The InCalf book

for New Zealand Dairy Farmers
The InCalf Book
for New Zealand dairy farmers

Steps for making herd reproductive management decisions.

Step 1: Assess herd reproductive performance

Step 2: Identify scope for improvement and associated benefits

Step 3: Consider options for change and select best option(s)

Step 4: Implement selected management option(s)

Review
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Foreword

The need to improve reproductive performance is a high priority for New Zealand’s dairy farmers. An industry target of achieving a 6-week in-calf rate of 78% by 2015 is established in the ‘Strategic Framework for Dairy Farming’s Future’.

In order to achieve this, dairy farmers and their advisers need a process with support material that provides:

• improved fertility performance measures and monitoring;

• an agreed knowledge base and approach using improved skills; and

• planning for improved fertility.

When faced with similar herd fertility challenges in 1996 the Australian dairy industry initiated the InCalf project. Under John Morton, the 3-year InCalf study showed that dairy farmers have control over many of the factors that affect fertility. InCalf found that change for the better does not necessarily follow provision of information; there needs to be a process that engages and supports the farmer into taking action.

InCalf has since developed and rolled out an impressive extension programme, which includes The InCalf Book, Fertility Focus report, Herd Assessment Pack, and InCalf training programmes for Australian dairy farmers and advisers.

Through a Memorandum of Understanding between Dairy Australia and DairyNZ, New Zealand dairy farmers and advisers can now access the InCalf resources, which DairyNZ has adapted for New Zealand conditions.

This *InCalf Book for New Zealand dairy farmers* is the result of contributions from many leading experts on both sides of the Tasman, and I believe it will be an essential resource for dairy farmers wanting to improve reproductive performance.

The expected outcomes are:

• economic gains through improved production and fewer empty cows;

• streamlined breeding management systems, reducing stress; and
• less reliance on hormonal interventions, providing improved animal welfare and assurance of market acceptability for dairy products.

This is a great opportunity for New Zealand’s dairy industry to take advantage of these benefits, to help us maintain our competitive advantage on the international stage. Thanks to all those involved in producing this programme and making it available to New Zealand’s dairy farmers.

Tim Mackle, PhD
CEO DairyNZ
About InCalf

The Australian InCalf project developed a vision: “To enable dairy farmers to achieve measured improvement in herd reproductive performance.”

That vision is equally applicable in New Zealand for dairy farmers seeking to improve their reproductive performance towards industry targets.

In both Australia and New Zealand farmers indicated that they needed a supporting process to bring about real improvement in their herds.

Farmers need to be able to:

- assess the current reproductive performance in their herd;
- assess their scope for improvement and the likely benefits;
- determine their options for change; and
- implement their chosen changes.

InCalf’s next challenge was to determine how to achieve the vision. This stage of the planning has drawn on the best available extension and technical expertise, and the team has developed the InCalf extension package which includes:

- The InCalf Book;
- The InCalf Fertility Focus report;
- The InCalf Herd Assessment Pack tools; and
- InCalf training programmes for farmers and their advisers.

In producing *The InCalf Book for New Zealand dairy farmers* the editors were deliberate in retaining the excellent design features of the Australian InCalf Book. This book is technically sound; the result of contributions from many leading experts on both sides of the Tasman. We believe it will be an essential resource for dairy farmers wanting to improve herd reproductive performance.
The Technical Review Team, with assistance from Dr Steve Little from InCalf Australia, have given the InCalf Book a New Zealand dairying context, emphasising elements that are more relevant to the challenges faced by New Zealand dairy farmers.

The majority of New Zealand herds are seasonal calving involving just one calving period in spring. *The InCalf Book for New Zealand dairy farmers* is written directly to farmers with seasonal calving herds.

We believe farmers with split-calving systems can derive just as much benefit from *The InCalf Book for New Zealand dairy farmers*, as the principles of seasonal calving apply equally to split-calving systems. Farmers seeking information about year-round-calving systems are referred to the Australian InCalf Book available from www.incalf.com.au.

Chris Burke, leader of editorial team
Mark Blackwell, project manager InCalf in New Zealand
How to get the most out of this book

The InCalf Book pulls together the accepted knowledge on dairy herd fertility, drawing on InCalf’s extensive on-farm research project as well as a huge number of experts on both sides of the Tasman, and in other countries.

We all understand that there is (unfortunately!) no one simple recipe for achieving optimal reproductive performance in all dairy herds. Every herd is different, so we have not produced a prescriptive manual on what to do to optimise herd fertility. We also know that farmers want a practical reference, not a scientific textbook.

What we have created is a reference to help as you step through the InCalf process of assessing your own herd situation, considering the scope for improvement in reproductive performance, looking at options for change and implementing the most appropriate ones for you. This book will also be useful for professionals providing you with advice in this process.

We don’t want you to read this book from cover-to-cover in one sitting and then file it away on a bookshelf. This is a book designed to be left out where you and your farm team meet. Use it frequently to find specific information, and stimulate thought and discussion. Let it get tattered through regular use – that’s what it’s for!

Finding the information you want

We have designed the book so you can find the specific information you are looking for quickly and easily. Here are some ways of finding the particular bit of information you are looking for:

- The contents page lists the topics in each chapter.
- ‘Actions and options at each stage of the fertility cycle’ (pages 7–12) lists what to consider and when through each stage of the cow’s life, and directs you to the right page.
- Within ‘Section 3 – Acting on Priorities’, the chapters start with a page listing topics/headings covered in that chapter.
- The A to Z index (pages 199–202) provides you with the most comprehensive means of finding information on a specific topic.

You will also see many cross-references throughout the book. These point you to other pages within the book that are relevant to that particular topic.
Special features to help you use the book

The book has a number of special features within each chapter in addition to a hierarchy of headings to make it easy to find and read information quickly.

This symbol indicates the achievable target for a given performance measure. These targets are based on the actual results achieved by the top 25% of dairy farmers in New Zealand (NZ Monitoring Fertility Project Report 2003). Use these targets to see what performance is realistically possible in your herd.

This symbol indicates the trigger level. Half the farmers in the Monitoring Fertility Project study achieved a better result than this. Further investigation is warranted if your herd’s performance is less than this figure.

This symbol marks a short segment providing you with more technical detail on a specific topic.

This symbol indicates that a separate InCalf herd assessment tool is available. The InCalf tools have been developed to help you (and your adviser) investigate key management areas which affect your herd’s reproductive performance. They allow you to assess past and present performance and also consider likely future outcomes.

This symbol refers to the InCalf Fertility Focus report that is available separate to this book to assist you to measure and assess past and present herd reproductive performance. This easy-to-use single page report is software generated and can be obtained for your herd from participating herd improvement organisations, herd management advisers or InCalf-accredited herd management software packages.

Jigsaw pieces

Farmers’ comments relevant to Chapters 8-14 on the last page of each of these chapters point to where the associated information appears.

Appendices – Down to Details

When reading certain chapters you may be referred to one of six appendices towards the back of the book. These appendices contain extra, more detailed information and look-up charts (pages 169–194).

Definition of terms

Use this list to look up the meaning of terms used in this book that you are not familiar with or when you are unsure of a precise meaning (pages 195-198).
Acknowledgements

DairyNZ and the InCalf New Zealand project team gratefully acknowledges the original contributors of the Australian InCalf Book; from which this revised edition for New Zealand dairy farmers in based upon.

The complete list of original contributors and the InCalf Advisory Committee can be viewed in the Australian InCalf Book at www.incalf.com.au.

The InCalf New Zealand project team could not have successfully revised The InCalf Book for New Zealand dairy farmers without the technical and administrative expertise of numerous people; and the valued test reader contributions from farmers, advisers and industry experts.

Funding organisations

InCalf acknowledges funding support from New Zealand dairy farmers through DairyNZ.

InCalf acknowledges co-funding support from MAF Sustainable Farming Fund.

Supporting organisations

InCalf recognises the many organisations that have and continue to support the InCalf project.

- Dairy Australia
- Dairy Cattle Veterinarians (DCV) of the New Zealand Veterinary Association (NZVA)
- New Zealand Institute of Primary Industry Management (NZIPIM)
- LIC
- Ambreed
- New Zealand Animal Evaluation Ltd (NZAEL)
## Section 1

**Focus on fertility**

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From the day a heifer calf is born, you control the factors that influence her future fertility and whether she gets in calf on time, every time.

What you do each day of the heifer’s life will determine how well she grows, if she is healthy at calving time, if she recovers before mating, if she is correctly detected on heat and mated, and if she conceives. The cycle then starts again.

The ‘fertility for life’ cycle involves calf and heifer rearing; first mating, pregnancy and calving; subsequent matings, pregnancies, calvings; and, eventually, culling. Success will require your attention throughout the cycle.

At each stage of a cow’s life, you must have a management plan in place that answers an important question: “Today, have I done all I can to ensure high reproductive performance?”
Here are just some of the questions that need to be asked at each stage of the fertility for life cycle to help you achieve high reproductive performance.

- **Calf and heifer rearing**
  - Are your heifers reaching the target liveweights you have set for your farm?

- **Mating heifers for the first time**
  - Are the heifers big enough to be cycling before mating?
  - What bulls have you selected?
  - Are you going to synchronise the heifers?
  - How many bulls do you need?

- **First pregnancy**
  - What is your pregnancy testing strategy for heifers?

- **Calving heifers**
  - Do they start calving before the cows?
  - Will they calve at body condition score 5.5?

- **Calving cows**
  - Will they calve at body condition score 5.0-5.5?
  - How will you manage cows with health problems?
  - Is the total feed supply sufficient?
  - Are there too many late-calvers?

- **Pre-mating and mating cows**
  - What is your heat detection strategy?
  - How will you deal with non-cyclers?
  - Are your AB facilities adequate?

- **Pregnancy**
  - Have you submitted your records (heats, non-cycling treatments, mating and pregnancy diagnosis) to your herd improvement organisation, or entered them into an InCalf-accredited software program so you can receive your InCalf Fertility Focus report?

- **Culling**
  - What cows will be culled?

*The InCalf Book* summarises the actions you need to consider at each stage in the ‘fertility for life’ cycle.
Reproduction management plan: a framework

There is no simple recipe for achieving good reproductive performance. Every farm is different and will require its own reproduction management plan. The aim of a reproduction management plan is to maximise the rate at which the cows in your herd get in calf. This is done by implementing the options described in *The InCalf Book* and using *The InCalf Tools* that focus on the key fertility management areas of:

- calf and heifer management;
- body condition and nutrition;
- heat detection;
- dealing with non-cyclers;
- sire selection and AB;
- bull management;
- cow health; and
- calving pattern.

The planning process requires you to think about the different options described and to decide on those you wish to implement. You may need input from an adviser in deciding the best options to use.

This chapter describes all the aspects of reproduction management that you need to consider at each stage of the fertility cycle. It provides a framework that can be used to ensure that you don’t forget any important tasks, and that your reproduction management plan is complete. It will include tasks that will help you assess performance, and define and achieve your targets.

The basis of the framework is the fertility cycle. You have to start thinking about all the things that need to be done to animals at each stage of the cycle. That involves understanding the information presented in the chapters on the key reproduction management areas and deciding what’s needed at each stage of the fertility cycle for all the animals on your farm.

To help you get started, the framework presented in this chapter gives a summary of the actions and options at each stage of the fertility cycle. The framework also provides a useful index for tracking down the information you need within the other chapters.
The framework can be used to develop a reproduction management plan for different times of the year. This plan becomes a calendar of events for the season to accommodate cows at different stages of the fertility cycle.

Careful construction of a reproduction management plan that provides you with a calendar of events will allow you to take a complex topic like fertility, and implement a programme on your farm that will improve the reproductive performance of your herd.

“It’s just getting all too hard. There is no way I can juggle all of these priorities! With a nutrition plan and a mating plan and a heifer plan and a health plan – I’ve got a new plan for every day of the week!

Our farm doesn’t work like that. I need to have a summary of what to do for each group of animals. I don’t want to forget all of the little points.

This framework might be just what I need to sort out my priorities.”
Actions and options at each stage of the fertility cycle

Birth

Calves
- Identify the best person on the farm to rear calves well (page 47).
- Feed colostrum to newborn calves (page 47).
- Ensure feeding, housing and disease control allow high growth rates and minimise disease occurrence (page 47).
- Schedule vaccination, trace element supplementation and disease control programmes (page 48).
- Wean calves once they reach the target weight for weaning AND they are regularly eating enough calf meal or pellets each day (page 49).

Heifers
- Set target ‘weight-for-age’ liveweights (page 42).
- Grow heifers to achieve target liveweights (page 49).
  - If necessary, continue to supply good quality supplements after weaning until heifers are at least 200 kg liveweight (page 50).
  - Protect heifers from facial eczema.
  - Schedule vaccination, trace element supplementation and parasite control programmes (page 50).
- Monitor liveweight every 3 months from weaning to calving and feed to ensure heifers achieve these weights (pages 41, 53).
- Look after underweight heifers (page 49).
- Consider differentially feeding groups of heifers according to their liveweight (pages 49-50).
First mating

- Decide when to start mating yearling heifers (page 51).
- Look at the advantages of mating heifers to start calving 1 to 2 weeks earlier than the milking herd (page 51, 151).
- Feed to ensure heifers achieve target weights and gain weight continually throughout the mating period (page 53).
- Mate heifers (page 53).
- Decide whether to use AI or bulls with heifers (page 51).
- Select bulls that reduce calving difficulty (pages 51, 123).
- Will it be beneficial to heat synchronise your heifers? (page 181)
- Monitor bull-serving behaviour throughout mating (page 125).

First pregnancy

- Manage pregnant heifers (page 53).
- Feed to ensure heifers achieve target liveweights (page 53).
- When will you pregnancy test heifers? (page 53).
- Run the heifers as a separate mob leading up to calving (page 53).

Calving heifers and cows

- Weigh heifers 2 months before calving (page 43).
- Attend to the special requirements for induced cows (pages 137, 152).
- Record each cow’s calving: cow ID, date, calf ID, and whether assisted or induced (pages 24, 133).
- Minimise health problems around calving (page 133).
- Learn how to assist a cow that is having trouble calving (page 135).
- Promptly treat and record details for cows that had a twin calving, an assisted calving, retained foetal membranes, a vaginal discharge or lameness (page 133).
- Plan to have mineral/trace element levels at optimum by calving (page 68).
- Body condition score cows prior to calving (page 61).
- First and second calvers should calve in condition score 5.5 (page 60 and ‘Drying-off table’ page 65).
- Mature cows should calve in condition score 5.0-5.5 (page 66).
- Check the calving pattern of heifers (page 45) and the whole herd (page 150).
Pre-mating (early lactation)

- Decide when to start and stop mating (page 147).
- Body condition score cows a couple of weeks before mating (page 61).
- Minimise condition loss in early lactation (page 69).
- Use quick nutritional checks (page 70).
- Review your heat detection programme (page 79).
- Ensure everyone knows how to detect heats (page 78).
- Choose and buy your heat detection aids (page 85).
- Use a combination of paddock observation and heat detection aids (page 84).
- Plan extra-well for heat detection if managing a larger herd (page 90).
- Use tail paint to detect non-cycling cows before mating (page 100).
- Check pre-mating cycling rate (page 193).
- Decide how you will deal with non-cyclers (page 102).
- Prepare for AB and check your facilities (page 113).
- Consider the advantages of hybrid vigour from crossbreeding (page 109).
- Choose an AB bull team with a high Breeding Worth, balanced with desirable breeding values for traits best suited to your system (pages 107-108).
- Select the best type of ‘natural mating’ bulls for your system (page 123).
- Cull older and aggressive bulls (page 123).
- Select bulls to minimise difficult calving (page 123).
- Do you need extra bulls? (pages 128-129).
- Are the bulls in good health and condition for mating? (page 122)
- Ensure you have sufficient young bulls (page 128).
- Prepare bulls for use in the herd (page 123).
- Run bulls as a group before mating (page 124).
- Arrange a bull drenching and vaccination programme (page 122).
- Consider veterinary examination of bulls (page 124).
- Consider veterinary examination for cows with a uterine infection (page 136).
Mating

- Use quick nutritional checks daily (page 70).
- Record the date and sire for all inseminations and natural matings (page 24).
- Are you regularly sending the information to your herd organisation, or entering it into an InCalf-accredited software programme, so you can receive your InCalf Fertility Focus report? (page 26).
- Check your 3-week submission rate (page 28).
- Observe for heats in the paddock 2 hours after milking and in the early afternoon (page 84).
- Do you and your employees know what to do when you are not sure if a cow is on heat? (page 81).
- Consider heat detection in a larger herd as a high priority task that gets designated to the ‘best’ person/people for that job (pages 84, 90).
- Make sure AB technicians use recommended practices (page 111).
- Look after cows separated out for insemination (page 118).
- Don’t delay mating once a cow has been detected on heat (page 117).
- Avoid inbreeding (page 110).
- Rest and rotate bulls regularly and monitor for lameness and service problems (page 124).
- Ensure at least two sexually active bulls are running with the herd at all times (page 125).
- Handle bulls safely (page 124).
**Pregnancy**

*(mid to late lactation)*

- Use drying-off decision rules that include body condition and days to next calving (table on page 65).
- How will you body condition score your herd? (page 59).
- Consider options to maintain or increase body condition score in late lactation (page 64).
- Use quick nutritional checks daily (page 70).
- Choose and implement a pregnancy testing strategy for your herd (page 158).
- Use your pregnancy test results for future planning (page 162).
- Obtain your 6-week in-calf rate (page 29).
- What is your empty rate? (page 29).
- Arrange to get your InCalf Fertility Focus report and review reproductive performance (page 26).
- Have cows suspected to have aborted checked by a veterinarian (page 140).
- Assess bull performance (page 126).
- Monitor abortion rates and implement prevention (page 139).
- Seek professional advice if the herd abortion rate is excessive (page 140).
- Be careful when handling aborted cows, calves or membranes (page 140).
- Check your herd for excessive difficult calvings, retained foetal membranes, discharges, lameness or clinical mastitis, and implement prevention if required (page 133).
- Consult your vet early if you intend to induce cows (page 137).
Pregnancy (dry period)

- Cows should calve at condition score 5.0–5.5 (page 66).
- Prepare cows for lactation (page 68).
- What are your options to prevent disease at calving and in early lactation? (pages 68, 132)
- Prepare any cows for induction and monitor them closely (page 137).

Culling

- Prepare a culling list (page 165).
- Have cows suspected to have aborted pregnancy tested by a skilled pregnancy tester before culling (page 140).
- Will you carry over empty cows? (page 164)

Using a framework like this helps you be sure you’ve covered all bases so you end up with a good, all-round plan.

A reproduction management plan helps you make sure that your day-to-day actions are working toward the goal of better reproductive performance.

When you come to the practical realities of ‘what should I be doing today?’ you’ll be able to feel confident that it all fits in.
The key measures of success and your approach to improving herd reproductive performance will vary, depending on your calving system.

*The InCalf Book* does not aim to help you decide which calving system you will use in your herd. Rather, it will help you achieve optimal performance within whatever calving system you have chosen.

Every year, more than 96% of cows in New Zealand calve between July and October. Another 2% calve between March and May. Most herds in New Zealand are seasonal calving with a single calving period in spring. Some herds are split calving herds with calving periods in both spring and autumn.

*The InCalf Book for New Zealand dairy farmers* deals exclusively with these seasonal and split calving systems, with no distinction between herds with one or two calving periods each year.

If you are one of a small number of New Zealand herds that use a year-round calving system, refer to the original Australian InCalf Book for information on how to achieve optimal reproductive performance.
The InCalf Fertility Focus report for New Zealand dairy farmers retains the ability to identify herds by calving system, and reports on reproductive performance as a Seasonal, Split or Year-round calving herd.
What are the benefits of improved fertility?

How much is improved reproductive performance worth to you? The answer will depend on your own situation. However, improved performance can make a sizeable impact on your bottom line, as well as simplify your farm management (see table below).

The value of these benefits will depend on how much you increase your herd reproductive performance. To see what top farmers are achieving, and to decide if you have room for improvement in your herd, take a look at Chapter 5.

Farmers from throughout Australia and New Zealand have told InCalf why they value high herd reproductive performance. You can expect the following benefits from improved fertility.

<table>
<thead>
<tr>
<th>Benefits of improved fertility</th>
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<tr>
<td>Fewer cows culled as empties allows increased culling of genuine low-producing cows, increases in herd size or a reduction in the number of heifer replacements required.</td>
</tr>
<tr>
<td>Increased profit since earlier calved cows generate more milk income than later calved cows in most herds.</td>
</tr>
<tr>
<td>More compact calving pattern with fewer late-calved cows, fewer empty cows and fewer cows requiring hormonal intervention.</td>
</tr>
<tr>
<td>More cows getting in calf early in the AB period, providing more replacement heifers, or the potential for a shorter AB period.</td>
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<tr>
<td>More AB heifers born early in the calving season which streamlines calf rearing and heifer management, allowing farm staff to focus on other tasks.</td>
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<tr>
<td>Fewer days feeding dry cows and observing cows for calving problems.</td>
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The InCalf Tools can provide estimates of economic benefits which may be gained from improving your performance in key fertility management areas.
Section 2
Analysing for action

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It is important to continually refine your herd management strategies. The following key steps can be used to improve herd reproductive performance:

1. Assess herd reproductive performance.
2. Identify scope for improvement and associated benefits:
   - Compare your performance to previous years, to other herds and to what’s possible.
   - Weigh up the benefits from increased herd reproductive performance.
3. Consider options for change and select the best option(s).
   - Weigh up the costs of implementing each change.
4. Implement the selected management option(s).

Review the effects of these changes as part of your management cycle.

Steps for making herd reproductive management decisions.
The focus

High reproductive performance means that cows become pregnant without undue delay. To compare your herd’s current reproductive performance to previous years and to other herds, it is necessary to assess what percentage of cows in your herd became pregnant quickly.

InCalf recommends some specific measures to describe herd reproductive performance.

Performance measures

**InCalf recommends the 6-week in-calf rate and the empty rate.**

The 6-week in-calf rate tells you the percentage of cows in your herd that became pregnant in the first 6 weeks of the mating period. These cows will calve early in the calving period next year without being induced. Where artificial breeding (AB) is used for the first 3-6 weeks of the mating period, many or all of these cows will be pregnant to an AB sire.

The empty rate tells you the percentage of the herd that failed to become pregnant during both the AB and bull mating periods.
Thinking about change

Herd reproductive management is a complex topic that has a significant impact on other areas of dairy farm management. The principles that support a well-managed reproductive programme are consistent with other aspects of farm management.

• **Small steps can make big gains.** A gain of 1-2% in many of the management areas that affect fertility may not seem like much, but the cumulative effects can make a big difference to your bottom line.

• **Detail can make the difference.** In many cases, the solutions are not expensive or time consuming. However, they do take careful planning and attention to detail. Cutting corners and poor timing can make improvement a slow process.

• **Record keeping makes for easier management.** Without a good system of recording and measuring performance, and comparing the results with targets, it is almost impossible to determine your priorities. Without good records, you and your farm team will not know whether performance is satisfactory and will find it difficult to manage key tasks, such as treating, inseminating and pregnancy testing cows.

• **Results require a team effort and good communication.** Make sure everyone on the team has well-developed skills and knows what the targets are. It’s also good to give yourself and your farm team a pat on the back for achieving a target. It’s one thing to realise there are opportunities for improvement, but another to take advantage of them. Accurate and timely record keeping, regular measuring and checking against the targets identify these opportunities.

How you respond is an individual choice. You need to keep an eye on the costs of change compared to the expected benefits. Your advisers can support you in each step of the process (page 19) and provide ideas for change, what to do and how to do it.

Your adviser network could include your veterinarian, breeding company rep, farm consultants (private and industry), financier, farm owner or trusted mentor.

Each of your advisers offers specific knowledge, skills and experience. It is important that you encourage your advisers to talk to each other about your farm’s reproductive programme and, when appropriate, to co-operate in its implementation. Using The InCalf Tools is a great way to get advisers talking.

Electronic herd recording is easier, accurate and timely. Involve the team in setting, monitoring and achieving targets.
Measuring performance

Getting an accurate picture of herd reproductive performance offers a starting point for improvements. This chapter discusses measures that allow you to compare between years and to identify what is achievable.

It is important that these measures are accurate and can be consistently calculated year after year. This isn’t easy without a good record keeping system. Taking little steps can often make the biggest gains, so accuracy is important. Accurate records begin with the birth of every calf.

If you measure the reproductive performance of your herd with the best measures and at the best times, you will be able to:

- confidently compare your herd’s reproductive performance to previous years and to the results achieved by top farmers;
- respond more quickly when the measures indicate that reproductive performance is not as good as desired;
- assess whether the changes you have made to improve herd reproductive performance have worked; and
- use reliable, accurate measures to help motivate your farm team and guide them towards better performance.

There are a number of measures available to assess reproductive performance. Some give you an overall picture; others an insight to a particular component of reproductive performance.
The best overall measures describe the rate at which cows get pregnant once mating begins and the number of cows that remain empty at the end of mating. The following two measures are used to determine where your herd is at:

- 6-week in-calf rate
- Empty rate.

Once you know where your herd is at, it is often useful to understand a bit more about what is contributing to the result. A number of measures are available to help here.

To get cows in calf quickly, they need to be inseminated early in the mating period and this is measured by the 3-week submission rate.

You also need to ensure that a reasonable proportion of inseminations result in pregnancy. To measure this, you have to be able to tell whether a cow conceived to an insemination. There are two ways of doing this – directly through pregnancy testing or indirectly using non-return to heat.

Finally, a number of detailed measures are available to assess specific management areas. For example, 3-week submission rate of first calvers and pre-mating heats for the whole herd. These measures will be described in chapters on those particular topics.

The InCalf Fertility Focus report provides you with your own herd’s results for overall performance, the drivers of overall performance and key indicators that are useful for assessing specific areas of farm management. Obtain this report from participating herd improvement centres, herd management advisers or InCalf-accredited herd management software packages.

### You keep talking about good records but what exactly do we need to record?

Information that is critical for measuring herd reproductive performance includes:

- Calving details (cow ID, calf ID, date, assisted calvings, health problems). This should also include if the cow was induced.
- Pre-mating heat records (Cow ID, date recorded).
- Non-cycling treatment records (Cow ID, date, treatment).
- AB inseminations (cow ID, date of insemination, technician, bull and any doubt as to whether the cow was on heat).
- Pregnancy test results (cow ID, date of pregnancy test, test result and, if pregnant, number of weeks pregnant or the service date she conceived to).
- Cows culled or died (cow ID, date of culling or death, whether culled or died, and reason).
- Natural matings (cow ID, date of service and bull identification).

Make sure you keep your records up to date to make the information easier to find and use.

*Your vet and herd improvement organisation can help with recording systems (paper and electronic), supplies of pocket books, wall charts, etc.*
Is she pregnant ... or not?

How do you know if a cow is pregnant? How do you know if she’s not? The best way to tell is by using pregnancy testing. Pregnancy testing allows you to calculate in-calf and conception rates, if done within 14 weeks from the Planned Start of Mating date. The conception rate tells you the percentage of inseminations that result in a confirmed pregnancy at pregnancy test.

If you don’t spend the money on pregnancy testing, you need to rely on watching for heat. You may presume a cow is pregnant if she doesn’t return to heat after service. The non-return to heat rate (shortened to the non-return rate) is often used to estimate the conception rate. It tells you the percentage of cows that were mated more than 24 days ago and have not been detected on heat since.

Conception rate and non-return rate are not the same thing: a high non-return rate is not the same as a high conception rate.

After a cow has been inseminated:

- some cows become pregnant and do not come back on heat – on average about 53% of cows; and
- others do not become pregnant and come back on heat 18–24 days later.

If all cows did one of these, a high non-return rate would always indicate a good conception rate. But the absence of heat doesn’t necessarily mean that a cow is pregnant. Unfortunately, cows are more complicated than this!

- Some cows will not become pregnant and will cycle 18–24 days later, but the heat will be missed.
- Others will not become pregnant and will cycle 18–24 days later, but will express no (or very weak) heat signs.
- Others will become pregnant but will later lose the embryo; some may come back on heat 4 or more weeks later.
- Other cows will not become pregnant but will not cycle again.

These points mean that the conception rate is almost always lower than the non-return rate. Conception rate is typically about 10 percentage points lower than non-return rate but in your herd, conception rate could be as much as 20 percentage points lower than the non-return rate.

Alarm bells should ring if the non-return rate is less than 64%. Ask your adviser to help you set a plan to improve.
Targets and triggers

*The InCalf Book for New Zealand dairy farmers* provides you with targets to strive for (pages 27–29). The targets describe the results achieved by the top 25% of farmers from the NZ Monitoring Fertility Project 2003.

Triggers are provided to prompt you to investigate a result further. These triggers give an indication that 50% of farmers in the NZ Monitoring Fertility Project 2003 achieved a better result.

The targets and triggers described in this book should be compared with results for your herd calculated using the InCalf approach, as used in the InCalf Fertility Focus report. Results from other methods of calculation should not be compared to the targets and triggers presented in this book.

What to do to measure herd reproductive performance

- Establish a system for recording cow information (page 24).

- Choose and implement a pregnancy testing strategy for your herd (page 158).

