



**InCalf book for
dairy farmers**
2nd edition 2017

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Foreword

The *InCalf book* (2nd edition) assists farmers and advisers to develop an effective, profitable strategy to achieve farm targets for herd reproduction whatever calving system is employed.

Incorporating the very latest science, tools, expert knowledge and on-farm experience, the *InCalf book* gives farmers the best available information they need to effectively manage reproduction and achieve their farm profit and business goals.

While the basic requirements for successful herd management have not changed greatly since the first edition of the *InCalf book* was published in 2003, farmers are now typically managing larger herds with lower inherent fertility.

The industry now has a range of excellent genetic selection and data analysis tools available to drive permanent and cumulative improvements in herd fertility, such as the Daughter Fertility Australian Breeding Value (ABV), however farmers still need to maintain focus on the other management drivers of herd fertility.

The *InCalf book* reflects advances in knowledge of key areas of reproductive management including synchrony programs, genetic selection, use of sexed semen, heifer rearing and measuring reproductive performance through Fertility Focus reports.

The technical review of this publication involved contributions from many industry experts including dairy reproduction and genetics researchers, farm consultants, extension providers, veterinarians, herd improvement and artificial breeding experts, along with a panel of experienced dairy farmers. The design of the book has also been updated to make it easier to use and ensure that it links more effectively to other industry tools and resources.

It is our hope that the *InCalf book* will assist farmers to better understand and prioritise herd fertility issues and implement sound management plans to optimise their herd reproductive performance.



Ian Halliday
Managing Director



01

Fertility for life

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Fertility management plan: a framework for control	6
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Overview

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

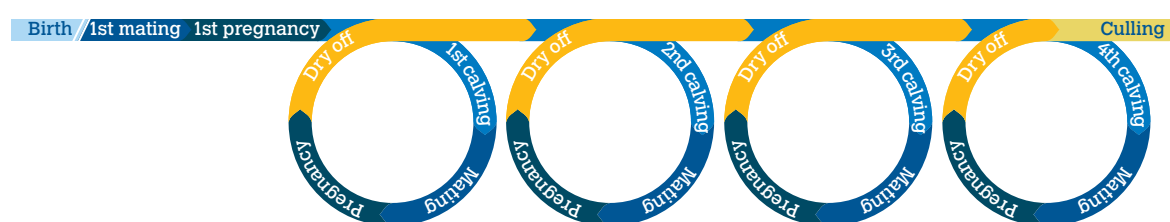
What you do each day of the heifer's life will determine how well she grows, if she is healthy at calving time, if she recovers before mating, if she is correctly detected on heat and mated, and if she conceives. The cycle then starts again.

Life cycle of a dairy cow

The ‘fertility for life’ cycle for an individual cow involves calf and heifer rearing; first mating, pregnancy and calving; subsequent cycles of mating, pregnancy, calving as a member of the milking herd and eventually culling. Success will require your attention throughout the cycle – and you will need to do this for every animal in the herd!

The stages in the life 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?



Questions for each part of the cycle

The InCalf book summarises considerations for each stage in the ‘fertility for life’ cycle. A fertility management plan for the life cycle of each animal will give you the best chance to achieve good herd reproductive performance.

When to ask what

Here are some of the questions to ask at each stage of the fertility for life cycle to help you achieve high reproductive performance.

Part	Questions
Calf and heifer rearing	<ul style="list-style-type: none"> › Are your heifers reaching the target live weights and frame sizes you have set for your farm?
Mating heifers for the first time	<ul style="list-style-type: none"> › Are the heifers big enough to be mated? › Do you start mating before the cows? › What bulls have you selected? › Are you going to synchronise the heifers? › How many bulls do you need?
First pregnancy	<ul style="list-style-type: none"> › What is your pregnancy testing strategy for heifers?
Calving heifers	<ul style="list-style-type: none"> › Are you minimising body condition losses after calving?
Calving cows	<ul style="list-style-type: none"> › Will they calve at body condition score 4.5–5.5? › How will you manage cows with health problems? › Is the diet sufficient? Is it balanced? › Are there too many late calvers?
Pre-mating and mating cows	<ul style="list-style-type: none"> › What is your heat detection strategy? › How will you deal with non-cyclers? › Have you checked your AI practices? › Are your AI facilities adequate?
Pregnancy	<ul style="list-style-type: none"> › Have you planned early (14 week pregnant) and follow-up pregnancy testing? Have you submitted your records to your herd improvement centre or adviser, or entered them into an InCalf-accredited software program so you can receive your <i>InCalf Fertility Focus</i> report?
Culling	<ul style="list-style-type: none"> › What cows will be culled?

Fertility management plan

A framework for control

Every farm is different, requiring its own Reproductive Management Plan. A Reproductive Management Plan revolves around the fertility cycle to optimise herd reproductive performance by getting sufficient cows pregnant at the right time for your farm.

Achieving the objective

The objective of all fertility management plans is to get every cow pregnant as soon as possible after the chosen time to start mating. The InCalf book and InCalf resources focus on the key areas.

The planning process

The planning process requires you to think about the different options and to decide which ones you wish to implement. You may need input from an adviser for your decision. This reference provides a framework to ensure that you do not forget any important tasks, and that your fertility management plan is complete. It includes tasks that will help you assess performance, and define and achieve your targets.

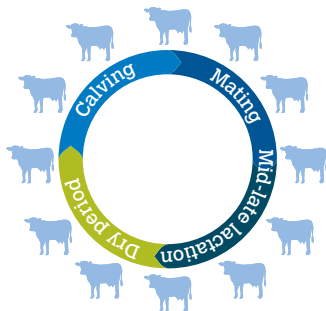
The framework

The basis of the framework is the fertility cycle of the cow. Start thinking about what needs to be done at each stage of the cycle. To get started, the framework in this chapter provides:

- › a **summary of the actions and options** at each stage of the fertility cycle
- › **useful index** for tracking down the information you need within the other chapters.

Year-round or seasonal/split?

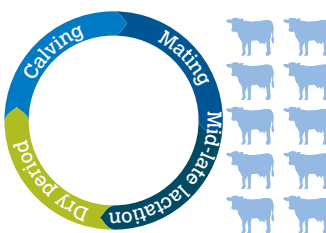
Year-round



Animals in all stages of the fertility cycle are present on the farm at any one time. The tasks in the framework must be scheduled for particular groups at particular times with daily and annual tasks.

The result will be a calendar of events for the year that schedules all tasks.

Seasonal/split



Cows in each calving group are in a similar stage of life. The Plan framework:

- › can be used to develop a fertility management plan for different times of the year
- › becomes a calendar of events for the season managing cows at different stages of the fertility cycle.

Calving systems

The key measures of success and your approach to improving herd reproductive performance will vary, depending on your calving system. The InCalf book covers these main calving systems:

- › year-round
- › split
- › seasonal.

Where the information is different between systems, you will be able to select the colour-coded panels that suit your farm.

Year-round calving herds

Split/seasonal calving herds

Note: The book does not aim to help you decide which calving system you should use in your herd. Rather, it will help you achieve optimal performance within the calving system you have chosen.

Describing the systems

Year-round

Generally, year-round herds calve for at least 10 months of the year. Batch calving systems that calve groups of cows in set months of the year across the year are a form of year-round calving.

Split calving

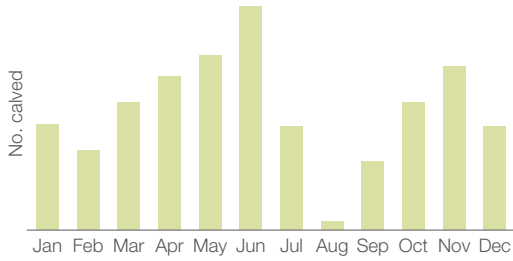
These herds calve in two or three distinct time periods each year. If two periods, usually spring and autumn.

Seasonal calving

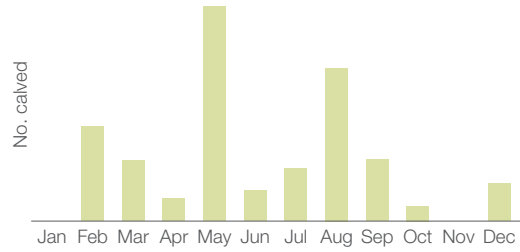
In seasonal calving herds, all cows calve in a single time period each year.

Illustrating the systems

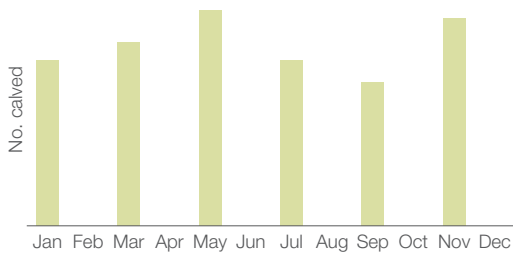
Year-round calving



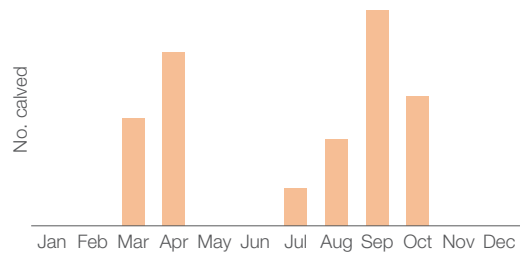
Year-round calving



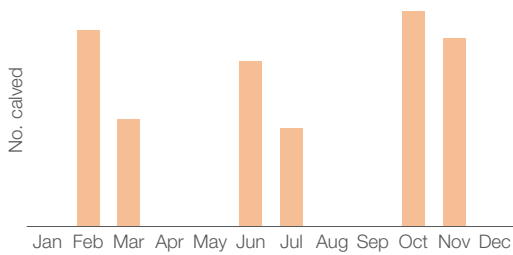
Year-round calving (batch calving)



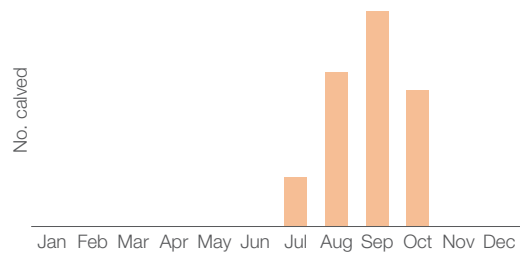
Split calving



Split calving



Seasonal calving



Benefits of improved fertility

Improved fertility gives you flexibility to better manage your dairy farm and your herd. You can choose your calving pattern and the best time to calve. As fertility declines you lose this ability. A fertile herd:

- › is more profitable
- › has better lifetime performance
- › is generally healthier and more productive
- › calves more easily and when you want them to calve
- › offers more opportunity to sell surplus animals or increase herd size, and
- › is more resilient, flexible, adaptable and responsive to management than less fertile herds.

InCalf tools enable you to estimate the economic benefits to be gained from improving your herd's reproductive performance.

How much is improved reproductive performance worth to you?

Improved performance can make a sizeable impact on your bottom line and simplify farm management. The value of these benefits depends on how much you increase your herd's reproductive performance.

See: To see what top farmers are achieving, and to decide if you have room for improvement in your herd, Chapter 3 Setting targets, page 23.

Benefits for each calving system

InCalf Resources can provide estimates of benefits from improved performance in key fertility management areas. Australian farmers have told InCalf why they value high herd reproductive performance.

Year-round

- › Fewer cows with long lactations due to late conception
- › Average days in milk not excessively long
- › Slightly reduced semen costs

Split

- › Fewer carryover cows
- › Compact calving within batches

Both year-round and split

- › Higher average daily milk production due to fewer low-producing, late-lactation cows
- › Fewer cows:
 - becoming excessively fat due to long lactations
 - with long dry periods because they were late to get in calf
 - sold as low-producers because they didn't get in calf in a reasonable time.

Seasonal

- › Fewer days feeding dry cows and observing cows for calving problems
- › More compact calving pattern with fewer late-calved and non-pregnant cows
- › Increased profit: earlier calved cows generate more milk income over feed costs than later calved cows
- › More cows getting in calf early in the AI period, providing more replacement heifers, or the potential for a shorter AI period

Split and seasonal

More AI heifers born early in the calving season:

- › streamlining calf rearing and heifer management
- › allowing farm workers to focus on other tasks, and
- › giving those heifers more opportunity to calve down early in the calving season at 24 months of age.

All methods

Fewer cows culled because of fertility issues allows increased culling of genuine low-producing cows, increases in herd size or a reduction in the number of heifer replacements required.

Where to start?

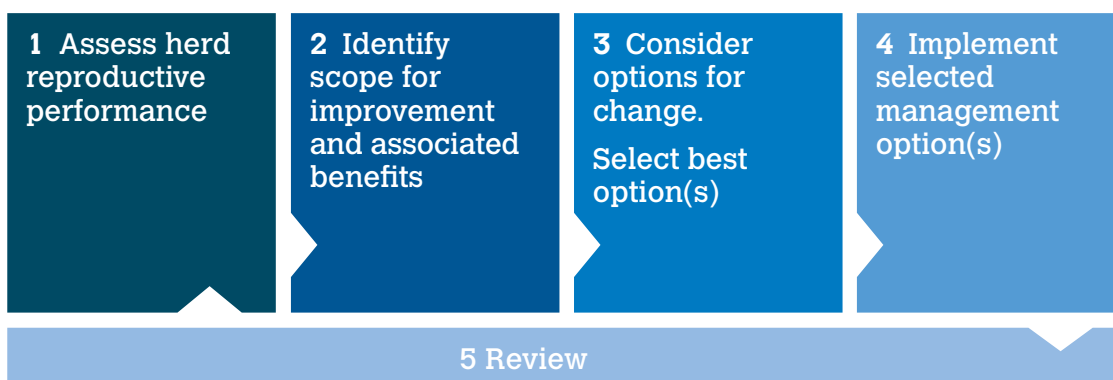
Managing the ‘fertility for life’ cycle for an individual cow is challenging.

Managing the ‘fertility for life’ cycle for a herd of individual cows is too complex to do without planning.

Process for improvement

This diagram illustrates stages in assessing through to improving your results.

Steps for making herd reproductive management decisions



What is high reproductive performance?

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, measure the percentage of cows in your herd that become pregnant quickly. Measurement and monitoring of performance is an important component of the management cycle. InCalf recommends some specific measures to describe herd reproductive performance.

See: Chapter 2 Measuring and Monitoring, page 13.

Thinking about change

Herd reproductive management has a significant impact on other areas of farm performance. The principles that support a well-managed reproductive program are consistent with other aspects of farm management.

- › **Small steps can make big gains.** A gain of 1–2% in many 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 but do take careful planning and attention to detail. Cutting corners and poor timing can delay or prevent improvements from occurring.
- › **Focus on the most limiting things.** Applying all of your effort on only one area will rarely provide a large improvement in herd performance if there are other areas also holding the herd back. You will make greater gains in herd performance when you work on all of the limiting areas together. It is better to make modest gains in each of them than to focus on achieving high performance in one area alone.
- › **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 assess performance and 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.

Importance of record keeping

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 and provide ideas for change, what to do and how to do it.

Use your network

There is a network of advisers from the veterinary, farm adviser, nutritional, agronomy, herd improvement and breeding fields that can help you to achieve your goals. Each adviser offers specific knowledge, skills and experience. It is important that you encourage any advisers that you may use to talk to each other about your farm's reproductive program and, when appropriate, to co-operate in its implementation.

Using the InCalf resources is a great way to get advisers talking. Using the recommended InCalf measures is important to ensure there is uniform understanding of farm performance.



Computerised herd records are easier to maintain, analyse and update. Involve all the team in keeping data up to date and in using the records to set and monitor targets.



02

Measuring and monitoring

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Overview

This chapter discusses

Measurement and monitoring systems.

Applying measurement and monitoring to:

- › assess performance, and
- › set achievable targets your herd and farm.

Key points

- › Effective managers measure and monitor performance.
- › You need to measure a few things in reproduction but you also must do this consistently, completely and regularly.
- › Don't just record data - use it to analyse performance. This will identify areas to focus upon.
- › Pregnancy testing is the most fundamental reproductive measurement.

What is meant by measuring and monitoring?

Reliable, accurate measures of herd reproductive performance offer both a starting point for identifying areas for improvement and provide a means of monitoring progress and effectiveness as you implement change.

Definition: measuring

Measuring is the process of assigning a number to show the size or amount of something. This could be the weight of animal or the number of heifers pregnant.

- › **Effective** measurement is the cornerstone of many trades and disciplines.
- › **Effective** measures have standards that define what, how and when you measure and how any derived value is calculated and standards allow measurements to be reliably repeated and compared.

Definition: monitoring

Monitoring is the process of regular measuring for checking the progress or quality of something over time.

- › **Monitoring** allows you to follow progress and to identify when something is not performing to expectations.
- › **Monitoring** systems require effective measurements that can be reliably repeated.

Example: You may monitor the proportion or number of empty cows in your herd each year.

Benefits of measurement

Effective measuring and monitoring of your herd's reproductive performance with the best measures and at the best times enable you to:

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

You can't manage what you don't measure.

Establishing a measurement and monitoring system

What you will need

Accurate measurement and monitoring of herd reproductive performance relies on:

- › good record keeping of all relevant reproductive data in an accurate, accessible, complete and timely manner starting with the birth of every calf and continuing till culling
- › a system for storing and accessing your records. For most this is a choice about the computer program to use. You need to consider how the program can be used on your farm (e.g. are mobile application versions available?) and if the software can easily exchange data with other industry programs
- › timely and accurate analysis of reproductive data so measures of reproductive performance can be calculated in a standard way and when needed
- › standard measures that are accurate and can be consistently calculated and compared year after year
- › updating staff and advisers and providing staff training sessions to ensure everyone knows:
 - what data is to be collected by whom, when and how it is collected
 - what data is to be analysed by whom, when and how it is analysed
 - refer to 'The People in Dairy' on the DA website for further information.

What exactly do I need to record?

The minimum information for effectively measuring herd reproductive performance is:

- › cow details: ID, date of birth, breed
- › calving details: ID, calf ID, date, assisted calvings, health problems
- › artificial inseminations: ID, date of insemination, technician, bull and any doubts about heat
- › pregnancy test results: ID, date of pregnancy test, test result, number of weeks pregnant or the service date she conceived to
- › cows culled or died: ID, date of culling or death, whether culled or died, and reason.

Important: With up-to-date data, all essential measures should be available in the timeliest manner possible.

Supporting information

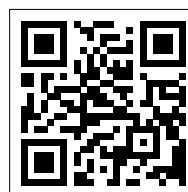
Other information that can assist in measuring herd reproductive performance includes:

- › natural matings: ID, date of service and bull identification
- › cow milk production from herd recording or inline metering
- › cow health events
- › young-stock weights.

Note: Your vet and herd improvement centre can help with recommendations for software or supplies of pocket books, wall charts, etc.

DataGene's HerdData app allows you to enter data and retrieve herd information on your Android or Apple smartphone or tablet while you are working with you herd.

See: datagene.com.au/HerdData to find out more about the HerdData app.



Measures of herd reproductive performance

Range of measures

You will need to use a range of measures to assess overall reproductive performance.

- › **Some:** give an overall picture of herd performance; others an insight to a particular component of reproductive performance.
- › **Some:** can be generated during mating; others are available only after mating has finished and pregnancy testing has been done.

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.

Recommendation

InCalf recommends specific measures be used to determine where your herd is at:

- › Year-round calving herds: 100-day in-calf rate and 200-day not-in-calf rate.
- › Seasonal calving herds: 6-week in-calf rate and the not-in-calf rate at the end of mating.
- › Split-calving herds: 6-week in-calf rate for each mating period and the not-in-calf rate after two mating periods.

Year-round performance measures	Seasonal/split performance measures
<p>For year-round calving herds, InCalf recommends the:</p> <ul style="list-style-type: none">› 100-day in-calf rate which tells you the percentage of cows in your herd that became pregnant within 100 days of calving. These cows will calve again within 12½ months of their last calving.› 200-day not-in-calf rate tells you the percentage of cows that have failed to become pregnant by 200 days after calving. These cows will not calve until at least 16 months after their last calving. Some will never become pregnant.	<p>Seasonal</p> <p>For seasonal calving herds, InCalf recommends the</p> <ul style="list-style-type: none">› 6-week in-calf rate which 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. If artificial insemination (AI) is used for the first 3–6 weeks of the mating period, many or all of these cows will be pregnant to an AI sire.› not-in-calf rate at the end of mating tells you the percentage of the herd that failed to become pregnant during both the AI and bull mating periods. <hr/> <p>Split</p> <p>For split calving herds, InCalf recommends the</p> <ul style="list-style-type: none">› 6-week in-calf rate for each mating period› the not-in-calf rate after two mating periods, cows not in calf after two consecutive mating periods are likely to be sold due to low production following a prolonged lactation.

Three levels of measures

There are three levels of measures:

- 1.in-calf rates
- 2.drivers of in-calf rates, and
- 3.key indicators to areas for improvement.

In-calf rates

The **in-calf rates** describe the rate at which cows get pregnant once mating begins and the number that remain non-pregnant at the end of mating. These are the 2 key measures of overall reproductive performance which apply to a year-round or a seasonal/split calving herd.

Year-round calving herd	Seasonal/split calving herd
100-day in-calf rate	6-week in-calf rate
200-day not-in calf-rate	End-of-mating not-in-calf rate

Drivers of in-calf rates

The two drivers of the 6-week/100-day in-calf rate are submission rate and conception rate. They provide you with insights into mating performance.

Year-round	Seasonal/split
80-day submission rate	3-week submission rate
AI conception rate	AI conception rate

Why it matters

It is impossible to achieve high in-calf rates without good performance in both drivers of in-calf rates – you must have both a high submission rate and an acceptable AI conception rate. The submission rate is available sooner than in-calf rates, so can be useful for identify problems during current mating.

Measuring and monitoring both in-calf rates and the drivers of in-calf rates are necessary for effective reproductive management.

Key indicators to areas for improvement

The **key indicators to areas for improvement** are detailed measures available to assess performance in specific fertility management areas. Typically, they are a comparison of measurements between subsets of animals in your herd (e.g. first-calved heifers and mature cows) or against set industry targets (e.g. heifer weight at mating).

Examples

- › The submission rate in long-calved mature cows is a good indicator of heat detection efficiency because most of these cows will be cycling
- › Comparison of AI technician or bull conception rates can identify if individual bulls or technicians underperformed or if there is a herd-level problem in conceptions, and
- › The ratio of first calver to mature cow milk production can provide a good indicator of the effectiveness of young-stock management and growth.

In-calf rates and their drivers

The actual measures used differ between year-round and split and seasonal calving herds but provide similar types of information.

Key points

- › Have good cow IDs
- › Record heats and services
- › Undertake early and follow-up pregnancy testing

These steps produce accurate in-calf rates and useful information to identify and investigate problems.

Year-round calving measures

100-day in-calf rate

The 100-day in-calf rate tells you the percentage of cows in your herd that became pregnant within 100 days of calving. These cows will calve again within 12½ months of their last calving.

Meaning

A high 100-day in-calf rate requires many cows to become pregnant in the period shortly after calving when fertility can be compromised. A high 100-day in-calf rate provides for lower average days in milk and higher average milk production. Few cows have overly-long dry periods making it easier to manage body condition score across late lactation. A low 100-day in-calf rate can have multiple causes and further investigation is required.

Using the measure

Actual 100-day in-calf rate can only be calculated with regular early pregnancy testing (<14 weeks pregnant). The 100-day in-calf rate can only include cows that have calved 100 days or more at the time of the report. If used alone the 100-day in-calf rate will not detect a problem in current mating performance for at least another 100 days.

200-day not-in-calf rate

The 200-day not-in-calf rate tells you the percentage of cows not pregnant 200 days after calving. These cows will not calve until at least 16 months after their last calving. Some will never become pregnant.

Meaning

A high 200-day not-in-calf rate can also be due to multiple causes and should be investigated further.

A low 200-day not-in-calf rate reduces the number of involuntary culls, supports increased voluntary culling and reduces the number of heifers required.

Differences in relative performance between the 100-day in-calf rate and the 200-day not-in-calf rate can provide insight into reproductive performance in long-calved cows and herd bull performance.

Using the measure

The 200-day not-in-calf rate can only be calculated if whole herd pregnancy testing is done and is not available until many months after calving because cows have to be calved after at least 230–250 days to make the calculation.

Many year-round herds also seek to control the number of cows calving in each period in order to best manage milk production for the farm. The 100-day in-calf and 200-day not-in-calf rate can also help estimate total numbers of calvings in future periods.

Drivers of in-calf rates: 80-day submission rate

The 80-day submission rate is the percentage of cows inseminated or served by 80 days after calving. This must be good if 100-day in-calf rates are to be high.

Conception rate

Conception rate is the percentage of inseminations resulting in a positive pregnancy test. It will be difficult to achieve a good 100-day in-calf rate unless the conception rate is at least moderately good. An accurate conception rate can only be calculated if early pregnancy testing is undertaken.

The non-return rate can be used as an early-warning system for conception rate problems but it is not sufficiently accurate or reliable to substitute for a conception rate generated using early pregnancy testing.

Using the measure

In year-round calving herds, the key measures should be calculated:

- › at least every month in herds of more than 250 cows, and
- › quarterly in smaller herds.

You need enough cows for each calculation in smaller herds you may need to use data from the last 1–3 months.

Seasonal/split calving measures

For split-calving herds both primary measures are calculated for each individual mating period

6-week in-calf rate

The 6-week in-calf rate is the percentage of cows that became pregnant in the first 6 weeks of the mating period. These cows will calve early in the calving period next year. Where artificial insemination (AI) is used for the first 3–6 weeks of the mating period, many or all of these cows will be pregnant to an AI sire.

Meaning

A high 6-week in-calf rate requires many cows to become pregnant in the period shortly after calving when fertility can be compromised. A low six-week in-calf rate can have multiple causes and further investigation is required.

Using the measure

A high 6-week in-calf rate provides for a more compact calving pattern and increased milk production from pasture. There are more replacements and increased opportunity for voluntary culling of underperforming cows.

Early rectal pregnancy testing (between week 11–13 of mating) provides the most accurate measurement of 6-week in-calf rate.

End-of-mating not-in-calf rate

The not-in-calf rate at the end of mating is the percentage of cows that failed to become pregnant during both the AI and bull mating periods.

Meaning

The final rate will depend upon the duration of mating. A higher than expected not-in-calf rate can also be due to multiple causes and should be investigated further. Differences in relative performance between the six-week in-calf rate and the end-of-mating not-in-calf rate can provide insight into reproductive performance in long-calved cows and/or herd bull performance.

Using the measure

The end-of-mating not-in-calf rate requires pregnancy testing after the end of mating. End-of-mating not-in-calf 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 measure overall herd performance.

A low end-of-mating not-in-calf rate provides for fewer involuntary culls and reduces requirements for replacements. Increased voluntary culling can occur.

For split calving herds, InCalf also recommends the not-in-calf rate after two mating periods. Cows not in-calf after their second consecutive mating period are more likely to be sold due to low production following a prolonged lactation.

Drivers of in-calf rates

3-week submission rate

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

Depending on the causes of the poor submission rate, immediate corrective action may be possible – this is why timely recording and analysis of submissions is important. You can examine your heat detection and/or plan a synchrony program if you are still mating cows when you detect the problem.

10-day submission rate

The 10-day submission rate is an early warning that the 3-week submission rate may be low. It is the percentage of non-pregnant cows that were submitted for mating in the first 10 days of mating. Again, timely recording and analysis of submissions can allow problems to be identified and potentially fixed whilst AI is continuing.

Depending on the causes of the poor submission rate, immediate corrective action may be possible. You should examine your heat detection management and may consider synchrony program management options for cows not detected on heat.

Conception rate

Conception rate is the percentage of inseminations resulting in a positive pregnancy test. It is difficult to achieve a good 6-week in-calf rate unless the conception rate is acceptable. An accurate conception rate can only be calculated if early pregnancy testing is undertaken.

The non-return rate is an early-warning for conception rate problems but it is not sufficiently accurate or reliable to substitute for a conception rate generated using early pregnancy testing.

An effective measurement system is in place if you can consistently generate measures of in-calf rates and drivers of in-calf rates for your herd at the earliest possible opportunity.

Recommended measurement and monitoring approach

Ensure you have a measurement and monitoring system in place to record all the information required to allow you to calculate in-calf rates, their drivers, and key indicators to areas for improvements for your herd. Also:

- › choose and implement a pregnancy testing strategy that meets these requirements
- › regularly obtain reproductive performance measures for your herd. The best way to do this is having cow information entered into InCalf-accredited herd management software and printing an *InCalf Fertility Focus Report* (FFR)
- › compare your herd's results to industry targets, your herd's past performance and the performance of similar herds, and
- › if any of these measures indicate a decline in performance, investigate, seeking assistance from an adviser to review herd management.

Fertility Focus Report (FFR)

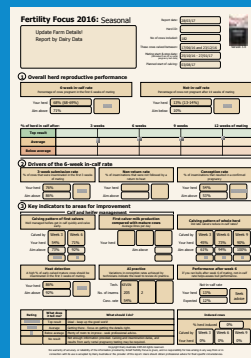
The *InCalf Fertility Focus Report* (FFR) is an annual report of past herd reproductive performance. A FFR describes your herd's reproductive performance focusing on in-calf rates and the drivers of in-calf rates.

Generating Fertility Focus Reports on a regular basis enables you to monitor herd performance and compare it to preceding years and industry targets using standard measures and calculation methods. The Fertility Focus Report can help you see the gains that you have made resulting from implementing your reproduction management plan. Request a FFR at least once per year as part of your assessment process.

Features of the report

The *InCalf Fertility Focus Report* is special for several reasons:

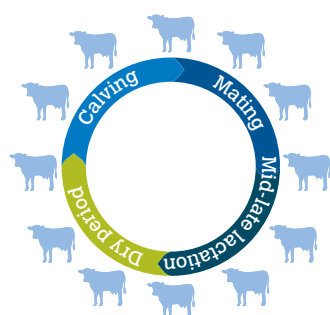
- › it enables standardised reporting of reproductive performance across Australia
- › it uses sophisticated techniques to analyse reproductive performance
- › it customises the report for each herd depending on the herd's calving system
- › analysis is customised for seasonal, split calving, and year-round calving herds
- › it can provide useful analysis of herd performance with data of variable quality
- › the best analysis is produced when the software has access to accurate records of all calvings, matings, and pregnancy tests, and
- › the system can provide basic results for herds with only calving dates recorded.



The *InCalf Fertility Focus* report provides your herd's drivers of overall performance and key indicators. Taken together the FFR provides a measurement of and insight into key aspects of herd reproductive performance. Obtain this report from participating herd improvement centres, herd management advisers or InCalf-accredited herd management software packages.

Measurement and monitoring challenges

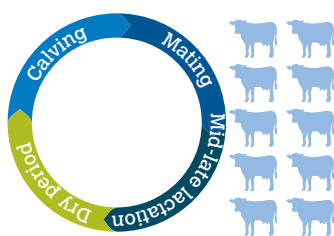
Year-round



For year-round herds, cows in all stages of the fertility cycle can be present on the farm at any one time. Year-round herds:

- › apply all aspects of their reproductive management plan to individual cows across the year
- › must manage individual cows at different stages of the fertility cycle at the same time – a calendar-based approach cannot be used
- › need to monitor and analyse current performance and adjust management constantly. Year-round herds typically place an emphasis on monitoring the drivers of performance.

Seasonal/split



For seasonal/split calving herds, cows in each calving group are in a similar stage of the fertility cycle. There are periods of the year when mating occurs intensively and periods when it does not occur at all. Seasonal and split calving herds:

- › apply phases of their reproductive management plan to groups of cows at different times of the year
- › use a calendar of events to manage groups of cows at different stages of the fertility cycle
- › have intense periods of mating, pregnancy testing and calving activity with periods of inactivity in between. These quiet periods can be used to analyse performance and to adjust management.

Is she pregnant ... or not?

The primary objective of mating is to get cows pregnant. Pregnancy testing is a key measurement activity for determining herd performance. Timely pregnancy testing allows you to calculate in-calf and conception rates and is one of the most important things to include in your plan.

Using return to heat to measure pregnancy

The non-return rate tells you the percentage of cows that were mated more than 24 days ago and have not been detected on heat since.

The non-return to heat rate (shortened to non-return rate) can be a good early indicator of the underlying conception rate but it is not accurate enough to confirm pregnancy in individual cows. Some – but not all – non-returns will be pregnant because after insemination some cows will:

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

Conception vs. non-return rate

Conception rate is typically about 10 percentage points lower than non-return rate in your herd – but can be as much as 20 percentage points lower than the non-return rate. Whilst they are too unreliable to estimate the conception rate they do provide an early warning system for conception failure. Alarm bells should ring if the non-return rate is less than 60%. Early pregnancy testing with foetal aging to identify conception dates is an essential measurement for effective reproductive management.

Why use a 'non-return rate'?

Non-return rates give an estimate of conception rate, and:

- › don't require pregnancy testing, only good heat detection
- › are available 11–18 days earlier than conception rates in seasonal/split calving herds, and
- › give an earlier indication of the success of the AI program.

Conception rate is about confirmed pregnancy. Non-return rate is about the 'non-return' to heat!



03

Setting targets

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Industry targets: seasonal/split herds	26
Setting achievable targets for my herd	28



Overview

It is important to set realistic objectives and know how to use your measurement and monitoring system to assess the performance of your herd. This will help you as you apply and adapt your reproductive management plan for your farm.

This chapter discusses

- › the reproductive performance that can and is being achieved by Australian farmers
- › industry performance targets and triggers, and
- › how targets and triggers can be used to identify areas for attention in your reproductive management plan.

Key points

Reproductive performance is too hard to manage without good records.

Good records help you:

- › to identify weak points in your system
- › make meaningful comparisons to others
- › set realistic targets for next mating.



Setting and using targets and triggers

The InCalf book provides you with industry-level targets to strive for in:

- › year-round herds, Year-round calving measures, page 24, and
- › split and seasonal herds, Seasonal/split calving measures, page 26.

Targets

The targets describe the results achieved by the top 25% of farmers during the InCalf research project, based on 6-week or 100-day in-calf rate. These targets remain realistic because many Australian herds continue to meet or exceed the targets.

Triggers

Triggers are provided to prompt you to investigate a result further. These triggers mark the performance level at which 50% of farmers in the InCalf research project managed to achieve a better result.

Using these targets and triggers

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.

Industry targets

year-round calving herds

So, I want a high 100-day-in-calf rate and a low 200-day not-in-calf rate

What is so good about a 100-day in-calf rate?

The 100-day in-calf rate is the best overall measure of reproductive performance because it is linked to farm profitability. Compared to cows that take a long time or fail to conceive, cows that conceive within 100 days of calving:

- › will calve again within 12½ months, and
- › generate higher profits.

Result: High 100-day in-calf rates = fewer cows with long calving intervals or culled as empty.

What to measure

For a good 100-day in-calf rate in year-round herds, you need to achieve:

- › a good 80-day submission rate, and
- › an acceptable conception rate.

100-day in-calf rate

The 100-day in-calf rate is the percentage of cows pregnant by 100 days after calving. Actual 100-day in-calf rate can only be calculated with regular pregnancy testing.

- ✓ Top farmers achieve 100-day in-calf rates of around 58%
- × If less than 45%, seek advice

200-day not-in-calf rate

The 200-day not-in-calf rate is the percentage of cows not pregnant by 200 days after calving. This is not available until many months after calving because cows have to be calved after at least 230–250 days to make the calculation. It is less useful for determining reproductive performance in recent months.

- ✓ Top farmers achieve 200-day not-in-calf rates of around 13%
- × If more than 19%, seek advice

The 200-day not-in-calf rate can only be calculated if whole herd pregnancy testing is done.

Drivers of in-calf rates

80-day submission rate

The 80-day submission rate is the percentage of cows inseminated or served by 80 days after calving. Must be good if 100-day in-calf rates are to be good.

- ✓ Top farmers achieve 80-day submission rate of about 73%
- × If less than 61%, seek advice

Conception rate

Conception rate is the percentage of successful inseminations resulting in a positive pregnancy test. It will be difficult to achieve a good 100-day in-calf rate unless conception rate is acceptable - but remember this is only an estimate.

- ✓ Top farmers achieve conception rates of about 51%
- × If less than 43%, seek advice

The non-return rate can be used to estimate conception rate.

Identifying problems early

In year-round calving herds, these key measures should be calculated:

- › at least every month in herds of more than 250 cows, and
- › quarterly in smaller herds.

Measure	What this tells you	Keep in mind	Performance	
			× Seek help	✓ Top farmers achieve
Overall herd performance				
100-day in-calf rate	% cows pregnant by 100 days after calving.	Best measure of overall herd reproductive performance.	Less than 45%	58%
200-day in-calf rate	% cows pregnant by 200 days after calving.	Not available until months after calving.	More than 19%	51%
Drivers of in-calf rates				
80-day submission rate	% cows inseminated or served by 80 days after calving.	Must be high if 100-day in-calf rate is to be good.	Less than 61%	73%
Conception rate	% inseminations that resulted in a positive pregnancy test.	Difficult to achieve a good 100-day in-calf rate unless conception rate is good. Regular pregnancy testing required to calculate.	Less than 43%	51%

The *InCalf Fertility Focus* report calculates the 100-day in-calf rate from early rectal pregnancy testing results. If these are not available, the report will only provide an estimate of the 100-day in-calf rate. Plan early pregnancy testing so you can calculate this measure.

Industry targets seasonal/split herds

What to measure

To assess overall herd reproductive performance, use both the 6 week in-calf rate and the not-in-calf rate. You need to achieve good 3-week submission and conception rates to achieve a good 6-week in-calf rate.

6-week in-calf rate

The 6-week in-calf rate is the percentage of cows pregnant in the first 6 weeks of the mating period.

- ✓ Top farmers can achieve a 6-week in-calf rate of around 71%
- ✗ If less than 60%, seek advice

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

Not-in-calf rate

The not-in-calf rate is the percentage of cows not pregnant at the end of mating. It requires pregnancy testing after the end of mating and cannot be calculated before then. Not-in-calf 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.

Assessing the not in calf rate

To assess the not-in-calf rate, take into account the length of the herd's mating period.

- › Select your herd's length of mating and check the not-in-calf rate at which to seek professional advice
- › For split calving herds, calculate the combined length of the herd's last two mating periods and compare the not-in-calf rate after two mating periods with these results
- › Only compare not-in-calf rates between herds at the same time-point of mating

Not-in-calf rate triggers and targets for mating periods of different lengths

Length of mating	Seek help	Top farmers achieve about
6 weeks	More than 40%	29%
9 weeks	More than 28%	20%
12 weeks	More than 21%	13%
15 weeks	More than 17%	10%

Assessing overall herd reproductive performance

To assess overall reproductive performance, you need both the 6-week in-calf rate and the not-in-calf rate.

The *InCalf Fertility Focus* report calculates the 6-week in-calf rate from early rectal pregnancy testing results. If these are not available, the report can provide an estimate of the 6-week in-calf rate.

Identifying problems early

Use this table to assess your results.

Measure	What this tells you	Keep in mind...	Performance	
			× Seek help	✓ Top farmers achieve
Overall herd performance				
6-week in-calf rate	% cows pregnant in the first 6 weeks of mating.	6-week in-calf rate and not in-calf rate are needed.	Less than 60%	71%
Not-in-calf rate (seasonal calving herds only)	% cows not pregnant after the end of mating.	6-week in-calf rate and not in-calf rate are needed.	More than 8%	Less than 5%
Not-in-calf rate after two mating periods (split-calving periods herd only)	% cows not pregnant after two successive mating.	Indicates a large problem if many cows are still not pregnant after two mating periods and a long break between.	More than 8%	Less than 5%
Drivers of 6 week in-calf rates				
10-day submission rate	% cows inseminated or served by 80 days after calving.	Must be high if 100-day in-calf rate is to be good.	Less than 36%	41% Assuming: No heat synchronisation or treatment of non-cycling cows before day 10 of mating.
3-week submission rate	% cows inseminated or served in the first 3 weeks of the mating period.	This must be good if 6-week in-calf rates are to be good.	Less than 75%	86%
Conception rate	% successful inseminations resulting in a positive pregnancy test.	Difficult to achieve a good 6-week in-calf rate unless conception rate is at least moderately good.	Less than 49%	53%

Can I get a 6-week in-calf rate if I don't have AI dates and haven't pregnancy tested?

You can get an estimate of your herd's 6-week in-calf rate, even if you haven't recorded matings and early rectal pregnancy tests. 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.

You will need to have calving date records and identities of any cows whose calvings were induced entered into InCalf-accredited software or provide them to your herd improvement centre or adviser. Then you will be able to obtain an *InCalf Fertility Focus* report which will provide you with this estimate.

Recommendation: It is much more accurate if you record AI dates and use early pregnancy testing. Your more accurate estimate can be used reliably to monitor progress of your herd across seasons.

Estimate example: estimating the 3-week submission rate

$$\text{3-week submission rate} = \frac{\text{Number of cows inseminated in first 3 weeks of mating} \times 100}{\text{Number of cows not-pregnant at Mating Start Date}}$$

- › Select all cows that were not pregnant on Mating Start Date, the number of non-pregnant cows
- › Count how many of these had at least one service in the first three weeks of mating
- › Only count cows once. Do not count the number of inseminations that were performed in the first 3 weeks – some cows may have two inseminations in that period.

Note: You will obtain a more accurate submission rate for your herd by obtaining an *InCalf Fertility Focus* Report.

Setting achievable targets for my herd

After you have evaluated your current level of herd reproductive performance, and considered the InCalf achievable targets, select your own target for each measure of reproductive performance:

- › If you are already at the achievable target, is it economically viable to set an even higher target?
- › If you are far from the achievable target, consider taking small steps towards improvement by setting a slightly easier target.

Review and plan

Discuss your results and your proposed targets with your farm team and advisers so they can assist you in achieving them. Plan to review your progress and your targets regularly to make sure you are making timely decisions and good progress.

Revising targets

Targets need to be revised as they are achieved or as the farm situation changes. For example, the introduction of a modified heat detection program may increase the success of mating. You may need to revise your future targets as you continue to improve herd reproductive performance:

- › Use consistent and accurate measures require good record keeping.
- › Use the standard measures described in this book so you can compare your herd between years and to what is possible.
- › Regularly check your performance against the targets.
- › Act when you see that you have not met your targets. If you use an adviser strongly encourage them to use InCalf recommended measures and guidelines when calculating and communication reproductive performance of your herd.

Year-round calving herd example

What would be a reasonable target for the 100-day in-calf rate by next year?

If your 100-day in-calf rate is 48%, it would be a big jump to get to 58% in one year. If you are only at 48%, you could aim to get just above 50% by next year. Pin the targets up to remind you. Monitor performance for periods less than a year (e.g. three months) to assess progress – if you have at least 100 cows available for the calculation. This minimum number is necessary to provide sufficient accuracy.

This year		Next year's target	
100-day in-calf rate	48%	100-day in-calf rate	53%
200-day not-in calf-rate	18%	200-day not-in calf-rate	15%

Seasonal/split calving herd example

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

If you have seasonal calvers with a 6-week in-calf rate of only 55%, it would be a big jump to get to 71% in one year. If you are only at 55%, aim to get just above 60% next year. Pin the targets up to remind you.

This year		Next year's target	
6-week in-calf rate	55%	6-week in-calf rate	63%
Not-in-calf rate	18%	Not-in-calf rate	15%

04

Acting on priorities

Setting priorities

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A Calf and heifer management	31
B Body condition and nutrition	53
C Heat detection	71
D Genetics, sires, mating strategies and artificial insemination	95
E Bull management	113
F Cow health	125

Overview

The birth of a heifer is the start of the journey. She needs to grow effectively to perform well as a milking cow. Her nutrition and body condition management through life strongly determine her production and reproductive performance. Her health at and after calving also are important. You need to manage each of these to get cows cycling when you want to mate them. You will also need to implement effective heat detection and good AI technique to get cows pregnant. If you use suitable genetics you ensure there is a cycle of continuous improvement in your calf crop. Managing the herd bulls and controlling bull mating is also necessary to catch those straggler cows not pregnant to AI.

