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New Zealanders don't believe me when I say that, in 1980, a slow let-down cow in a 13-cow herd on 10 hectares in Japan took 13 minutes to milk. The farmer had to buy hay and straw imported from USA, or more recently from China, which brought in their Foot and Mouth Disease in January 2011. The farmer later went broke. Nor would they believe that in 1990 I saw a USA dairy farmer spend three and a half hours twice a day milking 70 cows. He took my advice and moved to Oregon (climate like New Zealand and far better soils), rented land, improved the pastures, and soon milked 700 cows in two and a half hours in a New Zealand rotary he had built. Automatic cluster removers were used.

Milking is the most important job on a dairy farm, as it is harvesting your production - your income. But your time is money, so it must be used efficiently with everything in and around the dairy, which must be the best and in perfect order. Get it serviced and checked for electric shocks every year, or when needed, by the best in your area. Read *Shocks Affecting Animals*.

Neither cows nor milkers tolerate stress, so bosses and milkers must know what causes it and avoid it. Faulty milking machines, shocks, feeding manganese in minerals or in palm kernel, are all causes.

My learning came through milking from age 15 at agricultural college, then on my parents farm, for three farmers in New Zealand, on our dairy farm that we increased from 28 cows to 200 in 11 years, and from consulting for DeLaval NZ Ltd and helping farmers who had milking problems. Some were dairy design or milking machine faults (sagging milk lines causing changes in vacuums, long sagging milk tubes from the claws to the milk line causing plugging and often seen on farms and in photos in farming magazines, etc.), and some faults caused by the owners. Many were mineral imbalances, such as cows suffering low selenium, cobalt or sodium. Unhealthy cows don't milk well. Read the chapters in *Elements*.

Stress

This word is mentioned six times in this section and 17 times in this chapter, which is a worry because it relates to today's dairying.

The whole milking process taking too long (more than 2.5 hours from paddock to paddock because it adds up to no grazing for five hours twice a day) increases stress as cows get hungry. See *Speed of Milking*. With today's large herds

More muck in yards and dairies means less milk and more empty cows from stress and more stressed farmers - and families! More muck means more washing and more effluent to pump and spread.

If your cows don't walk in on their own, check the milking machine, the dairy design, shocks, the milker, mineral imbalances* your methods and the radio. Nice music attracts cows, some modern noise (not real music) upsets them. Having a radio playing all the time is important because it teaches cows to expect noise and voices of all types of people without fear. Also, leaving it on all day discourages birds, so keeps the dairy cleaner.

* A dairy farm in the Waikato feeding a mineral mix containing manganese, stressed the cows and so the milkers, because the pasture manganese level was too high, caused by high manganese water and soils that were under-drained and needed LimeMagPlus. One dairy farmer wrote, "Due to the dramatic improvement in cow behaviour at milking since starting to feed DeLaval Solminix mineral through the drinking water, I'm reluctant to change from it." It contains nine essential elements and no manganese. Correct drainage and liming with synergisms also reduces toxic mercury, cadmium and manganese levels.

The following shows the importance of minerals. When I was consulting for a milking machine company, I was sent to a new external rotary in south Waikato that had stressed cows and stressed milkers. The pulsators had been mixed - some were 70:30 and some 50:50. Cows hate change. 70:30 are

usually the best. The farm was on mostly sandy pumice soil so was low in minerals. See Soils > Pumice. I advised correcting the pulsator settings and dispensing DeLaval Solminix minerals through the drinking water, and the problems disappeared. Animals that graze pastures that have the 17 elements at optimum levels and receive Solminix are much tamer, and the cell count drops.

Read the chapter on Water and get yours tested by Hill Laboratories, 1 Clyde Street, Hamilton 3240. Phone 07-858-2000. Email mail@hill-labs.co.nz.

No stress

The late Bill Chynoweth, breeder of the excellent Pukeroro herd, was the quietest, most gentle milker I've ever seen, by a long way. He was a slow mover, never in a hurry, never raised his hands or voice - spoke to his cows gently, touching them with a rub, never a smack. His per cow production was double the NZ average.

In 1961, on our Piako Road farm, we had a Dutch 29% sharemilker, Harry Bloomers, who milked and looked after the cows for two years. He was softly spoken and slow moving. He achieved higher production per cow than any of us, and had less mastitis than any before or after, until 1966 when we sold the herd and put on a 50% sharemilker.

Most herds are milked in a hurry with too much, "Come on", "Move up", shouted at the tops of farmer's voices. Cows are not deaf. They are female, so like gentleness. For maximum production they need to be relaxed - not tense. I've seen hundreds of different people milking, and many leave a lot to be desired.

'Shhhhh clup'. Do you know what that is? The sound for air sucking into clusters applied quickly and roughly on to tight, tender udders. This can be avoided by holding the clusters much higher and bending the rubbers, and applying them gently.

USA research showed that cows were more content and less upset with a radio playing gentle pleasant music and occasional peoples' voices. The voices meant that cows heard other voices without fear so when a stranger arrived at the shed their voice didn't upset them. Loud noise over the radio with shouting above it upsets cows, especially ones **developed from the opposite** such as Pukeroro cows. Some farmers reported that Pukeroro cows were more easily stressed, which shows that those finding this, had a problem at milking. Incidentally, if the radio is left on all day and night, birds don't come in and pollute the shed, because they think that there are people there.



Earlier design had problems such as the milking equipment and wheels exposed to cow manure.

The following helps avoid stress affecting cows which are animals as are we, so have feelings, responses and can retaliate. They are not machines, so treat them as ladies.

1. Are the cows jammed up in the yard, or standing comfortably?
2. Are they walking willingly into being milked?
3. Are they coming in without anyone having to go out and drive them in? Animals are creatures of habit, so if trained to be driven they will wait for the person to drive them in.
4. Are they spoken to affectionately, as if speaking to the Queen, or commandingly as if they are deaf. Nothing with ears likes being shouted at, so why do so many farmers shout at their cows?
5. When the cows are entering any type of milking setup, don't look at them face on. To them that is threatening them, so they may stop, or at least be made nervous, which is the last thing you want before milking. After I taught this to a 320 cow farmer who had never emailed me (his wife did), he emailed me to say how much better they came into a herringbone, after he stopped looking them in the eye, but watched out of the corner of his eyes from his head facing the other way. If a strange dog comes up to you and you 'strong eye' it, it might bark at you and is more likely to attack you.
6. When applying clusters, don't cause any shhhh clups?
7. What percentage are chewing the cud as they stand being milked? It should be at least 75%. Check them on the 20th of each month (milk payment date - so you'll remember), or more often if there are problems such as more than 5% mucking in the bales.
8. Is it the same on both sides of a herringbone (USA swing over)? One side could have a current shock.
9. Does the cow yard gate make enough noise each time it starts for all to hear and move forward? If not, attach a bell.