- Regularly obtain reproductive performance measures for your herd by:
  
  - having cow information entered into InCalf-accredited herd management software and printing an InCalf Fertility Focus report;

  - providing cow information to a participating herd improvement organisation or adviser and requesting an InCalf Fertility Focus report; or

  - calculating some measures manually (Appendix 6, page 187).

- Compare your herd’s results with those presented on page 29 to determine if you should seek help or to confirm that you are already achieving top results.

- If any of these measures indicate that you need help, seek assistance from an adviser to review herd management.
What to measure

You will need to achieve high 3-week submission rates and conception rates to achieve a high 6-week in-calf rate.

6-week in-calf rate

The 6-week in-calf rate describes the percentage of cows in the milking herd that became pregnant in the first 6 weeks of the mating period.

- Top farmers achieve a 6-week in-calf rate of around 78%.
- If less than 68%, seek advice.

Early rectal pregnancy testing (page 159) provides the most accurate assessment of 6-week in-calf rate.

Empty rate

The empty rate describes the percentage of cows that were not pregnant at the end of mating. It requires pregnancy testing after the end of mating and cannot be calculated before this time. Empty rates do not give a good indication of how quickly cows get in calf and must be used with 6-week in-calf rates to assess overall herd performance.

To assess the empty rate, you need to take into account the length of the herd’s mating period.

- Select your herd’s length of mating and check the empty rate at which professional advice should be sought using the following table.

Empty rates for mating periods of different lengths.

<table>
<thead>
<tr>
<th>Length of mating</th>
<th>Performance: Seek help</th>
<th>Top farmers achieve about</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 weeks</td>
<td>&gt;32%</td>
<td>22%</td>
</tr>
<tr>
<td>9 weeks</td>
<td>&gt;15%</td>
<td>10%</td>
</tr>
<tr>
<td>12 weeks</td>
<td>&gt;9%</td>
<td>6%</td>
</tr>
<tr>
<td>15 weeks</td>
<td>&gt;8%</td>
<td>5%</td>
</tr>
</tbody>
</table>
Conception rates describe the percentage of inseminations that were successful, i.e. resulted in a positive pregnancy test. It will be difficult to achieve a good 6-week in-calf rate unless the conception rate is at least moderately good.

Top farmers achieve conception rates of about 60%.

If less than 53%, seek immediate professional advice.

A poor non-return (less than 64%, page 25) provides an early warning that the conception rate is likely to be poor.

Drivers of the 6-week in-calf rate:
The 6-week in-calf rate depends on several drivers. Two important drivers are 3-week submission rate and conception rate.

3-week submission rate
The 3-week submission rate tells you the percentage of cows submitted in the first 3 weeks of mating.

Top farmers achieve 3-week submission rates of about 90%.

If less than 81%, seek immediate professional advice.

Depending on the causes of the poor submission rate, it may be possible to take immediate corrective action. Consider heat detection management (page 77) and management options for cows not detected on heat (page 95).

Conception rate
Conception rates describe the percentage of inseminations that were successful, i.e. resulted in a positive pregnancy test. It will be difficult to achieve a good 6-week in-calf rate unless the conception rate is at least moderately good.

Top farmers achieve conception rates of about 60%.

If less than 53%, seek advice.

A poor non-return (less than 64%, page 25) provides an early warning that the conception rate is likely to be poor.

It’s been 3 weeks since the start of mating. I thought I should have mated more cows than I have. How can I estimate my 3-week submission rate?

3-week submission rate = \( \frac{\text{No. of cows inseminated in first 3 weeks of mating} \times 100}{\text{No. of cows at Planned Start of Mating date}} \)

- Select all cows that need to be mated this season. Use the number present at the Planned Start of Mating date.
- Count how many of these had at least one service in the first 3 weeks of mating.
- Cows are only counted once. Don’t simply count the number of inseminations that were performed in the first 3 weeks – some cows may have had two inseminations in that period.
- You will obtain a more accurate submission rate for your herd by obtaining an InCalf Fertility Focus report.
**Section 2: Analysing for Action**

### Measuring performance

<table>
<thead>
<tr>
<th>Measure</th>
<th>What this tells you</th>
<th>Keep in mind…</th>
<th>Performance:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall herd reproductive performance</strong></td>
<td>6-week in-calf rate % cows pregnant in the first 6 weeks of mating</td>
<td>6-week in-calf rate and empty rate are needed to assess overall herd reproductive performance.</td>
<td>Seek help Top farmers achieve about</td>
</tr>
<tr>
<td>Empty rate</td>
<td>% cows not pregnant at the end of mating</td>
<td>6-week in-calf rate and empty rate are needed to assess overall herd reproductive performance.</td>
<td>Depends on length of mating see table, page 27</td>
</tr>
</tbody>
</table>

**Drivers of 6-week in-calf rate**

<table>
<thead>
<tr>
<th>Measure</th>
<th>What this tells you</th>
<th>Keep in mind…</th>
<th>Performance:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-week submission rate</td>
<td>% cows inseminated or served in the first 3 weeks of the mating period</td>
<td>This must be good if 6-week in-calf rates are to be good.</td>
<td>&lt;81% 90%</td>
</tr>
<tr>
<td>Conception rate</td>
<td>% inseminations that were successful, i.e. resulted in a positive pregnancy test</td>
<td>It will be difficult to achieve a good 6-week in-calf rate unless conception rate is at least moderately good.</td>
<td>&lt;53% 60%</td>
</tr>
</tbody>
</table>

**We want to know our 6-week in-calf rate but haven’t pregnancy tested. Is this possible?**

You can still get an estimate of your herd’s 6-week in-calf rate, even if you don’t have early rectal pregnancy tests recorded. An InCalf Fertility Focus report will provide you with this estimate based on mating information if available (if so, this is called an ‘intermediate’ level of analysis, as indicated on the back of the report).

Even if you don’t have matings recorded, you can still get an estimate of your herd’s 6-week in-calf rate. However, this relies on when cows calve in the following year. It will be an approximate measure and can only be supplied after the next calving period (This is called a ‘basic’ level of analysis, as indicated on the back of the InCalf Fertility Focus report).

*It would be much more accurate if you recorded mating dates and used early pregnancy testing.*
Section 2: Analysing for Action

Setting targets

The herd reproductive performance measures for your farm give a picture of where you stand. Setting targets gives you the framework to help identify what areas need change.

Targets need to be revised as they are achieved or as the farm situation changes. For example, the introduction of a modified heat detection programme may increase the success of mating, and result in the need to revise your future targets.

To be sure that your targets are useful as you improve herd reproductive performance:

- use consistent and accurate measures, which requires good record keeping;
- use the standard measures described in this book so you can compare your herd between years and to what is possible (pages 27-28);
- regularly check your performance against the targets; and
- act when you see that you have not met your targets.
What are top farmers achieving?

From the results gathered during the InCalf research project, and from New Zealand’s own research, InCalf has established achievable targets for the important measures of reproductive performance in New Zealand herds. The targets reported here as ‘Top farmers’ describe what the top 25% of New Zealand herds achieve on average. This means that the targets are realistic for most New Zealand herds.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Top farmers achieve about</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-week in-calf rate</td>
<td>78%</td>
</tr>
<tr>
<td>Empty rate</td>
<td>Depends on length of mating (table, page 27)</td>
</tr>
<tr>
<td>3-week submission rate</td>
<td>90%</td>
</tr>
<tr>
<td>Conception rate</td>
<td>60%</td>
</tr>
</tbody>
</table>
How to set your targets

- Evaluate your current level of reproductive performance (page 26).

- Select your target for each measure of reproductive performance:
  - If you are already at the achievable target, is it economically viable to set a higher target?
  - If you are far from reaching the achievable target, consider taking small steps towards improvement by setting a slightly lower target.

- Discuss your targets with your farm team and advisers so they can better assist you in achieving them.

- Review your targets and progress often to make sure you are making timely decisions.

What would be a reasonable target for the 6-week in-calf rate next year?

If your herd has a 6-week in-calf rate of only 60%, it would be a big jump to get to 78% in one year. If you're only at 60%, you could aim to get just above 65% next year for a starter. Pin the targets up in the dairy so you don’t forget about them!

<table>
<thead>
<tr>
<th>This year</th>
<th>Next year’s target</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-week in-calf rate</td>
<td>60%</td>
</tr>
<tr>
<td>Empty rate</td>
<td>15%</td>
</tr>
<tr>
<td>6-week in-calf rate</td>
<td>65%</td>
</tr>
<tr>
<td>Empty rate</td>
<td>12%</td>
</tr>
</tbody>
</table>
Section 3
Acting on priorities

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Chapter 9. Body condition and nutrition 55
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Chapter 11. Dealing with non-cyclers 95
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Chapter 13. Bull management 121
Chapter 14. Cow health 131
Some things are more important than others

As a dairy farmer, you control many management areas that affect reproductive performance. Your herd will achieve high levels of reproductive performance if you make the best possible management decisions.

To achieve good reproductive performance, it may be necessary to make changes in several key fertility management areas. One or more areas may be limiting your herd’s reproductive performance more than others and may well be quite different from other herds in your district.

The InCalf Book will help you and your advisers identify the most important management areas that would improve the reproductive performance of your herd. For each key fertility management area, this section will show you:

- how to tell whether you need to change management in this area; and
- what to do and when to do it.

Where there are a number of management options, The InCalf Book will tell you the benefits of each and what you need to do to implement them.
Put the key things first

Getting the best possible reproductive performance from your herd requires attention to detail in a number of areas. InCalf research has clearly identified the key fertility management areas that must be successfully managed if good reproductive performance is to be achieved. The key messages are:

- don’t get caught with light heifers, Chapter 8;
- feeding affects body condition and condition affects fertility, Chapter 9;
- improve your heat detection programme, Chapter 10;
- deal proactively with any non-cycling problems, Chapter 11;
- organise well for AB and consider your herd’s future genetics, Chapter 12;
- make sure you’ve got a good bull team for natural mating, Chapter 13; and
- healthy cows are more fertile, Chapter 14.

In special circumstances, other factors can result in reduced reproductive performance, e.g. trace element nutrition, lameness or abortions. These factors occur less frequently but they can reduce fertility in some herds. You need to be able to determine whether they could be an issue on your farm.

There are many forms of treatment available for treating cows with reproductive disorders or to synchronise heats. These therapies can be used to streamline labour requirements in some herds and will help improve reproductive performance. However, they do not provide a magic answer to overcome problems arising within the key fertility management areas.
## Calf and heifer management

### Assessing calf and heifer management
- "I don’t see how a few light heifers will make a difference to herd fertility.”
- "I've seen my neighbours out there weighing heifers. Surely they’ve got something better to do?"
- "I've got a mixed breed herd. How do I know what targets to aim for?"
- "I've figured out my calving pattern for first calvers, but what does it tell me?"

### Rearing calves from birth to weaning
- "Isn’t it enough just to make sure the calf’s had a good drink soon after it’s born?"

### Growing heifers from weaning to mating
- "My heifers are way too light! How do I manage underweight heifers?"

### Planning mating
- "Why would you go to all that trouble of doing AB over yearling heifers?"

### What to do during mating

### What to do with pregnant heifers
Assessing calf and heifer management

The reproductive performance of replacement heifers is directly related to liveweight at mating and calving. Calves and heifers must be reared to achieve liveweight targets, otherwise their first calving will be delayed, their liveweight at calving will be too low and their fertility during their next mating period reduced. Well-grown heifers also produce more milk in their first lactation, compete better with mature cows and can survive longer in the milking herd than poorly grown animals.

Calf and heifer management on many farms is a limiting factor to herd reproductive performance. The first step in making improvements is to assess the calves and heifers in your herd.

Measuring liveweights, setting liveweight targets and assessing the calving pattern for first calvers are ways to do this (pages 41–45). Also assess the 3-week submission rate of first calvers (page 46).

Doing a good job of rearing calves from birth to weaning (pages 47–48) and growing heifers from weaning to mating (pages 49–50) will help you achieve optimal pre-calving liveweight targets for your heifers.

Achieving optimal liveweight targets by heifer Planned Start of Mating date ensures that maiden heifers cycle early, conceive early and calve early.

> Weigh your heifers every 3 months.

> Take action to improve nutrition and ensure good parasite control if the average weight is below target.
Measuring liveweights

Weigh your heifers every 3 months, and more often if you want to be more accurate and able to make management changes more quickly. Scales are by far the best option for weighing calves. Check that you are using the scales according to the manufacturer’s instructions. Weigh bands are an improvement on the ‘eye-o-meter’ but are not recommended for estimating liveweight of individual animals.

Weigh heifers at a similar time of day, preferably in the morning, or let them stand in the yard for 2 hours before each weighing to minimise the effect of changes in gut fill.

These tips may make your job easier:

• Walk through the heifer group regularly to get them used to people.

• Handle heifers quietly and do not force them through your set-up with items like polythene pipe. Although it’s sometimes difficult, be patient! It gets easier with practice.

• Use a bit of rubber matting or old carpet to cover the platform of the scales and reduce noise stress.

• It might be worth running the heifers through the dairy and yard when you bring them in for weighing, as this gets them used to the yard and shed.

• Portable cattle yards may be a worthwhile investment if cattle handling facilities are not suitable for weighing. Chat with the neighbours as these costs could be shared.

I don’t see how a few light heifers will make a difference to herd fertility.

You can expect reduced reproductive performance when heifer liveweights are low for two reasons: 1) delayed first calving; and 2) delayed interval from calving to the next conception.

When calf and heifer growth rates are low, by the time you start mating the heifers, liveweights are lower than you had aimed for. Low liveweight delays puberty, so these heifers are less likely to have started cycling at heifer Planned Start of Mating date. They often take longer to get in calf and will calve late.

Late-calving heifers commonly become late-calving cows and reduce overall reproductive performance in the next mating period.

The 6-week in-calf rate in first lactation can be reduced by more than 15% in underweight heifers.

Making sure heifers calve on time, and at the right size, takes planning.

I’ve seen my neighbours out there weighing heifers. Surely they’ve got something better to do?

Weighing heifers gives you a good idea of how they are growing compared with your targets. You already know that the smaller first calvers seem to take longer to get in calf. They often end up treated as non-cyclers, induced to calve or sold after just one or two lactations because they didn’t get back in-calf on time. The InCalf Tools provide quick and easy methods for weighing heifers and assessing the results against targets.

Make 3-monthly weighing a habit.
Setting liveweight targets in heifers

Setting liveweight targets for heifers is an individual farm decision. Determine the ideal liveweight for your heifers by weighing some mature cows of the desired size.

Weigh the 6-8 year olds, as these cows will be at their mature liveweight by this age. In spring calving herds, the best times to weigh them are in December-January or in April-May. At these times, body condition scores should be 4.0 to 5.0 and the unborn calf will not yet be having a great impact on liveweight.

You should aim to have your heifers at 30% of this mature cow liveweight at 6 months, 60% at 15 months and 90% at 22 months of age.

Another way to estimate mature cow liveweight is using the Liveweight Breeding Value (Lwt BV) of the heifer or line of heifers. The Lwt BVs can be obtained from your herd improvement organisation.

Use the following formula:

Expected mature liveweight = 503 kg + Lwt BV

So a heifer with a Lwt BV of 5 would expect to grow to a mature cow liveweight of 508 kg (= 503 + 5).

Once you have determined the preferred pre-calving liveweight for your heifers, you can plan target liveweights for heifers at different ages.

- Set individual farm targets for heifer liveweight from weaning through to calving (page 43).
- Weigh and measure heifers at least every 3 months.

*If the average liveweight of heifers is below the target, take action to increase growth rates (page 49).*

Don’t get caught with underweight heifers. They are far less likely to have a long, productive life in the herd.
Setting liveweight targets in heifers

Example targets are shown below. Modify these tables to suit your herd based on the liveweight of your mature cows weighed around April to May. This is in late lactation or early in the dry period, before foetal growth affects cows liveweight.

Alternatively, use their Liveweight Breeding Values to estimate mature cow liveweight by referring to the graph on page 44.

The table below assumes reasonably constant growth rates from weaning to calving. If it is not possible to maintain high growth rates from mating to calving, you will need to set higher target weights to achieve before mating.

The struggle to achieve liveweights by Planned Start of Mating date is more difficult for late-born heifers. These heifers will not be 15 months of age when mating starts. You may need to preferentially feed later born heifers to achieve the targets.

<table>
<thead>
<tr>
<th>When</th>
<th>Liveweight for typical heifers (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature cow liveweight</td>
<td>400</td>
</tr>
<tr>
<td>Liveweight Breeding Value (Lwt BV)</td>
<td>-103</td>
</tr>
<tr>
<td>3 months (fully weaned)</td>
<td>70</td>
</tr>
<tr>
<td>6 months (30% of mature liveweight)</td>
<td>120</td>
</tr>
<tr>
<td>9 months</td>
<td>160</td>
</tr>
<tr>
<td>12 months</td>
<td>200</td>
</tr>
<tr>
<td>15 months (60% of mature liveweight)</td>
<td>240</td>
</tr>
<tr>
<td>18 months</td>
<td>290</td>
</tr>
<tr>
<td>22 months (90% of mature liveweight)</td>
<td>360</td>
</tr>
</tbody>
</table>

Breed differences are factored into these ‘weight-for-age’ targets through their different mature cow liveweights, and Liveweight Breeding Values (BV). The 15-month (60%) targets relate to heifer Planned Start of Mating date. The 22-month (90%) target relates to two months prior to heifer Planned Start of Calving Date, before the foetus, foetal fluid and membranes dramatically increase in weight.
Estimate from the graph the mature cow liveweight (kg) for heifers using their Liveweight Breeding Value (Lwt BV).

It doesn’t matter what breed or breed-composite they are when using the Lwt BV.

For example, the expected mature cow liveweights of heifers with a:

- Lwt BV of +25 will be 528 kg (= 503 kg + 25)
- Lwt BV of -25 will be 478 kg (= 503 kg - 25)

"I’ve got a mixed breed herd. How do I know what targets to aim for?"

Nearly one-third of cows in New Zealand are Holstein-Friesian x Jersey crosses. You can weigh a sample of mature crossbred cows to determine their mature cow liveweight, and estimate the targets off the ‘weight-for-age’ table (previous table).

Or you can request a ‘trait evaluations’ report from your herd improvement organisation showing heifer Liveweight Breeding Values, and read from the graph their expected mature cow liveweights. The mature cow liveweight can be estimated for individual heifers or for different groups of animals (graph above).

Then estimate the ‘weight-for-age’ targets for your heifers from the table (page 43).

There isn’t really a good excuse for not knowing the expected mature liveweights of your replacement heifers.
Assessing the calving pattern of first calvers

The calving pattern of first calvers is an indicator of how successful your calf and heifer management has been. The calving pattern can be less reliable as an indicator if you have fewer than 30 first calvers.

Review the calving pattern of first calvers:

- **Top farmers have 75% of their heifers calved by week 3 and 92% by week 6 of calving in the herd.**
- If less than 65% of heifers calved by week 3 and less than 85% of heifers calved by week 6 of calving in the herd, review:
  - calf and heifer management;
  - bull management; and
  - inseminating technique and heat detection if AB was used.

Expect higher results if the Planned Start of Mating date for heifers was earlier than for the milking herd.

If the mating period for your heifers started before the cows, you can use the table at the bottom of this page to determine how well your heifers calved. If the Planned Start of Mating date for heifers was later than for the milking herd, it may be difficult to achieve a high percentage of first calvers calved by week 3 of calving in the herd. If you had to delay the Planned Start of Mating date because yearlings were poorly grown, review calf and heifer rearing. If the Planned Start of Mating date was delayed because of management convenience, plan to implement an earlier Planned Start of Mating date for heifers.

The Planned Start of Mating date for heifers should be the same or earlier than the main herd to ensure heifers conceive early in the mating period that follows their first lactation.

Mating heifers earlier helps get them calved early and gives more time to recover before the next mating begins.

<table>
<thead>
<tr>
<th>Mating start date for heifers last year.</th>
<th>% of heifers calved by week 3 of calving in the herd</th>
<th>% of heifers calved by week 6 of calving in the herd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same as cows</td>
<td>Less than 65%</td>
<td>Less than 85%</td>
</tr>
<tr>
<td>1 week earlier than cows</td>
<td>Less than 75%</td>
<td>Less than 89%</td>
</tr>
<tr>
<td>2 weeks earlier than cows</td>
<td>Less than 80%</td>
<td>Less than 93%</td>
</tr>
<tr>
<td>3 weeks earlier than cows</td>
<td>Less than 85%</td>
<td>Less than 94%</td>
</tr>
</tbody>
</table>
Assessing the 3-week submission rate of first calvers

The 3-week submission rate of first calvers may be a good indicator of how successful your calf and heifer management has been, and how they are performing now they are in the milking herd.

Review the 3-week submission rate of first calvers:

Top farmers have 90% of their first calvers submitted by week 3 of AB.

If less than 81% of first calvers in the herd are submitted by week 3, review:

- calf and heifer management;
- management of feed supplies and animal nutrition;
- pre-mating heat detection (page 82) and non-cycling cow treatment (page 102);
- heat detection during AB; and
- cow health.

Expect higher results if the Planned Start of Mating date for yearling heifers was earlier than for the milking herd, and the yearling heifers achieved their 22-month liveweight targets.
Rearing calves from birth to weaning

From the day a heifer calf is born, you start the process of maximising her potential to get in calf. You need to rear healthy calves, provide them with good nutrition and adequate housing, and run an accurate identification and record keeping system.

Identify the best person on the farm to rear the calves. Successful calf rearing demands patience, skill and an empathy with young animals, as well as knowledge of diseases and feeds.

Identify calves as soon as possible after birth using a MAF approved animal identification scheme. The current Animal Health Board rules apply – all cattle are required to wear a device in accordance with an approved animal identification scheme.

A healthy environment is essential to rearing healthy calves.

Housing should be clean, dry, well ventilated and draught free.

If bedding is provided, use non-edible types such as untreated shavings, sawdust or bark chips. Group calves together according to age and size with no more than 10 calves per group. It is not a good idea to mix batches of calves. Sick calves should be isolated so that infectious diseases are not transferred to healthy calves.

Isn’t it enough just to make sure the calf’s had a good drink soon after it’s born?

The calf has to get a drink, but it’s got to be enough of the right stuff – colostrum. It is critical that newborn calves consume 1–2 litres of good-quality colostrum during the first 6 hours of life. During the first 24 hours of life, Holstein-Friesian calves need a total of 4–5 litres, while Jersey calves need 2–3 litres.

Many dairy calves get insufficient amounts of colostrum early enough to achieve the high blood levels of immunoglobulin that is required for optimal health and survival.

If you have any doubt that calves have received this colostrum by suckling the dam, you should give them 1–2 litres of colostrum using a bottle or stomach tube. For this initial feed, only use colostrum from the first milking after calving. Don’t use colostrum from induced cows. Good quality colostrum can be stored in a refrigerator for up to 7 days or frozen in 1–2 litre containers for later use.

Colostrum quality is variable between cows and is most likely to be high in lower-producing, older cows that have not been induced. You can buy a colostrometer to test colostrum quality. Avoid using colostrum from cows possibly infected with Johne’s disease (JD).

It’s taken a lot of work to get that calf on the ground. You don’t want to lose it for lack of a few litres of good colostrum.
There are many successful ways to rear calves, including early weaning, restricted milk systems and *ad lib* milk systems. In general, feed milk, colostrum or milk replacer until calves are at least 5 weeks old. For all systems, make any change to the quantity or type of milk fed gradually, and be consistent with time of feeding, milk temperature and milk concentration.

- Remove the calf from its mother soon after birth and ensure it receives adequate, good-quality colostrum (see bottom of page 47). Identify and record birth and dam details.

- Dip calf navels with a strong (2%) alcohol-based iodine solution immediately after birth, especially if wet conditions exist.

- Check that fresh water, clean straw and high-quality calf meal or pellets (at least 12 MJ ME/kg DM and 18% crude protein) are available at all times.

- Separate sick calves and feed them last. Don’t forget to wash your hands, boots and feeding equipment after handling them.

- Vaccinate against clostridial diseases and leptospirosis according to the manufacturer’s instructions. Consider vaccinating against IBR (Infectious bovine rhinotracheitis) and BVD (Bovine viral diarrhoea) where there is a history of these diseases in your herd. Calves generally require two or three vaccinations in their first year of life and annual boosters thereafter. Vaccination generally needs to commence from 6 weeks of age. Develop an appropriate vaccination programme with your vet.

- Check that all calves are drinking milk and eating meal or pellets on a daily basis.

- Thoroughly clean and disinfect calf sheds between seasons. Consult your vet to find out about appropriate disinfectants.

- Do not re-use pens that have housed sick calves unless the bedding has been replaced and the pens have been thoroughly disinfected.
Growing heifers from weaning to mating

Good calf management must be followed by a focus on heifers in the time from weaning to their first calving. This will provide the best opportunity for heifers to calve on time in the first and subsequent years.

Selecting the right time to wean calves is a two-part decision: they must have reached their target weight and be eating at least 0.75 kg of calf meal or pellets each day. Holstein-Friesian calves should be weaned between 90 to 110 kg; Jersey heifers should be weaned between 65 and 85 kg. Dehorning calves well before weaning will avoid any setback in growth that may occur.

The key to feeding heifers is to ensure they economically achieve targeted weights (page 41) with good frame development. Remember that the first 12 months are the most critical for skeletal and muscle development. Heifers require high-quality pasture to achieve liveweight targets. If, for some reason, pasture quality is poor, then consider adding a high-quality supplementary feed. Older heifers may also require a supplementary feed at strategic times when pasture is unable to fulfil their requirements for energy and protein (e.g. the summer–autumn period in many districts).

Differentially feeding groups of heifers according to their size and weight can help to ensure that smaller, lighter heifers reach their target liveweight for mating. During mating, avoid sudden reductions in feed. The reproductive performance of heifers can be reduced if feed is reduced during mating.

My heifers are way too light! How do I manage underweight heifers?

Heifers with below target liveweights are often the result of too little pasture or from offering pasture that was mature, dry and of low quality. This can occur when heifers are grazed on the dairy farm, on run-offs or when grazing off farm on a grazing contract.

When pasture allowance is inadequate or of poor quality, you should consider adding supplements to the diet. There are supplements that can be added to provide energy alone, or a combination of energy and protein. You should discuss the options with an adviser.

Don’t forget to control parasites that can also reduce heifer growth rates. Review your current routine with your vet.

Don’t get caught with light heifers.
• Make sure calves graze abundant, high-quality pasture so that they are achieving their liveweight targets. If not, feed good quality supplements (at least 11.5 MJ ME/kg DM and 16% crude protein) until calves reach 200 kg. Remember that protein content and quality is important to ensure good skeletal and muscle development.

• Develop a parasite control programme in consultation with your vet.

• Don’t forget the clostridial/leptospirosis booster vaccination in the first autumn and at 12 months of age.

• Monitor liveweights at least every 3 months. If results are below targets (page 43) revise pasture-feeding management. Are they getting enough high-quality pasture? If high-quality pasture cannot be provided, consider supplementary feeding to increase heifer growth rates. Review your parasite control programme (page 49).

• Protect your heifers from facial eczema (North Island) during late summer and autumn with zinc dosing and supplementary feed options.

• Keep heifers away from areas irrigated or contaminated with effluent.

• Consider the need to supplement heifers with trace elements, vitamins and other feed additives with advice from an adviser.

• Keep heifers away from poisonous plants, including tutu and bracken fern.

For good reproductive performance, late-born heifers must achieve the same liveweights as the earlier-born heifers by Planned Start of Mating date. To achieve this, they must grow more quickly than earlier-born heifers. Consider preferentially feeding late-born heifers to achieve the same liveweights as their older counterparts.
Planning mating
Planning ahead will make for a more successful heifer mating period.

- Decide when to mate yearling heifers.
  Think about mating these heifers to start calving 1 to 2 weeks earlier than the milking herd to help them achieve good reproductive performance at their next mating. You will need your yearling heifers at the required target mating weight (page 43) 1 to 2 weeks earlier if you want to do this.

- Decide if you are going to AB the yearling heifers or use bulls for natural mating.

- When artificially inseminating yearling heifers, use sires proven under New Zealand conditions with a low Calving Difficulty Breeding Value (BV) (page 110).

- A sire’s Calving Difficulty Breeding Value (BV) predicts the percentage of assisted calvings expected when he is mated to yearling heifers. The lower the BV, the fewer expected assisted calvings, and the higher the BV, the more expected assisted calvings.

- Be aware there is as much variation in Calving Difficulty BV among the Holstein-Friesian breed.

- Jersey sires have BV’s typically less than zero (e.g. -5%) and don’t cause a problem. Holstein-Friesian sires have BVs typically positive in value (e.g. +6% and many will cause calving problems in heifers). The Calving Difficulty BVs for crossbreed sires are intermediate (e.g. -1%, and generally suitable for heifer mating).

- When using bulls for natural mating yearling heifers, use a breed of bull known to be easy calving (page 123).

"Why would you go to all that trouble of doing AB over yearling heifers?"