The relationship between each of these components is complicated and this can make it difficult to identify which parts may be holding you back. The good news is that each part can be readily understood and effectively managed individually. They can also be monitored in isolation.

This section describes the essentials of each component and how to measure and monitor performance. Remember that you will need to work on each component if your herd is to achieve their best result.

Key points

Almost everything you do will affect reproductive performance.

Some of the most important influences happen outside the mating period!
Make sure you:

- › grow good young stock
- › effectively manage the nutrition of the herd.

Focusing on detail during mating will help you get cows mated and pregnant.
This means good:

- › heat detection
- › AI technique
- › bull management.

There are few days in a year when you can't influence reproduction!

Setting priorities

Some things are more important than others

You control many management areas that affect herd reproductive performance. Your herd will achieve high levels of reproductive performance if you make the best possible management decisions.

Key fertility management areas

InCalf research has clearly identified the key fertility management areas that must be successfully managed for good reproductive performance. These areas are:

- › Calf and heifer management
- › Body condition and nutrition
- › Heat detection
- › Sire selection
- › AI practices
- › Bull management
- › Cow health.

Getting results

To achieve good reproductive performance, changes in several areas may be necessary. However, not all these areas are of equal importance – some will be limiting your herd's reproductive performance more than others and these may be different from other herds in your district. You need to identify and prioritise, putting your effort and resources into the areas contributing most to improved herd reproductive performance rather than areas you find easiest to manage or in which you have the most interest or skill.

Put the key things first

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

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

Which option to implement

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. The key messages in this section of The InCalf book are:

- › don't get caught with light heifers
- › feeding affects body condition and condition affects fertility
- › strive to continually improve your heat detection performance
- › deal proactively with any non-cycling problems
- › select the most suitable genetics for your herd
- › organise well for AI
- › make sure you've got a good bull team for natural mating, and
- › healthy cows are more fertile.

“I wasted years striving to reduce my cow health problems at calving, convinced these were holding back my herd’s reproductive performance, when I should have spent more time focusing on heat detection and heifer rearing as these were really holding me back!”

Special circumstances

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 may need to work with specialist advisers (e.g. vets, nutritionists) to determine if there is an problem on your farm.

Treating reproductive disorders

There are many forms of treatment available for use in cows with reproductive disorders or to synchronise heats. These therapies and approaches can be used to streamline labour requirements in some herds and can help improve reproductive performance. However, they do not provide a magic answer to overcome problems arising within the key fertility management areas. You are best to control these by working on the fundamental cause of the problem. The InCalf book can help you to address problems in these root cause areas.

Points to remember

- › Small steps can make big gains
- › Detail can make the difference
- › Try to focus on the most limiting things
- › Record keeping makes for easier management
- › Good results require a team effort and good communication

Section A Calf and heifer management

Heifer liveweights at mating and calving have a big impact on herd reproductive performance. Calves and heifers reared to achieve mating and calving liveweight and height-for-age targets are much more likely to:

- › cycle
- › conceive
- › calve without delay, and
- › milk well as first calvers then succeed in getting back in calf early in the next mating period.

Well grown heifers also produce more milk in their first and subsequent lactations, compete better with mature cows and can survive longer in the milking herd than poorly grown animals.

In this section

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Maximising your heifers' potential	32
Setting mature heifer growth targets	34
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Young-stock rearing strategy checklist	39
Rearing calves from birth to weaning	40
Colostrum – the essential starter for calves	42
Feeding unweaned calves and weaning calves	46
Growing heifers from weaning to mating	48
Growing heifers from mating to calving	51

Key points

- › Ensure every calf receives adequate high-quality colostrum.
- › Know the growth targets you need to achieve in the young stock at each age.
- › Commit to monitoring growth and adjusting diets to make sure you hit the growth targets.
- › Carefully plan the yearling mating program so they calve easily and at the right time for the herd.

Maximising your heifers' potential

Importance of skeletal growth

Heifer growth is not only about liveweight gain – it is also about skeletal development. Most skeletal growth occurs during the first year of life whereas more weight is put on (the larger frame) in the second year of life.

Heifers require good nutrition and management across both years of life to reach their potential as adults. Every extra kilogram of body weight and centimetre of height at first calving promotes better lifelong:

- › reproductive performance, and
- › milk production.

Managing the heifer journey

Having an effective system to grow heifers is the best way to protect your investment. This requires setting:

- › a growth target at first calving for your heifers, and
- › intermediate growth targets along the way so you can keep them on track.

You need to weigh and measure the height of your heifers regularly so you can give them effective supplementary feeding as required.

Your investment

Heifers leave a big investment of your time and money. They need to get pregnant, calve and milk well – and then keep getting pregnant in order to pay back their costs and provide a return on your investment. A heifer that does not give you a second lactation simply will not pay back her rearing costs – you cannot afford to have too many heifers fail.

Doing a good job of rearing calves from birth to weaning and growing heifers from weaning to mating will help you to meet your pre-calving targets. This gives them the best chance of calving successfully, falling pregnant again soon after calving and lactating to their potential. This approach will maximise other returns from your investment in young-stock.

Other resources

The Dairy Australia website has resources dedicated to effective and practical calf and heifer rearing available from including:

- › *Rearing Healthy Calves*
- › *Heifers on Target* – A guide to growing more productive heifers

See: dairyaustralia.com.au/animal-management for more information and resources.

Contact: If you are interested in attending a Heifers on Target discussion group, contact your Regional Development Program.

Weighing guidelines

Aim to weigh your heifers every 3 months, but be flexible. Weigh more frequently during periods of feed stress, if the heifers drop off their targets or there is a tail developing in the mob. Weighing during the spring flush may be less frequent – as long as parasite control is effective.

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.

Scales are the most accurate way of monitoring weight – weigh bands are not accurate enough. Check scales regularly and follow the manufacturer's instructions.

Measuring wither height

Place a tape measure or mark the target wither heights inside the race or crush. This will help you identify heifers that are too short and to monitor progress of the group against the target.

Recommendation

Every time you vaccinate or drench your heifers, check if they are due to be weighed – it may be convenient to do both jobs at once.

Tips for handling and weighing

These tips may make your job easier:

- › Walk through the heifer group regularly to get them used to people.
- › Use a bit of rubber matting or old carpet to cover the platform of the scales and reduce noise stress.
- › Run the heifers through the dairy and yard when you bring them in for weighing, to get them used to the yard and shed.
- › Handle heifers quietly and do not force them with items like poly pipe. Be patient, it gets easier with practice.
- › Portable cattle yards may be a worthwhile investment if cattle handling facilities are not suitable for weighing.



These heifers are in good condition, but you won't know if they are up to target weights until you weigh them. Looks can be deceiving.

Setting mature heifer growth targets

Determining growth targets

Heifer growth targets should be based on:

- › the average height and weight of mature cows in your milking herd
- › your chosen age at first calving.

Determining your mature cows' liveweight

Measure the liveweight of some mature cows in your milking herd. If you don't have access to a set of scales:

- › look at liveweights recently recorded for culled cows, or
- › estimate based on the annual milk production of your mature cows using this general rule of thumb: kg liveweight = kg milk solids produced in a 305-day lactation.

Note: Estimate from the mature-cow milk production of your cows. Because the nutrition of your herd will also influence milk production, it is more accurate to measure the weight of some representative adult cows in your herd.

Choosing the age at first calving

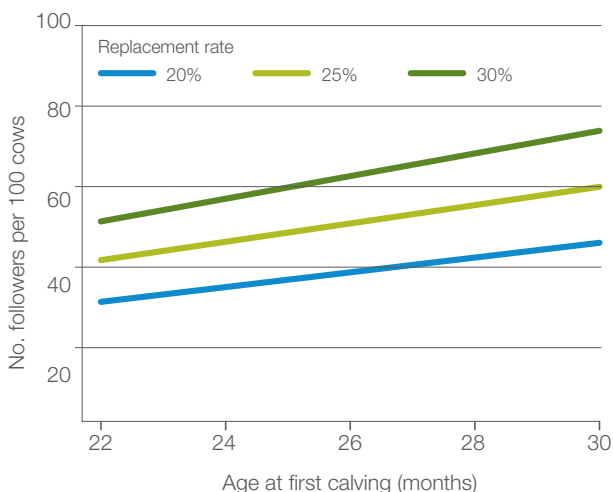
Choosing to calve heifers earlier requires them to grow faster to meet target weights at mating and calving. Calving heifers before 24 months offers advantages – but is challenging. The age at first calving can be more readily extended beyond 24 months in year-round herds. Whilst this is easier to do it has associated costs.

You require fewer replacements if you calve heifers before 24 months. This can provide for a significant reduction in rearing costs as you have fewer replacements per milking cow to support.

Year-round

This chart illustrates that you effectively have to carry more young stock to allow later calving and this increases your total heifer rearing costs. Typically, it is more economical to invest in better heifer growth and to calve heifers at or before 24 months than to extend the age of first calving.

No. followers per 100 cows by age at first calving



Followers: Calves and yearlings

Seasonal/split

An advantage of calving well-grown heifers before 24 months is that they calve before the cows. This gives them more time to recover from calving before mating starts. Early-calved heifers perform better at mating and have higher in-calf rates than later-calved heifers.

Moving heifers who would have calved from week 6 of calving forward 2 weeks significantly improves their subsequent mating performance. Other advantages include more time to train heifers to the dairy. Remember, you may need extra labour and time to train a herd of mostly early-calved heifers.

Benefits of early-calved heifers

The benefit can be seen in this table.

Heifers calving at same time as cows			Heifers calving two weeks ahead of cows			Gain
Calve week	Days calved by MSD	6-week ICR (%)	Calve week	Days calved by MSD	6-week ICR (%)	Improvement in 6-week ICR
1	79	49.2	-2	93	50.6	1.4
2	72	47.9	-1	86	50.1	2.2
3	65	46.0	1	79	49.2	3.2
4	58	43.0	2	72	47.9	4.9
5	51	38.8	3	65	46.0	7.2
6	44	32.9	4	58	43.0	10.1
7	37	25.4	5	51	38.8	13.4
8	30	16.7	6	44	32.9	16.2
9	23	8.7	7	37	25.4	16.7
10	16	3.0	8	30	16.7	13.7
11	9	0.6	9	23	8.7	8.1
12	2	0.0	10	16	3.0	3.0

Challenge of earlier calving

The challenge of earlier calving is the need to get heifers pregnant at a younger age. They have less time to reach their target weight and height at first calving. Calves and heifers have enormous potential for growth so this can be achieved if desired. However, you will need to feed them well to grow faster to meet the targets along the way.

Key point: If you choose to calve cows before 24-months of age you will need to adjust your age targets.

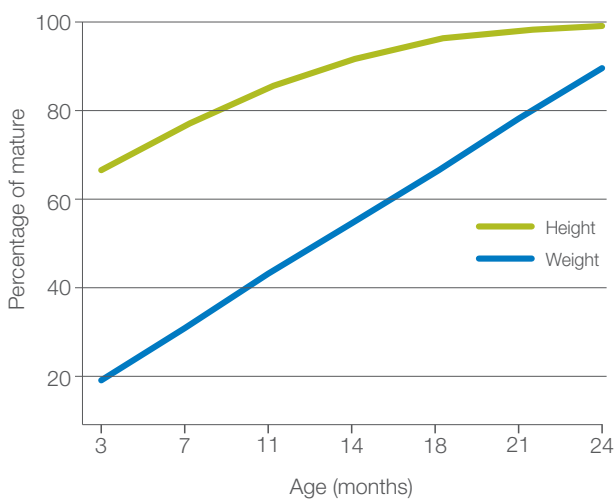
Setting milestones for heifer growth

Weight and height growth

Once you know your target weight and age for first calving, you can map the height and weight growth curves for your young stock and set milestones. This chart shows the relationship between age and the mature cow target weights and height for heifers calving at 24 months of age.

Note: Good skeletal growth allows the heifer to fill her frame through her second year. Heifers with stunted skeletal growth do not reach the same mature weight as heifers with well-grown frames. Focus on heifer growth from birth to first calving – there is no slack period rearing young stock!

Weight and height growth as a percentage of mature values



Heifer liveweights and wither heights

Use these tables table for heifer liveweights (kg) and wither heights (cm) for high reproductive performance based on 90% of mature cow liveweight at 22, 23 or 24-month calving.

22-month calving

Age (months)	% mature weight (% height)	Mature cow liveweight (kg) and wither height (cm)					
		450 (126)	500 (130)	550 (134)	600 (137)	650 (141)	700 (145)
3	18% (60%)	81 (76)	90 (78)	99 (80)	108 (83)	117 (85)	126 (86)
Take action		<77 (<72)	<86 (<74)	<94 (<76)	<103 (<79)	<111 (<81)	<120 (<82)
6	31% (71%)	138 (89)	134 (87)	169 (94)	184 (97)	174 (95)	215 (102)
Take action		<131 (<85)	<127 (<83)	<161 (<89)	<175 (<92)	<165 (<90)	<204 (<97)
15	65% (94%)	292 (118)	325 (121)	357 (125)	390 (128)	422 (132)	455 (136)
Take action		90% (100%)	<309 (<115)	<339 (<119)	<371 (<122)	<401 (<125)	<432 (<129)
22	90% (100%)	407 (127)	452 (131)	497 (134)	542 (138)	588 (142)	633 (146)

23-month calving

		Mature cow liveweight (kg) and wither height (cm)					
Age (months)	% mature weight (% height)	450 (126)	500 (130)	550 (134)	600 (137)	650 (141)	700 (145)
3	18% (60%)	81 (76)	90 (78)	99 (80)	108 (83)	117 (85)	126 (86)
Take Action		<77 (<72)	<86 (<74)	<94 (<76)	<103 (<79)	<111 (<81)	<120 (<82)
6	31% (70%)	137 (88)	152 (91)	167 (94)	182 (96)	197 (99)	187 (97)
Take Action		<130 (<84)	<144 (<86)	<159 (<89)	<173 (<91)	<187 (<94)	<437 (<133)
15	62% (92%)	281 (116)	312 (119)	344 (123)	375 (126)	406 (130)	437 (133)
Take Action		<267 (<110)	<296 (<113)	<327 (<117)	<356 (<120)	<386 (<124)	<632 (<145)
23	90% (100%)	406 (127)	451 (130)	497 (134)	542 (138)	587 (142)	632 (145)

24-month calving

		Mature cow liveweight (kg) and wither height (cm)					
Age (months)	% mature weight (% height)	450 (126)	500 (130)	550 (134)	600 (137)	650 (141)	700 (145)
3	18% (60%)	81 (76)	90 (78)	99 (80)	108 (83)	117 (85)	126 (86)
Take Action		<77 (<72)	<86 (<74)	<94 (<76)	<103 (<79)	<111 (<81)	<120 (<82)
6	30% (70%)	135 (88)	150 (90)	165 (93)	240 (107)	195 (98)	210 (96)
Take Action		<128 (<84)	<143 (<86)	<157 (<88)	<228 (<102)	<185 (<93)	<200 (<91)
15	60% (90%)	270 (114)	300 (118)	330 (121)	360 (124)	390 (128)	400 (131)
Take Action		<257 (<108)	<285 (<112)	<314 (<115)	<342 (<118)	<371 (<122)	<380 (<124)
24	90% (100%)	405 (127)	450 (130)	495 (134)	540 (138)	585 (142)	630 (146)

Breed differences are factored into these 'weight-for-age' targets

Monitoring and measuring progress

Use targets to monitor progress and make changes to keep heifers on track. These age sign posts identify when to measure height and weight. If you measure regularly you will have time to:

- > detect growth problems early and
- > take action to improve nutrition and health (especially parasite control).

Staying on track

- > Monitor heifers especially closely in periods of pasture shortage, low pasture quality or if there is a tail developing in the group. It is too late to do anything if you discover that they are undersized at the point of calving. Do not let heifers fall too far behind – use supplementary feeding to keep them on track. Take action if either the average weight or height is below the listed trigger point. Consider separating and preferentially feeding individuals that are falling behind.

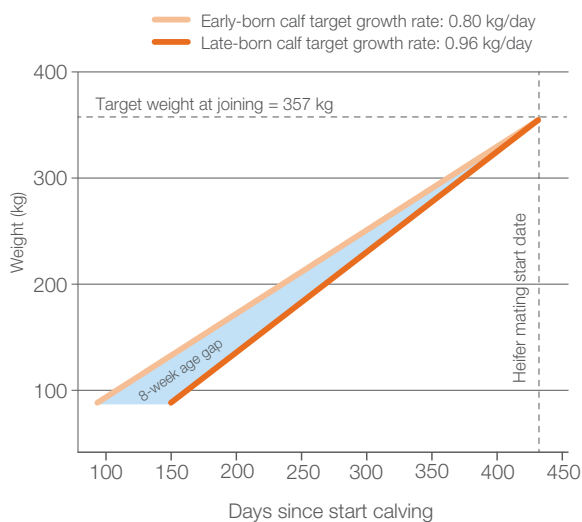
A consistent growth rate for all animals and across all stages of the year is not always possible.

You may need to set a higher target weight at first calving to allow heifers to get ahead and better navigate through more difficult periods on your farm.

Season/split calving herds

Consider running separate heifer groups, allowing preferential feeding of late-born heifers or stragglers. In seasonal/split calving herds, late-born heifers must grow faster to meet target weights at mating and calving.

Growth rate range for calves in seasonal/split herds



Monitoring the tail in the mob

Even if the average liveweight of the heifer group is on target, determine if there are excessive numbers of significantly underweight heifers. These are at risk of poor reproductive performance and milk production. If so, consider separating and managing separately to help them to catch up to their targets and herd mates.

- › Calculate the weight-for-age threshold for 'heifers too light' by multiplying the target liveweight-for-age by 0.9.
- › Count the total number of heifers in the group and the number of heifers in the group with liveweights below this 'heifers too light' threshold liveweight, and express as a percentage.
- ✓ Less than 5% of heifers too light, when managed by top farmers
- ✗ If 5–15% of heifers too light, see an adviser regarding the potential benefits of drafting these animals off from the main group and feeding them separately.
- ✗ If more than 15% of heifers too light, see an adviser **urgently** regarding the potential benefits of drafting these animals off from the main group and feeding them separately. If drafting is not feasible, consider increasing feed inputs for the whole group.

Young-stock rearing strategy checklist

Questions	Answers
Do you want to maximise first-calf heifer reproductive performance?	<ul style="list-style-type: none">› First calf heifers do better at their next mating period if they calve ahead of the cows. They have more time to recover from calving.› If you choose to calve heifers ahead of the cows, they need to grow faster so they can reach the target weight at a younger age.
Do you want to increase herd size through self-replacement?	<ul style="list-style-type: none">› Calving heifers at a younger age can help as this decreases the delay from birth to lactation.
Can you provide good quality feeds for calves and heifers?	<ul style="list-style-type: none">› If you decrease the age at first calving, you will need to provide good quality feeds

See: dairyaustralia.com.au/incalf to ensure you can achieve acceptable heifer growth rates.

Check:

- ✓ the availability, cost and pasture quality of agisted land
- ✓ the ability to regularly provide supplementary feeds to heifers
- ✓ the cost of feed supplements necessary to achieve desired weight gains, and
- ✓ how much of the farm area with good quality pasture is available for rearing heifers?

Other considerations

With good-quality pasture and low-cost supplements you can reach target weights earlier allowing you to calve heifers on average between 21–24 months of age. If pasture and supplements are not cost effective:

- › aim for an average heifer calving age of 24-months, delay beyond 24 months is not economic, or contract-rear heifers off-farm if farm feed supplies are insufficient, or
- › purchase well grown heifers.

The InCalf Heifer Tool provides an easy-to-use process for weighing heifers, identifying the current and target liveweight gap, and assessing potential benefits from improved heifer management.

“Do not plan to calve heifers at younger ages unless target liveweights can be met.”

Rearing calves from birth to weaning

From the birth of a heifer calf you can 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.

There are many successful ways to rear calves, including early weaning, restricted milk systems, ad-lib milk systems and fortified milk systems. In general:

- › feed milk, colostrum or milk replacer until calves are at least 5 weeks old, and
- › place the most skilled and capable person in charge of calf rearing on your farm.

Some universal rules for calf rearing

Here are some universal rules that apply to all calf rearing systems:

- › Remove the calf from its mother soon after birth and ensure it receives adequate, good- quality colostrum:
 - Identify and record birth and dam details
 - Dip/spray calf navels with a strong (2%) iodine solution immediately after birth, especially if wet conditions exist
 - Check that fresh water and high-quality concentrates (at least 12 MJ ME/kg DM and 18% crude protein) are available at all times
 - Separate sick calves and feed them last
 - Remember to wash your hands, boots and feeding equipment after handling calves
- › Vaccinate against clostridial diseases and leptospirosis according to the manufacturer's instructions.

Note: Calves require 2 or 3 vaccinations in their first year of life and annual boosters thereafter.

- › Check that all calves are drinking milk and eating pellets on a daily basis
- › Thoroughly clean and disinfect calf sheds between seasons. Consult your adviser about suitable disinfectants
- › Do not re-use pens that have housed sick calves unless bedding is replaced and the pens thoroughly disinfected

Johne's disease

In regions where Bovine Johne's disease (BJD) is common, the calf rearing system should minimise the risk of transmission which increases with long periods of suckling.

- › Remove calves from their mothers within the first 24 hours or within 12 hours where BJD is common.
- › Graze heifers on areas of the farm reserved solely for young stock, until 12 months of age.
- › Do not graze heifers on areas irrigated or contaminated with effluent. Do the same for agisted heifers.

Identifying and recording calves

Identify calves as soon as possible after birth using a permanent National Livestock Identification Scheme (NLIS) ear tag or other tags as required. Recording the IDs of both the calf and its mother is good practice as this helps you to also identify the sire if early pregnancy testing with foetal aging was used. Knowing calf parentage will help you manage the genetics of your herd more effectively.

Maintain a healthy environment

A healthy environment is essential for rearing healthy calves. Housing should be clean, dry, well ventilated and draught free. If bedding is provided, use non-edible types such as sawdust or rice hulls. 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 infectious diseases are not transferred to healthy calves.

Pre-calving management of cows

How cows are managed before calving influences calf survival and performance. Best calf performance happens in cows with:

- › Good dry period and transition management ensuring production of high-quality colostrum
- › Minimal leaking of milk before calving preventing colostrum from being wasted
- › Effective immunity against calf diseases. Vaccination of cows with suitable vaccines can boost specific antibodies in colostrum.

See: dairyaustralia.com.au/healthycalves for the *Rearing Healthy Calves* manual.

Calving management

Most calf mortalities occur within the first 24 hours of life. If losses in excess of 5% occur this should be investigated and the causes identified. Careful attention to calving cows with timely assistance of cows experiencing difficulty calving will help both cow and calf. Regular calf removal ensures all calves are promptly moved to the shelter of the calf shed. Close attention at calving will help you to minimise losses.



Colostrum: the essential starter for calves

What is Colostrum

Colostrum is the first milk produced after calving. It contains:

- › very high levels of nutrients and protective antibodies also called immunoglobulins (IgG)
- › antimicrobial chemicals, and
- › growth factors that promote health and growth of the calf and development of the udder.

Why is it important?

Colostrum is how the cow transfers antibodies to her calf giving the calf temporary immunity against common infections. Calves are born with almost no circulating antibodies so they must obtain it through colostrum. Calves that do not absorb enough antibodies from colostrum are termed to have experienced a **Failure of Passive Transfer (FPT)**. Calves with FPT have no short-term immunity and are at increased risk of:

- › poor weight gain
- › higher veterinary costs
- › poorer reproductive performance as adults
- › dying in the pre-weaning and post-weaning periods
- › infection and disease during the pre-weaning period, and
- › lower milk production in their first and second lactations.

Isn't it enough just to make sure the calf has 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. In the first 24 hours:

- › Holstein-Friesian calves need a total of 4–5 litres
- › Jersey calves need 2–3 litres.

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.

Feeding colostrum

The calf's gut can only absorb the antibodies from colostrum in the first 24-hours of life. Two colostrum feeds within 12 hours of birth to every calf is the primary objective – it is essential that all calves complete their colostrum intake in 24 hours.

Amount

The amount of colostrum to feed depends upon the calf size and the quality of colostrum.

- › A 40kg calf needs two feeds of 2 litres (4 litres in total) of good quality colostrum before 12 hours' of age.
- › Feed more colostrum if the colostrum quality is lower than desired.

Recommended approach

The recommended approach is to collect calves twice daily and:

- › feed all new calves, male and female, immediately with the best available colostrum
- › mark them as fed
- › provide the second colostrum feed at the calf shed and within 12 hours of birth, and
- › mark them again as having completed their colostrum program.

Note: Effective calf recording and marking systems prevent calves from 'slipping through the net'.

Feeding methods

Colostrum can be fed via a teat or fed by an oesophageal feeder (stomach tube). You should learn how to stomach-tube feed a calf as there are often calves that struggle to teat-feed.

See: dairyaustralia.com.au/healthycalves to download the *Rearing Healthy Calves* manual.

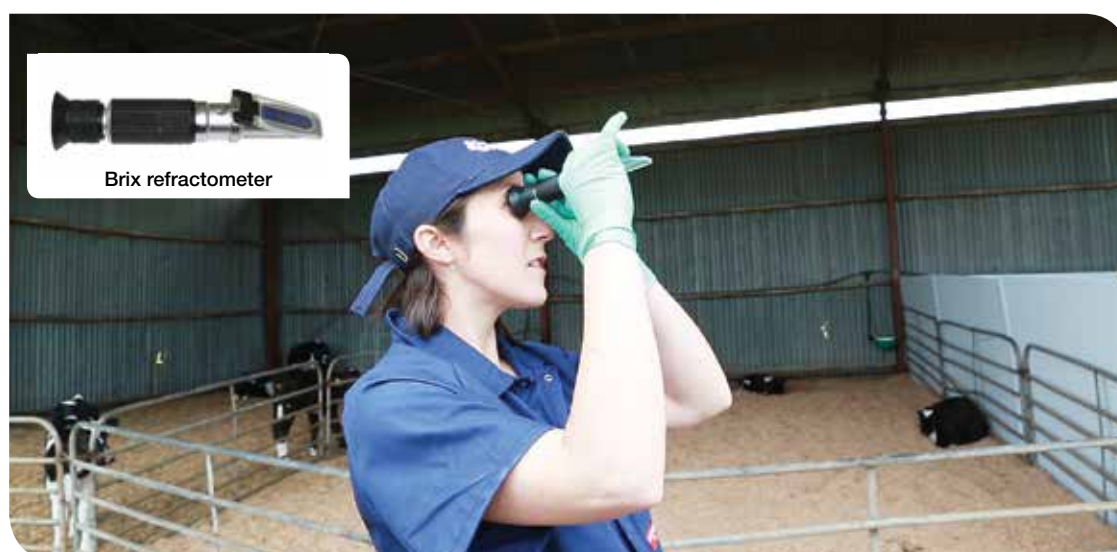
Questions about colostrum feeding

This table answers some common questions about colostrum feeding.

Questions	Answers
If I actively give colostrum within 24 hours of birth, will this mean there will be no sick or dying calves?	<ul style="list-style-type: none">› Successful colostrum management is one of the most important pieces to the calf rearing puzzle.› However, it will not compensate for poor hygiene, overwhelming infection or inadequate housing.
Is there any benefit in feeding colostrum for longer than 24 hours?	<ul style="list-style-type: none">› Colostrum is a nutritious and energy dense feed. It contains other valuable nutrients besides antibodies.› IgG will only be absorbed from the gut of the calf for 24 hours.› After this, IgG will remain in the gut and provide local immunity. It can help with viral causes of scours but no benefit for long term immunity.› The non-antibody components of colostrum continue to be absorbed after 24 hours of age. These have been shown to have a beneficial effect on calf feed conversion efficiency, udder development and long term-productivity when an adult. Colostrum truly is a super food for calves! <p>Note: Remember colostrum can have a laxative effect.</p>

Assessing colostrum quality

It is recommended to measure every freshly-calved cow's colostrum. Knowing the quality of the colostrum helps you make the best choice for her calf. Feed high-quality colostrum from another cow if a cow's colostrum is inadequate. Brix refractometers are simple meters that indicate colostrum IgG concentration. A Brix score of 22% is the cut off for good quality colostrum. This indicates the colostrum has an IgG concentration of 50 mg/ml or greater).



The 'Golden Rules' of Colostrum Management

Because colostrum can vary between cows you need to manage each cow and calf individually.

- › Measure colostrum from every cow.
- › Feed the best colostrum available to each and every calf.
- › Aim to complete colostrum feeding of each calf by 12 hours and no later than 24 hours after birth.
- › Only pool colostrum from multiple cows together if they are all of the same quality.
- › Store and use colostrum appropriately.

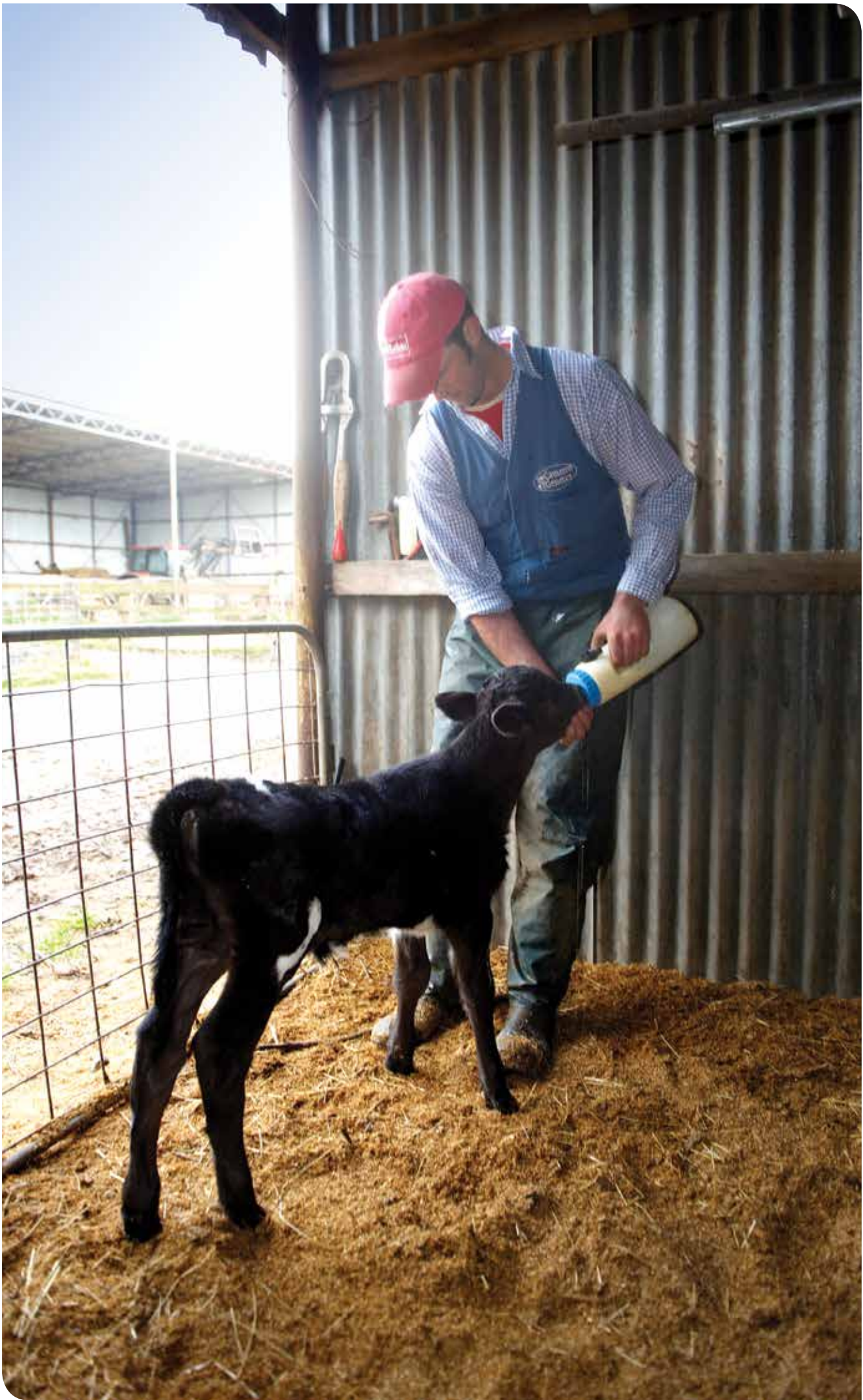
Testing for failure of passive transfer (FPT)

Consider testing a sample of calves for FPT within a few days of being fed colostrum. This is a simple blood test that your veterinarian can perform. Measuring calves for FPT lets you see the overall performance of your colostrum program because the blood antibody levels of very young calves are determined by the quality, amount and timing of colostrum intake. Aim for fewer than 20% of calves with evidence of FPT.

Storing and feeding colostrum

Colostrum can be refrigerated in the short term or frozen for longer-term storage. Only freeze colostrum that cannot be used within a few days. Storing colostrum requires care and preparation. Colostrum should be warmed to 32°C before feeding. Use a warm (not hot) water bath.

See: dairyaustralia.com.au/healthycalves to download the *Rearing Healthy Calves* manual.



Feeding unweaned calves and weaning calves

Develop an efficient, effective, economical feeding process that is low-stress for calves and for workers. There are a number of options and considerations for an effective system.

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.

Milk feeding

A calf can drink 20% of their body weight as whole milk. A 50kg calf can drink 10kg – 10 litres – of milk providing for 0.9kg/day weight gain. Spread this volume across at least two feeds to prevent scouring.

Keep milk or milk replacer consistent. Feed the same milk at the same time across the period and consider:

- › will you feed waste milk or milk replacer?
- › could feeding fortified milk work for you?
- › does an automated milk feeder system suit your farm? An automated feeding system will guarantee each calf a set volume of milk. These may require a change to your calf rearing set-up and infrastructure. You also need to ensure any automatic feeder works correctly.

Water, concentrate and roughage

- › Make sure that all your calves have access to ad-lib fresh water from birth.
- › Monitor water quality and check for leaks – any permanently-wet areas in the calf environment can lead to health problems.
- › Ensure calf starter pellets – minimum 18% protein or grain is provided to promote rumen development and will assist the weaning process. Monitor daily intakes to gauge when to wean calves. Calves need to be consuming enough energy from the starter pellets to handle the removal of milk from their diet. For most calves this means they need to be eating sufficient calf pellets per day.
- › Provide access to roughage from 3 weeks of age – but limit intakes (don't provide too much).

Milk vs milk replacer

Whole milk

- › This also includes transition milk (from the second to eighth milking after calving), poor-quality colostrum (<22% Brix score), hospital milk or vat milk.
- › can vary in supply and quality and it is unpasteurised so can carry and spread diseases such as salmonella, mycoplasma and Johne's disease to calves. Pasteurising can reduce risk.
- › Feeding antibiotic-contaminated milk to calves is not recommended.

Calf milk replacer

Calf milk replacers are viable alternatives to whole milk. There are a range of calf milk replacers available. They vary in the protein and fat compositions, along with other additives such as coccidiostats, pre-biotics and pro-biotics. Replacers vary in their composition and in mixing rates. Make sure you:

- › store calf milk replacers carefully
- › always use suitable water when mixing calf milk replacer
- › avoid changing milk replacer if possible.

Fortified milk programs

Calf milk replacers can be added to whole milk to increase nutrient density. This can promote growth rates without the need to feed high volumes of milk. Care is required to get it right.

Weaning calves

Selecting the right time to wean calves off milk/milk replacer is determined by the two key requirements:

- › calves must have reached their target weaning weight, and
- › each calf should be eating 1–2 kg of concentrates per day depending on their breed.

Depending on your breed and mature cow weight you can wean Holstein/Friesian calves between 90–110 kg and Jersey heifers between 65–85 kg live weight.

Reduce stress for calves

Weaning is a stressful time for calves. It involves a change from a liquid to a solid diet, a change in environment and exposure to new pathogens and increased parasite challenge. Decide if you will wean gradually over 7 days or wean abruptly. Calves must be eating enough concentrate per day to wean abruptly. Minimise extra stressors by:

- › timing vaccination, disbudding etc. beforehand
- › preparing calves for weaning.

Concentrates for weaning

Calves with functioning rumens will be eating enough concentrate to be safely weaned. The quantities in this table are based on calf starter containing 18–20% crude protein.

Breed	Concentrate in weight per day
Holstein	1.5–2 kg/day
Jerseys	1–1.5 kg/day

Controlling calf diseases

Research shows that calves that get sick before weaning have poorer growth after weaning, are older at first calving and as adult cows have reduced milk production and longevity. These negative effects can affect lactations more than two years later.

Minimising disease in calves should therefore be a priority. Remember to record details of all sick calves. Good records may help you understand why some calves subsequently fail to perform as adults. Work with your veterinarian to measure and monitor disease rates and develop a management program for individual diseases.

Targets

You should aim for the following in calves from birth to weaning:

- ✓ Less than 20% of calves in a group with failure of passive transfer (FPT) as indicated by a serum protein level <50g/L. See your vet to discuss testing your calves.
- ✓ Less than 10% of calves requiring treatment with antimicrobials and/or electrolytes
- ✓ Less than 3% of calves dying

Getting advice

Whilst season, climate and environment produce natural variation in these results seek advice if any indicator is above the expected limit. Good biosecurity and regular, effective cleaning of all calf equipment – especially feeding equipment – is essential to maintain calf health.

Growing heifers from weaning to mating

Key to feeding heifers

Good calf management needs to be followed by effective growth from weaning to first calving – otherwise all the hard work you have put into calf rearing can be lost. The first 12 months are the most critical for skeletal development so ensure there is adequate growth during the first year of life. In many cases, supplements will be required as:

- › young heifers are unable to achieve high growth rates on a diet of average pasture and/or hay alone.
- › older heifers require supplementary feed at times when pasture is unable to fulfil their requirements for energy and protein, for example the summer–autumn period in many districts throughout Australia.

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. Avoid sudden change or reduction in feed – especially during mating – as this can substantially reduce reproductive performance.

Some universal rules for heifer-rearing

- › Feed good quality concentrates (at least 11.5 MJ ME/kg DM and 16% crude protein) until calves reach 200kg, unless they are fed abundant, high-quality pasture. Adequate protein content and quality is needed to drive skeleton and muscle development.
- › Develop appropriate worm, tick, lice and buffalo fly control programs where required in consultation with your vet. Vaccinate for tick fever between 4 and 10 months if appropriate for your region.
- › Remember the clostridial/leptospirosis booster vaccination at 12 months of age.
- › Monitor liveweights at least every 3 months on average. If results are below targets, consider supplementary feeding to increase heifer growth rates and review your parasite control program.
- › Keep heifers away from areas grazed by mature cattle, irrigated or contaminated with effluent to prevent infection with Johne's disease.
- › Do you need to supplement heifers with trace elements, vitamins and other feed additives? Consult with an adviser.
- › Every time you vaccinate or drench your heifers, check if they are due to be weighed – it may be convenient to do both jobs at once.
- › Keep heifers away from poisonous plants, including lantana and bracken fern.

Managing the nutrition of growing heifers

Feed heifers so they achieve target weights with good frame development at the right age. As a heifer grows its demand for energy and protein change and their gut capacity changes. It is important to:

- › tailor the diet to meet the energy, protein and mineral requirements for achieving the growth target
- › feed within a ration that the calf can physically eat.

See: dairyaustralia.com.au/animal-management for more information.

Estimating feed demand

Follow these steps to estimate the feed demand for growing heifers:

Step	Action
1	Calculate growth rate required to achieve target weights
2	Determine the minimum nutrient requirements of the age group of heifers
3	Estimate the type and quantity of pasture heifers will be consuming. Is pasture alone adequate?
4	Use estimates of the feed values of available feeds to formulate a diet to satisfy requirements

See: dairyaustralia.com.au/incalf for the *Heifer Rearing Cost Calculator* to estimate the energy and protein content of the total diet and determine if requirements are satisfied and predict a growth rate.



Weighing heifer

Increasing growth rate

If the average live-weight of your heifers is below the target, take action to increase their growth rates. Remember to increase the frequency that you weigh and measure them – you need to monitor them more frequently once they slip from their original targets. If you need to take action remember to change the diet gradually across a few days to prevent any intake problem in the heifers.

Heifer mating considerations

Planning ahead will make for a more successful heifer mating period. Have you answers for these questions?

- › When will you mate heifers?
- › What bulls will you need?
- › If you are going to AI the heifers, what needs to be done before mating?
- › Have you considered using a professional AI technician, as heifers can be more difficult to inseminate?
- › Have you allowed for the extra time and skilled people required to implement an AI heifer program?
- › Will you heat synchronise heifers to allow planned use of people's time?
- › 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.

In year-round calving herds

Mating is determined by the target age at first calving. It is important to have good records of heifer age and monitor them to ensure that they reach the target live weight for mating by this age. Remember that it is easier to reach target weights by delaying the time of first mating but this will increase the cost of rearing replacements.

In seasonal/split calving herds

Think about mating heifers to start calving two weeks earlier than the milking herd to provide for better reproductive performance at the next mating. Remember that you will need to grow your heifers faster in order to get them to their target weights at mating and at calving if you use this approach.

Strategies to minimise calving problems in heifers

Use AI sires from the Good Bulls Guide. This will help you select suitable sires for your heifers. Use:

- › high Calving Ease ABVs sires, at least a Calving Ease ABV of 103 with a minimum reliability of 60%, or a smaller breed that will naturally provide easy calving in your heifers.

One approach to minimising calving difficulties and to produce extra replacements is to use Jersey AI sires over Holstein heifers and rear the crossbred replacements.

Short gestation or sexed semen

You may also consider using short gestation length sires or sexed semen to reduce calving difficulties in heifers. Taking into account:

- › Short gestation bulls may not have desirable production, daughter fertility, type or temperament characteristics; they are selected solely for their capacity to provide small calves. Heifer calves from short gestation sires may not perform as milking cows.
- › Sexed semen increases the odds of pregnancy with a female calf. Heifer calves tend to be smaller than bull calves and this can help reduce the risk of difficult calving in heifers.

Caution: Remember that heifers receiving sexed semen need to be managed well to achieve good conception rates.

Why would you go to all that trouble AI-ing heifers? It pays to discuss ...

Don't use AI on heifers without serious consideration. Discuss this option with your vet, semen supplier and other farmers. Mating heifers to Holstein AI sires can result in serious calving difficulties that can often outweigh any benefits. However, there are several positive reasons to AI your heifers:

- › It allows you to rear extra AI replacements to increase herd size more rapidly
- › In seasonal herds, you can get the same number of AI replacements with a shorter AI period in the milking herd, and
- › As a bonus, you can increase the rate of genetic gain of your herd.

Pregnancy testing

The period between mating and calving is a good time to measure weights and to measure the reproductive performance of the heifers. Early pregnancy testing between 5–14 weeks after the start of mating lets you identify the conception date of pregnant heifers.

You will also know which heifers conceived early and can predict calving dates accurately so you can better manage heifers through the transition period and at calving.

Pregnancy testing 6–8 weeks after the end of mating identifies non-pregnant and later calving heifers but cannot reliably identify conception dates in heifers more than 15 weeks pregnant.

Note: When pregnancy testing heifers in a seasonal/split calving herd, assess their predicted calving pattern.



Growing heifers from mating to calving

Assessing reproductive performance

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

The period between mating and calving is a good opportunity to assess the reproductive performance of the heifers. Early pregnancy testing, less than 15 weeks after mating began, 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 the management at calving.

Pregnancy testing 6–8 weeks after the end of mating only identifies non-pregnant and later calving heifers. If you are pregnancy testing heifers in a seasonal/split calving herd, assess their predicted calving pattern.

Maintaining growth

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.

If heifers have not reached their target weight when close to calving, consider running them separately from springing cows and feeding them preferentially otherwise include them in the cow transition program as calving approaches.

- › 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 program, see Controlling calf diseases, page 47.
- › Identify non-pregnant heifers and consider culling them.

Monitoring the overall success of your heifer rearing program

The reproductive and milk production performance of first-calf heifers compared against the mature cows in your herd are key indicators of the overall success of your calf and heifer rearing program.

You can also examine the reproduction, milk production and survival records of heavier and lighter heifers at first calving to see how the two groups performed. You might find this motivating!

