FERTILITY IN NEW ZEALAND DAIRY HERDS: INDUSTRY SITUATION AND A WAY FORWARD FOR IMPROVING ON-FARM REPRODUCTIVE PERFORMANCE

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Key messages

- Fertility has declined in New Zealand dairy herds
- A variety of factors have contributed to this decline
- There is profit in improving herd reproductive performance
- Achieving good reproductive performance is still 'manageable', using a proactive planned approach.

Industry situation

Declining fertility

Fertility of dairy cows in New Zealand has declined over the last 30 years. Nationally recorded data used for animal evaluation purposes describes this as 10% fewer cows re-calving within the first 42 days of the seasonal calving period (Figure 1; Harris et al., 2006). The decline is largely attributed to a reduced conception rate (chance of conception to a mating event), since submission rates (% of herd mated in 21 days) have remained stable, or increased marginally in recent years. Survey data indicates that routinely achievable conception rates of 65% during the 1970's have eroded to 55% or less with the modern cow (Macmillan et al., 1984; Xu and Burton, 2003). This decline has occurred alongside gains in milk production and the New Zealand dairy industry continues to target increased productivity; 50% total productivity gain and 40% growth of milk solids by 2015 (Strategic Framework for Dairy farming's Future 2005-2015).

Higher anoestrous rates

In the last 30 years, anoestrous rates appear to have trebled (from 7 to 20%). The increase has followed a breed preference change from Jerseys to Friesians. In the 1970's, less than half the national herd was inseminated artificially (45%), and with equal proportion of Jersey or Friesian semen. By the mid-1990's, 85% of cows were mated artificially using mostly (70%) Holstein-Friesian semen. Friesians take longer to cycle than Jerseys, are more likely to be treated for anoestrum, and are particularly sensitive to changes in body condition (Burke et al., 1995; McDougall et al., 1995; Xu and Burton, 2003). Additionally, the Dexcel Strain Trial

showed that the 1990's-type Holstein Friesian with predominantly New Zealand ancestry took at least seven days longer to start cycling than the genotypic counterpart of the 1970's.

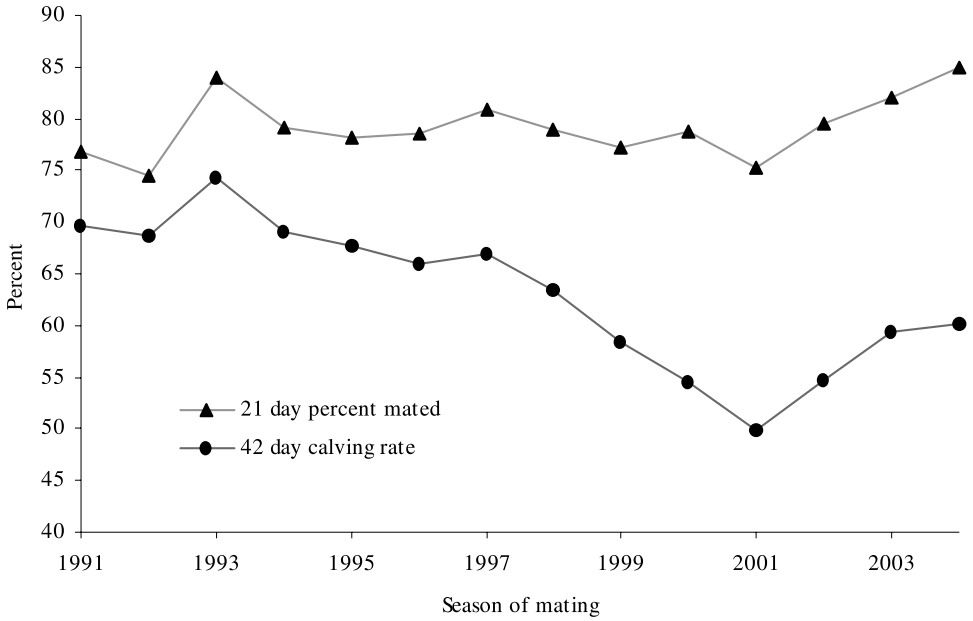

Figure 1: National trends in 21 day submission rate and 42 day calving rate from Harris et al., 2006. Calving rate is assumed to closely reflect the previous seasons 6 week in calf rate, since this data excludes first calvers, but accounts for empties.