There are several reasons to AB your yearling heifers. It allows you to rear extra AB replacements to increase herd size more rapidly. You can also get the same number of AB replacements with a shorter AB period in the milking herd. As a bonus, you can increase the rate of genetic gain of your herd by using this strategy. Don’t take AB’ing heifers on without serious consideration. Mating heifers to Holstein-Friesian AB sires can result in serious calving difficulties that can often negate the benefits. You should discuss this option with your vet, semen supplier and other farmers first.
• Use of Holstein-Friesian sires on yearling heifers is not recommended. If you decide to use Holstein-Friesian semen on heifers, select sires with a Calving Difficulty BV less than +2. The lower the Calving Difficulty BV the better! This will reduce, but not eliminate, the calving difficulties you are likely to experience.

• If you are going to AB your heifers, check what needs to be done (page 183).
  – Have you considered using an experienced professional AB technician, as heifers can be more difficult to inseminate than cows?
  – Have you allowed for the extra time and skilled people required to implement an AB heifer programme?

• Will you heat synchronise heifers to allow planned use of people’s time? (page 183)

• What bulls will you need? (page 128)

• If heifers are to begin calving before the cows, you will need to plan the labour and skills required to manage them during the calving period and when being introduced to the milking routine.
**What to do during mating**

The focus during the mating period is on maintaining growth and implementing a successful mating programme.

- Monitor liveweights at least every 3 months. If results are less than targets, consider supplementary feeding to increase heifer growth rates and review your parasite control programme (page 47).

- Monitor bull serving behaviour throughout mating to ensure heifers are being mated successfully.

- Ensure sufficient bulls are used (page 128).

**What to do with pregnant heifers**

Once heifers are in calf, they still need to grow right up until calving at a rate sufficient to achieve targets.

The period between mating and calving is a good opportunity to assess the reproductive performance of the heifers. Early pregnancy testing (no more than 14 weeks after mating started) allows you to identify which heifers conceived early in the mating period as well as predicting calving dates. Knowing when heifers are expected to calve can help in their management at calving. Pregnancy testing from 5 weeks after the end of mating will identify empty and later calving heifers.

- Monitor liveweights at least every 3 months. If results are less than targets, consider supplementary feeding to increase heifer growth rates and review your trace element and parasite control programmes (page 47).

- Identify empty heifers and cull them.

If you are pregnancy testing heifers, assess their predicted calving pattern (page 45).

Heifers are still growing when they calve for the first time. Even though they are smaller, they should receive at least the same quantity of feed as mature dry cows. A 30 kg unborn calf requires 32 MJ ME/day in the last 4 weeks before calving. This is equivalent to 2.8 kg DM/day; and is over and above what the heifer requires for her own maintenance and growth. If heifers have not reached their target weight when close to calving, consider running them separately from springing cows and feeding them preferentially.
Now I get it. If I don’t start early, they’ll never be big enough. (Page 40)

Boy, it takes a lot of feed to get those skinny heifers back in shape. (Page 49)

Weighing heifers is pretty important, I guess we should get a set of scales. (Page 41)

We thought those heifers were going all right until we saw that liveweight target table. (Page 43)

I’d better talk to someone to sort out this heifer AB stuff. (Page 51)

Get ready! We need three-quarters of those heifers calving down in the first 3 weeks. (Page 45)

Those bulls had better be working! (Pages 53 and 128)

Those poorer heifers are going to end up getting in calf late. (Page 45)

They’ve got to grow a calf and themselves – it’s a big ask for the heifers. (Page 53)
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Body condition and nutrition

Effective management of body condition and nutrition over the whole season improves herd reproductive performance, cow health and milk solids production.

Pasture fed spring calving cows face a profile of condition score change over the season in the shape of the letter W. After cows calve they lose condition in early lactation and gain condition after mating. They can then lose condition again in mid to late lactation, and only regain condition once dried-off (see graph below).

Most New Zealand herds have some cows that are too thin at calving. They also have some cows that lose too much body condition in early lactation. Both are problems that reduce reproductive performance.

Cows in body condition score 5.0–5.5 at calving have substantially better reproductive performance than cows in lower body condition.

Losses of one body condition score can be expected in early lactation, and cows calving at 5.0-5.5 will likely be condition score 4.0 at Planned Start of Mating date.

Cows that calve in low condition score 4.0-4.5 may lose less condition but end up at condition score less than 4.0 at mating. They produce less milk solids, take longer to start cycling and their reproductive performance suffers (page 96).

Excessive losses of condition score (1.5 scores or more) can occur when cows calve in body condition score above 5.5, reducing their reproductive performance. First calvers are at risk of losing more than one condition score, but as long as they calved early, and are gaining condition prior to the Planned Start of Mating date, they have every chance of getting back in calf early.

Pattern of condition score change for cows calving at different condition scores.

Most New Zealand herds have some cows that are too thin at calving. They also have some cows that lose too much body condition in early lactation. Both are problems that reduce reproductive performance.
It’s frustrating to see those cows lose condition in early lactation. Cows naturally lose body condition during early lactation because their daily appetites take several weeks longer to peak than their daily milksolids yields do. Until a cow’s daily intake of energy from the feed eaten exceeds the amount of energy she needs each day for milksolids production, walking and regular body function, she will ‘milk the fat from her back’.

Cows will stop losing body condition at about 7 weeks after calving (8 weeks for first calvers and cows older than 6 years), but only if good energy intakes are being maintained. This point is called the post-calving body condition ‘nadir’. The sooner the cow passes this point and starts gaining weight, the better her chance of having heats before the Planned Start of Mating, and getting pregnant early.

Cows, especially first calvers, milked once-a-day from calving, may achieve higher submission rates and in-calf rates with fewer non-cycling treatments, than if milked twice-a-day.

Detecting small changes in condition score over a short period is difficult, especially during the weeks leading up to the start of mating. Liveweight monitoring would be a more sensitive measure.
The herd manager has to work out the herd’s feed requirement or diet – how much pasture, and how much supplement may need to be fed.

and you’d be looking to see cow liveweights gaining from 3 weeks before the Planned Start of Mating date. Automated weighing systems offer a convenient means of monitoring liveweight trends over time. Be wary of the effect of day to day variation in gut fill. Look for trends over several days or weeks.

You need to check aspects of nutritional management regularly to detect problems quickly and take action to avoid unwanted loss of condition and reduced reproductive performance.

When considering changes to nutritional management, you need to think about the whole farm system:

- What are the likely benefits now and further on?
- Will these benefits outweigh the costs involved?
- Will there be added costs in terms of time or extra labour?
- Will this change affect other parts of the farm?

Keep in mind that a diet is the total feed actually consumed by cows – it includes both grazed pasture and supplements. Forage supplements are conserved silages and hays, and grazed fodder crops. Concentrates are supplements such as cereal grains or pellets that have a high energy and/or protein density often fed in the bail.

Diet balance refers to the relative proportions of energy, protein, effective fibre, vitamins and minerals in the diet.
Assessing herd body condition

What is body condition scoring?

Body condition scoring is the assessment of the amount of fat and muscle covering the bones of a dairy cow, regardless of her body size. It involves assessing the amount of fat covering specific locations on the cow, such as around the head of the tail and over the backbone, to determine how thin or fat the animal is.

Condition scoring is a simple process. It involves using the ‘hands on’ method at the dairy to calibrate your eye for visual assessment of condition score.

InCalf body condition recommendations for New Zealand use a condition scoring system which rates cows on a scale from 1 to 10 – 1 is extremely thin and 10 is extremely fat. The points on the cow to assess and the procedure for condition scoring using a 1 to 10 system are fully described in the ‘Condition Scoring Made Easy’ booklet.

By scoring a representative sample of the whole herd or particular groups of cows, you can calculate the percentage that are either too thin or too fat, and this can be used as a tool to assess herd nutritional management and drying off policies.

Isn’t the connection between body condition scores and getting cows in calf a bit of a stretch?

The link between body condition scores and herd reproductive performance is much stronger than most think. Cows that calve too thin (less than score 5.0) generally take longer to start cycling after calving. This can reduce submission rates and conception rates. Conception rates are usually about 7–8% higher for cows inseminated at their second heat after calving, rather than their first. Cows that calve too thin are more likely to be inseminated at their first heat, resulting in lower conception rates.

Cows that lose excessive condition in early lactation also have reduced reproductive performance. First and second calvers are especially vulnerable. These cows take longer to start cycling after calving, reducing submission and conception rates. Poor expression of heat signs can also occur in some situations.

If you have more than 15% of your cows below 5.0 at calving – take action. If you have more than 15% of cows above 5.5 at calving you may need to take action also.
Body condition targets

Body condition targets are based on the 1 to 10 scale, as described by ‘Condition Scoring Made Easy’ (page 59).

Cows at less than body condition score 5.0 at calving have 6-week in-calf rates lower than if they had calved in the optimal condition score range of 5.0–5.5.

Cows that lose 1.5 more body condition scores between calving and mating can be expected to have reduced reproductive performance compared to cows with more moderate losses.

To maximise herd reproductive performance, every farm must have a strategy in place to effectively assess body condition score. You may want to implement your own system of regular condition scoring, using the procedure suggested in ‘Condition Scoring Made Easy’. Alternatively, get an adviser who is condition scoring cows on a regular basis to perform this task. Make sure your adviser calibrates themselves regularly against ‘Condition Scoring Made Easy’.

Once you have a system in place to measure body condition, feeding programmes can then be developed to achieve body condition targets while milksolids production targets are also met. A sound feeding programme allows you to meet the following herd targets:

- not more than 15% of cows are below body condition score 5.0 at calving;
- not more than 15% of cows are above body condition score 5.5 at calving;
- the average decrease in body condition score for the herd after calving is not more than 1.0;
- not more than 15% of cows are below body condition score 4.0 at mating; and
- cows maintain or gain body condition from the commencement of mating.
When to body condition score

Regular condition scoring will allow you to monitor nutritional trends and provide sufficient warning to take action before poor condition reduces reproductive performance.

Monthly checks using the scoring sheet on page 35 of *Condition Scoring Made Easy* are recommended. Record your herd’s average condition score profile throughout lactation on a graph like that on page 56 of *The InCalf Book*. Record and monitor your first calvers’ profile separately from the mature cows.

If you wish to limit condition scoring to the most important times, they are:

- after the end of mating, before dry summer/autumn conditions reduce pasture quantity and quality;
- in late lactation (90-120 days or 3-4 months) before Planned Start of Calving date;
- just before Planned Start of Calving date;
  - at this time, calculate the average condition score for at least 70 cows selected at random, the percentage below 5.0, and the percentage above 5.5.
- two weeks before the Planned Start of Mating date;
  - at this time, calculate the average condition score for at least 70 cows selected at random, and the percentage below 4.0.

Also calculate the difference in condition score from calving to 2 weeks before the start of mating.

How do I know what cows to body condition score? What’s a representative sample?

InCalf recommends you score at least 70 cows using the system described by ‘Condition Scoring Made Easy’.

To get the 70, randomly select the cows using their cow ID or where they are milked. To ensure a random selection, score every cow with an ID ending in an even number if you are milking 150 cows, or an ID ending in ‘0’, ‘1’, or ‘2’ if you are milking 250 cows, and so on until you get a tally of 70 cows. Alternatively, score those cows milked in a certain position in the dairy (e.g. every 8th bail on a rotary platform or every 4th set of cups in a herringbone shed). Score cows in those positions only. Don’t score the first or last 70 cows to be milked or the first or last cow in on each side during milking.

In the dairy shed, arrange to see the cows from a position above and to the rear of the cow. In a rotary you can stand on a raised platform that is close to the cows. In a herringbone, step up to view selected cows. The other way of doing it is to score the cows in the exit race as they leave the dairy.

If you wish to score cows in the paddock, take care to select a random group and position yourself close to the cows. Score 70 cows standing with their tail, rump and back clearly visible. Keep referring to the photos in ‘Condition Scoring Made Easy’ as your reference point.

* A little practice can make this job pretty quick.
Section 3: Acting on Priorities

Interpreting condition scores

Interpret body condition score results carefully, and use them to make decisions that improve the herd’s reproductive performance.

These decisions are about achieving condition score targets for calving (5.0-5.5) and mating (at least 4.0) through changing both feed supply and feed demand.

There are decision rules to help but you may still need professional advice to refine these rules for your own herd and farm system.

The purpose of calculating (and graphing) your herd’s average condition score is to ensure herd condition score is following a critical path (graph on page 56) towards achieving the targets.

The range of condition score within your herd is used to assess what percentage of the herd you need to do something about. For example what percentage of cows should get preferential feeding, or how many cows should you dry off this week?

Decisions vary through the season and relate to the four most important times to condition score the herd (page 61)
### Section 3: Acting on Priorities

#### Body condition score results

<table>
<thead>
<tr>
<th>What to consider immediately</th>
<th>What to consider to prevent it happening again</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>After the end of mating, and before dry summer/autumn conditions reduce pasture quantity and quality</strong></td>
<td></td>
</tr>
<tr>
<td>More than 15% of the herd is still less than 4.0 going into a dry summer</td>
<td>Plan to protect condition score loss in mid-late lactation. Quantify feed supply available. Identify and remove culls early. Consider once-a-day milking for mid-late lactation. Anticipate early drying-off of first calvers.</td>
</tr>
</tbody>
</table>

| **In late lactation, 90-120 days (3-4 months) before Planned Start of Calving date** |
| Drying off trigger levels reached for some cows and heifers | Apply drying off decision rules (page 65) If possible, increase feed inputs to increase body condition in late lactation (page 65). Feed to increase condition during the dry period (page 66). | – Examine the costs and benefits of increasing feed inputs during late lactation. – Determine if reducing stocking rate is appropriate. – If most cows in low body condition are first calvers, then review management of heifers (page 49). |

| More than 15% of cows have a body condition score above 5.5. | Feed to maintain condition during the dry period (page 66). Don’t allow over-conditioned cows to lose condition when dry. More closely monitor BCS in late-lactation – avoid cows reaching 6.0 BCS. | Seek help from an adviser to: – Check diet balance. – Determine if cows are being overfed in late lactation. |

| **Just before Planned Start of Calving date** |
| More than 15% of cows have a body condition score below 5.0. | If possible, separate thin cows into a group before and for several weeks after calving and preferentially feed (pages 66, 68). Consider separating thin cows and milking them once-a-day. | Review drying off policy (page 65). Increase body condition in late lactation (page 64). Increase condition during dry period (page 66). See above for strategies described for cows in low condition at drying off. |

| More than 15% of cows have a body condition score above 5.5. | If possible, separate fat cows into a group for several weeks after calving and preferentially feed to reduce the risk of excessive body condition loss. | Monitor BCS in late-lactation more closely – avoid cows reaching BCS 6.0. Carryover cows are at a high risk for being too fat at calving. |

| **2 weeks before Planned Start of Mating date** |
| More than 15% of cows lost more than 1.5 condition scores, or the herd average condition score dropped by more than 1.0 during early lactation. | Examine the costs and benefits of increasing feed supply to prevent any further losses in body condition (page 69). | Consider strategies to minimise body condition loss in early lactation (page 69). |
How to achieve body condition targets

Body condition score targets are achieved by manipulating the quantity and type of feed provided to the herd, frequency of milking (once vs. twice-a-day), and the length of lactation. In all cases, the costs and benefits of changing these will need to be carefully analysed. Seek help from an adviser if you are unsure of the benefits of changing or modifying your herd’s feeding, milking frequency and/or drying-off programme.

1. Put condition on cows in late lactation

It can be difficult to put condition on cows in late lactation with pasture only, because extra pasture eaten tends to increase milk solids production rather than condition score. Also, you may need to be increasing average pasture cover for winter feed at this time.

The options to consider include:

A. Increasing feed inputs for all cows in late lactation
   • Increase the allocation of good-quality pasture if your grazing rotation, pasture cover and feed budget allows.
   • Apply nitrogen fertiliser to stimulate pasture growth so that pasture cover increases and the pasture allocation to the herd can be increased.
   • Alter supplementary feeding to increase the cows’ total dietary intake of energy above those required for milk solids production, walking and regular body function.
   • Increase the amount of carbohydrate in the cow’s diet (e.g. maize silage supplement), while maintaining or increasing daily energy intake. Ensure balanced intakes of energy, protein and other nutrients if supplements exceed one third of the total feed allocation.

Use progressive drying-off in late lactation to achieve calving condition score targets.
B. Consider preferentially feeding cows in late lactation

Preferential feeding generally requires the physical separation of cows into groups.

- Select cows with body condition scores below your threshold level, e.g. 4.5.
- If it is practical to milk two groups, consider running the thin cows separately and increasing their total feed inputs with high-quality pasture and supplements.
- Consider putting thin cows and young cows on once-a-day milking, while maintaining their level of feeding.
- If an individual cow ID and bail feeding system is available, increase daily allocations of supplement to the selected cows.

C. Consider early drying off for cows below condition score thresholds in late lactation

Progressive drying off of thin cows, and later drying off the whole herd on the basis of a feed budget may be necessary to achieve calving condition score targets.

It is easier to put weight on dry cows because all surplus energy fed to them is directed to increasing body condition rather than milk solids production.

Lactating cows are more efficient than dry cows in converting energy from feed into body weight gain. However, on many New Zealand dairy farms, insufficient feed supplies in late lactation deny cows the opportunity to milk on while also gaining condition score.

With your adviser, prepare a feed budget from late lactation, right through to 2 weeks before Planned Start of Mating date.

Include the extra feed required to achieve calving condition score targets of 5.0-5.5, as described in Condition Scoring Made Easy.

- Identify first calvers and cows with body condition scores less than 5.0, less than 4.5, and less than 4.0.
- Dry off individual cows at the number of days before calving, depending on their age, expected calving date and condition score using the table below.
- Feed using dry period feed options (page 66).

<table>
<thead>
<tr>
<th>Days (months) from next calving</th>
<th>Condition Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow</td>
<td>Rising 3-yr heifers</td>
</tr>
<tr>
<td>120 (4)</td>
<td>3.0</td>
</tr>
<tr>
<td>90 (3)</td>
<td>3.5</td>
</tr>
<tr>
<td>60 (2)</td>
<td>4.0</td>
</tr>
<tr>
<td>Calving</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Drying off may occur progressively using condition score ‘triggers’ shown in the table below. These drying off triggers provide you enough time to rebuild condition on cows before next calving. See Condition Scoring Made Easy for how long it takes cows to regain condition, for feeds of different quality and intake allowances.
2. **Ensure cows achieve condition score 5.0–5.5 at calving**

Cows need to be maintaining or gaining body condition during the dry period to ensure they calve in the best condition for high reproductive performance. However, many pastures and supplementary feeds provided to dry cows are of lower nutritional quality, providing inadequate total daily intakes of energy and protein, even if available in large amounts.

- Test supplementary feeds for nutritional value (especially hay and silage) to ensure they are suitable for feeding to dry cows.

- If higher-quality forages are in limited supply or prohibitively expensive, consider feeding supplements to dry cows to enable them to consume sufficient energy on a daily basis. Ensure that all cows in the group have equal access to supplements. Seek advice on the best ways to utilise poorer-quality forages and on how to feed concentrates if used.

- Separate thin cows at drying off and feed them differentially to achieve their respective condition targets. Redraft them periodically on condition score.

- Manage cows so that they do not calve in body condition score above 5.5.

Monitor and record the condition score of your herd throughout the dry period. After drying-off there may be a large range of condition scores within the herd that demands separate mobs, and differential feeding to close the condition score gap for different groups.
By calving you need to lift the herd average condition score at calving to 5.0-5.5, and also tighten up the variation within the herd, as shown in the chart below. For this example herd that starts calving on 30 July, average condition score in May was 4.3, with 75% of cows below condition score 5.0. In June the average condition score had lifted to 4.7, but there were still 50% of cows below calving target 5.0. By July the herd was on target with average condition score 5.1, with only 10% below 5.0 and 10% above 5.5.

An example of how preferential feeding in the dry period can ensure that the majority of cows in a herd can achieve calving condition targets.

Jerseys in condition score 4.0, 4.5, 5.0 and 5.5.
3. **Prepare cows for lactation 2–3 weeks before calving**

Around calving, the cow undergoes a dramatic transition from dry and heavily pregnant to fully lactating. This is a very stressful period for the cow and she is vulnerable to many problems and disorders that can affect her health and productivity.

In the last month before calving a mature cow requires 20% of her mature cow liveweight in metabolisable energy (MJME) daily to meet her energy requirements. That means a 400 kg Jersey needs 80 MJME/day, a 500 kg Friesian needs 100 MJME/day. This is some 10% higher than traditionally recommended and is an important consideration to prevent condition score loss before calving.

Feeding during the last 2–3 weeks before calving not only determines what happens to body condition at this time, but also provides an opportunity to prepare the cow for the coming lactation. Strategic feeding can reduce diseases and disorders around calving and reduce the potential for condition score loss following calving.

The principles of feeding at this time include:

- Satisfy the cow’s daily requirements for energy, protein, vitamins and minerals.

- If a cow is to be fed more than 3–4 kg/day of concentrate supplement after calving, it will be necessary to adapt her rumen to the concentrates and so reduce the risk of rumen upsets. Feed 2–3 kg/cow/day of a similar concentrate supplement to dry cows in the last 2–3 weeks before they calve.

- Manage the mineral levels of the cow’s diet in the 2–3 week period before calving as this allows her to better cope with the huge metabolic demands placed on her around calving. This reduces her risk of suffering disorders such as milk fever, ketosis and retained foetal membranes.
  - feed a diet low in potassium and sodium;
  - feed a diet with low levels of calcium; and
  - supplement with magnesium.

Pastures can be naturally high in potassium but this potential problem is overcome by magnesium supplementation before and after calving, and with calcium supplementation after calving to colostrum cows.

If the body condition score of cows is not between 5.0 and 5.5 one month before calving, it’s too late. Make plans to have the calving cows in better condition next year.
4. **Minimise body condition loss in early lactation**

Body condition score loss in early lactation is normal. Cows most likely to lose excessive condition in early lactation are first calvers, those that calve above body condition score 6.0 and very high-yielding Holstein-Friesian genotypes that are not bred for systems based primarily or solely on pasture feeding.

For the first 6 weeks after calving there is not much you can do to alter the rate of body condition loss. Extra feed eaten during this period is simply converted into more milksolids. After 6 weeks, however, the cow’s metabolism will have altered and her appetite increased so that better feeding will maintain or replenish body reserves and condition score. The aim is to ensure this happens before the mating period begins.

Principles of feeding at this time include:

- Feed the highest possible quality pasture to your cows after calving and throughout their early lactation. Make sure cows have access to as much pasture as your grazing rotation and feed wedge will allow, while maintaining consistent even grazing residuals to recommended levels (i.e. 7-8 clicks on a rising plate meter).

- Allow your cows to increase their energy intake naturally by increasing the pasture allocated, but without you allowing their grazing residuals to lift above recommended levels.

- Walk the farm weekly to assess changing pasture cover and feed wedge, in anticipation of early surpluses or deficits. Respond to pasture deficits proactively with the addition of supplements, nitrogen and/or alteration to rotation length.

- If supplements are used after the first 6 weeks in milk, balance nutrient intakes from pastures with supplements as required to ensure daily energy and protein intakes are sufficient to prevent excessive loss of condition as cows approach peak lactation. Work with an adviser to ensure the diet is correctly balanced for energy, protein, effective fibre, vitamins and minerals (page 75).

- When you must make changes to the diet of early lactation cows, make them gradually. Increase or reduce concentrate supplements in half-kilogram steps over several days. Work with your vet to recognise early signs of ruminal acidosis in early lactation.
Using quick nutritional checks

Body condition scoring your cows at the three to four most useful times during lactation and the dry period is essential, but has some limitations. Body condition scoring cows every day, week or month isn’t practical – and small changes over a short period are very difficult to detect. There are a number of quick checks that may alert you to nutritional problems in your herd, especially if concentrates are being fed. You can then act to correct them before they cause undesired loss of condition and subsequent reduced reproductive performance.

It is particularly important to keep a watchful eye from 2 weeks before mating starts until the end of mating.

Use the following quick checks to ensure that your herd’s nutrition is on track, and that no undesired condition score losses are occurring.

1. Check your pastures before and after every grazing.
2. Check your cows are eating the supplements you offer.
5. Monitor milk fat.
6. Check cud chewing.
7. Check manure consistency.

Keep in mind that a sudden change in one of the quick checks may be due to a temporary fluctuation in herd nutrition. Provided the check returns to normal quickly, herd reproductive performance may not be adversely affected.

Take action when:

- a quick check remains abnormal for several consecutive days; or
- several quick checks become abnormal at the same time.
1. Check your pastures before and after every grazing

The amount and quality of grass in the paddock before and after grazing is very important to both the nutritional management of the herd and the management of the pasture.

Checking the characteristics of pasture in a paddock before and after grazing allows you to adjust your grazing rotation to ensure your cows are eating as much pasture as possible on a daily basis, while maintaining the quality of the pasture at future grazings. Seek help from an adviser to obtain specific recommendations on the characteristics of pastures for your farm that are ready to graze.

You need to act if cows are grazing your pastures too laxly. This can occur because you are underestimating pre-grazing pasture cover, over allocating paddock area, feeding supplements when not needed, or you have not identified a feed surplus and need to close up some areas for silage.

Lax grazing residuals in early lactation will subsequently reduce:

- pasture quality;
- cows energy intakes;
- liveweight gain; and
- milk solids production during the critical pre-mating and AB period.

Attempts to correct reduced milk solids production by offering even more feed, or forcing the cows to graze lower to recover previously high residuals often makes the situation worse.

You also need to act if cows are grazing your pastures too low. This can occur because you are short of feed (there wasn’t sufficient pasture available when the cows went in the paddock). In this case you need to think about increasing feed supply by:

- applying nitrogen fertiliser;
- increasing supplementary feeding; and/or
- altering your grazing rotation if the pasture does not exhibit the recommended pre-grazing characteristics for your region.

Pastures can also be grazed too short if you have set your grazing rotation incorrectly and the cows don’t have sufficient area. Discuss your grazing rotation with an adviser to plan any adjustments.
2. **Check your cows are eating the supplements you offer**

Excessive supplements left in the feed-pad bins or on the paddock might indicate that:

- cows have not had enough time to eat the amount offered;
- the pasture allowance is sufficient and the supplement is simply being wasted; or
- the supplements are unpalatable or of low quality.

Excessive concentrate feed left in the bail might indicate that:

- some cows have not had enough time during milking to eat the amount offered;
- the feed system is not supplying the correct amount of feed to every bail;
- a disease or management issue is reducing feed intake of some cows; or
- the supplements are unpalatable.

3. **Monitor daily milksolids yield**

Milksolids yield is usually linked to energy intake. If it drops daily by more than 0.07 to 0.1 kg milksolids/cow/day over 2–4 days:

- Consider increasing energy intake by increasing supplementary feeding or pasture allocation, if your grazing rotation allows. If milksolids yield does not increase within 5 days of increasing the energy intake, seek help from an adviser to review the feeding levels and diet balance.
- Check that cows have had sufficient access to drinking water.
- Review your grazing management and daily feed allocation and residuals. Pasture quality may have declined as a consequence of lax grazing residuals in previous grazing rotations.

When comparing differences in milksolids yield per cow, be sure to account for differences in numbers of cows milked into the vat, milking times and milk removed from the vat for feeding calves.

Also remember that both milk protein % and milk fat % naturally reduce after calving as milk yields peak. They rise again through mid and late lactation.
4. **Monitor milk protein**
The milk protein percentage may be related to the energy intake from the diet. If the milk protein percentage falls, it is likely that energy intake has fallen. Less commonly, dietary imbalances (page 75) can cause falls in milk protein percentage.

Compare current milk protein percentage in the vat with the same time last year, using a 10-day average figure:

- If it is more than 0.2% below the same time last year:
  - consider increasing daily energy intake by increasing supplementary feeding or pasture allocation if your grazing rotation allows;
  - complete the checks described in this section to ensure no other nutritional problems are present; and
  - seek help from an adviser if increased milk protein percentage does not follow increased energy intake and other adjustments to the diet within 5 days.

- If it is more than 0.2% above the same time last year, the energy intake of the cows this year has probably improved.

When comparing with the same time last year, be sure to account for changes in herd calving pattern and milk yield.

5. **Monitor milk fat**
Changes to milk fat percentage, on a daily or annual basis, can indicate diet problems. Increasing fat percentage in early spring pasture indicates cows are being underfed and are losing condition.

Compare the average bulk vat milk fat percentage for the current 10-day period with that for the previous 10-day period. Also compare the average bulk vat milk fat percentage for the current 10-day period with that for the same time last year.

If the result is more than 0.2% below:

- check the diet contains adequate levels of effective fibre. Seek help from an adviser if the problem persists; and
- complete the checks described in this section to ensure no other nutritional problems are present.

When comparing with the same time last year, be sure to account for changes in herd calving pattern, milk yield and calving condition.
6. **Check cud chewing**

When cows are sitting down, at least half of them should be chewing their cud. If they are not, this may suggest that their rumen function is upset. Check that the diet contains sufficient effective fibre, that cows are eating the diet offered and that all cows have equal access to all feeds offered. If feeding concentrates in large quantities, you may need to include a buffer in the feed.

If recently calved cows are the group most affected and they are being fed more than 3–4 kg of concentrate supplements, review transition management for those cows still to calve (page 68).

If you find less than half of the cows chewing their cud when sitting down, and are unsure of the cause, seek help from an adviser.

7. **Check manure consistency**

Manure that is excessively loose or dry and firm for the diet fed may indicate a dietary imbalance that requires action. The use of dung consistency as a quick nutritional check is more suited to dairy systems that feed significant amounts of supplements.