10. Are cows and staff relaxed, quiet, not moving quickly or shouting at the cows or each other? Stressed people cause stressed cows, and visa versa when cows are fed manganese in minerals and/or palm kernel. Cows don't understand English, so shouting for them to come in, shouting for them to pack in tightly and then shouting to each other, all sound the same, so stress the cows. Cows are calmest when there is only one person in the shed, and second calmest when a radio is used correctly.



11. Cows and staff are the least stressed in external rotaries and most stressed in internal rotaries because cows feel that they are standing on the edge of a cliff. Near the exit, some start pushing to get out as one is above. In externals shown on page two some cows have to be woken up to leave. Cud chewing can be 90% in external TurnStyles above showing contentedness.

12. One cow mucking per batch is too many. I saw the Abrahamson brothers near Otorohanga milk 500 cows in an external rotary in 1980 and only one mucked. They told me, that sometimes none mucked. One had 5% of 500 cows muck until he changed from a cheap milking machine which had repeated problems, to a dearer DeLaval which was more profitable in the long run, after which almost none mucked.

13. One for which I don't have a solution is cold hands and cold water. There is the joke, "Why did the cow jump over the moon? The farmer had cold hands." Very few now wash already clean udders from grazing pasture, because dry clean teats are more hygienic and produce cleaner milk.

14. If a cow comes in soiled by another in the yard, sometimes because of packing them too tightly,

it needs to be washed, but cows should not be jammed up. These are ideal, as is the backing gate yard cleaning system - no more hosing yards. Use the warm water from the cooler for udder washing, otherwise the cow doesn't know why she was suddenly blasted with an icy blast, so next time hesitates about coming in. When cows muck in the herringbone, it can be washed away with the high pressure cold water hose while the cows are standing there, but being gentle with it is worthwhile to keep cows happy.

15. This yard shows the gate not jammed up stressing the cows. It has a broom under the gate and washes the yard as it moves.

16. Trying to think of possible causes of stress in cows made me realise that cows drinking water high in manganese could contribute, as has happened when feeding manganese in mineral mixes in New Zealand, which is already high in manganese. The Chris Rhodes Naturopathic or Hill Laboratories water test show the levels. If necessary, filter it out, especially if you drink it, because it can increase the risk of Parkinson's disease. A good Waikato dairy farmer friend died too young because of it. Read the Water chapter and Elements > Manganese and Human Health Elements > Manganese.



17. Palm kernel extract (PKE) is very high in manganese and copper, both heavy metals, which have stressed cows quite severely, sometimes increasing the incidence of deaths. See Feeding Supplements > PKE which is a bad feed.

Speed of milking

Cows like being milked in a good dairy, but still dislike leaving the paddock, walking long distances, especially on rough steep over-cambered lanes, and standing on concrete, especially if hot, so cool it with water ahead of them entering. Cows hate being on concrete in yards or buildings; they like being on clover-based pastures. Most of all, cows dislike being rushed, shouted at and cursed. Aim to have the dairy in the centre of the farm, and direct lanes as short as possible.

Farmers who walk or ride behind the herd, waste between ten and twenty minutes at every milking. A dog should be at the back and the farmer ahead or, if a gate has to be closed or opened, walk through the paddocks and apply cluster on the first cow when it is in position. See Dogs.

Milking times per cow vary tremendously. A 12-aside herringbone in Canada had two milkers. On weekends only one milked - in less time, because there was no talking to each other. In New Zealand many milk in a 20 aside on their own. They open the exit gate while there are still two or three clusters to be removed. They have no gate at the back of the herringbone and a guillotine type gate at the front which always stops the cow. They walk up looking at the clusters on the other side, and apply to the first one as she arrives. The others walk in quietly and stack themselves. Straight back rails speed it up because they can walk in and out next to each other. Milkers never leave the pit. A backing gate and/or gentle dog can keep them coming in.

If the dairy has shocks, a faulty milking machine, a noisy radio, clusters applied roughly or left on for too long, or a milker who eyeballs them, they will be slow. See Dairying > Shocks.

Stimulating cows

Some dairy farmers and scientists think that cows need stimulating (called 'prepping' or 'preparing in the USA), before applying the milking machine clusters. They seem to think that a human hand can

do a better job than a modern milking machine, but they are wrong. Full and firm udders want the milk removed immediately.

Some scientists don't think practically; they are too far from the coal face and bank account, and their whole education revolves around theory and perfection on paper, seldom including farmer time and costs. One did expensive trials with identical twins and recommended 35 seconds stimulation. Today, where one person applies clusters to 700 cows in two mobs in a rotary in less than three hours, as is common in New Zealand, stimulating would add 700 times half a minute or 5.8 hours to each milking, which takes only three hours, so is not practical.

With apologies to the good researchers, learning for and getting a degree only proves that the degree holder can read, remember and write, and proves nothing else. Many learn more and more, about less and less until they know not much of wide overall practical use. A wide practical knowledge and open brain are essential in farming and all life.

The following examples show why a highly qualified scientist in the 1960s recommending hand stimulation of 35 seconds per cow was completely wrong. Doing it would bred up a national herd that required it.

While still in South Africa pre 1954, when we changed from hand milking to using milking machines, immediately after the clusters were first applied some cows looked around with a proud, motherly look and moored gently as if it was their calf sucking. This shows the gentleness of good milking machines, which can stimulate calves better than cold human hands which are inclined to be in a hurry and rough, when all a cow wants is the milk removed gently from a tight, sometimes sore udder.

As a consultant, when staying with client Austin Moore of Maine, USA in 1982, I noticed that while he was doing the usual USA preparation, most of his nice, quiet Jerseys fidgeted and moved from foot to foot uncomfortably, which are signs of dislike. They were grazing on new clean paddocks after each milking and walking on a clean dry lane. I suggested that he need not prepare them because the udders were clean and cows did not need prepping. His tie-stall barn was also spotless. The next morning he was in for breakfast 20 minutes ahead of time and when his wife asked what the problem was, he told us that he had put the clusters straight on. After breakfast I suggested that we check the milk volume, and it was up.

