milked TAD every day - the last time they did that.
- 2005 - showing a slightly lower peak MS production, but better total MS production to December.
- 2006 - slower start, but showing a higher and earlier peak MS production.



Langdon TAD Aug 2003	33,827 kgs M.S.	**677** MS/ha	0 MS/peak cow
Langdon OAD Aug 2005	34,610 kgs M.S.	**692** MS/ha	0 MS/peak cow
Langdon OAD Aug 2006	35,683 kgs M.S.	**714** MS/ha	0 MS/peak cow
	0 kgs M.S.	**0** MS/ha	0 MS/peak cow

Figure 1. Daily milksolids (kg MS) production during early- to mid-lactation on the Langdon Farm for the 2003-04 season, when cows were milked twice-a-day (TAD), and for the 2005-06 and 2006-07 seasons, when cows were milked once-a-day (OAD) for the first 4-6 weeks post-calving and then milked TAD thereafter.

The effect of OAD milking in early lactation was examined by French researchers (Remond *et al*., 1999), with high-producing cows milked OAD for 3 or 6 weeks, or heifers milked OAD for 3 weeks, then both milked TAD thereafter. Immediate milk production losses were 19% for the heifers and 13% for the older cows. At 18 weeks, differences in MS production per cow were not significant for either heifers or cows milked OAD for 3 weeks, but cows milked OAD for 6 weeks were yielding 12% less than those cows milked TAD from the start of lactation (Table 1).

Table 1. The effect of short-term once-a-day (OAD) milking (either 3 or 6 weeks) on immediate and carry-over losses in milksolids yield (kg MS/c/d) for high-producing French heifers (3 weeks only) and cows. Adapted from Remond *et al.* (1999).

Treatment	MS yield over time	Heifers		MS loss (%)	Cows		MS loss (%)
		TAD	OAD		TAD	OAD	
3-week OAD	Weeks 1-3	1.63	1.32	19	2.34	2.03	13
3-week OAD	Weeks 4-18	1.91	1.83	4	2.43	2.4	1
6-week OAD	Weeks 1-6				2.47	1.74	30
6-week OAD	Weeks 7-18				2.34	2.05	12

3. Anytime feed supply becomes inadequate for TAD milking

What will happen if cows are milked OAD for 3 weeks?

- Milk production drops immediately at a predictable rate
- Somatic cell counts (SCC) rise – and then fall
- Weight loss is reduced
- Milk production will return to where it would have been if cows had remained well fed and milked TAD for the 3 weeks.

The cross-bred trial at the Whareroa site in Taranaki used a 3-week OAD milking challenge in December 2003 and again in March 2004. The results in Figure 2 showed that as long as cows are well fed during and after the challenge, subsequent milk production was not affected.

Mid-lactation **Late-lactation**

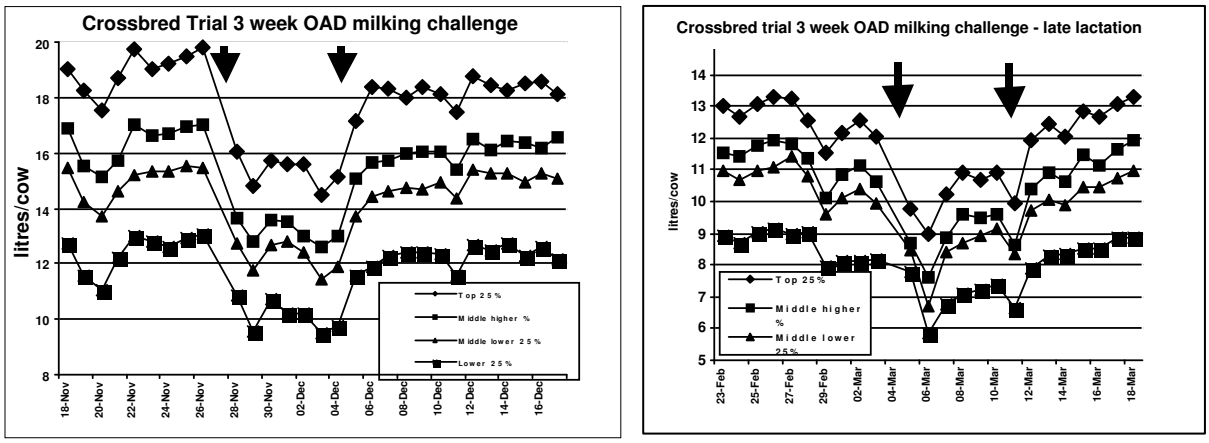


Figure 2. The effect of a 3-week once-a-day (OAD) milking challenge on daily milk yield from cross-bred cows in mid- and late-lactation. (Data are presented for 4 yield quartiles).

4. ***For lame cows for as long as it takes for them to recover***
   A healed pregnant cow is much more valuable than an empty one. Milk lost from milking OAD for the period of lameness is often compensated for by days in milk at the end of the season.

5. ***For the whole season in only part of the herd, especially young cows***
   - This strategy could be used to take advantage of land too far from the dairy for TAD milking systems to work efficiently. Indicators of the need for this strategy are: cows and people getting too tired, too many lame cows, or a low in-calf rate. This system has been adopted by a number of farmers who have then moved on to become full-season, whole herd, OAD milking farmers.
   - For example, Landcorp at Waimakariri have a long narrow farm with 900 cows, of which 350 younger cows are milked OAD all season. These OAD milkers are required to walk all the tracks greater than 2 km from the farm dairy. This system results in a 3% greater in-calf rate for the younger, OAD milking, cows compared to the older, TAD milking, cows indicating that the split is not quite large enough yet. Therefore, the threshold for walking could potentially be extended to greater than 1.5 km.
   - Concern has been expressed about the effect of OAD milking in heifers on the subsequent milk production if returned to TAD milking. Although no research has been done directly on this issue in New Zealand, the 4-year trial in Taranaki showed that heifers milked OAD then milked OAD for 4 lactations could produce 450-500 kg MS as 5 year olds on OAD, which was the same level as 5 year olds milked TAD throughout their life.

6. ***During the second half of the season***
   Dexcel research has explored this strategy at the Waimate West Demonstration Farm (WWDF), with key production data presented in Table 2.
   - Is it better than OAD milking all season? Not as much as we might expect from the potentially better match of feed supply and animal feed demand.
   - The system should use feed more efficiently – but more silage was made and carried forward in the part-season OAD milking (TAD/OAD) system. Comparative stocking rate (CSR) was lower, and the surplus may be a reflection of that, rather than the actual system.
   - Spring and early summer require a full staff team.
   - In theory, days in milk and cow condition targets are more likely to be achieved as autumn stocking rate is less than if the farm was on full-season OAD milking. However, WWDF has not been able to demonstrate that theory to date.
   - Some of the gains in animal health and reproduction enjoyed by many OAD milking farms are not available to the TAD/OAD split season milking system as this system requires TAD milking through calving, mating and the silage-making season.

Table 2. Production data from two years (2004-05 & 2005-06 seasons) of the WWDF comparison of full-season, once-a-day (OAD) milking, and part-season OAD milking (TAD/OAD). (Difference calculated as ((TAD/OAD) – OAD)/OAD) *100).

	OAD	TAD/OAD	Difference (%)
Stocking rate (cows/ha)	4.35	3.92	-9.9
Comparative stocking rate (kg live weight/t DM)	103	95.5	-7.3
Silage made (kg DM)	357.5	517	44.6
Days in milk	266	268	0.6
Milksolids production per cow (kg MS/cow/yr)	267	311	16.7
Milksolids production per ha (kg MS/ha/yr)	1162	1224	5.3
Economic farm surplus (EFS) ($/ha)	1829	1869	2.2

7. For various lengths of time at the end of lactation as feed supply declines

A traditional use of OAD milking, but it must be done well to gain the advantages of additional days in milk potentially offered. The immediate sharp rise in bulk milk SCC and possible incidence of clinical mastitis when a herd begins OAD milking indicates that the period must be long enough, and the gains great enough, to justify the costs. SCC normally declines close to the original level after 7 –10 days.