Cows grazing high-quality spring pasture may produce runny manure, but this is not scouring. It is a reflection of rapid digestion and high water content of lush spring pasture. The cows are likely to be getting sufficient effective fibre for rumen function.

If concerned that cows are not getting enough effective fibre from pasture, get a pasture sample tested. Cows require 30%-35% effective fibre (or NDF) when grazing only spring pasture. The effective fibre levels of spring pasture are seldom under 36%. However, new pastures growing rapidly in spring may be less than 36% NDF.

Feeding hay or straw to cows, when they do not need extra fibre, reduces their energy intake and will not help their reproductive performance.

If grain feeding, check for whole grains in manure. Only consider intact grains – those with ‘milk’ or starch in the grain – and disregard husks. Excessive quantities of intact whole grains in manure indicates inadequate digestion. The likely causes are:

- the grain has not been processed or crushed adequately; or
- the diet may be deficient in effective fibre.

Seek help from an adviser to determine the cause of abnormal manure.
Make sure your cows are getting sufficient feed and a well-balanced diet

If one or more of these dietary indicators become abnormal or change suddenly, it is likely that cows are either not getting sufficient feed or their diet is not well balanced. Herd reproductive performance may be affected, so you should act quickly to assess the diet and make appropriate adjustments.

Cows require a diet that supplies sufficient energy, protein, effective fibre, vitamins and minerals in the correct balance.

On a pasture based diet the balance of nutrients becomes more important once the level of supplement fed reaches one third of the total diet.

When problems arise, seek help from an adviser to review the provision and balance of these dietary components.

Trace elements

Trace elements are an important part of dairy cow nutrition. Inadequate intake of any of the essential trace elements can result in decreased reproductive performance. Important trace elements in pasture systems are Cobalt (Co), Copper (Cu), Iodine (I), Selenium (Se) and Zinc (Zn).

Deficiencies can be primary or secondary. Primary deficiencies arise because of insufficient levels of the particular trace element in the diet. Secondary deficiencies arise when the pasture contains something else that reduces the uptake of the trace element (e.g. pasture with high molybdenum reduces the adsorption of copper).

Discuss with your vet:

- what trace elements are likely to be limiting for your region;
- whether or not some blood tests or liver biopsies would be worthwhile; and
- what your trace element supplementation strategy should be for your herd.
Section 3: Acting on Priorities

With ‘Condition Scoring Made Easy’ I’m sure we are now scoring the herd right. (Page 59)

We had a lot of milk fever last year. We’d better review their diet and magnesium. (Page 68)

I didn’t realise condition was so important in getting cows in calf. (Page 60)

We had a lot of milk fever last year. We’d better review their diet and magnesium. (Page 68)

I had lots of cows that didn’t show a pre-mating heat. That’s because they were less than 4.5 at calving. (Page 60)

My challenge now is to make sure they start to regain weight before mating. (Page 69)

That’s why we’ve got so many empty first calvers. They lost too much condition after calving. Pages 60 and 69

Our cows looked a bit hungry, and my paddock checks show we were grazing too short. (Page 72)

So, we need to condition score cows at 4 critical times: the end of mating; before drying off; just before calving; and just before mating. (Page 61)

To get our cows to condition score 5.0 at calving, we’ll have to feed budget and dry-off some cows earlier. (Page 65)

I had lots of cows that didn’t show a pre-mating heat. That’s because they were less than 4.5 at calving. (Page 60)
Heat detection

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The importance of good heat detection

Good heat detection programmes can have a major impact on overall herd reproductive performance. While it seems obvious that cows not detected on heat will not get pregnant to AB, the key to ensuring semen is not wasted and cows conceive at the right time is accurate heat detection.

The first step towards getting better results is to assess current heat detection practices to see if they can be improved. There are two types of errors that can occur during heat detection. You can miss a cow that is actually on heat or you can misinterpret the signs shown by a cow and think she’s on heat when she’s not.

If you miss a lot of heats, the submission rate of your herd will be low. The submission rate is a key driver of the 6-week in-calf rate. You are aiming for high submission rates, but you don’t want to achieve this by inseminating cows that are not on heat.

I’ve been mating cows for years. Surely I know how to detect heat?

It’s fine to say that you are a good heat detector but InCalf research has shown that in around one-quarter of seasonal calving herds, heat detection errors are likely to be limiting reproductive performance.

There are two mistakes that are commonly made by many farmers when detecting heat. They miss heats and invent heats. It sounds unusual to invent heats, but how many times have you recorded the wrong cow ID or confused the cow that was on heat. Sometimes these misdiagnosed or misidentified cows are inseminated when they were not on heat? The results of these mistakes are cows taking longer to become pregnant and poorer herd reproductive performance.

Heat detection errors could well be holding you back.
Assessing heat detection using submission rate

Submission rates are a useful tool in assessing your current management of heat detection.

Submission rates can be low for two reasons:

1. Your cows are showing heat normally but you are not detecting them.

2. You have lots of ‘non-cyclers’ in your herd that are not showing heat normally (see Chapter 11).

Low submission rates suggest action is required. Start by reviewing heat detection practices then look at other areas such as body condition, lameness or other health issues.

Using submission rates

Obtain your herd’s 3-week submission rate for early-calved, mature cows on day 22 of mating. Early-calved, mature cows are cows that are 4 or more years of age at calving and that calved 8 or more weeks before the start of mating. The 3-week submission rate of this group of cows in the herd is a good indicator of heat detection accuracy.

Top farmers achieve a 95% 3-week submission rate for early-calved, mature cows.

If less than 85%, the low submission rate in early-calved mature cows is a strong indicator that heat detection rates are low and reviewing detection strategies should be a high priority. The other most likely possible cause is an excessive number of non-cyclers due to low body condition at calving and/or before the Planned Start of Mating date. Check your body condition score records to determine if cows calved below condition score 5.0 and/or are still losing condition coming into mating (page 67).

Cows are called ‘non-cyclers’ when they have not started normal heat cycles after calving. Excessive numbers of non-cyclers can be due to low body condition at calving, excessive body condition loss after calving, lameness and other cow health problems after calving. The number of non-cyclers is also increased if more cows calve late in the calving period (see Chapter 11).

So, I don’t want too many non-cyclers in my herd and I’ve got to be careful not to miss heats.
I think she’s on heat but I’m not sure. Should she be inseminated?

• Record a ‘?’ in the AB record whenever you inseminate a cow that is possibly on heat but you are not sure.
• Look up any previous insemination and heat records for the cow that is possibly on heat.
• Inseminate if the cow has not been inseminated since calving and is showing reasonable signs of heat.
• If the cow’s previous insemination was more than 20 days ago, inseminate.
• If the cow’s previous insemination was less than 20 days ago, inseminate if the previous heat was weak (marked with a ‘?’). Otherwise, look for more signs of heat. If these are seen, inseminate.
• If you decide to inseminate a doubtful cow:
  – if difficulty is encountered passing the inseminating pistolette through the cervix, perform a deep cervical insemination.

If more than 10% of inseminations are cows with weak heat signs, or many intervals between consecutive inseminations are less than 18 days, then …

Take a long hard look at your heat detection practices.
What to look for in a cow that is on heat

A cow is most likely to be on heat if:

• she is standing to be mounted by other cows;
• tail paint is removed (page 86); or
• heat mount detector is triggered (page 88).

A cow may be on heat if:

• she attempts to mount other cows;
• tail paint is rubbed but not removed;
• she is restless or bellowing;
• she has poor milk letdown;
• you see mucus around the vulva;
• you see mud marks on the flanks; or
• the heat mount detector is lost.

Cows with at least two of these signs are possibly on heat but showing only weak signs. Some will not be on heat. Make sure everyone knows what to do with cows that are showing weak signs of heat (see page 80).

Normally, you can expect cows or heifers to show signs of heat every 18–24 days with an average of around 21 days.

Cows often have a short cycle after their first heat and are in heat again 8–12 days later. The average interval from calving to first heat in pasture-fed cows in good body condition is 35–45 days. It is about 10 days longer than this in first calving heifers.

It is important that everyone on the farm knows the signs of heat. You may know them, but do all the members of the farm team?
How to improve your heat detection

The best heat detection programmes start with careful planning, good observation and the effective use of detection aids. Being able to distinguish and interpret cow behaviour and other signs is critical – so are good record keeping and training for the people responsible for heat detection.

Step 1 is to review the heat detection skills available on your farm – are they up to scratch? Does everyone involved know exactly what to look for when detecting cows on heat? (page 81)

Step 2 involves determining which aids you will use; remember, farmers with the best heat detection results use a combination of observation and heat detection aids (page 84). No one method is perfect. Be prepared to test several combinations of options to identify the one most suitable to your herd. Tail paint is the most commonly used heat detection aid (page 86).

Finally, keep an eye on the detail. Schedule regular times to monitor the success of the programme (page 79). This information is critical if you are to spot trends early. A successful heat detection programme relies on monitoring and fine-tuning all through the mating period.

Recording heats before mating begins

The period before mating begins offers an opportunity to practise heat detection skills, check for cows not detected on heat and anticipate when cows may next come on heat. Farm team training should be organised at this time. The most experienced person can help less experienced team members interpret signs of heat.

Train team members by making a paddock visit at the recommended time for a ‘look-and-learn’ session. Next day, let team members do the detecting with you just checking; monitor that heat detection efficiency is being maintained by checking tailheads during milking and comparing daily heat records.
Heat detection before mating

- Monitor heats before the Planned Start of Mating date if you wish to treat cows not detected on heat early (see Chapter 11).
- Record which cows have a heat before Planned Start of Mating date.
- Calculate your herd’s pre-mating cycling rate (see below). This tells you the percentage of cows in your herd that have shown signs of heat before mating begins.

If less than 65%, your heat detection has not been effective or you have too many non-cyclers in the herd. You may need to modify your pre-mating heat detection strategy (page 78), ensure that most cows calve early in future calving periods (page 151), calve your cows in better condition at the next calving period (page 66) or make sure that heifers reach their target liveweight at calving (page 43). Also check that your cows calved in condition score 5.0 and are holding or improving body condition coming into the mating period (page 69).

Is there a simple way to check for non-cycling cows?

- Apply tail paint of one colour (e.g. green) to every milker from 35 days before the Planned Start of Mating date. For split-calving herds that run spring and winter milkers together in spring, a different colour can be used to distinguish winter milkers, with detected heats in this group indicating that the cow is still not pregnant.
- Apply tail paint (green) to later calvers when they first enter the milking herd.
- Check tail painted cows for rubbed tail paint at least twice weekly until Planned Start of Mating date.
- At these checks:
  – ensure all cows have an unbroken strip of paint throughout the monitoring period; and
  – repaint rubbed cows with a different colour paint (e.g. red).

The cows with the original tail paint colour (green) are unlikely to have come on heat since tail paint was first applied. Cows with the other tail paint colour (red) have had at least one heat since tail paint was first applied.

You can also estimate your herd’s pre-mating cycling rate with this method:

\[
\text{Pre-mating cycling rate} = \frac{\text{No. of red painted cows} \times 100}{\text{No. of green} + \text{No. of red painted cows}}
\]

It seems like an extra job at a busy time of year, but this system can let you know early how many cows are cycling and is essential for treating non-cyclers early.
Section 3: Acting on Priorities

Boy, it doesn’t take long to miss a heat!
The average duration of heat in dairy cows is about 14 hours as long as weather conditions are normal. Heats can be as short as 2 hours and as long as 28 hours. Paddock checks should be performed at least twice daily to catch short heats.

Paddock checks twice a day are a real commitment – but doing them well is the key to achieving good results.

Using paddock observations and detection aids for best results

InCalf research has shown that the best heat detection results are achieved by combining paddock observations and heat detection aids such as tail paint and heat mount detectors.

During a paddock check, observe cows quietly, paying particular attention to restless groups of cows. A twice-daily time commitment is required. This is a very accurate method if your farm team are well trained and cows can be easily identified.

Sexually active groups contain cows standing to be mounted as well as those attempting to mount other cows and they help pinpoint cows most likely to be on heat.

- Check that all cows in the herd are individually identified using eartags and/or freezebrands that can be read from some distance.
- Do paddock checks 2 hours after the morning milking and again in the early afternoon. Cows show strongest heat signs once most of the feed in their paddock has been grazed.
- After insemination, return cows to the milking herd as soon as possible to encourage formation of new sexually active groups.
- Consider evening paddock checks 2 hours after the p.m. milking if you wish to maximise the number of cows detected on heat.
- If several people are involved in heat detection, implement a system to ensure that all involved share their records. For example, a whiteboard at the dairy.
- Observe cows for heat without disrupting their activity. Walk up quietly – no motorbikes or dogs!
- Record the identity number of every cow detected on heat at each paddock check.

Heat detection at the dairy shed only

Relying solely on heat detection at the milking shed will increase the risk of missed heats, but if this is what you choose to do, here are some important things to consider:

- Your heat detection programme must be well planned and executed. Ensure that all heat detection aids (e.g. tail paint and/or heat mount detectors) are correctly applied and well maintained (pages 85-89).
- Your staff must be spot on in their interpretation of heat detection aids. Designate a person experienced and confident in reading the signs of a cow on heat solely by heat detection during milking and give this job high priority (page 91).
Heat detection aids

Several options are available to aid heat detection and increase heat detection rates. Each cow must have a unique number so that it can be readily and accurately identified.

Determine which of the following options will suit your heat detection strategy. Remember, for the best results use a combination.

1. Tail paint (pages 86-87), when combined with paddock checks, requires the least expensive materials. This combination can be successful if implemented correctly and with diligence.

2. Heat mount detectors (page 88) are a little more expensive than tail paint, but are easier to read, require less maintenance once applied and can increase heat detection rates.

3. Activity meters (including pedometers) (page 89) can be integrated into computerised herd information systems, but are expensive.

4. Heat synchronisation (page 92 and Appendix 5) allows for intensive periods of heat detection and/or set-timed AI without the need for heat detection.

Each of the heat detection tools has advantages and disadvantages, so it is a matter of working out what suits your work routines, budget and goals.

Heat detection at the dairy requires a designated person who is skilled with applying and interpreting detection aids such as tail paint.
Section 3: Acting on Priorities

1. Tail paint

Correctly used, tail paint is an inexpensive and effective aid for people detecting heat. Only commercial products labelled for use as tail paint should be purchased.

A strip of tail paint is applied to the rear portion of the backbone of each cow. Cows on heat will stand when mounted by herdmates or a bull and the tail paint will be gradually rubbed off as the other animal dismounts.

It is possible to achieve high heat detection rates using tail paint when combined with paddock checks, provided the paint is maintained appropriately.

- Apply or refresh existing tail paint to all cows just prior to the Planned Start of Mating date.

Correct placement of tail paint.
Apply a strip:

> no more than 20 cm long;
> no more than 5 cm wide over the rear segment of the backbone;
> no further back than the start of the tail; and
> sufficiently thick to cover the skin with some hair fibres still visible.

How do I make sure I get the tail paint on right?

When we first started tail painting, we often made the mistake of applying the paint too thickly and in too wide a band. You only need to cover the uppermost ridge of the spine/tail head region that will be rubbed by the brisket of the riding cow. A common recommendation is to apply the paint with forward strokes to make the hair stand on end and leave a rough finish.

Be sure to use commercial tail paint or sprays, not house paint, roof paint or aerosol raddles. Follow the manufacturer’s instructions.

Applying tail paint correctly can really improve detection rates.
• Ensure every cow (except those actually on heat) has an unbroken strip of paint throughout the AB period.

• Touch up tail paint at least weekly.

• At each milking, check for cows with rubbed or broken tail paint.

• For cows on heat, re-check that the tail paint has been rubbed immediately before each cow is inseminated. This will help avoid inseminating cows that are not on heat.

• Reapply tail paint to recently inseminated cows once other cows no longer try to mount them. Use a different coloured paint on cows after their first insemination. This will help identify cows that have not yet been inseminated and this helps you decide whether to inseminate a cow that is showing only weak signs of heat (page 80).

• Continue this at least until the end of the AB period.
2. Heat mount detectors

InCalf research has shown that heat detection rates are higher in herds using heat mount detectors. They can result in higher detection rates than tail paint, particularly in herds where less skilled or unmotivated staff are checking for cows on heat. Best results are achieved when heat mount detectors are combined with paddock checks for heat.

There are two types of heat mount detectors – pressure-activated ‘tubes’ or scratch-off ‘patches’. They are applied to the rear portion of the backbone of each cow. Cows on heat will stand when mounted by herdmates or a bull and the detector responds to the pressure or rubbing from the mounting animal, becoming brightly coloured and easily recognised.

- Apply heat mount detectors to every cow on the day before mating starts.

- Check for other signs of heat if a heat mount detector is lost as it may indicate a cow is on heat (page 81).

- Remove activated heat mount detectors from cows on heat at the time of insemination.

- Replace the heat mount detector following insemination, when the cow is no longer being mounted. Continue this replacement policy until the end of the AB period.

- Switch to tail paint after the first insemination if you are confident high levels of heat detection can be maintained. If you are not confident, use heat mount detectors after the first round of AB because the sexually active groups are smaller and less active making some cows harder to detect.

- Check heat mount detectors regularly and replace if they are damaged or are coming loose.

- Avoid using heat mount detectors if cows have access to low tree branches that are likely to rub them off.
3. Activity meters (including pedometers)

Activity meters are electronic transponders that detect movement. Pedometers are one type of activity meter that is strapped onto the lower leg of each cow in the herd. Other meters hang around the cow’s neck. Throughout the day, they record cow movement. Cows on heat walk more as they are restless and mount other cows. Walking is recorded and compared to the record of activity on previous days when the cow was not on heat. Some brands make the comparison to the rest of the herd on the same day. At the dairy, the information is stored in a computer from which cows most likely to be on heat can be automatically drafted if facilities are installed.

They are not widely used in New Zealand herds, where grazing cows can freely form vigorous sexually active groups.

- Before installing activity meters, visit herds that have used them with measurable success (high submission and conception rates).
- Check the reliability and durability of more than one system before you buy.
- Thoroughly train your farm team in the use of this technology.
Managing heat detection in larger herds

Missed heats are more likely in larger herds, where staff are unable to recognise individual cows, so more planning and attention to farm team training are required.

- The period before mating begins offers an opportunity to train farm team members before accurate heat detection becomes really crucial (page 81).

In the week before mating starts, rehearse heat detection and drafting procedures. Check and repair any faults in drafting gates to ensure cows for inseminating do not escape. You should also decide whether or not bulling cows seen at or before the p.m. milking are to be drafted out and held separately close to the shed overnight. This may depend on the time in the morning that the AB technician usually calls. The AB technician will need your assistance with bringing in the cows and locking them in for inseminating.

- Clear forms of animal ID that can be read from some distance are essential to ensure you and others can correctly identify each cow detected in heat while grazing or moving around in a sexually active group (page 84).

- Everyone involved in drafting and inseminating tasks (herd owner, manager, employers, employees and contractors) has responsibility to ensure that facilities are safe, accessible, convenient and comfortable for both the people and animals (page 113). You should consult with the Area Manager for the AB service about the handling facilities required for inseminating large numbers of cows in larger herds.

If the task of detecting heats and drafting at the dairy shed are separate processes on your farm, ensure that the cows in heat are clearly identified (e.g. stock marker aerosol or shaving foam) to make your drafting easier (page 84). If using an aerosol stock marker, apply the mark to a different location each day; rotating every 3 days. This will prevent cows being inseminated wrongly over two consecutive days.

If you have automatic drafting facilities, the heat detector can immediately enter the identification number of the cow on heat into the computer for this cow to be auto-drafted when exiting the dairy shed. This same data can be a great source of information for further reproductive tasks, such as pregnancy testing (page 158).

Ensure you have a contingency plan in case the auto drafting facility malfunctions!

Larger herds present extra challenges to heat detection.
**Should we accept poorer heat detection now that we’re managing a larger herd?**

There is no real reason why cows in larger herds should be less fertile than those in smaller herds. Heat detection in larger herds needs to very well planned, because staff won’t have the advantage of knowing individual cow behaviours or their identification by sight.

Who will be doing the heat detection? Are they conscientious and skilled at it? Will it be their sole job at the milkings during AB, or are they also expected to put cups on? What process is in place to ensure that a cow detected in heat does indeed get inseminated when the AB Technician turns up? Who is looking after the records?

**We achieve good heat detection in our larger herd by making it a key priority during AB, assigning the best people to the job and backing that up with meticulous planning.**
Heat synchronisation

Most synchronisation programmes will have a limited effect on 6-week in-calf rate, and are unlikely to reduce the empty rate. It is the management benefits you need to consider in deciding whether to use synchronisation or not.

Heat synchronisation can offer efficient use of labour as the work of heat detection and AB is shortened into planned, intensive periods.

It can be used to compress three cycles of breeding (9 weeks) into a 7-week mating programme, or two cycles (6 weeks) into a 4-week mating programme.

Synchronisation programmes may help increase heat detection rates in large herds, where less skilled or motivated people are employed or where the herd manager’s time is limited. This is because people detecting heat can focus on the job for short, predicted periods.

When detecting heat during a synchronisation programme, simple aids such as tail painting or heat mount detectors are essential. Some programmes require fixed timed inseminations, meaning that no heat detection is required at all during that period. Some options allow resynchronisation of returns to service. This helps achieve increased heat detection rates for returns to service.

Details describing synchronisation programmes for use in cows and heifers can be found in Appendix 5 ‘Options for heat synchronisation’.

If considering using heat synchronisation for the first time, consult your veterinarian and other farmers/advisers who have experience using heat synchrony options.

Managing cows not detected on heat

Cows that don’t come on heat when you are ready to mate them cost money, time and often annoy managers when there is already enough to do.

The reasons why a cow wasn’t detected on heat vary but the result is the same: she doesn’t get inseminated and she won’t get in calf according to your preferred schedule.

This is a critical area of breeding management in seasonally calving herds. It has been given a chapter of its own (Refer to Chapter 11 ‘Dealing with non-cyclers’).
I didn’t realise that heat detection errors are such a problem. (Page 78)

We need to be much more organised with heat detection now that we’re managing a 600-cow herd. (Page 90)

I’d better get my facts straight before I show Rob how to detect heat. (Page 81)

Now we can use the InCalf Fertility Focus report to help assess how our heat detection is going. (Page 79)

I saw those nifty heat detectors at the factory – perhaps I’ll have to give them a go. (Page 88)

I’ve got to make time after lunch to check cows for heat in the paddock. (Page 84)

Synchronisation helped get mating over and done with quickly this year. (Page 92 and Appendix 5)

We don’t think we can get away with just tail paint any longer. (Page 84)
Dealing with non-cyclers

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Non-cyclers reduce herd reproductive performance

Non-cyclers will prevent you obtaining a target 78% 6-week in-calf rate. This is because non-cyclers depress both of the two key drivers of 6-week in-calf rate, which are:

- 3-week submission rate (page 28); and
- conception rate to first insemination (page 28)

Both of these drivers are important, but the 3-week submission rate has a bigger impact because it is more readily influenced by your management during that first 3 weeks of the AB programme.

Of course, good heat detection is essential to reach the submission target of 90% or more. The cows not inseminated in the first 3 weeks in a herd with good detection rates will mostly be “non-cyclers”.

There are two types of non-cyclers:

1. cows that have ovulated (ie. ovaries are ‘cycling’) but not shown heat; and
2. cows that have not even started ovulating since calving, and cannot have a heat.

Those in the first type may have had a “silent” heat.

About 80% of cows will not have a heat at the first ovulation after calving. The cows in the second type are technically described as non-cycling or “anoestrus”. It is the most common form of infertility in New Zealand herds.

A veterinary examination is required to distinguish cows in each category. However, the current recommendation is that both types of non-cyclers will benefit from receiving the standard form of treatment (See Appendix 4 “Treatment options for non-cycling cows,” page 177).

“We have great heat detection, so why do we get 3-week submission rates of only 75%?”

Having good heat detection skills and a strong desire to not miss any heats is crucial to getting cows back in calf quickly, but this only applies to cows that are cycling. Non-cyclers will reduce submission rates no matter how good your heat detection skills are.

Non-cycling is the most common form of infertility in New Zealand herds.
Most herds in New Zealand treat some non-cyclers. Some start these treatments early, before the Planned Start of Mating date. Others wait until after mating has started.

Treatments starting before week 3, and before week 6 of mating, are described as late, or very late treatments.

The upside to delaying treatment is that there will be fewer non-cyclers needing treatment. The downside of delaying treatment is that it becomes increasingly less effective at dealing with a non-cycling problem and improving the 6-week in-calf rate.
Post-calving recovery

The first visible post-calving heat in a healthy cow that has had an uncomplicated calving will normally occur within 6 weeks. A second genuine heat may follow it 8 to 12 days later in about 30% of cows. A genuine short cycle should only occur once, and only after the first post-calving ovulation.

During the post-calving recovery period, the cow’s reproductive tract must return to normal and cycling must start again. Not surprisingly, the incidence of non-cyclers is affected by calving date relative to the Planned Start of Mating date. About 25% of late calving cows may need to be treated as non-cyclers. It should be less than 10% for cows calving in the first 4 weeks from the Planned Start of Calving date.

“It’s incredible what a cow needs to do between calving and getting back in-calf”

A cow has only 12 weeks after calving to get back in-calf, if she is to calve at the same time next year.

The uterus must first recover through a process called uterine involution. This generally takes 4 weeks provided there is no infection present. Meanwhile, the cow’s ovaries are attempting to reactivate after a long dormant period during the previous pregnancy.

The onset of cycling starts with a ‘stutter’, with silent heats and short cycles, but eventually normalises to cycles of 18-24 days with strong signs of heat. Cows are more fertile on their 3rd and 4th heats than their 1st or 2nd heats. Cows that calve in the first 4 weeks and start having strong heats 5 weeks after calving, will be fertile for the first round of AB.

Manage cows to recover from calving and be fertile again for the first 3 weeks of mating.
Factors causing a non-cycling problem

As well as calving date, other factors that affect the number of non-cyclers in a herd include:

- Poor heifer rearing, especially in Friesian heifers – under-weight heifers have a longer interval to first heat and at least a 10% lower submission rate unless treated (page 46).

- Young cows – more first-calving heifers are treated as non-cyclers compared to mature cows. First calvers need an extra 10 days to start cycling. You can ease this problem by mating the 15-month replacement heifers a week or two before AB starts in the milking herd (page 51).

- Breed – more Friesians, especially Friesian heifers are treated as non-cyclers compared to crossbred or Jersey cows.

- Body condition score – calving condition score, condition loss from calving to mating, and condition score when mating starts all affect the incidence of non-cycling. Thin cows take longer to start cycling and have 3-week submission rates that are around 10% lower than cows (or heifers) that calve at the recommended body condition score of 5.0 (or 5.5 for heifers). Cows with a calving condition score above 5.5 derive minimal benefit from their greater body reserves (page 60).

- Abnormal calving and uterine infections – cows with assisted calvings, twins and uterine infections are more likely to be treated as non-cyclers (page 136).

High levels of milk production do not increase the numbers of non-cyclers at start of mating. Rather, high-producing cows start cycling sooner in better fed, higher producing herds.

First calvers losing excess condition score may warrant separation from the herd and preferential treatment. However, this needs to be done well before mating starts. By the time non-cycling is diagnosed, it is too late to intervene other than by hormonal treatment.
Pre-mating heat detection to find the non-cyclers

The easiest way to identify non-cycling cows is to do pre-mating heat detection. Use tail paint or heat mount detectors (see pages 86-88) to pick out the cycling cows. Every cow in the herd should be tail painted initially with a common colour; say green. As cows cycle and lose their tail paint, repaint them with a second colour; say red. By 2 weeks after applying tail paint, about half the cycling cows will have been identified. At 3 weeks, those cows still with the original paint colour will be the non-cyclers. You can draft them out for checking by the herd veterinarian and treat appropriately (see Appendix 4 “Treatment options for non-cycling cows”, page 177).

Option 1: Every cow in the herd will need to be tail painted 4 to 5 weeks before the Planned Start of Mating date. This will allow non-cyclers to be identified, treated and inseminated within the first few days of the AB programme. This is because it takes at least 3 weeks to find the non-cyclers and another 9 to 10 days from veterinary examination to first insemination.

Option 2: If tail paint is first applied a week later (3 weeks before start of AB mating), then the non-cyclers will be identified, examined and treatment started co-incidentally with AB start date. Most of the treated non-cyclers on this regime will be inseminated from 9 to 12 days later (during the second week of the AB programme).

Option 3: Apply tail paint on the day before the first day of AB mating. This may seem to be the most convenient option but it does mean the non-cyclers will not be identified until the end of the third week of the AB programme. Delaying identification and treatment will mean that most of them will be inseminated during the fifth week of mating. Consider extending AB into week 5, to cover the large number of synchronised heats expected, rather than bulls.

“*We’re not really sure if we have a non-cycling problem or not?*”

Don’t get caught out by a non-cycling problem. Poor submission rates can be a consequence of too many non-cyclers in your herd at the Planned Start of Mating date. Doing pre-mating heat detection gives you the option of managing a non-cycling problem early.

*Know which cows are cycling and which are not, before mating starts!*
Whichever option you use, give your AB technician at least a week’s notice of the increased semen demand from the group of non-cyclers coming into synchronised heats on the same day.

