

InCalf Fertility Focus

User's Guide



DairyNZ 



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For more information visit

dairynz.co.nz/incalf

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Introduction

This Guide is for users of the InCalf Fertility Focus Report. It is to help you better understand how the results reported in the Fertility Focus Report are calculated and how they should be interpreted.

Since the Fertility Focus Report was first used in New Zealand herds, a number of 'tips and traps' have become evident. These are also detailed in this Guide.

The Guide has been structured so you can quickly find the information you need.

This Guide concentrates on the Fertility Focus Report for seasonal calving herds (herds in which a single group of calvings occurs within a 12-month period). Key differences for split-calving and year-round calving herds are also summarised.

Some key points:

- The Fertility Focus Report provides a standardised and rigorous assessment of herd reproductive performance
- The quality of the report that Fertility Focus generates depends on the accuracy and completeness of the records entered into the database
- Indicators of success in five of eight key management areas recognized as influencing herd reproductive performance are reported in the Fertility Focus Report
- The Fertility Focus Report is a central aid, but to fully support herd managers as they work to improve reproductive performance, you will need additional sources of information
- Equations, targets and triggers used in the Fertility Focus Report are based on analyses of large datasets from New Zealand herds.

This updated User's Guide is aligned with the 2017 second edition of the InCalf Book for New Zealand dairy farmers, and the recent version 3 upgrade to the Fertility Focus software and report. These updates were executed by Datagene (Dairy Australia) with technical support from John Morton, and validated with data from LIC MINDA used in NZ Dairy Statistics. Changes were made in consultation with the dairy industry national reproduction strategy group representing veterinarians, Fertility Focus Report providers, milk processors, researchers and developers in New Zealand.

Funding for the updates was provided by DairyNZ, with support of Dairy Australia. Provision of the original Fertility Focus Report and associated InCalf resources by Dairy Australia is gratefully acknowledged.

Current licensed providers of the Fertility Focus Report are LIC, CRV-Ambreed and InfoVet.

The example Fertility Focus Report used in this Guide is from a real New Zealand herd.

Fertility Focus and this Guide are designed to be used in conjunction with the InCalf Book for New Zealand Dairy Farmers and other InCalf tools and resources (www.dairynz.co.nz/incalf).

This Guide will become a key resource underpinning InCalf Training Courses.

We know you will find this Guide useful in the field when using the Fertility Focus Report to support improved reproductive performance.

Types of Fertility Focus Reports

Calving system

Fertility Focus produces different reports for each of the three calving systems:

- Seasonal calving
- Split calving
- Year-round calving.

The software automatically determines which calving system was used based on calving dates during the 12-month period being analysed. If it takes more than 25 weeks for 80% of the herd to calve, the herd is considered a year-round calving herd for that 12-month period. If there are two or three distinct calving blocks, the herd is considered a split calving herd, and a single block of calving represents a seasonal calving herd for that 12-month period. In 2017, more than 90% of herds in NZ were classified as seasonal calving.

Level of detail

Each Fertility Focus Report has one of three levels of detail:

- Detailed (the highest status report)
- Intermediate
- Basic.

The report type is shown on page 2 (reverse side) of the report.

Behind Your Detailed Fertility Focus Report		 Version 3.01 	
Report period: Cows calved between 24/05/17 and 29/11/17. This was the most recent period with sufficient herd records that enabled an analysis to be completed.	Report date:	23/10/18	
Calving system: Seasonal Your herd has been classified as seasonal calving because most calvings occurred in a single batch lasting less than 21 weeks.	PTPT:		
Level of analysis: Detailed Your good record keeping means a detailed analysis was possible for your herd.	Herd Code:		
	Calvings up to this date requested for analysis:	23/10/18	
	No of cows included:	498	
	These cows calved between:	24/05/17 and 29/11/17	
	Mating start & end date: <small>(based on AB or pregnancy test data)</small>	01/10/17 - 30/12/17	

The Fertility Focus Report assesses the data that are available and provides the highest status report possible for a 12-month period reported. For more details, see below under 'How to get a detailed Fertility Focus Report'.

Below are examples of the three report types that are generated for a seasonal calving herd.