I am certain that using OAD milking in the later part of the lactation can be used to great advantage (in the order of $15 - $30 per cow in milk production and much better control of cow condition score), but it must be used very well. In this case, 10 – 15 days in milk can be added to lactation length. The cows have to be somewhere during this time period and if that is on the milking platform I argue that feed makes more money being processed through a cow that is in milk. If the feed supply has already declined below the OAD milking demand and cow condition is low, little or no advantage will be gained, often all that happens is SCC gets out of control and dry off actually occurs earlier than continuing milking TAD until farm cover declined to a set point.

References

Rémond, B.; Coulon, J.P.; Nicloux, M.; Levieux, D. (1999): Effect of temporary once-daily milking in early lactation on milk production and nutritional status of dairy cows. *Ann. Zootech., **48***: 341-352.

The Genetic Improvement of Cows for Once-a-Day (OAD) Milking

A.W. McPherson, J.E. Pryce and A.M. Winkelman

LIC, Private Bag 3016, Hamilton, New Zealand.

Introduction

The relative infancy and low adoption of widespread once-a-day (OAD) milking production systems within New Zealand has resulted in most current OAD milking cows having been bred from a twice-a-day (TAD) milking background. Many may recall that Professor Colin Holmes made the following comment in 2002;

> "Cows have been selected for TAD milking: therefore they are the wrong cows for OAD"

There are numerous examples from herds that have converted to OAD milking where farmer experience tells us that some cows adapt well to OAD milking, while others find the transition difficult. Ross Goudie has reported that his top OAD milking cows peaked at 28 litres and 2.5 kg milksolids (MS) per day, culminating in over 500 kg MS per lactation in the 2005-06 season.

Such variation is the key to providing an opportunity to genetically improve cows for OAD milking production systems in order to achieve production levels equivalent to those under TAD milking. The amount of ground to be made up in average MS (kg/year) produced under OAD milking (compared with TAD milking) is indicated in Table 1.

Table 1. Differences in average annual kg milksolids (MS) produced when cows are milked once-a-day (OAD) or twice-a-day (TAD).

Age	System	Holstein-Friesian		HFxJ		Jersey	
		kg MS/c	% Diff.	kg MS/c	% Diff.	kg MS/c	% Diff.
2	OAD	226		240		217	
	TAD	269	16%	270	11%	241	10%
3	OAD	274		301		271	
	TAD	312	9%	316	5%	279	3%
4	OAD	299		326		299	
	TAD	345	13%	347	6%	306	2%
5	OAD	308		324		305	
	TAD	356	13%	358	9%	315	3%
6	OAD	311		325		300	
	TAD	355	12%	355	8%	312	4%
7	OAD	306		318		295	
	TAD	351	13%	355	10%	306	4%

OAD Index

The development by LIC of a breeding index specifically for OAD milking represents a major initiative in the history of farming OAD milking herds.

LIC introduced the OAD Index in 2003 at a time when there was insufficient data available to analyse from what were then relatively few OAD milking herds. By necessity the index utilised a "desired gains" approach in which official Animal Evaluation Unit (AEU) breeding values (bvs) for traits in the Breeding Worth (BW) formula were subjectively weighted to suit likely OAD milking requirements, e.g., additional selection pressure was applied against milk volume.

The subsequent growth in OAD milking created sufficient data by 2005 to allow LIC to start to meaningfully analyse the relationship between OAD milking and TAD milking, and to further develop the OAD Index. A test day model was used to calculate bvs for cows milked in known OAD milking herds. This initial analysis was restricted to 2 year old animals and sufficient data was available for only 4 of the traits in the BW formula (i.e., milk volume, fat, protein & somatic cell count [SCC] score).

These OAD bvs were then compared with official AEU bvs. The correlations between these estimates ranged from 0.66 to 0.81, depending on breed and trait, suggesting that OAD milking and TAD milking traits are genetically different. A correlation of 1 would indicate that two traits are the same; a substantial departure from 1, e.g., ≤ 0.8 can arbitrarily be interpreted as a genetically different trait.

This analysis has just been repeated in 2007 using new data collected since 2005, and extended to cover all age groups up to 7 year olds. The new correlation estimates are shown in Table 2.

Table 2. Correlation estimates between once-a-day (OAD) milking and twice-a-day (TAD) milking breedings values (bvs) for milk production traits using data collected from 2004/05 – 2006/07.

	Protein	Fat	Milk volume	SCC score
Holstein-Friesian	0.78	0.77	0.82	0.77
HF x J	0.76	0.81	0.82	0.82
Jersey	0.75	0.84	0.80	0.76

Although assumed to be genetically different, OAD milking and TAD milking traits are still sufficiently related to allow the development of predictive equations to estimate OAD bvs (for the 4 traits listed above) from TAD bvs for use in the OAD Index, and enable application of the OAD index to animals in the wider population. These are effectively conversion equations of bvs from TAD to OAD milking. The current OAD Index will now be updated to incorporate the revised correlation estimates.

Predictive equations for the other traits in BW (i.e., liveweight, fertility & residual survival) will be developed when adequate data becomes available from OAD milking herds. Until then TAD bvs for these traits need to be used in the OAD Index.

The OAD Index now uses the same economic weightings for each trait as used in

BW, i.e., there are no subjective weightings. The OAD Index is a ranking tool that is deliberately expressed using scaled units to avoid confusion with BW. Unlike BW, it has no "meaningful" units *per se*.

The updated OAD Index is a more accurate indicator of OAD milking performance than either its predecessor or BW.

Several other traits not included in the OAD Index (or BW) have been suggested to be of value under OAD milking, e.g., milking speed, udder conformation etc. Individual herds can still carefully apply additional selection pressure for these characteristics if required, albeit at some compromise, in the same way that secondary traits are incorporated into some TAD milking breeding plans. The Customate *Plus* mating programme is available to recommend selective matings for individual cows.

Future development of the OAD Index, beyond trait selection and improved bv estimation, will be reliant upon the provision of suitable economic data that demonstrates that the relative importance of the index traits is significantly different in OAD milking compared with TAD milking. For example, are the economic consequences of different levels of fertility, or SCC, greater or lesser under OAD milking?

Breeding Scheme Design

Is a dedicated OAD milking breeding scheme warranted? The answer to this question is ultimately dependent upon the future uptake of OAD milking. Genetic and economic factors need to be considered.

Firstly, with only 3% of New Zealand herds currently employing OAD milking, and the relative infancy of the system, it is logical to assume that the best genetics for OAD milking are still hidden away in TAD milking herds and will remain so for the immediate future.

Secondly, the size of the current and foreseeable OAD milking, artificial breeding (AB), market would likely restrict or eliminate the financial incentive for LIC to heavily invest in a full stand-alone OAD milking breeding scheme.

That said, LIC has been contract mating and sourcing a limited number of bulls from OAD milking herds for progeny testing, as well as providing annual access to *bona fide* OAD milking herds to a special selection of 40 young bulls (from the 300 already assembled for the Sire Proving Scheme) re-ranked on the basis of the OAD Index. The first of these bulls were sold in 2005 and will receive progeny test evaluations in the 2008-09 season.

Selection responses have recently been modelled for a range of possible breeding scheme designs.

1. Conventional progeny testing of 300 bulls in Sire Proving Scheme ("TAD")
2. Joint scheme where 300 bulls are sampled in both TAD and OAD milking herds, with daughter numbers in each related to relative importance ("Joint")
3. Separate schemes are run for each of TAD and OAD milking, with the 300 bulls distributed exclusively across the 2 environments related to relative importance ("2 Env't")

Figure 1 illustrates the expected response in protein yield (kg/year) across a range of correlations when the relative importance between TAD and OAD milking is in the ratio of 70%:30%, i.e., 30% of herds are milked under OAD milking, or 30% of the AB market is OAD milking. Assuming a correlation between TAD and OAD milking of 0.8, slightly improved rates of gain would be achieved where separate schemes are operated ("2 Env't). The reality, however, is that OAD milking does not constitute this high level of relative importance.