No matter which date is selected for initial tail painting, the paint strips should be checked at least every 3 to 4 days during the pre-mating period or daily if AB mating has started. Repaint cows that have clearly been ridden with a second colour. If a cow has not been ridden, you may still need to touch up the paint strip with the original colour because of weathering and hair shedding (page 86).
Section 3: Acting on Priorities

Treating non-cycling cows

Treatment programmes change as new technology is developed and external factors influence what veterinary products are available. Refer to Appendix 4 “Treatment options for non-cycling cows”, page 177, for current recommendations, but always consult with your veterinarian for latest advice on treating non-cycling cows.

The costs of treating non-cycling cows must first be incurred in one season so that the benefits can be derived the following season. These benefits are having the treated non-cyclers calve earlier than if treatment had been delayed or not implemented at all. Earlier calving means a longer lactation with higher production as well as a longer interval from calving to mating.

Non-cyclers are a ‘sub-fertile’ group of cows and treatment only goes part way to restoring them to ‘full-fertility’. Treating non-cyclers is a short-term solution of necessity in many cases.

New Zealand research shows that early treatment of non-cyclers:

- increases their submission rate; and
- helps these cows get back in-calf quicker.

This will contribute to a higher herd 6-week in-calf rate, and a more compact calving pattern next calving season.

However, these same studies found that early treated cows:

- had similar empty rates to untreated non-cyclers; and
- similar 6-week in-calf rates the following mating season.

You’re best to avoid a non-cycling problem from the outset by addressing the factors that cause cows to be non-cyclers (page 99).

“Should I treat those non-cyclers, or hope they sort themselves out?”

As a rule of thumb, about 45% of cows identified as non-cyclers before mating starts will begin cycling by themselves and be mated within the first 3 weeks. Their chance of conceiving to this mating will only be about 45%, since it is their first heat after calving. Of greater concern is the other 55% of non-cyclers that will not be inseminated in the first 3 weeks of mating.

Identifying and treating non-cyclers early is the most effective way to ensuring non-cyclers receive their first insemination within the first few days of the AB period, and return heats in the 4th week of mating are more fertile than otherwise.

Treating non-cyclers early is the most effective way to immediately alleviate a non-cycling problem.
When reviewing your herd’s reproductive performance, list the non-cyclers and check their records individually to determine why they became non-cyclers and why they needed to be treated.

What were the underlying reasons for these cows being non-cyclers?

If you don’t consider this question and address the underlying causes, non-cyclers will continue to impact on your herd’s reproductive performance.

“Is it normal to be treating 25% of our cows for non-cycling every year?”

There will always be some non-cycling cows in the herd; no matter how tight your calving pattern is or how good condition score was at calving. The prevalence of non-cyclers may vary between seasons, depending on climatic conditions.

Herds that achieve industry targets for reproductive performance have less than 15% cows non-cycling before the Planned Start of Mating date. Having to treat more than 15% of the herd each year for non-cycling indicates and underlying problem that needs to be addressed.

Making sure heifers reach target liveweights, improving body condition and nutrition, implementing an effective heat detection programme, and attending to any cow health issues, are all important activities for minimising the number of non-cyclers.

Having to treat too many non-cyclers each year indicates an underlying management problem that should be addressed!
I have never thought much about what the cows need to do to start having good heats after calving.

So that’s why heifers benefit by calving earlier than the cows, they take an extra 10 days to cycle.

We had the non-cyclers checked this year and the vet told us they’d already had a heat.

We can’t do much about age, or breed for now, but we sure can do better with young-stock rearing and calving condition.

I never believed that my better milkers were the problem non-cyclers anyway.

We’ve having to treat at least 25% of our cows for non-cycling every year ... what’s this telling us?

We’d better start doing pre-mating heats to see if we have a non-cycling problem.

Now we know which cows are non-cycling, I guess we’d better do something about it.
“What if I want to put more emphasis on daughter fertility when picking sires?”

“Is that Fertility BV connected to the fertility of the semen or that of the daughters?”

“Is it true that crossbreds are more fertile?”

“What assurances do we have that our AB technicians are doing the best job possible?”

“What do you mean by having facilities in good shape?”
Sire selection and AB

Artificial breeding (AB) allows farmers to improve profits through the genetic improvement of their herds, using artificial insemination (AI) of semen from proven high Breeding Worth (BW) sires.

In New Zealand, the term ‘AB’ is preferred over ‘AI’ to reflect the fact that a successful breeding programme is more than just about the inseminating process.

Managing an AB programme is another process that requires careful planning.

Good AB programmes pay attention to sire selection (page 107), providing suitable insemination facilities (page 113), proper insemination practice (pages 114-116) and good heat detection (page 78).
Sire selection

Choosing a team of sires with high BW rankings is the first step in making sure herd genetics for profit are maximised. BW already includes genetics for cow fertility.

Some AB sires produce daughters that are genetically more fertile than others. The genetic make-up of your herd for fertility may therefore be a little better or worse than average. However, the differences between New Zealand herds are generally small, because most New Zealand farmers use recommended teams of proven high BW bulls. In most New Zealand herds, it is unlikely that genetics are substantially limiting reproductive performance.

It is important to use a team of bulls to spread the risk that any of the individual bulls in the team might not be as good as expected, or might be transmitting undesirable traits that are not recorded in the New Zealand Animal Evaluation system.

By taking reproductive performance into account in the BW, along with efficiency of milksolids production and other traits when selecting AB sires, it is likely that there will be no future genetic decline in reproductive performance due to selection for efficiency of milksolids production.
Section 3: Acting on Priorities

Use of Fertility Breeding Values

Fertility Breeding Values (BVs) are comparative measures expressed as percentages of daughters that re-calve within the first 6 weeks. The Fertility BVs can be used to compare sires of all ages, breeds and crosses in New Zealand.

Fertility BVs for bulls and cows are referenced to a genetic base of zero, being the average of cows born in 1995. So cows with Fertility BVs of 0 have the same genetic merit for fertility as the base cows born in 1995.

In comparing cows with Fertility BVs of +5% (high genetic merit for fertility) with cows with Fertility BVs of -5% (low genetic merit for fertility), you can expect 10 more high merit cows per hundred to re-calve in the first 6 weeks of the herd’s calving period.

Bulls transmit half their Fertility BV to their daughters. The other half comes from the dam. In comparing bulls with Fertility BVs of +10% (high genetic merit for daughter fertility) against bulls of -10% (low genetic merit for daughter fertility) you can expect 10 more high merit daughters per hundred to re-calve in the first 6 weeks of the herd’s calving period when they are managed together in the same herd.

If you want to avoid breeding from sires with low genetic merit for cow fertility you can inspect the Ranking of Active Sires (RAS) List published annually in the October Dairy Exporter, and continuously updated on the website for the New Zealand Animal Evaluation system (www.aeu.org.nz).

Inclusion of the occasional bull with a cow fertility BV between 0% and -5% in your team of AB bulls will make no practical difference to the fertility of your future herd. However, using a team of bulls that consistently average as low as -5% for cow fertility will lead to a long-term genetic decline in the fertility in your herd.

Is that Fertility BV connected to the fertility of the semen or that of the daughters?

There are two parts to the fertility of AB sires:

Semen fertility – Bulls with higher semen fertility produce semen that is more likely to get cows pregnant and so conception rates are higher. While conception rates are similar for semen from most bulls, a small number of bulls and particular batches of semen have a reduced conception rate. This is not related to the Fertility Breeding Value (BV).

Daughter fertility – AB sires with higher daughter Fertility BVs produce daughters that are more likely to become pregnant sooner, due to genetics. This is because daughters of some bulls cycle sooner after calving or have higher conception rates. Fertility is not highly inherited but the genetic differences are large enough to warrant inclusion in the Breeding Worth of AB sires.

By choosing sires with a high Breeding Worth, you also select for daughter fertility.

What if I want to put more emphasis on daughter fertility when picking sires?

The Breeding Worth (BW) of proven sires already includes the value of daughter fertility (Fertility Breeding Value), along with other important traits, especially milk solids production relative to their daughter size.

Fertility is one of the many traits that breeding companies take into account when breeding and selecting bull teams.

You should at least be aware of the Fertility BVs of the sires you are using!
**Crossbreeding adds hybrid vigour**

If you are breeding crossbred cows they will have additional hybrid vigour for fertility. New Zealand Animal Evaluation data measures the hybrid vigour enhancement of fertility beyond the effects of the breeding values.

The hybrid vigour advantage for first crosses is that the 6-week in-calf rate is around 3.4% higher than you would expect from mating parents of the same single breed.

The hybrid vigour advantage for subsequent crosses is that the 6-week in-calf rate is around 2% higher than you would expect from mating parents of the same single breed.

Crossbred AB sires will retain and impart a 1.7% hybrid vigour advantage.

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**Is it true that crossbreds are more fertile?**

Crossbred cows are recognised as having the highest fertility. This is because fertility has a good level of hybrid vigour. Young crossbred cows are less likely to be culled as empty than young Holstein-Friesian cows. Older crossbred cows are less likely to be culled as empty than older Jersey cows. However, as in many straight-bred herds, the reproductive performance of many crossbred herds is reduced by problems in key fertility management areas.

*Crossbreds are more fertile, but a straight-bred herd under good management will be more fertile than a crossbred herd that’s poorly managed.*
Selecting bulls to minimise calving difficulty

Some sires, especially Holstein-Friesian, cause higher rates of assisted calving when mated to yearling heifers, as a direct genetic effect of the bull.

Subsequent reproductive performance is worse after assisted calving (page 133).

This sire effect is reflected in a proven sire’s Calving Difficulty BV.

A sire’s Calving Difficulty BV predicts the percentage of assisted calvings expected when he is mated to yearling heifers.

Jersey sires have Calving Difficulty BVs typically less than zero, for example -5%.

Holstein-Friesian sires have BVs typically positive in value, for example +6%.

Crossbreds have BVs intermediate between these two breeds, for example -1%.

When artificially inseminating yearling heifers, use sires proven under New Zealand conditions with a low Calving Difficulty Breeding Value (BV).

Breeding companies provide groups of Holstein-Friesian or crossbred bulls that are selected for use on Holstein-Friesian yearling heifers.

Alternatively, all Jersey bulls are suitable for use on Holstein-Friesian yearling heifers.

Avoid inbreeding

Inbreeding tends to have a negative effect on cow profitability through lower fertility, lower production and higher incidence of genetic disease. Avoid inbreeding by not using semen from sires with closely related cows. Your AB company has programmes to help you avoid inbreeding.
Assessing insemination practice

In New Zealand, professional AB technicians managed by breeding companies do the majority of inseminations. They are responsible for semen storage, handling and insemination technique, and have control procedures in place to ensure the best possible service is provided. Make sure this is the case for inseminations done in your herd.

Conception rates are reduced substantially when semen is not stored and handled correctly or when insemination technique is unsound. Australian InCalf research has shown that at least 40% of DIY (do-it-yourself) technicians could achieve at least a 5% increase in conception rates by improving insemination practices.

The non-return rate can provide an early warning of a low conception rate and is a worthwhile first check (page 25). If the non-return rate for your herd is less than 64%, or conception rate is low (less than 53%) you need to investigate potential causes, such as the following, and take the recommended action:

- Poor inseminating practice – report your concern to the field supervisor of your AB service.
- Poor body condition at calving or excessive loss of body condition following calving – review body condition score targets and herd nutrition (pages 60, 64).
- Inaccurate heat detection – review your heat detection programme (page 79).
- Excessive numbers of late calvers – review calving pattern (page 150).

To reliably assess conception rates, you will need to age foetuses by pregnancy testing (page 158).

The InCalf Fertility Focus report provides estimates of non-return rates or conception rates if foetal aging is done during pregnancy testing (page 158).

> If you are a DIY inseminator you should ensure that your insemination technique is spot on by attending a refresher course.
There are other possible causes of low non-return rate and low conception rate. You may need to seek help from an adviser.

The non-return rate or conception rate achieved in a herd can vary for a number of reasons. That makes it difficult to compare the conception rate achieved by a single AB technician to expected performance targets. However, the field supervisor can access results obtained by one technician working in several herds. These results can also be compared with those obtained by different technicians working in the same herd.

What assurances do we have that our AB technicians are doing the best job possible?

Professional AB technicians are fully trained in proper storing and handling of semen, as well as inseminating technique. Their performance is also monitored by their field supervisor. Very seldom can a poor result be attributed to poor technician performance. Contact your breeding company if you have concerns, but the problem is much more likely to be things under your control; like too many late calvers; too many non-cyclers needing treatment; inaccurate heat detection; and poor cow condition.

Consider the more likely causes of poor non-return rates before complaining about the AB technician.
Getting ready for AB

It is important to prepare your AB programme. Have a well-planned system with your farm team ready, supplies at hand and facilities in good shape. All the details for providing good facilities are included in the ‘Guidelines to Artificial Breeding Facilities’ available on the LIC web site.

- Check that AB facilities provide a safe working environment.
- AB facilities may need to be upgraded to match increasing herd size.
- Mating Detail Certificate books need to be completed before the AB technician arrives.
- Where multiple sires are being used, organise/mark cows to assist the AB technician get the right straw into the right cow.
- DIY technicians should:
  - Consider practising their technique on cows in heat before mating starts. This can be done without using semen by blocking off the end of the pistolette with a piece of paper towel and placing a sheath over the pistolette.
  - Consider having their technique checked by the local AB service supervisor on the farm.
  - Attend a refresher course if they have not done one for two years or are not confident with their technique.
- Place a bench for straw preparation in a stable, secure, clean and convenient working position away from direct sunlight, rain, dust or pungent chemicals.
- Provide clean cold and hot water, a rubbish bin to dispose of gloves, paper and sheaths, and a scrubbing brush to clean gumboots.
- Arrange for the technicians to check the facilities and to familiarise themselves with the yards and gates.
- Plan to have two people present for cow handling and inseminating. More staff may be required if a synchronisation programme has been used.

What do you mean by having AB facilities in good shape?

Inseminating facilities should be safe, accessible, convenient and comfortable for both the technician and the animal. Remember, the herd owner and management are responsible for providing a safe workplace for the technician.
Liquid semen storage and handling

Liquid (or ‘fresh’) semen rather than frozen semen is widely used because about 5-10 times as many straws of liquid semen can be produced from the same ejaculate.

Liquid semen has a shelf life of about 3 days. It is important that it not be used after the stated time.

Liquid semen straws are stored in an insulated container to maintain a steady temperature and prevent sperm damage. It is important to keep liquid semen straws in this insulated environment until use.

Fertility of liquid semen is similar to frozen-thawed semen.

When using liquid semen, AB technicians are instructed to:

Choose a safe and comfortable place to work, away from direct sunlight, rain, dust and pungent chemicals.

Place the required number of inseminating pistolettes (with plungers pulled back 75mm) on the opened lid of your AB-case with the tips well clear of any contact.

Select and remove only the number of straws that can be used within 15 minutes.

Ensure that the semen container is returned to its insulated state as quickly as possible.

Handle straws at their ends to minimise temperature changes to the semen.

If required by the semen distributor, ensure each straw is given a sharp, downward flick to move the nitrogen bubble through the semen and locate the nitrogen at one end of the straw.

Place these straws in a safe dry place.

Place the straws into the barrel of the inseminating pistolette and cut the end off the straw at right angles with clean sharp scissors before covering with sheath.

Carefully prime the straw by slowly and firmly moving the plunger into the pistolette until you see movement of the semen at the tip of the sheath, taking care not to expel any semen.

Place the loaded pistolette on the lid of your AB-case with the tip overhanging the lid by about 10cm.

Inseminate the cow using the same technique as for frozen-thawed semen (page 116).
Frozen semen storage and handling

The sperm contained within semen straws is fragile and requires great care when handling.

**Proper inseminating practice using frozen semen:**

> Know the location of each bull’s straw before lifting the canister.
> Lift the canister only as high as the ‘frost line’.
> Lift selected straws using tweezers.

**Checklist for semen handling**

<table>
<thead>
<tr>
<th>Tank</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Check that the semen tank is full of liquid nitrogen when delivered.</td>
<td></td>
</tr>
<tr>
<td>Twice weekly, check liquid nitrogen levels in the semen tank.</td>
<td></td>
</tr>
<tr>
<td>Twice weekly, check the semen tank for ‘frosting’ on the outside of the neck of the tank. This indicates a tank insulation breakdown.</td>
<td></td>
</tr>
<tr>
<td>Identify straws using coloured marker rods placed in the goblets (or a similar system).</td>
<td></td>
</tr>
<tr>
<td>Know the location of each bull’s semen before you retrieve the straw from the tank. You only have two seconds to check the bull’s name on the straw before it starts to thaw.</td>
<td></td>
</tr>
</tbody>
</table>

**Handling straws**

| Lift selected straws using tweezers; only lift one straw at a time. |  |
| Only thaw as many straws as you can use within 15 minutes. |  |
| Only lift the canister up to the ‘frost line’ in the tank to select straws. |  |

**Thawing straws**

| Thaw straws in water at ambient temperature for at least 30 seconds. If using a water bath, maintain water temperature in the 32-38°C range. Keep straws in the water until shortly before use. |  |
| An automated thawing flask that controls water temperature is useful if you are inseminating large numbers of cows. |  |
| Ensure the water level covers all but the top 1 cm of the straw. |  |
| Only touch the ends of the straw. |  |
| Dry each straw gently and thoroughly with a paper towel or wipe before loading into the pistolette. |  |
| Load the straw into the pistolette, then cut it at right angles with clean, sharp scissors before covering with a sheath. |  |
| Carefully prime the loaded pistolette. |  |
| Keep the loaded pistolette free of contamination and out of direct sunlight. |  |
Insemination technique

Patience, practice and proper hygiene are the keys to good insemination technique.

**Checklist for insemination technique**

<table>
<thead>
<tr>
<th>Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wipe the lips of the cow’s vulva clean of mucus, dirt and faeces using a clean paper towel or wipe.</td>
</tr>
<tr>
<td>Provide a clean entry for the pistolette through the vulva – Open the lips by pressing your arm down in the rectum or with the aid of paper towel.</td>
</tr>
<tr>
<td>Direct the pistolette upwards at 45° to avoid the opening to the bladder.</td>
</tr>
<tr>
<td>Follow the progress of the pistolette with your hand in the rectum. Do not push your hand towards the cervix ahead of the pistolette.</td>
</tr>
<tr>
<td>Work the pistolette through the cervix. Place the index finger at the front of the cervix to feel the pistolette passing through, preventing the pistolette progressing too deep into the uterus. Position the pistolette so it is only just protruding from the front of the cervix.</td>
</tr>
<tr>
<td>Deposit all the semen slowly and steadily into the body of the uterus just through the cervix. Wait a moment before slowly withdrawing the pistolette.</td>
</tr>
<tr>
<td>Remove the pistolette with a smooth action while the arm is still inserted in the rectum.</td>
</tr>
</tbody>
</table>

Sperm deposited in the cervix are less likely to progress to the uterus; they flow back into the vagina with the mucus.

*The pistolette is referred to as a gun in this figure.*
Timing of insemination

Both sperm and eggs have a limited lifespan in the race for the two to meet. The timing of an insemination in relation to a cow’s heat signs is important to the likelihood of conception. Best conception rates occur following insemination 4–12 hours after a cow has first stood to be mounted, but detecting when the cow started standing is not practical.

Extensive field trials in New Zealand and elsewhere show no advantage in conception rates by inseminating cows under the ‘am/pm’ rule. The key thing is to inseminate cows at the next opportunity after detection of standing heat. Advances in semen processing technologies allow for once-daily inseminating to be sufficient.

- Cows first seen on heat detected before or at the morning milking – inseminate that morning.
- Cows first seen on heat detected through the day or at evening milking – inseminate next morning.
- If inseminating twice-daily, do not delay insemination unnecessarily.

Refresh tail paint or heat mount detectors when the cow has gone off heat – generally at the next milking. Re-inseminate any cow that is still on heat two milkings later (24 hours later).
Managing cows separated out for AB

Once-daily inseminating means that cows will need to be separated from the herd while waiting for the AB technicians to call. This may include overnight separation in large herds when bulling cows are drafted out during the evening milking. They will need to be held separately and also milked separately (preferably before the rest of the herd). Cows first detected bulling at the morning milking may only need to be separated from the herd for a few hours.

‘Good management practice’ is required to minimise stress for these separated cows.

- Provide access to drinking water and shelter from wind.
- Do not hold animals for extended periods on concrete (especially as bulling cows may injure themselves on concrete and yard rails).
- Provide access to pasture if animals are held overnight.
- Avoid holding a single cow out on its own. Provide it with a couple of companions even if they are not to be inseminated.
- Move the animals back into the yards for inseminating with the minimum degree of pressure.
- Don’t force the cows with farm bikes or dogs.
- Load up the inseminating race for the technician without excessive use of alkathene and noise. Remember, the inseminating race may not be familiar territory to the cows; or they may associate the race with ‘adverse’ experiences, such as vaccinating, vet visits or lameness or pregnancy testing.

Cows can tolerate some stress without affecting their chances of conception. Just being in heat and riding other cows as well as reducing grazing time and pasture intake will be somewhat stressful. But following the principles of ‘good management practice’ will always eliminate unnecessary stress.
All that good semen last year – and I only got 20 heifer calves. (Page 111)

I reckon I’ve been passing the pistolette too deep. I’d better book into that insemination refresher course. (Page 116)

No more twice-daily inseminations for me. I might even get to tea on time. (Page 117)

The Fertility BV tells me how good the daughters should be, not how good the bull’s semen is. (Page 108)

It’s a good idea to eliminate unnecessary stress on cows separated out for AB. (Page 118)

With all those bulls out there, it seems like the BW and BVs for daughters is the way to go. (Pages 107-108)

I’ve heard that my semen supplier can protect our herd against inbreeding. (Page 110)
### Bull management

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<td>“Can we skimp on feed for the bulls if we’re short on grass through autumn?”</td>
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<td>Selecting the best bulls to use</td>
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<td>Preparing bulls for work</td>
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</tbody>
</table>
Bull management

Good bull management means running adequate numbers of healthy, fertile, well-grown bulls with the herd; reducing the stresses caused by heat, over-working or dominant animals; and handling bulls to minimise the risk of injury to people and animals.

Growing bulls

By the time a bull reaches 14–15 months, he should have achieved 50% of his mature weight. This should increase to 85% by 2 years of age.

If rearing your own bulls, growing them to the recommended targets is the best way to ensure their future performance. If purchasing bulls, buy virgin bulls whenever possible as they are less likely to introduce venereal diseases to the herd.

To maintain bull health, ensure that bulls receive the same vaccination programme as the heifers and cows. In addition, develop a drenching programme with your vet.

Bulls need to be kept in good body condition, particularly prior to mating. Several weeks before the bulls will be used, make any required diet changes to ensure bulls are not too fat or too thin. They should be in body condition score 4.5 to 5.5.

Can we skimp on feed for the bulls if we’re short on grass through autumn?

Sexual maturation in bulls is a continuous process starting from before birth. However, there is particularly rapid testicular growth between 7 and 10 months of age. Underfeeding at this time significantly reduces testicular growth with a delay in the onset of puberty. Underfeeding in older bulls will reduce their stamina.

> Don’t forget to vaccinate and drench the bulls.
> Reduce fighting by grouping bulls well before mating.
> Body condition score bulls well before mating to give you time to make diet changes.
Selecting the best bulls to use

When choosing bulls to use, you must consider their age, size, health and the breed-related risk of assisted calvings. If you plan to rear heifer calves from the bulls, you also need to consider the bulls’ genetic merit and pedigree.

- Select bulls from a bull rearer with a reputation of growing and delivering healthy bulls.

- Older bulls can be temperamental, difficult to manage and are more likely to have injuries to the penis, back or legs. Use bulls that are no more than 4 years old.

- Choose virgin bulls whenever possible as they are less likely to introduce venereal diseases to the herd; but avoid using bulls that are less than 15 months old.

- Insist on bulls vaccinated for leptospirosis and verified free of tuberculosis (TB), bovine viral diarrhoea (BVD), neospora, Johne’s disease and EBL. Consider testing for Trichomoniasis and Campylobacter (vibrio).

- Select bulls of similar size and age; and from the same mob. This will reduce fighting when they are with the herd.

- Exclude bulls with deformed feet.

- Select bulls of similar size to the cows or heifers to be mated, always preferring smaller bull size (Jersey bulls with Holstein-Friesian cows). If bulls are heavier than the cows or heifers, then injuries to both bulls and cows are more likely. Observe bulls serving tall cows; ensure they are able to serve correctly.

- Use bulls that are likely to minimise the number of calvings requiring assistance, especially with Holstein-Friesian heifers.

In larger herds, bull matings are rarely recorded and staff can become confused differentiating between AB calves and natural mating calves. This is particularly problematic among crossbred herds using Jersey bulls for natural mating. In this case, consider using ‘easy calving’ breeds, especially Herefords, for a week between the end of AB and before the tail-end Jersey bulls go out. This will establish a clearer finish to AB calvings next year.

### Bull breeds and risk of assisted calving

<table>
<thead>
<tr>
<th>Low risk of assisted calvings</th>
<th>Medium risk of assisted calvings</th>
<th>High risk of assisted calvings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jersey</td>
<td>Holstein-Friesian</td>
<td>Limousin</td>
</tr>
<tr>
<td>Murray Grey</td>
<td>Angus</td>
<td>Charolais</td>
</tr>
<tr>
<td>Hereford</td>
<td>Poll Hereford</td>
<td>Simmental</td>
</tr>
<tr>
<td>Red Poll</td>
<td></td>
<td>Belgian Blue</td>
</tr>
</tbody>
</table>
Preparing bulls for work

Good bull management requires planning to ensure bulls are well adjusted to their environment prior to mating. Move bulls to your farm 2–3 months before they are required for work. Buy bulls from the same mobs and split them into two teams for a rotational bull mating policy (‘half resting, half working’). This will reduce fighting.

When the bulls arrive on farm:

- check for any injuries that may have occurred during transport;
- any walking defects;
- trim hoofs if necessary; and
- walk among them observing for any individuals showing aggression or ‘stalking’ behaviour, especially Jersey bulls – they may not be suitable to run with the milking herd.

Arrange for a veterinary examination of all bulls at least a month before you wish to put them with the herd. This can reduce the risk of reduced reproductive performance due to poor bull performance. Several types of examination are possible ranging from a simple physical exam, to a serving ability test, or a full assessment of semen quality. Discuss the options with your vet.

Sometimes bulls can be really hard to handle on the farm. What do you do to make it safer for people and other animals?

Start by clearly explaining the risks associated with bulls to your farm team. Don’t expect your relief milkers to work with bulls that they have not been trained to handle.

Get rid of overly aggressive bulls; bulls that become obstructive and block the herd’s progress from the paddock to the dairy shed; or bulls that show stalking behaviour towards farm staff. Aggressive bulls will spend time fighting with other bulls, especially when they are running with the herd. They can injure other bulls, cows, people, as well as themselves.

Tasks like fitting chinball harness or trimming feet will require special care facilities to protect bulls and people.

The last thing you want is an injury that could have been prevented!
Managing working bulls

When bulls are running with the herd, you can take several steps to increase bull activity and reduce health risks.

• Ensure there are at least two sexually active bulls running with the herd at all times.

• Avoid using overly aggressive, dominant bulls.

• Swap bulls in the milking herd throughout the bull mating period every few days. This will help maintain sexual interest.

• Do not allow bulls to enter the concrete milking yard with the milking herd as concrete can cause excess hoof wear and lameness. To further reduce the risk of bull lameness and injury to bulls, cows and farm staff – train bulls to remain in the paddock when cows are brought to milking. Identify bulls with reflective tape or some other means for easy location of bulls in the dark.

• If applicable, ensure bulls do not gain access to the dairy and consume excessive amounts of concentrate rations. This can disrupt rumen function, causing sickness and reduced fertility.

• Monitor bulls for lameness each day. Remove lame bulls immediately and replace with healthy bulls.

• In larger herds, there may be too many bulls hiding among too many cows to draft out in the paddock or race. The only alternative is to draft at the dairy shed. In this case, allow for extra bulls to replace those who go lame or stop cows moving on the race.

• Regularly observe bulls serving to ensure they are serving correctly. Immediately remove bulls that are unable to serve properly and replace them with more capable bulls.

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The optimum temperature for sperm production in the testes is 33–36°C (3–6°C below body temperature). Higher temperatures caused by fever or heat stress affect sperm production and increase the number of abnormal sperm. Even slight increases in temperature (1–2°C) can cause major disturbances in semen production. Sperm production takes 2 months; once a bull recovers from fever or sickness, it can be 2 months before normal fertility is regained.
Assessing bull performance

Bull performance is difficult to measure directly so begin by assessing herd reproductive performance during the time when natural bull mating was used in the herd. If the herd’s reproductive performance during this period is less than satisfactory, one possible cause is poor bull performance.

Bull mating of yearling heifers

To check bull performance in heifers, start by assessing how quickly the yearling heifers became pregnant after the bulls were introduced. Consider using pregnancy testing 12 weeks after the Planned Start of Mating date for the yearling heifers. Use these results to calculate the percentage of yearling heifers that became pregnant in the first 3 and 6 weeks of mating.