Overseas genetics

Ironically, the importation and extensive use of the North American Holstein-Friesian genetics may have lessened this impact to some extent because this type of cow actually starts cycling quickly. However, breeding values for fertility among the New Zealand Holstein-Friesian population declines sequentially as percentage North-American ancestry increases (Harris et al., 2006). Numerous studies show how difficult this type of cow is to get pregnant and keep pregnant in the pasture-based seasonal system (eg, Burke et al., 2005).

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'Growing pains'

The most obvious farm systems change likely to have contributed to reduced fertility, has been the increased number of large-scale farms emphasising herd expansion while also experiencing a scarcity of skilled labour. Cow numbers exploded from 2.4 million to about 4 million between 1990 and 2005. How many of these 4 million cows are retentions that would otherwise have been culled under a more stable national population? Average herd size in the mid 1970's was 115 cows. It's now 322, with 15% of cows existing in herds of 500 or more. At the same time, staffing structures are supported by a labour market that is at a 20-year low in unemployment.

Not surprisingly, a disproportionate number of culled cows (nearly half of all culls) are because they are empty or due to calve very late. Culling for production these days might seem a luxury (16% of all culls), compared with 30 years ago when poor production was the greatest of culling reasons (33% of all culls). Advances made in veterinary, nutritional and management practices have not been sufficient to halt the decline in fertility, but are probably helping to slow this decline.

Hormonal interventions

Hormonal interventions have featured strongly as a means of improving reproductive performance, or perhaps more accurately, mitigating against deterioration in herd fertility. The two most prominent interventions are induced calving and anoestrous cow treatments. Induced calving became a routine practice in the late 1970's, allowing longer mating lengths and reducing empty rates. External pressures in relation to consumer perceptions of animal welfare and international market access for dairy produce will effectively eradicate the practice of routinely inducing calving.

During the late 1980's, progesterone treatment (ie, CIDR) became routinely used to treat anoestrous cows (Macmillan and Day, 1987). Although progesterone is the most efficacious treatment for inducing anoestrous cows to cycle, recent studies have confirmed that it will not: restore treated cows to 'full-fertility' status; address underlying problems associated with high anoestrous rates; or make cows easier to get pregnant the following year (McDougall and Compton, 2003 & 2006). New products (eg, OvSynch) may make treating anoestrous cows easier, but will not change these facts. Whether or not farmers have already concluded the same, the number of cows treated for anoestrum has trended downwards, while the number of farms not using anoestrous treatments has trended upwards in the past few years (Dexcel Economic Farm Survey data).

Economic value of improved reproductive performance

Linking reproductive performance to profitability has proved very challenging for several reasons:

1. The farm system is a complex web of inter-linked features. Changing one thing can lead to a whole host of other changes
2. Farm systems can be somewhat resilient to variances in reproductive performance, particularly when production per cow is far less than optimal due to stiff competition for feed availability
3. Reproductive performance influences the longer-term viability of the farm system. The full benefit of improved performance may take several seasons to be realized, similarly, a bad mating result will continue to have an impact over several seasons.

Nonetheless, there have been several different approaches to put a dollar value on reproductive performance. For example, the animal model that sits in behind the valuation of the Fertility BV estimates that a 1% change in the 6-week re-calving rate is worth $2.34 per cow (as revised February 2007). The Australian In-Calf Programme estimates that a 1% increase in the 6-week in calf rate is worth $4 per cow. Recent attempts using the Dexcel Whole Farm Model estimated a similar value ($3.34 per cow if the 6-week in calf rate increases 1%). Although the value varies by the approach used, it is clear that there are net returns to be had from improved reproductive performance. A big question is, "How much is it going to cost to get a lift in performance?" This will obviously determine profit. The next paper by Lynelle Kuriger shows that the cost may be little more than some time for better planning, and use of on-farm data to make informed decisions.

Industry needs

Genetic changes for the better

While fertility of NZ dairy cows remains high by world standards, it is clear that New Zealand is not immune to the antagonistic link that exists between milk productivity and reproductive capability. Some of the 10% reduction in cows (excluding heifers) calving during the first six weeks over the last 15 years can be traced back to decisions around the type of genetics being used by the industry. Despite indirect selection pressure against cows that cannot maintain a 365-day calving interval, undesirable reproductive traits developed using a genetic selection index that until recently (2001) did not account for fertility. The addition and recent

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modifications of breeding values in the $BW for fertility, longevity, somatic cell count and other traits that influence on-farm profitability are important steps in preserving functional traits and rebuilding fertility levels. Further, New Zealand Animal Evaluation Limited (NZAEL) predicts that half of replacement calves reared in 2015 will be crossbred. A large proportion of farms are already taking advantage of the benefit hybrid vigour brings to fertility. An additional 3.5% effective units can be added to the Fertility BV for first cross cows, and two-thirds of this advantage will be retained indefinitely in rotationally crossed herds. These trends imply future cows will continue to be efficient and profitable, but also with improved functional traits such as fertility. For this reason, the importance of getting the fertility BV accurately and correctly weighted in the $BW system cannot be overstated.