The last thing cows want is more milk let down into their already tight udder, which can be dangerous. In the 1950's, Bill Chynoweth, a top New Zealand farmer (mentioned above), with very well-fed, high-producing cows, washed one cow and was then called away. When he returned, the udder was like a balloon with milk pouring out of all four teats. After milking her, the udder was still inflamed. The next day she had severe mastitis and, despite full treatment and care, she had to be culled. I know this is not common, but it shows what delays can do, so be quick. If the power goes off, hand milk cows that have been stimulated in any way, and then milk those in the dairy and stop others from coming in.

Therefore, there must be no delay in applying the clusters. Delay is dangerous because of the limited let-down period of all cows and the shorter let-down time of some cows. All the available milk contained by the udder can be removed by an efficient milking machine, provided the milking process is completed by the end of the "let-down" which lasts between two and twelve minutes depending on the cow. New Zealand cows have been bred for fast natural let-down.

Obviously the teats should be dry and clean before milking. If they are not and the milking machine is working correctly with no slip, any dirt that is on the teat before applying the clusters should be still there after removal. The teat should still be dry. If not, you could be getting back-flow from allowing air in when applying shells shoddily (shhhh clup).

Prevent teats getting dirty by putting time into shaping lanes and paddocks so there are no muddy hollows or footpaths around gateways and troughs. Make the farm drainage perfect, maintain the lanes and gateways or use the fence let-down system. See the chapter on Fencing.

Prolonged hand stimulation of the udder will lose milk production from the fast, short time let-down cows which can gain weight. It'll favour those that have to be stimulated so they'll produce more, you'll then keep their calves and end up with a slow milking herd.

From here it is extracted by milking. Let down is initiated by stimulation, which includes entering

the milking area, hearing the milking machines, hands, or applying the machines. Some cows enter the milking area dripping milk, while some don't let down until a few seconds after the clusters have been applied. Neither need stimulating.

Creatures of habit

Dairy cows quickly get into habits. The cow that is handled quietly and regularly soon develops confidence and loses any fear it may previously have of getting hurt, and likes to come in to be milked. I've seen some cows walk in briskly, and some walk in slowly and begrudgingly.

When farming, we converted to a herringbone in 1959. I had made it wider and shorter, to reduce mine and cow walking time in and out, so they stood closer to right angles and the udders were easier to access from behind. At this stage, to save time, I stimulated two at a time for 20 seconds. However, this didn't last long, because our dairy farmer discussion group in 1959 (possibly the first in New Zealand) decided stimulating was a negative idea.

Cows are stimulated by anything that occurs regularly before each milking. Walking into the dairy stimulates them, so the clusters need to be applied as soon after as possible, every time. In large, say 30 aside herringbones, if cows finish milking before the clusters are removed, don't use all 30. As the front cow reaches the gate, it should have the clusters applied, not two minutes later as I've seen in some. Once let-down stops, milk production stops.

New Zealand cows in USA showed that compared with US cows, NZ ones let down sooner and milked out faster.

Cull the slow milkers because they'll upset the milker movement in a herringbone. In external rotaries they can go around twice to milk out completely. If you are increasing herd numbers and don't want to cull slow milkers, apply the cluster to them as soon as possible in a herringbone.

In herringbones, a few slow milkers can add time to milking. The clusters are best removed at the same time as others. The loss of milk is often little. Milking today is mass production, so all cows must conform. The smaller well-organised herringbone farmers, who know every cow, will sometimes take the clusters from a nearly finished cow opposite them and put them on a slow milker. In large herds this is not likely. Don't keep calves from slow milkers.

It is unfortunate that very few dairy farmers ever see another one milking. As a consultant, I aimed to see each client milking at least once a year. On one rotary, the milker was stepping to one side, lifting the clusters and stepping back to apply them because the first clusters applied were out of order. He should lift the cluster and apply it as the cow passes him.

Find out from your consultant which farmer has the best milking system, phone and visit him during milking, but wear the same colour clothes as he does and not the same as the vet or AI technician. Cows are not colour blind, and so associate things.

Brilliant Taranaki dairy farmer, Merv Hicks, invented and built the Turn-style rotary in 1969 and sold the marketing to DeLaval. While costly, they can save a staff unit and house, as well as increase per cow production.

It is unfortunately rare, but I've seen contented cows chewing their cud as they walk into the farm dairy, while being milked, and while walking out. This is more frequent on external rotaries. Cows don't like being jammed together as in herringbones, especially those with zigzag rails which don't allow for different size cows, so big ones are tight, and small ones can move forward and back. The exact regularity and no jamming of cows against others in rotaries is a reason for the slightly increased production of up to a litre per cow per day achieved in them.

Animals know best

Calves, lambs and kids rush up to their dams and drink immediately, without messing around, while some farmers by stimulating, have taught their cows slow let-down, and then selected the highest producers from the slow let-down milking system!

Half-way through seasonal milking when cows are not so keen to be milked, change to once a day milking. Cows will be keener to be milked, and you'll lose little and gain a lot, such as half the power and half your time.

Milking times

Many find milking a chore, mainly because it takes so long to milk. One person can now milk 400 cows single-handedly in 75 minutes at night and 90 minutes in the morning (more milk), using DeLaval's new fully-automated Turn-style 70 cow rotary milking system, with a concrete platform and automatic cluster removal. It has milk metering, cow ID, automatic feeding, and computerised drafting. Washing up and closing the cows in their paddock takes a bit longer. The cost is about NZ\$1,000,000, but saves one milker and their home.

Milking systems

The milking machine must be the best available. There were some new ones sold last year (2012) that are disasters, causing cows to muck ten times more than the best milking machines. However, some of the worst ones are cheaper - or are they, if there are problems?

One problem can be the automatic cluster remover ropes being too long, so pulling around the bottom of the leg, instead of higher up where it has less ill-effect on the leg. Another is automatic removers trying to pull the clusters off before the vacuum has closed off.

I was in a dairy and could see that the automatic cluster removers were not working correctly. Some were staying on for too long, and some were removing clusters while milk was still coming. The farmer got them checked, but could see that they were not operating as they should, so changed to removing clusters manually. To his surprise the amount of milk increased by a litre a day, so he did comparisons on several days and found that milk was always down when they were used, and up when they were not used.