- 75% of yearling heifers conceive in the first 3 weeks of mating, and 92% conceive in the first 6 weeks, when managed by top farmers.
- If less than 65% of yearling heifers conceive in the first 3 weeks of mating or less than 85% in the first 6 weeks, review:
  - calf and heifer management (page 40); and
  - bull management.
Bull mating in the herd

In many herds, the period following the first 6 weeks of mating reflects the bull mating period. Herd reproductive performance during this time is an indicator of bull performance. By assessing performance at this time, you may be alerted that changes to bull management may be required.

- Obtain the 6-week in-calf rate and the empty rate for your herd (page 27).
- Identify the total weeks of mating (AB period plus bull mating period).
- Look up the expected empty rate for your herd using the table below.
- If the actual empty rate for your herd is higher than expected, this indicates that herd reproductive performance after week 6 of mating was unexpectedly low. If bulls were running with the herd for most of this time, poor bull performance is one possible cause.

Expected empty rate (%), given 6-week in-calf rate and length of mating.

<table>
<thead>
<tr>
<th>6-week in-calf rate</th>
<th>Total weeks of mating (AB period plus bull mating period)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9</td>
</tr>
<tr>
<td>40%</td>
<td>28%</td>
</tr>
<tr>
<td>50%</td>
<td>24%</td>
</tr>
<tr>
<td>60%</td>
<td>19%</td>
</tr>
<tr>
<td>70%</td>
<td>14%</td>
</tr>
<tr>
<td>80%</td>
<td>9%</td>
</tr>
</tbody>
</table>

If I use my 6-week in-calf rate of 70% and look up my mating period, 6 weeks of AB and 6 weeks of bulls, I should expect 8% empty. But our empty rate was 15% when we pregnancy tested.

We’d better check our bull team as it doesn’t look like they were up to it and we don’t want a repeat performance next mating!

The InCalf Fertility Focus report calculates reproductive performance after week 6 and allows comparison with the expected empty rate, based on the 6-week in-calf rate and the total length of mating.
Using sufficient bull power

Knowing that enough bulls are available when cows are likely to be on heat is important in ensuring good reproductive performance. The number of bulls required will depend on the number of cows or yearling heifers likely to come on heat during the period the bulls are with the group.

Yearling heifers

Run 1 bull per 30 yearling heifers. Ensure there are always at least two sexually active bulls running with heifers from the start of the mating period.

Keep extra bulls around in case any need to be replaced during the mating period.

Managing return heats after a synchrony treatment

Remember, if you are using a heat synchrony, and returns will occur when bulls are running, you need to double the ratio of bulls running with the yearling heifers during this period (one bull per 15 non-pregnant heifers). Alternatively, recommence heat detection and AB for 3 or 4 days, starting 19 days after the previously synchronised inseminations (page 181-183).
Ensuring sufficient bull power in the herd

At least one bull for every 30 cows still needing to get in-calf is required when the bulls are run with the herd after AB. If you are not sure how many cows are already in calf, consult with an adviser or estimate at a low percentage of 40-50%.

Using your herd size, check the table below to estimate the number of bulls required. You will also need additional bulls to allow for regular bull rotations during the mating period and to replace bulls that become inactive or unhealthy (e.g. lame). A ‘half resting, half working’ bull rotation policy will require double the numbers of bulls shown in the table below.

Don’t forget to double the ratio of bulls if you use a heat synchrony for the short period around the time those cows are due back on heat. If you still suspect that bull numbers will be insufficient, then consider doing heat detection and AB for 3-4 days when peak returns are due (19-22 days after initial synchronised inseminations).

Seek professional advice on the management of bull teams if more than six bulls are required with your herd.

As mating progresses, fewer bulls will be needed as the number of empty cows decreases, but never run less than two bulls with the herd.

When bulls are running with the herd, keep track of cows on heat. This can provide early warning of poor herd reproductive performance, and helps determine which cows may be empty and when cows became pregnant.

- Record dates of all cows observed on heat wherever possible. This is essential if you do not use pregnancy testing or if you choose a pregnancy testing option that relies on heat detection to identify when cows became pregnant (page 160).
- Use heat records to provide early warning of poor herd reproductive performance.

Minimum number of bulls required to run with the herd at any one time.

<table>
<thead>
<tr>
<th>No. cows in milking herd</th>
<th>Likely % of herd pregnant at start of bull mating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very low (less than 40%)</td>
</tr>
<tr>
<td>100</td>
<td>2-4</td>
</tr>
<tr>
<td>200</td>
<td>5-6</td>
</tr>
<tr>
<td>300</td>
<td>7-8</td>
</tr>
<tr>
<td>400</td>
<td>9-11</td>
</tr>
<tr>
<td>500</td>
<td>12-13</td>
</tr>
<tr>
<td>600</td>
<td>14-15</td>
</tr>
</tbody>
</table>
By the time we give the bulls a rest, we’ll need a few extra in the team.

(Page 129)

I think George’s days are numbered – he’s too big and he’ll have a go at me next.

(Page 124)

Perhaps we’ll switch to Jerseys for the heifers.

(Page 123)

AB went well but not many got in calf after we turned the bulls out.

(Page 127)

We can’t get away with the same number of bulls as last year.

(Page 129)

Those bull calves need a drench and some decent feed. And I’ll check with my vet to ensure the bulls don’t bring any diseases onto the farm.

(Page 122)

We can’t get away with the same number of bulls as last year.

(Page 129)
<table>
<thead>
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<th>Section 3: Acting on Priorities</th>
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<tr>
<td>Assessing cow health</td>
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<tr>
<td>Assisting at calving</td>
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<tr>
<td>“I hate helping heifers calve. What’s the best way to go about it?”</td>
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<tr>
<td>Follow-up treatment for cows with health problems</td>
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<tr>
<td>Managing induced cows</td>
<td>137</td>
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<tr>
<td>Minimising abortions</td>
<td>139</td>
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<tr>
<td>“How do you calculate abortion rates?”</td>
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<tr>
<td>“One of my best heifers has aborted. Now what do I do?”</td>
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<tr>
<td>Dealing with the Phantom Cow Syndrome</td>
<td>141</td>
</tr>
</tbody>
</table>
Cow health

Cows that suffer health problems around the time of calving or in early lactation can suffer reduced reproductive performance. Common health problems include giving birth to twins or stillborns, difficult calvings, retained foetal membranes, vaginal discharges, lameness, ketosis and mastitis.

Some health problems, such as retained foetal membranes, affect the reproductive tract directly while others such as lameness can affect reproductive performance because they reduce feed intake and so result in body condition loss. Lame cows are also less willing to show strong heats.

Induced cows have an increased risk of calving disorders and require additional care from drying off until after calving.

Cows that abort are frustrating and costly, and pose health risks to other animals and humans.

Keeping an eye on cow health has other benefits:

• Preventing health problems can reduce labour requirements, simplify management and even increase milk production and income.

• Preventing calving problems and lameness improves cow welfare and reassures consumers that animal welfare is being maximised in New Zealand dairy herds.

If your herd has only a small number of cows affected by these health problems, it is unlikely that they are reducing herd reproductive performance. However, if too many cows are affected, you can expect overall herd performance to be substantially reduced. Good record keeping will help identify if too many cows in your herd are being affected.
Assessing cow health

To improve cow health, you need accurate records and a strategic approach to treatment and prevention.

Keep records for cows with the following health problems:

- Twin calving – any cow having twins.
- Assisted calving – any assistance required to deliver calf.
- Stillborn calf – calf born dead or died within 24 hours of birth.
- Retained foetal membranes – membranes visible externally on the day after calving.
- Vaginal discharge – pus discharge from vulva more than 14 days after calving.
- Lameness – cow not bearing full weight on at least one leg and walking is affected.
- Other health problems, including ketosis and clinical mastitis (These disorders can affect reproductive performance directly or indirectly). Displaced abomasum and cystic ovaries will also affect reproductive performance but these are uncommon health problems in New Zealand.

Using these records, count the number of cows affected by each type of health problem and express this number as a percentage of all cows. Compare this percentage affected with the levels shown in the table below and on the following page to determine if a review of management is required. Some cows may appear in more than one category.

**A checklist for acting on cow health problems.**

<table>
<thead>
<tr>
<th>Health problem</th>
<th>Prevention</th>
<th>Immediate actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twin calving</td>
<td>There are no practical strategies to prevent twin calvings.</td>
<td>• Check for external signs of retained foetal membranes on the day after calving.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If retained foetal membranes are present, treat as described below.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Seek veterinary assistance promptly if affected cows go off milk, lose condition, stop eating or look sick.</td>
</tr>
<tr>
<td>Assisted calving</td>
<td>• Carefully select AB sires and bulls (pages 110, 123).</td>
<td>• Closely monitor heifers and cows leading up to calving.</td>
</tr>
<tr>
<td></td>
<td>• Ensure calves and heifers reach liveweight targets (page 43).</td>
<td>• Provide appropriate assistance to calve if required (page 135).</td>
</tr>
<tr>
<td></td>
<td>• Feed cows and heifers to calve in body condition 5.0–5.5, respectively (page 66).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Check nutrition during the late dry period and calving time and control milk fever in cows close to calving (page 68).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Seek veterinary assistance promptly if affected cows go off milk, lose condition, stop eating or look sick.</td>
</tr>
</tbody>
</table>
A checklist for acting on cow health problems (continued).

<table>
<thead>
<tr>
<th>Health problem</th>
<th>Prevention</th>
<th>Immediate actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stillborn calf</strong></td>
<td>Implement prevention strategies if more than 1% of non-induced cows have apparently normal calvings but the calf is stillborn or dies within 24 hours of birth.</td>
<td>Seek professional assistance and check for external signs of retained foetal membranes on the day after calving. If retained foetal membranes are present, treat as described below. Seek veterinary assistance promptly if affected cows go off milk, lose condition, stop eating or look sick.</td>
</tr>
<tr>
<td><strong>Retained foetal membranes</strong></td>
<td>Implement prevention strategies if more than 2% of non-induced cows have retained membranes 24 hours after calving.</td>
<td>• Minimise assisted calvings (see above). • Prevent access to cypress or pine trees. • Feed cows and heifers to calve in body condition 5.0–5.5, respectively (page 66). • Check nutrition during the late dry period and calving time and control milk fever in cows close to calving (page 68). • Consult your vet on whether selenium and vitamin E nutrition is adequate. On the day after calving, cut membranes off below the vulva (page 136). Do not pull on or manually remove membranes. Seek veterinary assistance promptly if affected cows go off milk, lose condition, stop eating or look sick.</td>
</tr>
<tr>
<td><strong>Vaginal discharge after calving</strong></td>
<td>Implement prevention strategies if more than 1% of cows have a discharge more than 14 days after calving.</td>
<td>Adopt strategies that prevent assisted calvings and retained foetal membranes (see above). Seek veterinary assistance promptly if affected cows go off milk, lose condition, stop eating or look sick.</td>
</tr>
<tr>
<td><strong>Lameness in early lactation</strong></td>
<td>Implement prevention strategies if more than 5% of first calvers or more than 5% of older cows become lame between calving and week 6 of mating.</td>
<td>For more information about managing lame cows and preventing lameness, speak to an adviser. Treat lame cows promptly and safely. Seek veterinary advice on the correct treatments for different causes of lameness. Ensure that lame cows have easy access to sufficient high-quality feed to minimise body condition loss. Move lame cows slowly and graze them close to the dairy.</td>
</tr>
<tr>
<td><strong>Clinical mastitis</strong></td>
<td>Implement prevention strategies if more than 10% of cows per year or 5% in any one month are diagnosed with clinical mastitis</td>
<td>Implement SAMM plan guidelines and seek veterinary advice. Seek veterinary advice about the causes and treatment of mastitis.</td>
</tr>
<tr>
<td><strong>Abnormally cycling cows</strong></td>
<td>There are a number of conditions that will cause cows to cycle irregularly or not at all, e.g. cystic ovaries.</td>
<td>Seek veterinary advice on cows with abnormal cycling activity.</td>
</tr>
<tr>
<td><strong>Other health problems</strong></td>
<td>Seek advice if more than 5% of cows suffer other problems at calving or in early lactation.</td>
<td>Any health problems that causes body condition loss in early lactation can indirectly affect reproductive performance. Ketosis is an example. Other problems, such as non-cycling, will affect reproductive performance more directly. Seek professional assistance for treatment and prevention when these types of problems occur.</td>
</tr>
</tbody>
</table>
Assisting at calving

Provide assistance to calving heifers and cows when any of the following occur:

• Heifers not calved within 5–6 hours after first sign of abdominal straining.

• Cows not calved within 3–4 hours after first sign of abdominal straining.

• Calving has not occurred within 3–4 hours after membranes have ruptured.

• Delivery has commenced, the calf’s legs or head are (just) visible externally and it is obvious that the calf’s presentation is abnormal.

• Delivery has commenced, the calf’s legs or head are (just) visible externally and the calf is not delivered within 30 minutes.

If you think that a cow may have calved (e.g. she may have placenta hanging from the vulva) but have not found the calf, perform a vaginal examination to ensure that she has in fact calved.

If you assist too early, the cervix and vagina may not be fully dilated and you risk severe trauma to the cow and more difficulty in removing the calf.

I hate helping heifers calve. What’s the best way to go about it?

• Wash the external parts of the birth canal thoroughly with warm water containing disinfectant. Stop and wash again if the cow dirties this area.

• Wash your arms and hands and lubricate your arm with obstetrical lubricant.

• Feel for the position of the calf by inserting your arm into the vagina. Normally, you will find the calf presented with two front legs and the head entering the birth canal or, alternatively, two hind limbs.

• If the calf isn’t in either of these two positions, bring it into the correct position before any form of traction is applied to the calf.

• If you cannot feel the calf’s head, do not presume that the two legs presented are hind limbs. The legs may in fact be front legs and the head is twisted back. Check to make sure you can positively identify the hocks of both back legs and the calf’s tail.

If you cannot bring the calf into the correct position within 10–15 minutes, or if you are not sure what you are feeling or how to proceed, stop and seek immediate veterinary attention.

Prolonged attempts at correction can lead to severe damage to the birth canal, loss of the calf and in severe cases loss of the cow. Use calving jacks or pulleys carefully. Excessive or prolonged traction to deliver a large calf can result in severe damage to the cow.

Next year, get your heifers in shape and be careful what bull you use. Prevention is much better than this cure!
Follow-up treatment for cows with health problems

Cows that have any of the following factors have an increased risk of infection in the reproductive tract (uterus):

- twin calving;
- assisted calving;
- stillborn calf;
- retained foetal membranes;
- vaginal discharge after calving; and
- abortion.

Infections can persist for weeks or even months after calving. These cows have reduced reproductive performance even though many show normal heat cycles and no abnormal discharge is detected externally.

Cows with these infections often cure themselves over time. Repeated heat cycles increase the chance of this occurring. However, it takes time for cows to heal themselves.

Commonly 10% to 15% of cows have a uterine infection 4 weeks before mating starts; and many of these have no recorded problems at calving. To detect these cows, consider asking your veterinarian to examine the entire herd using the Metricheck® device. Treatment of any infected cows, usually with intra-uterine antibiotics, will result in improved fertility.

Further treatment options are available, including earlier and weekly examinations and treatment of cows with the problems listed above. Consult your vet for specific advice for your herd and your situation.
Managing induced cows

Calving induction is used in some herds to reduce the number of late-calving mature cows (Calving induction cannot be used on first calving heifers). While the use of calving induction is discouraged, judicious usage of it is beneficial in ensuring tighter calving patterns.

Induced calving treatments can reduce the cow’s immune response and increase the risk of disease. If induced cows are selected carefully, well prepared and managed carefully, the adverse effects on cow health can be minimised. Information on induction programs and creating an ‘Induction List’ is given on page 152–154.

Induced cows require assistance at calving more often because, although the calf is small, it is more often in an incorrect position and uterine contractions are often weak. In a non-induced cow, the membranes start detaching several days before calving. This detachment is not as advanced when induced cows calve, so more have retained foetal membranes. However, they recover well and have similar reproductive performance to non-induced herd mates that calve at the same time. Older cows (over 8 years) are at more risk of metabolic diseases such as milk fever, grass staggers and ketosis.

For a complete reference describing the appropriate management of induced cows and calves, refer to the ‘Induction Code of Practice’ established in 2005 by DairyNZ and the New Zealand Veterinary Association through your vet.

Select cows for calving induction carefully

Select cows for induction carefully. This is a two-step process: cows are selected as candidates for induction after dated pregnancy testing, then, in the dry period, cows are double-checked as being suitable for induction prior to treatment. This process is described on page 152.

Prepare these cows well

To minimise problems associated with induction, cows need to be well prepared and monitored closely.

- At dry off, treat cows to be induced with a dry cow treatment chosen in consultation with your vet.
- Ensure cows to be induced are managed and fed to calve in body condition score 5.0–5.5.
- Feed during the dry period so that cows do not lose condition.
- Implement a feeding programme for induced cows that will reduce problems including milk fever, grass staggers and ketosis.
- Ensure magnesium supplementation commences at least 3 weeks before starting the induction programme.
- Ensure trace element requirements are being met by checking cows for selenium, copper, magnesium, cobalt and iodine status.
- Exclude cows with known health problems, such as Johne’s disease (JD), mastitis, lameness and facial eczema.
Refer to page 68 for more information on preparing cows for lactation.

- Keep induced cows in clean, well-drained, sheltered paddocks until calving.

**Monitor induced cows closely**

- Cows typically calve 10 to 21 days after the first induction treatment. Seek veterinary advice for cows not calved by 21 days after treatment.

- Cows with sufficient udder development 10–14 days after the initial treatment, can be given a second injection that will result in calving within 2 days. Discuss the use of this option with your vet.

- Do not allow induced cows to run milk before calving; to prevent this, start once or twice-daily machine milking once udder development has begun. Ensure teat spray is applied after each milking.

- Induced cows that calve without substantial milk production should be milked twice-daily and fed similarly to other recently calved cows. Persist in milking cows producing negligible milk for at least 2 weeks; moderate milk yield can commence 2 or more weeks after induced calving.

- Check induced cows three times daily until they calve; react promptly if they show signs of any disorder. Seek veterinary attention if you are not certain that you can treat the disorder adequately. Induced cows often deteriorate rapidly when ill.

- Be aware that signs of calving can be less obvious in induced cows and that induced cows usually require assistance at calving more frequently than non-induced cows. Once cows are being milked, check for signs of clinical mastitis twice-daily.

- Manage induced calves humanely (Appendix 2, page 171).

- Record each cow’s calving date, record her as being induced and record any disorders. Check pages 133-134 for a guide to treating any disorders.

- Before Planned Start of Mating date, consider veterinary examination of induced cows that also had twin calving, assisted calving, retained foetal membranes or vaginal discharge after calving (page 136).
Minimising abortions

Having a high number of cows abort is a major cost to the farm.

Cows abort for a range of reasons and show different signs.

Some of the common reasons for abortions are:

• infection with neospora;
• infection with bovine viral diarrhoea (BVD);
• infection with lepto(-spirosis);
• eating branches or needles from macrocarpa (cypress) or pine trees (including radiata and ponderosa pines);
• fungal abortion from poorly made silage; and
• nitrate poisoning.

The common signs of abortion include:

• membranes hanging from the cow’s vulva;
• the cow passing or licking its foetus;
• a return to heat or a vaginal discharge after a cow is thought to be pregnant; and
• failure to calve at or around the expected time.

Good management of aborted cows will reduce the risks to both humans and other cows, and maximise subsequent reproductive performance.

How do you calculate abortion rates?

You will find the level of abortions recorded in any herd depends on the method used to diagnose abortions and the stage of gestation that cows are thought or confirmed to be pregnant. You need to use a consistent approach. The best way is to focus on monitoring the period between rectal pregnancy testing and expected calving date.

Count the number of cows in the following categories:

• cows with membranes hanging from their vulva or seen passing or licking their foetus more than 3 weeks premature;
• cows identified as empty at a second rectal pregnancy test following a confirmed pregnancy at a previous pregnancy test; and
• cows that have failed to calve at or around the expected time following a positive pregnancy test.

Use the following formula at every calving period:

\[
\text{No. of cows aborted} \times 100 \\
\text{No. of cows diagnosed as pregnant during the previous mating period (excluding cull cows)}
\]
Assessing the abortion rate in your herd

- Observe pregnant cows for signs of abortion.
- Record the identity of aborting cows, date and observed signs.
- Calculate your herd’s abortion rate. If cows are pregnancy tested early (between 6 and 15 weeks) after service, seek professional advice if the abortion rate exceeds 6%. If cows are pregnancy tested longer after service (e.g. 12–24 weeks), seek professional advice if the abortion rate exceeds 2%.

Routine prevention

A number of control options are available. Seek veterinary advice to implement the strategy best for your herd. Keep in touch with your vet to learn about new control methods.

- Ensure pregnant cows do not have access to branches or needles from macrocarpa (cypress) or pine.
- Implement ongoing herd vaccination against lepto-(spirosis).
- Consider testing and eradicating any BVD spreaders from your herd (includes all stock).
- Consider use of BVD and neospora vaccines.
- Do not feed silage that has fungal contamination.
- Bulls may carry diseases that cause abortions. Have bulls fertility and disease tested before introduction to the herd.

You wouldn’t believe it; one of my best heifers has aborted. Now what do I do?

She is at risk of contracting a severe reproductive tract infection after aborting, so call your vet for prompt treatment if she goes off her milk, loses condition, stops eating or looks sick.

Check for external signs of retained foetal membranes on the day after aborting. If observed, manage retained foetal membranes as described on page 134.

If you are not going to cull her, consider the follow-up treatment options to reduce uterine infections described on page 136.

Some infections that cause abortion in cattle can affect humans, so handle aborted foetuses and membranes wearing disposable gloves and avoid contact with vaginal discharges from aborted cows. Consult your vet on the best way to minimise the risks.

Where possible, do not allow dogs access to aborted foetuses or membranes. Remove aborted foetuses and membranes from the paddock and bury them.

By managing her well now, you will have a better chance of getting her in calf again.


**Routine management**

- During the dry period, watch for evidence of abortion or early calving.
- Have suspect cows rectal pregnancy tested before culling. Cows can show return to heat or vaginal discharge and still be pregnant.
- If a cow aborts, take steps to minimise risks to the people, the aborted cow and other cattle.
- If abortions are to be investigated, retain the freshly aborted foetuses and placenta for laboratory examination.

**Dealing with the Phantom Cow Syndrome**

A true phantom cow is one that conceives early to AB but the embryo dies, while the cow continues to believe she’s pregnant and doesn’t return to heat. Phantoms show up later as unexpected empties.

The Phantom Cow Syndrome is largely evident in North American type Holstein-Friesians, with the cause being poorly understood.

Sometimes cows may simply appear as phantoms but the true reason is inaccuracies with heat detection and poor heat detection efficiency as mating progresses.

One method of addressing a phantom cow problem is to implement an early pregnancy testing strategy, that may involve repeat examinations. Consult your vet on options to alleviate a phantom cow problem.
It all makes sense now. Hardly any of last year’s sick cows got in calf early. (Page 132)

I’d better make a list of cows that had twins, difficult calvings, retained membranes or discharges. (Page 133)

We’ll need some extra dry-cow, magnesium oxide and some good quality hay for the induced cows. (Page 137)

You mean we can catch something from that aborted calf? We’d better get the gloves out. (Page 140)

Jane’s been at me to get rid of those macrocarpa trees. She’s right again. (Page 139)
# Section 4

Pulling it all together

<table>
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<td>Chapter 17. Choosing a pregnancy testing strategy</td>
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<td>Chapter 18. Making culling decisions</td>
<td>163</td>
</tr>
</tbody>
</table>
When you are faced with a complex issue, such as herd reproductive performance, you quickly realise that the solution doesn’t come in a single package – often many actions are needed to meet your targets.

To ensure success, these actions need to be part of the overall farm management. This takes into account factors such as the farm’s pasture and livestock resources, human resources, farm finances and business objectives.

The first question to ask is, “What is the best date for my herd’s Planned Start of Calving?” This will govern when you start your AB programme and may also influence when you decide to stop mating. Another key question is: “How many opportunities do I give that cow to get in calf?” These need to be conscious decisions controlled by you.

Measuring reproductive performance without the critical information leaves you open to surprises. A planned pregnancy testing programme will give you the information you require to accurately measure current performance and plan ahead.

What cows do you want to cull to meet farm objectives? What cows are you forced to cull because they are empty? Improved reproductive performance gives you the choice to cull based on your farm’s objectives.

The final step is to pull it all together in a reproductive management plan. A reproductive management plan identifies the targets, your preferred strategies and a schedule of routine tasks to be completed. The plan addresses animals at all stages of the fertility for life cycle.

To help you develop your own reproductive management plan, *The InCalf Book* provides a framework as a starting point for improving your herd’s reproductive performance.
Starting and stopping mating

A desirable calving pattern has at least 87% of the whole milking herd calving in the first 6 weeks with few late-calving cows. Late-calving cows are hard to get in calf and excessive numbers reduce herd reproductive performance substantially. Many herds suffer reduced reproductive performance because calving periods spread over more than 8 weeks.

Good planning is required to take a spread calving pattern and make it more compact. The process begins by selecting the dates when mating will start and stop, and then ensuring that most cows get in calf early and any induction is managed according to the ‘Induction Code of Practice’ established in 2005 by DairyNZ and The New Zealand Veterinary Association (Appendix 2, page 171).

The link between a cow’s calving and mating dates is influenced by whether you would like her to calve on the same calendar date next year. A normal pregnancy is 40 weeks so conception must occur within 12 weeks after calving if she is to calve on or before the same date next year. As a cow’s normal cycle is 3 weeks, it makes sense to divide a herd’s calving dates into 3-week blocks in relation to the Planned Start of Calving date (PSC). These also relate to the intervals from calving to Planned Start of Mating date (PSM). The table below shows the comparison between these intervals.

<table>
<thead>
<tr>
<th>Calving Group</th>
<th>Calving to PSM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very early – before PSC</td>
<td>More than 12 weeks</td>
</tr>
<tr>
<td>Early – 1st 3 weeks</td>
<td>9–12 weeks</td>
</tr>
<tr>
<td>Mid – 2nd 3 weeks</td>
<td>6–9 weeks</td>
</tr>
<tr>
<td>Late – 3rd 3 weeks</td>
<td>3–6 weeks</td>
</tr>
<tr>
<td>Very late – within 3 weeks of PSM or later</td>
<td>Less than 3 weeks</td>
</tr>
<tr>
<td>Planned Start of Calving (PSC); Planned Start of Mating (PSM).</td>
<td></td>
</tr>
</tbody>
</table>

Calving date and calving to Planned Start of Mating date (PSM) interval.
Selecting mating start and stop dates

Selecting the ideal time to start and stop mating – and the subsequent pattern of calving – are individual decisions dependent on factors such as feed supply, labour availability, milksolids price and climate. Once the calving start date is set (Planned Start of Calving), the Planned Start of Mating date is automatically determined.

For a handy reference to relate your Planned Start of Mating date to the Planned Start of Calving, see the look-up chart on page 173.

Consider starting your heifer mating programme 1 to 2 weeks before the main herd. This increases the number of heifers that will calve during the first 3 weeks of the herd’s calving period (page 51) and increases their chance of conceiving early in the next mating period.

Effect of interval from calving to Planned Start of Mating on reproductive performance (NZ Monitoring Fertility Report 2003).

<table>
<thead>
<tr>
<th>Calving to PSM interval</th>
<th>6-week in-calf rate</th>
<th>Empty rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 12 weeks</td>
<td>77%</td>
<td>7%</td>
</tr>
<tr>
<td>9–12 weeks</td>
<td>75%</td>
<td>8%</td>
</tr>
<tr>
<td>6–9 weeks</td>
<td>66%</td>
<td>11%</td>
</tr>
<tr>
<td>3–6 weeks</td>
<td>54%</td>
<td>16%</td>
</tr>
<tr>
<td>Less than 3 weeks</td>
<td>&lt;40%</td>
<td>&gt;20%</td>
</tr>
</tbody>
</table>

What’s the big deal about getting more cows calved in the first 3 weeks of calving?

After calving, the cow’s reproductive tract must contract to normal size. Fluids and contamination must be eliminated and she must commence normal heat cycles. Some cows recover from calving quickly and can become pregnant very soon after calving. More typically however, recovery takes longer. For this reason, reproductive performance is usually low soon after calving, increasing to a peak around 12–15 weeks after calving.

Cows must become pregnant as soon as possible after the Planned Start of Mating date. For every week that calving is delayed, the cow has one week less before the next Planned Start of Mating date to recover from calving. This is why cows calved in the first 3 weeks of calving have substantially better reproductive performance than cows calved later.

Cows that calve more than 8 weeks after the start of calving have less than half the chance of conceiving during the first 6 weeks of mating, and double the chance of remaining non-pregnant at the end of mating, compared with cows calving in the first 3 weeks (see table above).

I’d back the early calver every time! Keep calving compact.
Once you have determined your herd’s Planned Start of Mating date, you need to think about the duration of mating – when to stop mating. This again is an individual decision, but the number of empty cows you are willing to accept at the end of mating will be one factor you need to consider. The acceptable number of empty animals will vary between farms depending on:

- whether you can carry empty cows over to a second mating period (e.g. split calving herds), or carry over for a full year;
- the number of heifer replacements you have available;
- whether you are building up herd numbers;
- the number of cows that will need to be culled for reasons other than reproduction, such as mastitis; and
- whether you will use calving induction.