- ✓ Top farmers have 73% of first calved heifers calved by week 3 and 92% by week 6 of calving in the herd.
- ✗ If less than 51% of first calved heifers calved by week 3 and 85% by week 6 of calving in the herd, review:
 - calf and heifer management
 - bull management
 - AI technique and heat detection if AI was used
- ✓ Top farmers achieve milk production in first calvers of at least 85% of the milk production of the mature cows.
- ✗ If your figure is less than 80%, review calf and heifer management practices as this may indicate the heifers were underweight at calving.
- ✓ Top farmers will have at least 85% of their first calvers go on and calve a second time within 400 days of their first calving.
- ✗ If your figure is less than 80%, review calf and heifer management practices as this may indicate the heifers were underweight at calving.

The *InCalf Fertility Focus* report calculates the calving pattern of first calvers and the ratio of first calver milk production compared to that of mature cows (average litres/day).



Section B Body condition and nutrition

Body condition is the visual appearance of the cow primarily determined by the amount and distribution of fat covering her muscles and bones – it is essentially the ‘fatness’ or ‘thinness’ of the cow.

Effective management of cow body condition and nutrition provides reproductive, milk production, feed conversion, cow health and welfare benefits.

Body condition management – is all about regular measurement and early intervention.

In this section

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How score cows body condition and record results	56
When and why to measure body condition scores	59
What to do if BCS results are off target	62
Transition cow management and feeding	65
Keys to successful transition cow management	67
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Key points

- › Body condition and cow nutrition affect farm performance and profitability and have a major impact on reproduction.
- › It takes time for cows to change body condition score. You must start modifying diets in the months leading up to calving if you want your cows in their best shape for mating.
- › Effective management of cows through the dry period, calving and into mating provides large production and reproduction paybacks.
- › This requires a transition cow program that provides an appropriate dry period and an effective transition cow diet for at least three weeks before calving.

Managing and measuring body condition

Managing body condition is all about managing your herd's nutrition program. Condition scoring your cows at critical times during their lactation cycle lets you know if you need to consider changing herd nutrition.

Negative energy balance

Cows normally lose body condition during early lactation because appetite takes several weeks longer to peak than their daily milk yields do. Until their feed intake increases to the point where their dietary nutrient supply meets their nutrient demand for milk production and maintenance, cows are said to be in 'negative energy balance'. They will lose weight while in this state.

Consequences of body condition loss

Early negative energy balance and excessive body condition loss leads to reduced reproductive performance through delayed resumption of cycling and lower conception rates at insemination. Negative energy balance is more related to feed intake than milk production. Herds and cows that achieve high milk yields without excessive body condition loss in early lactation have good reproductive performance.

Avoiding excessive body condition loss

The key to avoiding excessive body condition loss after calving is to:

- › calve them down in the body condition score range 4.5–5.5
- › keep them eating as much of an energy and protein-dense milker diet as their appetites allow, having managed:
 - their pre-calving transition feeding well for good rumen adaption, and
 - minimal reduction in dry matter intake.

Checking nutritional management

Detecting small changes in condition score over a short period is difficult. 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, consider:

- › 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?

Measuring herd body condition

Before you can manage something effectively, you must measure it reliably so you can monitor change and detect when things are going astray early. Regularly measuring the body condition of the herd is an essential component of the nutritional management.

What is body condition scoring?

A body condition score (BCS) is:

- › a visual assessment of the amount of fat and muscle covering the bones of a cow, regardless of breed and body size
- › not affected by gut fill or pregnancy (unlike liveweight)
- › an assessment of specific locations on the cow to determine how thin or fat the cow is.

How the BCS works

In Australia, an 8-point scale is most commonly used for dairy cattle:

- › 1 is extremely thin, and
- › 8 is extremely fat.

By scoring a representative sample of the whole herd or particular groups of cows, you can calculate an average herd body condition score and the proportion of cows that are too thin and too fat.

The scoring method is the same for all dairy breeds despite their differences.

- › **Holstein** Angular body shape, appear thinner, carry more body fat over ribs
- › **Cross-bred** More even distribution of fat over body
- › **Jersey** Narrow body with prominent hip bones and higher set tail

What BCS tells you

Assessing a cow's BCS using a 1 to 8 scale provides a standardised measure of a cow's energy and protein reserves as stored in body fat and protein and tells a lot about her:

- › previous level of feeding
- › likely future productivity, and
- › future feed requirements.

How to score cows body condition and record results

Two observations

Using the 1 to 8 scoring system is simple and it only takes seconds to score each cow. You only need to make two observations to determine the BCS of any cow to the nearest half score.

- › First, observation is between the tail and pins, an easily viewed area where cows first lay down fat.
- › Second, observation may be the inside of the pins, the backbone or the depression between hip and pin, depending on the first observation.

Illustrating the two observations

1st Observation

How sunken is the area between the tail and pins?

Deeply Sunken



Sunken



Slightly Sunken



Filled In



2nd Observation

Are the insides of the pins hollow?

YES



Condition Score 3

NO



Condition Score 3.5

Is the backbone a bumpy sharp ridge?

YES



Condition Score 4

NO



Condition Score 4.5

The depression between the hip and pin is:

U-SHAPED



Condition Score 5

SHALLOW



Condition Score 5.5

FLAT



Condition Score 6

Two examples of cow body condition scores

A cow in condition score 4.5 all breeds

1st observation

Area between tail and pins is sunken

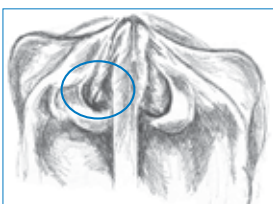


Image courtesy of DEPI (Vic.)



Image courtesy of DairyNZ

2nd observation

Backbone is not a bumpy, sharp ridge



Image courtesy of DEPI (Vic.)

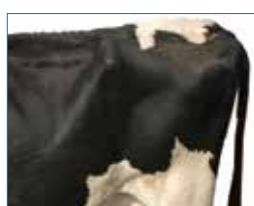


Image courtesy of DairyNZ

A cow in condition score 5.5 all breeds

1st observation

Area between tail and pins is slightly sunken to filled in

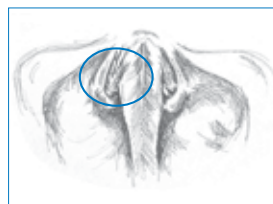


Image courtesy of DEPI (Vic.)



Image courtesy of DairyNZ

2nd observation

Depression between hip and pin is shallow

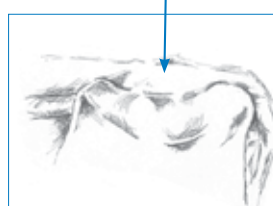


Image courtesy of DEPI (Vic.)



Image courtesy of DairyNZ

BCS handbook and smartphone app



Seasonal/split calving herds

For seasonal/split calving herds, use the Dairy Australia cow body condition scoring smartphone app or a Dairy Australia recording sheet. The app is more than a recording tool – it also does all the necessary calculations for you.

See: dairyaustralia.com.au/BCS to download the BCS handbook app.

Additional resources

- › **See:** dairyaustralia.com.au/incalf for more information.
- › Contact your Regional Development Program to obtain a scoring handbook, a complete guide to monitoring and managing your herd's body condition.
- › **See:** dairyaustralia.com.au/BCS to download the handbook or to order a hard copy and get the scoring smartphone app and recording sheets.

Body condition targets

Body condition targets relate to:

- › average herd body condition score, and
- › proportion of cows that are too thin and too fat.

Both provide valuable information on herd nutrition. These herd BCS targets are recommended:

At calving

- › Herd average BCS between 4.5–5.5
- › < 15% of cows below score 4.5
- › < 15% of cows above score 5.5.

At mating

- › < 0.6 decrease in average score of the herd since calving
- › < 15% of cows lose more than one score since calving
- › Cows should maintain or gain body condition after commencement of mating.

At drying-off

- › Herd average BCS between 4.5–5.5. This is the same as the desired BCS at calving
- › Cows should maintain or gain body condition during the dry period.

Why these targets?

Cows that lose more than one body condition score between calving and mating are likely to have reduced fertility compared to cows experiencing only moderate BCS loss. They typically take longer to restart cycling and have lower submission and conception rates. They also often show weak heats.



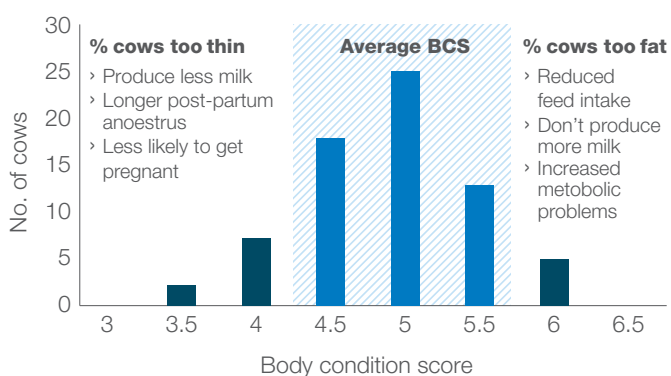
Cow calving in BCS 4

Cows below BCS 4.5 at calving

- › are less fertile producing less milk
- › take longer to start cycling again
- › have lower submission rates and conception rates than cows in good BCS
- › are more likely to be inseminated at their first heat, resulting in lower conception rates
- › partition more feed energy to body condition gain instead of milk production
- › produce less than their genetic potential, and
- › tend to have lower lactation persistency.

Cows above BCS 5.5 at calving

- › are more likely to have calving problems
- › are at increased risk of metabolic disorders
- › have suppressed appetites after calving, and therefore likely to lose excessive condition.



If you have more than 15% of your cows below 4.5 or above 5.5 at calving – take action.

When and why to measure body condition scores

Seasonal/split calving herds: timing

To improve herd reproductive performance, body condition scoring is most useful at 5 times during the fertility cycle.

When	Why
1. At 8–10 weeks before drying-off	<ul style="list-style-type: none">› To check if cows are on track to dry off at the desired BCS target› To adjust the diet to increase BCS if necessary
2. At drying-off	<ul style="list-style-type: none">› To check if cows have achieved the BCS profile desired at calving.› To determine if the intended dry cow diet needs adjusting
3. Just before calving	<ul style="list-style-type: none">› To check if cows have held their body condition through the dry period.› To determine if the intended fresh cow/early lactation diet needs adjusting
4. Two weeks before mating start date	<ul style="list-style-type: none">› To check if cows have lost excessive condition since calving› To determine if the intended diet for the mating period needs adjusting
5. Three weeks after mating start date	<ul style="list-style-type: none">› To check if cows are gaining body condition.› To determine if the diet being fed during the mating period needs adjusting

Note: 1, 3 and 4 are the most important times to body condition score cows in each calving group.

Year-round calving herds: timing

Condition score across the year to take account of seasonal variation in cow demand and feed supply. Body condition scoring to manage nutrition for improved herd reproductive performance is most useful at three times during the fertility cycle.

When	Why
At drying-off	<ul style="list-style-type: none">› To check if cows are on track to meet BCS targets at calving› To determine if the intended diet for dry cows needs adjusting
Just before calving	<ul style="list-style-type: none">› To check if cows have held their body condition through the dry period› To determine if the intended diet for fresh cow/early lactation cows needs adjusting
40–60 days after calving (when eligible for insemination)	<ul style="list-style-type: none">› To check if cows have lost excessive condition since calving› To determine if the intended diet for cows heading into mating needs adjusting

How many cows do I need to score?

It is very important to score a representative selection of cows in your herd. This can be difficult in smaller year-round calving herds because there can be few cows in any category – especially in the transition group.

Seasonal/split calving herds: numbers and methods

Score at least 70 cows selected at random, a sufficient number, even for large herds. Then calculate the:

- › percentages of cows below 4.5 and above 5.5
- › average condition score, and
- › change in the average condition score between calving and two weeks before the start of mating.

Scoring methods

It is not necessary to score the same cows each time. With practice scoring 70 cows takes no more than 30 minutes.

In the paddock

If you prefer to score cows in the paddock, take care to select a random group. Position yourself within 20–30 metres of each cow and with a clear view of their tail, rump and back. Score only standing cows.

At milking

If scoring cows at milking take extra care to ensure you have a representative and random sample. Select cows strictly on their milking position. Position yourself in the dairy to be above and behind the cows. You can stand on a raised platform close behind the cows in a rotary dairy. Do not score cows from the pit of herringbone dairies. You will need an elevated position to view the specific scoring locations on selected cows properly. An alternative is to score the cows as they walk through the exit race after milking.

Example: Mark every 8th bail on a rotary platform or every 4th set of cups on each side in a herringbone shed, and score cows that are milked in those positions only. Don't score the first or last 70 cows to be milked and in herringbones don't score the first or last cow of each side.

Make sure you have a random selection of cows. The first 70 cows you encounter are rarely representative. You need to get a cross-section of the group.

Year-round calving herds: recording and numbers

Set up a recording system that allows you to record body condition scores at each stage. Use separate recording sheets for cows scored at:

- › drying off
- › calving, and
- › when they become eligible for insemination.

The sheets should record the date scored, the cow ID and the condition score. Record the scores in the order they are made, that is in date order.

How many to score?

If you milk:

- › 300 cows or less, you will need to score all cows at drying-off, just before calving and when they become eligible for insemination to get a reliable picture of the herd
- › 450 cows, scoring two out of every three cows should be sufficient
- › 600 cows, score every second cow.

Regular assessment


Analyse your BCS records on a regular basis (such as monthly), to determine the percentage of cows that are outside target condition scores at calving and drying off, as well as the condition score loss in early lactation.

Step	Action
1	<ul style="list-style-type: none"> › Analyse the condition scores of the last 70 cows to dry off. › Work back through these scores and count the cows with a condition score below 4.5.
2	<ul style="list-style-type: none"> › Analyse the condition scores of the last 70 cows to calve and count the cows with a condition score below 4.5, and above 5.5. › Calculate the average condition score for these cows.
3	Analyse the condition score of the last 70 cows to become eligible for mating (40–60 days after calving), calculate the: <ul style="list-style-type: none"> › average condition score of these cows, and › difference between this value and the average condition score for freshly calved cows.

Keeping track of cows scored

Use the version of the Dairy Australia recording sheet which allows you to record the ID of each cow you condition score. **See:** dairyaustralia.com.au/BCS to download the recording sheet.

Body Condition Score (BCS) recording sheet

 Dairy Australia
Your Livestock Matters

Farm: _____ Address: _____

Cow group: _____ Stage of lactation cycle: _____ Date(s): ___/___/___ to ___/___/___

	Date	3	3.5	4	4.5	5	5.5	6	6.5+	Cow ID
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
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69										
70										
No. of cows:										(A)
Total BCS:										(B)
No. of cows below 4.5:										(C)
% of cows below 4.5:										(C / A x 100)
Average BCS of herd:										(B / A)
No. of cows above 5.5:										(D)
% of cows above 5.5:										(D / A x 100)

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For information on body condition scoring for herd management, visit www.dairyaustralia.com.au/BCS

The InCalf Body Condition Tools provide alternative ways to record body condition scores, interpret results and estimate the likely impacts on herd performance.

What to do if BCS results are off target

If your BCS results are outside the recommended targets for calving and mating, consider an immediate intervention to improve the herd's BCS profile. Effective actions will provide reproductive benefits for the upcoming mating. Plan to prevent the problem from happening again next year.

Actions to consider

This table summarises the actions you may consider.

BCS results	Immediately	To prevent it happening again
At 8–10 weeks before drying-off (seasonal/split calving herds) or at drying-off (year-round calving herds)		
More than 15% of cows are below BCS 4.5	<ul style="list-style-type: none"> › Increase feed inputs in late lactation and during the dry period. › Feed all cows or target only those cows below score 4.5 if you can preferentially feed. 	Seek advice to: <ul style="list-style-type: none"> › examine the costs and benefits of increasing feed inputs in mid-late lactation › determine if reducing stocking rate is appropriate. Check all cows have equal access to feed. If most thin cows are first calvers, review heifer management.
More than 15% of cows are above BCS 5.5	<ul style="list-style-type: none"> › Feed to maintain condition during the dry period. › Don't allow over-conditioned cows to lose condition when dry. 	Seek advice to: <ul style="list-style-type: none"> › check diet fed throughout lactation if most fat cows have been calved less than 10–12 months › determine if cows are being overfed in mid-late lactation.
Just before calving		
More than 15% of cows are below BCS 4.5	Separate thin cows and preferentially feed them before and for several weeks after calving.	<ul style="list-style-type: none"> › Increase body condition in late lactation. › Maintain condition during the dry period. › See above actions for when there are too many thin cows at drying-off.
More than 15% of cows are above 5.5 BCS	<ul style="list-style-type: none"> › Monitor fat cows closely for health problems, especially in the first week after calving. › Separate fat cows and preferentially feed them for several weeks after calving. 	<ul style="list-style-type: none"> › If less than 15% of cows were above BCS 5.5 at drying-off but more than 15% are above BCS 5.5 before calving, then cows have been overfed during their dry period. › Reduce the amount fed to dry cows in future.
Early lactation: 2 weeks before mating start date in seasonal/split calving herds, or 40–60 days after calving in year-round calving herds		
Average herd BCS has decreased by more than 0.6 since calving	Seek advice to examine the costs and benefits of increasing feed inputs to prevent further losses in body condition.	<ul style="list-style-type: none"> › Review pre-calving transition feeding program with help from an adviser. › Consider increasing feed intakes to minimise body condition loss in early lactation.

Recommendations for achieving body condition targets

Body condition score targets are achieved by manipulating the quantity and type of feed provided given. Analyse the costs and benefits of changing the diet beforehand. Seek help from an adviser if you need it or are unsure about your proposed changes to the feeding program.

Put condition on cows below score 4.5 in late lactation

Consider these options for managing cows below score 4.5 in late lactation:

- › increase feeding levels for the whole herd
- › preferentially feed those cows below score 4.5
- › early drying off for cows below score 4.5.

8–10 week time for improvement

An 8–10-week period is sufficient time to achieve at least one body condition score increase if extra feed inputs are provided. If more than 15% of cows, that is 10 out of 70, are below body condition score 4.5 at 8–10 weeks before drying off, consider increasing feed inputs:

- › to the whole herd, or
- › just to the cows below score 4.5, if possible.

Subsequently, ensure all cows maintain or gain condition through the dry period.



Manage dry cows to achieve condition score 4.5–5.5 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 (less than 9 MJ ME/kg DM), providing inadequate total daily intakes of energy and protein, even if available in unlimited amounts.

Consider these options for increasing condition score of dry cows:

- › feed extra concentrate supplements if forages are limiting or prohibitively expensive
- › separate thin cows (below score 4.5) at drying off and feeding them a higher energy diet using higher quality forages and/or concentrates.

Implement an effective transition feeding program

Cows go through dramatic metabolic changes in the last three weeks before calving to prepare them for calving, lactation and re-breeding. Cows that transition poorly from springing into early lactation will lose excess body condition, have lower milk production, are less fertile and are more likely to be culled.

A special transition diet for the last three weeks before calving will help:

- › meet the cow's increasing demand for energy and protein
- › minimise the reduction in feed intake as calving approaches, preventing excess body condition loss and reducing the risk of metabolic disorders
- › adapt the cow's rumen to the post-calving diet, and
- › minimise risk of milk fever and many other cow health problems associated with low blood calcium level around calving.

Warning: If the cow body condition score is not between 4.5 and 5.5 two weeks before calving, it's too late. Plan to have the next group of calving cows in better condition.

Note: Early pregnancy testing with foetal aging to establish the date of conception is essential for managing transition cows. An accurate estimate of the due calving date will help you to give cows a transition diet for three weeks before calving.

Minimise body condition loss in early lactation

Some body condition loss in early lactation is to be expected. A cow's change in body condition score in early lactation is inversely related to their body condition score at calving. The fatter the cow at calving, the more condition is lost in early lactation.

Feeding in early lactation

Feed the highest possible quality pasture/forage to your cows after calving and through early lactation to minimise body condition loss after calving.

- › Balance nutrient intakes from pasture with supplements as required to ensure daily energy and protein intakes are sufficient for preventing excessive loss of condition as a cow approaches peak lactation.
- › Work with an adviser to ensure the diet meets fibre, mineral and vitamin requirements.
- › Encourage feed intake and avoid upsetting normal rumen function.
- › Consider including buffers such as sodium bicarbonate when concentrate intake exceeds 4–5 kg DM/cow/day.

Make all dietary changes slowly during early lactation. For example, increase concentrate supplements in half-kilogram steps over several days to give the cow time to adapt to the energy density of the new diet.

Options for minimising condition score loss in early lactation

For detailed, specific nutritional advice on feeding early lactation cows, seek help from a nutrition adviser.

- › If you have a computerised bail feeding system in the dairy:
 - use this to step up freshly-calved cow concentrate feeding levels slowly over the first 7–10 days of lactation, and
 - if you have a split or year-round calving herd, use it to preferentially feed cows in early lactation with extra concentrates.
- › If you don't have a computerised bail feeding system in the dairy, consider running early lactation cows, those calved less than 100 days, separately to allow you to feed them according to their needs.

Transition cow management and feeding

Significant advances in dairy nutrition and production in recent years have been achieved from better management of cows in the pre-calving transition period, the last 3–4 weeks before calving. This short period of time provides an important management opportunity for dairy farmers to improve their herd's:

- › health
- › milk production, and
- › reproductive performance.

Why is effective transition nutrition important?

Effective pre-calving transition nutrition sets the cow up for a successful lactation by helping to:

- › prevent milk fever
- › control health problems soon after calving related to low blood calcium levels, such as ketosis, abomasal displacement, mastitis, retained placenta, uterine infection, calving requiring assistance and ruminal acidosis
- › minimise time and stress spent treating sick and downer cows
- › improve animal welfare
- › reduce death and culling rates around calving, and
- › improve in-calf rates.

Reducing milk fever

With a sound transition program, milk fever in herds can be reduced to almost nil. This represents a large saving in money (a clinical milk fever case costs over \$300 on average), and in time spent treating cases.

Effective transition nutrition is good for the cows, for you and your staff. Good transition diets help calving to go smoothly.

Common approaches

There are a number of common approaches to pre-calving transition feeding, each varies in the extent to which it helps the cow deal with challenges of adapting to lactation.

Six commonly used approaches are:

- › pasture/hay/anionic salts in fodder or water
- › pasture/hay/grain-based concentrate
- › pasture/hay/anionic salts/concentrate
- › pasture/hay/professionally formulated, commercially produced anionic transition supplement (lead feed)
- › TMR/PMR – fully integrated transition diet.

Costs and benefits

Depending on the approach, a transition feeding program could cost between \$20 and \$80 per cow, but return a net benefit of up to \$200 or more per cow, after additional labour and feed costs. These benefits come in the form of extra milk production, less disease, fewer losses and culls, and improved fertility.

How much you stand to gain from improving transition nutrition on your farm depends upon:

- › your current approach to transition feeding
- › your current levels of milk fever and other cow health problems
- › your current herd milk production and reproductive performance, and
- › your capacity to establish and deliver an effective transition feeding program.

Further information

Dairy Australia has several resources to help you understand Transition Cow Management ranging from manuals to fact sheets and education and training opportunities. There are specific resources for planning, implementing and reviewing your transition cow management and feeding program, including:

- › Transition Diet Milk Fever Risk Calculator,
- › Checklist for transition cow management,
- › Tally Sheet for recording cow health problems at calving, and
- › Review Worksheet.

See: dairyaustralia.com.au/TCM for more information and resources.

Putting transition cow management into practice

Transition feeding does not require you to change your feeding system or milker grain/concentrate feeding rate. The transition feeding approach that best suits your farm depends on:

- › your intended grain/concentrates feeding rate during early lactation
- › your feeding infrastructure and equipment, and
- › the health, production and fertility benefits you are seeking.

Lead feed

A commercial transition supplement, lead feed, is often used as part of a pre-calving transition diet. A lead feed is a grain-based supplement which may contain protein supplements, magnesium, anionic salts or an anionic feed product, micro-minerals, rumen modifiers and other additives.

Transition heifers feeding for heifers should be included in your transition feeding program. Whilst they are unlikely to experience any milk fever benefits as clinical milk fever is rare in heifers, the transition diet will:

- › help their rumen to adapt to the lactation diet
- › provide extra minerals, and
- › help them socialise with older animals.

Extra benefit: If you choose to lead feed in the dairy, this also allows heifers to become familiar with the holding yard, shed, concrete surfaces and dairy cow flow.

Keys to successful transition cow management

Four keys to success

Get accurate due calving dates

The optimal time to feed the transition diet pre-calving is 3 weeks. Moving cows into the transition cow group at the right time requires accurate estimates of calving dates. The most accurate estimates are obtained from rectal or ultrasound pregnancy testing of cows between 5 and 15 weeks pregnant.

Design a nutritionally sound, low milk-fever risk transition diet

The first consideration for a nutritionally sound, low milk fever risk pre-calving transition diet should be to provide sufficient energy and proteins to meet the cow's daily requirements, allowing for her reduced feed intake in the lead up to calving.

Then, consider the transition diet's mineral specifications – in particular its calcium, phosphorus, magnesium and Dietary Cation Anion Difference (DCAD) levels. Each component level contributes independently to the diet's milk fever, and subsequent herd reproductive performance risk reduction, so they are all important.

See: The Transition Cow resources from Dairy Australia.

Prepare your farm team

It is essential to feed the correct quantity and composition of feed to every cow in transition on every day of her transition. A transition feeding program introduces new tasks and different work routines at an already very busy time of the year for seasonal and split calving herds.

Seek help if you are unsure. An experienced adviser can help you design work flows, define roles and responsibilities, write operating procedures, train personnel, assist you to source suitable transition diet components and help you design the diet in advance.

Control transition cow daily intakes

Make sure that every animal in the transition group gets unrestricted access to all components of the transition diet and that they eat the intended quantity each and every day. Focus on consistency of delivery and of intake.

Use quick nutritional checks

Body condition scoring has limited ability to identify small change or change occurring over a short period of time. Body condition scoring focus is on assessing the end result of herd nutrition. Supplement body condition scoring by using some quick checks that can alert you to nutritional problems in your herd. A dietary problem detected early can be corrected before there is any undesired loss of condition.

- › In year-round calving herds, quick nutritional checks are required throughout the year
- › In seasonal/split calving herds, it is particularly important to monitor from 2 weeks before mating starts until the end of mating.

What's happening in the dairy?

Feed left behind in the dairy indicates a problem.

- › If half the bails have more than 10% of grain/concentrate left behind after milking, then investigate.
- › If more than one bail in 10 has more than 50% left, some cows may have substantially reduced appetites. Check cud chewing and manure consistency to determine if this is caused by ruminal acidosis and seek help from an adviser.



What's happening in the milk vat?

Changes in milk composition are directly linked to the cow's diet.

- › A **low fat test** may occur due to lack of fibre and alterations in rumen fermentation.
- › A **high fat test** in early lactation cows may be a sign that they are mobilising excessive body reserves.
- › A **falling protein test** is a sign that energy intake has dropped.
- › Less commonly, ruminal acidosis can also cause the milk protein percentage to drop.

Monitor changes in the average bulk vat milk fat and milk protein concentrations over consecutive 7–10 day periods and compare to the same period last year. Investigate if fat or milk protein test varies by more than 0.2%. If, after making adjustments to the diet the problem persists, seek help from an adviser.



What's happening in the paddock?

Regular observations of cows in the paddock can be valuable in measuring how cows are coping with the diet. The best time to observe cows is when they have eaten and are likely to be sitting down. This will probably be two to three hours after milking. Regularly check and monitor:

- › extent of lameness in the herd
- › rumen fill
- › cud chewing
- › post-grazing pasture residuals
- › extent of scouring cows, and
- › manure consistency.

What to look for

Keep in mind that there can temporary fluctuations in any one of the quick check levels and no problem may be present – especially if the check levels return to normal quickly. Be more concerned if there is persistent or worsening change over a few days or if more than one indicator is signalling a problem. Seek advice if you are unsure what is happening in your herd.

Other feeding strategies for improving fertility

Main priorities

When feeding for high herd fertility, ensure that your:

- › cows are achieving body condition targets at key times during the lactation cycle, through feeding sufficient quantities of nutritionally well-balanced diets
- › cows and replacement heifers are well prepared for the challenges of calving, lactation and re-breeding, through sound pre-calving transition cow management and feeding, and
- › replacement heifers achieve target bodyweight and frame size at mating and first calving, as both impact on their reproductive performance.

Having addressed these, there are several other nutritional strategies related to specific nutrients and dietary ingredients which you may wish to discuss with an experienced nutritional adviser.

Other nutritional strategies

Other nutritional strategies for improving cow fertility include:

- › Use of diets in the transition period before and after calving and in early lactation to minimise the extent and duration of negative energy, protein and minerals balance.
- › Use of diets in early lactation that promote increases in plasma glucose and insulin, improving metabolic and hormonal status of cows.
- › Use of specific types of dietary fat in pre- and post-calving transition diets that enable the diet's energy density to:
 - be lifted without increased dependence on rapidly fermentable carbohydrates
 - improve energy balance, and
 - reduce the incidence of metabolic diseases and elevate blood levels of reproductive hormones.
- › Use of other specific nutrients and dietary ingredients/additives that may assist by other means, such as:
 - correcting nutritional deficiencies
 - improving rumen function
 - improving cow metabolic and hormonal function or
 - binding plant toxins.

This is a field of ongoing research and improvement so you should always consult with your nutrition adviser before choosing and implementing any of these strategies, to determine the potential benefits and costs.

“Managing herd nutrition can be a challenge. Seek help from a nutritional adviser if you are unsure about your strategy”



Section C Heat detection

Heat detection aims to identify cows that are about to ovulate. Good heat detection programs 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 AI, the key to ensuring semen is not wasted and cows conceive at the right time is accurate heat detection.

Requirement for regular assessment

Regularly assess your current heat detection practices to see if they can be improved. But it will be difficult to know if you have a problem, or the type of heat detection problems that may exist in your herd, without measuring performance.

Calculating the submission rate, that is the proportion of eligible cows detected on heat and inseminated, is a good first step to measuring performance. There are other calculations that also help you to:

- › assess the quality of heat detection
- › identify if you are:
 - missing too many heats, or
 - submitting too many cows for mating that are not on heat.

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Key points

- › Heat detection identifies cows suitable for mating.
- › Your system should identify as many cows truly on heat as possible but without presenting cows not on heat for service.
- › Cows show characteristic signs of heat such as mounting. You need to dedicate time and people to observe these activities and/or use systems to identify cows that are on heat.
- › Heat synchronisation programs can help but they cannot substitute for dedicated effort to get cows cycling and to detect them on heat.

Measuring heat detection performance using submission rate

Submission rate

The submission rate is the proportion of eligible cows detected in heat across part or all of the mating period and can provide useful information on heat detection performance. A high submission rate needs:

- › your cows to be cycling and showing heat, and
- › to detect them when they show heat.

A low submission rate suggests a problem requiring action. Submission rates can be low for two reasons:

- › your cows are showing heat normally but you are not detecting them
- › you have lots of 'non-cyclers' in your herd that are not showing heat.

What is a non-cycler?

A **non-cycler** is a cow that has not started normal heat cycles after calving. This may be due to low body condition at calving, excessive body condition loss, lameness, or other health problems after calving. In seasonal/split calving herds, the number of non-cyclers increases if more cows calve later in the calving period.

The *InCalf Fertility Focus* report calculates your herd's 3-week submission rate for early-calved, mature cows. Alternatively, you can calculate this figure manually, as explained in the InCalf Heat Detection Tool.

Seasonal/split calving herds

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 4 years of age or older at calving, and that have calved 42 days or more before the start of mating. These cows should mostly be cycling before the start of mating so the 3-week submission rate of this group is a good indicator of heat detection efficiency, that is, your ability to detect cows that are truly on heat.

- ✓ Top farmers achieve a 92% 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 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 4.5 and/or are still losing condition coming into mating.

Year-round calving herds

Using submission rates

At least every 2 months, obtain your herd's 80-day submission rate. Calculate the submission rate for both the most recent period and for the preceding 12 months.

- ✓ Top farmers achieve an 80-day submission rate of about 73% across a 12-month period.
- ✗ If the 80-day submission rate is less than 61%, low performance may be due to low heat detection rates and/or excessive numbers of non-cycling cows due to low body condition at calving, excessive body condition loss after calving or cow health problems. If your herd's 100-day in-calf rate is also low, seek an in-depth measurement of heat detection by an adviser.

Ensure your heat detection strategy includes a method of identifying cows in the mating group or cows due to be mated. Try using a tail-tape system that rotates the tape colour every three weeks.

See: Using Tail paint, page 81

Caution

If excessive numbers of cows are being inseminated when not on heat, the submission rate will be high but conception rates will be poor. Check your herd's conception rate is at least 43%.

The InCalf Fertility Focus report calculates your herd's annual 80-day submission rate for you.



Heat detection

Exploring heat detection errors

Examining the pattern of heats and returns in individual cows can help identify the type of heat detection errors that may be occurring. There are two heat detection errors that you can make:

- › **Fail to detect** a cow showing signs of heat – this is a false negative or missed heats. If you have too many missed heats then your heat detection efficiency will be low, and your submission rate will be reduced.
- › Submitting **a cow as being on heat** when she is **not** – this is a false positive heat. If you have too many false positive heats then your heat detection accuracy will be low, so while your submission rate may be high your conception rate will be reduced.

You need both high heat detection efficiency, that is few false negatives, and high heat detection accuracy, that is few false positives, if you are to obtain a high conception rate and a good in-calf rate at AI.

Impact of false positives and negatives

Research shows that heat detection errors are likely to be limiting reproductive performance in around one-quarter of seasonal calving herds and three-quarters of year-round calving herds.

You should review your heat detection practices and check cow body condition and health if you have a low submission rate, that is:

- › 3-week submission rates < 75% in seasonal or split calving herds, or
- › an 80-day submission rate < 61% in year-round calving herds.

Note: Could cows be experiencing heat stress due to high temperatures +/- humidity? Refer to page 137 for further information.

Keep the objective in mind

Remember the objective is to get cows pregnant, not just to submit them for service.

Effective heat detection has minimal numbers of false negatives and false positives.

Deciding whether she should be inseminated

I think she's on heat but I'm not sure. Should she be inseminated?

- > Record a '?' in the AI record when 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.
- > 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:
 - and you have difficulty passing the insemination gun through the cervix, perform a deep cervical insemination. In other words, don't pass the gun right through into the uterus.
 - consider using less expensive semen.

Warning



If more than 10% of inseminations are in cows with weak heat signs, or many of the intervals between consecutive inseminations are less than 18 days, then review your heat detection practices.

Heat detection and what to look for in a cow that is on heat

Observable changes

There are many changes that occur in cows around the time of heat. Cows may behave differently and milk production, feed intake and rumination can change. Cows also experience physiological change: there is increased vaginal mucus and they have altered levels of the hormones progesterone and oestrogen. These changes occur together and in patterns that can be used to better identify when a cow is in heat.

Most likely on heat

A cow is most likely to be on heat if:

- › she is standing to be mounted by other cows
- › the tail paint is removed, or
- › the heat mount detector is triggered.

May be on heat

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
- › she has mucus around the vulva
- › she has mud marks on the flanks, or
- › the heat mount detector is lost.

Confirming on heat

Cows with at least 2 of these signs are possibly on heat but showing only weak signs. Some will not be on heat. Make sure everyone on the farm team knows how to recognise heat signs and what to do with cows that are showing weak signs of heat.

Normal cycle

Normally, you can expect a cow to:

- › show signs of heat every 18–24 days with an average of around 21 days in cows and 20 days in heifers.
- › often have a short cycle after their first heat and be in heat again 8–12 days later.
- › have an average interval from calving to first heat of 30–35 days when pasture-fed and in good body condition. This can be 10 days longer in first-calved heifers.

See: dairyaustralia.com.au/incalf for further information. To watch a training video on heat detection, scan this code.



On heat: standing to be mounted



May be on heat: trying to mount other cows
heat: standing to be mounted



Improving heat detection by the farm team

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

The best heat detection programs start with careful timing, good observation and the effective and considered use of detection aids. Distinguishing and interpreting cow behaviour and other signs is critical. Commit to training and refreshers for the farm team and keep good records if you are to improve.

Steps to follow

Measure, analyse and discuss heat detection performance to reinforce training and keep skill levels and motivation of the farm team high.

Step	Questions and actions
1	Review the heat detection skills of your farm team: <ul style="list-style-type: none">› Are they up to scratch?› Does everyone involved know exactly what to look for when detecting cows on heat?› Do they know what to do with a cow detected on heat?
2	Determine which aids you will use. Farmers with the best heat detection results use a combination of paddock observation and heat detection aids. 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.
3	Determine how cow heats and matings will be recorded, information shared between workers and the data will be entered into the computer system. Good record keeping will help farm work flow and support analysis that can identify problems in heat detection. This will help you continually improve.
4	Finally, keep an eye on the detail. Schedule regular times to monitor the success of the program. You need to measure from the start and monitor if you are to spot problems early. A successful heat detection program depends on your capacity to monitor and fine-tune through the mating period.

Recommendations

- › If heat detection and drafting at the dairy shed are separate processes, ensure that cows in heat are clearly identified to make drafting easier.
- › If using an aerosol stock marker, apply the mark to a different location each day, rotating every three days to prevent cows being inseminated wrongly over two consecutive days.
- › If you have automatic drafting, the heat detector can immediately enter the identification number of the cow into the computer so the cow can be auto-drafted exiting the dairy shed. Ensure you have backup if the auto drafting malfunctions.

Note: This data can be used for other tasks such as pregnancy testing.

Training and refreshing the farm team

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. This is a good time for farm team training. Experienced people should work with and help less experienced team members to interpret signs of heat. Make sure you place an experienced and capable person in charge before mating begins.

Paddock visits

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 rate is being maintained by checking tail heads during milking and comparing daily heat records.

Clear processes

Make sure everyone understands the processes that follow the detection of a cow on heat. Where is this recorded? Who needs to know? When is the cow to be drafted? All the farm team should know exactly what needs to be done when a cow on heat is detected.

Year-round calving herds: Heat detection before mating

- › Record dates for observed heats between calving and insemination so you can anticipate when cows may next be on heat.
- › If you are using anticipated heat dates, be sure cows are not being submitted too early, when they are coming on to heat, rather than after standing heat has occurred.
- › Records of past heats help confirm that cows showing weak signs of heat about 3 weeks after a recorded date are actually on heat.

Seasonal/split calving herds: Heat detection before mating

- › Monitor heats before Mating Start Date if you wish to treat cows not detected on heat early. Use the Why Wait heat synchrony option or estimate the herd's pre mating cycling rate.
- › Record which cows have a heat before Mating Start Date.
- › Calculate your herd's pre-mating cycling rate. This tells you the percentage of non-pregnant cows in your herd that have shown signs of heat before mating begins.

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

- › Apply tail paint of one colour (e.g. red) to every non-pregnant milker 30 days before Mating Start Date.
- › Apply tail paint (red) to later calvers when they first enter the milking herd.
- › Check tail painted cows for rubbed tail paint twice weekly until Mating Start 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, blue for example.

Evaluating results

The cows with the:

- › original tail paint colour (red) are unlikely to have come on heat since tail paint was first applied.
- › other tail paint colour (blue) have had at least one heat since tail paint was first applied.

The pre-mating cycling rate can be calculated with this method:

$$\text{Pre-mating cycling rate} = \frac{\text{No. of blue painted cows} \times 100}{(\text{No. of blue} + \text{No. of red painted cows})}$$

Benefit

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.

If less than 70%, then your heat detection has not been effective or you have too many non-cyclers. You may need to modify your pre-mating heat detection strategy, ensure that most cows calve early in future calving periods, calve your cows in better condition at the next calving period or make sure that heifers reach their target live weight at calving. Check that your cows have not lost excessive body condition after calving.

Impact of missing heats on in-calf rates

Here is an example that demonstrates the impact that a reduction in submission rate due to missed heats, that is reduced heat detection efficiency, has on a seasonal calving herd's 6-week in-calf rate.

It shows a baseline situation of 90% heat detection efficiency, that is 90% of cycling cows are actually detected, and a scenario where the heat detection efficiency is 10% less at 80%. If you follow the calculations, you can see that in this particular example this 10% difference in heat detection efficiency has translated into a 6% difference in herd 6-week in-calf rate.

Note: This example assumes a 6-week minimum AI and heat detection period.

Cost of delayed conception

This example shows the cost of delayed conception in a seasonal calving herd due to a 10% reduction in heat detection efficiency.

Time period	Baseline	Reduced heat detection efficiency (10%)
Heat detection efficiency: weeks 1–3	90%	80%
% cycling by end of weeks 3	90%	90%
Conception rate	50%	50%
% becoming pregnant in weeks 1–3	41%	36%
Heat detection efficiency: weeks 4–6	90%	80%
% empties that cycle in weeks 4–6	80%	80%
Conception rate	50%	50%
% becoming pregnant in weeks 4–6	21%	20%
6-week in-calf rate	62%	56%

Using paddock observations and detection aids for best results

InCalf research indicates that the best heat detection results are achieved by combining paddock observations and heat detection aids such as tail paint and heat mount detectors. A twice-daily time commitment outside of milking is required. This is a very accurate method if your farm team are well trained and the cows can be easily identified in the paddock.

Recommendations

- › Ensure that all cows in the herd are individually identified using ear tags and/or freeze brands, that can be read from some distance.

Note: Reading individual cow IDs can be challenging in big herds if observation distances are great.

- › 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.
- › Consider evening paddock checks 2 hours after the afternoon milking to maximise the number of cows detected on heat.
- › **In year-round calving herds**, use a tail-tape system that rotates tape colour. Begin with red tail tape in cows approaching the end of their voluntary wait period (VWP). Focus on cows with red tail tape when observing the herd.
- › After insemination, return cows to the milking herd as soon as possible unless using vasectomised bulls or hormone-treated steers.
- › If several people are involved in heat detection, implement a system to ensure that all involved share their records each day.

Example: A whiteboard at the dairy.

What to look for in the paddock

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. During a paddock check, observe cows quietly, paying particular attention to restless groups of cows.

- › Observe cows for heat without disrupting their activity.
- › Only mark cows detected on heat in the paddock if this does not disturb the herd.
- › Record the identity number of every cow detected on heat at each paddock check.

Heat detection at the dairy shed only

Heat detection can be done at the milking shed by inspecting the heat detection aids on all cows at milking. Relying solely on heat detection at the dairy increases the risk of missed heats because many cows in heat do not show visible signs of heat during or walking to milking. However, if this is what you choose to do:

- › your heat detection program must be well planned and executed. Ensure that all heat detection aids are correctly applied and well maintained, and
- › 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.

Heat detection aids

Several options are available to aid heat detection and increase heat detection rates. Heat detection aids are especially useful for cows that are not detected displaying heat signs in the paddock.

Each cow must have a unique ID number so that it can be readily and accurately identified.

Warning



It is easy to miss a heat. The average duration of heat for dairy cows is around 12 hours. Heats can be as short as 2 hours or as long as 28 hours. Weather conditions can affect heat display. Twice daily paddock checks will help you to catch cows with all but the shortest of heats.

Twice daily paddock checks are a real commitment. Doing them well is a key to achieving good results.

Selecting an aid

Determine which of these options best suit your heat detection strategy, budget, facilities and farm team skill level. For the best results use a combination – and continually measure and monitor performance.

Option	Base
Tail paint and paddock checks	<ul style="list-style-type: none">› Requires the least expensive materials› Can be successful if implemented correctly and with diligence
Heat mount detectors	<ul style="list-style-type: none">› More expensive than tail paint› Easier to read› Require less maintenance once applied› Can increase heat detection rates
Automated heat detection technology, including activity meters	<ul style="list-style-type: none">› Can be integrated into computerised herd information systems› Require considerable initial expense and fine tuning to operate to best effect in your herd
Heat synchronisation	Allows for intensive periods of: <ul style="list-style-type: none">› heat detection› insemination, and› calving.

In summary

Each of the heat detection options has advantages and disadvantages, so it is a matter of working out what best suits your farm's 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.

Using tail paint

How it works

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 used.