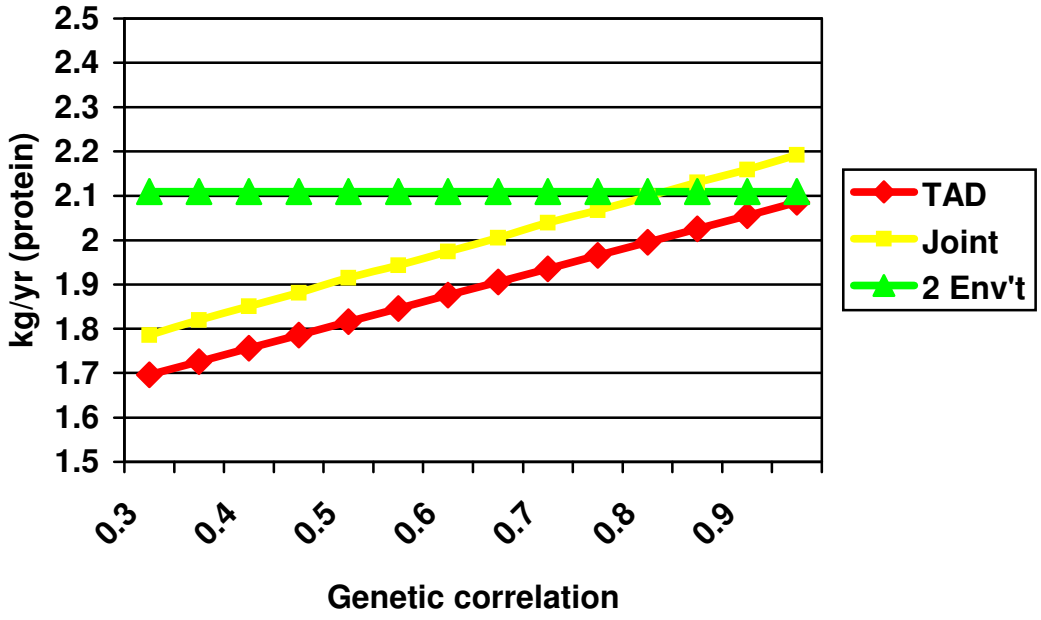


Figure 1. The expected response in protein yield (kg/yr) in relation to the genetic correlation between twice-a-day (TAD) and once-a-day (OAD) milking for possible breeding schemes (TAD vs. Joint vs. 2 Env't), when the relative importance between TAD and OAD milking is 70%:30%.

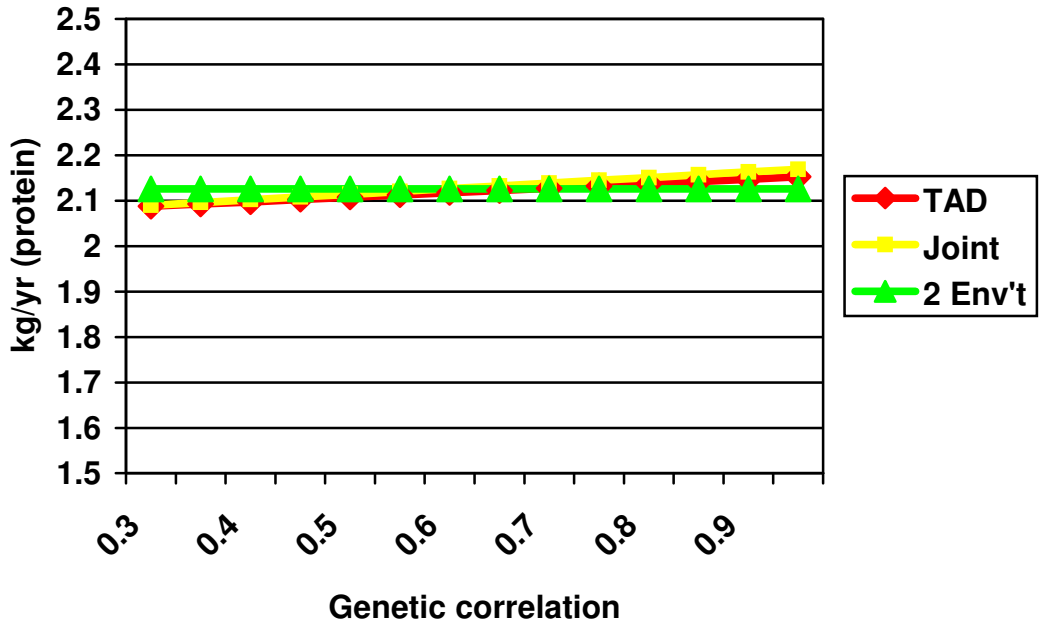


Figure 2. The expected response in protein yield (kg/yr) in relation to the genetic correlation between twice-a-day (TAD) and once-a-day (OAD) milking for possible breeding schemes (TAD vs. Joint vs. 2 Env't), when the relative importance between TAD and OAD milking is 95%:5%.

Therefore, Figure 2 illustrates the expected response in protein yield (kg/year) across a range of correlations when the relative importance between TAD and OAD is in the ratio of 95%:5%, i.e., 5% of herds are milked under OAD milking, or 5% of the AB market is OAD milking. This scenario is much more representative of the true situation. Almost irrespective of the underlying correlation, there is no genetic advantage in operating either joint or separate breeding schemes for OAD milking. Figure 3 illustrates the break-even points where separate TAD milking and OAD milking breeding schemes become viable for various correlations and relative importance.

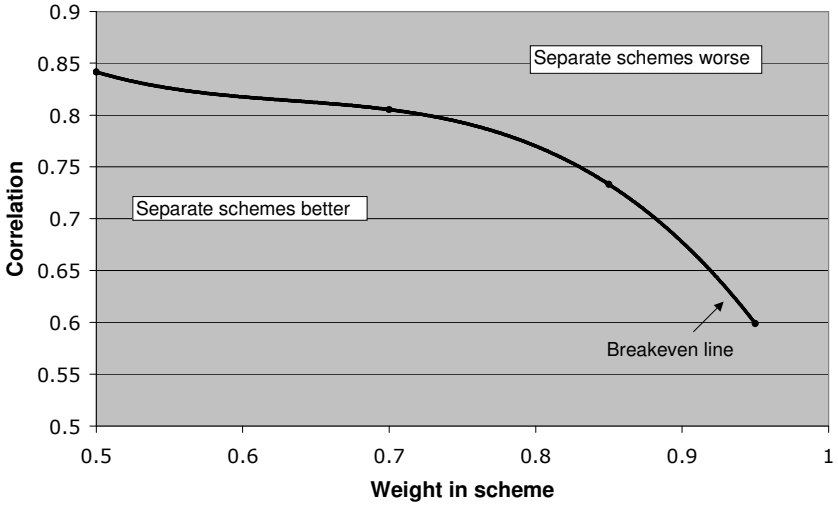


Figure 3. The break-even points where separate breeding schemes for twice-a-day (TAD) and once-a-day (OAD) milking become viable, based upon the relationship between the genetic correlation between TAD and OAD milking, and the relative importance of TAD milking to OAD milking (weight in scheme).

The optimal breeding scheme design for OAD milking depends on the genetic correlation with TAD milking and its relative importance (market share). When correlations are low, separate schemes are preferable, although this is countered where the relative importance of OAD milking is low. Assuming a genetic correlation with TAD milking of 0.8, the relative importance of OAD milking would need to increase to 30% to make separate breeding schemes desirable.

Summary

Variation exists in OAD milking performance that can be genetically exploited. The development of the OAD Index by LIC was an important milestone and is currently the best tool for OAD milking herds to use to select sires of future replacements. Refinement of the OAD Index will progressively occur as suitable genetic and economic data becomes available.

Significant investment in a dedicated OAD milking breeding scheme to specifically generate bulls for OAD milking systems will not be economic until the relative importance (market size) of OAD milking increases. This would require a significant expansion from the status quo. Hence, continuation of the current programme in which young bulls are predominantly sampled in TAD milking herds, but some are selected using OAD Index and made available for joint sampling in OAD milking herds, remains the preferred option within a breeding scheme reliant on progeny testing.