Not using them can make milking faster in a herringbone because it is quicker to move clusters from one cow to another, than from the hanging position. Manual removal also allows milkers to check the udders visually and by hand if necessary.

As milkers seldom see other farmers milking, they don't learn all the good milking techniques. LIC consulting officers who could help, usually go home before milking. Farmers should ask their LIC consultant who the best milker is, his SCC figure, speed of milking, conception rate, and then visit the best during a milking.

Automatic milking system (AMS)

This is a complete system covering the whole farm layout which is quite a big job to set up with solar powered gate controls. The layout and animal movement control is quite complex.

The Waikato Greenfield AMS, run from 2001 by Ruakura then closed by DairyNZ, can be seen on http://www.dairynz.co.nz/page/pageid/2145836818/Greenfield_Farm

Training cows is a job. Research has shown that Jerseys learn new systems more quickly than others, which could be because they are tamer, so less stressed.

It was found that cows didn't like getting up in the morning before about 7 am, and they preferred to come and be milked at about 9 am, resulting in a queue of a quarter of the herd until about midday - not good in hot sun, or for milk production and manure in lanes.

About 90% of the cows chose to be milked only once a day, so Holstein production will suffer compared with smaller high milk solids cows.

Repairs and maintenance was high with the technician having to come to Greenfield almost every day. They had a log book that I checked a dozen times over seven years when I took clients there. I have been told that newer machines have reduced this. I suggest that if the system suits you, buy an established brand that has sold thousands, not an unproved one.

Some have bad design faults, for example the floor should slope upwards slightly because cows like standing that way. It is one reason why cows like rotaries so much. Also standing slightly up discourages cow moving backwards which, if done in the bale, slows cluster application.

I believe that the cow should not be able to see anyone who enters the area and they should not talk, unless there is a radio going all the time, which is a good practise in all dairies. See above. At Greenfield, if someone came in and spoke, the cow in the bail would move back and lower its head to

see who was there. With a radio going all the time, cows would not know someone had arrived.

With DeLaval AMS, a cow just lifts her head out of the feed bin to see what is happening, so doesn't move back and forward again.

The total cost of automatic milkers is excessively high per animal with buildings, extra lane and fencing layout, animal control and direction system. Before spending about a third of a million dollars, do a complete budget and look into the possibility of part-time milkers milking once a day from a month or two after calving, because that is what Greenfield cows did. Add the cost of grain that has to be fed to encourage cows in to the bale. Eating grain into an empty rumen is not good because it is inclined to move through without regurgitating and enough chewing to add enough saliva.

The cost in 2009 in New Zealand dollars to own and milk a cow normally is \$800 per annum which is \$700 in an automatic milker with its lower staff costs. Capital costs are not included because of the extreme variations.

To buy an automatic system costs about \$3,500 per cow.

Cost or value of a cow \$2,000 to produce \$2,700 worth of milk.

Total cost \$5,500 per cow.

The cost of borrowing at 6% is \$330 per annum, plus the \$700 above equals \$1,300 for \$2,700 worth of milk, so a gross income of \$1,400. Land value is not included, but at 6% on \$40,000 per hectare milking 3 cows per hectare can be \$800 per cow in the Waikato, leaving little profit to the farmer.

Over the last 50 years, the milk payout per kg of solids to farmers has dropped in most areas of the world and this doesn't look like changing, so costs have to be reduced.

Dairy farmers in New Zealand have survived by milking more cows, going from an average of 60 cows per farm in 1955 to 370 now. This increase can't continue indefinitely.

Production in the Waikato Greenfield system was lower than the area average. Their figures are available from them. Google for Waikato + Greenfield + robotic.

If, like the New Zealand Greenfield one, 90% of cows will come in only once a day on average, do a costing on paying someone to milk once a day. There could be someone in your area looking for part time work when their children are at school. Milking can be done at any time. 9 am is a good time before it gets too hot in summer and when the pasture has a slightly higher energy level than at 5 or 6 am, which is also too early for cows, who generally prefer a 9 am milking.

Be aware that some AMS have been installed and removed. One reason given was because it was not installed in the centre of the farm. If this is done, power and tanker track (and fencing) costs have to be included. This is not usually a high costs on small farms.

90 is claimed to be the maximum number of cows per single unit. If you try to milk more, your cows will be standing for longer in the sun, messing in the lane, from about 9 am until about 11 am, which AMS systems have shown is cows' favoured milking time.

There are left and right units, each using some different components. If you need two units avoid having a left and right one and having to keep left and right parts as spares. Find out from your supplier which is the most used in his/your area, and find out which is the most used in your country - your supplier could have a majority of one which is not the common one in your country. Spare parts run out and if you can't milk, it could be catastrophic.

Costs

From Australia: two robot dairies compared with an 18 a side herringbone swing over with automation gave a price difference of only \$111,000 for the two dairies, assuming both were being installed from scratch - i.e., neither was using existing infrastructure.

Conventional milking system (CMS)

Plant & equipment installed	\$292,806 (ex GST)
Building, concrete, yarding, etc	\$455,600 (ex GST)
Total (\$)	\$748,406 (ex GST)
Average MS Capital Invested \$/cow/year	\$312

Automatic milking system (AMS)

Plant & equipment installed	\$594,621 (ex GST)
Shed, concrete, yarding etc	\$265,000 (ex GST)
Total	\$859,621 (ex GST)
Average MS Capital Invested \$/cow/year	\$358

For both installations above, the "plant and equipment installed" included milk vat, cooling system, auto cleaning, plant and equipment.

The Average milking system (MS) capital invested/cow/year was calculated by dividing the total capital cost by the specified herd size and then dividing by the effective life of the MS used (15 years for CMS and 15 years for AMS in this instance).

The conventional milking system incorporates technologies such as automatic cup removers, electronic feeders and cleaning systems. It was deemed that this was most appropriate as a comparison with automatic milking systems.

Dairy costs were provided by an industry consultative group which included dairy shed designers and installers as well as milking machinery sellers for both the AMS (DeLaval) and CMS. The sheds themselves were neither extremely extravagant nor excessively basic.

With the AMS, a more basic dairy could be designed as the area that the AMS takes up in the shed is quite small. It is interesting to note that with the CMS about 60% of the cost is in the shed, concrete and yarding whereas with the AMS about 60% was with the plant and equipment installed.