Management changes for the better

Management factors have a greater impact on reproductive performance than genetics. Arguably, it is 90% management and 10% genetics. For this reason, taking control of your herd's reproductive performance and formulating a reproductive management plan will pay dividends. The following section outlines the principles behind reproduction management planning, and offers some advice on how to formulate your own plan.

Reproduction management planning

There is no recipe for achieving good reproductive performance. Every herd, farm system and farmer differs, so each farm requires its own plan for managing herd fertility. Although there are many different ways to achieve good performance, most farmers are trying to achieve a similar outcome; as many cows in calf as possible, as early as possible.

Planning your management

A Reproduction Management Plan explains how you are going to manage all the main factors which drive your herd's reproductive performance. Within New Zealand dairy farming systems, these main drivers are:

- calf and heifer rearing
- calving spread
- bull management
- heat detection
- body condition score
- health
- genetics

Breaking down reproduction management into these key components makes it easier to understand, and plan for. It also highlights the fact that many things which affect your final in-calf rates are happening outside of the calving and mating period (particularly body condition score, and young stock rearing).

A reproduction management plan will outline strategies for dealing with each of these areas. It helps to put this plan in chronological order with dates so that it is like a calendar of events for you and your staff to follow (See Dexcel's Reproduction Management Calendar to help you with this process www.dexcel.co.nz).

For example, when planning your Bull Management strategy, you would address the following points:

- How many bulls will be required to service cows not pregnant to AB – see the Dexcel website for help?
- Organise bulls for lease or purchase. Consider, age, size, and group dynamics.
- Organise the vet for bull soundness checks.
- What date will bulls go into the herd, and what date will they be removed?
- What is the rotation policy for the bulls to ensure that they are regularly rested during the natural mating period?
- How will the bulls be managed to minimise their time on yards and races?
- Who is responsible for checking bull health and fitness during the natural mating period?

The role of herd data

Understanding the seven key areas of reproduction management is only part of the planning process. How do you know which areas you need to improve in? This is where your herd data becomes very important. A simple recording system which captures the right information will allow you to:

- diagnose the poor performing areas in your reproduction management, and monitor the effect of your changes
- accurately compare your herd's reproductive performance to previous years, and to results achieved by top farmers
- respond quickly when the measures indicate that reproductive performance is not as good as it should be
- provide goals and measures to motivate your farm team, and give them some direction.

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Below is a basic group of data that can be collected in your notebook (or in some cases by your AB technician). This data will allow you to do a thorough assessment of your herd's fertility, and diagnose areas of poor performance:

- calving dates for all cows
- induced cows and induction dates
- pre-mating heats (preferably individual cows and dates, but at least a figure for the percentage of the herd cycling one week before planned start of mating).
- anoestrus cows given a hormone based treatment (CIDR, OvSynch), and dates of treatment
- at risk cows (assisted calving, twins, retained membranes, dead calves, mastitis)
- AB mating dates
- bull mating dates
- early pregnancy test data
- body condition score data at three critical times during the season (dry off, calving, and mating).

Many farmers already collect a lot of this data. The challenge is to turn it into useful information that will give you the motivation and confidence to make on-farm changes. Data management programmes such as MINDApro and MISTRO are the best tools for analysing your data, and generating management reports. However, many key performance indicators can be calculated without the use of a computer programme.

Figure 2 is an overview of some key performance indicators that are useful for analysing a herd's reproductive performance.

1. Start at the top line of Figure 2. If you are achieving the targets for 6 week in-calf rate and final empty rate, your reproduction management is very good and it is unlikely that you need to take further action. If you are not achieving these targets it is necessary to investigate further.
2. Look at your submission rate and conception rates (if PD data is available) as these are the two major drivers of in calf rate.
3. Finally, drill down into the seven management areas (which drive submission and conception rates). In which areas is there a sizeable gap between your herd's performance and the industry target?
4. Look critically at your management in those areas and identify where management can be changed for improved performance next season.
5. In some cases, you may not have collected enough data to benchmark your performance. Put it in your plan to collect that data in the future.