Effect of Nutrition on Once-a-Day (OAD) Milking

Dawn Dalley

Dexcel Ltd., Lincoln, Christchurch

Executive summary

1. Offering 4.5 kg DM of cereal pellet for the first 6 weeks of lactation to cows milked once a day (OAD) increased peak milksolids (MS) production by 0.2 kg MS/cow/day to 1.83 kg MS/cow/day.
2. A carryover effect from meal feeding lasted for at least 4 weeks and was higher for cows milked OAD than those milked twice a day (TAD).
3. Cows milked OAD in early lactation had 3 and 5% lower energy intakes than those milked TAD on pasture and pasture + meal, respectively.
4. Cows milked OAD lost 0.25 condition units less in early lactation than cows milked TAD.
5. Feeding pasture + grain from mid-January to mid-February to cows milked OAD from calving kept MS yield at 1.3 kg MS/cow/day, compared with 1.15 kg MS/cow/day for those on pasture.
6. Failure to feed high-quality pasture or supplement at transition from TAD to OAD milking in mid-summer can lead to large decreases in MS yield.

Introduction

Cows milked OAD can be successfully managed with either 12 or 24 hour grazing. The key determinants of which to choose are paddock size and personal preferences. Some farmers don't want the hassle of moving cows in the afternoon so choose 24 hour grazing.

Of greater importance is the quality and quantity of feed on offer. Cows milked OAD can be more sensitive to feed deficits and declining pasture quality. They respond by reducing milk production. This has also been observed in herds on irrigated farms when feed supply has declined in mid- to late-lactation. When additional feed is available or pasture quality improves, cows with a lower Breeding Worth (BW) are less likely to increase MS production, instead they use the additional feed for body condition gain.

Spring Experiment

In spring 2006 we embarked on a research programme in Taranaki to investigate the effect of diet quality and metabolisable energy (ME) intake on milk production at several stages during lactation. By the end of the 2006-07 season we will have undertaken feeding challenges in early-, mid- and late-lactation. Only the early lactation results and preliminary mid-lactation milk production results are presented in this paper. The objective of the spring trial was to compare the milk production, energy balance and reproductive performance of cows milked either OAD or TAD, and offered either the standard post-calving diet of pasture plus forage supplement (Std.), or this diet supplemented with 4.5 kg DM of a high quality grain pellet (Conc.) for the first 6 weeks post-calving. In addition, with the OAD milking treatment we were interested in any carryover effects of improved nutrition on subsequent OAD

and TAD milk production (Figure 1). Cows calved between 26th July and the 24th August.

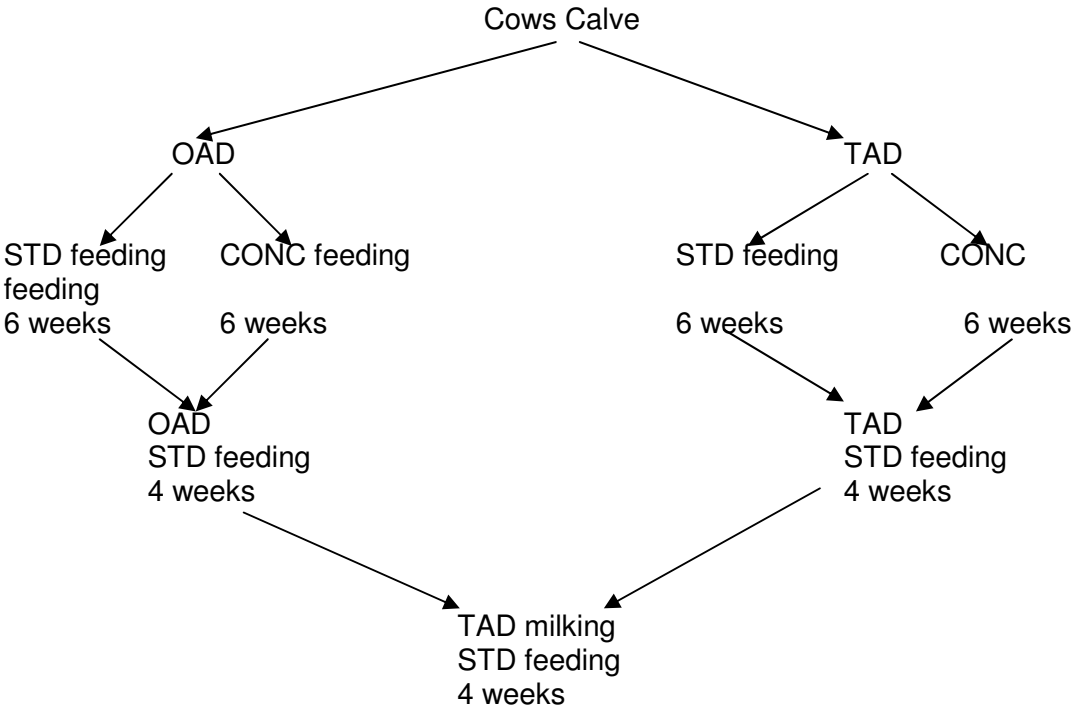


Figure 1. Schematic diagram of the nutritional challenge trial at WTARS during spring 2006. Cows were milked once a day (OAD) or twice a day (TAD), and offered either the standard post-calving diet of pasture plus forage supplement (Std.), or this diet supplemented with 4.5 kg DM of a high quality grain pellet (Conc.) for the first 6 weeks post-calving. OAD and TAD milking cows then returned to the Std. diet for 4 weeks, and then all cows were placed on TAD milking.

Offering 4.5 kg DM of 12.5 MJME/kg DM cereal pellet for the first 6 weeks of lactation to cows milked OAD increased peak MS production by 0.2 kg MS/cow/day to 1.83 kg MS/cow/day (Figure 2). This compares to a peak MS production of 2.5 and 2.37 kg MS/cow/day for the TAD Conc. and TAD Std. treatments, respectively (Figure 2). The difference in MS production between the OAD Std. and OAD Conc. treatments continued to week 10 post-calving, after which all cows were returned to TAD milking. The carryover response to concentrate was higher for the cows milked OAD than those milked TAD. At a $4.00/kg MS payout the immediate response to the concentrate was 80c more per cow per day. The DM and ME intakes of the treatment groups are presented in Table 1.

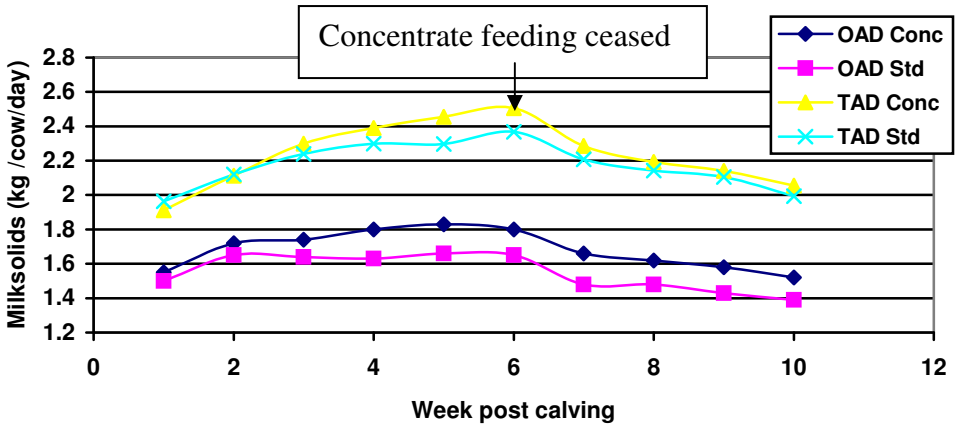


Figure 2. Average milksolids production (kg MS/cow/day) for the first 10 weeks of lactation in cows milked either once a day (OAD) or twice a day (TAD) with (Conc.) or without (Std.) 4.5 kg DM concentrate supplementation.