Conclusion on milking systems

I would not install AMS. Think of everything, such as cow cycling detection, AB and mastitis treatment, monitoring bloat and ill health monitoring and treatment.

Adjoining farms would be better installing an external rotary between them, and paying one milker to milk all the cows.

Large herds changing from a herringbone to an external rotary produce about a litre more milk per cow per day in the flush, and save one staff unit and a house which need not be built or can be rented. The reasons for more milk are -

- Cows are much more relaxed. They push to get on the rotary and most chew their cud all the time.
- Milking is faster so cows are happier and more productive from being in pastures for longer than in lanes and dairies.
- Cows, as with all animals and people, prefer the same bale and same treatment every milking. Rotaries give this, without so much of what animals dislike, which is being jammed up in a herringbone and waiting to be milked.

An alternative is to continue with the system you have and milk once a day, especially if you have Jerseys that don't drop as much in milk solids production as Friesians, or you could change to Jerseys.

Almost since the beginning of dairying in New Zealand, about 100 years ago, New Zealand dairy farmers have been paid for milkfat, not volume, and then for protein as well. Now there is an international trend towards payment for milk solids, and mostly protein.

The old AMS at Greenfield plant near Hamilton

Automatic sore teat treatment can be less effective than manual treatment of sores on teats like this one. The cow being able to see out is not good.

New ones like the DeLaval one are vastly improved.



Sore teats

If teats are sore, cows are more likely to kick during cluster application and removal. Front teats suffer more and are harder to see, so check them. An iodine with emollient spray immediately after milking helps. In a severe case, apply an ointment.

Hoof care

Some farmers lose money because of hoof problems, especially on large farms where cows have to walk a kilometre to the rear paddocks and back again. If the lane has faults such as too much slope (twisting hooves) and/or stones damaging hooves, 5% of the cows may have to be kept in a close paddock.

At the end of each milking or day, wash hoof mats and hang up to dry. If using copper in any form, don't hang the mats over galvanised pipes or rails because the copper will corrode them.

The secret of hoof mats is the tough permeable fabric which allows the transfer of disinfectant to and from the core which holds the liquid. The strong dense core holds the liquid and hydraulic action squirts it into the hoof.

If a hoof bath is used, change the bath and wash it out at least weekly. Many get built and then not used because -

1. They don't achieve good results so farmers stop using them.
2. They get dirty and are hard to clean.
3. Users don't clean and renew the product as often as necessary so they don't achieve results because the product loses its effectiveness.
4. They hold a lot of liquid which requires more product.
5. They are usually in the open so can be diluted with rain.
6. They can freeze.
7. Animals don't like them.

Foot or hoof mats prevent and/or overcome some of the above problems.

For more information see <http://www.sweetmans.co.nz> and www.shoof.co.nz

Kicking clusters off

There are three categories of this: just with one cluster, many cows doing it, or just one cow.

1. One cluster with a problem of incorrect, twisted or loose liner in the shell, pulsation speed or ratio wrong and shocks.
2. If many animals do it check for -
 - Pulsator faults of wrong speed, wrong ratio, leaking, etc.
 - Vacuum too high or too low.
 - Liners need replacing.

- Flies. Biting flies cause a quick reaction.
 - Milking taking too long. When we changed from slide pulsators to electronic in 1961, milking was much faster and udders milked out visibly more. I was amazed. Milk production increased.
 - Faulty automatic cluster removers, which too many are. A farmer who suspected them changed to manual removal and increased milk production.
3. Single animals are more likely to do it if -
- Teats are sore from chapping, cuts, facial eczema or spring eczema damage.
 - Mastitis or damaged udder from it or other causes, such as internal eczema teat or udder damage or reflected pain.
 - Digestive pain. Check if she kicks at her tummy when in the field, or after eating grain, or other supplement.
 - The kicking off habit developed because of one or more of the above.
 - Lice. These are more inclined to gather and breed under in front of the udder and above and behind the udder.
- Some animals tolerate any of the above while others won't.

Shocks

These can be a serious and costly problem in dairies and water troughs. See Dairying > Shocks.

Milk quality

Top quality milk is the most important thing in dairying. This means cleanliness, efficient milking machines, low somatic cell counts and mastitis.

Site the farm dairy in the middle of the farm if possible, to avoid long treks for the cows to milking. This may be limited by tanker access and electric power sources, but these costs can soon be recouped in time saved daily, and in extra production.

Feed taints from things such as land cress which, if grazed within a few hours of milking, can give the milk a strong flavour which cannot be removed. This bad rancid flavour is concentrated in the fat, and some dairy companies' penalty for cress tainted milk can be no payment at all.

Land cress grows all the year round, so is a continuing problem to be watched for. It thrives in new pastures, disturbed areas like races, gateways, drain cleanings and around water troughs.

Treatment should consist of spraying pastures at the seedling stage, as per the manufacturers' instructions. Spraying makes weeds more palatable by raising the sugar levels, so keep stock out of sprayed areas for two weeks after spraying.

If you have a paddock with cress and have to graze it, do so immediately after milking and then move the cows after a couple of hours to another paddock free of the weed. This will reduce the chance of tainting the milk.

The same practice should be used when grazing Puna chicory and brassicas (turnips, swedes, chou-moellier), which can also taint milk and spoil its manufacturing qualities.

Surveys have shown that mastitis in grazed cows is half that of confined ones. Fewer flies could be one reason.

Grade costs

As well as the cost to the farmer, down-grades of milk costs the dairy company and the country from lost sales through inferior products. A grade can cost the value of 20 litres of detergent, so trying to economise on the amount of detergents can be expensive.

Finding the causes of grades

- One or more cows can cause grade problems which milk tests from factories may not identify as originating from cows. These will obviously be difficult to locate.
- Coolers can open bug-filled cracks when warm milk is on one side and cold water on the other. Also, water can enter the milk through faulty coolers and not all farm water is pure.
- Check milk temperatures from milking until the collection by the tanker.

- There are many hidden causes of poor quality milk. One of these is feeding rotten silage in paddocks, or anywhere cows can eat or lie on it. Bacteria in bad silage can even go through the animal and come out in the faeces. If cows lie down on this, the teats become polluted. Normal washing doesn't remove all the bacteria spores and bulk washing with a high pressure hose makes things worse so is a no-no. The bacteria concerned is a survivor. Even teat sprays don't kill them.
- Milk being churned is bad for it and for the fat test, because lumps of cream can form which bypass the milk sampling system. Avoid air flowing through the milk as happens when clusters are applied roughly - a shhhh clup sound can be heard. Air leaks also churn the milk as the air runs through the milk. Milk pumps running too fast can also cause churning.