Fertility Focus 2017: Seasonal

Example herd

Report date: 21/12/18
 PTPT:
 Herd Code:
 No of cows included: 498
 These cows calved between: 24/05/17 and 29/11/17
 Mating start & end date: 01/10/17 - 30/12/17
 (based on AB or pregnancy test data)
 Next planned start of calving: 10/07/18
 Duration of mating: 91 days
 Duration of AB period: 91 days



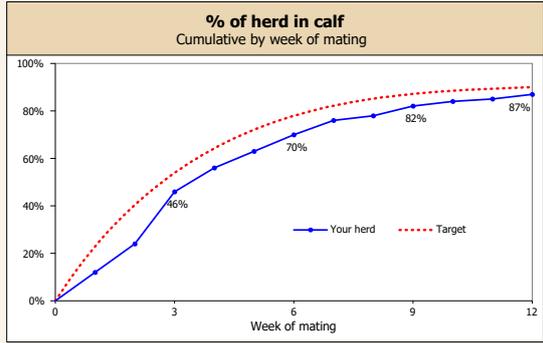
1 Overall herd reproductive performance

6-week in-calf rate
 Percentage of cows pregnant in the first 6 weeks of mating

Your herd: 70% (70-71%) ★★★
 Aim above: 78%

Not-in-calf rate
 Percentage of cows not pregnant after 91 days of mating

Your herd: 12% (11-12%) ★★★
 Aim for: 9%



2 Drivers of the 6-week in-calf rate

3-week submission rate
 % of cows that were inseminated in the first 3 weeks of mating

Your herd: 77% ★
 Aim above: 90%

Non-return rate
 % of inseminations that were not followed by a return to heat

Your herd:
 Aim above:

Conception rate
 % of inseminations that resulted in a confirmed pregnancy

Your herd: 59% ★★★★★
 Aim above: 60%

3 Key indicators to areas for improvement

Calving pattern of first calvers
 Well managed heifers get in calf quickly and calve early.

Calved by	Week 3	Week 6
Your herd	39%	89%
Aim above	80%	95%
	★	★

Calving pattern of whole herd
 Did late calvers reduce in-calf rates?

Calved by	Week 3	Week 6	Week 9
Your herd	47%	78%	95%
Aim above	67%	88%	98%
	★	★	★

Pre-mating heats
 A high % of well managed cows will cycle before the start of mating.

Your herd: 0% ★
 Aim above: 85%

3-week submission rate of first calvers
 Well managed heifers cycle early

Your herd: 82% ★★★
 Aim above: 90%

Heat detection
 A high % of early-calved mature cows should be inseminated in the first 3 weeks of mating.

Your herd: 87% ★
 Aim above: 95%

Non-cycling cows
 Treated non-cyclers get in calf earlier.

Treated	By MSD	Wks 1-3	Wks 4-6
Your herd	0%	0%	0%

Rating	What does it tell me?	What should I do?
★★★★★	Top result	Ideal - keep up the good work!
★★★☆☆	Above average	Getting there - focus on getting the details right.
★☆☆☆☆	Below average	Plenty of room to improve - seek professional advice.
☆☆☆☆☆	No result	Not enough information provided - seek help with records.

Performance after week 6
 Expected not-in-calf rate helps assess management affecting performance after week 6 (including bull management and herd nutrition).

Not-in-calf rate
 Your herd: 12% OK
 Expected: 14%

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Intermediate report

A) With not-in-calf rate

The intermediate report differs from the detailed report as follows:

A 6-week in-calf rate is estimated rather than being calculated based on pregnancy test results. These estimates are calculated using the % of the herd calved in the first 6 weeks, the 3-week submission rate and the non-return rate. If the non-return rate cannot be determined by Fertility Focus, then the estimate is based on just the % of the herd calved in the first 6 weeks and the 3-week submission rate.

Fertility Focus 2017: Seasonal

Report date: 21/12/18
 P1PT:
 Herd Code:
 No of cows included: 498
 These cows calved between: 24/05/17 and 29/11/17
 Mating start & end date: 01/10/17 - 30/12/17
 Next planned start of calving: 10/07/18
 Duration of mating: 91 days
 Duration of AB period: 91 days

1 Overall herd reproductive performance

6-week in-calf rate
 Percentage of cows pregnant in the first 6 weeks of mating
 Your herd: 66%
 Aim above: 78%

Not-in-calf rate
 Percentage of cows not pregnant
 Your herd: 14%
 Aim for: 9%

2 Drivers of the 6-week in-calf rate

3-week submission rate
 % of cows that were inseminated in the first 3 weeks of mating
 Your herd: 77%
 Aim above: 90%

Non-return rate
 % of inseminations that were not followed by a return to heat
 Your herd: 74%
 Aim above: 64%