Table 1. Average pasture, forage supplement and concentrate dry matter intake (DMI, kg/cow/day; and ME intake, MJME/cow/day) during the first six weeks of lactation in cows milked either once a day (OAD) or twice a day (TAD) with (Conc.) or without (Std.) 4.5 kg DM concentrate supplementation.

	OAD Std.	OAD Conc.	TAD Std.	TAD Conc.
Pasture DMI	10.4	9.4	11.0	9.9
Forage DMI	2.1	2.1	2.1	2.2
Concentrate DMI	0	3.5	0	3.5
Total DMI	12.5	15.0	13.1	15.6
MEI	147	179	154	184

Blood non-esterified fatty acid (NEFA) concentrations decreased for all treatments from calving to 6 weeks post-calving (Figure 3) and correspondingly, blood glucose concentrations increased (data not presented). In general, cows milked OAD had lower NEFA concentrations than those milked TAD, and cows offered concentrate had lower NEFA concentrations than those on the standard diet. Blood NEFA concentrations are an indication of the amount of body tissue mobilisation that is occurring. These results suggest that cows milked TAD were mobilising more body condition than those milked OAD, and that offering concentrate also reduced body tissue mobilisation. Blood beta-hydroxybutyrate (BOH) concentrations (an indication of ketosis) were highest in the TAD Std. group and lowest in the TAD and OAD Conc. groups (Figure 4). The blood results are supported by condition score data collected weekly throughout the experiment (Figure 5). The OAD milking cows lost less condition (0.25 of a condition score) than the TAD milking cows in early lactation. At their lowest point the TAD milking cows averaged 4.25 condition score compared with 4.5 for the OAD milking cows. Milking frequency or nutrition had no effect on the number of weeks over which the cows lost weight, with all cows reaching their lowest body condition 7-8 weeks post-calving. Interestingly, offering a high-energy concentrate for the first 6 weeks did not affect the rate of condition score loss for either milking frequency.

The results of the spring trial indicate that increasing the ME intake of cows milked OAD in the first 6 weeks will increase MS production at peak, and this benefit is still present at week 10 of lactation. While this experiment achieved a higher ME intake

using cereal grain it is likely that a similar outcome could be achieved by offering a higher allowance of good quality spring pasture.

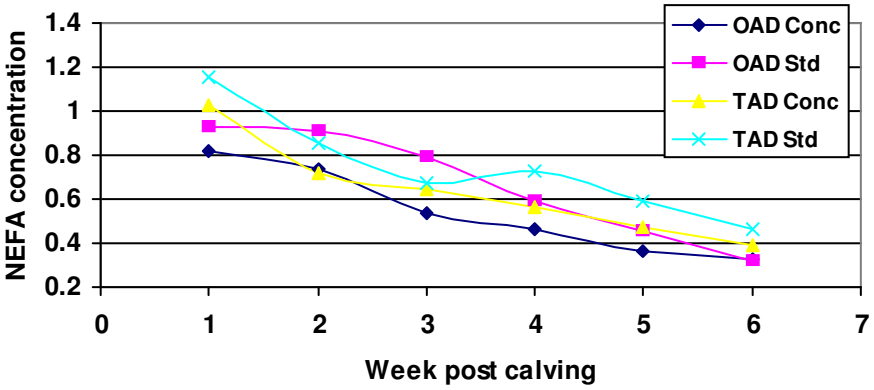


Figure 3. Blood non-esterified fatty acid (NEFA) concentrations during the first 6 weeks of lactation for cows milked either once a day (OAD) or twice a day (TAD) with (Conc.) or without (Std.) 4.5 kg DM concentrate supplementation.

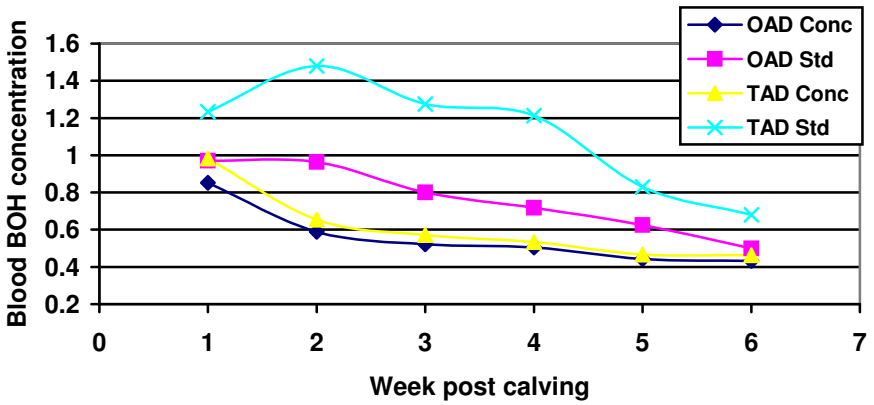


Figure 4. Blood beta-hydroxybutyrate (BOH) concentrations during the first 6 weeks of lactation for cows milked either once a day (OAD) or twice a day (TAD) with (Conc.) or without (Std.) 4.5 kg DM concentrate supplementation.

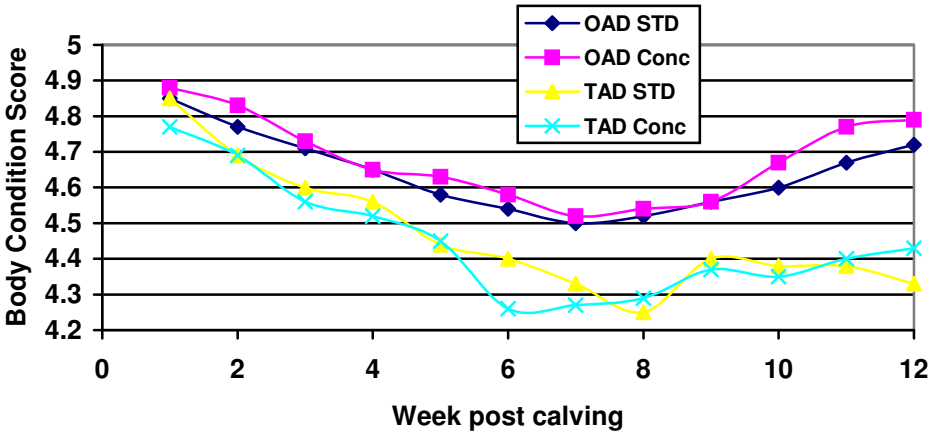


Figure 5. Body condition score during the first 12 weeks of lactation for cows milked either once a day (OAD) or twice a day (TAD) with (Conc.) or without (Std.) 4.5 kg DM concentrate supplementation.

Summer Experiment

In summer 2007 we undertook an experiment at WTARS to compare 2 different feeding regimes during mid-lactation in mature dairy cows milked either TAD, OAD all season (full-season OAD; FSOAD) or OAD from mid-January (part-season OAD; PSOAD). In addition to the standard pasture and forage supplement diet (Std.), cows in the concentrate (Conc.) groups were offered 4.5 kg DM of a 12.5 MJ ME/kg DM grain pellet. Concentrate feeding began 5 days prior to the commencement of the trial. The PSOAD herd were switched to OAD milking on day 1 of the trial. Feeding grain from mid-January to mid-February to cows milked OAD from calving maintained MS production at a higher level than similar OAD milking cows offered a standard pasture/forage diet (Figure 6).

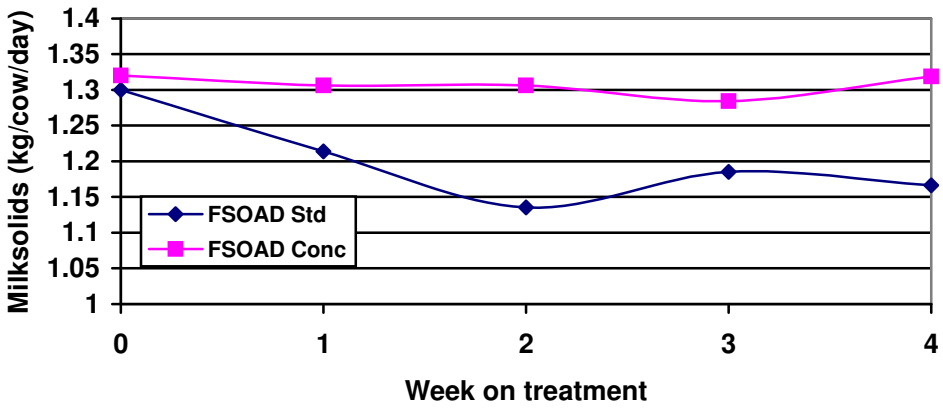


Figure 6. Daily milksolids production in mid-lactation of cows milked once a day (OAD since calving (full-season OAD; FSOAD) and offered a pasture/forage diet with (Conc.) or without (Std.) 4.5 kg DM concentrate supplementation.