Long lactations

Some farmers milking about 1,000 cows find the calving period stressful, even with three milkers, so they milk some cows for up to 600 days before calving them again. Cows that don't continue producing well are put in calf sooner. Some in New Zealand have gone away from once a year calving to calving in spring and autumn to spread the calving workload.

Drying off

Research has shown that for maximum production during the next lactation, cows should be dry for at least 40 days and preferably no longer than 70 days. Heavily stocked farms on seasonal milking frequently run out of pasture, and have no option but to dry off early to avoid cows getting thin and causing lower production in the next lactation. One solution is to not overstock the farm, but droughts will occur.

Drying off is a critical time on the dairy farm. Every farm is different, but there are some common factors in the decision making. Points include: calving dates, cow condition, effect on the bank balance, effect on next season's production, pasture available, and whether expenses will be incurred in the subsequent winter/spring period through insufficient winter feed, therefore having to buy supplements.

During this time, pasture measuring and budgeting is like checking a bank statement; it tells you where you are, and by changing figures (what ifs) you can plan for the next season.

Firstly, the dry matter intake of milking cows weighing 500 kg (1,100 lb) should be maintained at no less than 12 kg (26.5 lb) DM/day until a day or two before drying off. Secondly, with spring calving, the farm cover should be increased to the required level by late autumn. Thirdly, cow condition should be no lower than 4.5 on a ten scale, and increased to 5 or better by calving. Much above CS 5 is of no advantage, and 6 can be a disadvantage because cows can bag up too much, making the udder so tight that it drips milk, so needs to be half milked out before calving.

Milking cows for too long and ignoring the above is a recipe for trouble ahead.

To reduce milk production, reduce feed gradually, but never to below 1.8% of their live weight of good pasture, and don't feed this low for too long. Watch their milk production, body condition and stress.

Procedure

Using the above points, decide the date of the last milking. Continue to feed well to keep production up, keep somatic cell counts down and to maintain good cow condition. For the last seven days, reduce pasture to maintenance levels of about 5~7 kg of dry matter (DM) per cow per day depending on cow size and, if necessary to reduce milk production, reduce water over the last few days, but no longer because cow condition can drop. Don't limit water if feeding mostly hay or dry feed.

Don't prolong drying off - milking every second day increases cell counts and the likelihood of mastitis, and the milk is of poor quality. If your cell counts are high, it may pay to discard the milk. Spread it on to land to be cultivated or short pasture. Don't graze it for two months and then not graze it short for several grazings. Preferably on-off graze it a few times, so that cows don't lie down in it.

Continue feeding at low levels of 5 to 7 kg dry matter for the first seven days after drying off.

If mastitis is not a problem, use selective dry cow therapy at the last milking, otherwise treat them all. Before treating, sanitise the teat end thoroughly with methylated spirits or similar. Insert the tube

carefully as little as possible (5 mm or 1/4") to reduce teat damage. Finish with a thorough teat spray until a drip hangs on the bottom of the teat. This and all spraying must be done immediately after cluster removal to prevent anything else entering the teat channel.

Remember that 'dry cow treatment' cows must not have milk sold for six weeks, depending on the treatment used and if on once a day milking, twice the recommended discard period applies.

Teat seals are achieving good results in herds that have a high incidence of mastitis.

Use fresh, dry, clean, mud-free paddocks or a shavings pad (not a muddy lane) during and after drying off, and again before calving to avoid mastitis infection.

Seven days after the last milking, check teats visually or by feeling if unsure, **not** by taking a squeeze which opens the teat canal again, unless there is a visual or felt problem.

Adding cow condition in winter is expensive

It takes 10 extra 20 kg bales of good hay (\$60 to \$100; worth 10 to 17 kg of milk solids), or the equivalent feed, to put a condition score (CS) on a 500 kg cow in winter. Aim to dry off cows with none under a condition score of 4, and none over 5 (scale of 10), except for cows that are likely to lose condition over winter. These include first calvers and old cows. These should be dried off in better condition and if necessary grazed separately.

Under-feeding for months before drying off can decrease the CS, although high producers, first calvers, old cows and some others can lose condition whatever you do, unless you dry them off. Those which calve at under 5 will produce less and be harder to get in calf, because they will be thin, and those too much over 5 could have problems at calving, and the extra condition is wasteful.

If cow condition drops, milk once a day. Under seasonal milking, dry off cows by a CS of 2.5 four months before calving and a CS 3 three months before.

The formula for 500 kg (1,100 lb) cows is 6 kg (13 lb) DM maintenance plus about 1 kg (2.2 lb) DM per 0.175 kg (0.39 lb) of milk solids, so if averaging:

1.4 kg (3 lb) MS/day, they need 14 kg (31 lb) DM/day, if

1.2 kg (2.6 lb) they need 13 kg (29 lb)

1.0 kg (2.2 lb) they need 12 kg (26 lb)

0.9 kg (2 lb) they need 11 kg (24 lb)

0.7 kg (1.5 lb) they need 10 kg (22 lb)

0.5 kg (1.1 lb) they need 9 kg (20 lb) or if

0.4 kg (0.9 lb) or 5 kg (1.1 lb) of milk/day they need drying off. One kg is one litre.

Emergencies

There could be times when, through illness or shortage of staff, milkings have to be reduced. Missing an occasional milking has insignificant effect on the total production for the year, but once-a-day milking throughout the lactation can lower production by 20 to 40% depending on breed, level of production and the pasture growing conditions.

Milking once a day for a week or two, about six months after calving can decrease milk production by about 20% initially, after which it can increase again and return to the previous level if milked twice a day again.

Cull early

Meat prices to the farmers drop when the market is flooded by culls, so aim to cull low producing cows ahead of other farmers to get higher prices, and to avoid feed shortages affecting the whole herd. This means culling low producers as soon as found, all the time in winter, and when dry weather, heat and winds create a pasture shortage. If there is plenty of pasture, it can be later. This is one of the times when a week can put a successful farmer even further ahead.