Consider each of these factors when deciding on the number of empty cows you are willing to accept, and use the following table to estimate the duration of mating that would be appropriate for your herd. You can also use the table below to estimate the likely number of empty cows you will have to manage for a given length of mating.

Calving induction can be used in mature cows within the Induction Code of Practice. Calving induction cannot be used on first calvers, so limit mating periods in yearling heifers to 9 weeks. Similarly, later calving, older cows should not be induced (page 152) and these cows can prolong the calving period if they are retained in the herd. To maintain a compact calving pattern, only retain yearling heifers and older cows that conceive in the first 9 weeks of mating.

### Estimating the percentage of cows that will not become pregnant from the start to end of mating.

<table>
<thead>
<tr>
<th>Total length of mating</th>
<th>Estimated % of cows empty at the end of mating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Common result</td>
</tr>
<tr>
<td>6 weeks</td>
<td>32%</td>
</tr>
<tr>
<td>9 weeks</td>
<td>15%</td>
</tr>
<tr>
<td>12 weeks</td>
<td>9%</td>
</tr>
<tr>
<td>15 weeks</td>
<td>8%</td>
</tr>
</tbody>
</table>
Assessing the herd calving pattern

If your herd’s reproductive performance is not as high as you would like, the first thing to look for is a spread calving pattern. In turn, a better calving pattern gives better reproductive performance. To assess your herd’s calving pattern:

- Calculate the percentage of the herd (cows and first calving heifers) calved by weeks 3, 6 and 9 following the Planned Start of Calving date. Compare your result with the following table:

<table>
<thead>
<tr>
<th>Seek help</th>
<th>Top farmers achieve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calved by week 3</td>
<td>less than 50%</td>
</tr>
<tr>
<td>Calved by week 6</td>
<td>less than 75%</td>
</tr>
<tr>
<td>Calved by week 9</td>
<td>less than 92%</td>
</tr>
</tbody>
</table>

- Assess the calving pattern of your first calvers (page 45).
Improving the herd calving pattern

Improving a herd’s calving pattern needs action at both ends of the calving period: pushing more cows to the beginning of calving and reducing the number of late-calving cows.

After you’ve finished mating, it seems too early to start thinking about the following year’s mating period. However, this is the time to start making plans for a compact calving pattern.

• Check that you have a high percentage of first calvers due to calve in the first 3 and 6 weeks of calving (page 45).

• If not, closely monitor the growth of your next batch of calves and heifers to ensure they meet target liveweights (page 43). Also check bull management and/or AI mating management of the heifers (pages 126, 183).

• Consider opportunity of having heifers start calving 1-2 weeks before main herd.

• Maximise 3-week submission rate (page 28) and conception rate (page 28) to help achieve high 6-week in-calf rates.

• When buying animals, check that they will calve no later than week 6 and preferably by week 3 of your herd’s calving pattern.

• Consider culling later-calving cows. Late-calving cows must be above-average producers to compensate for the reduced income resulting from later calving.

• Consider whether calving induction is to be used. If so, it should involve early planning with your veterinarian and must be implemented within the Induction Code of Practice. Create an induction list identifying selected cows that are due to calve late. Use the table on page 153 to plan the induction date(s). Improved herd reproductive management will reduce the need for induction to achieve a compact calving pattern.
Planning calving induction

Calving induction can be used, within the Induction Code of Practice guidelines until 2010, to reduce the number of late calving cows.

You must have a documented reproduction management plan developed with your veterinarian, with the purpose to minimise inductions towards the dairy industry’s agreed target of 2% by 2010.

A calving induction programme must be well managed to achieve the desired outcomes. It starts with an ‘induction list’. Cows due to calve late are selected using strict criteria (see left), treated so they calve early in the calving period, and are carefully managed to reduce health problems. The use of induction risks animal welfare, milksolids production and reproductive performance if not managed well and must always be conducted under veterinary supervision.

- After pregnancy testing, prepare an induction list that contains possible candidates for induction and the proposed induction date for each cow (page 153).
- Determine the date for first induction treatment of the first group of cows to be induced.
- Check to ensure each cow meets the induction criteria (see box on left).
- Arrange for a veterinarian to pregnancy test the cows and administer the first induction treatment. Discuss follow-up actions with your vet, such as re-treatment of cows that don’t respond to the first induction treatment.
Example table for preparing an induction list. This table is for herds where the aim is to induce cows 6 to 12 weeks before their expected natural calving date. A complete list is available in Appendix 3, page 175.

<table>
<thead>
<tr>
<th>Date of first induction treatment</th>
<th>Select cows due to calve naturally between:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Earliest (6 weeks away)</td>
<td>Latest (12 weeks away)</td>
</tr>
<tr>
<td>15 Jul</td>
<td>26 Aug</td>
<td>7 Oct</td>
</tr>
<tr>
<td>22 Jul</td>
<td>2 Sep</td>
<td>14 Oct</td>
</tr>
<tr>
<td>29 Jul</td>
<td>9 Sep</td>
<td>21 Oct</td>
</tr>
<tr>
<td>5 Aug</td>
<td>16 Sep</td>
<td>28 Oct</td>
</tr>
<tr>
<td>12 Aug</td>
<td>23 Sep</td>
<td>4 Nov</td>
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<tr>
<td>19 Aug</td>
<td>30 Sep</td>
<td>11 Nov</td>
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<td>26 Aug</td>
<td>7 Oct</td>
<td>18 Nov</td>
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<td>2 Sep</td>
<td>14 Oct</td>
<td>25 Nov</td>
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<tr>
<td>9 Sep</td>
<td>21 Oct</td>
<td>2 Dec</td>
</tr>
<tr>
<td>16 Sep</td>
<td>28 Oct</td>
<td>9 Dec</td>
</tr>
</tbody>
</table>

"We understand that calving induction needs to be well planned but how would we come up with an induction list so early?"

Planning to induce cows to calve early in the calving period gives them their best chance at conceiving in the first 6 weeks of mating.

An induction list needs to be created in consultation with your veterinarian. This list will show when the first induction treatment should be administered, and which cows are potentially eligible (table above or Look-up Charts, page 175). The date of first treatment may differ between cow-batches, depending on their expected calving dates.

The Induction Code of Practice requires that the expected calving date without induction is known because calving can only be induced between 6-12 weeks early. This means that conception date needs to be determined by ‘foetal-aging’ during pregnancy testing (page 158).

Establish a specific management plan for these induction candidates to ensure that the Induction Code of Practice guidelines will be met. This will include early drying-off and a feeding plan to ensure body condition targets are achieved.

Calving induction requires early planning and consultation with your veterinarian."
Good management of induced cows leading up to calving and during calving will increase their chances of calving early in the following year, and is important to minimise the associated health risks. Management of cows induced to calve is described on pages 137–138. The management of calves born following induction is described in Appendix 2 (page 171).

For further details describing the appropriate management of induced cows and calves, refer to the Induction Code: Responsibilities and cow selection criteria 2005 through your vet.

What to do before Planned Start of Mating date

If poorly managed, cows that have health problems around the time of calving are at risk of not cycling before Planned Start of Mating date. As induced cows have a higher incidence of health problems, they must be carefully monitored.

Consider veterinary examination of cows that had:

- twin calving;
- assisted calving;
- stillborn calf;
- retained foetal membranes;
- vaginal discharge after calving; or
- abortion.
Choosing a pregnancy testing strategy

For effective management decisions, it is essential to know which cows are pregnant and when they conceived, as this determines when they will calve. Accurate knowledge of when cows conceived and their due-to-calve dates is critical as it allows you to:

- accurately measure the 6-week in-calf rate to assess overall herd reproductive performance;
- confidently cull cows as empty;
- confidently dry-off cows at your preferred time before their due-to-calve date;
- differentiate AB from natural mating pregnancies;
- identify cows due to calve late and any that could potentially be induced;
- more accurately select cows that are close to calving; and
- provide approximate due-to-calve dates if selling cows.
Each farm needs a strategy to identify and record which cows are pregnant and when they conceived. Several strategies are available.

The best strategy for your herd will depend on what information you require from pregnancy testing.
Pregnancy testing methods

The main methods used for determining the pregnancy status of cows are rectal examination using a hand or ultrasound probe, or continuous heat detection.

Early rectal pregnancy testing by a skilled operator is the most accurate method to identify cows that are 5 weeks pregnant or more, and can also provide good estimates of when cows conceived if tested at 12-14 weeks of pregnancy or less.

I reckon they’re just guessing when they tell me how far pregnant the cow is.

Rectal pregnancy testing, between 5 and 14 weeks of pregnancy, is the best way of getting reasonably accurate estimates of when cows will calve.

Skilled pregnancy testers estimate the age of the pregnancy by examining the cow’s reproductive tract for the presence of:

• fluid;
• foetal membranes;
• the foetus;
• round placental attachments (cotyledons); and
• enlarged arteries.

Early in pregnancy, the feeling and appearance of these change quite quickly as pregnancy progresses. For example, a 7-week pregnancy feels different to a 10-week pregnancy. This makes it easier for the operator to determine whether the last recorded insemination date is, in fact, the conception date, or whether the cow conceived to an earlier or later insemination.

In contrast, later in pregnancy the part of the reproductive tract that is examined changes much less. For example, a 24-week pregnancy cannot be distinguished from a 27-week pregnancy.

It is more difficult to estimate the age of the pregnancy in cows that are extremely fat (over body condition score 6).

Pregnancy testing within 14 weeks of a mating date is pretty accurate.
Pregnancy testing strategies

A pregnancy testing strategy involves testing certain groups of cows at particular times, using an appropriate method. A range of strategies is described in the following section, but the keys to success for all pregnancy testing strategies include:

- ensuring all cows are clearly identified and no two cows have the same identity number;
- a check of the facilities with the person performing the pregnancy testing before the appointment; and
- a means of accurately recording the results of the test, including the estimated date of conception.

In the case of rectal pregnancy testing, you also need:

- A list of all cows to be tested, including the number of weeks (or days) since each cow’s last recorded mating (listing previous mating dates can also be handy). Remember that pregnancies less than 5 weeks (35 days) old cannot be reliably confirmed.

- Use a worksheet that can be quickly generated for your cows and mating dates using computer-based software available from your herd improvement organisation.

The Fertility Focus report can add a lot of value to your pregnancy testing strategy by reporting your herd’s actual 6-week in-calf rate and empty rate. Make sure your pregnancy test results, including age of pregnancies, are entered into your electronic herd record system.
Early rectal pregnancy testing

This is the most accurate way to determine which cows are pregnant and when they conceived. It involves testing groups of cows both during and after the end of mating. The strategy eliminates the need to watch for heats after the end of the AB period.

- Test all cows that are not already confirmed pregnant, at 12–14 weeks after the start of mating.
- Re-test cows that have not been confirmed pregnant, 8–9 weeks after the first test. At the same time, re-test cows previously diagnosed as pregnant but that you suspect may have aborted.
- If the second test was less than 6 weeks after the end of mating, then re-test cows that have not been confirmed pregnant, 6–8 weeks after the end of mating. Also re-test cows previously diagnosed as pregnant but that you suspect may have aborted.
- Use the look-up chart on page 174 for help with the dates.

Rectal pregnancy testing after the end of mating

All cows in a mating program are pregnancy tested once, 6-8 weeks after the end of the mating program. This strategy identifies empty cows accurately, and can also differentiate between those that became pregnant during the last 6 weeks of mating, compared with cows that got back in-calf prior to that. Importantly, if you plan to do inductions, the first pregnancy test should occur less than 18 weeks after the start of mating.

A single pregnancy test 6-8 weeks after the end of mating will be too late if you want to know precisely when cows got pregnant to AB mating dates. You’ll need to get the early test done as well to get this information.

Rectal pregnancy testing of selected cows

Cows suspected to be empty or to have aborted are pregnancy tested 6-8 weeks after the end of mating. Other cows are assumed to have conceived at their last recorded insemination or bull mating. This strategy is less accurate as it relies on continuous and accurate heat detection (page 160). If you need to accurately identify which cows conceived during the AB period, you should adopt an early pregnancy testing strategy as described above.

Which cows to test:
- Cows seen on heat in the last 6 weeks of mating or after the end of the mating period.
- Cows with any question marks on their AB dates.
- Cows that had vaginal discharges, membranes observed, or suspected of aborting during the mating period.
Using continuous heat detection to determine pregnancy

Continuous heat detection can be used to determine when cows become pregnant but it has limited accuracy. Cows seen on heat after their last insemination, or after mating has ended, are assumed to be non-pregnant. Cows that are not observed to return to heat following service are assumed to have conceived at their last recorded AI date or bull mating.

Using heat detection to determine which cows are pregnant and when they conceived has shortcomings. The accuracy of the strategy depends entirely on whether all heats are accurately detected and recorded. This means you need a system of accurate and continuous heat detection in place. You will also be fooled by any pregnant cows that show heats (which does happen!), and cows that are not having heats even though they’re empty.

Many herds find continual heat detection difficult and many cows will have heats that are missed or misdiagnosed. If this is the case in your herd, you will require a pregnancy testing strategy (page 158). In nearly every herd, a pregnancy testing strategy will be superior to relying on heat detection in determining which cows are pregnant and when they conceived.

If you decide that heat detection is the appropriate option for your herd, you need to:

• ensure that all cows are clearly identified and that no two cows have the same identity number;
• plan a continuous and effective heat detection strategy (page 82) (which has to run until at least 6 weeks after the end of mating);
• use heat detection aids continuously; and
• record all observed heats accurately.


Pregnancy testing strategies for heifers

Early identification of empty heifers allows prompt assessment of reproductive performance and quick action to be taken. The approach you take to determining the pregnancy status will depend on the information you require. If you choose not to pregnancy test heifers at all, you must be highly confident that their reproductive performance will be good and that you do not require their expected calving dates.

1. Early rectal pregnancy testing

A strategy using early rectal pregnancy testing will accurately identify empty heifers, and also give the best estimate of the conception date and predicted calving date. Knowing when heifers are expected to calve can assist management at calving time.

When to test heifers:

- Test all heifers at 12–14 weeks after mating begins; and if necessary
- Re-test heifers not detected pregnant at the first test, 6-8 weeks after the end of mating to confirm later calving and empty heifers.

Early rectal pregnancy testing also allows the reproductive performance of a group of heifers to be identified as soon as possible.

- 75% of heifers conceived in the first 3 weeks of mating, and 92% conceived in the first 6 weeks, when managed by top farmers.
- If less than 65% of heifers conceive in the first 3 weeks of mating or less than 85% in the first 6 weeks, review:
  - calf and heifer management (page 40);
  - bull management (page 126); and
  - Insemination technique and heat detection if AB was used (page 115, 79).

2. Late rectal pregnancy testing

This strategy involves one pregnancy test of all heifers in a mating group, 6-8 weeks after the end of mating. It will accurately identify empty heifers, but may be too late to accurately identify conception dates or predicted calving dates.
Using pregnancy testing results

Now that you have your herd’s pregnancy test results, you can put them to work.

- Use your software or submit your information to your herd improvement centre or your adviser to obtain an InCalf Fertility Focus report. Compare your herd’s performance to what top herds achieve and use the methods described in Chapter 5 to obtain insights to areas where improvement is possible.
- Prepare an induction list if you plan to use calving induction in the following season.
- Plan your feeding strategy based on the expected calving pattern.
- Prepare a culling list.
- Look for patterns among empty cows.
  - Are they late calvers?
  - Were they treated as ‘non-cyclers’?
  - Are they mainly heifers?

How can I have two cows with the same expected calving date but they calve two weeks apart?

Even where early or regular rectal pregnancy testing is implemented, quite a few cows will calve more than a week earlier or later than their expected date based on pregnancy test records.

There are several reasons for this:

1. Cows will vary in the length of their pregnancy. On average the length of pregnancy is 282 days. Hormones released from the foetal calf trigger calving. Individual calves vary in the time at which they trigger the calving process.

2. In a small number of cows, even experienced pregnancy testers will select the wrong insemination date as the conception date. While early rectal pregnancy testing gives the best chance, it is not always possible to distinguish between two possible conception dates. Natural biological variation in pregnancies means that pregnancy testing cannot be exact in all cows. The wrong insemination date is more likely to be selected as the conception date where:
   - mating records are incomplete or inaccurate;
   - the cow had two inseminations or services less than 3 weeks apart;
   - bulls are running with the herd and service dates are not all recorded; or
   - cows are pregnancy tested when more than 14 weeks pregnant.

3. Cow identification and recording errors are common causes of cows not calving within a week of their due date.

Generally about 70% of cows will calve within a week of their due date based on early rectal pregnancy test results. Typically, around 10% of cows will calve more than 10 days before their due date and a further 10% of cows will calve more than 10 days after their due date.

Calving wouldn’t be normal without a few surprises!
Making culling decisions

The number one reason for cows being culled in New Zealand is because they are empty. Empty cows make up about half of the culling in most herds. Too many of them are young cows.

When deciding the fate of an empty cow, you have to weigh up her potential to produce milk and the negative effect she may have on future herd reproductive performance.

Those empty cows just have bad fertility genes. Culling them will get rid of the problem. Right?

A cow’s reproductive performance is determined both from genetic and non-genetic characteristics. Non-genetic characteristics include the way the cow is managed.

Genetics only makes a small contribution to whether a cow gets in calf on time. The biggest contribution comes from how she is managed, right from the day she’s born.

Non-genetic characteristics can be temporary (such as a short period where the cow was lame) or fairly permanent. For example, if a cow aborted after eating macrocarpa branches and her reproductive tract then became infected, the result may be permanent damage.

Culling cows with poor reproductive performance can have a small effect on overall herd reproductive performance through both non-genetic and genetic effects.

When you cull an empty cow, you don’t usually know if it was because of genetics or management. Some empty cows may actually have genes for normal fertility, and others for poor fertility. So culling cows with poor reproductive performance will not change the herd’s genetics for fertility very much.

Lastly, the dam is only half the story. Culling will also have only a small effect on the herd’s genetics for fertility because the sire contributes half the genes. Selecting AB sires with a high Fertility Breeding Value will have a stronger influence across the whole herd than culling particular cows with poor reproductive performance.

Don’t be too quick to blame genetics – they’re probably not the cause!
Assessing culling decisions

Culling strategies can affect your herd’s reproductive performance. Empty cows are usually culled so it is unlikely that large numbers of consistently less fertile cows are retained in the herd.

However, a shortage of replacement heifers will sometimes mean that selected empty cows are carried over to the next season’s AB programme; particularly when the value of in-calf cows is very high relative to their meat value as culls.

To determine the impact of keeping less fertile cows in your herd, well-kept records are required. These records should reveal whether or not carryover cows keep having trouble getting back in calf; or if it may have been your fault, not theirs, that they were empty in the first place.

The decision to cull a cow must also take into account each cow’s milk production ability and other economically important traits, as well as age. Timing of culling decisions will also be influenced by the overall farm situation, especially feed supply.

By improving herd reproductive performance, you can cull on the basis of profit, not pregnancy.

If a large number of cows currently in the herd have been carried over (having failed to get in calf in at least one previous mating period), then they may be reducing overall herd reproductive performance.

How much these cows reduce herd reproductive performance depends on the percentage in your herd that have been carried over after any previous mating period; and also whether the reason they were empty in the first place was their fault or yours.

Determine the percentage of cows in your herd carried over after any previous mating:

If less than 10%, carryover cows are unlikely to be having much effect on overall herd reproductive performance.

Achieving a 78% 6-week in-calf rate will reduce the empty rate and provide you with more culling choices.
Choosing cows to cull

Choosing cows to cull has to take into account more than their reproductive performance. The potential they have to remain in the herd and create additional profit has to be weighed against the costs of keeping them until their next calving.

Preparing a culling list

There are many reasons for culling cows from the herd. Consider and prioritise these reasons. Some of these will be ‘must cull’ reasons to you. Others will be ‘would like to cull’, but only if we can.

The task of preparing the culling list can be made easier using a computer-based programme available through your herd improvement organisation. Contact them for advice.

The first group of cows to go on the likely culling list are the empties. Also list the cows that you suspect may have aborted and will need to be checked by your vet.

You will have to take account of the following factors in making a decision to cull or keep empty cows:

- Production Worth (PW) and somatic cell count.
- The health and reproductive history from last calving for each empty cow. Take into account obvious reasons, like poor health or lameness, as these may have been resolved.
- Are any of the empties carryover cows?
- Whether you are going to generate a profit from retaining empty cows for future breeding. How much will it cost you to keep her until her next calving?

The second candidates for the cull list are cows with persistently high somatic cell counts (SCC), or they have had several episodes of clinical mastitis. The following factors need to be taken into account in ranking these cows from most likely to least likely for culling:

1. Cows that have had 2 or more cases of clinical mastitis in a season are twice as likely to get clinical mastitis in the next season.

2. Cows with SCC greater than 150,000 at any herd test are twice as likely to get clinical mastitis in the next season.

So, consider culling cows that have had two or more cases of clinical mastitis, have had elevated SCC at multiple herd tests over multiple years and have previously been treated with dry cow therapy.
Next, consider culling low producers and cows due to calve late.

- If you have enough pregnant cows to cull on production, think about the due-to-calve date and age of low-producing cows.

- Base these decisions on Production Worth (PW) while taking into account the expected future life of the cow. The Lactation Worth (LW) is suited to culling decision involving older cows as it can show up those that are no longer as good as they used to be.

- Late calvers should be above average PW to compensate for the reduced income resulting from later calving.

- You may be able to sell cows due to calve late to other herds with later calving periods.

The final category in creating your herd’s ‘ideal’ culling list is to add the cows that don’t fit into your herd because they are:

- slow milkers;
- temperamental in the milk shed;
- ‘stirrers’ that bunt and upset other cows;
- cows with collapsed udders that are difficult to put the cups on; and
- too big or small for the dairy shed set-up.
Appendices

Down to details

Appendix 1 – Monitoring conception rates of AB technicians

Appendix 2 – Management of calves born following induced calving

Appendix 3 – Look-up charts

Appendix 4 – Treatment options for non-cycling cows

Appendix 5 – Options for heat synchronisation – yearling heifers and cycling cows

Appendix 6 – Estimating herd reproductive performance

Definition of terms

Index
A1 Monitoring conception rates of AB technicians

Professional technicians do the majority of inseminations in New Zealand, and breeding companies have control procedures in place to ensure the best possible service is provided.

A professional technician inseminates many cows, in several herds, often where other technicians are used as well. This allows their performance to be closely monitored against other technicians, and action taken if results are not acceptable.

The earliest indicator of technician performance is the 18-24 day non-return rate, which if poor gives an early warning that the conception rate during the entire AB period could be low. To be fair to the technician, only eligible matings are checked. Eligible matings exclude: cows inseminated on the first day of AB; natural matings; and returns less than 18 days or returns greater than 24 days from a previous insemination date. Be aware that your 1-24 non-return rate and overall non-return rate are likely to be 10% less than the 18-24 day non-return rate of eligible returns used to monitor AB technicians.

If you are a DIY technician you can look at your own 18-24 day non-return rate to eligible matings, or better still, your ‘true’ conception rate if early pregnancy testing is performed (page 190). The major disadvantage with DIY is that, if the conception rate is low, it is difficult to determine whether your technique needs improving or whether factors other than insemination technique are reducing conception rates. If you have any doubt, you should consider an insemination refresher course or have a professional technician do half the inseminations and compare your results.

If you have more than one DIY technician operating in the herd, you can compare conception rates achieved by each technician to give an indication of whether insemination practices are up to scratch.

- Cows inseminated by the different technicians should have a similar time since calving, age, and body condition. Alternating the days you perform the inseminations can help ensure this.
- The minimum number of inseminations to use in a comparison is 50.
- Smaller significant differences between DIY technicians can be detected with higher numbers of inseminations. Use the table to the right to determine the conception rate difference that indicates a DIY technician’s insemination practices should be reviewed.

Let’s consider Peter and Jim. They each performed about 200 inseminations. Peter worked out his conception rate as 39%, and Jim calculated his conception rate at 52% (a difference of 13%).

The trigger point for 200 cows is a conception rate difference of 10%. As Peter’s conception rate was more than 10% lower, he should review his insemination practices.

<table>
<thead>
<tr>
<th>No. of inseminations by each technician</th>
<th>Conception rate difference trigger *</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>15% or more</td>
</tr>
<tr>
<td>200</td>
<td>10% or more</td>
</tr>
<tr>
<td>400</td>
<td>6% or more</td>
</tr>
</tbody>
</table>

* If the difference between conception rates is greater than this trigger, review insemination practices (pages 111, 116).
DairyNZ and The New Zealand Veterinary Association have created guidelines for calving induction and the management of calves following induction (the ‘Induction Code of Practice’). For more information, speak to your vet.

**Overview**

The intention of the Induction Code of Practice is that cows are induced at such a time that calves are not born alive. However, in some cases the calves will be alive at birth.

Calves born alive following calving induction (‘induced calves’) are usually unsuitable for sale until they are several weeks old. They also have reduced chances of survival and require a higher level of management to ensure they remain healthy and grow. Growth rates are often reduced by calving induction.

Induced calves should be assessed at birth. Calves not suitable for rearing should be promptly and humanely euthanased. If induced calves are to be reared, they must be managed carefully.

**What to do**

- Assess the vitality of each induced calf.
- Identify and euthanase those calves that are:
  - more than a month premature;
  - unable to stand, walk and suckle within 8 hours of birth; or
  - incapacitated in any other way.

If induced calves are to be reared successfully, careful management of their nutrition program and their environment is essential.

**Euthanase ‘non-viable’ induced calves humanely**

The preferred method of euthanasia is a headshot using a conventional firearm or a ‘captive bolt gun’. The shot should be aimed towards the brain at a point determined by the intersection...
of two imaginary lines drawn from the inside corner of the eye to a point a little above the opposite ear.

The induced calf should then be ‘bled out’. Bleeding out is where the throat is cut completely, and all the major blood vessels are severed. If the calf is not bled out after the initial headshot, it is essential to check the animal within 3-4 minutes of using the firearm to ensure that the animal is dead and not simply stunned. Calves must not be shot in the poll (back of the head position).

If calves are not shot, they may be killed by a firm blow to the head with a blunt heavy instrument using sufficient strength to stun the animal and render it unconscious; ‘bleeding out’ must then take place after the calf has been stunned.

Except in extreme circumstances, calves must not be destroyed by a ‘bleeding out’ only. The blood supply to the brain of cattle is sufficiently different compared with other livestock that this can result in prolonged consciousness.

For further information on emergency humane destruction, refer to the NAWAC Code of Recommendations and Minimum Standards for the Emergency Slaughter of Farm Livestock and/or the person in charge should consult with the veterinarian if inexperienced with the procedure.

**Rear ‘viable’ induced calves carefully**

While not recommended, where induced calves are to be reared:

- Feed at least 2 litres of good-quality colostrum (i.e. not from an induced cow or heifer) in the first 6 hours after birth, followed by another 2 litres in the next 6–12 hours (See page 47 for information on colostrum management). Calves should receive at least 10% of their body weight as colostrum in the first 12 hours of birth.

- Feed colostrum rather than milk for 10 days as 3 to 4 feeds a day. This provides extra protection against intestinal diseases.

- Ensure the calves’ housing provides shelter from weather, is clean, warm, dry, well ventilated and draught free.

- Rear induced calves separately from non-induced calves for the first 2 weeks of life to minimise the effects of competition from heavier, stronger calves.

- Closely monitor induced calves until weaning.

- Look for reduced feed consumption and any signs of disease, and promptly treat any disorder. Seek early veterinary attention where necessary.
**Look-up charts**

Use this look-up chart to establish the dates when your herd has been calved 3, 6 and 9 weeks.

This chart is useful in planning and measuring herd reproductive performance. Once the Planned Start of Calving date has been established, you can look up the appropriate Planned Start of Mating date (PSM). It is also useful when assessing the herd’s calving pattern in terms of the number of cows calved within 3, 6 and 9 weeks of the Planned Start of Calving date.

<table>
<thead>
<tr>
<th>PSM last year</th>
<th>Planned start of calving this year</th>
<th>3 wks</th>
<th>6 wks</th>
<th>9 wks</th>
<th>3 wks</th>
<th>6 wks</th>
<th>9 wks</th>
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<tbody>
<tr>
<td>1 Jan</td>
<td>10 Oct</td>
<td>30 Oct</td>
<td>20 Nov</td>
<td>11 Dec</td>
<td>10 Apr</td>
<td>30 Apr</td>
<td>21 May</td>
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<td>8 Jan</td>
<td>17 Oct</td>
<td>6 Nov</td>
<td>27 Nov</td>
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<td>6 May</td>
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<td>15 Jan</td>
<td>24 Oct</td>
<td>13 Nov</td>
<td>4 Dec</td>
<td>25 Dec</td>
<td>24 Apr</td>
<td>14 May</td>
<td>4 Jun</td>
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<td>22 Jan</td>
<td>31 Oct</td>
<td>20 Nov</td>
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<td>29 Jan</td>
<td>7 Nov</td>
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<td>9 Jul</td>
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<td>12 Feb</td>
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Use this look-up chart to establish when your herd should be pregnancy tested.

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Use this look-up chart to determine which cows are potentially eligible for the first induction treatment on any given calendar date.