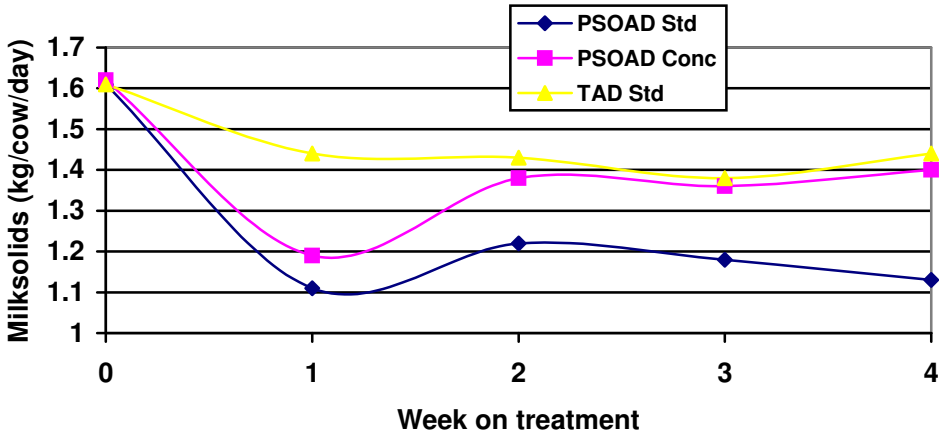


Figure 7. Daily milksolids production in mid-lactation of cows milked twice a day (TAD) or once a day (OAD) from mid-January (part-season OAD; PSOAD), and offered a pasture/forage diet with (Conc.) or without (Std.) 4.5 kg DM concentrate supplementation.

In the TAD milking – PSOAD milking comparison, all groups dropped in yield in the first week of the experiment. However, by week 2 of the trial MS production of the PSOAD Conc. cows had increased to a level similar to the TAD milking control herd (Figure 7). Production of the PSOAD Std. herd was similar to that of the FSOAD Std. herd viz. approximately 1.15 kg MS/cow/day (Figures 6 and 7).

Waimate West Demonstration Farm (WWDF) OAD Milking Trial

At the WWDF in the 2004-05 season the switch to OAD milking at the end of January coincided with a period of hot dry weather and a decline in feed quality and quantity. In hindsight the decision to feed silage was made a week too late and consequently production declined rapidly from 1.2 kg MS/cow/day to 0.75 kg MS/cow/day in two weeks (Figure 8). In the 2005-06 season silage feeding was commenced 10 days prior to the switch to OAD milking and was continued throughout the summer. This resulted in a much smaller (0.25 kg MS/cow/day) decline in yield. This season a similar decline was observed but production has stayed higher through to late March due to a wetter summer and better quality feed available (Figure 8). One encouraging result at the end of the 2005-06 season was the increase in production observed once good quality autumn pasture was available in mid-April.

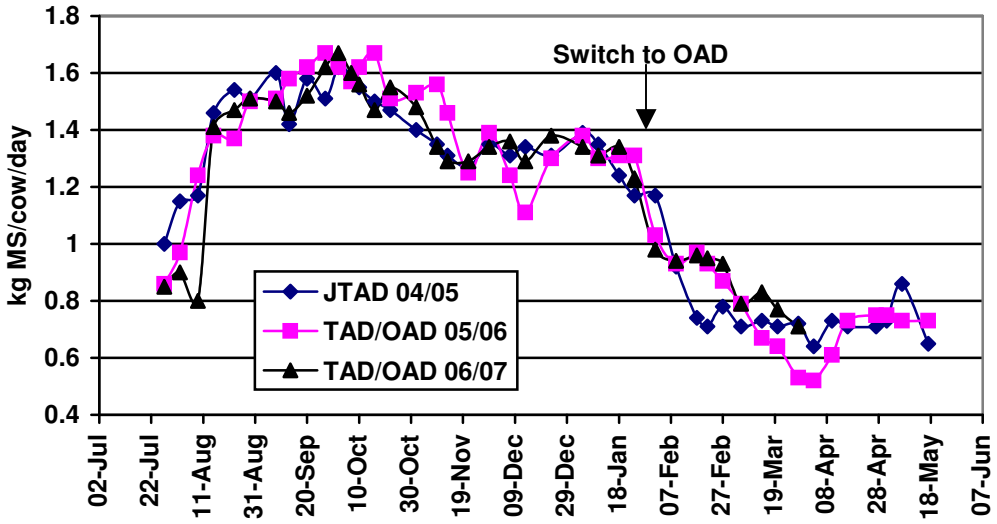


Figure 8. Milksolids production (kg MS/cow/day) in Jersey cows for the part-season once-a-day (OAD) milking herd (TAD/OAD) at WWDF during the 2005-06 and 2006-07 seasons, compared with TAD milking production in the previous 2004-05 season.

Conclusions

Nutritional management of cows during the transition period from TAD to OAD milking is critical. Don't leave it until you are short of feed to make the change, as this is likely to result in a large decrease in production (up to 0.5 kg MS/cow/day). Excellent pasture management, to ensure sufficient high quality pasture is available at all times, is critical to the success of the OAD milking system. Any mistakes with feeding will quickly be seen in the vat and are often difficult to correct.

Once-a-Day (OAD) Milking: Surveys of Farmer Opinion

Peter Gatley

LIC, Private Bag 3016, Hamilton, New Zealand.

Once-A-Day (OAD) Milking: Surveys of Farmer Opinion

Peter Gatley
General Manager Genetics
LIC

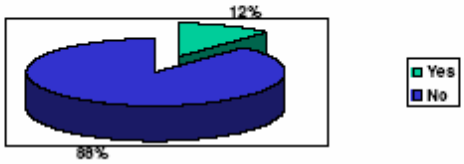
Two surveys

- Sample of NZ dairy farmers
  - Attitudes to OAD milking
- Sample of OAD farmers
  - Advantages
  - Disadvantages
  - Impact on production and profit
  - Intentions

Survey One: Random sample of NZ dairy farmers

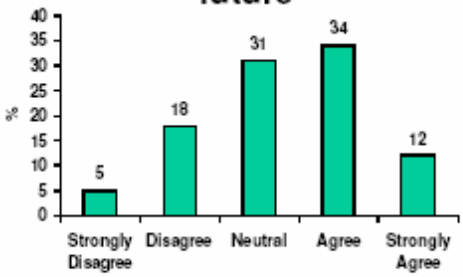
- Conducted by LIC Business Information Unit
- December 2006
- Postal
- 359 respondents
- Includes TAD and OAD farmers at random

Are you currently using, or have used in the past, the OAD technique?