It costs NZ\$800 to own, keep and milk a NZ\$1,500 cow for a year. This is \$2.19 a day. If she is not producing quite a bit more than that each day, she should be sold. Most grazing farms that cull when short of feed find that the remaining cows then get more feed, and so increase the milk production by as much as what the culled ones were producing, because it takes 7 to 9 kg of pasture dry matter to

maintain a cow before she produces anything.

Bovine somatotropin

This growth hormone is not allowed in New Zealand and I don't recommend using it anywhere. See www.biotech.iastate.edu/biotech_info_series/bio3.html

Animal health

For maximum production, perfect health is imperative. See Animal Health.

Running costs per extra cow per annum

See the spreadsheet Dairy # Cows For Max Profit and enter yours to achieve the highest profit possible on your farm. It shows how many cows should be milked for maximum profit on your grazing farm.

It costs NZ\$800 to keep and milk a cow for a year. At a field day I ran on a Waikato farm in 1990, an Australian Department of Agriculture consultant attended with his computer and a similar program he had developed. In a 250 cow herd we were only 5 cows different which pleased us both, and gave the farmers who were attending confidence in the GrazingInfo spreadsheets.

Some male farmers don't like figures. They could ask their wife or children to enter them. When consulting I did one mentioned above on farms in 15 minutes. It should be used in conjunction with the Budget/Profit spreadsheet.

Decreasing to the optimum number of cows has increased annual income by up to \$13,000 for some farmers.

Milker comfort

This is just as important as cow comfort.

Floors where milkers walk must not be slippery. They have caused severe accidents. Concrete can be roughened with grooves, or covered with non-slip rubber or plastic.

Clothing must be comfortable and safe. This means the right size and fitting snugly. Loose clothing can get caught in machinery and pull the wearer into it. Long aprons can make moving fast to avoid something (bull, calved cow, etc.) difficult.

Over-working is a very costly fault

I've visited many USA confinement dairy farmers who were brain-dead from over-work, so they could not think or plan. Some boasted that they were in the 20,000 Club for having milked 20,000 times (27 years) without a break!

Some farmers would boast, "I've been farming for 50 years."

I would look around and think, "No, you've been making the same mistakes for 50 years!"

Causes of cows dunging excessively in yards, during milking or as they leave

- Scared of humans (Never hit them and don't wear the same colour clothes as the vet or AI person)
- Uncomfortable in bail
- Faulty cluster removers
- Shocks
- Sore teats
- Lacking minerals especially selenium which helps control muscles
- Low or high magnesium
- Uneven milking or seeing cows ahead of them eating feed from troughs
- Unwell for any reason
- Nervous by nature so dislike being jammed up against other cows. This is a major advantage of rotaries where each cow has its own bail. However, some rotary bales are too short for large cows so they are jammed up too tightly.

Internal rotaries [shown here](#) scare cows who know there is a large hole behind them, so some even

try to jump out of the internal rotary and most push to get out. **As shown**, the cow entering sees the stressed cow trying to jump out to get away, so is stressed before entering. There was no radio so cows would be frightened by unaccustomed noises. A trial in Europe showed that cows preferred gentle music rather than loud noise, called 'music' today.

In the 1970s, I saw 500 cows milked in an external rotary when only one dunged and the owner said that sometimes none do.

The latest external rotaries have a bar that stops the cow's tail from lifting which reduces dunging.

Minimising dunging

- Cows should not be allowed to loiter in lanes. It messes up the lanes and wastes fertility. Train your dog, which will soon train your cows, to stand up and move away from the gateway and drop their manure, before coming into the lane. They usually dung a few minutes after standing.

- Walk them quietly to the dairy.
- Don't compress them in the yard.
- Have no temper, or control it completely. One upset cow upsets others. Cull cows which upset you or others.

- Avoid shocks. Many dairies have electric shocks of some sort.
- Avoid tight corners, slippery concrete, sudden noises, but have a radio going with smooth music not wild savage-type noise (modern dins). The music one has been proven and dairies without radios have cows which are more easily upset by a strange noise, or even a new voice.

- Wear the same colour overalls or clothes. You and the vet administering medical treatments on your stock should wear a different colour.

- Avoid a dog or human that stresses them. Stress makes muck. Animals don't like the smell of muck, which sometimes makes them muck. So wash it away as soon as possible. Do it carefully without squirting water on the cows which is frightening to them.

I've seen 400 cows milked in a turn-style rotary by two milkers in just over an hour and only two dunged (more may urinate). This is while in the dairy. Many more dunged while waiting in the yard, especially if squeezed tightly. Herringbones have two to three times more dung.

- Keep milking times short. Large herds (300 or more) should be milked in two or more batches to halve the time in the yard. A good dog will bring them in. A round yard or two adjacent rectangular yards allow a continuous flow without jamming cows up and without a pause in milking.

- Always have them go to a new feed after milking so that they move there quickly and don't stand in the lane. If they do stand (because you gave them a fresh bite before milking to reduce bloat risk, fill them before grain, etc.), have your dog move them to their paddock.

- Close cows in paddocks.

Last avenue

If, after applying all of the above, you still have a problem, ask about it at your discussion group meeting and/or contact your vet and consultant for help, or email support@grazinginfo.com with photos of cows and ask for suggestions. Your farm consultant should see at least one milking each year on all their clients' farms, and should see beef handling on dry stock farms.

Animal movement

Bringing herds of 300 or more cows up lanes is a slow job. Larger herds are usually divided into two or more mobs.

Most go down the lane on a farm bike and then ride up behind the cows. I sometimes walked through the paddocks grubbing weeds both ways. I walked much faster than cows, so could grub weeds as I went and be in the dairy ready to apply clusters as the first cows arrived. See Dogs.

A better way is to use a good dog to bring them up while the milker goes ahead of the mob, wets the yard to cool it in summer and make washing easier. Then the first cows walk in to the bails and clusters are applied, saving at least five minutes twice a day.

A U shaped race allows cows to go down the second lane to the next paddock to be grazed. It also

allows paddocks to be closer to square. See Fencing.

Over-stocking causes hungry stressed cows

Milking in winter in Mediterranean-type climates

Positives of autumn calving?

If you are grazing and relying on the amount of pasture grown, it is imperative that you milk the optimum number of cows with calving dates to match pasture growth patterns (see Spreadsheets Dairy #Cows For Max Profit kg).