Conception rate
 % of inseminations that resulted in a confirmed pregnancy
 Your herd:
 Aim above:

3 Key indicators to areas for improvement

Calving pattern of first calvers
 Well managed heifers get in calf quickly and calve early.
 Calved by Week 3 Week 6
 Your herd: 39% 89%
 Aim above: 80% 95%

Calving pattern of whole herd
 Did late calvers reduce in-calf rates?
 Calved by Week 3 Week 6 Week 9
 Your herd: 47% 78% 95%
 Aim above: 67% 88% 98%

Pre-mating heats
 A high % of well managed cows will cycle before the start of mating.
 Your herd: 0%
 Aim above: 85%

3-week submission rate of first calvers
 Well managed heifers cycle early
 Your herd: 82%
 Aim above: 90%

Heat detection
 A high % of early-calved mature cows should be inseminated in the first 3 weeks of mating.
 Your herd: 87%
 Aim above: 95%

Non-cycling cows
 Treated non-cyclers get in calf earlier.
 Treated By MSD Wks 1-3 Wks 4-6
 Your herd: 0% 0% 0%

Rating	What does it tell me?	What should I do?
★★★★★	Top result	Ideal - keep up the good work!
★★★★	Above average	Getting there - focus on getting the details right.
★★★	Below average	Plenty of room to improve - seek professional advice.
★	No result	Not enough information provided - seek help with records.

Performance after week 6
 Expected not-in-calf rate helps assess management affecting performance after week 6 (including bull management and herd nutrition).
 Your herd:
 Expected:

C Cumulative in-calf rates cannot be calculated, so the graph is not presented.

D Non-return rate, if determinable, is reported instead of conception rate.

B Not-in-calf rate is reported only if enough cows have either a non-aged or late aged positive pregnancy diagnosis or a 'doubtful/recheck' pregnancy diagnosis.

E Performance after week 6 cannot be calculated.

Intermediate report

B) Without not-in-calf rate

A 6-week in-calf rate is estimated rather than being calculated based on pregnancy test results. These estimates are calculated using the % of the herd calved in the first 6 weeks, the 3-week submission rate and the non-return rate. If the non-return rate cannot be determined by Fertility Focus, then the estimate is based on just the % of the herd calved in the first 6 weeks and the 3-week submission rate.

Fertility Focus 2017: Seasonal

Report date: 21/12/18
 PTPP:
 Herd Code:
 No of cows included: 498
 These cows calved between: 24/05/17 and 29/11/17
 Mating start & end date: 01/10/17 - 30/12/17
 Next planned start of calving: 10/07/18
 Duration of mating: 91 days
 Duration of AB period: 91 days

1 Overall herd reproductive performance

6-week in-calf rate
 Percentage of cows pregnant in the first 6 weeks of mating
 Your herd: 66%
 Aim above: 78%
Your herd's 6-week in-calf rate has been estimated. Supply results of early aged rectal pregnancy testing for greater accuracy.

Not-in-calf rate
 Percentage of cows not pregnant
 Your herd:
 Aim for:

% of herd in calf
 Cumulative by week of mating
 A graph of % herd in calf through the mating period could not be plotted. Supply the results of early aged rectal pregnancy testing.

2 Drivers of the 6-week in-calf rate

3-week submission rate
 % of cows that were inseminated in the first 3 weeks of mating
 Your herd: 77%
 Aim above: 90%

Non-return rate
 % of inseminations that were not followed by a return to heat
 Your herd: 74%
 Aim above: 64% OK

Conception rate
 % of inseminations that resulted in a confirmed pregnancy
 Your herd:
 Aim above:

3 Key indicators to areas for improvement

Calving pattern of first calvers
 Well managed heifers get in calf quickly and calve early.
 Calved by Week 3 Week 6
 Your herd: 39% 89%
 Aim above: 80% 95%

Calving pattern of whole herd
 Did late calvers reduce in-calf rates?
 Calved by Week 3 Week 6 Week 9
 Your herd: 47% 78% 95%
 Aim above: 67% 88% 98%

Pre-mating heats
 A high % of well managed cows will cycle before the start of mating.
 Your herd: 0%
 Aim above: 85%

3-week submission rate of first calvers
 Well managed heifers cycle early
 Your herd: 82%
 Aim above: 90%

Heat detection
 A high % of early calved mature cows should be inseminated in the first 3 weeks of mating.
 Your herd: 87%
 Aim above: 95%

Non-cycling cows
 Treated non-cyclers get in calf earlier.
 Treated By MSD Wks 1-3 Wks 4-6
 Your herd: 0% 0% 0%

Performance after week 6
 Expected not-in-calf rate helps assess management affecting performance after week 6 (including bull management and herd nutrition).
 Your herd:
 Expected:

Rating	What does it tell me?	What should I do?
★★★★★	Top result	Ideal - keep up the good work!
★★★★	Above average	Getting there - focus on getting the details right.
★★★	Below average	Plenty of room to improve - seek professional advice.
★	No result	Not enough information provided - seek help with records.