This chart is useful in preparing a calving induction list. One of the requirements for induction is that cows must be between 6-12 wks away from their due-calving date. If planning on inducing, consult with your veterinarian in early autumn to manage inductions according to the ‘Induction Code of Practice’.

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Use this look-up chart to establish predicted calving date from conception date.

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<td>31 Dec</td>
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Treatment options for non-cycling cows

Treatment options for cows not detected on heat are being frequently updated as further trial results become available. This means that your vet should be consulted about current recommendations for each product. Generally, three treatment options are available:

1. Intravaginal device before the Planned Start of Mating date.
   Intravaginal devices include CIDR® or CueMate®.

2. Intravaginal device around 3 weeks after the Planned Start of Mating date.

3. ‘GPG’ (e.g. Ovsynch®).

1. **Intravaginal device before the Planned Start of Mating date**

   Intravaginal devices inserted before the Planned Start of Mating date allow most of the treated cows to be inseminated early in the mating period.

   Begin the programme by checking for heats from 35 days before the Planned Start of Mating date. Commencing 9 days before the Planned Start of Mating date, cows which have not been detected on heat and which have been calved more than 3 weeks are eligible for treatment and receive a sequence of injections and an intravaginal device. The majority of cows are inseminated at a set time 3 days after device removal. Some cows will come into heat before then and should be inseminated upon heat detection.

   This option will routinely involve most cows being inseminated on detected heat 2-3 days after device removal, with the remainder being fixed-time inseminated. However, conception rates to first inseminations of these treated cows may only be 35% to 45%.

   Retreatment (or resynchrony) of the treated and inseminated cows prior to the next heat cycle may be used to enhance heat detection in the second round of mating. In this case, the intravaginal devices are replaced 15 or 16 days after the first inseminations for a 5-day period. Most of the cows that have not become pregnant at the first insemination will come back on heat for their second insemination within a 3-day period.
The intravaginal device treatment option can increase the 6-week in-calf rate of the treated cows by up to 15%, compared to no treatment at all. However, results may vary between herds, partly depending on the herd’s calving pattern (too many late calvers), and partly on the herd’s body condition score. A 10% increase in the 6-week in-calf rate of treated cows is a likely result.

If this option is combined with Why Wait heat synchrony for cycling cows (page 184), it is possible to inseminate almost all cows in the herd early in the mating period. The combined programme means that the effort of heat detection can be focused on short predictable periods.

- Start monitoring for heats from 35 days before the Planned Start of Mating date (page 83).

- 9 days before Planned Start of Mating date, identify cows not detected on heat. Generally this will be about 25–30% of the herd.

- Present these cows for veterinary examination to confirm their suitability for treatment.

- Implement the programme of injections and intravaginal devices exactly as advised by your vet.

- Clearly mark treated cows. Accurate cow identification is critical when administering injections and intravaginal devices. It also ensures that intravaginal devices can be removed from every treated cow on the designated day and subsequent injections correctly administered.

- Clean, store and reuse intravaginal devices strictly as advised by your vet.
• If treated cows are retreated/resynchronised, either ensure adequate numbers of bulls are running with the herd (page 128), or recommence heat detection and AB for the 4 days following the resynchrony treatment when most of the cows that come back on heat are expected to do so.

• Analyse records to identify which particular groups of cows (heifers, late calvers, lame cows, etc) were actually treated. This may assist future management planning.

2. Intra vaginal device 3 weeks after the Planned Start of Mating date

Using this option rather than no treatment at all is likely to have only a small effect on the 6-week in-calf rates of treated cows (less than 5%).

Fewer cows will require treatment for non-cycling than Option 1. If 100 cows required treatment with Option 1, only 30 to 40 cows would require treatment under Option 2, but the proportion will vary between farms.

Relative to Option 1, this option will further delay the first insemination in some cows. This may result in even fewer cows conceiving early in the mating period than under Option 1.

• Commence heat detection and AB from the Planned Start of Mating date.

• About 3 weeks after the Planned Start of Mating date, identify cows not yet inseminated and present these cows for veterinary examination to help identify the reasons that cows have not been detected on heat.

• Treat cows in the same manner as Option 1 (intra vaginal devices used before the Planned Start of Mating date).
3. **GPG (Ovsynch®)**

A ‘GPG’ treatment, such as Ovsynch®, is a sequence of three injections (GnRH, Prostaglandin, GnRH) with rigid time constraints.

Every cow is inseminated between 12 and 24 hours after the third injection. This system requires no heat detection for the first insemination, however heat detection is required for all subsequent inseminations.

The GPG treatment was designed for treating cows that are already cycling, but is now being used to treat non-cyclers as well. This treatment can be applied before or during mating, as described above for intravaginal device treatments.

Use of ‘GPG’ on non-cyclers within pasture-based herds is yet to be rigorously tested.

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If using a ‘GPG’ treatment during the mating period, be very careful NOT to include cows that have already been inseminated. The second injection (prostaglandin) will cause abortion if given to a cow in early pregnancy.

---

**Work with your vet when arranging the use of any of these three options for treating non-cyclers.**
A5 Options for heat synchronisation – yearling heifers and cycling cows

Several heat synchronisation options are available for yearling heifers, and for cycling cows. The purpose here is to synchronise the heats of animals that are already cycling, so they can be inseminated at the same time and within the first few days of the mating period.

If you choose to use heat synchronisation on yearling heifers and cycling cows, it is important that the options are thoroughly investigated. The benefits of synchronising heifers (page 51) and cycling cows (page 92) need to be offset against the extra costs and time to required to plan and implement the programme. It is also important to investigate the practical requirements of any programme (pages 182-183).

Work with your vet to develop the best strategy. Take time to understand when and how the treatments work. This will give you an idea of the extra labour, facilities, time and cow identification required. Provide ample warning to your AB organisation that large numbers will be inseminated on planned dates.

Check things like:
- How will the synchronisation treatments be administered at the right times?
- How will synchronisation treatments and inseminations be recorded?
- Is heat detection necessary, and how will it be done?
- How will cows be drafted and held for insemination?
- Do we have easy access to the heifers and what yard facilities are available?
- How will large numbers of cows on heat each day be inseminated?
- Are extra staff required, including AB technicians and stock handlers?
- Have you selected the sires to be used?
• Does your AB technician know about the synchrony coming up? When and how many?

• What about the synchronised returns 18-24 days later? Enough bulls or AB again?

• Will there be intense periods of calving next year? Do we need to:
  – account for a rapid start to calving in our feed budget?
  – have more staff on during peak times to supervise calving and identify AB calves correctly?
  – increase colostrum storage capacity and calf rearing facilities?

If we’ve got a big group to synchronise, what else do we need to consider?

Administering treatments
• Treat cows during milking but check the safety of platforms.
• Although the synchronisation treatments should not affect milk yields, disturbances to the normal milking routine can disrupt normal cow flow.
• Ensure animals for treatment are clearly identified.
• Ensure that recently calved animals (or pregnant animals?) are excluded. Mark these cows with paint or marker at the start of the programme to avoid treating them by mistake.

Coping with large numbers of cows on heat
• Consider providing extra feed to the synchronised cows on the day before the peak heat period is expected to ensure adequate feed intakes and reduce damage to pasture.
• Monitor cows for signs of milk fever in the two days following these heat periods.

Inseminating large numbers of cows or heifers
• Ensure that inseminating facilities allow efficient cow flow and minimise bending or walking by AB technicians and helpers.
• Rest AB technicians during these insemination programmes.
• Do not exceed 3 hours. AB technician fatigue can be a bigger problem for novice AB technicians.
• Before inseminating large groups of cows or heifers, seek advice from a professional AB technician experienced in these programmes.

Bull selection
• The most convenient form of inseminating is to use semen from one sire for 20 to 50 inseminations as they occur and then switch to another sire. This minimises errors in recording, decreases the time taken, and avoids straws being left thawed for extended periods before they are used. Check you are using bulls that won’t cause inbreeding with your cows (page 110) if you adopt this approach.
Treatment options

1. **Prostaglandin (PG) programmes**

A wide range of synchronisation programmes are available using prostaglandin (PG), and these are usually the least expensive. PG options can be used in both cows and heifers. They involve one or two injections of PG.

Treatment with PG does not work in non-cycling cows and yearling heifers that have not yet started cycling (i.e. prepubertal). Also, a single PG injection will not work on any cows that have been on heat in the last 6 days; but the 2 PG injection programme will overcome this problem. Cows that respond to PG are usually on heat within 2–5 days of treatment, but some cows may take up to 7 days to respond.

This section describes the basic PG programmes, but there are a number of subtle variations that can be made to the basic programmes by vets to suit individual farm requirements.
• **Single Why Wait:** Cows or heifers are observed for heat for 6–7 days before the Planned Start of Mating date. Those that show signs of heat are then injected with PG 5 days after the Planned Start of Mating date. This option results in most animals coming on heat during the first 12 days of mating. This treatment does not work in prepubertal heifers and non-cycling animals.

• **Double Why Wait:** Cows or heifers are observed for heat for 12–14 days before the Planned Start of Mating date. Those that show signs of heat are then injected with PG either 2 days before the Planned Start of Mating, or 5 days after Planned Start of Mating date, depending on when they were on heat. This option results in most animals coming on heat during the first 12 days of mating. This treatment does not work in prepubertal heifers and non-cycling animals.

• **Modified Why Wait:** Cows or heifers are heat detected and mated normally during the first 6 days of mating. Cows not seen on heat during this time are given a single injection of PG on day 6 or 7 of mating. This option results in most animals coming on heat during the first 12 days of mating. This treatment does not work in pre-pubertal heifers and non-cycling cows.

• **Aggressive PG:** All cows or heifers are treated with two injections about 12 days apart, with the second injection being 2 days before the Planned Start of Mating date. This option results in most cows coming on heat during the first 5–6 days of mating. This treatment is does not work in prepubertal and non-cycling cows.

Check treatment dates when planning your strategy with your vet. The interval between the two injections of PG in some of these options can be modified if required.

Observe treated animals for heat. Most animals that respond will be on heat 2–4 days after PG injection, but some will take up to 7 days to respond. Inseminate animals only after heat is detected.
2. **Intravaginal devices**

Intravaginal devices can be used in cows as well as heifers. The programmes involve a series of injections and intravaginal inserts. Programmes can be used concurrently with cycling and non-cycling cows but are likely to be most effective in cycling cows. This option is preferable to PG options if heifers are substantially below target liveweights at mating or a high proportion of the herd is not cycling.

All animals commence treatment 9 days before the Planned Start of Mating date, with most treated cows showing signs of heat over a 3-day period following the Planned Start of Mating date.

Check treatment dates when planning your strategy with your vet. Do not vary the treatment dates without discussing this with your vet.

Options are available to use fixed time insemination or insemination following detection of heat. While fixed time insemination options may reduce the time required for the programme and increase submission rates, the conception and pregnancy rates may be lower. For programmes using heat detection, most animals that respond will show heat over a 3-day period following the last treatment.

If treated cows are retreated/resynchronised, either ensure adequate numbers of bulls are running with the herd (pages 128-129), or recommence heat detection and AB for the 4 days following the resynchrony treatment when most of the cows that come back on heat are expected to do so.
3. ‘GPG’ (e.g. OvSynch®) for milking cows

A ‘GPG’ treatment, such as Ovsynch®, is a sequence of three-injections (GnRH, Prostaglandin, GnRH) with rigid time constraints for use in milking cows. It is not recommended for use with heifers.

Every cow is inseminated between 12 and 24 hours after the third injection, with no requirement for heat detection. The programme enables all cows to be inseminated on the first day of mating. The ‘GPG’ programme can be used concurrently with cycling and non-cycling cows but is likely to be most effective in cycling cows.

This system has no heat detection for the first insemination. Heat detection is required for subsequent inseminations. Relatively few cows display heat signs after treatment, minimising disruption.

If using a ‘GPG’ treatment during the mating period, be very careful NOT to include cows that have already been inseminated. The second injection (prostaglandin) will cause abortion if given to a cow in early pregnancy.
A6 Estimating herd reproductive performance

The most reliable method of estimating herd reproductive performance is to obtain an InCalf Fertility Focus report. It uses sophisticated calculation methods to give the best measures of reproductive performance. If it is not readily available, you will need to make your own estimate of your herd’s reproductive performance.

This appendix provides simple methods for estimating the reproductive performance of your herd. Because it uses simplified methods which are slightly less accurate, results calculated using these approaches may differ from those obtained on an InCalf Fertility Focus report.

Estimating reproductive performance using a calculator and discussing the outcomes is a good start.
Estimating herd reproductive performance

6-week in-calf rate

This is the best measure of overall herd reproductive performance. The actual 6-week-in-calf rate can only be calculated reliably if pregnancy testing is performed.

How to calculate

1. Select all cows that were present at Planned Start of Mating date. This is the total number of cows.
   - Include all cows calved before and during the mating period.
   - Exclude deaths and all cows that you did not intend to be mated.
2. Using early pregnancy testing results, count how many of these became pregnant in the first 6 weeks of mating. This is the number of cows pregnant in the first 6 weeks of mating.

   \[
   \text{6-week in-calf rate} = \frac{\text{no. cows pregnant in the first 6 weeks of mating}}{\text{total no. of cows}} \times 100
   \]

Empty rate

Tells you the percentage of non-pregnant cows at the end of mating.

This measure excludes the yearling replacement heifers. The empty rate for this group can be calculated in the same way, but consider it separately from the milking herd. Likewise, empty rate for any carryover cows should also be considered separately.

How to calculate

1. Select all cows that were present at Planned Start of Mating date. This is the total number of cows.
   - Include all cows calved before and during the mating period.
   - Exclude deaths and all cows that you did not intend to be mated.
2. From the results of pregnancy testing results, count how many of these did not become pregnant. This is the number of cows not pregnant.

   \[
   \text{Empty rate} = \frac{\text{no. cows not pregnant}}{\text{total no. of cows}} \times 100
   \]

Example

At the end of calving, the final count was 350 cows calved. We’ve just finished pregnancy testing and 255 were pregnant in the first 6 weeks. So:

\[
\frac{255 \times 100}{350} = 73\%
\]

I can check page 27 to see how I’m going.

Example

We finished pregnancy testing today and we ended up with 35 empties from 350 cows. So:

\[
\frac{35 \times 100}{350} = 10\%
\]

Check page 27 to analyse this result.
**3-week submission rate**

A good 3-week submission rate must be achieved if 6-week in-calf rates are to be good.

**How to calculate**

1. Select all cows that were present at Planned Start of Mating date. This is the total number of cows.
   - Include all cows calved before and during the mating period.
   - Exclude deaths and all cows you did not intend to be mated.

2. How many of these cows had at least 1 insemination or mating to a natural bull in the first 3 weeks of mating? This is the number of cows inseminated in first 3 weeks of mating.
   - Cows are only counted once. Don’t count how many inseminations were performed in the first 3 weeks as some cows may have had two inseminations in that period.

3-week submission rate =

\[
\frac{\text{no. cows inseminated in first 3 weeks of mating} \times 100}{\text{total no. of cows}}
\]

**Conception rate**

It will be difficult to achieve a good 6-week in-calf rate unless conception rate is satisfactory.

Conception rates can only be calculated reliably if regular pregnancy testing is performed.

See the following section on how to calculate the conception rate for your herd.

---

**Example**

We had 350 cows at the Planned Start of Mating. In the first 3 weeks, we’ve inseminated 275 cows. We had no hope of getting those late calvers mated. We’ll have to do better next year!

So:

\[
\frac{275 \times 100}{350} = 79\%
\]

I can check page 28 to see how I’m going.
**How to calculate your herd’s conception rate**

1. List inseminations and natural matings to bulls in the date order that they were performed, and which occurred at least 6 weeks before your latest pregnancy test visit.
   - An easy way to do this is to use your daily insemination records as shown on the following page.
   - Work back until you have at least 50 inseminations and services.

2. Record the conception date for each cow beside the insemination date.

3. Count the number of these inseminations and services. This is the number of inseminations.

4. Count the inseminations and services that resulted in a pregnancy. This is the number of inseminations that resulted in pregnancy.
   - Remember, for these inseminations the conception date will be the same day as the insemination date.

Conception rate =
\[
\frac{\text{no. of inseminations that resulted in pregnancy} \times 100}{\text{no. inseminations}}
\]

**Example**

My latest pregnancy test was 23 January. So, I will select all inseminations up to 12 December. This gives me 75 inseminations on the list; 39 of these inseminations resulted in a pregnancy:

\[
\frac{39 \times 100}{75} = 52\% \text{ of inseminations were successful}
\]

How well am I doing? Check pages 28 and 32.

---

Your herd improvement organisation can provide a ‘pregnancy test worksheet’ to assist during pregnancy testing. The worksheet shows the days or weeks since your cow’s most recent recorded mating. The vet’s predicted days or weeks pregnant can be recorded against that cow and entered into the database. An InCalf Fertility Focus report can then calculate your 6-week in-calf rate and empty rate.
Conception rate – this doesn’t look quite as easy as I thought it was. I have to get the pregnancy testing done before I can work this one out. So I start with my insemination record book.

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<th>Cow ID</th>
<th>Sire</th>
<th>Conception date (from preg. testing)</th>
<th>Tick if insemination date matches conception date</th>
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**Pre-mating cycling rate**

Top farmers achieve a pre-mating cycling rate of 85% by ensuring that well-reared heifers calve early, maintaining a compact calving, meeting condition score targets and efficient heat detection.

If your pre-mating cycling rate is less than 65%, you have a ‘non-cycling problem’. This could be a result of deficiencies in pre-mating heat detection (page 82) and/or the presence of too many genuine non-cyclers for reasons described on page 99.

**How to calculate pre-mating cycling rate**

1. Select all cows that were present at the Planned Start of Calving date, and exclude any deaths since calving. This is the total number of cows.

2. How many of these cows had at least one recorded pre-mating heat between calving and the Planned Start of Mating date? Cows are only counted once if they had more than one pre-mating heat.

\[
\text{Pre-mating cycling rate} = \frac{\text{no. cows observed on heat}}{\text{total no. of cows}} \times 100
\]

**Non-cycling rate (for early treatment option)**

You can calculate your herd non-cycling rate at any time relative to the Planned Start of Mating date. If opting for the recommended ‘early’ treatment option, then use the non-cycling rate at 7 to 10 days before the Planned Start of Mating date.

**Example**

We tail painted the whole herd of 350 cows 4 weeks before the start of AB, and recorded 250 cows with at least one recorded heat after 3 weeks.

\[
\frac{250 \times 100}{350} = 71\%
\]

The non-cycling rate is simply the reverse of cycling rate (i.e. 100% – 71% = 29% were non-cyclers.)

**Example**

We tail painted the whole herd of 350 cows 4 weeks before the start of AB, and identified 100 cows with no recorded heat by 1 week before Planned Start of Mating date.

\[
\frac{100 \times 100}{350} = 29\%
\]
**Example**

We presented 100 non-cyclers out of 350 cows to the vet after 3 weeks of pre-mating heats. The vet found 20 cows that had already cycled that we had not spotted. We decided to leave these untreated. That left 180 cows as genuine non-cyclers.

We chose to treat 50 of these right away ('early') so they would be inseminated in the first week of AB.

So:

\[
\frac{50 \times 100}{350} = 14\%
\]

We treated another group of 20 cows (6%) after 2 weeks of AB (late).

So:

\[
\frac{(50+20) \times 100}{350} = 20\%
\]

is 20% treated in total, with 14% being early-treated and 6% being late-treated.

---

**Non-cycling treatment rate**

Treated non-cyclers get in calf earlier, but not every non-cycler gets treated. Veterinary examination can determine the reproductive state and most appropriate action for individual cows.

Also treatments can occur at different times relative to the Planned Start of Mating date (page 100, 177).

- Early – treatment started before Planned Start of Mating.
- Late – treatment started within the first 3 weeks of mating.
- Very late – treatment started after end of week 3 of mating.
### Definition of terms

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<th>Description</th>
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<tr>
<td>3-week submission rate:</td>
<td>The percentage of cows that received at least one insemination or mating in the first 3 weeks of the mating period. <em>This measure must be high in order to achieve a high 6-week in-calf rate.</em></td>
</tr>
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<td>6-week in-calf rate:</td>
<td>The percentage of cows that became pregnant in the first 6 weeks of mating. <em>This is the best measure of overall herd reproductive performance.</em></td>
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<td>Abortion:</td>
<td>A loss of a pregnancy any time following a positive pregnancy test, or observation of a cow expelling uterine contents prior to normal length of pregnancy. May also be referred to as a ‘slip’.</td>
</tr>
<tr>
<td>AB (Artificial Breeding):</td>
<td>The breeding of specific superior dairy heifer replacements through mating cows to high genetic merit sires by artificial insemination (AI).</td>
</tr>
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<td>Adviser(s):</td>
<td>Professional or trusted people who can support you with the InCalf process (e.g. vets, breeding company rep’s, farm consultants, farm owner or mentor).</td>
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<tr>
<td>Anoestrus cow:</td>
<td>See Non-cyclers, non-cycling cows.</td>
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<tr>
<td>Body condition score:</td>
<td>The assessment of the amount of muscle and fat covering the bones of the cow, using specific points on the cow’s body.</td>
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<tr>
<td>BV (Breeding Value):</td>
<td>A comparative estimate of an animal’s genetic merit for individually measured traits.</td>
</tr>
<tr>
<td>BW (Breeding Worth):</td>
<td>An overall profit ranking for bulls and cows on their expected ability to breed replacements which will be efficient converters of feed into profit. It is used as a guide to making breeding decisions. BW estimates are comparable across herds, ages and breeds.</td>
</tr>
<tr>
<td>Calving pattern:</td>
<td>The percentage of calvings within a herd’s calving period that occur by week 3, week 6 and week 9 following the Planned Start of Calving (PSC) date.</td>
</tr>
<tr>
<td>Carryover cows:</td>
<td>Cows that are empty at the end of one mating period which are kept in the herd to be mated in a future mating period.</td>
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<tr>
<td>Conception rate:</td>
<td>The percentage of inseminations that resulted in a pregnancy as determined by pregnancy testing. <em>Taken alone, this measure does not describe overall herd reproductive performance, but a satisfactory conception rate is required to achieve a high 6-week in-calf rate.</em></td>
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<tr>
<td>Condition Scoring Made Easy:</td>
<td>A systematic approach to body condition scoring using a 10-point scale.</td>
</tr>
<tr>
<td>Crossbreeding:</td>
<td>The act of using a different sire breed for mating a cow, resulting in crossbred progeny that have mixed characteristics of the parent breeds, in addition to some hybrid vigour.</td>
</tr>
<tr>
<td>Drying off decision rules:</td>
<td>Prescribed thresholds for drying-off cows based on age, body condition score and time to next calving date. The rules ensure there is sufficient time to achieve condition score targets at calving.</td>
</tr>
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Early calved, mature cows: Cows that are 4 or more years of age at calving and that calved 8 or more weeks before the start of mating.

Empty cows: Cows determined by pregnancy test from 5 weeks after the end of mating to have failed to get in calf during the mating period.

Empty rate: The percentage of cows within a given mating group that failed to become pregnant by the end of a mating period. Can also be termed not-in-calf rate. *Taken alone, this is not a precise measure of overall herd reproductive performance in seasonal and split calving herds.*

‘Eye-o-meter’: An estimate by visual assessment.

Fertility for Life cycle: The path a female takes from her birth until she is culled from the herd. This starts with birth, then follows calf and heifer rearing, first mating, pregnancy and calving, followed by subsequent cycles of mating, pregnancy and calving until she is eventually culled.

First calver: A cow in her first lactation. Referred to as a ‘rising 3 year old’ later in that first lactation.

Genetic merit: Characteristics of an animal that are determined by its genes and not influenced by environmental or management factors. The genetic merit of an animal is determined by its parents and can be passed on to its offspring.

Heat (oestrus): The behavioural display by the cow to indicate the appropriate time for being mated. May also be referred to as ‘bulling’.

Heat cycle (oestrous cycle): The normal pattern of when cows show signs of heat. The typical interval between heats is 21 days, with the range being 18–24 days. Cows show signs of heat for between 2 and 28 hours, with an average of 14 hours.

Heat detection programme: A combination of routine tasks, detection aids and recording systems selected and applied by a farmer to effectively determine if and when a cow shows signs of heat.

Heat synchronisation: A procedure to aid herd management where cows or heifers are treated so that all or most come on to heat and may be inseminated within a short period.

Heifer: A female that has not yet calved. Heifer age groups are further defined as ‘heifer calves’ (less than a year old), and ‘yearling heifers’ (1-2 years old).

Hormonal intervention: Use of hormones to manipulate when a cows cycles and calves. See non-cycling treatment, heat synchronisation and induced calving.

Hybrid vigour: The additional improvement in the traits (e.g. fertility or milksolids production) of a crossbred cow above and beyond the expected performance of the sire and dam, which are of different breed types. Can also referred to as heterosis.

Inbreeding: The result of mating a cow or heifer with a closely related sire. Progeny can have congenital problems and perform poorer than expected given the genetic-merits of the sire and dam.
**InCalf Fertility Focus report:** A single-page summary of reproductive performance in your herd, which is available from your herd improvement recording service.

**InCalf Herd Assessment Pack tools:** A set of stand-alone worksheet calculators for assessing the key areas of reproductive management and prioritising for action.

**InCalf ‘process’:** The continuous improvement process of assessing your herd reproductive performance, identifying scope for improvement and associated benefits, considering options for change and implementing selected management options.

**In-calf rate:** See 6-week in-calf rate.

**Induced calving:** A hormonal intervention to induce a cow to calve at an earlier time than it would otherwise.

**Liveweight targets:** Specific weights of live cattle, at clearly identified ages, used to monitor the success of a heifer or bull rearing programme. The specific target weights will vary with ‘mature cow liveweight’ breed, sex and overall farm management objectives.

**Mature cow liveweight:** Liveweight that a cow achieves when fully matured.

**MJ ME/kg DM:** Megajoules of metabolisable energy per kilogram of dry matter of a feedstuff. One of the measures used to compare the nutritional value of feedstuffs.

**Natural mating:** The period of mating when bulls are run with the herd or heifer mob to mate any animals that come into heat.

**Non-cyclers, non-cycling cows:** Cows that have not yet started normal heat cycles after calving (as opposed to cows that are showing signs of heat but which have not been detected). These cows will not be detected on heat by paddock observation or the use of any heat detection aid.

**Non-cycling treatment:** A hormonal intervention to induce non-cyclers to start cycling at an earlier date than they would otherwise.

**Non-genetic characteristics:** Characteristics of an animal determined by environmental or management factors. These characteristics cannot be passed on to its offspring.

**Non-return rate (NRR):** The percentage of inseminations where the cow did not return to heat within 24 days after the insemination. A poor non-return rate provides an early warning that the conception rate is likely to be poor.

**Non-return rate (18-24 days):** A form of non-return rate used by breeding companies to monitor AB technician performance that excludes both short returns (<18 days) and long returns (>24 days).

**Oestrus:** See Heat.

**Phantom cow:** A cow that was assumed pregnant but later found to be empty. True phantoms do conceive but the embryo dies while the cow continues to ‘believe’ she’s pregnant. Cows can falsely appear to be phantoms when heat detection is inaccurate and poorly implemented as mating progresses.
Planned Start of Calving date (PSC): The date of the planned start of calving in a particular calving period.
(This is 282 days after this group’s previous Planned Start of Mating date).

Planned Start of Mating date (PSM): The first day of mating in a particular mating period.

Planned Start of Mating date for heifers: First day of mating for the yearling heifers.

Preferential feeding: Offering a daily feed allowance or diet to a specific group of animals, which is different (generally higher) in quantity and/or quality from that offered to the main herd.

Pregnancy test: A diagnostic test to check if a cow is pregnant, and possibly the date of conception and age of the pregnancy. Skilled operators examine uterine contents by manual palpation or ultrasonography.

Pre-mating cycling rate: The percentage of cows in the herd detected on heat before the Planned Start of Mating date (PSM).

Production worth (PW): A measure of the ability of the cow to convert feed into profit over her lifetime. PW is used for culling and buying decisions, and can be used to compare across different breeds and age groups.

Replacement heifers: A female that has not yet calved, but which has been reared or purchased in the anticipation that this animal will become a member of the milking herd.

Reproduction Management Plan: Your own documented plan for managing the ‘Fertility of Life cycle’ activities required for optimising herd fertility. The plan must at least describe what will be done, when and by whom? It may also include “what if” contingency options.

Submission rate: See 3-week submission rate.

Supplements: Any feed type provided to animals in addition to grazed pasture.

Targets: Median level of performance for various reproductive measures achieved by herds in the top quartile (best 25%) of the NZ Monitoring Fertility Report 2003.


Weigh bands: A device that measures girth width, from which liveweight is estimated based on known relationships between girth width and liveweight.

Yearlings, yearling heifers: Females that are 1 to 2 years old.
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Dairy cow fertility underpins the viability and productivity of every dairy business. InCalf Research involving nearly 40,000 dairy cows in more than 200 dairy herds across Australia clearly demonstrated the substantial potential to improve reproductive performance in most herds. New Zealand studies involving more than 50,000 cows in more than 200 seasonal calving herds, back up the findings of the Australian InCalf research.

For the first time, New Zealand dairy farmers now have an easy-to-use reference book covering the latest and most reliable information on dairy herd reproductive management.

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