In the milder parts of New Zealand and on non-pugging soils, such as correctly drained and farmed peat and pumice, more are changing to autumn calving because -

- Some farms can grow more pasture per day in an average winter than in an average dry late summer, and especially in droughts that occurred in 2008 and 2013.
- Autumn pasture growth is often more reliable than spring growth when soils are over-wet, warm weather is late coming and there is more cloudy weather.
- Artificial nitrogen works when there is moisture and enough warmth, but doesn't work in dry conditions. Incidentally, lime-plus (see Elements > Calcium), which is deficient in 99% of New Zealand and Japanese pastures, grows much more balanced pasture than any nitrogen can and for years, not just for months.
- Cows produce better in cool weather than in hot weather.
- Peak milk flow penalties don't apply and **town milk farmers have done it for decades**.
- If enough calve in autumn, dairy factories need not be so big to cope with spring flushes of just a few days.
- In dry summers, those running pasture-only operations sometimes have to dry off a lot of cows to feed the remainder to keep them milking. Autumn calvers would be dry then anyway.
- Autumn pasture is not conserved, so doesn't get as long, so pugging and clover suppression are reduced. Grazing from say 3,000 kg/ha down to 1,200 as is often done, can cause severe pugging. Farmers doing this find that clover content increases and pastures improve.
- Mob sizes are smaller so are faster to move.
- Some can get winter milk price premiums.

Negatives of autumn calving? Negatives of all year milking??

- If both spring and autumn calving systems are used, milking becomes a 365 day operation. Once a day milking can make it less of a drag.
- In cold winters, even in NZ, there can be times with no or very slow pasture growth.
- If autumn is very dry, achieving an adequate feed cover before winter will be difficult. In the Waikato, the autumn rains have been starting later in recent years.
- Cows can be harder to get in calf in winter.
- Staff may be harder to get for this type of operation.
- Dairy effluent can't be spread onto wet soils, so extra storage may be needed. Effluent can be reduced by having gutters deflect rain, preferably into reservoirs, and yard water between milkings deflected to a drain.

Wet paddocks can be improved for many benefits with shallow spinner drains every 30 metres. A bark or chip feed pad may be needed to feed supplements in wet weather or on wet soils.

Before considering a feed pad and troughs, feed along fence lines before the cows get into the paddock, so they don't mill around. My best and most profitable dairy and beef farmers did this. Very successful Ian McDonald of Patetonga built them and stopped using them after a couple of years. In large herds the effluent handling doubles.

Producing the maximum amount of milk solids

The following are from Googling "finecut silage + regurgitation". Most are from USA. New Zealand's lush pasture is a low fibre diet. Most of the silage referred to was maize (corn).

- Milk fat percentage increased slightly when longer cut silage was fed to cows receiving low fibre

diets as in pasture.

- As expected, milk fat content was substantially higher for cows fed adequate forage fibre diets than for those fed low fibre diets.
- Milk fat tended to be higher when long, rather than fine, silage was fed.
- Increasing silage chop length increased milk production while maintaining milk fat content, was beneficial for milk production in diets of minimum forage fibre, and effectively enhanced milk production in diets lacking forage fibre.
- Increasing silage particle length effectively increased fat content of milk, but at the expense of dry matter intake and milk production.
- The addition of a small amount of hay to low forage fibre diets was less effective than increased particle length of silage.
- As expected, cows fed adequate fibre diets chewed their cuds for longer than cows on the low fibre diets of lush pasture.

Herd testing

Automatic ID of both cows and flasks of milk can enormously reduce the cost and time of herd recording. Rotaries are perfect for this. In herringbones, the milker wears the recording and ID system. Variations in accuracy are so slight that the reasons for testing are not adversely affected.

KiwiCross

The KiwiCross in New Zealand is doing well and increasing faster than other breeds here. It is a grazing, medium-sized, strong cow.

LIC have done an excellent job in developing this new medium-sized dairy breed for grazing and with high fertility (12 month calving). They also perform well under once-a-day milking.

If necessary, Google for KiwiCross.

Management

This starts with planning, which starts with records. Records in a drawer at the home office are not as useful as ones on a large white board or two in the farm dairy.

Records should include -

- Plan of farm lanes, paddocks, numbers and/or name, size, gates, water pipes, valves (numbered) and troughs.
- Paddocks in spreadsheet form for dates of paddocks to be grazed on each day, and to record fertilising, spraying, harvesting and comments.
- Jobs today, tomorrow, next week, next month.
- Herd details - number milking, dry, heifers, calves, cows to cull, etc.
- A section for staff to record their notes.

Getting out of small dairying or retiring

What do you do when tired of milking, and/or your herd is not big enough to support a sharemilker or paid staff?

- Employ a local youth, or person wanting part-time work, just to milk.
- Milk once a day (OAD) at a time to suit. Early afternoon is best, so the cows get their OAD pasture feed when the pasture energy is highest and nitrates lowest. This is working well for some in NZ, such as a widow with young children on a 120 acre steep hilly farm, milking only 120 cows so not enough to pay a worker. OAD cows eat less because they walk less, so you milk more cows to eat the available pasture. You can milk even more cows to stop them getting so much pasture that they bag up too tightly before each milking. This also means that the drop in per ha or acre production is not as great. Jerseys are best for OAD because of their higher solids levels.
- Install a New Zealand swing-over herringbone and milk 50 cows in half an hour.
- Go seasonal. The winter break works wonders.
- Make and sell cheese and/or whole milk and cream, provided it is allowed and your herd is free of all diseases.

Incomplete

Some blame heat for low conception rates. If conception rate is a genetic problem, genetics should be improved. The figures below are from a Chinese dairy farm in Guangdong province in the tropical zone of China, with an annual average temperature of 19 to 26°C. The lowest monthly average temperature is 7 to 12°C and the warmest monthly temperature is 27 to 29°C. The amount of sunshine is 1,600 to 2,600 hours. Average rainfall is 1,000 to 2,300 mm and non-frost days in 1986 where 346.

The New Zealand conception rate is the best despite NZ being annual, so cows have to calve every 12 months, therefore NZ has selected for high conception rates for 100 years.

Table 2. Reproductive performance.

Origin	Number of cattle	Conception rate at one heat %	Conception rate per year %
New Zealand	1132	57.2	91.7
Denmark	499	56.4	89.8
USA	1816	41.5	81.1
Guangdong black and white	1639	56.9	86.7

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