The following paper by Joy Burke supports this paper, and demonstrates how a farmer is managing her herd to achieve her reproductive performance goals. It discusses how she identified management areas for improvement, following an assessment of the previous season's performance, using the herd data she had available at the time.

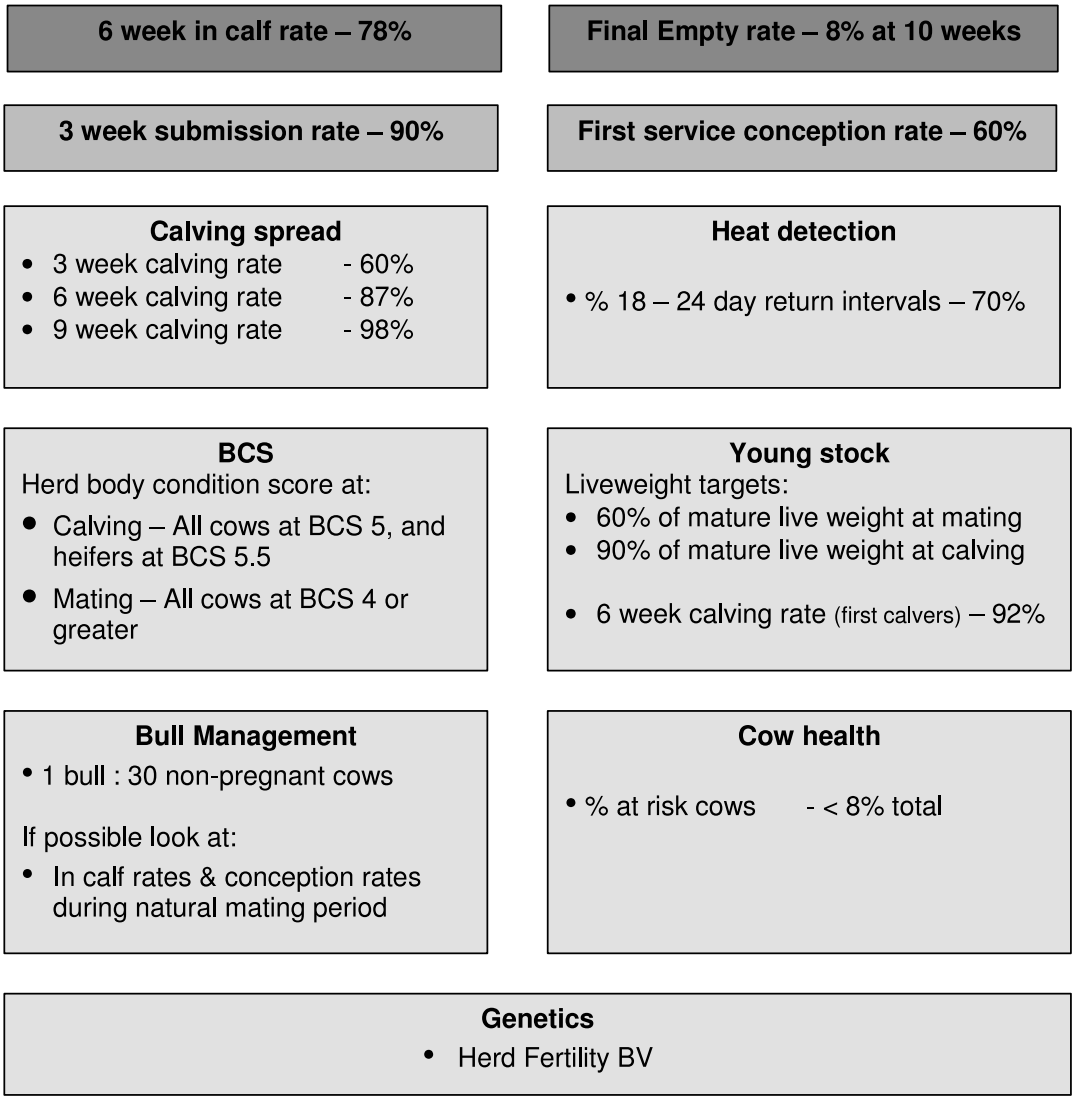

Figure 2: A set of key performance indicators and benchmarks for assessing your herd's reproductive performance

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