Apply a strip of tail paint to the rear portion of the backbone. Cows on heat will stand when mounted by herd mates or a bull and the tail paint will be gradually rubbed off as the other animal dismounts.

You can achieve high heat detection rates using well-maintained tail paint and paddock checks.

Try to tail paint a couple of days before you plan to check heats.

- › Tail paint is more effective if it has weathered a bit.
- › Only use commercial tail paint.
- › Follow the manufacturer's recommendations.



Using tail paint effectively

- › Ensure every cow, except those actually on heat, has an unbroken strip of paint:
 - throughout the AI period in seasonal/split calving herds, or
 - if it is in the mating group in year-round calving herds.
- › Touch up tail paint weekly.
- › Only cover the uppermost ridge of the spine/tail.
- › Apply with forward strokes to make the hair stand on end and leave a rough finish.
- › Only use commercial tail paint or sprays, not house or roof paint or aerosol raddles.
- › 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 to help avoid inseminating cows that are not on heat.
- › Reapply a different coloured paint to recently inseminated cows once other cows no longer try to mount them to help:
 - identify cows not yet inseminated, and
 - you to decide if to inseminate a cow showing only weak signs of heat.
- › Continue this until the:
 - end of the AI period in seasonal/split calving herds, or
 - cow has been confirmed pregnant in year-round calving herds.
- › Consider using tail paint to all cows:
 - on or before, Mating start date (MSD) – seasonal/split calving herds, or
 - as cows reach their voluntary waiting period (VWP)- year-round calving herds.

Note: Tail paint can be used before mating, before MSD in seasonal/split herds or before the VWP has been reached in year-round herds, to monitor for heats before mating.

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
- > sufficiently thick to cover the skin with some hair fibres still visible.



Using heat mount detectors

Benefits

InCalf research shows that heat detection rates are higher in herds using heat mount detectors. They can result in higher detection rates than tail paint, particularly in year-round calving herds, or herds where less skilled or unmotivated stock handlers are checking for cows on heat.

Best results are achieved when heat mount detectors are combined with paddock checks for heat.

How heat mount detectors work

Heat mount detectors are applied to the back of cows in a position where they can be triggered by pressure or rubbing from a mounting animal. Some heat mount detectors use pressure-activated 'tubes' of paint that burst on pressure. Others use scratch-off 'patches' that reveal a bright colour when activated and cows can easily be recognised as being on heat – even when not showing any heat display signs.

False mount

Remember that detectors can be activated by a 'false mount' which occurs when a cow is mounted when it is not on heat but cannot escape a mounting herd mate in a confined area.



Applying a heat mount detector

- > Follow the manufacturer's instructions for applying the heat mount detector
- > Use the recommended adhesive.



This heat mount detector signals that the cow has been mounted and is likely to be on heat.

Using heat mount detectors

- › Apply heat mount detectors to:
 - every cow on the day before MSD in seasonal/split calving herds
 - individual cows as they pass their WWP in year-round calving herds.
- › Remove activated heat mount detectors at the time of insemination.
- › Replace the heat mount detector after insemination, when the cow is no longer being mounted. Continue replacing until the:
 - end of the AI period in seasonal or split calving herds, or
 - cow has been confirmed pregnant in year-round calving herds.
- › In seasonal/split-calving herds only switch to tail paint after the first insemination if you are confident of maintaining high levels of heat detection.
- › Check heat mount detectors regularly and replace if they are damaged or are coming loose
- › Don't use heat mount detectors if cows have access to low tree branches that are likely to rub them off.

Note: Check for other signs of heat if a heat mount detector is lost as it may indicate a cow is on heat.



A scratch-off heat mount detector

Using automated heat detection systems including activity meters

How they work

Automated heat detection systems use electronic sensors to record one or more hormonal, physiological or behavioural indicators that change around the time of heat and ovulation in cows. A computer algorithm analyses the records and based on alarm threshold settings for the indicators used, identifies those cows most likely to be on heat.

A feature of many automated heat detection systems is identification of the time that cows first come into heat which can be useful for predicting the time of ovulation and therefore the best time for insemination.

Monitoring cow movement

Most automated heat detection systems include a cow movement monitor. Most cows coming into heat will become restless and move about more. This activity is recorded with a motion sensor attached to a collar or leg band and can be analysed to identify the time and level of increased activity signalling the onset of heat.

Monitoring more than movement

Increasingly systems are analysing more than just movement, for example:

- > milk production
- > rumination, and/or
- > body temperature.

Benefits

These combination systems provide both better performance in heat detection and other useful information on the cow's health. Systems vary in the number, type and position of cow sensors used, the amount of data collected, the way data is transferred, analysed and interpreted. However, all affect the practicality and performance of the system for detecting cows in heat.

What to consider

If considering buying an automated heat detection system, compare the cost against the potential benefits. The cost is easier to estimate as the benefit depends upon current reproductive performance being achieved, the cost of achieving this and the likely improvement in performance or convenience you can expect from the new system.

Pros and cons

Automated systems for detecting cows in heat can help improve reproductive management and performance. These systems are a tool and not a set and forget solution as they require time and expertise to set up and to optimise. Actual herd performance will depend upon how you use the information.

Best performance occurs when the information from the automated system is combined with direct observations and knowledge of individual cows.



A heat detection collar



A heat-detection enabled ear tag

Automated heat detection systems – it's all about the alarm threshold

Adjusting the alarm threshold settings of the system is critical for heat detection efficiency and accuracy.

- › Raise the trigger point too far, and your heat detection efficiency will be reduced and more false negatives will result. More heats will be missed and your submission rate will be reduced
- › Lower the trigger point too far, and your heat detection accuracy will be reduced and more false positives will result. Your submission rate may be high but your conception rate will be reduced

Choosing the best option

If you have an automated heat detection system or are considering installing a system, work with the manufacturer and with your reproductive adviser to fine-tune the system to best suit your herd and your needs. Don't just use the factory default settings.

Further information

For further information on what to consider before you purchase an automated heat detection system refer to the Dairy Australia web site.

See: dairyaustralia.com.au/incalf for more information and resources including fact sheets on heat detection and activity meters.

Interest group: If you are interested in attending a Heat Detective discussion group, contact your Regional Development Program.

Using tail tape in year-round calving herds

Using tail tape for heat detection

A system of tail tagging your cows with coloured cloth tape (not plastic electrical insulation tape) can increase detection rates and make life easier. Ensure that your farm team understand any system you implement.

Using a coloured tape system

A coloured tail tape system lets you easily see the stage each cow has reached in her mating cycle. For example:

- › red tail tape always means that these cows require a really careful look when heat detecting and should always be wearing fresh tail paint and/or a heat mount detector (the mating group)
- › green tail tape always means that a cow has been inseminated, but is not yet confirmed pregnant. Do not inject these cows with prostaglandin, even if there is no insemination recorded.

Note: Some cows will have both colour tags.

1. Identify cows that have been inseminated but are not yet confirmed pregnant

When cows on heat are inseminated:

- › remove activated heat mount detectors and any red tail tape
- › record insemination date, cow ID, bull and technician
- › apply green tail tape to identify recently inseminated cows.

2. Identify cows in the mating group that require particular attention for heat detection

At one milking, every week

- › Use calving dates to identify cows that have recently passed their Voluntary Waiting Period. Apply:
 - yellow tail tape, and
 - either tail paint and/or a heat mount detector.
- › Using insemination records, identify cows with green tape due back on heat in the next week. Apply:
 - yellow tail tape leaving the green tape visible, and
 - fresh tail paint and/or a new heat mount detector to these cows.
- › Check tail paint or heat mount detector on all other red tail-taped cows; touch up tail paint if necessary or ensure that the heat mount detector is okay.

At every milking

Examine cows with red tape for evidence of rub marks, rubbed tail paint and/or activated or missing heat mount detector.

3. Identify cows due for pregnancy testing

From cows with green tail tape, select those inseminated more than 5–6 weeks ago and have them pregnancy tested.

- › For cows confirmed pregnant, remove all tail tapes and heat mount detectors.
- › For cows diagnosed as empty:
 - apply fresh tail paint or heat mount detector
 - new red tail tape, and
 - remove green (recently inseminated) tape.

Put the tape on firmly, a couple of wraps, but not so tightly as to risk disturbing blood circulation to the tail.

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.

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
- › 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 when inseminations are done. The AI technician will need your assistance with bringing in the cows and locking them in for insemination.

Recommendations

- › Clear forms of animal ID easily read from some distance are essential to ensure correct identification of each cow detected in heat while grazing or moving around in a sexually active group.
- › Consider assigning a dedicated staff member to observe heat detection aids as the cows pass through the dairy across the duration of the AI period.
- › Everyone involved in drafting and inseminating tasks, herd owner, manager, employers, employees and contractors, is responsible for ensuring that facilities are safe, accessible, convenient and comfortable for both people and animals.
- › In larger herds consult with the Area Manager for your artificial breeding service about the handling facilities required for inseminating large numbers of cows.

Should we accept poorer heat detection when 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 be 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 the AI period, 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 by the AI technician? Who is looking after the records?

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

Larger herds present extra challenges to heat detection.



Heat synchronisation

Most synchronisation programs will have a limited effect on in-calf rates. It is the management benefits you need to consider in deciding whether to use synchronisation or not.

Benefits

Efficient use of labour

Heat synchronisation can offer efficient use of labour as the work of heat detection and AI is shortened into planned, intensive periods. In seasonal and split herds, it can be used to compress three cycles of breeding (9 weeks) into a 7-week mating program, or two cycles (6 weeks) into a 4-week mating program.

Increased heat detection rates

Synchronisation programs may help increase heat detection rates in large herds, if people are less skilled or have limited time because the people detecting heat can focus on the job for short, predicted periods.

When detecting heat during a synchronisation program, simple aids such as tail painting or heat mount detectors are essential. Some programs:

- › require fixed timed inseminations, meaning that no heat detection is required at all during that period
- › allow resynchronisation of returns to service to help achieve increased heat detection rates for returns to service.

Consult experiences sources

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

Planning

Planning is the key to a successful heat synchronisation program. Start by talking to your vet to determine the best program for you. Take the time to fully understand when and how the treatments work to give you an idea of the additional labour, facilities, time and cow identification required. Check things like:

- › How will the necessary synchronisation treatments be administered? What are the correct dose rates and times?
- › How will synchronisation treatments and inseminations be recorded?
- › Is heat detection necessary, and if so, how will it be done?
- › How will cows be drafted and held for insemination?
- › How will large numbers of cows on heat each day be inseminated?
- › Are extra staff required – including AI technicians and stock handlers?
- › Have sires been selected, semen supplies and storage arranged?
- › Does your AI technician(s) know about the synchrony coming up? When and how many?
- › What about the synchronised returns 18–24 days later? Enough bulls or AI 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 AI calves correctly?
 - increase colostrum storage capacity and calf rearing facilities?

Further information

- › Discuss the required support with your AI Centre
- › Details describing synchronisation programs for use in cows and heifers are described in the appendix 186.

Managing cows not detected on heat

Why cows not detected in heat are important

Cows that don't come on heat when you are ready to mate them cost money and time. They can prevent you from achieving your target 6-week/100-day in-calf rate by decreasing both the key drivers of in-calf rates:

- › 3-week/80-day submission rate, and
- › conception rate.

Both drivers are important, but the submission rate has a bigger impact because your management more readily influences it. Good heat detection is essential to reach submission targets but too many non-cyclers will hold back herds with good heat detection rates.

Two types of cows not detected on heat

There are 2 types of cows not detected on heat. They are cows that have:

- › ovulated, that is ovaries are 'cycling' but not shown heat, and
- › **not** even started ovulating since calving, and cannot have a heat (anoestrus cows).

Common causes

Failure to detect cows in heat is more common in year-round calving herds but can still be a problem in seasonal/split calving herds.

- › Some cows have a 'silent heat', that is a very brief and difficult to detect heat, the cows were fertile but were only mounted once or twice, if at all.
- › About 80% of cows do not show heat at the first ovulation after calving. Most healthy cows will have their first visible heat within 6 weeks of calving.
- › Late-calving cows in seasonal and split systems may not have time to have a visible heat before mating starts and typically make up the majority of non-cycling cows in seasonal and split calving herds.

A veterinary examination can identify causes. The current recommendation is that both types of cows not detected on heat will benefit from similar treatments making individual diagnosis less important.

Post-calving recovery

After the first visible, post-calving heat in a healthy cow with an uncomplicated calving, 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 MSD in seasonal/split calving herds and
- › VWP in year-round calving herds.

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 is 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 which generally takes 4 weeks provided there is no infection present, and
- › 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 then 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 calving in the first 4 weeks and having strong heats 5 weeks after calving, will be fertile for the first round of AI.

In seasonal/split calving herds, manage cows to recover from calving and be fertile again for the first 3 weeks of mating.

Factors affecting the number of cows not detected on heat

Factors that affect the number of cows not detected on heat in a herd include:

- › Calving date – in seasonal/split-calving herds, cows that have calved late may not have had insufficient time to start normal heat cycles
- › Poor heifer rearing – underweight heifers have a longer interval to first heat and at least a 10% lower submission rate unless treated
- › Young cows – more first-calving heifers are treated as non-cyclers compared to mature cows. First calvers generally need an extra 10 days to start cycling. You can ease this problem by mating the replacement heifers a week or two before AI starts in the milking herd.
- › 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 (BCS below 4.5) take longer to start cycling. Fat cows (BCS above 5.5) tend to lose excessive body condition after calving due to suppressed appetite, going into severe energy balance. They also take longer to start cycling.
- › Abnormal calving and health problems after calving – cows with assisted calvings, twins, cystic ovaries, an infected uterus (metritis) and/or lameness are more likely to be treated as non-cyclers.

Note: High levels of milk production do not necessarily increase the number of non-cyclers at start of mating.

Treating first calvers

First calvers losing excess body condition may be better separated from the herd and given 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.

Important: A non-cycling cow may in fact be pregnant! Identify non-cyclers

The easiest way to find non-cycling cows is to detect heats before you plan to mate the cow. Tail-paint or heat mount detectors can show you who is cycling before mating. An alternative to pre-mating heat detection is to identify cows that have not been detected:

- › three weeks after mating start date, seasonal and split herds, or
- › after their voluntary withhold period has expired, year-round herds.

The downside of this approach is that you identify non-cyclers later than if you used pre-mating heat detection but typically you identify fewer non-cyclers because the cows have had more time since calving to return to cycling activity.

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!

Treating cows not detected on heat

Treatment programs change as new technology is developed and external factors influence what veterinary products are available.

Refer: The appendix describes some current approaches to treating/synchronising non-cycling cows, but always consult with your veterinarian for latest advice.

Costs and benefits

Benefits from treating non-cycling cows occur in the next season while the treatment cost is incurred in the current one. The primary benefit is that treated non-cyclers calve earlier than if treatment was delayed or not implemented.

- › In a seasonal/split calving herd, 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.

Benefits of early treatment of non-cyclers

Research shows that early treatment of non-cyclers:

- › increases herd submission rate, and
- › Helps more high risk cows get back in-calf earlier.

In a seasonal/split calving herd early treatment contributes to a higher herd 6-week in-calf rate, and a more compact calving pattern next calving season.

Note: 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.

Actions to take

If you have a problem with cows not detected on heat, you should:

- › consult with your vet on options for treating cows not detected on heat
- › consider identifying cows not detected on heat before Mating Start Date in seasonal/split calving herds or within 80 days of calving in year-round calving herds.

A range of options is available to treat cows not detected on heat. Your treatment option will depend on costs, practical requirements to successfully implement it and the expected performance of the treatment.

Recording and measurement

Record the treated cows so you can measure and compare their reproductive performance after pregnancy testing. If an option suits your situation, plan the strategy for delivering the program in your herd well before you need to start. Meet with your vet to discuss the strategy and its practical implications.

Using intravaginal devices to treat cows not detected on heat



Seasonal calving herds

Treatment options

Treatment options for cows not detected on heat are being frequently updated as further trial results become available. This means that you should consult your vet about current recommendations for each product. Currently, four treatment options are available:

- › intravaginal device before Mating Start Date
- › intravaginal device 12 days after Mating Start Date
- › intravaginal device around 3 weeks after Mating Start Date
- › GPG treatment (Ovsynch®).

See: Appendix for details on treatment options for cows not detected on heat.

“Sometimes in seasonal/split calving herds, cows are treated as non-cyclers when they haven’t been calved very long. The main reason is they didn’t calve early enough in the calving period. Cows calving in the first 6 weeks are less likely to be ‘non-cyclers’, so ensure cows calve as early as possible in the calving period.”

Year-round calving herds

Managing cows not detected on heat

Managing cows not detected on heat requires a monthly routine. Each month, you need to:

- › identify which cows calved more than 80 days before and have not been detected on heat, and
- › have them examined and treated by a vet following your chosen program.

Veterinary examination

A veterinary examination is particularly important if less than 61% of cows in your herd are detected on heat 80 days after calving. You also need to examine cows that have been pregnancy tested empty at a previous visit but have not subsequently been mated.

Determining causes

Following this routine also allows you to determine the main causes for your cows not being detected on heat.

- › Some cows will have had a heat that was not detected. In this case, these cows can be injected with prostaglandin (PG) or treated in the same way as other cycling herd mates due to be inseminated.
- › If most of the cows examined have had a heat that was not detected:
 - review your heat detection program, and
 - consider heat synchronisation options.

Note: Heat synchronisation can help increase heat detection rates. Consider using heat synchronisation programs that enable fixed time insemination.

- › Some cows will not have been on heat since calving. In this case, these cows can be treated as for non-cycling cows in seasonal/split calving herds. It may be better to delay treatment for cows that are in low body condition, are lame, or are first calvers.
- › If most of the cows examined have failed to show signs of heat and
 - are in low body condition, measure body condition and nutrition and if first calvers are more commonly affected, also measure calf and heifer management.
 - have suffered disorders such as cystic ovaries, an infected uterus, or lameness, plan to control these health problems, with advice from your vet.

Section D Genetics, sires, mating strategies and artificial insemination

Choosing suitable sires for your herd is one of the most effective ways you can improve the profitability and performance of your herd over the long term.

Artificial insemination (AI) allows farmers to improve profits through genetic improvement of the herd.

Managing an AI program requires preparation and planning. If you are to get sufficient cows pregnant and to benefit from using AI, you need:

- › good heat detection
- › proper AI technique, and
- › careful selection of AI sires.

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Key points

- › AI provides a way for you to modify the traits in your herd.
- › Only use sires with superior Australian breeding values for traits that can improve your herd. Use the Good Bulls Guide.
- › Weigh up the advantages and disadvantages of sexed semen, crossbreeding and other AI strategies before committing to change.
- › Always apply good AI technique. Short-cuts simply don't work!

Sire selection using Australian Breeding Values (ABVs)

Improving genetics

Most Australian herds have opportunity to improve their genetics and achieve more profit, better fertility and other trait improvements. By introducing the right genetics into your farm business, you will permanently lock in the genetic benefits carried by good bulls into all future offspring. Small improvements in cow production, fertility, longevity and in other traits are obtained each generation. Over time they add up to be substantial gains. A superior sire will improve these traits in your herd.

Selecting good sires

If you consistently select superior AI sires, you effectively accelerate the rate of genetic gain of your herd. Conversely, if you make a poor sire selection you will lock in small losses for many years to come as their poor genes are passed down the daughter line.

It takes the same amount of time and effort to choose a good AI sire as it does to select a poor AI sire – so why not use this time to best advantage and choose the best bulls for your herd!

Australian Breeding Values (ABVs)

Australian Breeding Values (ABVs) are the best estimates of an AI sire's genetic merit in Australian dairy herds. An ABV is a measure of a bull's ability to pass on characteristics to his daughters. ABVs are available for a range of traits such as protein yield, survival, calving ease, daughter fertility, etc. The ABVs provide a convenient and effective way for you to select AI sires with the most desirable traits for your herd.

ABVs and genomics for females

ABVs for females can also be determined using genomics. The DNA from a sample of tail hair is analysed in the laboratory to determine the genetic makeup and merit of the animal. Genomic testing can be used to identify genetically superior replacement calves for retention and to identify which surplus heifers may be sold. Two important reproductive traits are the:

- › Daughter Fertility ABV, and
- › Calving Ease ABV.

Daughter Fertility ABV

The Daughter Fertility ABV rates sires by the fertility of their daughters. A sire with a high ABV for Daughter Fertility will produce genetically more fertile daughters than a sire with a low ABV. The Daughter Fertility ABV is calculated by measuring the reproductive performance of each sire's daughters. The average Daughter Fertility ABV is 100.

A herd of cows with a Daughter Fertility ABV of 100 can be expected to have an industry-average 6-week in-calf rate. A herd with a Daughter Fertility ABV of 105 can be expected to have a 6-week in-calf rate 5% above the current industry average. Research shows that:

- › daughters from high Daughter Fertility ABV bulls (above 102) have a 15% higher 6-week in-calf rate compared to daughters from low Daughter Fertility ABV bulls below 98, and
- › the top 16% of Holstein bulls have a Daughter Fertility ABV of 105 or more (103 in Jerseys).

To accelerate genetic gain for fertility, it is recommended that you choose AI sires from the Good Bulls Guide that are at least 105 for Daughter Fertility ABV.

Calving Ease ABV

Reducing the rate of assisted calvings, particularly in heifers, should also be a breeding objective. Avoid high-risk breeds of sires and certain sires within a breed. The Calving Ease ABVs assist you to identify low-risk sires within the breed. The average Calving Ease ABV for a breed is 100. Bulls with a Calving Ease ABV **above** 100 have on average **fewer** assisted calvings than bulls that are below 100.

You should choose bulls with a Calving Ease ABV of at least 103 to minimise the risk of assisted calvings.

Using Selection Indices to choose sires

What are your breeding goals?

Most farmers have more than one breeding goal and it becomes increasingly difficult to identify the most suitable sires when you are examining the ABVs across multiple traits. There are multi-trait breeding indices that estimate the overall impact of sires in a herd, allowing you to:

- › rank sires, and
- › choose the most suitable for your herd.

How do the indices work?

The indices weight various ABVs such as milk production, daughter fertility, type etc. The sum of a bull's individual ABVs multiplied by their economic value across all the ABVs in the index provides the single-number estimate of the overall merit of the bull. This value expresses the impact of the sire on daughter profitability compared to the current average cow. High ranking sires have genetic trait combinations that provide extra profit which is more than milk production and includes the genetic effects on profit of:

- › better fertility
- › cow survival, and
- › milk quality, etc.

Choose the index that best suits your breeding goals

Farmers differ in their breeding goals. Whilst there are common goals, studies indicate that some farmers place more emphasis on performance, cow health or cow type. Industry has developed three indices to allow farmers to identify sires from within each of these focus areas.

For each index the breeding characteristics or traits that contribute to profitability, type or performance are combined using subtly different weightings into three separate genetic ranking indices.

If you are most interested in...	Then choose the...
to deliver maximum profit, a balance of traits for: <ul style="list-style-type: none">› production› type and› health	Balanced Performance Index (BPI)
traits like: <ul style="list-style-type: none">› fertility› mastitis resistance,› feed saved, and› longevity	Health Weighted Index (HWI)
overall type and mammary system	Type Weighted Index (TWI)

Note: Bulls that rank highly within the BPI, HWI and TWI are listed in the Good Bulls Guide and Good Bulls App. Select highly ranked bulls within the index that best meets your breeding goals.

The Good Bulls Guide

Choosing AI sires from the Good Bulls Guide is the first step towards improving herd profitability. Select AI sires that represent the best value for money by considering their index value, semen cost and capacity to meet or exceed your minimum requirement for individual traits, such as daughter fertility, and calving ease.

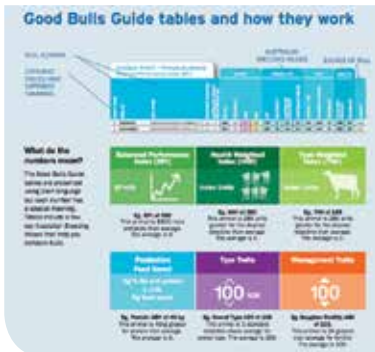
This is a simple way to choose AI sires and is backed by strong, independent science. Bulls have been evaluated by independent, scientific assessment using the world's best practice genetic evaluation. Each bull has listed ABVs for each trait and the index scores for the BPI, HWI and TWI. All bulls are evaluated and scored using the same system so you can compare sires from different companies or countries from which the bull is sourced with confidence.



The Good Bulls mobile app

The Good Bulls mobile app is a smartphone application version of the Guide. It includes tools to assist you search for suitable sires, to select and sort candidates, provide reminders and export your preferences to your artificial breeding company.

See: datagene.com.au to view the Good Bulls Guide and download the Good Bulls app.



RANK	PROFIT INDEX	BULL NAME	SEX	AGE	PROFIT INDEX			PRODUCTION			TYPE		FERTILITY		SERVICE			
					PROFIT INDEX	PROFIT INDEX	PROFIT INDEX	PROFIT INDEX	PROFIT INDEX	PROFIT INDEX	PROFIT INDEX	PROFIT INDEX	PROFIT INDEX					
1	304	RENGAW MANGMAN HUNMER EE	♂	A	304	77	289	256	237	90	11	25	300	102	76	108	69	GAC
2	298	CAUSTER MAERBULL	♂	A	298	70	267	304	196	90	89	23	304	103	73	109	65	GAC
3	290	JET STAR MANDMAN TROON	♂	A	290	79	222	278	191	90	53	20	185	100	80	111	99	GAC
4	292	VH MIRACLE	♂	A	292	84	263	289	128	95	144	27	127	104	81	119	82	VK
5	290	MAREEM MAREEM	♂	A	290	93	256	278	205	89	178	54	106	104	91	118	51	SEM
6	277	AMGHETTI HEMBO LIND	♂	A	277	87	237	281	94	86	121	43	106	100	91	114	88	SEM
7	275	TOPSIED GOLDNET	♂	A	275	79	236	265	192	83	63	23	111	103	71	96	73	GAC
8	268	RENGAW JARDIN JAMER	♂	A	268	80	230	252	149	93	100	31	103	104	71	162	75	ABS
9	266	HEBUSE GOLDWYMANHORN 1208	♂	A	266	88	216	248	143	96	113	84	103	106	87	132	70	GAC
10	263	COGENT TWIST	♂	A	263	90	195	249	149	98	413	57	105	101	91	106	91	CR

Images from the Good Bulls Guide, April 2017

Note: The Good Bulls Guide and mobile app are updated regularly ensuring the latest AI sire bulls are listed.

Calculating the impact of AI selection on profit

The AI sires' indices are reported in units representing the net superiority or inferiority of the sire against the average animal, that is animals with an index value of 0, using the individual index objectives. The BPI unit is dollars representing the difference in profit, allowing a comparison of potential gain against the semen price. As half the genetics come from the bull and half from the cow, a sire with a BPI of \$250 could provide an average of \$125 extra profit per year in his daughters.

Monitoring genetic progress

You can monitor the ten-year genetic trends for fertility and other traits with a Genetic Progress Report. The herd average genetic performance for profit and for individual traits are charted from the previous ten years and the genetic trends in your herd compared to the industry average trend. This useful report identifies specific traits to focus on when selecting AI sires for your herd to maximise profit. Evidence shows that consistent selection of highly-ranked sires from any one of the three indices is working. Farms that are using one of the indices to select sires have stopped the long-term genetic decline in reproductive performance and daughters are now increasingly more fertile than their dams.

See: dairyaustralia.com.au/incalf for more information.

Keep genetics in context

Good sire selections provide cows with an opportunity to perform better than their parents due to superior genetics. The great advantages of genetics are that effects last for the cow's lifetime and they accumulate – genetic (advantages and disadvantages) are passed onto the next generation. The rate of genetic improvement for fertility varies markedly between herds, indicating that genetics for fertility could be improved in most herds.

Good sire selections are only part of the story. For most herds, faster improvement in herd reproductive performance will be achieved by making good sire choices and focussing on the key herd management areas described in other chapters of this book. Work on both genetics and other management areas together.

Is the fertility ABV connected to the semen or the daughters?

There are two parts to AI sire fertility, Semen fertility and Daughter Fertility ABV:

- › Conception rates are similar for semen from most bulls but a small number of bulls and particular batches of semen have a reduced conception rate, not related to the Daughter Fertility Australian Breeding Value (ABV).
- › AI sires with higher Daughter Fertility ABVs produce daughters more likely to become pregnant sooner. 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 Balanced Performance Index (BPI).

Avoiding inbreeding

Inbreeding can have a negative effect on profitability through lower fertility, lower milk production and higher incidence of genetic diseases. Avoid negative effects by not mating AI sires with related cows.

- › Select a different AI sire if you know the proposed AI sire and the cow have a close ancestor in common.
- › Ask your semen supplier about computer programs to identify AI sires too closely related to individual cows.

Short Gestation Length (SGL) sires

SGL semen is from bulls producing pregnancies on average shorter than the typical 282 days. Gestation may be reduced by up to 10 days so late-calving cows calve earlier and to get in calf earlier next mating period.

Calves from SGL bulls should not be kept as milking cows if there is no information provided about sire genetic merit for dairy traits.

Most SGL sires have not been bred for milking or reproductive traits while some bulls with a high ABVs for calving ease tend to have smaller calves from shorter gestation.

Important: SGL semen from sires without ABVs or with inadequate ABVs for dairy traits should not be used in cows from which you intend to breed herd replacements.

Note: Commonly used mop up bull breeds such as Angus and Jersey can have shorter gestation length but there is a variation between individuals. Using these breeds does not guarantee shorter gestation.

Sire selection tips

Use the Good Bulls Guide or Good Bulls App to choose sires with a breeding index matched to your herd's breeding goals:

- › Choose bulls that are at least 105 for Daughter Fertility ABV to accelerate genetic gain for fertility. Select AI sires that are best value for money.
- › Select a range of AI sires not one or two to reduce the risk of using sires with semen of lower fertility.
- › Consider carefully before changing breed, strain or cross-breed to improve reproductive performance.
- › Avoid using sires with an ABV for calving ease below 103 in order to avoid unnecessary calving difficulties.

See: datagene.com.au to see the current list of all AI sires.

Using sexed semen

Why use sexed semen?

The sex of the calf is determined by the sperm at fertilisation. Sperm carry either an X (female) or Y (male) chromosome. Technology for sorting an ejaculate into X and Y sperm fractions is under continual development and the industry has access to AI straws containing mostly female (90%+ purity) sperm. Using sexed semen within an AI program offers potential advantages and some challenges.

Obtain up-to-date information on expected conception rate performance and on which animals may be suited to sexed semen before committing to use sexed semen.

How is sexed semen different from conventional semen?

Semen collected at AI centres can be sent for sexing where the ejaculate is processed and sexed. The sexing process is another step which can reduce the lifespan of sperm after thawing. Typically, there are fewer viable sperm per straw of sexed semen when compared to conventional semen. Fewer sperm per straw does not necessarily reduce conception rates but it does require:

- › high cow fertility
- › proper semen handling, and
- › good AI technique and timing.

Warning: If cow fertility and AI practices are sub-optimal, there may be a lower or more variable conception rate.

Potential advantages

In well-planned and managed mating programs, the potential advantages of using sexed semen are:

- › you can expect upwards of 90% (but not 100%) of calves born to be heifers – so fewer bobby calves
- › more heifers can be available as replacements, providing faster rates of genetic gain, and increased:
 - culling choices, and
 - opportunity to sell surplus (pregnant) cows.
- › required replacements can be obtained from fewer inseminations and the AI period can be shortened
- › fewer calving problems as heifer calves are generally smaller than bull calves – and important advantage from use of sexed semen in maiden heifers
- › easier rearing of heifers in seasonal and split calving systems. The replacements are born earlier in the calving period, are of the same age and can be managed as a more uniform group.

Potential disadvantages

There are aspects to using sexed semen that you need to consider. These include:

- › Conception rates:
 - tend to be lower than for conventional, unsexed semen. Under ideal conditions the conception rate of sexed semen can approach 90% of that of conventional semen. For example: if conventional semen has a conception rate of 50% sexed semen may average $50\% \times 90\% = 45\%$.
 - can be variable compared to conventional semen making it risky to use sexed semen for all AI matings. Reduce variability with planning, concentrating on detail and excluding use in females with compromised fertility.
- › A reduced conception rate will affect the calving patterns of split and seasonal herds and reduce the 100-day in-calf rate in year-round herds so empty rate can increase if the performance is reduced.
- › Selecting suitable females for insemination with sexed semen and preparing them for AI is an extra job at a busy time but essential to get right.
- › Sexed semen straws typically cost more than conventional semen combined with the reduced conception rate can increase the semen cost per pregnancy. Consider the increase in cost for each conception and also the hidden cost of each delayed pregnancy when you use sexed semen.
- › there can be limitations on bull choices, minimum dose orders, timing and availability when using fresh sexed semen. Often this may require pre-booking and use of synchronised heats.

Fresh versus frozen sexed semen

There are two commercially available sexed semen products:

- › fresh sexed semen, or
- › conventional frozen sexed semen.

Fresh sexed semen

Fresh sexed semen is slightly more fertile than comparable frozen semen but must be used within 48–72 hours of collection. Generally, it is used in females synchronised to be inseminated on a pre-set date.

Effective use of fresh sexed semen requires good forward planning, and coordination between the:

- › semen supplier
- › AI technician, and
- › veterinarian.

Conventional frozen sexed semen

Frozen sexed semen can be used as per other frozen semen. However, the requirements for high fertility in the cow and good semen handling and AI technique remain.

Practical considerations for using sexed semen

Work with your dairy breeding adviser to identify which groups of animals (heifers, cows etc.) and which individuals you will mate with sexed semen and the mating program and timing.

With careful planning, sexed semen can be used in eligible heifers and cows. Reserve use for:

- › heifers that are well grown, and
- › cows that have been calved more than 40 days, healthy, cycling and fertile.

Note: You need to plan and carefully manage a sexed semen mating programs.

Spreading the risk

Always use at least three sexed-semen AI bulls to spread the risk. This can be difficult when only using fresh semen so consider using conventional semen in more animals to spread risk.

- › bulls with a high daughter fertility index – an ABV for daughter fertility above 105
- › bulls with higher sexed semen fertility values if available
- › low-birthweight bulls for use on maiden heifers to minimise calving difficulties.

Timing, facilities, planning and training

Timing of AI is important. Are your cattle handling facilities suitable for quiet, stress-free and efficient insemination? Consider how many heifers will be born from the program and if you have sufficient calf rearing facilities.

Allow for the extra labour, feed, medication and vaccination costs involved. The farm team should be:

- › experienced in heat detection
- › briefed in the treatment and insemination protocols to precisely follow the plan on the day, and
- › trained in best practice for semen handling and insemination and handling and thawing sexed semen.

“You need to examine all the costs and benefits – it is not just the difference in price between a sexed straw and a conventional straw of semen. Work with your adviser to identify the opportunities in your herd.”

Impact on future calving pattern

Heifers and cows that calve late are less fertile in the subsequent mating period in seasonal and split calving herds. So, any delay in conception will extend calving dates affecting future reproductive performance of the herd.

To minimise the impact of any reduction in sexed semen conception performance it is recommended to:

- › use sexed semen for 1 or 2 cycles only, following on with conventional semen or a bull, and
- › mate heifers 2–3 weeks earlier than the herd to compensate for the effect of lower semen fertility on calving pattern. This requires a heifer rearing program that enables heifers to grow to their target mating bodyweight at a younger age, as young as 13 months.

Recommendations for sexed semen use in heifers

Synchrony programs allow greater product choice for sexed semen – fresh or frozen can be used. Higher conception rates occur in animals mated to visible standing heat so choose synchrony programs requiring visual heat detection over fixed-time insemination where possible.

Work with your adviser to identify the best time to inseminate treated heifers, and:

- › Inseminate with sexed semen within 24–36 hours of the onset of standing heat
- › Select bulls with an ABV for calving ease of at least 102 or use bulls from a smaller breed (e.g. Jersey) to minimise calving difficulties.
- › Ensure all heifers:
 - have reached the minimum target weight – even for the youngest heifer
 - are healthy, vaccinated and free of reproductive diseases such as Pestivirus.

Recommendations for sexed semen use in cows

Herds with lower herd reproductive performance should seek professional advice before using sexed semen.

- › Fertility tends to be lower in cows than in heifers – conception rates in cows are often 10% or more lower than in heifers due to the combined effects of age, previous calving, lactation and disease.
- › Limiting the use of sexed semen to the most fertile cows yields better, more reliable results. Selected cows should:
 - be free of reproductive, metabolic or other disease
 - be calved for a minimum of 40 days
 - be aged between 2–6 year olds, and
 - have transitioned well into lactation with minimal bodyweight loss.
- › Cows may still experience a reduction in conception rate compared to that obtained from conventional semen. Consider the impact of any reduction in conception rate on your subsequent calving pattern before proceeding. Work with your adviser to make the best choice.
- › Some herd management software programs help you identify the cows most suitable for sexed semen.

Further information

See: dairyaustralia.com.au/incalf for more information and resources, webinars and case study examples.

Crossbreeding

What is crossbreeding

Crossbreeding involves mating of parents from different breeds. A crossbreeding strategy involves the selection of a sire from a different breed to the cow at each mating to increase the hybrid vigour of any offspring.

Hybrid vigour is the opposite of inbreeding where inbreeding is a loss of genetic diversity in offspring that follows the mating of related parents. Greater genetic diversity in offspring typically allows them to outperform their parents across many traits. The extent of this hybrid vigour improvement will vary depending on the trait of interest.

Crossbreeding can provide gains when used in pure-bred Holstein and Jersey breeds where inbreeding can be a problem.

Importance of sire selection

The most important factor for success with either system is sire selection. Hybrid vigour will improve many characteristics, but not as much as the gain that can be made from selecting high genetic merit semen.

Using natural sires may eliminate many advantages that crossbreeding could provide. It is also important to remember that hybrid vigour cannot be transferred to the next generation. Any gain in genetic diversity achieved will be lost from future generations unless an ongoing crossbreeding strategy is applied.

Is it true that crossbreds are more fertile?

Crossbred cows are recognised as having higher fertility because the fertility trait 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.

Advantages and disadvantages of crossbreeding

Advantages of crossbreeding	Disadvantages of crossbreeding
Hybrid vigour (heterosis) can be significant. Crossbreeding is a way to reverse inbreeding.	Hybrid vigour in the initial cross declines with any backcrossing to parental breeds.
Complementary sire and dam traits can be selected for within each parent breed. The effects are additive in crossbred progeny.	It is more difficult to manage the breeding program in a crossbred herd – particularly if using three or more breeds.
There is a wider range of genetics to choose from when more than one breed is involved.	Crossbred animals are generally of lower value than pure bred animals. Crossbred heifers often have fewer markets.
Crossbred animals tend to be more robust and have greater longevity than pure bred animals.	Milk yield of crossbred cows is lower than for Holstein.
Crossbreed herds typically have a better herd age structure and need fewer replacements than pure bred herds.	There can be: <ul style="list-style-type: none">› fewer desirable behavioural traits in the progeny, and› greater variation in size and appearance, particularly with early generations of crosses.

Requirements for successful cross breeding

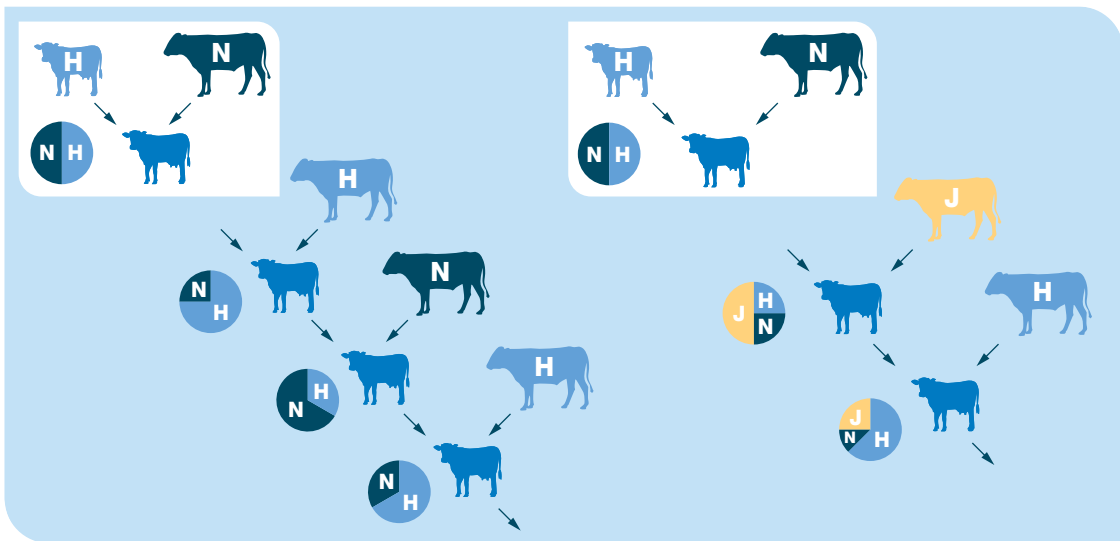
The two main options for a farmer considering crossbreeding are to use a 2-breed or 3-breed strategy. It can become complicated to manage sire selection. Every female requires a dedicated and individual decision to select the most appropriate sire. Good records are essential.

Diagram of cross breeding strategies

This diagram shows two examples of crossbreeding strategies

- > 2-breed Holstein (H) x Norwegian Red (N) cross on the left, and
- > 3-breed Holstein (H) x Norwegian Red (N) x Jersey (J) on the right.

The circles represent the breed proportions in successive generations.



Further information

See: dairyaustralia.com.au/incalf for more information.

Measuring AI performance

Artificial insemination (AI) practices can have a major impact on herd reproductive performance. A low conception rate to AI generally results in lower in-calf rates. Ensuring good AI performance requires management of 5 key areas:

- › general preparation
- › semen storage and handling
- › insemination technique
- › timing of insemination, and
- › cow handling.



Artificial insemination

InCalf research shows that at least 40% of do-it-yourself technicians could achieve at least a 5% increase in conception rates by improving AI practices. It can be easy to let things slip so strive to maintain focus on AI.

What to measure

The performance of AI should be measured using the conception rate. A conception rate suggesting that AI practices should be reviewed are less than:

- › 49% in seasonal/split calving herds
- › 43% in year-round herds, and
- › 55% in well-grown heifers.

The non-return rate can provide an early warning of a low conception rate to AI and is a worthwhile first check. If the non-return rate for your herd is less than 60% or conception rate is as low as these percentages, you need to investigate further.

Measuring AI technician conception rates

AI technicians, whether professional or DIY, can measure their performance using the conception rate.

It is good practice to regularly measure the conception rate of AI technicians – especially DIY technicians.

Conception rates can be compared to expected performance or between individual AI technicians.

Take care when comparing technicians because the conception rate achieved in a herd can vary for other non-technician related reasons. This makes it difficult to interpret small differences in conception rates between technicians – especially for technicians working different farms.

However, conception rates achieved in heifer AI programs are generally high and can be used to assess the AI performance of the technician. Expect 60% in heifers achieving target weights. A conception rate of less than 55% in well-grown heifers suggests that AI practices should be reviewed.

Comparing AI technicians' results

The second method of measuring the AI practices of technicians relies on having more than one technician operating in the herd.

Comparing the conception rates achieved by multiple technicians gives an indication of whether AI practices are up to scratch.

Again, take care to make sure comparisons are valid – commonly the second technician only assists on synchronised heats when a large number of cows require insemination. Comparing performance of a technician that mostly inseminated naturally cycling cows to one that mostly inseminated treated non-cycling cows may not be valid.

Work with your adviser if you have a low conception rate and wish to explore performance of individual AI sires or AI technicians.

The *InCalf Fertility Focus* report provides estimates of non-return rates, conception rates and a comparison of the conception rates achieved by different AI technicians if foetal aging is done during pregnancy testing

Professional AI technicians

If all inseminations are performed by professional AI technicians check that:

- › your technicians are accredited by the National Herd Improvement Association (NHIA), and
- › non-return rates achieved by your technician are monitored as part of their business's quality assurance program.

DIY technicians

If DIY technicians perform most inseminations in your herd, compare technician conception rates in those who have completed at least 50 inseminations in your herd.