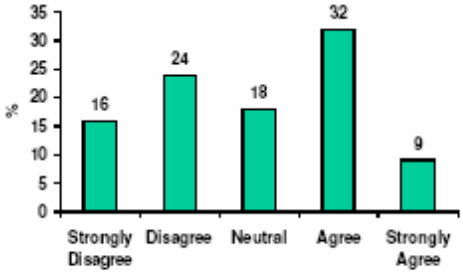


NB: OAD not defined

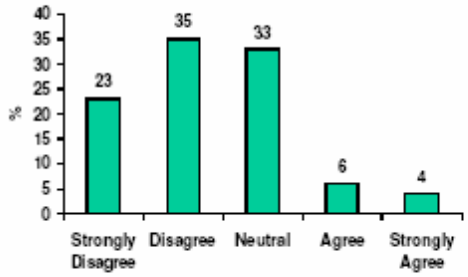
OAD milking will become increasingly popular in the future



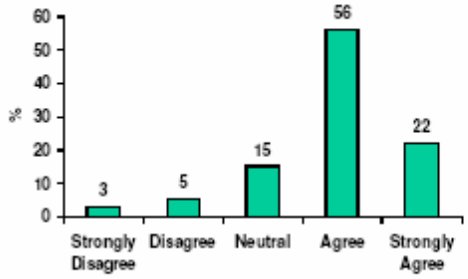
I may be interested in using OAD at some stage



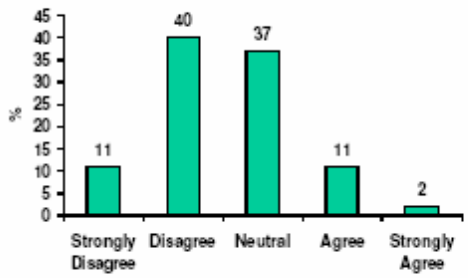
Farmers who milk OAD are lazy



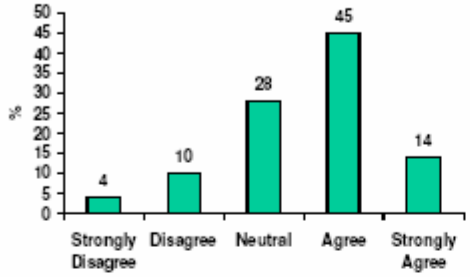
OAD milking is a good lifestyle option



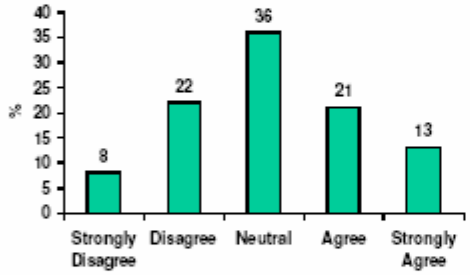
OAD milking is a fad that will die out



In some circumstances OAD is the most profitable option



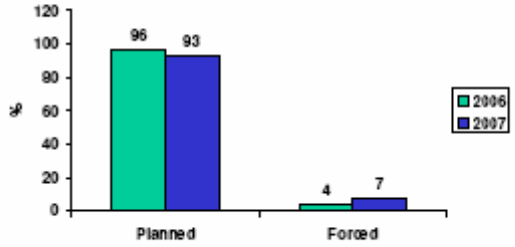
OAD milking is not an option for ambitious farmers



Survey Two: Sample of OAD herds

- Conducted by LIC Business Information Unit
- March 2007
- Postal
- 208 respondents
- Respondents qualified as OAD prior to peak production, with the intention of remaining OAD till drying off

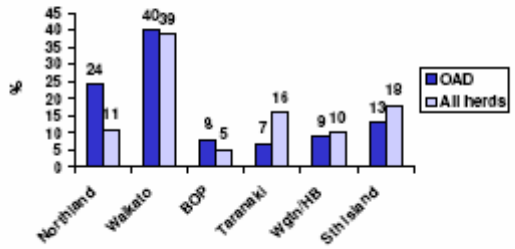
Planned or forced to go OAD?



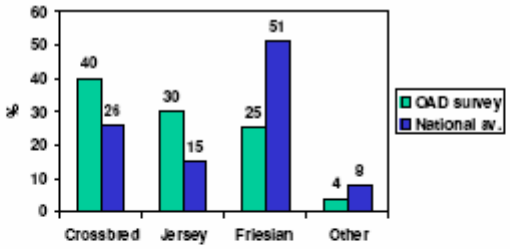
Herd/mob size

- Mean 239
- Median 190
- Minimum 40
- Maximum 1650

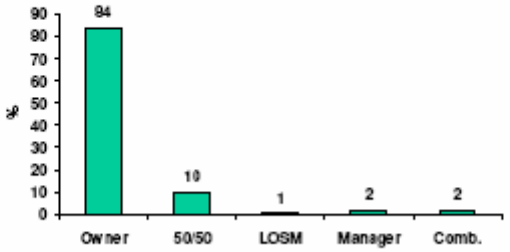
Region



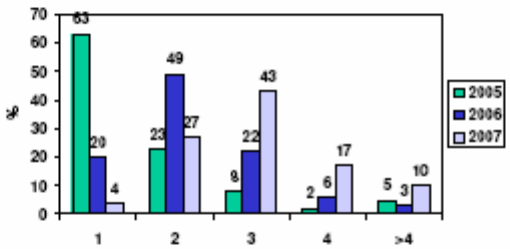
Main breed of cow



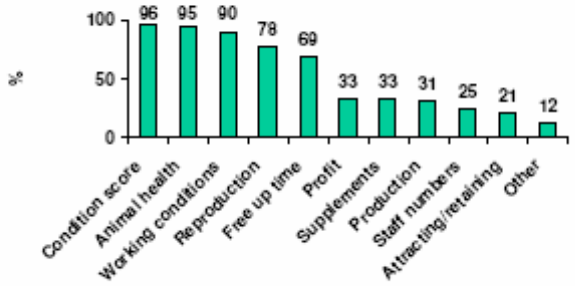
Farm ownership status



How many seasons have you milked OAD?



Benefits experienced?



Respondents identified 6 benefits on average, all identified some

Other benefits of OAD

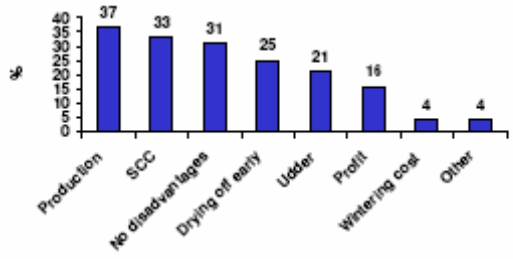
- Extended lactation
- Avoiding capital expenditure
- Milking off land not usable in TAD system
- De-stressed
- Happier cows, happier me
- Hate PM milking
- Lower costs

(cont.)

Other benefits of OAD (cont.)

- Less water required
- Less effluent to deal with
- Less heat/fly stress
- No lameness
- Returns from cull cows
- Renewed interest
- Able to milk all season by myself
- I'm still here

Disadvantages experienced?

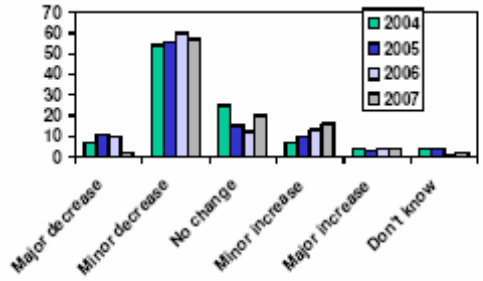


31% listed no disadvantages

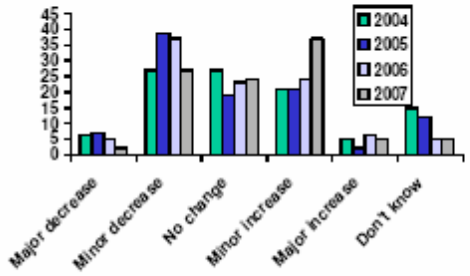
Other disadvantages of OAD

- Longer morning milking
- Essential to have 15% more animals
- Cup slip in spring
- Cooling requirements
- More mastitis
- Some heifer wastage as not suited to OAD

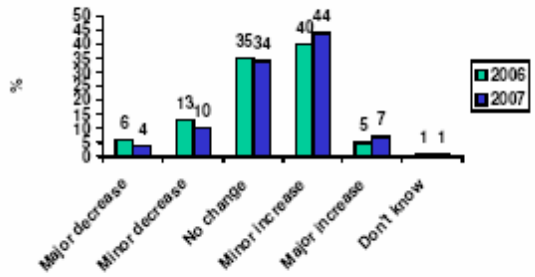
Impact on production



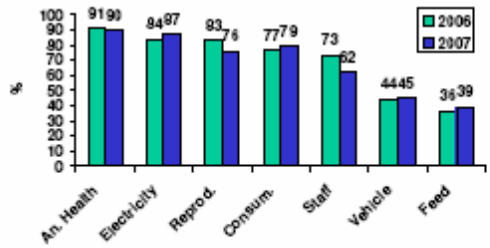
Impact on profit



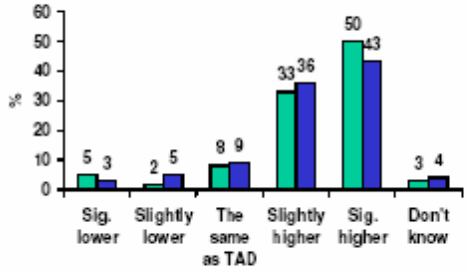
Impact on bulk SCC



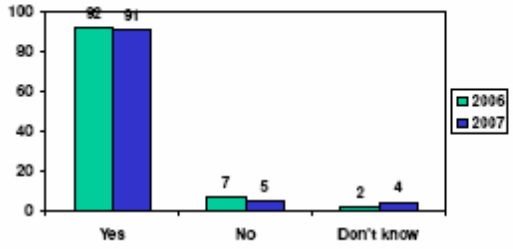
Expenses reduced



When milking OAD, fertility is….



Intend to continue OAD next season?



What will you do differently?

- Calve a week earlier to lengthen lactation
- Change to different brand of cup liners
- Dry cow therapy (first time in 4 years)
- Herd test for cell counts
- Fewer staff
- Increase stocking rate to utilise condition advantage
- Use the best bulls for OAD milking
- Shorten calving spread from 12-9 weeks

Every respondent took the opportunity to make a general comment about their OAD milking experience

"The potential for this style of farming has yet to be achieved".

"We have more mastitis than on TAD, and milk has to be kept from the vat for 8 days instead of 4".

"Does require increased culling for low persistency in late lactation, mastitis cows and udder/teat conformation. However better health and low MT rate assist by reducing involuntary culling".

"Get over your preconceptions and give it a go, you'll be pleasantly surprised".

"I believe it is the future to dairying in Northland".

"It's great. We have just reached 1400 kgMS/ha and we are on a par with the best production ever achieved. 70% of our cows have conceived to $4^{1/2}$ weeks AB".

"Same production, less work, so why milk twice a day?".

"Concept suits us but still like to see higher production. Key probably pasture management/quality and cow selection".

"Some high BW 2yo Friesians have dried off before December. A lot of young cows leaking milk".

"This 3 year trial has demonstrated that if the right stocking rate is employed, cows are selected for OAD and low SCC, very good production (1150-1200 kgMS/ha) can be achieved. This compares very favourably with 1250 in our control TAD herd".

"Udders – up to 4% extra culls from failure of udders. OAD index is rubbish. Bulls need index over 6 years, not just 2 years".

"It is the simple way to milk large herds. After you walk 2km each way OAD becomes more profitable than TAD".

"OAD cows must have excellent udders, ie, low cell count, good teat placement, good udder connection. If any of these are not right the cow will not survive OAD".

"OAD has been extremely positive for animal and man. The cows have produced way beyond our expectations. The secret for us has been to fully feed the cows".

"OAD milking has given me a new, fresh outlook on farming. I was tired of the 24/7 tie to the farm and very little time for my family. I was ready to sell up, then we took the plunge and went OAD and I have never been happier".

"OAD milking is the best management system that I have enacted in my career of 29 years milking cows. Last year I made more taxable income than I ever have"

"Don't tell everyone".

Useful Once-a-Day (OAD) Milking Information

Milk Vat Refrigeration Requirements for Once-a-Day (OAD) Milking

Evan Woods

Dairy Technology Services (DTS) Ltd., Private Bag 20502, Te Rapa, Hamilton

For dairy farmers on twice-a-day (TAD) milking, the milk vat refrigeration unit size is worked out on a 60/40 am/pm ratio. Therefore, any changes to this ratio will need to be considered to ensure that milk cooling meets the required industry standard of milk entering the vat at 18°C before being cooled down to 7°C within three hours of the completion of milking. This includes pre-cooling as well as the actual refrigeration.

Although there is a lower daily milk volume during once-a-day (OAD) milking of between 80 to 85% of TAD milking, this milk enters the vat once a day instead of the normal 60/40 split between am and pm milkings. This causes an increase in heat loading, and can drastically affect the efficiency of the cooling system. Sometimes to compensate for the lower milk volume during OAD milking, more cows are milked so that the actual volume drop is minimal, which unfortunately compounds this problem.

Calculated Heat Load

The figures below show an example of the difference in cooling capacity required when switching from TAD milking to OAD milking.

Cow Numbers	350
Litres per cow	25 L
Maximum volume	8750 L
Milk entry temperature	20°C
Milking Time	4.5 hrs

60% of the normal TAD milking = 5250 litres, which requires 16.9 Kw
85% of the normal TAD milking = 7437 litres, which requires 23.95 Kw

Time Temperature Graph

Figure 1 below indicates the difference in cooling time when the condensing unit was originally sized for the normal 60/40 TAD milking and then used for OAD milking. This resulted in a greater amount of time required to cool milk down to 7°C, and in this case, longer than the required industry standard of within three hours of the completion of milking. Therefore, the size of the milk vat refrigeration unit should be an important consideration when switching to OAD milking.

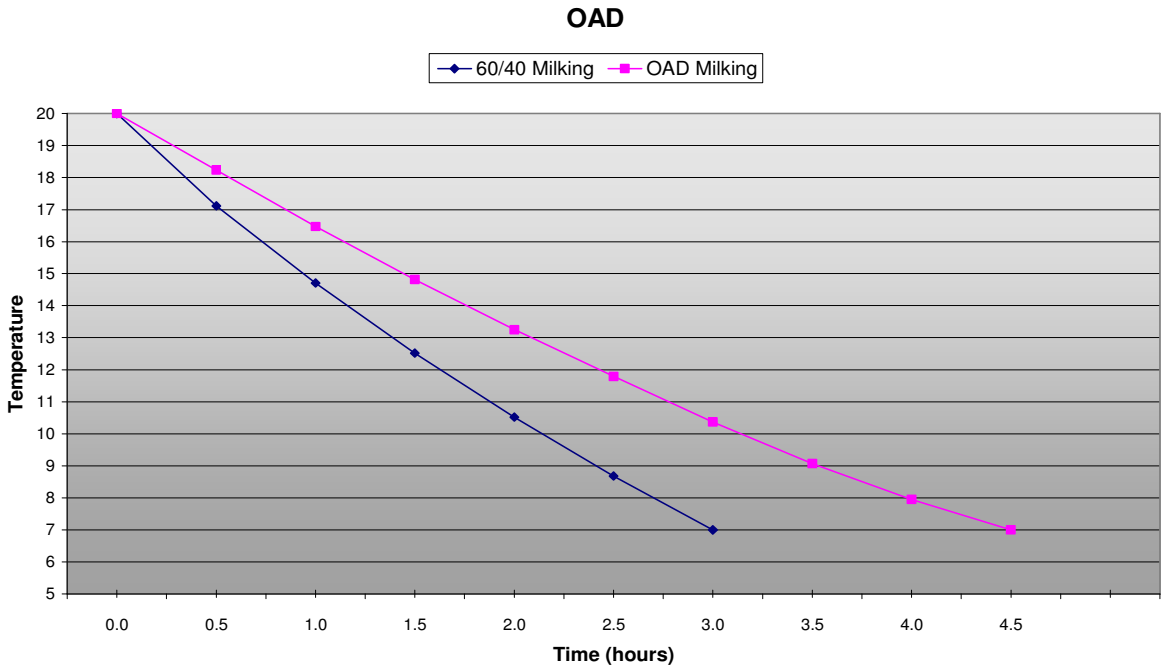


Figure 1. Differences in milk vat cooling time when switching from 60/40 am/pm twice-a-day (TAD) milking to once-a-day (OAD) milking.