Checkpoints and targets

- ✗ If the difference between technicians was more than 15%, review the AI practice of all farm technicians.

Assess the conception rates achieved in a heifer AI program if at least 50 heifers were inseminated.

- ✓ Top technicians achieve conception rates of at least 60% in heifers at target liveweight for mating.
- ✗ If less than 55%, review AI practice, see Semen storage and handling, page 109.

To reliably assess conception rates, you will need to age foetuses by pregnancy testing. This means pregnancy testing cows when they are between 5-13 weeks pregnant.

What to do if you have a low AI conception rate?

If you have evidence of a low conception rate to AI you should systematically investigate potential causes, such as the following, and take the recommended action:

- › Inadequate AI practices or poor quality semen – review AI practices on your farm
- › Poor body condition at calving or excessive loss of body condition following calving – review body condition score targets and herd nutrition
- › Inaccurate heat detection – review your heat detection program
- › Excessive numbers of late calvers in seasonal/split calving herds – review calving pattern.

There are other possible causes of low non-return rate and low conception rate. You may need to seek help from an adviser.

Recommendations

If 2 of your farm team and yourself are trained as technicians, it's good practice to share the insemination duties and compare your results. Use your record keeping system to record who performed each insemination. Once pregnancy testing has been completed, work out conception rates for each technician. This is easier if you obtain an *InCalf Fertility Focus* report.

Benchmark

A good way to check AI practices is to get a professional technician to inseminate at least 50 cows. The resulting conception rate is a good benchmark to which other technicians can be compared.

While the technician is at the farm, you could also have him/her check the AI practices for yourself and your farm team.

Comparison

Alternatively, you can compare the practices of DIY technicians by comparing conception rates where at least 50 inseminations have been completed on groups of cows with similar time since calving, age and body condition. Alternating the days you perform the inseminations can do this for you.

No. inseminations performed by each technician	Review AI practices if conception rates differ by
50	15% or more
200	10% or more
400	6% or more

Practice makes perfect. Send technicians to an AI refresher course every two years to ensure their AI technique is spot on.

Getting ready for AI

It is important to prepare for AI. A well-planned system with your farm team ready, supplies at hand and facilities in good shape is more likely to be successful.

Checklist

- › Semen is a significant item in the farm budget. How effective it is, is up to you. Poor AI practice can be a costly and frustrating outcome of sloppy semen storage and handling, incorrect AI technique or poor timing of AI.
- › Check that AI facilities provide a safe working environment.
- › AI facilities may need to be upgraded to match increasing herd size.
- › If multiple sires are being used, organise/mark cows to assist the AI technician get the right straw into the right cow.
- › DIY technicians should:
 - consider practising their technique on cows in heat in the fortnight before mating starts in seasonal/split calving herds. This can be done without using semen by blocking off the end of the gun with a piece of paper towel and placing a sheath over the gun.
 - Consider having their technique checked by a professional technician on the farm.
 - Attend an AI refresher course if they have not done one for two years or are not confident with their technique.

See: nhia.org.au/artificial_insemination_courses.html for more information from the National Herd Improvement Association of Australia.

- › Place a bench for straw preparation in a stable, secure, clean and convenient working position away from direct sunlight, rain, dust or chemicals.
- › Provide clean cold and hot water, a rubbish bin to dispose of gloves, paper and sheaths, and a hose and 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 program has been used.



- › Many DIY technicians could increase conception rates with improved AI practices
- › Ensure your AI technique is spot on at an AI refresher course.

Are your AI facilities in good shape?

It is the farmer's responsibility to provide a safe workplace for the AI technician. AI facilities need to be:

- › safe
- › accessible
- › convenient, and
- › comfortable for both technician and animal.

Semen storage and handling

Checklist for good semen handling

Are you doing everything correctly? Follow this checklist to evaluate your semen-handling skills.



The sperm contained within frozen semen straws are fragile and require great care when handling.

Item	Check
Tank	<input type="checkbox"/>
Check that the semen tank is full of liquid nitrogen when delivered.	<input type="checkbox"/>
Twice weekly, check liquid nitrogen levels in the semen tank.	<input type="checkbox"/>
Twice weekly, check the semen tank for 'frosting' on the outside of the neck of the tank. This indicates a tank insulation breakdown.	<input type="checkbox"/>
Identify straws using coloured marker rods placed in the goblets (or a similar system).	<input type="checkbox"/>
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.	<input type="checkbox"/>
Handling straws	<input type="checkbox"/>
Know the location of each bull's straw before lifting the canister.	<input type="checkbox"/>
Only lift the canister up to the 'frost line' in the tank to select straws.	<input type="checkbox"/>
Lift selected straws using tweezers; only lift one straw at a time.	<input type="checkbox"/>
Only thaw as many straws as you can use within 10 minutes.	<input type="checkbox"/>
Handle sexed semen especially carefully.	<input type="checkbox"/>
Thawing straws	<input type="checkbox"/>
Thaw straws in a water bath kept at 32–38°C for at least 30 seconds. Keep straws in the water bath until shortly before use.	<input type="checkbox"/>
Thaw sexed semen especially carefully.	<input type="checkbox"/>
Monitor water temperature continuously with a thermometer in the water bath. Semen is rapidly damaged if thawed in temperatures outside the 32–38°C range. An automated thawing flask that controls water temperature is useful if you are inseminating large numbers of cows.	<input type="checkbox"/>
Ensure the water level covers all but the top 1 cm of the straw.	<input type="checkbox"/>
On cold days, rub the gun briskly with a dry paper towel to avoid cold shock and keep the loaded gun warm before use.	<input type="checkbox"/>
Only touch the ends of the straw and do not allow it to flick.	<input type="checkbox"/>
Dry each straw thoroughly with a paper towel before loading into the gun.	<input type="checkbox"/>
Load the straw into the gun, then cut it at right angles with clean scissors before covering with a sheath.	<input type="checkbox"/>
Keep the loaded gun free of contamination and out of direct sunlight.	<input type="checkbox"/>

Insemination technique

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

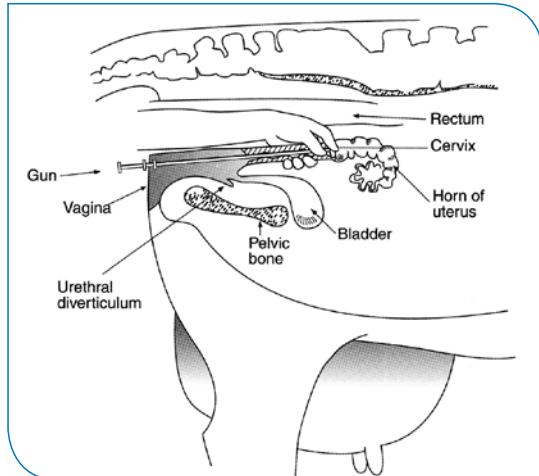
Checklist for good insemination technique

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

Recommendation: sperm placement

Sperm deposited in the cervix are less likely to progress to the uterus: they flow back into the vagina with the mucus. Deposit the semen into the body of the uterus at the point just past the end of the cervix.

Correct placement of semen: deposit all the semen just through the cervix



Can I save a few bucks by splitting straws?

Splitting straws means using a single straw on more than one cow so you risk low conception rates and may spread disease.

- › Halving the number of sperm inseminated can reduce conception rates varying from less than 1% in some sires to more than 10% in others.
- › When the volume of semen is low, it is very difficult to ensure the semen is placed correctly in the uterus. Technicians must be highly skilled to perform the insemination.
- › The second half of a split straw will have been warmed to body temperature, and then cooled a little before being inseminated in the second cow. Temperature fluctuations can be lethal for sperm.
- › Using the same AI gun and sheath for more than one cow, you run a risk of spreading infectious diseases.

Splitting straws is not recommended. It is better to focus on improving AI conception rates by avoiding short cuts. There are probably better ways to save than splitting straws!

Timing of AI

Timing for ovulation

Both sperm and eggs have a limited lifespan. Timing AI relative to when a cow ovulates is important. The best conception rates occur when insemination is 0–16 hours before ovulation as this provides for large numbers of fertile sperm to be waiting at the site of fertilisation, the oviduct, when the cow ovulates.

Cows in good reproductive health typically ovulate 23–33 hours after the start of their heat period. It is most practical to inseminate cows shortly after first detection on heat because most cows will have already been on heat for a number of hours by the time they are detected. For most cows this will time insemination to occur just before ovulation.

The safest practice is to inseminate each cow detected on heat at the next opportunity for insemination. Your choice includes whether to inseminate once or twice daily during mating.

Once-daily versus twice-daily AI

Once-daily AI is where all cows identified on heat are sent for insemination at the next AI time and where there is only a single AI time per day. This provides a similar conception rate to twice daily AI in most herds.

Note: If changing from once daily to twice daily, measure non-return rates before changing permanently.

Twice-daily AI uses the **AM/PM AI** system. This is an alternate to once-daily AI and requires you to use morning and evening AI each day. Insemination is delayed in each cow by approximately 12 hours from first detection. Cows first seen on heat:

- › before or at the morning milking – inseminate at the evening AI
- › through the day or at evening milking – inseminate at the next morning's AI.

Will my conception rate improve if I switch to the AM/PM system?

Potential benefit

The benefit of twice daily over once daily insemination is small for most herds. Herds with a large number of cows having delayed ovulations may benefit from switching to the AM/PM rule. In these herds the AM/PM switch could potentially increase the low conception rate by 3–5% over once-daily AI.

Challenging logistics

However, the logistics of identifying cows on heat and drafting those for next AI are more complicated than for once-daily AI systems. Discuss the pros and cons of the AM/PM system with your adviser before implementing – especially if you only use manual heat detection on your farm.

It is likely to be more effective for you to address any causes of delayed ovulation in the herd through better body condition management, nutrition and genetics.

Note: Before changing from twice daily to once daily consider the staff and facilities necessary to inseminate the larger number of cows once a day. Are there other ways to address the low conception rate problem?

Optimising automated heat detection

Many farms now have automated heat detection systems. These can accurately identify the start of heat. Automated systems make it easier to apply the AM/PM rule by identifying which of the next two AI times best suit each individual cow.

The system can also be instructed to draft the right cows for insemination before each AI time. Work with your system provider and adviser to implement these features if you are currently using twice-daily AI.

Once-daily is easier than AM/PM AI. There is minimal impact on conception rates if cows are in good health, body condition, naturally cycling and long calved. More reasons to focus on getting the basics right!

When to re-inseminate

It is not necessary to re-inseminate a cow if she is still on heat at the next milking. However, if the cow is on heat two milkings (24 hours) later, re-inseminate her according to the system you are using. Once mating begins in:

- › seasonal/split calving herds, inseminate all cows seen on heat, calved more than 3 weeks before
- › year-round calving herds, inseminate all cows seen on heat after their Voluntary Waiting Period, except cows definitely to be culled and cows where an Ovsynch® program is being used.

The InCalf AI Practice Tool may be useful in helping identify areas of your AI practice that may increase your risk of reduced herd reproductive performance.

Handling cows separated out for AI

Once-daily inseminating means that cows will need to be separated from the herd while waiting to be inseminated. 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 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.

Minimise stress in separated cows

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

- › 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 and water if animals to be held for more than an hour. Move the cows back into the yards for inseminating with the minimum degree of pressure.
- › Avoid holding a single cow alone. Provide a couple of companions even if they are not to be inseminated.
- › Load up the inseminating race for the technician without stressing them. Remember, the AI 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.
- › Be patient with difficult/temperamental cows – don't add further to their stress levels.

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 eliminate unnecessary stress.

Section E Bull management

Bull management can have a significant impact on herd reproductive performance. The consequences of poor bull management in the milking herd and heifers can include:

- › high not-in-calf rates
- › a spread in conceptions that can affect calving pattern
- › spread of disease, and
- › adverse animal welfare.

Ensuring good bull performance requires management of three key areas: selection (and rearing) of bulls, day-to-day management of working bulls and bull power.

What good management means

Good bull management means:

- › running adequate numbers of healthy, fertility-tested, well-grown bulls with the herd
- › reducing the stresses to bulls such as those caused by heat, over-working or dominant animals, and
- › handling bulls to minimise the risk of injury to people and animals.

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Key points

- › Herd bulls are an important part of many mating programs. They are not an 'afterthought' after AI.
- › Use sufficient well-grown, locally adapted, disease-free and fertility tested bulls to effectively mate your cows and heifers.
- › Rotate bulls regularly and watch for problems and breakdowns.

Measuring bull performance

Getting started

Bull performance is difficult to measure directly. Begin by measuring 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.

Assessing performance of bull mating of heifers

To check bull performance in heifers, start by measuring how quickly the heifers became pregnant after the bulls were introduced.

In seasonal or split herds

Use manual pregnancy testing with foetal aging 12 weeks after the group's Mating Start Date. Calculate the percentage of heifers that became pregnant in the first 3 and 6 weeks of mating.

- ✓ 75% of heifers conceive in the first 3 weeks of mating, and
- ✓ 92% conceive in the first 6 weeks.
- ✗ 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, and
 - bull management.

Assessing performance of bull mating of the herd: year-round calving herds

When using bull mating in the herd, use regular pregnancy testing to allow you to calculate the 100-day in-calf rate on a regular basis. Review bull management if the 100-day in-calf rate is less than 58% and if bulls ran with the herd or many cows on heat were mated to bulls.

Note: Seek professional assistance if the 100-day in-calf rate is less than 45% with bull mating.

Keep records

Record all heat dates to bull matings. This information can help you measure bull performance and can help with identifying conception dates at pregnancy testing. A chin-ball harness on bulls can help you detect the cows that they serve.

Assessing performance of bull mating of the herd: seasonal/split calving herds

In most seasonal and split calving herds, bull mating follows the AI period. This is often from the end of the sixth week of mating. Herd reproductive performance after the end of AI provides an indicator of bull performance. By measuring reproductive performance across the whole of the mating period – not just the AI period – you can assess bull mating performance and identify potential bull mating problems.

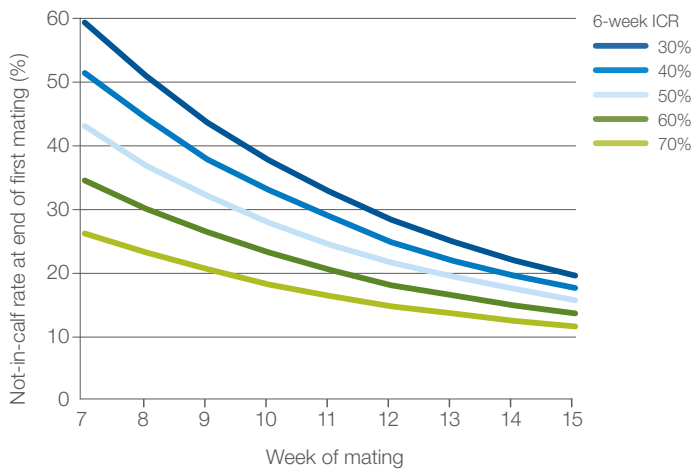
The measurement and monitoring process

- ▷ Obtain the 6-week in-calf rate and the not-in-calf rate for your herd. The 6-week in-calf reflects the performance of the AI mating. Calculate the pregnancy rate to the bull mating period from the end-of-mating not-in-calf rate and the 6-week in-calf rate.
- ▷ Identify the total weeks of mating, the AI period and the bull mating period.
- ▷ Look up the expected not-in-calf rate for your herd using the following table.
- ▷ If the actual not-in-calf 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.

The expected not in-calf rate (%), given 6 weeks in-calf rate and length of mating

6 week in-calf rate	Total weeks of mating (AI period plus bull mating period)		
	9 weeks	12 weeks	15 weeks
30%	43%	28%	20%
40%	38%	25%	18%
50%	32%	22%	16%
60%	26%	18%	14%
70%	21%	15%	12%
80%	15%	12%	10%

Expected non-in-calf rate at the end of mating by 6-week in-calf rate and duration of bull mating



“If I use my 6-week in-calf rate of 60% and look up my mating period, 6 weeks of AI and 9 weeks of bulls, I should expect 14% not-in-calf. But we had 20% not-in-calf when we pregnancy tested. I’d better check my bull team as it doesn’t look like they were up to it and I don’t want a repeat performance next mating!”

The *InCalf Fertility Focus* report for seasonal/split calving herds calculates reproductive performance after week 6 and allows comparison with the expected not-in-calf rate, based on the 6-week in-calf rate and the total length of mating.

Growing bulls

Growing bulls effectively

If you rear your own bulls, you need to grow them effectively so they can perform to their potential. This means you need to regularly monitor live weight of growing replacement bulls – just as you do for your heifers. Monitoring helps you to keep bull growth on track and make adjustments if they start to deviate from target. Target bulls to grow to:

- › 50% of their mature weight at 14 months, and
- › 85% of mature weight at 2 years of age.

Purchasing bulls

If you purchase bulls:

- › make sure they have reached their target weight, and
- › if possible, buy virgin bulls to reduce risk of introduction of venereal diseases into your herd.

Can I skimp on feed for the bulls until the break comes?

Sexual maturation in bulls is a continuous process starting before birth. There is particularly rapid testicular growth between 7 and 10 months of age and testicular size in bulls is strongly correlated to fertility.

Underfeeding at this time significantly reduces testicular growth with a delay in the onset of puberty. Underfeeding in older bulls will reduce their stamina. Make sure you don't underfeed your bulls before or during mating!



- › Don't forget to vaccinate and drench the bulls correctly (timing and amount).
- › Reduce fighting by grouping bulls well before mating.
- › Body condition score bulls well before mating to give you time to make diet changes and get bulls back on target.

Selecting the best bulls to use

Selection criteria

Your selection criteria for bulls to be used for natural matings depends upon your plan for the calves.

If you are using the bulls simply to get the cows pregnant and intend to sell all calves from natural matings then your selection criteria revolve around the physical characteristics of the bull. Specifically:

- › age
- › size
- › health, and
- › the breed-related risk of assisted calvings.

If you will rear the heifer calves: genomic testing

If you plan to rear heifer calves from bull matings then in addition to the list above, you also need to consider the genetic merit and pedigree of each bull. Genomic testing of bull calves can help you identify individuals that are suitable as herd bulls. A genomic test will estimate the performance of the bull's daughters with a reliability similar to that of a proven bull with 30 daughters. If you plan to keep female replacements from bull matings then remove all bulls that present an inbreeding risk. Turn bulls over at least every 2 years to prevent a bull from mating with his daughter.

Selection and management guidelines

- › Older bulls can be temperamental, difficult to manage and are more likely to have injuries to the penis, back or legs. Fertility also tends to decrease in older bulls. 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. Avoid using bulls that are less than 15 months old unless they have been fertility tested as capable.
- › Apply the same health program to your bulls as you do to your heifers and cows to prevent them from breaking down with disease or introducing disease to the herd when they are run together:
 - Consider the Theileria status (or risk) in your herd. Make sure the introduced bulls are from herds of similar status or risk. Avoid introducing disease into your cows or into your bulls during mating.
- › Parasite control in bulls is important, work with your veterinarian to develop a suitable bull drenching program.
- › Select bulls of similar:
 - size to the cows or heifers to be mated, always preferring smaller bull size, for example, Jersey bulls with Holstein – Friesian cows. Injuries to bulls and cows occur more commonly when bulls are much heavier than the cows or heifers they are serving. Observe bulls serving tall cows; ensure they are able to serve correctly.
 - size and age and from the same mob to reduce fighting when they are with the herd.
- › Exclude bulls that are sick, injured or lame, or have deformed feet.
- › Select bulls that are low risk for calving problems, especially with Holstein – Friesian heifers. Consider using genomic testing to identify bulls with high ABVs for calving ease as they are more likely to sire smaller calves than bulls with a low ABV for calving ease.
- › Ensure a sufficient number of bulls to provide enough bull power – with reserves – for the whole of the natural mating period.

What is Vibriosis?

Vibriosis is a venereal disease in cattle that causes infertility and occasional abortion (previously known as campylobacter). Signs most commonly seen with *Vibrio* infections are:

- > poor conception rates after the introduction of bulls
- > cows and heifers returning to heat
- > occasional abortions around 6 months of pregnancy, and
- > a delay until recalving or a spread out calving pattern depending on your calving system.

Vaccinate all bulls against Vibriosis.

Bull breeds and risk of assisted calving

This table shows evaluation of different breeds for risk of assisted calving.

Low risk of assisted calvings

Jersey

Medium risk of assisted calvings

Holstein

Murray Grey

Angus

Hereford

Poll Hereford

Red Poll

High risk of assisted calvings

Limousin

Charolais

Simmental

Belgian Blue



Make calving easier by avoiding bull breeds with a high risk of assisted calving, selecting bulls with high ABVs for calving ease, avoiding bulls whose calves required assistance in previous years and bulls with prominent shoulder blades.

Include bulls in your farm biosecurity plan

- › Bulls are a special risk for disease introduction so they must be included in the biosecurity plan for the farm. Insist on bulls being vaccinated for leptospirosis and bovine viral diarrhoea (BVD).
- › Choose bulls that are low risk for Bovine Johnes Disease (BJD), Trichomoniasis and Vibriosis.
- › Test all bulls to ensure they are not infected with pestivirus (also called BVDV). Bulls permanently infected with pestivirus (PIs) present an extreme risk of herd reproductive failure and should not be admitted.
- › Test all beef bulls to ensure they do not carry Enzootic Bovine Leucosis (EBL). Consider testing for any other diseases relevant to your property and biosecurity plan.
- › Avoid introducing bulls from Theileria-affected regions into Theileria-free herds. Similarly, avoid introducing bulls from Theileria-free regions into herds located within Theileria-affected regions.



Work with your veterinarian for all relevant tests of new bulls for your herd before they are mingled with your cattle. You don't want the bulls introducing disease to the females nor do you want the bulls getting sick on introduction to the females.

Differentiating between AI calves and natural mating calves

In larger herds, bull matings are often not recorded and staff can become confused differentiating between AI calves and natural mating calves.

This is particularly problematic among crossbred seasonal/split-calving herds using Jersey bulls for natural mating. In this case, consider using 'easy calving' breeds, especially Herefords, for a week between the end of AI and before the tail-end Jersey bulls go out. This will establish a clearer finish to AI calvings next year.

Don't stress out your bulls or yourself!

Relocating bulls can cause a period of reduced bull fertility for up to 2 months. Transport and handling, feed and water restrictions, lameness, disease and social stresses associated with mixing bulls that are not familiar with each other can all contribute to this problem.

Preparing bulls for mating

Planning

Plan to ensure bulls are well adjusted to their environment before mating.

- › Move bulls to your farm at least 2–3 months before they are required for work. If moving bulls from a dry, cool climate to a warm, humid environment, move them an extra 2 months beforehand.
- › Run bulls that will be used in the herd together as one group for 2–3 months before introducing them to the herd to reduce fighting during mating. Alternatively, split them into two teams for a rotational bull mating policy, “half resting, half working”.
- › Buy bulls from the same mobs and split them into 2 teams for a rotational bull mating policy to reduce fighting.

Checking on arrival

- › 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.

Body condition checks

Bulls in body condition score 4.5 to 5.5 perform best. Bulls need to be in good body condition both:

- › well before mating to support good sperm production, and
- › during mating to maintain a healthy work attitude.

Put bulls on a diet consistent with the female herd diet so they will not experience any gut upsets when put with the females. Make any dietary changes at least two months before the bulls will be used to ensure there is no check to sperm production in the period before and during work.

Veterinary bull breeding soundness evaluation (VBBSE)

A Veterinary Bull Breeding Soundness Evaluation (VBBSE) is the best way to identify and remove infertile bulls and those bulls not fit for work from your bull team. Australian studies and findings from VBBSEs reveal that a high proportion of dairy herd bulls are sub-fertile. These bulls appear normal – you cannot identify them by looking at them in the paddock as a large number of fertility problems are not externally obvious, occurring in the semen, testicle or penis. The VBBSE is a cost-effective way of removing most low fertility bulls from your team. The VBBSE comprises 3 parts:

- › Physical examination – This involves examination of the bull for size, body condition, eyes, conformation, feet and legs and mobility. The bull's penis, prepuce, scrotum, testicles and internal sexual organs are also examined. Bulls need to have no detectable abnormalities to pass.
- › Semen evaluation – This involves collecting a semen sample from the bull and sending it to a laboratory for microscopic examination. Bulls need >70% normal sperm to pass.
- › Serving ability test – Conducted if a serving problem is suspected.

Bull handling: making it safe 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. Establish routines so the bulls know what to expect and how to behave every day.

Aggressive bulls that fight with other bulls, especially when they are running with the herd can injure other bulls, cows, people and themselves. Get rid of overly aggressive bulls that:

- › become obstructive and block the herd's progress from the paddock to the shed, or
- › show stalking behaviour towards farm staff.

Tasks like fitting chinball harness or trimming feet will require special care and suitable facilities that will protect both the bull and the people. The last thing you want is a preventable injury!

Scheduling the VBBSE

Schedule the VBBSE 1–2 months before mating to allow for effective decisions if there are large numbers of infertile bulls. A VBBSE should be done before every breeding period where bulls are used – even for individual bulls that have been previously tested.

A high rate of bull breakdowns occur during mating so that bulls that have previously passed a VBBSE test are now not guaranteed to be fertile for all future mating periods. Similarly, some conditions that contribute to a previous VBBSE failure such as lameness may resolve allowing a bull to pass a VBBSE now. So, plan to test all bulls before each bull mating period.

A bull that passes a VBBSE does not guarantee that the bull will perform well at the next mating periods due to risk of breakdowns, illness and injury but a bull that fails a VBBSE is very unlikely to be able to perform at the next mating period.

Remove the bulls that fail the VBBSE but continue to observe the bulls that pass the VBBSE when they are with the females.

Use 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.

Always run at least two working bulls.

Bull mating of heifers

Run one fertility-tested bull per 30 non-pregnant heifers and a minimum of two bulls. Keep extra bulls around in case any need to be replaced during the mating period.

If you are using a synchrony program, 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, and increase the rotation of bulls during busy periods including return heats.

When using an AI synchrony program consider AI'ing again on the first return heat to alleviate pressure on the bull team.

Bull mating in seasonal/split calving herds

The number of bulls required after AI depends on herd size and the percentage of the herd already in calf. 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 following table to estimate the number of bulls required. You will need additional bulls to allow for regular bull rotations during the bull mating period and to replace bulls that become inactive or unhealthy. A ‘half resting, half working’ bull rotation policy will require double the numbers of bulls shown in the table.

Run at least one fertility tested bull per 30 non-pregnant cows and a minimum of two bulls. If you use a heat synchronising program, double the ratio of bulls to one fertility tested bull per 15 cows for the short period around the time those cows are due back on heat. If more than six bulls are required, seek professional advice on managing a large bull team.

Minimum number of bulls with the herd

As mating proceeds, you can reduce bull numbers as the number of non-pregnant cows decreases. Never run fewer than 2 sexually active bulls in the herd at any one time.

No cows in milking herd	Likely % of herd pregnant at start of bull mating			
	Very low < 40%	Low 40–50%	Moderate 50–70%	High > 70%
	Number of bulls			
100	2–4	2–3	2	2
200	5–6	4–5	3	2
300	7–8	6	4–5	3
400	9–11	7–8	5–6	3–4
500	12–13	9–10	7	4–5
600	14–15	11–12	8–9	5–6

Tracking cows on heat

Keep track of cows on heat when bulls are running with the herd. Too many for too long may indicate a problem with the bulls. Record heats for all cows observed on heat during bull mating to help you can analyse bull performance and identify likely bull service conception dates at pregnancy test.

Bull mating in year-round calving herds

In a year-round calving herd, the 100-day in-calf rate can be used to estimate the number of bulls required to be run with the herd. If you're not sure what your 100-day in-calf rate is, assume it is less than 50%.

Using your herd size, check the following table to estimate the number of bulls required. You will need additional bulls to allow for regular bull rotations and to replace bulls that become inactive or unhealthy.

Run 1 fertility tested bull per 50 cows in the herd and a minimum of two bulls to allow for a relatively constant mix between pregnant and non-pregnant cows any one time. There is an increased risk if you rely on one bull but the risk of a herd reproductive failure lessens when fewer than 5 cows are expected on heat each week.

Minimum number of bulls with the herd

No cows in milking herd	Likely 100 day in calf rate for herd	
	< 50%	> 50%
Number of bulls		
100	2	2
200	2-3	2-3
300	4	3-4
400	5	4-5
500	6-7	5-6
600	7-8	6-7

Tracking cows on heat

Don't forget: if you use heat synchrony, you'll need extra bulls for a short period around the time those cows are due back on heat. Double the recommended number of bulls for the period when synchronised returns to heat are expected. Keep track of cows on heat when bulls are running with the herd. Too many for too long may indicate a problem with the bulls.

- › Record dates of all cows observed on heat unless monthly or bi-monthly pregnancy testing of cows not previously diagnosed as being pregnant is being done.
- › Consider using chin-ball harnesses on bulls to help you detect more of the cows on heat during this period.

The InCalf Bull Management Practices Tool may be useful in helping identify areas of bull management that may increase your risk of reduced herd reproductive performance.

Managing working bulls

Increasing activity and reducing health risks

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 2 sexually active fertility-tested bulls with the herd at all times.
- › Avoid using overly aggressive, dominant bulls.
- › Swap bulls in the milking herd regularly through the bull mating period. Rest bulls for several days before returning them to the herd to help them refresh and maintain sexual interest.
- › Do not allow bulls to enter the concrete milking yard with the milking herd. Concrete can produce excess hoof wear and lameness:
 - Train bulls to stay in paddocks.
 - Mark bulls with reflective tape to make it easier to see them in the dark and hold them back from the herd.
- › Keep bulls from gaining access to the dairy platform. Do not let them consume the dairy concentrate ration as it may provide excessive amounts of carbohydrate and lead to rumen acidosis, sickness and reduced fertility.
- › Monitor bulls for lameness each day. Remove, treat and rest lame bulls promptly. Replace them with healthy bulls.
- › Consider the use of preventative hoof trimming or rubber blocks to help prevent lameness.
- › Regularly observe bulls that are serving to ensure they are working correctly. Immediately remove bulls that are unable to serve properly and replace them with more capable bulls.

Manage heat stress risk

Heat stress can reduce bull performance. Try and run individual bulls with the herd for no longer than two days before resting during periods of high heat stress risk. Further reduce heat stress risk by:

- › providing adequate shade and cool water
- › considering strategies such as:
 - using more bulls, and
 - providing bulls with extra or longer rest periods between work.

An Australian study showed that bulls > 4 years of age were 7 times more likely to breakdown during the joining period!

Effect of temperature on sperm production

The optimum temperature for sperm production is 33–36° which is 3–6° below body temperature. Higher temperatures caused by fever or heat stress affect sperm production and will increase the number of abnormal sperm.

Even a slight increase in temperature of 1–2°, will cause major disturbance to sperm production. Sperm production takes 2 months and once a bull recovers from fever, sickness or any stress, it may take 2 months before normal fertility is restored.

Section F Cow health

Cows that are sick around the time of calving or in early lactation are at risk of reduced reproductive performance. Common health problems include:

- › giving birth to twins
- › difficult calvings
- › milk fever
- › retained foetal membranes
- › vaginal discharges
- › lameness
- › ketosis, and
- › mastitis.

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Key points

- › Healthy cows do better than sick cows during mating.
- › Controlling problems at calving and in early lactation will have reproductive benefits at next mating.
- › Reducing calving problems and metabolic disease by careful sire selection and effective transition cow management are proven winners.
- › Identifying and treating early cows with infections or problems after calving will help them restore fertility.
- › Monitor individual diseases to see if you have a problem.

Measuring and monitoring cows' health

Assessing the effect on your herd

If your herd has only a small number of cows affected by these health problems, it is unlikely that poor health is reducing herd reproductive performance to any significant level. However, if many cows are affected, you can expect overall herd performance to be substantially reduced.

Some health problems, such as retained foetal membranes and vaginal discharge, affect the reproductive tract directly, while others can affect reproductive performance indirectly because they divert the cow's energy resources away from the reproductive system. For example:

- › lameness affects reproductive performance indirectly because it reduces feed intake, resulting in body condition loss. Lame cows are less willing to show strong heats and may stop cycling.
- › mastitis diverts energy to the immune system to fight infection. Both clinical and subclinical mastitis can damage cow fertility. If a cow gets mastitis before mating a delay in conception of up to 22 days is likely. Pregnant cows that get clinical mastitis are at increased risk of abortion because of prostaglandin release by the inflamed udder.
- › heat stress reduces feed intake and diverts energy to sweating and panting.

Cost and risk

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

Insidious diseases such as BVD virus (Bovine Viral Diarrhoea or Pestivirus) have the potential to cause significant reproductive losses and increase susceptibility to other infectious diseases.

Benefits of good cow health

Keeping a close eye on cow health has other benefits:

- › Preventing health problems can reduce labour requirements and simplify management, especially in seasonal/split calving herds, as most cow health problems tend to occur in the first weeks of lactation.
- › Healthy cows will give more milk and income and cost less to keep. They also last longer in the herd.
- › Preventing calving problems and lameness improves cow welfare and reassures consumers that animal welfare is being maximised in Australian dairy herds.

Benefits of keeping records

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

Keeping good cow health records involves recording the cow ID, date, diagnosis and the treatment for every case. These records enable you to:

- › identify all cows who have had a health problem that may affect mating
- › detect if you have an emerging cow health problem in your herd
- › calculate the rate of each health problem in your herd, expressed as a percentage of all cows calved, and compare them to industry targets
- › examine and treat cows at risk of reduced fertility before mating. (Timely treatment gives the best chance for recovery and restoration of fertility before mating).
- › monitor the success of strategies you implement to reduce cow health problems in your herd.

Measuring and monitoring cow health underpins the process of continual improvement.

The InCalf Cow Health Tool will help you further assess the level of these cow health problems within your herd and their economic importance.

Checklist for monitoring and acting on cow health problems

How to use this table

Using your records, calculate the percentage of cows affected by each type of health problem. Compare the percentages with the levels in this table to determine if a review of management is required.

Health problem	Trigger for action	Prevention	Immediate actions
Calvings requiring assistance	> 3%	<ul style="list-style-type: none"> › Select AI sires with high calving ease ABV's. › If AI'ing maiden heifers, consider using Jersey sires. › Carefully select bulls. › Ensure replacement stock reach liveweight targets. › Calve down cows and heifers in body condition range 4.5 to 5.5. › Plan transition cow management to prevent milk fever. 	<ul style="list-style-type: none"> › Provide assistance to cows in difficulty. › Check if metritis is present more than 14 days after calving. › Seek veterinary attention immediately if affected cows go off their milk or lose condition.
Retained foetal membranes – membranes visible externally on the day after calving	> 6%	<ul style="list-style-type: none"> › Minimise assisted calvings. Calve down cows and heifers in body condition range 4.5 to 5.5. › Plan transition cow management to prevent milk fever. › Prevent access to cypress or pine trees. › Consult your vet on whether selenium and vitamin E nutrition is adequate. 	<p>On the day after calving, cut membranes off below the vulva. Do not pull on or manually remove membranes. Check to see if metritis is present more than 14 days after calving. Seek veterinary attention immediately if affected cows go off their milk or lose condition.</p>
Vaginal discharge after calving – more than 14 days after calving	>10%	<ul style="list-style-type: none"> › Plan transition cow management to prevent milk fever. › Adopt strategies that prevent assisted calvings and retained foetal membranes. 	Consult with your veterinarian regarding treatment.
Lameness – favouring one or more limbs, or walking & standing with an arched back. Occurring in the first 100 days of lactation (year-round) or up to week 6 of mating (seasonal/split)	> 4%	<ul style="list-style-type: none"> › For more information about managing lame cows and preventing lameness, speak to an adviser. › Your vet may need to diagnose the types of lameness that are occurring in your herd so you can control the cause of the lameness and treat affected cases most effectively. 	<ul style="list-style-type: none"> › Treat lame cows promptly and safely. › 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.
Clinical mastitis – hot and swollen quarter or changes in milk (watery or clots) that persist beyond the first 3 strips of milk	> 5 cases/ 100 cows/ first 30 days of lactation	<ul style="list-style-type: none"> › Consider the use of a teat sealant dry cow antibiotics in individual cows at drying off. › Consider the use of a teat sealant in maiden heifers 4 weeks before calving. › Start milking cows leaking milk before calving. › For more information about preventing mastitis at calving time, speak to a Countdown 2020 accredited adviser. 	Promptly identify and hygienically treat clinical mastitis cases.

Health problem	Trigger for action	Prevention	Immediate actions
Other health problems	> 5%	Any health problems that cause body condition loss in early lactation can indirectly affect reproductive performance. Ketosis and displaced abomasums are examples.	Other problems, such as cystic ovaries, can affect reproductive performance more directly. Seek professional assistance for treatment and prevention when these types of problems occur.

See: dairyaustralia.com.au for more information and resources on cow health and for more detailed information on individual diseases and their controls.

Expected benefits of improved health

Remember that an improvement in cow health may not automatically translate into improved reproductive performance – often non-health related problems are more important. Improved cow health will provide other advantages that make control worthwhile. Work with your veterinarian to manage the cow health problems that reduce herd reproductive performance.



Cow calving normally
Photo courtesy of Jessa Fleming

Minimising the risk of milk fever

What is milk fever?

Milk fever or hypocalcaemia occurs at the start of lactation if a cow is unable to maintain a normal blood calcium level (greater than 2 mmol/L) in the face of the sudden increase in demand for calcium by the udder.

A low blood calcium level at calving leads to milk fever and many other health problems, causing a reduction in the cow's smooth muscle function and depression of the cow's immune function.

Two forms of milk fever

Two forms of milk fever are seen:

- › Clinical milk fever which is a severe reduction in blood calcium level and the cow is unable to stand, she goes down, adopting a characteristic posture and is often depressed.
- › Sub-clinical milk fever which is a milder reduction in blood calcium level and the cow appears normal, but the muscles of the digestive tract and uterus work less effectively and immune function is compromised. She will therefore have a 'weak' calving effort, increasing the likelihood of calving difficulties, and be at greater risk of uterine prolapse, retained foetal membranes and uterine infection (metritis).

Warning

For every case of clinical milk fever seen in a herd, there may be 8 or more cases of subclinical milk fever.

Milk fever is not only a risk factor for reproductive disorders, it is a 'gateway disease' which leads to a higher risk of many other diseases, including ketosis, displaced abomasum and mastitis.

Transition cow management is the key

The key to preventing milk fever is effective transition cow management. A nutritionally well integrated transition feeding program helps the cow deal with the many challenges of calving, lactation and re-breeding, including meeting the demand for calcium at the onset of lactation. Controlling milk fever requires planning.

See: Minimise body condition loss in early lactation, page 64, in Section B: Body condition and nutrition.

Not only is effective transition nutrition good for your cows and your bottom line, it also reduces calving hassles for the people on the farm.

Important: Careful surveillance of calving cows is always necessary as you can never eliminate difficult calvings. Malpresentation can occur at any calving.

To attend a Low Stress Calving discussion contact your Regional Development Program.

Minimising the number of calvings that require assistance

Cows needing calving assistance are less likely to conceive early, more likely to be empty at the next mating period and more likely to develop other health problems such as uterine infections. Reducing calving difficulties will provide for better cow and calf welfare.

See: Bull breeds and risk of assisted calving, page 114, Section E: Bull management.

How to minimise calving assists

Minimise the number calving assists in your herd by:

- › using high Calving Ease ABV sires in your AI program
- › using herd bulls with low breed-related risk for assisted calving when used on your herd
- › ensuring replacement stock reach their liveweight targets at mating and at calving
- › having a transition management program and transition diet that minimises milk fever.



AI sires with a Calving Ease ABV above 100 are less likely to produce pregnancies that require assistance at calving than sires whose Calving Ease ABV is under 100. The 'Good Bulls Guide' lists each bull's Calving Ease ABV. It is easy to select sires with a high Calving Ease ABV by using the Good Bulls app.

When is the right time to assist at calving?

Indicators that it is time to assist:

- › heifers not calved within 5–6 hours after first sign of straining
- › cows not calved within 3–4 hours after first sign of straining
- › calving has not occurred within 3–4 hours of the membranes rupturing
- › delivery has started and the calf is visible externally but the calf presentation appears abnormal
- › delivery has started and the calf has not been delivered within 30 minutes of being visible externally.

How to help cows calving

What to do to help cows having trouble calving:

- › Always do a vaginal examination. Check the presentation and the size of the calf. If there is a simple malpresentation for example a head back, then correct before assisting the cow to deliver. Could there be twins? If you cannot easily correct a malpresentation or if the calf appears to be too big then stop and call your veterinarian.
- › You should also vaginally examine any cow that you are unsure of having calved, for example she may have afterbirth showing, and you have not found the calf to confirm calving. Cows that continue to strain after having one calf should also be examined. Twins are not uncommon.
- › Remember, if you assist too early, the cervix and vagina may not be fully dilated. You risk trauma and pain to the cow and calf as it is harder to extract a calf when the cow is not ready to deliver.
- › Remember to record all cows that you assist. These cows are at increased risk of infection and of reduced reproductive performance at the subsequent mating.

Managing uterine infections after calving

Uterine infection (metritis) after calving is a common problem. Whilst some discharge after calving is normal any discharge that persists for a number of weeks after calving is a problem. Herd reproductive performance can suffer if there are a large number of cows with uterine infections around mating.

Consequences if untreated

Many cows with uterine infection will show normal heats and have outwardly normal cycles and not all have a visible vaginal discharge. Herds can have a large number of cows with uterine infections more than 14 days after calving but with few outward signs of infection. Cows with unresolved infection typically:

- › do not get back in calf, or
- › get pregnant later than uninfected herd mates.

Factors contributing to uterine infection

These factors increase the risk of developing a uterine infection:

- › twin calving
- › assisted calving
- › a dead calf at or within 24 hours of calving
- › retained foetal membranes
- › milk fever at or within 24 hours of calving
- › vaginal discharge after calving, and
- › abortion.

The case for early treatment

Cows with uterine infections usually cure spontaneously – but slowly. Because we need to get the cow pregnant at the earliest opportunity, timely treatment of uterine infection can speed recovery and restore fertility earlier than would otherwise occur.

Early treatment and recovery is particularly desirable in seasonal or split herds where late-calving cows with uterine infections are at very high risk of failing to get in-calf at the next mating.

A cow that has experienced any of the events associated with increased risk of uterine infection as well as any other cow that you suspect may be 'dirty' beyond 14 days after calving should be examined by your veterinarian to see if they have a uterine infection.

Identifying uterine infection

An internal examination of the vagina and its contents is needed to identify those infected cows with no obvious discharge or smell. If you just treat the obvious cases, you will miss all infected cows with no external discharge. This is a fast, effective and safe procedure and can be combined with a single treatment for infected cows. Examination and treatment should occur between 2-4 weeks after calving and ideally 2–4 weeks before the start of mating.

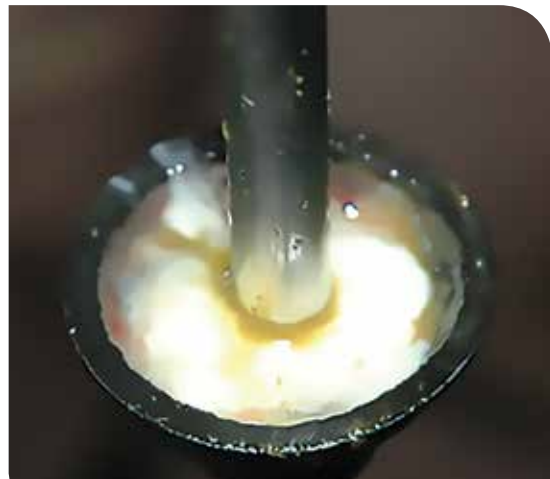
You may wish to consider examining every cow after calving and before mating. In seasonal and split calving herds a whole-herd examination can be done efficiently – even during milking – by a veterinarian using the specialised internal examination device.

Treatment: uterine infusion

Treatment of uterine infections using a single uterine infusion is more effective than using a prostaglandin injection. Only registered products for use in uterine infusion should be used. Affected cows treated with a registered product before mating are 3 times more likely to conceive at their first AI than if left untreated.



A positive Metricheck examination on a cow with metritis. Once identified, this cow can be treated and recover in time for mating.



Examples of a positive Metricheck

Minimising lameness

Consequences of lameness

Lameness reduces a cow's reproductive performance. Lamé cows' heats are commonly missed and they:

- › often do not cycle
- › can have impaired mounting behaviour
- › have weaker heat signs than non-lame herd mates and are mounted less frequently
- › will reduce their feed intake leading to excessive body condition loss and preventing cycling
- › are 3.5 times less likely to cycle within 60 days of calving than non-lame herd mates.

Indications of lameness

A mildly lame cow may only show subtle signs such as arching of her back when standing and/or walking. These mild signs are important because cows with them can have reduced fertility.

If a significant proportion of the herd walk with arched backs but do not favour an individual limb, corrective trimming at drying off may reduce lameness levels in the following lactation.

Causes of lameness

There are many types and causes of lameness. Examples include footrot, sole penetrations, sole ulcers and white line disease – each produces distinct changes to the foot.

There is likely to be more than one type of lameness in the herd and knowing the main types gives you clues about what may be the causes operating in your herd. It is important to know the type, frequency and level of lameness if you are to treat and control lameness effectively. Your veterinarian can provide this information from regular examination and treatment of lame cows in your herd.

Prompt treatment of lameness minimises negative impacts and provides for improved cow comfort. Early treatment limits feed intake depression and subsequent body condition loss providing both reproduction and production benefits.



Lameness may stop her from getting in calf because she stops eating and loses weight

Further information

See: healthyhooves.dairyaustralia.com.au/ to access the Healthy Hoofs presentation and management of lameness manual. Also view videos on lameness prevention, scoring and treatment.

How to minimise lameness

There are several things that you can do to minimise lameness, including:

- › **Providing sufficient dairy yard space** to hold the cows safely. Cows need to be able to manoeuvre. If heads are up or cows are pushing at an angle with their feet, then the yard is too tightly packed or small.
- › **Moving cows comfortably.** Cows need to see where to place their feet for each step. Pushing cows too hard along the track and/or congesting them too tightly leads to poor foot placement and lameness. This churning makes lameness problems worse.
- › **Minimising rocks and stones** on concrete. Rocks and gravel on concrete are likely to damage or penetrate a sole when stood on.
- › **Minimising the time cows spend on concrete.** Concrete produces excessive wear to soles and this can lead to thin, soft soles and increased lameness. An especially important consideration in farms using feed pads or free-stall barns where cows can spend long periods standing on concrete.



Overcrowding in the dairy yard will lead to causes of lameness such as white line disease

Minimising abortions

Look for these signs

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. 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.

Monitoring and recording

Good management of aborted cows will reduce the risks to both humans and other cows, and maximise subsequent reproductive performance. 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.

Calculating the abortion rate

Seasonal and split calving herds

Use the following formula at every calving period:

$$\frac{\text{No. of cows aborted} \times 100}{\text{No. of cows diagnosed as pregnant during the previous mating period (excluding cull cows)}}$$

In year-round calving herds

Use this formula every 6 months:

$$\frac{\text{No. of cows aborted for the past year} \times 100}{\text{Average no. of cows in the milking herd}}$$

- ✗ If cows are pregnancy tested early (between 6 and 15 weeks) after service, seek professional advice if abortion rates exceed 8%.
- ✗ If cows are pregnancy tested longer after service (e.g. 12–24 weeks), seek professional advice if abortion rates exceed 5%.

Control options

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 or browse on from cypress or pine.
- › Implement ongoing herd vaccination against leptospirosis (lepto).
- › Consider testing and removing any BVD spreaders from your herd (includes all stock).
- › Consider use of BVD and neospora vaccines.
- › Do not feed silage that has fungal contamination.
- › Have bulls' fertility and disease tested before introduction to the herd.
- › Control mastitis. Pregnant cows that get clinical mastitis have a 3-fold increased risk of aborting.
- › 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.

Take care when handling aborted calves, membranes or discharges. Some causes of abortion can produce infections in humans. Apply good hygiene when handling aborted materials and cows who have recently aborted.

Returning to service after insemination but not pregnant at the end of mating

Some cows can be:

- › found to be empty at final pregnancy test, but
- › inseminated early in the mating period, and
- › not subsequently detected returning to heat.

What happened?

These cows are typically assumed pregnant after the insemination. The causes include:

- › cows conceiving but failing to hold their pregnancy (embryonic loss)
- › cows returning to heat but not being detected, and
- › cows lapsing into anoestrus after service.

Investigating causes

If you have identified a number of cows with this problem, then you will need to consider each of the potential causes in turn.

- › Work towards reducing the level of anoestrus (or non-cycling cows) in your herd.
- › Consider specific treatments for non-cycling cows.
- › Examine your heat detection efficiency.
- › Take steps to reduce the risk of cows experiencing embryonic loss after an early insemination. This can occur when using synchrony programs with fixed time AI in cows that are not long enough calved or are in low body condition. The fixed time insemination of these cow essentially forces a conception to occur but the cow is unable to carry the embryo to term.
- › Work with your veterinarian to exclude cows that are of increased risk of embryonic loss and exclude them from fixed time AI programs whilst they are high risk. These cows may benefit more by being withheld from the program and given time to recover from calving or restore body condition. One method of addressing this problem is to implement an early pregnancy testing strategy that may involve repeat examinations. Consult your vet on options for your herd.

See: dairyaustralia.com.au/fastfacts for more information on specific causes of abortion.

Minimising the risk of heat stress

Effects of heat stress

Cows that experience heat stress at certain stages of the fertility cycle can suffer reduced reproductive performance as well as reduced milk production and cow health.

- › Cows heat stressed:
 - after calving often take longer to resume cycling after or may lapse back into anoestrus
 - during mating often have shorter heats and more silent heats, leading to lower submission rates. Their conception rates are also lower.
 - in early pregnancy have an increased risk of embryonic death
 - in late pregnancy give birth to lighter calves. They also produce less milk in the following lactation and are more likely to have health problems around calving than cows that remain cool. These impacts are due to impaired udder and placental development and a suppressed immune system.
- › Unborn calves of cows heat stressed during late pregnancy are pre-programmed for sub-optimal health and performance – they are more likely to die or be culled between birth and the end of their first lactation, they are less fertile at first mating and produce less milk in their first lactation. This is due to long lasting changes in body metabolism and gene expression.
- › To avoid these long lasting negative impacts on herd productivity and profit, farms that dry cows off over the hot months of the year need to take steps to prevent heat stress in early dry cows and transition cows. All cows must have access to adequate shade and cool drinking water at all times.



Shade cloth can provide cost effective relief

Monitoring cow breathing rate

The most useful and practical way to determine how your cows are actually coping with the prevailing conditions and managing their heat load is to check their breathing rate. An increased breathing rate is the first defence the cow uses to dissipate heat, and therefore the first outward sign of heat stress.

Check using a watch and count the number of breaths in at least 20 cows by observing flank movements over a 20-second interval and then multiply by 3. The best place to do this is in the paddock before afternoon milking.

- ✓ 40–60 breaths per minute is normal.
- ✗ More than 60 breaths per minute indicates a core body temperature of about 39°C. At this point, you need to take action. At 70+ breaths per minute, the cow is starting to struggle. In the 80s, heat stress is severe.

Strategies to improve in-calf rates during hot conditions

During times when heat stress is likely to be encountered during mating:

- › Make an extra effort heat detecting. Cows will cycle for shorter periods and at cooler times of the day.
- › Consider running more bulls with the herd during the bull mating period. Conception rates will not increase but there is more chance of inseminating cows on heat for shorter periods.
- › Consider mating more heifers in these times to maintain your desired calving pattern. Heifers are more heat tolerant than older cows.

If you are drying cows off over the hot months of the year, ensure that they have access to adequate shade and cool drinking water at all times throughout their dry period. If existing natural shade from trees in paddocks on the home farm or support block used for dry cows is inadequate to provide 4 m² per cow at midday, then alternative paddocks should be sought.

Heat management strategies

Strategies to help cows manage their heat load are:

- › Providing shade in paddocks, laneways, over dairy holding yards and feed pads to reduce the amount of heat the cow accumulates each day. Shade is king!
- › Using sprinklers and fans to help cows offload heat by evaporation
- › Changing milking times
- › Ensuring access to drinking water at all times
- › Changing paddock rotations
- › Developing a summer nutrition program.

See: dairyaustralia.com.au/animal-management and coolcows.com.au more information and resources.

Managing pestivirus (Bovine Viral Diarrhoea: BVD)

What is BVD?

Pestivirus or bovine viral diarrhoea (BVD) virus is a very common virus circulating in and between most Australian dairy herds. Approximately 90% of dairy herds have been exposed to pestivirus at some time and 75% of herds having evidence of active or recent infection. Pestivirus can:

- › prevent conception
- › cause embryonic loss and stillbirths, and
- › result in the birth of weak, underperforming persistently infected (PI) calves.

PI calves are typically 'poor doers' and most do not survive for long in dairy herds – either dying or being culled as a low producer. PIs are extremely efficient spreaders of virus and this is how infection is maintained in herds.

Outbreaks and eradication

Rarely BVD can produce a large outbreak. Damaging outbreaks tend to occur when virus enters a naïve herd or re-enters a herd that has remained free of virus for a number of years.

Pestivirus can be eradicated from a herd by testing and removing permanently infected animals. This creates a challenge to keep virus from re-entering the now increasingly susceptible herd.

To remain free of virus requires strict and complete biosecurity controls and ongoing monitoring.

How outbreaks occur

Breaches can occur on and off the home farm. Pregnant females can contact the virus when away on agistment, from infected neighbouring cattle over the fence or from contaminated equipment such as trucks or visitors that have recently come into contact with the virus.

The longer a herd has been free of virus the fewer cows that will remain with immunity. After a few years, all adult females will be vulnerable to infection and this increases the risk of a serious outbreak should the virus be re-enter.

How will you control pestivirus?

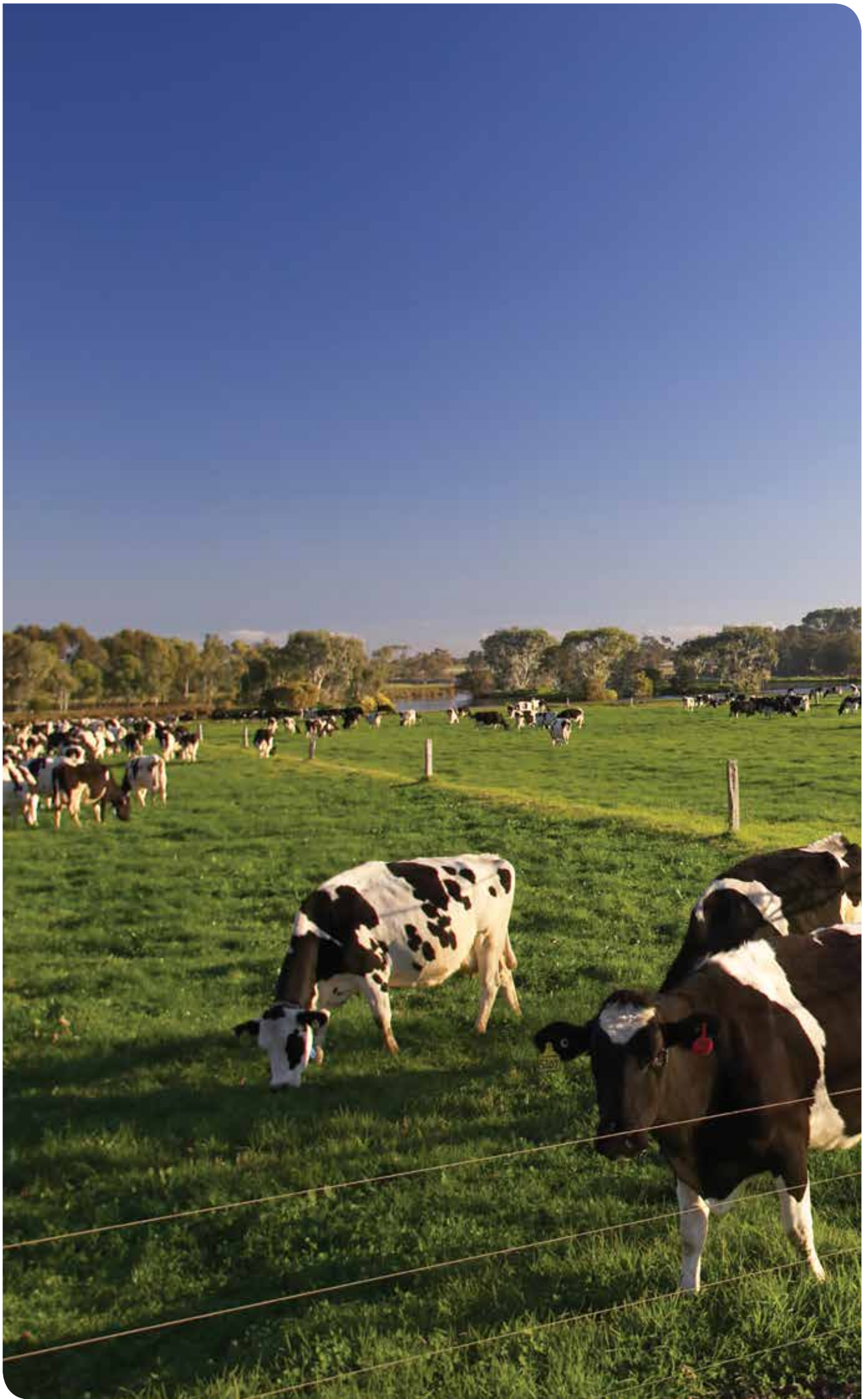
You need to decide if and how you will control pestivirus. You need to weigh up the feasibility of control, costs and benefits of eradication as well as the risk of (serious) outbreaks. Your vet can help you decide the most suitable strategy for your herd.

As a minimum, control the risk of an outbreak during bull mating. Ensure all herd bulls are free of pestivirus and vaccinated. A vaccine against pestivirus is available that is approximately 80% protective against in-utero infections resulting in the birth of PI calves.

Further information

See: dairyaustralia.com.au for more information and resources about managing pestivirus risk.





05

Pulling it all together

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, all actions need to be part of the overall farm management, taking into account factors such as the farm's pasture and livestock resources, human resources, farm finances and business objectives.

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Section A What calving system works best for me?

First ask, 'What sort of calving system works best for me?'. Your system governs when you start and stop mating. Choosing a calving system that is profitable and suits the farm objectives is a critical decision because the calving system drives many aspects of farm management.

Note: This section is not about which calving system you should use but about how to manage reproduction in your chosen calving system most efficiently.

Other questions

Other decisions, controlled by you are:

- › 'How long will I mate for?'
- › 'How many opportunities do I give that cow to get in calf?'
- › 'Is it worthwhile to carry her to her next mating period?'

Measurement and planning

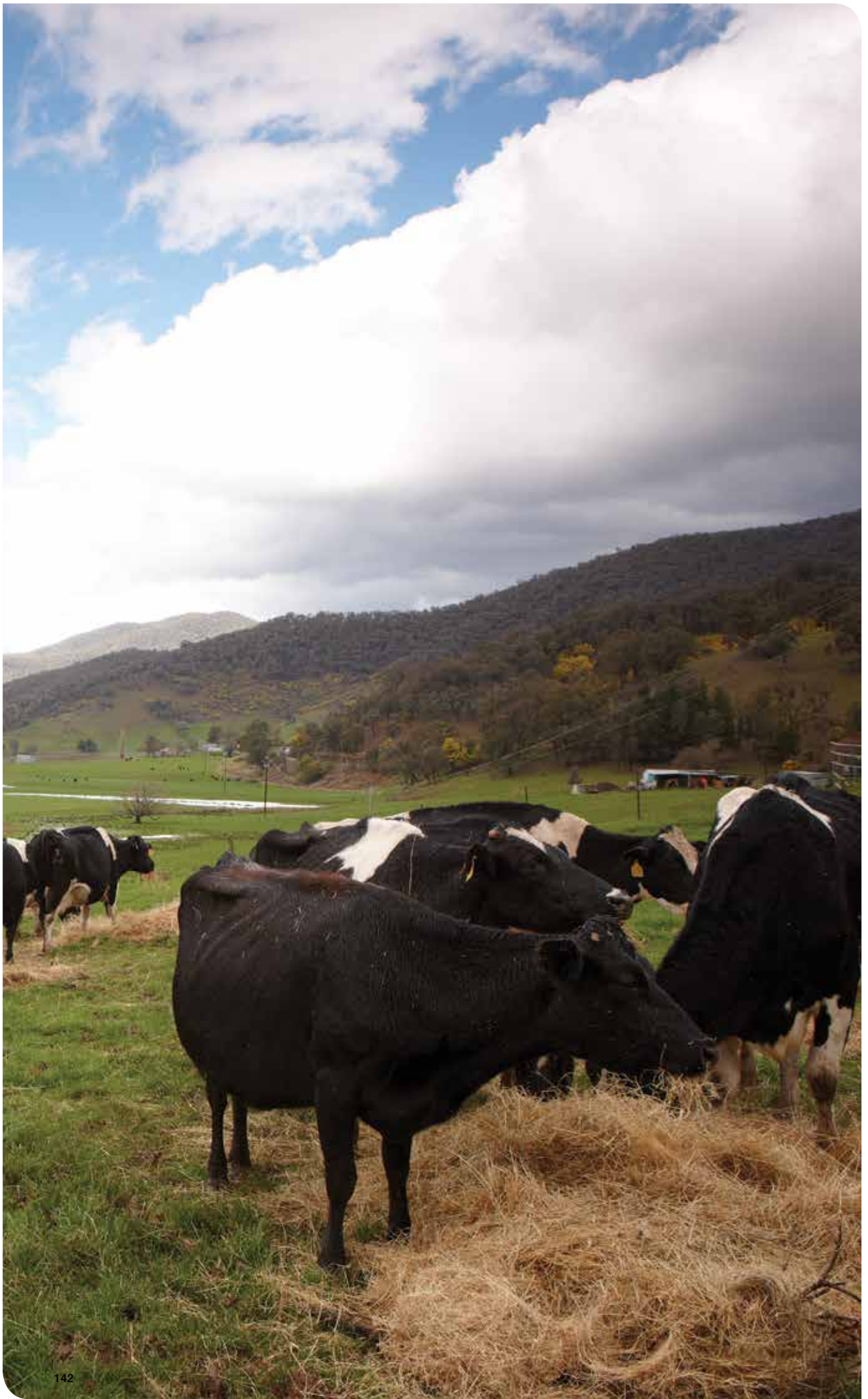
Measuring reproductive performance without the critical information leaves you open to surprises. An accurate pregnancy testing strategy will give you the information you require to accurately measure current performance and plan ahead.

What cows do you want to cull to meet farm objectives? What cows are you forced to cull because they are non-pregnant? Improved reproductive performance gives you the choice to cull based on your farm's objectives.

Fertility management plan

The final step is to pull it all together in a fertility management plan. A fertility 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 fertility management plan, the InCalf book provides a framework as a starting point for improving your herd's reproductive performance.



Section B Starting and stopping mating: year-round calving herds

In this section

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Selecting a Voluntary Waiting Period	145
Determining the longest VWP to suit the herd	146
Pathway to improve performance in year-round herds	149

Key points

- › Select the right VWP for your herd. You will need to balance cow fertility and herd milk production impacts of your VWP choice.
- › Decide when you will stop mating cows that are not pregnant.
- › You need to manage cows individually to achieve your goals. This requires good record-keeping and regular assessment.

Starting and stopping mating: year-round calving herds

In a year-round calving herd, it is easy to lose track of the length of time between when cows calve and when they should be first mated, and how many times they have been mated this lactation.

It is also important to make a conscious decision on how long to continue to mate a cow that is proving difficult to get in calf. A long gap between calving and when the cow is first mated is common and this will reduce the 100-day in-calf rate. Allowing cows too many matings increases the 200-day not-in-calf rate.

These reductions in reproductive performance will lead to increases in the average days in milk, reduced milk production and profit.



Selecting a Voluntary Waiting Period

The key decisions that you need to make are:

- > how long you will delay mating in freshly-calved cows
- > how long you will continue to mate non-pregnant cows before listing them for culling.

Because cows are at all stages of the reproductive cycle it is essential to establish these mating rules and to monitor performance.

Definition: Voluntary Waiting Period (VWP)

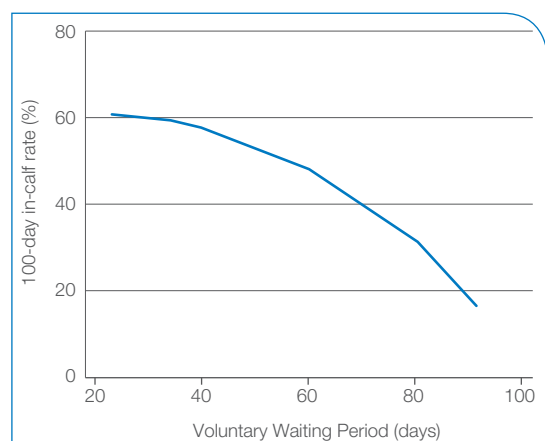
The Voluntary Waiting Period (VWP) is a term used to describe the time after calving during which no inseminations are to be performed – even if the cow is detected on heat.

The role of the VWP is to allow the cow sufficient time to recover from calving and let her reproductive tract repair and prepare for the next mating and pregnancy. Once cows pass their VWP, their reproductive tract is more able to conceive and to hold a pregnancy if inseminated.

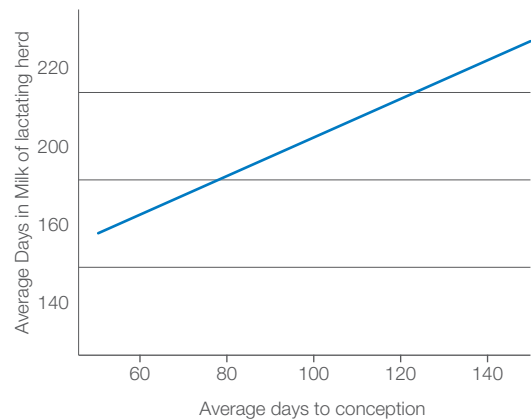
Choosing a VWP

Reproductive performance is very low after calving. Fertility slowly returns to normal at between 12–15 weeks after calving for most cows. Mating cows either too soon or delaying mating too long after calving are both inefficient. Choose a VWP for your herd that provides adequate conception rate for first matings and provides for high 100-day in-calf rate and low average days in milk.

The idea is to begin inseminations just at the right time – not too soon or too long after calving.



- > An example of how herd 100-day in-calf rate can improve with shorter Voluntary Waiting Periods.
- > High 100-day in-calf rates are achieved with shorter Voluntary Waiting Periods.



“Increasing the VWP will delay the time to conception. This will increase the average days in milk for the herd”

Dangers of overly short VWP

Overly short VWPs, less than 30 days, will result in higher 100-day in-calf rate and lower 200-day not-in-calf rate, but it will also increase semen use and cost, reduce the conception rate and only provide a few extra pregnancies.

Danger of overly long VWP

Overly long VWPs, greater than 60 days, will provide for higher conception rates and reduce semen use but also reduce the 100-day in-calf rate and increase the 200-day not-in-calf rate resulting in unnecessary delay to becoming pregnant and increasing the average days in milk for the herd.

Lactation persistence

A key consideration when selecting a VWP is the lactation persistence of the herd. Lactation persistence is a measure of how much individual cow milk production declines from mid to late lactation. Herds with a small decline, said to have good persistency, may consider a longer VWP.

This is possible because milk production does not decrease greatly in herds with good lactation persistence, even though the average days in milk increases for the herd following use of a longer VWP. In general, it is better to use as short a VWP as practical.

Usual VWP time

Most VWPs are between 30–60 days with 40–50 days best for most herds.

Determining the longest VWP to suit the herd

Information required

To use the following table, obtain your herd's lactation persistence and 305-day production.

1. From your herd test reports, look up average daily production for days
 - 101 to 200, and
 - 201 to 300.
2. Calculate the difference between the two.
3. Divide by 3.

Result

This gives you the lactation persistence. Repeat this for several herd test reports at different times of year to give a result for the entire year. The result is the approximate lactation curve decline for your herd which is how much daily production per cow typically drops each month after the cow has passed peak production.

- › Obtain your herd's 305-day milk yield from your herd test reports.
- › Use your 305-day milk yield and lactation persistence to look up the optimum VWP for your situation using the table below.

Recommended VWPs for year-round calving herds

Use this table to determine the longest VWP appropriate for your herd. Obtain your herd's 305-day milk yield from your herd test reports and use this to look up the optimum VWP for your situation.

Lactation persistence for herd	Recommended VWP for herds with an average 305-day production per cow	
How much daily production per cow typically drops each month after the cow has passed peak production	6,000 litres	9,000 litres
Less than 1 litre/month (very slow decline in yield after peak)	50 days	60 days
1–2 litres/month	40 days	40 days
More than 2 litres/month (rapid decline in yield after peak)	30 days	40 days

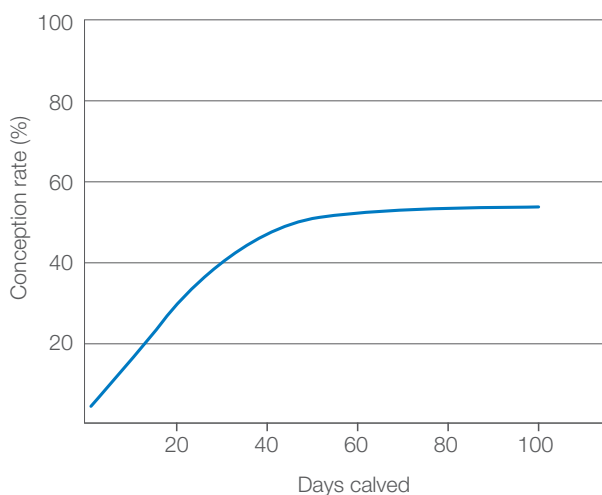
In choosing a VWP for your herd, you should also consider:

- › a shorter VWP if herd heat detection rate is low, see: Heat detection and what to look for in a cow that is on heat, page 75
- › a longer VWP (10 extra days) for cows that you have decided to inseminate with more expensive semen
- › not increasing the VWP simply because cows have had abnormal calvings or diseases since calving, and
- › not increasing the VWP for cows in poor body condition.

Offsets

The losses from slightly reduced conception rates for the first insemination after calving are usually more than offset by the gains from earlier conception and higher production.

The relationship between conception rate and days from calving to insemination



Using extended lactation in your herd

Cows with high milk production persistency may profitably have their lactation extended out to 16 months. This requires you to not mate the cow at the more traditional time after calving as an early pregnancy will force the cow to be dried off at around 10 months of lactation.

How to benefit from extended lactation

To benefit from extended lactation:

- › Identify the cows for extended lactation, and delayed mating, from lactation records
- › Confirm that herd reproductive performance is sufficient to allow you to delay mating in selected cows. Will you have enough replacements?
- › Manage cow nutrition to prevent extended lactation cows from getting over fat in late lactation. Over-fat dry cows are at increased risk of problems next lactation. See *Why these targets?*, page 58.
- › Maintain strict culling policies for cows that do not become pregnant when required after calving – irrespective of their lactation persistency.

The InCalf VWP Tool will help you verify your current VWP and measure the effects of changing it on herd reproductive performance.

When to stop mating

If a cow is not pregnant and reaches 200 days after calving, you need to decide whether to keep inseminating her when she returns to heat. Consider the following questions in making this decision:

- › What is the cow's current production?
- › What is her total production for the lactation?
- › How old is she?
- › Does she have a high cell count?
- › Has she had clinical mastitis?
- › Has she been hard to get in calf previously?
- › If I stop inseminating her, will I get sufficient heifer replacements?
- › What is the cost of continuing to inseminate the cow? Should I use cheap semen or the herd bull?



Consider pregnancy testing suspect cows around 150 days after calving. This gives you the option of treating or synchronising the cow for another mating before she reaches 200 days calved.

Pathway to improved performance in year-round herds

Consider 4 components

There are 4 components to consider:

- › breed enough well-grown heifers that calve easily at 2 years of age
- › maximise the herd 100-day in-calf rate, and
- › minimise the 200-day not-in-calf rate
- › cull under-performing cows.

Breeding enough heifers to calve easily at 2 years of age

More replacement heifers will support increased voluntary culling in the milking herd. Extra heifers can also be mated to fill any calving gap when insufficient cows will be calving. Having sufficient well-grown heifers that calve at 21-24 months of age helps you to manage average DIM and service culling. If there is an insufficient quantity replacement heifers to meet your target replacement rate, then consider the use of sexed semen to increase the number of replacements.

Maximise the herd 100-day in-calf rate

Getting cows pregnant shortly after calving is challenging. These are the things you need to get right:

- › Ensure cow body condition and nutrition is setting the herd up to succeed? See Section B: Body condition and nutrition, page 53.
- › Prepare cows for mating when they are still within their voluntary wait period. Examine and treat cows at risk of reduced fertility before the end of the VWP. Timely treatment gives the best chance for recovery and restoration of fertility before mating. See A checklist for monitoring and acting on cow health problems, page 127.
- › Could a synchrony program provide benefits in your herd? See Heat synchronisation, page 89.
- › Use heat detection aids and tail tape to mark cows for mating that are not yet pregnant and need to be closely watched for a heat. See Using tail tape in year-round calving herds, page 81.
- › Have any cow not seen on heat 80 days after calving examined by a vet.
- › Maximise 3-week submission rate (see Improving your heat detection, page 71) and conception rate (see Checklist for good insemination technique, page 110).
- › Ensure you use only sires with high Daughter Fertility ABVs for mating (see Daughter Fertility ABV, page 96).
- › Manage your bulls to ensure the bull team can perform at its best (see Managing working bulls, page 124).

Minimise the 200-day not-in-calf rate

Identify empty cows at the earliest opportunity. Early identification provides more time to prepare them to mate again to give them every opportunity to become pregnant earlier.

- › Use regular early pregnancy testing to find those cows that are not pregnant (see Using pregnancy testing, page 160)
- › Have procedures that clearly identify the cows due to return each week and monitor the success of heat detection of repeat breeders
- › Identify cows calved 150 days and not confirmed pregnant and ensure that they are clearly marked for heat observation
- › Identify non-pregnant cows that may be suited to extended lactation
- › Retest all early pregnancy-tested cows before dry off to confirm they are still pregnant.

Cull under-performing cows

- › It is important to have a protocol for culling non-pregnant cows:
- › Old cows have reduced fertility, consider culling all cows over 7 years of age and not pregnant by 150 days after calving if you have enough replacements:
- › Mark cows that are > 200 days in milk and not pregnant as 'do not breed' and cull them at the end of their lactation.
- › Cows that require more than 150 days from calving to become pregnant should be preferentially culled
- › Rear enough replacements to allow you to remove these cows at the end of their lactation.

Pathways to success

- › There is a lot to get right and there are always cows at different stages of their reproductive cycle. It is a big job but you can achieve success by:
- › Making sure someone is responsible for mating management. Do they have the knowledge, skills and resources to succeed? Have you set achievable targets and a plan to get there?
- › Involving your team: Provide training sessions for your staff. Ensure everyone knows how to detect a cow on heat and the procedures to ensure she gets mated with the right semen at the right time.
- › Regularly reviewing reproductive performance. Work with your veterinarian and again involve your on-farm team.



Section C Managing your calving pattern: seasonal and split calving herds

In seasonal and split calving herds, calving pattern, that is the spread of calvings in a given calving period, has a major impact on subsequent herd reproductive performance.

Cows that calved in the first three weeks of calving typically have 6-week in-calf rates around 70% whereas very late calved cows that calve after week 9 of calving, typically have 6-week in-calf rates around 20%. Not-in-calf rates are also affected.

What is a desirable pattern?

A desirable calving pattern has most cows calving in the first 6 weeks of the calving period, with few late-calving cows to reduce herd reproductive performance.

Many herds have calving periods that stretch beyond 8 weeks. Not only does this contribute to reduced reproductive performance, it also has implications for many key aspects of farm management, including:

- › scheduling of tasks
- › cash flow
- › labour
- › pasture, and
- › feeding management.

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Strategies for a compact calving period	154
Why is keeping calving compact so important?	155
Planning to improve the calving pattern of the next calving period	156
Building an effective work team	158

Key points

- › Late cows make it hard to have a compact calving pattern next time round.
- › Work on reducing late calving cows by getting them pregnant earlier or by replacing them with early-calving heifers.
- › Getting a cow to advance her calving date is difficult. Her chances improve if she has fully grown, is in good body condition, has had a good transition period and an easy calving and cycling before the start of mating.

Measuring the herd calving pattern

Assessing your herd's 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 both cows and first calving heifers calved by weeks 3, 6 and 9 following the planned start of calving and compare your result with this table:

Note: For split calving herds, do the calculations separately for each calving period.

Calved by week...	Seek help if less than...	Top farmers achieve...
3	51%	61%
6	77%	94%
9	94%	100%

Note: Measure the calving pattern of your first calving heifers.

It is easy to calculate the calving pattern of your herd, that is, the percentage calved by weeks 3, 6 and 9, using a Fertility Focus report. It also calculates the calving pattern of your first calving heifers separately as an indicator of the success of your heifer mating program.

The InCalf Calving Pattern Tool will enable you to estimate the herd's likely calving pattern for the upcoming calving period, compared to targets, and measure the benefits of closing this gap on herd performance.

Selecting mating start and stop dates

Once the Planned Start of Calving (PSC) is chosen the Mating Start Date (MSD) is also automatically determined. Selecting the ideal time to start and stop mating – and the subsequent pattern of calving – are individual decisions beyond the scope of this book that depends upon factors such as:

- › labour availability
- › feed supply
- › milk price, and
- › climate.

See: For a handy reference to relate your Mating Start Date to the Planned Start of Calving, use the look-up charts in Appendix AI page 179.

The value of thinking in 3 week blocks

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 leaving the cow 12 weeks from calving to become pregnant again if she is to calve on or before the same date next year.

As a cow's normal cycle is 3 weeks dividing the herd's calving period into 3-week blocks relative to the Planned Start of Calving (PSC) date is a useful way to group cows facing similar reproductive challenges.

The same principle divides the intervals from calving to Mating Start Date (MSD) and from MSD to the end of mating into three-week blocks.

Calving date and reproductive performance

There is a strong relationship between calving date and subsequent reproductive performance. The more days from calving to MSD the better the reproductive performance will be.

Effect of interval from calving to Mating Start Date on reproductive performance

This table shows the comparison between these three-week block intervals and subsequent performance:

Calving group	Calving to MSD [^]	6-week in-calf rate	Not-in-calf rate
Very early – before PSC [*]	More than 12 weeks	76%	5%
Early – 1st 3 weeks	9–12 weeks	71%	6%
Mid – 2nd 3 weeks	6–9 weeks	61%	9%
Late – 3rd 3 weeks	3–6 weeks	51%	13%
Very late – within 3 weeks of MSD [^] or later	Less than 3 weeks	22%	23%

Note: ^{*}Planned Start of Calving (PSC): date of planned start of calving in a particular calving period

[^]Mating State Date (MSD): Date of first day in a particular mating period.

Strategies for a compact calving period

The principles for maintaining a compact calving period and that for tightening a spread calving pattern are the same. However, you will need good planning and commitment to be successful.

Early calving heifers

Most gains can be made by having well grown first calf heifers that calve early in the calving period.

These are much easier to get back in calf in the first 3 weeks of the mating period.

Consider starting your heifers' mating program 2 weeks before the main herd to increase the number of heifers that will calve during the first 3 weeks of the herd's calving period and their chance of conceiving early in the next mating period. This will require you to grow heifers faster in order to achieve their target weight earlier.

Strategies for late-calving cows

Other strategies target the late-calving cows. You may wish to consider:

- › using synchrony programs (see Heat synchronisation, page 89 and Managing cows not detected on heat, page 90), and/or
- › sexed semen (see Using sexed semen, page 100).

Starting and stopping mating

Once you have determined your herd's Mating Start Date, you need to think about the duration of mating – when to stop mating. There are several factors to consider including:

- › how long you want to calve for
- › how many replacement heifers you seek to rear, and
- › the number of non-pregnant cows you are willing to accept at the end of mating.

Acceptable number non-pregnant?

The acceptable number of non-pregnant animals will vary between farms and depends upon:

- › whether you can carry non-pregnant cows over to a second mating period in split calving herds
- › the number of heifer replacements you have available
- › whether you are building up herd numbers, and
- › the number of cows that will need to be culled for reasons other than reproduction, such as mastitis.

Factors to consider for non-pregnant cows

Consider each of these factors when deciding on the number of non-pregnant cows you are willing to accept. Use the following table to:

- › estimate the duration of mating that would be appropriate for your herd
- › estimate the likely number of non-pregnant cows you will have to manage for a given length of mating.

Estimating the expected percentage of cows NOT pregnant at the end of mating

To maintain a compact calving pattern, you need a mating duration of no longer than 12 weeks, and aim to have the majority of cows pregnant within the first 8 weeks.

Total length of mating	Estimated % of cows not pregnant at the end of mating	
	Common result	The best you could hope for
6 weeks	40%	29%
9 weeks	28%	20%
12 weeks	21%	13%
15 weeks	17%	10%

Why is keeping calving compact so important?

Time for recovery

In seasonal and split-calving herds, striving to have cows become pregnant as soon as possible after the Mating Start Date is critical because for every week that calving is delayed, the cow has one week less before the next Mating Start Date to recover from calving.

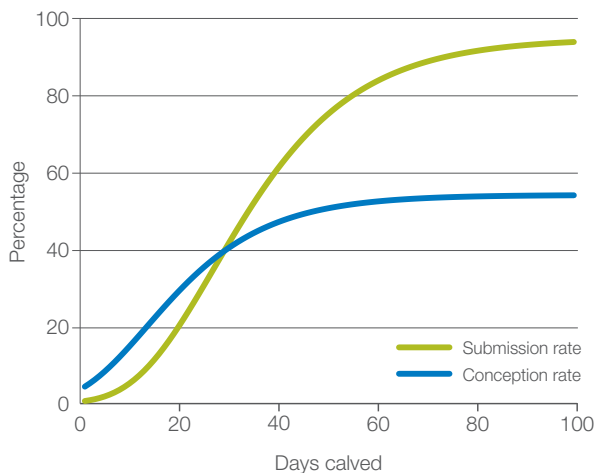
Cows calved in the first 3 weeks of calving have substantially better reproductive performance than cows calved later. Cows need time for their reproductive tract to recover from calving and cows that calve earlier hit peak fertility earlier than later-calving cows.

Submission and conception rates

- › Submission rates for cows increase with time after calving. Submission rates peak when cows are approximately 80 days calved and decline very rapidly for every day under 60 days that a cow is calved by mating start date.
- › Conception rates don't peak until cows are 50 days calved. Conception rates decline rapidly for every day under 30 days calved at insemination. Cow fertility becomes compromised at MSD in cows that calve beyond the first three weeks of calving.
- › Cows that calve more than 7 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 that they will not be pregnant at the end of mating, compared with cows calving in the first 3 weeks.

Aim to keep calving compact. An early-calving cow has the best chance of getting back in calf early again.

Submission and conception rates by days calved



Calving group	Calving to MSD	Avg. 3-week submission rate (%)	Avg. first-service conception rate (%)	Avg. 3-week pregnancy rate (%)
Very early – before PSC	More than 12 weeks	94%	54%	51%
Early – 1st 3 weeks	9–12 weeks	90%	53%	48%
Mid – 2nd 3 weeks	6–9 weeks	77%	51%	39%
Late – 3rd 3 weeks	3–6 weeks	43%	41%	18%
Very late – within 3 weeks of MSD or later	Less than 3 weeks	5%	15%	1%

Early calving cows really do have the best chance to perform well next mating!

Planning to improve the calving pattern of the next calving period

Timing

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 period next time.

The biggest predictor of your 6-week in calf rate is the pattern of the preceding calving period. 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.

Remember that you also need well-grown heifers that calve early in a compact calving pattern and require minimal assistance to calve to maintain your herd calving pattern.

Strategies to tighten the calving pattern at the next calving period

The biggest gains will be due to strategies that directly influence the calving pattern, although smaller gains will also be made by optimising reproductive performance so cows get in calf quickly.

- › Check that you have a high percentage of first calvers due to calve in the first 3 and 6 weeks of calving (see Monitoring the overall success of your heifer rearing program, page 51). If not, closely monitor the growth of your next batch of calves and heifers to ensure they meet target live weights (see Monitoring and measuring progress, page 37). Also, check bull management and/or AI mating management of the heifers (see Heifer mating considerations, page 49).
- › Consider the opportunity to have heifers start calving 1–2 weeks before the main herd
- › Maximise 3-week submission rate (see Improving your heat detection, page 76) and conception rate (see Getting ready for AI, page 108 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, those not pregnant in the first 8–9 weeks of mating (see Preparing a cull list, page 177). Late-calving cows must be above-average producers to compensate for the reduced income resulting from later calving. Late-calving cows older than 7 years of age have declining conception rates – they are not likely to get pregnant early so should be preferentially culled.
- › Rear more replacement heifers to provide scope for extra culling. Heifer synchrony programs (see Heat synchronisation, page 89) and sexed semen (see Using sexed semen, page 100) used on well-grown heifers can increase the number of replacement heifers.
- › Consider using AI with Shorter Gestation Length (SGL) sires or use herd bulls from breeds with shorter gestations towards the end of mating to advance the calving dates in cows conceiving late
- › Split calving herds should measure which late calving; high production cows are to be carried over to the next calving period. These cows should be first checked to see they are suitable for extended lactation.

Using the Fertility Focus report

A Fertility Focus report gives a standardised and consistent measurement of herd performance. Use Fertility Focus reports to compare herd performance across years and between farms

- › Calculate 3-week submission rate and first insemination conception rate and set targets for next year to help achieve high 6-week in-calf rates (see Industry targets: seasonal/split herds, page 151)
- › Evaluate the success of any interventions. Effective? Use them again? Alternatives?
- › Your veterinarian can help with the review and planning process
- › Calculate the number of bulls you will need for the next mating (see Use sufficient bull power, page 121). Prepare your bull team in advance of mating (see Preparing bulls for mating, page 120).

Maximising early conceptions at the next mating period

Review the last mating period with your staff:

- › what worked;
- › what can be improved, and
- › what you will do differently next time.

Planning your effort

You are always able to influence the next mating. Practically this means you need to plan an annual calendar. Given that mating is a critical time to influence herd profitability and longevity allocating time to plan your approach to mating and to update and train the staff before mating starts is good thinking. Mating is a critical time to influence herd profitability and longevity, this is a good so invest planning and effort into so focus on the the first few weeks of the mating period, particularly when trying to make your calving pattern more compact.

- › Carry out a Veterinary Bull Breeding Soundness Examination (VBBSE) (see Veterinary bull breeding soundness evaluation (VBBSE), page 120) and vaccinate all bulls for pestivirus. Preparing bulls for mating (see Preparing bulls for mating, page 120).
- › Consider doing pre-mating heat detection to identify and manage non-cycling cows (see Starting a heat detection program, page 76)
- › Consider veterinary examination of cows at risk of not cycling before Planned Start of Mating date, that is cows that had health problems around the time of calving and late calving cows (see Managing uterine infections after calving, page 131)
- › Manage cows that have been drafted for AI appropriately
- › Consider whether a synchrony program (see Heat synchronisation, page 89) or a non-cycling cow treatment program (see Managing cows not detected on heat, page 90) may benefit your herd
- › Plan to use early pregnancy testing with foetal aging to identify pregnant cows and to estimate their calving date (see Using pregnancy testing, page 160).

Managing the cycle

Remember that the fertility cycle is continuous – what you do today can affect performance tomorrow. Irrespective of your calving system or the time of the year you are always able to influence the next mating. You will need well-grown heifers if they are to perform to their best ability and you need to control body condition and nutrition of the herd for best performance.

- › Make sure you are growing good heifers (see Maximising your heifers' potential, page 32)
- › Is cow body condition and nutrition setting the herd up to succeed? (See Managing and measuring body condition, page 54)
- › Avoid using bull breeds with a high risk of assisted calving. Selecting bulls with high ABVs for calving ease (see Calving Ease ABV, page 96). Avoid using herd bulls whose calves required assistance in previous years and bulls with prominent shoulder blades (see Bull breeds and risk of assisted calving, page 130).

Building an effective work team

Involvement

Involve your team: Provide training sessions for your staff. Ensure they know:

- › how to detect a cow on heat
- › the procedures to ensure she gets mated with the right semen at the right time.



Responsibility

Allocate responsibility for mating management to farm team members. Do they understand the plan? Have they been trained? Remember that this is a critical time to influence herd profitability and longevity, so it is important to invest planning and effort into the first few weeks of the mating period, particularly when trying to shorten your calving pattern.

Tools and tasks

- › Use heat detection aids. Make sure all staff know how to use them.
- › Have a check list of the necessary supplies and make sure you have spares on hand before mating starts.
- › Carry out pre-mating heat detection and use this time as a practice for staff, testing protocols and producing a target list of non-cycling cows.

See: thepeopleindairy.org.au for information and tips on developing an effective work team.

Section D Choosing a pregnancy testing strategy

It is important to know which cows are pregnant and when they conceived to allow effective management. Many critical management decisions revolve around knowing when a cow will calve. An effective pregnancy testing strategy is an essential measurement activity.

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Choosing a suitable pregnancy testing method for your situation	167
Pregnancy testing strategies	170
Pregnancy testing strategies for heifers	172

Key points

- › Pregnancy testing is essential for managing reproduction.
- › Rectal pregnancy tests and milk pregnancy tests are available.
- › Early pregnancy testing with foetal aging is essential to estimate 100-day and 6-week in-calf rates. This can only be achieved using rectal testing methods and in cows between 5 –13 weeks pregnant.
- › Accurate foetal aging lets you manage dry-off and transition and will identify sire of pregnancy.
- › Follow-up pregnancy testing is important to estimate end-of-mating in-calf rates.

Using pregnancy testing

To measure and monitor herd reproductive performance

Pregnancy testing enables you to accurately measure and monitor herd reproductive performance.

- › 100-day in-calf rate and 200-day not-in-calf rate in year-round calving herds (see Year-round calving measures, page 15)
- › 6-week in-calf rate and not-in-calf rate in seasonal and split calving herds (see Seasonal/split calving measures, page 16).

Timely pregnancy testing also allows you to calculate the conception rate – a driver of in-calf rates.

Record keeping

Keeping good data combined with regular analysis is the basis of a fertility management plan. The minimum records for good monitoring are animal birth dates, calving dates, mating dates and pregnancy test results.

With these data, you can:

- › calculate the reproductive performance of your herd or of groups within the herd such as heifers
- › look for patterns among empty cows. Were they late calvers? Treated as non-cyclers? Mainly heifers or first calvers?
- › see more clearly the effectiveness of individual parts of reproductive management on performance
- › examine the impact of heat detection, AI, calving pattern etc. on overall herd performance, and
- › predict future calving and milk production allowing better budgeting of finances and feed.

To inform decisions on individual cows

Pregnancy testing with foetal aging is required for you to determine cow conception dates with confidence and is an essential component of a herd's effective pregnancy testing strategy. Effective and complete pregnancy testing data enables you to:

- › confidently re-breed or cull cows as non-pregnant
- › provide approximate due-to-calve dates if selling cows
- › confidently dry-off cows at your preferred time before their due- to-calve date, providing longer lactations, more milk income
- › more accurately draft springing heifers and dry cows into transition cow groups so they receive the transition diet for the optimal 3 weeks prior to calving and minimise transition diet costs, and
- › know the sire of the calf This helps you manage the genetics of the herd and avoid inbreeding.

Year-round calving herds

Pregnancy testing enables you to:

- › focus extra heat detection efforts on non-pregnant cows
- › use heat synchrony to induce heats in non-pregnant cows
- › more accurately predict milking herd size for the coming 6 months.

Seasonal/split calving herds

Pregnancy testing enables you to:

- › differentiate AI from natural mating pregnancies
- › identify the sire of the AI pregnancy based on conception date
- › identify cows that become pregnant in the last few weeks of mating.

Foetal aging is currently only possible using manual rectal pregnancy testing by an experienced operator and is most reliable when cows are between 5 and 15 weeks pregnant.



Rectal pregnancy testing using ultrasound

Pregnancy testing has many paybacks

Pregnancy testing with foetal aging helps you to predict the next calving date with some accuracy. You can use this information to more accurately identify dry-off dates for individual cows that provide a 60 day dry period. Now you can milk each cow to her individual dry-off date. This may allow you to produce extra milk, minimise transition cow feeding costs and generate more profit than would have occurred if you used a blanket dry off date for the herd.

Pregnancy testing methods

There are two main methods for pregnancy testing.

- › **Manual (rectal) examination** of the cow's reproductive tract by an experienced operator using manual palpation and/or an ultrasound probe, or
- › **Laboratory testing of a sample** of milk or blood obtained from the cow to determine the level of specific proteins or hormones associated with pregnancy.

Advantages and disadvantages of the two pregnancy testing methods

Measurement	Manual (rectal) examination	Laboratory testing of milk or blood sample
Advantages	<ul style="list-style-type: none"> › Experienced operators are very accurate at identifying both pregnant and non-pregnant cows › Results are available immediately. Testing is completed 'cow-side' and cows can be treated/drafted immediately. › Foetal aging can be performed by an experienced operator in cows pregnant between 5 and 14 weeks. › Some reproductive diseases can be detected at testing. 	<ul style="list-style-type: none"> › Most tests are very accurate at identifying pregnant cows. › Tests are non-invasive – there is low risk of abortion. › Can be convenient – especially with 'farmer collection'. › Can be cost effective – especially when small numbers of animals require testing and/or samples can be stored before sending to the laboratory.
Disadvantages	<ul style="list-style-type: none"> › Rectal examination is an invasive procedure. There is a small risk of injury to cow, operator and foetus. › Requires good facilities for safe examination. › Needs an experienced operator. › Operator fatigue can be a problem when large numbers are tested. Consider using more than one operator or testing over a number of days in big herds. › Can be expensive when only small numbers of cows are tested. 	<ul style="list-style-type: none"> › Some tests are only moderately accurate at identifying empty cows. › Unable to directly age pregnancies with accuracy. › Results are not immediately available. Samples sent to a laboratory for testing. › May give false positive results in cows recently calved and in cows that have recently lost their pregnancy. › Require extra handling and leading to increased errors in identification.



Laboratory pregnancy testing of milk samples

Importance of accurate record keeping

All pregnancy tests demand accurate identification of each cow and correct recording of results (or samples). Think about all the steps required to get an accurate pregnancy test record:

- › The cow has to be identified correctly at the test.
- › The pregnancy test result needs to be accurate.
- › The correct result must be recorded against the correct cow ID on the data sheet.
- › The results have to be correctly transcribed from the result sheet to the herd records.

Everybody on pregnancy testing day needs to play their role to ensure the results are recorded accurately.

Accurate identification of animals and careful recording of results are essential. All animals with clear ID tags, no duplicate IDs and good recording practice. Think about how easy it can be to read the number '8' as a '3' or to write numbers in the wrong order (e.g. '4782' instead of '4872'). A result recorded against the wrong cow is a wasted measurement and lost information!

Tip: Pre-print specific recording sheets with the entire group's animal IDs.

Return to heat is an unreliable measure of pregnancy

Not all cows that have been served and not seen returning to heat will be pregnant. The proportion of served cows not returning to heat can provide an estimate of the herd conception rate but it is not a reliable test in individual cows.

An empty cow may not be detected returning to heat because she:

- › was not detected when on heat
- › did not have or display a visible heat and is a non-cycler
- › lost her pregnancy, or
- › has cystic ovarian disease.

Why do cows with the same expected calving date calve two weeks apart?

Cows vary in the length of their pregnancy. The average pregnancy is 282 days and hormones from the calf trigger calving with calves varying at the time they trigger the process. Natural variation in pregnancies means that pregnancy testing cannot be exact in all cows.

Causes of errors in conception date

The wrong insemination date can be selected as the conception date when:

- > mating records are incomplete or inaccurate
- > the cow had two inseminations or services less than 2 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.

Other error causes

Cow identification and recording errors are common causes of cows not calving within a week of their due date.

General results from testing

Generally, about 70% of cows will calve within a week of their due date based on early rectal pregnancy test results. Typically, 10% of cows calve 10 days before and another 10% 10 days after their due date.

Preparing for manual pregnancy testing

Prepare for manual pregnancy testing by:

- › ensuring all cows are clearly identified and no two cows have the same identity number
- › checking the facilities are suitable with the person who will be performing the pregnancy testing
- › generating a list of all cows to be tested, including the number of weeks that the cow would now be in-calf if pregnant to:
 - either her last recorded mating, or
 - each of her recent matings.

Note: Most herd management software programs can generate a pregnancy testing list automatically.

Evaluating discrepancies

During pregnancy testing, provide the likely number of weeks pregnant, based on the last recorded service for each cow as she is being examined to the operator. If there is any discrepancy between the number of weeks pregnant from mating data and the manual estimate of the pregnancy tester, discuss the result with the operator, agree and then record the estimated date of conception.

Record each result before moving to the next cow!

Improving the accuracy of foetal aging when using manual pregnancy testing

You can help improve the accuracy of foetal aging by providing the mating history of each cow at the time of examination. The pregnancy tester can better match their estimate of foetal age range to the mating history to identify the most likely service of conception. The process is often as follows:

The examiner's initial estimate is for a...	On hearing that the cow has recorded services that...	The examiner chooses the...
11-week pregnancy	Would result in either a 10-week or 13-week pregnancy.	10-week service as the service of conception with confidence.

Note: A good operator working with good mating dates provides the most accurate way of aging pregnancies and of identifying the true conception date.

Worksheet example

An example of a pregnancy test worksheet with the days pregnant. Computer-based software can generate one of these quickly and accurately.

Pregnancy Test Worksheet				
				Date: 20/12/07
Cow no.	Last 3 services (days ago)			No. of days pregnant
1		56	35	35
2			65	35
3			48	?
4		72	50	50
5			71	71
6		64	42	42
7			53	53
8		70	48	48
9		68	45	?
10			49	49
11			70	70
12		59	38	38
etc				

The Fertility Focus report can add a lot of value to your pregnancy testing strategy by reporting your herd's actual 6-week/100-day in-calf rate and not-in-calf rate/200-day not-in-calf rate. Make sure your pregnancy test results, including age of pregnancies, are entered into your electronic herd recording system.

How do I get accurate due dry-off dates?

There are two simple actions to take that will dramatically increase the accuracy of your due drying off dates and calving dates. These are:

- › Pregnancy test cows 15 weeks in-calf
- › Bring a list of cows to be tested that includes the number of weeks that they would be pregnant if conceived for each of her recent matings.

Choosing a suitable pregnancy testing method for your situation

Pregnancy testing methods vary in their performance because some are naturally better at identifying pregnant cows while others are better at identifying empty cows. The most suitable testing method to use can vary depending on:

- › The pregnancy status of the herd, are they mostly pregnant or mostly empty?
- › The ability of the test to identify correctly:
 - pregnant cows
 - empty cows.
- › The type of mistake that you most wish to avoid – calling a:
 - pregnant cow empty – a false negative, or
 - empty cow pregnant – a false positive.

No test is perfect – mistakes (misclassifications) do occur. The number of mistakes that a test will make differ between tests but will also vary within a test as the proportion of pregnant animals examined changes.

A general summary of testing method performance

Each testing method has two performance specifications. These can be used to help select the most suitable test to use at each testing point. The performance specifications for tests for pregnancy are:

- › **Sensitivity:** The proportion of **pregnant** cows that return a **positive test** result, and
- › **Specificity:** The proportion of **empty** cows that return a **negative test** result.

Test	Test sensitivity (finding pregnant cows)	Test specificity (finding empty cows)	Foetal aging	Comment
Early manual pregnancy test	★★★★	★★★★★*	★★★★*	Requires an experienced operator and mating dates
Late manual pregnancy test	★★★★★*	★★★★★*	★★	Aging is too inaccurate
Laboratory test	★★★★★*	★★★★*	★	Assumes pregnant cows conceived to their last service

Follow up pregnancy testing

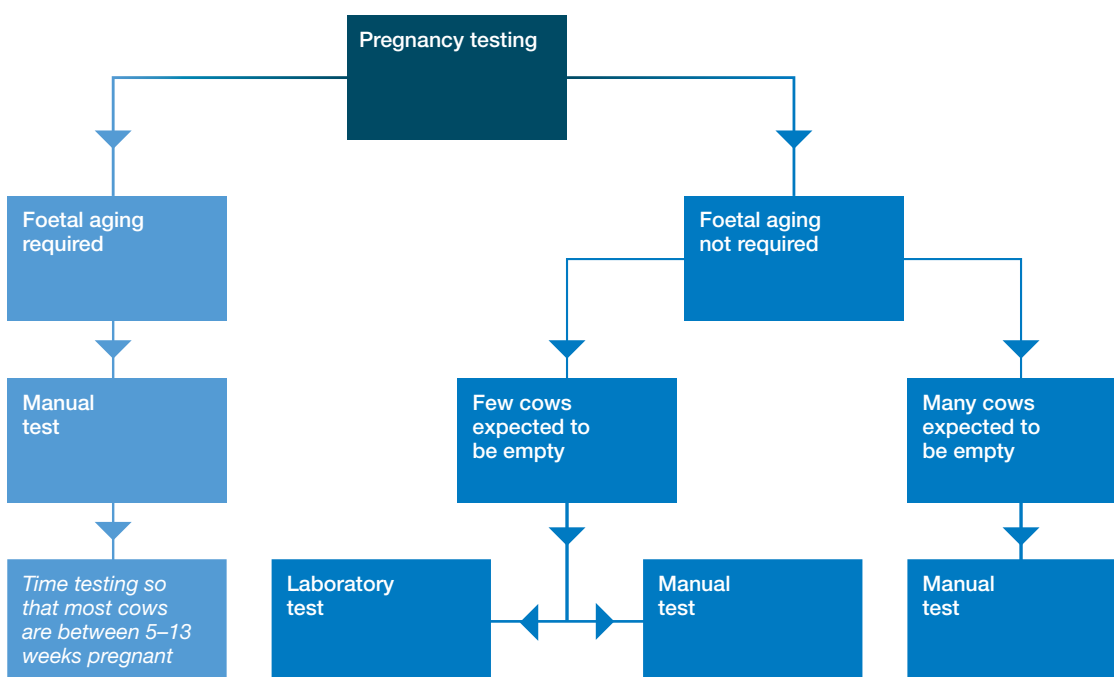
You need to plan follow-up pregnancy testing. This is recommended because for very early pregnancy diagnoses up to 10% of confirmed early pregnancies are subsequently lost. Consider re-examining cows diagnosed pregnant under 6-weeks at a later date to confirm that they have held.

Foetal aging

Foetal aging is best when cows are no more than 14 weeks pregnant. Cows that are not pregnant at this early pregnancy test are often still being mated. You need to retest these cows from 5 weeks after the end of mating to confirm their status.

Guide for selecting suitable pregnancy testing methods for a group of cows

The following flow chart provides a guide to identify suitable pregnancy testing methods for testing.



Manual pregnancy testing by an experienced operator is accurate for both pregnant and non-pregnant cows – a **sensitive** and **specific** test. An experienced operator should perform well in all situations.

Example 1: Choosing a method for Mary

Mary operates a seasonal-calving herd. She wants to identify cows pregnant to AI so plans to test the herd between 5–7 weeks after the end of her 6-week AI period. Mary typically finds half the herd is pregnant to AI. She needs to:

- › age the pregnancies in order to identify the cows that are pregnant to AI
- › identify the service of conception (and sire of pregnancy), and
- › predict the calving date.

Choice: Manual testing

Mary uses early manual pregnancy test and to assist foetal aging, she prepares a list of cows for testing. The list includes each cow's mating history and their expected number of weeks pregnant at examination if pregnant to their last recorded service. Mary will use this list and work with her pregnancy tester to identify the most likely date each pregnant cow conceived.

Example 2: Choosing a method for Fred

Fred operates a year-round calving herd. He uses early manual pregnancy testing by monthly veterinary visits to identify conception dates in pregnant cows and to mark non-pregnant cows for closer heat detection attention. Early pregnancy testing also helps Fred to monitor performance of his mating program each month.

Fred also likes to retest all previously confirmed pregnant cows as they approach their dry-off date to make sure they are still pregnant.

Choice: Laboratory testing

Fred chooses to use a laboratory test for this follow-up test in cows that he would like to dry off now and when the next routine veterinary visit is more than two weeks away. Fred gets reliable and accurate results allowing him to dry-off the positive test cows with confidence. He likes the advantages of the laboratory test in that he can collect the samples himself from the few cows that need testing each week. Fred finds this more convenient and cheaper than having extra veterinary visits to manually pregnancy test a few cows.

Some cows confirmed pregnant by pregnancy testing may fail to calve. This is most likely to be due to pregnancy loss (abortion) occurring after the pregnancy testing has been done. A normal loss rate after pregnancy testing 16–20 weeks after the Planned Start of Mating date is around 2%. When the loss rate is higher than 2 per 100 cows, a specific reason for abortion should be investigated to prevent a recurrence.

Pregnancy testing strategies

You need to select an appropriate method of pregnancy testing for each purpose and you also need to develop a pregnancy testing strategy for the herd. This is because there is simply no one time for pregnancy testing will suit all cows in your herd.

There a number of different of pregnancy testing strategies used. The strategy that provides for the most effective management and gives the best data for analysing reproductive performance requires early pregnancy testing of every cow.

Year-round calving herds

Regular pregnancy testing with foetal ageing

This is the most accurate way to predict the upcoming calving pattern and milk production, and plan dry-off activities for the next 6-months. Regular pregnancy testing is the only appropriate strategy to use if bulls are run with the herd. This requires you to test eligible cows each month but this can be more frequent in larger herds.

Cows for testing include:

- › all cows mated more than 35 days previously and not confirmed pregnant
- › when bulls are running with the herd, any cow calved more than 100 days and not confirmed pregnant, and
- › cows previously diagnosed as pregnant but that you suspect may have aborted since then.

Occasional pregnancy testing with foetal ageing

Testing eligible cows every 2–4 months will accurately identify cows that are pregnant and can provide workable estimates of conception dates for most cows:

- › provided AI is being used in the herd, and
- › mating information is available at pregnancy testing.

Note: Approximately $\frac{1}{4}$ of all pregnant cows may have inaccurate estimates of their conception and calving dates using this method.

Pregnancy testing of selected cows

Only cows suspected to be empty or to have aborted are pregnancy tested. Other cows are assumed to have conceived at their last recorded AI or bull mating. This strategy is not recommended due to inherent inaccuracy in identifying pregnancy status and conception dates from heat records.

Seasonal/split calving herds

Day 28 pregnancy tests

Cows can be accurately pregnancy tested from 28 days after insemination. This provides the earliest confirmation of non-pregnant cows that did not return to heat. These cows can be retreated and rebred again at first opportunity. This strategy is often used after a synchrony program where a large number of cows can be processed. Cows identified pregnant at this test are still within the high-risk period for embryonic loss and should be retested at a later date to confirm they have held their pregnancy.

Early pregnancy testing with foetal aging

This is the most accurate way to determine which cows are pregnant and when they conceived. It involves more than one visit and testing cows during mating with follow-up testing of non-pregnant and suspect cows after the end of mating. Time the early test to allow all pregnancies to AI to be accurately identified and aged. Follow-up pregnancy testing after the end of mating confirms non-pregnant cows and finds cows pregnant to a herd bull mating.

Benefits: Early pregnancy testing with foetal aging

This approach eliminates the need to watch for heats after the end of the AI period and means:

- › test all cows not confirmed pregnant 12–13 weeks after the start of mating
- › test at 12 weeks if the AI period was less than 6 weeks
- › if a synchrony program has been used at the start of mating, a pregnancy test from 28 days' gestation can be performed to find the empty cows to resubmit them to AI
- › re-test cows not confirmed pregnant, 8–9 weeks after the first test. Include any cows diagnosed as pregnant but suspected of aborting.
- › if the second test is less than 6 weeks after the end of mating, retest any cow not yet confirmed pregnant. Include any cows diagnosed as pregnant but suspected of aborting.

Pregnancy testing with foetal ageing after the mating period

All cows in a mating program are pregnancy tested once, 6 weeks after the end of the mating period. This strategy:

- › identifies non-pregnant cows accurately
- › can age pregnancies that are between 5 and 13 weeks with accuracy.

Failings of this strategy

For most cows, the conception dates cannot be accurately determined because most are pregnant to unrecorded herd bull matings. Foetal age and conception dates can only be estimated accurately in cows between 5–13 weeks pregnant. This strategy is not recommended because:

- › the majority of cows will not have accurate conception dates, and
- › the key measurement of performance – the 6-week in-calf rate – cannot be estimated with precision making it more difficult to monitor performance.

Not recommended: Pregnancy testing of selected cows

Cows suspected to be non-pregnant or having aborted are pregnancy tested 8 weeks after the end of mating. Other cows are assumed to have conceived at their last recorded AI or bull mating.

This strategy is not accurate at identifying pregnancies or in estimating conception and calving dates because it relies upon heat detection for these diagnoses. This strategy should be avoided.

Pregnancy testing strategies for heifers

Importance

Early rectal pregnancy testing enables you to identify reproductive problems early and better plan your heifers' transition management. It is not possible to provide the transition diet for the optimal 3 weeks prior to calving without early pregnancy testing with foetal aging.

Most heifers do not bag up until much closer to calving.

Strategy

Test all heifers at 12–13 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.

Benefits

Early rectal pregnancy testing also allows the reproductive performance of a group of heifers to be identified as soon as possible.

- ✓ 71% of heifers in-calf by 3 weeks, and 89% in-calf by 6 weeks after mating start date, when managed by top farmers.
- ✗ If less than 49% of heifers in-calf by 3 weeks after mating start date or less than 82% in-calf by 6 weeks, review:
 - calf and heifer management (see Section A: Calf and heifer management, page 31)
 - heat detection (see Section C: Heat Detection, page 71)
 - genetic selection and AI (see Section D: Genetics, sires, mating strategies and artificial insemination, page 95)
 - bull management (see Section E: Bull management, page 113).

See: dairyaustralia.com.au/incalf for more information and resources.

Section E Making culling decisions

She's a promising young cow and you know she is going to give plenty of milk but you've just called the truck to pick her up for tomorrow's sale because she didn't get in calf. It's a familiar story.

When deciding the fate of a non-pregnant cow, you have to weigh up her potential to produce milk and the negative effect she may have on future herd reproductive performance.

Good reproductive performance, with minimal non-pregnant cows, gives you the choice to make profitable culling decisions.

In this section

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Key points

- › Culling is an important component of maintaining herd reproductive performance.
- › Excessive culling is costly. You need to minimise the number of culls required through effective reproductive management.
- › You need a system for ranking and identify cows for culling.

Does culling empty cows get rid of bad fertility genes?

Factors affecting fertility

A cow's reproductive performance is determined both from genetic and non-genetic factors. Non-genetic factors include the way the cow is managed. Genetics only make 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 factors

Non-genetic factors may be temporary, such as a short period where the cow was inseminated using incorrect AI practice, or fairly permanent. For example, if a cow aborted and her reproductive tract became infected, the result may be permanent damage to one ovary. Examples of non-genetic factors that may contribute to a cow being empty at the end of mating include:

- › Some of her heats were not detected
- › The semen tank was not maintained properly and many of the AI straws were affected
- › There was insufficient bull power during the bull mating period and she was not served
- › She got pregnant but aborted following a period of heat stress after conception
- › She is pregnant! – but her result was incorrectly recorded at pregnancy testing.

Limitations of culling

Culling cows with poor reproductive performance may only 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. Not all non-pregnant cows have undesirable genes for fertility. Some non-pregnant cows may actually have genes for normal fertility, and others for poor fertility.

Culling cows with poor reproductive performance won't change the herd's genetics for fertility by much.

Remember, the female is only half the story. The sire contributes the other half of the genes. Selecting AI bulls with high daughter fertility ABV's will have a much stronger influence across the herd than culling a few cows with poor reproductive performance.

Good genetics give cows only an opportunity to perform better than their parents. How well they actually perform will depend on how you manage them!

Don't be too quick to blame genetics – they're probably not the biggest problem!

Informed culling decisions

How culling affects the herd's reproductive performance

Depending on your calving system, culling strategies may affect your herd's reproductive performance.

- › Seasonal herds – non-pregnant cows are usually culled in truly seasonal herds so it is unlikely that large numbers of consistently less fertile cows will be retained. Less fertile cows are unlikely to have a negative effect on reproductive performance.
- › Split herds – non-pregnant cows are often carried over from one mating period to the next. If so, this is a way that large numbers of consistently less fertile cows can be retained in the herd. This may have a small negative effect on herd reproductive performance.
- › Year-round herds – some cows continue to be inseminated for a long time after calving. If they become pregnant, these less fertile cows continue to be kept in the herd. If this continues over several years, increasing numbers of less fertile cows may be retained. This may have a small effect on herd reproductive performance.

You need to weigh up how much future profit you might forego if you cull her now as well as how much profit her replacement could potentially generate.

By improving herd reproductive performance, you can cull on the basis of profit, not pregnancy. You reach this point when you have more replacement heifers than you have empty cows. This should be the overarching goal of your fertility management plan – a slight surplus of replacement heifers each year.

By deciding based on profit, you maintain control over your farm's calving system which is the best way of maximising performance and satisfaction with your farm business.

Importance of records for culling decisions

If you keep good records you can quickly determine the impact of keeping less fertile cows in your herd. Any decision to cull a cow must also take into account her:

- › milk production ability
- › current milk yield
- › other economically important traits, and
- › age.

Seasonal/split calving herds

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 a little. How much these cows reduce herd reproductive performance depends on the percentage in your herd that have been carried over. Determine the percentage of cows in your herd carried over after any previous mating.

- ✓ If less than 10% in seasonal calving herds, carryover cows are unlikely to be having much effect on overall herd reproductive performance.
- ✓ If less than 20% in split calving herds, carryover cows are unlikely to be having much effect on overall herd reproductive performance.

Warning: It can be easy to slip into a habit of rolling non-pregnant cows over to the next mating period, quickly resulting in retention of too many low fertility cows in the herd. You need to understand the cost of generating and rearing extra heifers against the cost of culling (young) non-pregnant cows to identify the right number of carryover cows in split herds.

“There are 30 cows in my spring calving herd of 300 that I carried over this season. That's 10%. No wonder my autumn herd has grown to be 30% of the size of my spring herd over the past few years. I might see if I can reduce carryovers next mating.”

Year-round calving herds

If a large number of cows currently in the herd have had a long interval between their previous calvings, then they may be contributing to a reduction in herd reproductive performance. Determine the percentage of cows currently in your herd that went more than 16 months between any previous calvings.

- ✓ If less than 15% of cows, less fertile cows are unlikely to be having a large effect on herd reproductive performance.

There are 38 cows in my herd of 200 that had longer than 16 months between their last two calvings – maybe more like 20 months for some of them. That's 19%. Perhaps all those low fertility cows might be holding us back a bit.

Choosing individual cows to cull

Basis of selection

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 performance of any replacement that you may have available now or in the near future. There are also costs of keeping them until their next calving.

Year-round calving herds

Identifying cows for culling

Prepare your list by:

- › Identifying cows that have not become pregnant by 200 days after calving.
- › Checking the records of these cows for the following:
 - current production level
 - age
 - cell count, and
 - previous long interval between calvings.

When not to cull

Do you have enough heifers to replace culled cows and what does this cost? Continue to inseminate the cow if:

- › she is not a high priority to cull – she is still milking well, is not excessively old, has a low cell count and has not had unduly long intervals between calvings previously
- › you have insufficient heifer replacements, or
- › it is expensive to replace cows with heifers.

Note: Cows inseminated after day 200 of lactation can still be culled later even if they become pregnant.

Seasonal/split calving herds

Preparing a cull list

Culling decisions are easier when you have sufficient replacements to hand. Aim to have enough replacements each year to allow you to make some voluntary culls.

- › Record identities of all cows that are not pregnant.
- › Have any cows you suspect may have aborted pregnancy tested again.
- › Consider culling non-pregnant cows, taking in to account the following factors:
 - Current milk yield, Production Index, cell count and mastitis history of non pregnant cows
 - Health and reproductive history from last calving for each non-pregnant cow. Consider obvious reasons for non-pregnancy such as thin, lame, etc., as these may be resolved in later lactations.
 - In a seasonal herd, has the cow been non-pregnant after any previous mating period?
 - In a split herd, is the cow still not pregnant after two consecutive mating periods?
 - Can generate a profit from retaining non-pregnant cows for future breeding?
 - How much will it cost you to keep her until her next calving?
- › Consider culling cows due to calve late. Base these decisions on Production Index (PI) rather than actual production level.
 - If you have enough pregnant cows to cull on production, think about the due-to-calve date and age of low-producing cows.
 - It may be more profitable to retain average-producing cows that are due to calve early and, cull higher producers that are due to calve very late, especially if they are older cows.
 - Late calvers must be above average PI to compensate for the reduced income from later calving.

Note: You may be able to sell cows due to calve late to other herds with later calving periods.

Comparing early and late calvers

If you are to keep a late calver she must be an above-average milk producer in order to compensate for her potentially shorter lactation as a result of her calving towards the end of the calving periods. Use the production index (PI) and the expected calving week to select cows for culling or retention.

Example using the Production Index (PI)

For example, you have two rising 3-year old cows in a herd and:

- › one has a Production Index (PI) of 100 and is due to calve early, in week 1
- › the other is due to calve very late, in week 12.

Using this table, the late-calving cow would require a PI of 116 to be as profitable as the early calved cow.

Production Index (PI) required to compensate at next calving for later calving compared with an early-calved cow with a PI of 100		
Week due to calve	Rising 3-year old assume 5 more lactations	Rising 6-year old assume 2 more lactations
1	100	100
3	102	104
6	105	113
9	112	131
12	116	140

‘Boy, 1258 annoys me.

‘She’s coming up to 6 years old and has always been a good, quiet milker. I’ve just had her preg. tested by the vet and she’s not due to calve until 3 months after we start! I’m going to cull a few, but is she one of them?

‘Her PI is 115. I could calve her down late but I know that she wouldn’t end up giving as much milk.

‘If I calved her down late, she’d have to be even better, PI of 140, to make the same money.

‘As her PI is 115, it looks like I should cull her and keep one of those average producers that is going to calve in the first few weeks instead.’

06

Appendix

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A1 Lookup table for cows in year-round herds

Year-round calving herds

Establishing when 80, 100 and 200 days have elapsed after calving

Use this table to calculate 80-day submission rate, 100-day in-calf rate and 200-day not-in-calf rate in year-round calving herds.

Days after calving				Days after calving			
Calving date	80 days	100 days	200 days	Calving date	80 days	100 days	200 days
1 Jan	22 Mar	11 Apr	20 Jul	2 Jul	20 Sep	10 Oct	18 Jan
8 Jan	29 Mar	18 Apr	27 Jul	9 Jul	27 Sep	17 Oct	25 Jan
15 Jan	5 Apr	25 Apr	3 Aug	16 Jul	4 Oct	24 Oct	1 Feb
22 Jan	12 Apr	2 May	10 Aug	23 Jul	11 Oct	31 Oct	8 Feb
29 Jan	19 Apr	9 May	17 Aug	30 Jul	18 Oct	7 Nov	15 Feb
5 Feb	26 Apr	16 May	24 Aug	6 Aug	25 Oct	14 Nov	22 Feb
12 Feb	3 May	23 May	31 Aug	13 Aug	1 Nov	21 Nov	1 Mar
19 Feb	10 May	30 May	7 Sep	20 Aug	8 Nov	28 Nov	8 Mar
26 Feb	17 May	6 Jun	14 Sep	27 Aug	15 Nov	5 Dec	15 Mar
5 Mar	24 May	13 Jun	21 Sep	3 Sep	22 Nov	12 Dec	22 Mar
12 Mar	31 May	20 Jun	28 Sep	10 Sep	29 Nov	19 Dec	29 Mar
19 Mar	7 Jun	27 Jun	5 Oct	17 Sep	6 Dec	26 Dec	5 Apr
26 Mar	14 Jun	4 Jul	12 Oct	24 Sep	13 Dec	2 Jan	12 Apr
2 Apr	21 Jun	11 Jul	19 Oct	1 Oct	20 Dec	9 Jan	19 Apr
9 Apr	28 Jun	18 Jul	26 Oct	8 Oct	27 Dec	16 Jan	26 Apr
16 Apr	5 Jul	25 Jul	2 Nov	15 Oct	3 Jan	23 Jan	3 May
23 Apr	12 Jul	1 Aug	9 Nov	22 Oct	10 Jan	30 Jan	10 May
30 Apr	19 Jul	8 Aug	16 Nov	29 Oct	17 Jan	6 Feb	17 May
7 May	26 Jul	15 Aug	23 Nov	5 Nov	24 Jan	13 Feb	24 May
14 May	2 Aug	22 Aug	30 Nov	12 Nov	31 Jan	20 Feb	31 May
21 May	9 Aug	29 Aug	7 Dec	19 Nov	7 Feb	27 Feb	7 Jun
28 May	16 Aug	5 Sep	14 Dec	26 Nov	14 Feb	6 Mar	14 Jun
4 Jun	23 Aug	12 Sep	21 Dec	3 Dec	21 Feb	13 Mar	21 Jun
11 Jun	30 Aug	19 Sep	28 Dec	10 Dec	28 Feb	20 Mar	28 Jun
18 Jun	6 Sep	26 Sep	4 Jan	17 Dec	7 Mar	27 Mar	5 Jul
25 Jun	13 Sep	3 Oct	11 Jan	24 Dec	14 Mar	3 Apr	12 Jul

A2 Seasonal and split herds

Establishing when your herd has been calved 3, 6 and 9 weeks

Use this table to plan and measure herd reproductive performance in seasonal/split calving herds. Once you have decided on the planned start of calving date, you can look up the Mating Start Date (MSD). It is also useful when measuring the herd's calving pattern for the number of cows calved within 3, 6 and 9 weeks of planned calving start.

MSD last year	Planned start of calving this year	3 wks 6 wks	9 wks	MSD last year	Planned start of calving this year	3 wks	6 wks	9 wks
1 Jan	10 Oct	30 Oct 20 Nov	11 Dec	2 Jul	10 Apr	30 Apr	21 May	11 Jun
8 Jan	17 Oct	6 Nov 27 Nov	18 Dec	9 Jul	17 Apr	7 May	28 May	18 Jun
15 Jan	24 Oct	13 Nov 4 Dec	25 Dec	16 Jul	24 Apr	14 May	4 Jun	25 Jun
22 Jan	31 Oct	20 Nov 11 Dec	1 Jan	23 Jul	1 May	21 May	11 Jun	2 Jul
29 Jan	7 Nov	27 Nov 18 Dec	8 Jan	30 Jul	8 May	28 May	18 Jun	9 Jul
5 Feb	14 Nov	4 Dec 25 Dec	15 Jan	6 Aug	15 May	4 Jun	25 Jun	16 Jul
12 Feb	21 Nov	11 Dec 1 Jan	22 Jan	13 Aug	22 May	11 Jun	2 Jul	23 Jul
19 Feb	28 Nov	18 Dec 8 Jan	29 Jan	20 Aug	29 May	18 Jun	9 Jul	30 Jul
26 Feb	5 Dec	25 Dec 15 Jan	5 Feb	27 Aug	5 Jun	25 Jun	16 Jul	6 Aug
5 Mar	12 Dec	1 Jan 22 Jan	12 Feb	3 Sep	12 Jun	2 Jul	23 Jul	13 Aug
12 Mar	19 Dec	8 Jan 29 Jan	19 Feb	10 Sep	19 Jun	9 Jul	30 Jul	20 Aug
19 Mar	26 Dec	15 Jan 5 Feb	26 Feb	17 Sep	26 Jun	16 Jul	6 Aug	27 Aug
26 Mar	2 Jan	22 Jan 12 Feb	5 Mar	24 Sep	3 Jul	23 Jul	13 Aug	3 Sep

MSD last year	Planned start of calving this year	3 wks 6 wks	9 wks	MSD last year	Planned start of calving this year	3 wks	6 wks	9 wks
2 Apr	9 Jan	29 Jan 19 Feb	12 Mar	1 Oct	10 Jul	30 Jul	20 Aug	10 Sep
9 Apr	16 Jan	5 Feb 26 Feb	19 Mar	8 Oct	17 Jul	6 Aug	27 Aug	17 Sep
16 Apr	23 Jan	12 Feb 5 Mar	26 Mar	15 Oct	24 Jul	13 Aug	3 Sep	24 Sep
23 Apr	30 Jan	19 Feb 12 Mar	2 Apr	22 Oct	31 Jul	20 Aug	10 Sep	1 Oct
30 Apr	6 Feb	26 Feb 19 Mar	9 Apr	29 Oct	7 Aug	27 Aug	17 Sep	8 Oct
7 May	13 Feb	5 Mar 26 Mar	16 Apr	5 Nov	14 Aug	3 Sep	24 Sep	15 Oct
14 May	20 Feb	12 Mar 2 Apr	23 Apr	12 Nov	21 Aug	10 Sep	1 Oct	22 Oct
21 May	27 Feb	19 Mar 9 Apr	30 Apr	19 Nov	28 Aug	17 Sep	8 Oct	29 Oct
28 May	6 Mar	26 Mar 16 Apr	7 May	26 Nov	4 Sep	24 Sep	15 Oct	5 Nov
4 Jun	13 Mar	2 Apr 23 Apr	14 May	3 Dec	11 Sep	1 Oct	22 Oct	12 Nov
11 Jun	20 Mar	9 Apr 30 Apr	21 May	10 Dec	18 Sep	8 Oct	29 Oct	19 Nov
18 Jun	27 Mar	16 Apr 7 May	28 May	17 Dec	25 Sep	15 Oct	5 Nov	26 Nov
25 Jun	3 Apr	23 Apr 14 May	4 Jun	24 Dec	2 Oct	22 Oct	12 Nov	3 Dec

Use this look-up table to establish when your herd should be pregnancy tested

MSD	MSD +12 weeks	MSD +18 weeks
1 Jan	26 Mar	21 May
8 Jan	2 Apr	28 May
15 Jan	9 Apr	4 Jun
22 Jan	16 Apr	11 Jun
29 Jan	23 Apr	18 Jun
5 Feb	30 Apr	25 Jun
12 Feb	7 May	2 Jul
19 Feb	14 May	9 Jul
26 Feb	21 May	16 Jul
5 Mar	28 May	23 Jul
12 Mar	4 Jun	30 Jul
19 Mar	11 Jun	6 Aug
26 Mar	18 Jun	13 Aug
2 Apr	25 Jun	20 Aug
9 Apr	2 Jul	27 Aug
16 Apr	9 Jul	3 Sep
23 Apr	16 Jul	10 Sep
30 Apr	23 Jul	17 Sep
7 May	30 Jul	24 Sep
14 May	6 Aug	1 Oct
21 May	13 Aug	8 Oct
28 May	20 Aug	15 Oct
4 Jun	27 Aug	22 Oct
11 Jun	3 Sep	29 Oct
18 Jun	10 Sep	5 Nov
25 Jun	17 Sep	12 Nov

MSD	MSD +12 weeks	MSD +18 weeks
2 Jul	24 Sep	19 Nov
9 Jul	1 Oct	26 Nov
16 Jul	8 Oct	3 Dec
23 Jul	15 Oct	10 Dec
30 Jul	22 Oct	17 Dec
6 Aug	29 Oct	24 Dec
13 Aug	5 Nov	31 Dec
20 Aug	12 Nov	7 Jan
27 Aug	19 Nov	14 Jan
3 Sep	26 Nov	21 Jan
10 Sep	3 Dec	28 Jan
17 Sep	10 Dec	4 Feb
24 Sep	17 Dec	11 Feb
1 Oct	24 Dec	18 Feb
8 Oct	31 Dec	25 Feb
15 Oct	7 Jan	3 Mar
22 Oct	14 Jan	10 Mar
29 Oct	21 Jan	17 Mar
5 Nov	28 Jan	24 Mar
12 Nov	4 Feb	31 Mar
19 Nov	11 Feb	7 Apr
26 Nov	18 Feb	14 Apr
3 Dec	25 Feb	21 Apr
10 Dec	3 Mar	28 Apr
17 Dec	10 Mar	5 May
7 Jan	24 Dec	17 Mar

Seasonal/split calving herds

Establishing dry-off dates for cows in seasonal/split calving herds.

Use this table to prepare a dry-off list. It is also useful to determine when cows should be enrolled in the springer group to ensure that they receive the optimal 3 weeks on the pre-calving transition diet.

Conception date	Expected calving date	Latest dry-off date	Latest date to enrol cow in springer group
01 Jan	10 Oct	11 Aug	19 Sep
02 Jan	11 Oct	12 Aug	20 Sep
03 Jan	12 Oct	13 Aug	21 Sep
04 Jan	13 Oct	14 Aug	22 Sep
05 Jan	14 Oct	15 Aug	23 Sep
06 Jan	15 Oct	16 Aug	24 Sep
07 Jan	16 Oct	17 Aug	25 Sep
08 Jan	17 Oct	18 Aug	26 Sep
09 Jan	18 Oct	19 Aug	27 Sep
10 Jan	19 Oct	20 Aug	28 Sep
11 Jan	20 Oct	21 Aug	29 Sep
12 Jan	21 Oct	22 Aug	30 Sep
13 Jan	22 Oct	23 Aug	01 Oct
14 Jan	23 Oct	24 Aug	02 Oct
15 Jan	24 Oct	25 Aug	03 Oct
16 Jan	25 Oct	26 Aug	04 Oct
17 Jan	26 Oct	27 Aug	05 Oct
18 Jan	27 Oct	28 Aug	06 Oct
19 Jan	28 Oct	29 Aug	07 Oct
20 Jan	29 Oct	30 Aug	08 Oct
21 Jan	30 Oct	31 Aug	09 Oct
22 Jan	31 Oct	01 Sep	10 Oct
23 Jan	01 Nov	02 Sep	11 Oct
24 Jan	02 Nov	03 Sep	12 Oct
25 Jan	03 Nov	04 Sep	13 Oct

Conception date	Expected calving date	Latest dry-off date	Latest date to enrol cow in springer group
26 Jan	04 Nov	05 Sep	14 Oct
27 Jan	05 Nov	06 Sep	15 Oct
28 Jan	06 Nov	07 Sep	16 Oct
29 Jan	07 Nov	08 Sep	17 Oct
30 Jan	08 Nov	09 Sep	18 Oct
31 Jan	09 Nov	10 Sep	19 Oct
01 Feb	10 Nov	11 Sep	20 Oct
08 Feb	17 Nov	18 Sep	27 Oct
15 Feb	24 Nov	25 Sep	03 Nov
22 Feb	01 Dec	02 Oct	10 Nov
01 Mar	08 Dec	09 Oct	17 Nov
08 Mar	15 Dec	16 Oct	24 Nov
15 Mar	22 Dec	23 Oct	01 Dec
22 Mar	29 Dec	30 Oct	08 Dec
29 Mar	05 Jan	06 Nov	15 Dec
05 Apr	12 Jan	13 Nov	22 Dec
12 Apr	19 Jan	20 Nov	29 Dec
19 Apr	26 Jan	27 Nov	05 Jan
26 Apr	02 Feb	04 Dec	12 Jan
03 May	09 Feb	11 Dec	19 Jan
10 May	16 Feb	18 Dec	26 Jan
17 May	23 Feb	25 Dec	02 Feb
24 May	02 Mar	01 Jan	09 Feb
31 May	09 Mar	08 Jan	16 Feb
07 Jun	16 Mar	15 Jan	23 Feb
14 Jun	23 Mar	22 Jan	02 Mar
21 Jun	30 Mar	29 Jan	09 Mar
28 Jun	06 Apr	05 Feb	16 Mar

Use this look-up table to establish predicted calving date from conception date

Conception date	Expected calving date	Conception date	Expected calving date
1 Jan	10 Oct	9 Jul	17 Apr
8 Jan	17 Oct	16 Jul	24 Apr
15 Jan	24 Oct	23 Jul	1 May
22 Jan	31 Oct	30 Jul	8 May
29 Jan	7 Nov	6 Aug	15 May
5 Feb	14 Nov	13 Aug	22 May
12 Feb	21 Nov	20 Aug	29 May
19 Feb	28 Nov	27 Aug	5 Jun
26 Feb	5 Dec	3 Sep	12 Jun
5 Mar	12 Dec	10 Sep	19 Jun
12 Mar	19 Dec	17 Sep	26 Jun
19 Mar	26 Dec	24 Sep	3 Jul
26 Mar	2 Jan	1 Oct	10 Jul
2 Apr	9 Jan	8 Oct	17 Jul
9 Apr	16 Jan	15 Oct	24 Jul
16 Apr	23 Jan	22 Oct	31 Jul
23 Apr	30 Jan	29 Oct	7 Aug
30 Apr	6 Feb	5 Nov	14 Aug
7 May	13 Feb	12 Nov	21 Aug
14 May	20 Feb	19 Nov	28 Aug
21 May	27 Feb	26 Nov	4 Sep
28 May	6 Mar	3 Dec	11 Sep
4 Jun	13 Mar	10 Dec	18 Sep
11 Jun	20 Mar	17 Dec	25 Sep
18 Jun	27 Mar	24 Dec	2 Oct
25 Jun	3 Apr	31 Dec	9 Oct
2 Jul	10 Apr		

A3 Options for heat synchronisation and treatment of non-cycling cows

Several heat synchronisation options are available. If you choose to use these programs you need to understand the options, benefits, impacts and implementation considerations before making your choice. Work with your vet to decide if synchronisation/non-cycling cow treatments can work for you and to choose the most suitable program for your herd.

What is heat synchronisation?

Heat synchronisation:

- › involves treatment of cows with reproductive drugs in order to predictably time when the next heat and/or ovulation will occur
- › presents an alternative to heat detection as treated cows now ovulate together and within a predictable time window.

Some programs can control the time of ovulation with sufficient accuracy to support timed insemination without heat detection. Some programs can induce non-cycling cows to ovulate and continue cycling.

Types of programs

Synchrony programs vary but all have a set combination of products used in a carefully defined way. Programs are typically from one of the following types:

- › Prostaglandins (PG). PG works in cycling cows to control a phase of the ovarian cycle. Most programs require two injections timed to synchronise the majority of cows
- › Intravaginal devices. Contain progesterone which also control a phase of the cycle and can stimulate cycling to resume in anoestrus cows
- › GPG ('Ovsynch'). Use GnRH with PG to control the ovarian cycle and synchronise ovulation.

Follow instructions carefully

It is vital to follow program instructions exactly or the program may not work as expected. Some programs:

- › synchronise oestrus so that cows show heat together over a short period of time
- › synchronise ovulation only, so an egg is released and there may be no behavioural signs of heat
- › induce non-cyclers to start cycling, while others are only effective in cows that are already cycling
- › may be more suitable for use with sexed-sorted semen than others
- › work better in heifers than in lactating cows and vice versa.

Summary of benefits

This is a field of ongoing research and improvement so you should always consult with your veterinarian before choosing or starting a synchrony program. Programs that:

- › synchronise ovulation tightly allow fixed-time insemination to be used – avoiding the need to detect heats
- › compress the number of days that cows display visible heats still require heat detection because ovulation time is too variable to allow fixed time AI.

Benefits of synchrony

The benefits of synchrony can include:

Benefit	Explanation
Treatment of 'non-cycling' (post-partum anoestrus) cows	<p>In the short term, some synchrony programs can 'treat' anoestrus and help to get cows cycling again. Making the least fertile cows in the herd more fertile is useful.</p> <p>A period of non-cycling after calving is normal. An extended period of non-cycling or late calving in seasonal and split herds can be a cause of delayed conception and reduced reproductive performance. Long term solutions typically involve:</p> <ul style="list-style-type: none"> > modification of the calving pattern in seasonal and split herds > improving nutrition, and > better cow health.
Improving oestrus detection	<p>Detecting all cows in heat is a challenge. For example, a 500 cow herd using twice daily heat detection for 25 days to find cows for their first cycle will require 25,000 individual decisions. Reducing the number of days needed to examine cows for heats can improve performance and reduce misses.</p> <p>Cows will mount one another more often when there are more cows in or approaching heat. Synchrony promotes this behaviour making cows on heat easier to detect.</p> <p>Increasing heat detection efficiency gives significant benefit if you also achieve an adequate conception rate to the synchronised service. Estimates are that for every extra 10% of heats that are missed the six-week in-calf rate will decrease by 5%.</p>
Ease of management	<p>Farms with good AI facilities that can safely handle 600 cows to be inseminated in a day can benefit. Avoid having more synchronised inseminations than you can handle.</p> <p>An economy of scale is to be achieved when a significant percentage of the herd, 25–35%, become pregnant in one day – often the first day. For a rotary dairy with a good setup, planning, and plenty of help, the entire herd can be artificially inseminated with only a 20–50% increase in milking time.</p> <p>Natural variation in the duration of pregnancy spreads the calving load across more than one day. Generally, the biggest calving day will be no more than 30% of the cows that conceived on the day of FTAI. For 500 synchronised cows with a conception rate of 40% to fixed time AI, the maximum number to calve on one day would be 60 cows or less.</p>
Increasing fertility and number of heifer calves	<p>Calves born earlier tend to have less disease as there is less contamination of calving and calf rearing areas.</p> <p>They are older and reach their target weight more easily for joining and calving and so are heavier and more fertile at joining and more productive at calving.</p>
Synchronising the heifers	<p>Synchronising maiden heifers can produce more AI heifer calves, reduce the need for bulls, ease mating management of heifers, especially when heifers are run on outpaddocks. However, ensure you use:</p> <ul style="list-style-type: none"> > it on well-grown heifers at target weights. Smaller heifers are at significant risk of calving problems with AI semen as these calves may be larger than those produced by carefully selected herd bulls. > sire selection, only use bulls with calving ease ABVs. Sex-sorted semen can reduce calving problem risk as heifer calves are typically smaller than bull calves. > enough bulls to follow fixed time AI. Because ovulation is synchronised returns are also partly synchronised and extra bull power will be necessary. Especially important if only a single round of AI is used – double the number of bulls may be required to adequately cover return heats.

The realities of synchrony programs

Forethought and planning are key to a successful synchrony program. The farm team that needs to be involved in planning synchrony programs includes farm staff, your vet and your AI centre. Some common issues are:

Benefit	Explanation
The extra costs	The drugs, labour, semen and AI involve extra cost to be balanced against the potential benefits. Work with your veterinarian to understand the costs and the benefits in your herd as part of your decision process.
The extra labour	Batch treatment of cows requires much more labour on certain days. Plan to ensure that enough labour is available to: <ul style="list-style-type: none"> › administer the synchrony program › AI the cows on the correct day › manage the calving period at the other end, and › do the other necessary tasks around the farm on the busy days.
The non-responders	Not all cows respond. Non-cycling cows are particularly difficult to make cycle, ovulate, conceive and hold their pregnancy. Whilst good numbers will become pregnant there is a risk that: <ul style="list-style-type: none"> › non-cycling cows not responding to the program cannot easily be differentiated from cows that conceived to the first service – both do not come back into heat › non-pregnant and still non-cycling cows after synchrony treatment can be as high as 30% of cows. <p>Recommended: Early pregnancy diagnosis and re-treatment of non-responders.</p>
The accidents and risks	An element of risk is added if something goes wrong when large groups of cows are synchronised. Inadvertent errors in the administration of the program or external problems such as power failures can lead to significantly more difficult busy days and large financial loss.
The inefficiencies	There are many synchrony programs. Choosing the ‘wrong’ program can result in financial losses. The issue is for farmers and advisers is knowing which is the ‘right’ program for this year – there may be more than one and they may be different to last year’s right choice. This is an evolving field and program refinements and recommendations are continually updated. It is important that advisers are up to date with research and that farmers work with their trusted advisers well in advance of the mating period to ensure good decision making and planning.

Planning considerations

Considerations when planning a synchrony program include:

Consideration	Explanation
Type of synchrony	Synchrony programs can cause cows to cycle over several days, a small number of days, or they can allow for fixed-time AI with no heat detection. Generally, the cost goes up as the number of days of AI comes down. Some programs can treat non-cycling cows. Work with your vet to choose a program to suit you.
Treatments	Administering the treatments. Does this change staffing requirements? Can you: > easily identify the cows to be treated, particularly if they are with pregnant cows? > safely administer the treatments at the correct times? Note: Some of the drugs used can be dangerous, particularly to women of childbearing age.
Inseminating the cows	Can you inseminate the cows during milking or do you have the facilities to draft them correctly? With fixed-time AI the conception rates may be lower so: > consult with your AI centre to choose appropriate semen > ensure that you can book enough AI technicians on the right days > ensure you have enough labour to: - assist the technicians, and - record inseminations correctly.
Returns to heat	Make sure you book technicians in advance for the days when returns are expected. If returns to heat will occur when bulls are running, you need to double the number of bulls during the peak period of 18–24 days.
Calving next year	If 100 cows conceive on one day, the highest number of calvings on one day is generally about 20, with a spread of 9 days either side.
Calf infrastructure	Make sure you are equipped to handle not only the large number of calvings in a short period, but the increased number of heifer and bobby calves that you must manage over a shorter time span.

Making it part of an overall program

Synchrony should be applied as part of an overall herd health and management program. Deciding if synchrony has a place and which program is best, requires you and your adviser to understand the:

- > farm aims
- > cows earmarked for synchrony – are they cycling?
- > farm circumstances such as facilities, finances and feed as well as an excellent and realistic understanding of the various programs in use.

Further information

Dairy Australia fact sheet 'Guide to Synchrony Programs for Dairy Herds'.

See: dairyaustralia.com.au/incalf for more information.

A4 Estimating herd reproductive performance

Reliable Estimation Method: *InCalf Fertility Focus* report.

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.



Simplified methods

This appendix provides simple methods for estimating the reproductive performance of your herd. Because it uses simplified methods (which are slightly less accurate) the results calculated using these approaches may differ from those obtained on an *InCalf Fertility Focus* report.

Year-round calving herds

Estimating herd reproductive performance

Create a data table with the following headings to help you work out your herd's reproductive performance. An example is shown on the following page.

1. Cow number.
2. Calving date.
3. 80 days after calving: for each cow calculate the date 80 days after calving. Use the look-up chart on page 179 to help.
4. 100 days after calving: for each cow calculate the date 100-days after calving. Use the look-up chart on page 179 to help.
5. 200 days after calving: for each cow calculate the date 200-days after calving. Use the look-up chart on page 179 to help.
6. Date of first insemination or natural mating.
7. Conception date: once these cows have been pregnancy tested, record the conception date for each cow.
8. Tick if mated within 80 days.
9. Tick if pregnant in 100 days.
10. Tick if not pregnant by 200 days.

Year-round calving herds

No.	Cow ID	Calving date	80 days after calving	100 days after calving	200 days after calving	Date of first mating	Conception date (from preg. test)	Tick if mated within 80 days	Tick if by pregnant 100 days	Tick if not pregnant by 200 days
1	2770	3 Jan	24 Mar	13 Apr	22 Jul	5 Mar	5 Mar	✓	✓	
2	3040	4 Jan	25 Mar	14 Apr	23 Jul	1 Mar		✓		✓
3	2042	4 Jan	25 Mar	14 Apr	23 Jul	15 Mar	15 Mar	✓	✓	
4	2640	4 Jan	25 Mar	14 Apr	23 Jul	1 Apr	1 Apr		✓	
5	2764	5 Jan	26 Mar	15 Apr	24 Jul	9 Mar	30 Mar	✓	✓	
6	3016	5 Jan	26 Mar	15 Apr	24 Jul	7 Mar	28 Mar	✓	✓	
7	2066	5 Jan	26 Mar	15 Apr	24 Jul	5 Apr	5 Apr		✓	
8	2043	5 Jan	26 Mar	15 Apr	24 Jul	3 Mar	3 Mar	✓	✓	
9	3057	5 Jan	26 Mar	15 Apr	24 Jul	6 Mar	6 Mar	✓	✓	
10	1506	7 Jan	28 Mar	17 Apr	26 Jul	9 Mar	30 Mar	✓	✓	
11	2707	7 Jan	28 Mar	17 Apr	26 Jul	6 Mar	27 Mar	✓	✓	
12	2724	7 Jan	28 Mar	17 Apr	26 Jul	1 Mar	1 Mar	✓	✓	
13	2779	8 Jan	29 Mar	18 Apr	27 Jul	1 Mar	14 Apr	✓	✓	
14	1832	9 Jan	30 Mar	19 Apr	28 Jul	11 Mar	2 Apr	✓	✓	
15	2116	11 Jan	1 Apr	21 Apr	30 Jul	11 Mar		✓		✓
16	2806	11 Jan	1 Apr	21 Apr	30 Jul	10 Mar	3 Apr	✓	✓	
17	2753	11 Jan	1 Apr	21 Apr	30 Jul					✓
18	2771	11 Jan	1 Apr	21 Apr	30 Jul	9 Mar	21 Apr	✓	✓	
19	2008	11 Jan	1 Apr	21 Apr	30 Jul	11 Mar		✓		✓
20	2616	11 Jan	1 Apr	21 Apr	30 Jul	11 Mar	5 May	✓		
21	2723	12 Jan	2 Apr	22 Apr	31 Jul	10 Mar	10 Mar	✓	✓	
22	2765	12 Jan	2 Apr	22 Apr	31 Jul	17 Mar	17 Mar	✓	✓	
23	2006	12 Jan	2 Apr	22 Apr	31 Jul	23 Mar		✓		✓
24	2705	14 Jan	4 Apr	24 Apr	2 Aug	23 Mar	10 May	✓		
25	1312	15 Jan	5 Apr	25 Apr	3 Aug	10 Mar	3 Apr	✓	✓	
26	2019	15 Jan	5 Apr	25 Apr	3 Aug	5 Mar	5 Mar	✓	✓	
27	2760	16 Jan	6 Apr	26 Apr	4 Aug	23 Mar		✓		✓
28	1101	16 Jan	6 Apr	26 Apr	4 Aug	10 Mar	10 Mar	✓	✓	
29	2017	16 Jan	6 Apr	26 Apr	4 Aug	13 Apr				✓
30	2808	16 Jan	6 Apr	26 Apr	4 Aug	3 Apr	7 Aug	✓		✓

Year-round calving herds

No.	Cow ID	Calving date	80 days after calving	100 days after calving	200 days after calving	Date of first mating	Conception date (from preg. test)	Tick if mated within 80 days	Tick if by pregnant 100 days	Tick if not pregnant by 200 days
31	2031	16 Jan	6 Apr	26 Apr	4 Aug	13 Apr				✓
32	3041	16 Jan	6 Apr	26 Apr	4 Aug	10 Apr	10 Apr		✓	
33	2928	17 Jan	7 Apr	27 Apr	5 Aug	9 Mar	31 Mar	✓	✓	
34	2821	20 Jan	10 Apr	30 Apr	8 Aug	3 Apr	4 May	✓		
35	2901	20 Jan	10 Apr	30 Apr	8 Aug	31 Mar	31 Mar	✓	✓	
36	2801	20 Jan	10 Apr	30 Apr	8 Aug	13 Apr				✓
37	2035	20 Jan	10 Apr	30 Apr	8 Aug	3 Apr	12 Aug	✓		✓
38	2835	21 Jan	11 Apr	1 May	9 Aug	7 Apr	7 Apr	✓	✓	
39	2506	21 Jan	11 Apr	1 May	9 Aug	6 Apr	6 Apr	✓	✓	
40	2781	21 Jan	11 Apr	1 May	9 Aug	27 Apr				✓
41	2933	21 Jan	11 Apr	1 May	9 Aug	3 Mar	25 Mar	✓	✓	
42	2902	21 Jan	11 Apr	1 May	9 Aug	30 Mar	30 Mar	✓	✓	
43	2939	21 Jan	11 Apr	1 May	9 Aug	2 Mar	15 Apr	✓	✓	
44	2927	21 Jan	11 Apr	1 May	9 Aug	18 Apr	18 Apr		✓	
45	1566	21 Jan	11 Apr	1 May	9 Aug	7 Apr		✓		✓
46	3109	21 Jan	11 Apr	1 May	9 Aug	14 Apr	5 May			
47	3120	21 Jan	11 Apr	1 May	9 Aug	4 Apr	14 May	✓		
48	3107	21 Jan	11 Apr	1 May	9 Aug	21 Apr				✓
49	1467	21 Jan	11 Apr	1 May	9 Aug	14 Apr				✓
50	3065	22 Jan	12 Apr	2 May	10 Aug	2 Apr	2 Apr	✓	✓	
51	1489	22 Jan	12 Apr	2 May	10 Aug	14 Apr				✓
52	1678	22 Jan	12 Apr	2 May	10 Aug	30 Mar	20 Apr	✓	✓	

100-day in-calf rate

This is the best measure of overall herd reproductive performance in year-round calving herds. The actual 100-day-in-calf rate can only be calculated reliably if regular pregnancy testing is performed.

100-day in-calf rate =

$$\frac{\text{no. of cows pregnant by 100 days after calving} \times 100}{\text{total no. of cows selected}}$$

How to calculate

1. Select a group of at least 50 cows that calved at least 140 days before the last pregnancy testing visit in your herd.
 - › Determine the date 140 days before your last pregnancy testing visit.
 - › Work back from this date in your data table, and select at least 50 cows that calved prior to this date.
 - › Exclude cows you did not intend to be mated.
 - › How many cows are in the group? This is the total number of cows selected.
2. Count how many of these cows were tested as pregnant by 100 days after calving (a tick in column 9). This is the number of cows pregnant by 100 days after calving.

Example

So, I start looking up cows that calved more than 140 days before our last preg. test visit. Well 140 days is actually 20 weeks – that works out to be 30 January.

2753 isn't much of a cow and I decided not to join her this year.

51 cows on the list.

31 of them were pregnant by 100 days after calving.

$$\frac{31 \times 100}{51} = 61\%$$

This is the number of cows that were in-calf by 100 days after calving.

200-day not-in-calf rate

This rate tells you the percent of non-pregnant cows at 200 days after calving. This measure is not available until many months after calving.

The 200-day in-calf rate can only be calculated if regular pregnancy testing is performed.

How to calculate

1. Select a group of at least 50 cows that calved at least 240 days before the last pregnancy visit in your herd.
 - › Determine the date 240 days before your last pregnancy testing visit.
 - › Work back from this date in your data table, and select at least 50 cows that calved prior to this date.
 - › Exclude cows you did not intend to be mated.
 - › How many cows are in the group? This is the total number of cows selected.
2. Count how many of these cows were not pregnant by 200 days after calving (a tick in column 10). This is the number of cows pregnant by 200 days after calving.

200-day not-in-calf rate =

$$\frac{\text{no. of cows not pregnant by 200 days after calving} \times 100}{\text{total no. of cows selected}}$$

80-day submission rate

This measure gives the percentage of cows inseminated or served by 80 days after calving.

The 80-day submission rate must be high if the 100-day in-calf rate is to be good.

80-day submission rate =

$$\frac{\text{no. of cows mated by 80 days after calving} \times 100}{\text{total no. of cows selected}}$$

How to calculate

1. Select a group of at least 50 cows that calved at least 80 days ago.
 - › Determine the date 80 days before today.
 - › Work back from this date in your data table, and select at least 50 cows that calved prior to this date.
 - › Exclude cows you did not intend to be mated.
 - › How many cows are in the group? This is the total number of cows selected.
2. Count how many cows had at least one insemination or mating by 80 days after calving (tick in column 8). This is the number of cows mated by 80 days after calving.

Example

Cows calved more than 80 days – that would put us back to 30 March. I'm certainly getting practice with these lists! I start by counting the cows that calved before 30 March.

51 cows on the list altogether and 39 were inseminated by 80 days after calving. So that's ...

$$\frac{39 \times 100}{51} = 76\%$$

This is the number of cows that were mated by 80 days after calving.

How am I doing? Check page 24

Conception rate

It will be difficult to achieve a good 100-day in-calf rate unless conception rate is good.

Conception rates can only be calculated reliably if regular pregnancy testing is performed.

Turn to page 18 to see how to calculate the conception rate for your herd.

Seasonal/split calving herds

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 have calved in the most recent calving period. This is the total number of cows.
 - › Include all cows calved before and during the mating period.
 - › Exclude all cows that you did not intend to be mated.
 - › For split calving herds, include all cows that calved in the most recent calving period and cows that calved in previous calving periods that were pregnancy tested before Mating Start Date and found to be non-pregnant.
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.
 - › If the mating period is less than 6 weeks, use the total no. of cows becoming pregnant in the mating period. Seek professional advice to interpret the 6-week in-calf rate for shorter mating periods.

6-week in-calf rate =

$$\frac{\text{no. cows pregnant in the first 6 weeks of mating} \times 100}{\text{total no. of cows}}$$

Example

At the end of calving, the final count was 248 cows calved. We've just finished pregnancy testing and 180 were pregnant in the first 6 weeks. So:

$$\frac{180 \times 100}{248} = 73\%$$

How am I doing? Check page 27

Not-in-calf rate

Tells you the percentage of non-pregnant cows at the end of mating.

How to calculate

1. Select all cows that have calved in the most recent calving period. This is the total number of cows.
 - › Include all cows calved before and during the mating period.
 - › Exclude all cows that you did not intend to be mated.
 - › For split calving herds, include all cows that calved in the most recent calving period and cows that calved in previous calving periods that were pregnancy tested before Mating Start Date and found to be non-pregnant.
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.

Not-in-calf rate =

$$\frac{\text{no. cows not pregnant} \times 100}{\text{total no. of cows}}$$

Example

We finished preg. testing today and we ended up with 25 empties from 248 cows. So:

$$\frac{25 \times 100}{248} = 10\%$$

Check page 26 for seasonal and split calving herds or page 24 for year-round calving herds.

Not-in-calf rate after 2 mating periods

Tells you the percentage of non-pregnant cows at the end of two mating periods.

How to calculate

1. Select all cows that have calved in the calving period before last (the one before the most recent calving period). This is the total number of cows. Exclude cows that you did not intend to be mated in both mating periods.
2. From the results of pregnancy testing results, count how many of these did not become pregnant during the next two mating periods. This is the number cows not pregnant.

Not-in-calf rate after 2 mating periods =

$$\frac{\text{no. cows not pregnant} \times 100}{\text{total no. of cows}}$$

Example

Back in the autumn, we calved 150 cows. At the end of the June mating program, we had 50 of these pregnancy tested as non pregnant. Of these 50, 34 got pregnant during the November mating period. That leaves 16 out of the original 150 that did not get in calf during two mating periods. So:

$$\frac{16 \times 100}{150} = 11\%$$

Check page 26 for seasonal and split calving herds or page 24 for year-round calving herds.

10-day submission rate

A poor 10-day submission rate provides an early warning that 3-week submission rate may be poor.

How to calculate

1. Select all cows that have calved in the most recent calving period. This is the total number of cows.
 - › Include all cows calved before and during the mating period.
 - › Exclude 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 10 days of mating? This is the number of cows inseminated in first 10 days of mating.
 - › Cows are only counted once. Don't just count how many inseminations were performed in the first 10 days as some cows may have had two inseminations in that period.

10-day submission rate =

$$\frac{\text{no. cows inseminated in first 10 days of mating} \times 100}{\text{total no. of cows}}$$

Example

We calved 248 cows this season. In the first 10 days, I've inseminated 42 cows.

Even though I've mated 2376 three times already, I've only counted her once! So:

$$\frac{42 \times 100}{248} = 17\%$$

How am I doing? Check page 27

Example

We calved 248 cows this season. In the first 3 weeks, I've inseminated 195 cows.

I had no hope of getting those late calvers mated. I'll have to do better next year! So:

$$\frac{195 \times 100}{248} = 79\%$$

How am I doing? Check page 27

How to calculate

1. Select all cows that have calved in the most recent calving period. This is the total number of cows.
 - › Include all cows calved before and during the mating period.
 - › Exclude 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 and some cows may not have calved during the previous calving 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.

How to calculate your herd's conception rate

1. List inseminations and matings to natural 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 =

Example

My latest preg. test was 23 January. So, I will select all inseminations up to 12 December. This gives me 75 inseminations on the list; 39 inseminations resulted in a pregnancy:

$$\frac{39 \times 100}{75} = 52\%$$

This is the number of inseminations that were successful.

How well am I doing? Check page 27

“Conception rate – this doesn’t look quite as easy as I thought it was. I have to get the preg. testing done before I can work this one out. So I start with my insemination record book.”

Insemination date	Cow ID	Sire	Conception date (from preg. testing)	Tick if insemination date matches conception date
23 Oct	1143	Gorgeous	23 Oct	✓
23 Oct	1166	Gorgeous	Empty	
23 Oct	1870	Gorgeous	23 Oct	✓
23 Oct	2157	Gorgeous	23 Oct	✓
23 Oct	4606	Gorgeous	11 Nov	
23 Oct	1142	Gorgeous	Empty	
23 Oct	1740	Gorgeous	23 Oct	✓
23 Oct	1864	Gorgeous	23 Oct	✓
23 Oct	2116	Gorgeous	23 Oct	✓
23 Oct	2140	Gorgeous	10 Nov	
24 Oct	1108	Dazzle	24 Oct	✓
24 Oct	1807	Dazzle	13 Nov	
24 Oct	1865	Dazzle	30 Nov	
24 Oct	1716	Dazzle	24 Oct	✓
24 Oct	1823	Dazzle	Empty	
24 Oct	1824	Dazzle	29 Nov	
24 Oct	1853	Dazzle	24 Oct	✓
24 Oct	1871	Dazzle	24 Oct	✓
24 Oct	1879	Dazzle	15 Nov	
24 Oct	1906	Dazzle	Empty	
24 Oct	1932	Dazzle	24 Oct	✓
24 Oct	4216	Dazzle	Empty	
25 Oct	1106	Shady	25 Oct	✓
25 Oct	1119	Shady	30 Nov	
25 Oct	1201	Shady	12 Dec	
25 Oct	1805	Shady	13 Nov	
25 Oct	1860	Shady	25 Oct	✓
25 Oct	1117	Shady	25 Oct	✓
25 Oct	1312	Shady	25 Oct	✓
14 Nov	1108	Jersey bull	25 Dec	
14 Nov	1716	Glen	Empty	
14 Nov	1853	Glen	14 Nov	✓
14 Nov	1871	Glen	14 Nov	✓
14 Nov	1880	Glen	Empty	
14 Nov	1908	Glen	14 Nov	✓
14 Nov	1932	Glen	14 Nov	✓
14 Nov	2141	Glen	24 Nov	
14 Nov	4218	Glen	14 Nov	✓
14 Nov	1131	Jersey bull	12 Dec	

Insemination date	Cow ID	Sire	Conception date (from preg. testing)	Tick if insemination date matches conception date
14 Nov	1823	Glen	14 Nov	✓
14 Nov	1879	Glen	15 Dec	
14 Nov	1906	Glen	14 Nov	✓
14 Nov	1932	Glen	Empty	
14 Nov	4216	Glen	14 Nov	✓
15 Nov	1907	Fred	22 Dec	
15 Nov	2209	Fred	15 Nov	✓
15 Nov	3666	Fred	Empty	
16 Nov	2220	Jersey bull	16 Nov	✓
17 Nov	2207	Jersey bull	17 Nov	✓
19 Nov	2165	Jersey bull	Empty	
19 Nov	3567	Jersey bull	19 Nov	✓
19 Nov	3589	Jersey bull	19 Nov	✓
20 Nov	2778	Jersey bull	11 Dec	
21 Nov	1881	Jersey bull	21 Nov	✓
22 Nov	2027	Jersey bull	Empty	
22 Nov	2033	Jersey bull	Empty	
22 Nov	2402	Jersey bull	22 Nov	✓
22 Nov	3039	Jersey bull	22 Nov	✓
22 Nov	3666	Jersey bull	15 Dec	
22 Nov	2209	Jersey bull	22 Nov	✓
23 Nov	2220	Jersey bull	4 Jan	
30 Nov	2207	Jersey bull	30 Nov	✓
30 Nov	3567	Jersey bull	Empty	
7 Dec	1142	Jersey bull	7 Dec	✓
7 Dec	2140	Jersey bull	7 Dec	✓
7 Dec	2214	Jersey bull	Empty	
7 Dec	3567	Jersey bull	7 Dec	✓
7 Dec	2165	Jersey bull	Empty	
7 Dec	2778	Jersey bull	7 Dec	✓
7 Dec	3589	Jersey bull	Empty	
8 Dec	1740	Jersey bull	8 Dec	✓
9 Dec	1864	Jersey bull	9 Dec	✓
10 Dec	2116	Jersey bull	Empty	
11 Dec	2314	Jersey bull	Empty	
12 Dec	1540	Jersey bull	Empty	

A5 Monitoring reproductive performance in year-round calving herds

The challenge

Year-round calving herds can be challenging to manage because every cow is at a different stage of her reproductive cycle and mating of cows is always occurring. Year-round herds with poor reproductive performance tend to have:

- › Longer average days in milk (average > 180 – often 200 plus)
- › Insufficient replacements because not enough cows get in calf promptly. This in turn can result in a high bulk milk cell count due to a reduced ability to cull high cell count cows.
- › Over-conditioned dry cows because late-conceiving cows typically spend a lot more time dry. This can result in excessive weight loss after calving, which can reduce submission and conception rates.

Role of measurement

A regular cycle of measuring enables the most appropriate decision to be made for individual cows at each stage of their journey and detection of potential problems in herd reproductive performance as soon as practicable.

What to measure

Whilst the 100-day in-calf rate and the 200-day not-in-calf rates are the primary measures of reproductive performance for year-round herds they are not available until many months after mating. So, it is good practice to monitor the drivers of in-calf rates: – the 80-day submission rate and the conception rate to assess current mating performance.

Benefits of measurement

Potential problems can be identified by regularly comparing performance in reproductive measures between groups of animals such as heifers and mature cows, and over time such as summer-mated and winter-mated cows.

Monthly to three-monthly monitoring

Monthly to 3-monthly monitoring can identify problems early. Measure the 80-day submission rate for cows that calved 3–6 months ago, and the proportion of cows known to be empty in the last month that were detected on heat. Herd demographics, average days in milk, number of cows calving each month, number of dry cows, number of cows to calve next month etc., can also be monitored to determine if reproductive performance is providing the desired herd structure and production.

Example: Atherton Tablelands

John and Marilyn have a 260-cow pasture based dairy on the Atherton Tablelands. They have a herd health visit by their vet every month to pregnancy test cows and mated heifers and to examine non-cycling cows. The vet and farmer together analyse the visit data using the on-farm data management software to determine the reproductive performance of the group of cows just examined.

Assessment

To discuss how these results match targets, they look at the average days in milk for the milking herd as well as the number of cows that are calved:

- › less than 40 days that is inside the VWP
- › 40–150 days, these cows should be actively being mated or early pregnant, and
- › beyond 150 days, these cows should be pregnant.

Calculations

They calculate the:

- › number of cows and heifers that were pregnant at the visit. Their target is for at least 26 pregnancies, as they have calculated that this number will allow them to maintain a 12-month inter-calving interval. This gives them capacity to cull underperforming cows.
- › driver measures for the recently calved cows. They have sufficient cows and mating data to measure heat detection efficiency of the preceding 6 weeks in 3 week blocks. This really shows how on the ball they have been with their heat detection.

Pregnancy testing

Their vet pregnancy tests cows from 5 weeks after mating so they can calculate the conception rate for cows that were mated more than 35 days ago. They look at the conception rate for matings from 35–65 days ago and compare it to the conception rate for cows mated in the previous month as well as the same time 1 year ago.

They analyse data from 90 day periods because they need at least 40 cows to provide enough data for each estimate and they have a herd of 260 cows. For each block of 90 days they examine the:

- › 80-day SR, CR
- › 100-day ICR, and
- › 200-day NICR.

This regular up to date measuring allows them to track their current performances and correct any problems before their herds' days in milk gets too long.

A6 Definition of terms

3-week submission rate (seasonal and split calving herds)	The percentage of cows that received at least one insemination or mating in the first 3 weeks of the mating period. <i>This measure must be high in order to achieve a high 6-week in-calf rate.</i>
6-week in-calf rate (seasonal and split calving herds)	The percentage of cows within a given mating group that became pregnant in the first 6 weeks of mating. <i>This is the best measure of herd reproductive performance in the early mating period when cows have recently calved in seasonal/split herds.</i>
10-day submission rate (seasonal and split calving herds)	The percentage of cows within a given mating group that received at least one insemination or mating in the first 10 days of the mating period. <i>A poor 10-day submission rate provides an early warning that 3-week submission rate may be poor.</i>
80-day submission rate (year-round calving herds only)	The percentage of cows that received at least one insemination or mating by 80 days after calving. <i>This measure must be high in order to achieve a high 100-day in-calf rate.</i>
100-day in-calf rate (year-round calving herds only)	The percentage of cows pregnant by 100 days after calving. <i>This is the best measure of overall herd reproductive performance in cows that have recently calved in year-round herds.</i>
200-day not-in-calf rate (year-round calving herds only)	The percentage of cows that failed to become pregnant by 200 days after calving. <i>Taken alone, this is not a precise measure of overall herd reproductive performance in year-round herds (see 100-day in-calf rate).</i>
305-day lactation	The production of a cow up to drying off or day 305 of lactation, whichever is earliest. This is a standard way of presenting lactation yield for dairy cows.
ABV (Australian Breeding Value)	An estimated measure of the genetic merit of an animal. Traits assessed are production, daughter fertility, cell count, survival, liveweight, calving ease, conformation and workability. Available for Australian cows, Australian sires and overseas sires. ABVs are released twice yearly by DataGene which is the industry-owned organisation responsible for developing tools and resources to drive genetic gain and herd improvement in the Australian dairy industry.
Anionic salts	Acid salts, including magnesium sulphate, ammonium sulphate and ammonium chloride, used to alter the dietary cation-anion balance (DCAB) of the diet before calving to reduce the incidence of milk fever and other disorders around calving.
Automated heat detection system	A system of sensors and computer algorithms to detect cows in heat. A combination of pedometers, motion sensors, feeding and milk production data and cow history are used to identify cows in heat.
Balanced Production Index (BPI)	A weighted genetic selection index that balances the effect of production, fertility and type on profit.
Batch mating	The practice of 'batching' cows into discrete mating groups as an aid to co-ordinating mating tasks more efficiently. Heat synchronisation is often used in batch mating to ensure most cows are inseminated in a short time period (batches). Batch mating may be used in year-round or seasonal/split calving systems.
Biosecurity	A series of activities that protect a farm from the entry and spread of pests and diseases.
Body condition score	The visual assessment of the amount of muscle and fat covering the bones of the cow, using specific points on the cow's body.
Bovine viral diarrhoea virus (BVDV)	BVDV or pestivirus is a common and wide-spread cattle virus that can cause a wide variety of clinical signs in infected animals including immune suppression, foetal loss and birth defects. BVDV is highly infectious and easily spread.
Brix refractometer	Is a simple measurement instrument that measures the amount of light refracted in a liquid. A Brix refractometer can be used on farm to measure the amount of immunoglobulin (antibody) present in a colostrum sample.
Bull power	Is a measure of capacity of a bull team to service a mob of females. This is a function of the number of bulls per non-pregnant female and the absolute number of bulls running with the females.
Calving Ease ABV	A genetic breeding value estimate of the ease with which cows carrying the bull's progeny will calve. Bulls with higher Calving Ease ABVs tend to have fewer difficult calvings than sires with low values.
Carryover cows	Cows that are not pregnant at the end of one mating period and which are kept in the herd in order to be mated in a future mating period in seasonal/split herds.

Colostrum	The first milk of lactation, produced just prior to calving. Colostrum contains very high levels of (absorbable) antibodies and higher protein and fat concentration than normal milk. Colostrum provides essential passive transfer of immunity and nutrition for new born calves.
Conception rate	The percentage of inseminations that resulted in a pregnancy as determined by pregnancy testing. <i>Taken alone, this measure does not describe overall herd reproductive performance, but a satisfactory conception rate is required to achieve high 6-week in-calf rates and 100-day in-calf rates.</i>
Cow Body Condition Score	A systematic cow body condition scoring system on a 1–8 scale.
Crossbreeding	The mating of parents from different breeds. This is undertaken to capture favourable traits from both parent breeds and to increase hybrid vigour in offspring.
Daughter Fertility ABV	A genetic breeding value estimating the fertility of the daughters of sires. This is measured as the expected change to the 6-week in-calf rate from a herd of daughters of a sire compared to a herd of daughters from average sires.
Dystocia	A difficult calving.
Early calved, mature cows	Cows that are 4 or more years of age at calving and that calved 6 or more weeks before the start of mating.
Early rectal pregnancy testing	Rectal examination of cows by a skilled operator using a hand or ultrasound probe, to diagnose pregnancy status between 8 and 14 weeks after mating.
Empty cows	Cows determined by pregnancy test to be not pregnant following insemination or mating.
Estimated Genetic Value (ABV)	An Estimated Genetic Value (also know as Estimated Breeding Value) can be calculated for heifers, or bulls without daughters. It is the average of the ABV of both parents.
Extended lactation	The milking of a cow beyond 300 days of lactation. This is typically associated with an extension of the interval between calvings from 12 to beyond 18 months. The ability of a cow to maintain milk production (persistence) in late lactation determines suitability for extended lactation.
Failure of Passive Transfer (FPT)	The presence of inadequate concentration of antibody in the blood stream of the calf more than one day after birth. Calves with FPT have drunk insufficient high-quality colostrum during the first 24 hours of life.
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.
First calver milk production	The total volume of milk produced in a cow's very first 305-day lactation.
Genomics	The estimation of the genetic merit and likely performance of an individual from analysing an individual's genetic make up (i.e. which genes are present?).
Genomic breeding value	An estimate of the breeding value for a trait of an individual that was obtained solely using genomics.
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.
Good Bulls Guide /app	An industry computer application that estimates the breeding worth of listed sires. The Good Bulls app has breeding value information on over 20,000 sires and can calculate and rank the Australian selection index value for sires using any chosen index (e.g. BPI, HWI, TWI).
Hand mate	A mating procedure where the selected cow that is on heat is removed from the main group/herd and placed with a bull to allow service. The cow is then returned to the herd.
Heat cycle (oestrus cycle)	The normal pattern of when cows show signs of heat. The typical interval between heats is 21 days in cows and 20 days in heifers 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 aid	A device or marking system that is applied to cows that increase the visibility of heat activities. Aids include tail paint and heat-mount detectors.
Heat detection program	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 detection accuracy	The proportion of detected heats that occur in cows that are truly in heat. A low heat detection accuracy is associated with a low conception rate.
Heat detection rate	The proportion of true heats that are detected. A low heat detection rate is associated with a low submission rate and long (detected) return to heat intervals.
Heat mount detector	A heat detection aid that is applied to the back of the cow to detect mounting activity.
Heat stress	The inability of an animal to cool itself and maintain normal body temperature when exposed to 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.
Health Weighted Index (HWI)	A weighted genetic selection index that places increased emphasis on cow health traits such as fertility, mastitis resistance and longevity on profit.
Heifer	A female that has not yet calved.
Hybrid vigour	The improved performance of function of any trait following crossbreeding that produces a reduction in inbreeding.
In-calf rate	See 6-week or 100-day in-calf rate.
Interbull	The international organisation that converts breeding values for sires from different countries into a standard system. Member countries receive breeding value estimates for foreign bulls that have been converted to their own country's scale.
Lactation persistence	The drop in daily production per cow per month after the cow has passed peak production.
Lead feeding	Dry cow feeding in the 3 weeks just before calving with the aims of reducing cow diseases and disorders around calving and reducing the potential for condition loss following calving.
Liveweight targets	Specific weights (and heights) of live cattle, at clearly identified ages, used to monitor the success of a heifer or bull rearing program. The specific target weights will vary with breed, sex and overall farm management objectives.
Long lactation	A lactation of longer than 305 days because the cow's calving interval is longer than 12 months. The term 'extended lactation' is also common.
Mating Start Date for heifers	First day of mating the heifers in seasonal/split calving herds.
Mating Start Date (MSD)	The first day of mating in a particular mating period in a seasonal/ split calving herd.
Metritis	The inflammation of the wall of the uterus. Cows with unresolved metritis are at increased risk of failing to become pregnant in a timely manner after calving.
Milk oestrone sulphate	A compound in milk that can be used to indicate pregnancy. Milk samples are usually collected for analysis during routine herd test.
MJ ME/kg DM	Megajoules of metabolisable energy in each kilogram of dry matter of a feedstuff. One of the measures used to compare the nutritional value of feedstuffs.
Negative energy balance	Occurs when cows expend more metabolic energy on production and maintenance that they obtain from their diet. Cows in negative energy balance are using body tissue reserves and losing weight.
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-genetic characteristics	Characteristics of an animal determined by environmental or management factors. These characteristics cannot be passed on to its offspring.
Non-return rate	The percentage of inseminations where the cow did not return to heat within a specified period after the insemination. A poor non-return rate provides an early warning that the conception rate is likely to be poor.
Not-in-calf rate (at end of mating) (seasonal and split calving herds)	The percentage of cows within a given mating group that failed to become pregnant by the end of a mating period. This is dependent in part on the duration of the mating period. Taken alone, this is not a precise measure of overall herd reproductive performance in seasonal and split calving herds (see 6-week in-calf rate).

Not-in-calf rate after two mating periods (split calving herds)	The percentage of cows that failed to become pregnant after two consecutive mating periods. This is determined in part by the duration of the mating periods that failed to become pregnant by the end of a mating period. Taken alone, this is not a precise measure of overall herd reproductive performance in seasonal and split calving herds (see 6-week in-calf rate).
Pestivirus	See bovine viral diarrhoea virus (BVDV).
Planned Start of Calving (PSC)	The date of the planned start of calving in a particular calving period. (This is 282 days after this group's previous Mating Start Date.)
Preferential feeding	Offering a daily diet to a specific group of animals, which is different (generally higher) in quantity and/or quality from that offered to the main herd.
Production index (PI)	A calculated index given to each cow after each herd test. It ranks the cows within a herd based on their production on individual test days adjusted for stage of lactation and age. This enables the production of a 2-year-old heifer to be compared to a 6-year-old cow at a different stage of lactation.
Reliability (genetic)	A measure of the accuracy or confidence in an estimated breeding value for a trait. High reliability traits indicate that the estimated breeding value is a very close approximation of the true breeding value.
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.
Retained foetal membranes (RFM)	The failure of the cow to naturally pass the afterbirth by 24 hours after calving.
Semen Fertility ABV	The breeding value estimate of the ability of a sire's semen to get a cow pregnant. This is different to the Daughter Fertility ABV which estimates the average fertility of daughters sired by the bull.
Sexed semen	The process of separating an ejaculate into straws of semen that contain primarily 'female' or 'male' sperm.
Submission rate	See 3-week or 80-day submission rates.
Total Mixed Ration (TMR)	A ration made up of several different forages and supplements mixed and fed to cattle as a complete diet. The term Partial Mixed Ration (PMR) may be used to describe a ration fed in addition to or in replacement of some pasture.
Transition management	Management of the cow in the period extending from 3 weeks before calving until 2–3 weeks after calving.
Type Weighted Index (TWI)	A weighted genetic selection index that places increased emphasis on cow type traits such as udder conformation and cow frame and type on profit.
Veterinary Bull Breeding Soundness Evaluation (VBBSE)	An accredited veterinary examination procedure for assessing the fertility and servicing credentials of a bull. Few sub-fertile bulls will pass a VBBSE.
Vibriosis	A venereal disease in cattle that causes infertility and occasional abortion.
Voluntary Waiting Period (VWP) (year-round calving herds only)	A selected period of time after calving during which a farmer elects not to inseminate/mate a cow even though she may be observed on heat. <i>Shorter VWPs result in higher 100-day in-calf rates, and lower 200-day not-in-calf rates.</i>
Yearlings	Females that are 1 to 2 years old.



**Dairy
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Your Levy at Work

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