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C Cumulative in-calf rates cannot be calculated, so the graph is not presented.

D Non-return rate, if determinable, is reported instead of conception rate.

E Performance after week 6 cannot be calculated.

B Not-in-calf rate is reported only if enough cows have either a non-aged or late aged positive pregnancy diagnosis or a 'doubtful/recheck' pregnancy diagnosis.

Basic report

The basic report differs from the detailed report as follows:

A 6-week in-calf rate is estimated rather than being calculated based on pregnancy test results. Estimates are calculated using re-calving data.

Fertility Focus 2017: Seasonal

Example herd

Report date: 21/12/18
 PTPT:
 Herd Code:
 No of cows included: 498
 These cows calved between: 28/05/17 and 03/12/17
 Mating start & end date: 05/10/17 - 04/10/17
 Next planned start of calving: 14/07/18
 Duration of mating: 0 days
 Duration of AB period:
 inCalf
 Version 3.01
 DairyNZ

1 Overall herd reproductive performance

6-week in-calf rate
 Percentage of cows pregnant in the first 6 weeks of mating

Your herd 73%
 Aim above 78%
 ☆☆☆☆

Your herd's 6-week in-calf rate has been estimated. Supply results of early aged rectal pregnancy testing for greater accuracy.

Not-in-calf rate
 Percentage of cows not pregnant

Your herd
 Aim for
 ☆☆☆☆

% of herd in calf
 Cumulative by week of mating

A graph of % herd in calf through the mating period could not be plotted. Supply the results of early aged rectal pregnancy testing.

2 Drivers of the 6-week in-calf rate

3-week submission rate
 % of cows that were inseminated in the first 3 weeks of mating

Your herd
 Aim above
 ☆☆☆☆

Non-return rate
 % of inseminations that were not followed by a return to heat

Your herd
 Aim above
 ☆☆☆☆

Conception rate
 % of inseminations that resulted in a confirmed pregnancy

Your herd
 Aim above
 ☆☆☆☆

3 Key indicators to areas for improvement

Calving pattern of first calvers
 Well managed heifers get in calf quickly and calve early.

Calved by Week 3 Week 6
 Your herd 80% 90%
 Aim above 80% 95%
 ☆☆☆☆ ☆

Calving pattern of whole herd
 Did late calvers reduce in-calf rates?

Calved by Week 3 Week 6 Week 9
 Your herd 61% 82% 97%
 Aim above 67% 88% 98%
 ☆ ☆ ☆☆☆☆

Pre-mating heats
 A high % of well managed cows will cycle before the start of mating.

Your herd
 Aim above 85%
 ☆☆☆☆

3-week submission rate of first calvers
 Well managed heifers cycle early

Your herd
 Aim above
 ☆☆☆☆

Heat detection
 A high % of early-calved mature cows should be inseminated in the first 3 weeks of mating.

Your herd
 Aim above
 ☆☆☆☆

Non-cycling cows
 Treated non-cyclers get in calf earlier.

Treated By MSD Wks 1-3 Wks 4-6
 Your herd 0% 0% 0%
 ☆☆☆☆

Rating	What does it tell me?	What should I do?
☆☆☆☆	Top result	Ideal - keep up the good work!
☆☆☆	Above average	Getting there - focus on getting the details right.
☆☆	Below average	Plenty of room to improve - seek professional advice.
☆	No result	Not enough information provided - seek help with records.

Performance after week 6
 Expected not-in-calf rate helps assess management affecting performance after week 6 (including bull management and herd nutrition).

Your herd
 Expected
 ☆☆☆☆

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B Not-in-calf rate cannot be reported.

C Cumulative in-calf rate graph cannot be calculated, so the graph is not presented.

D No drivers of 6-week in-calf rate can be reported.

E Of the key indicators to areas for improvement, only the calving pattern indicators can be reported.

How to get a detailed Fertility Focus Report

Fertility Focus assesses the data and provides the highest status report possible for the 12-month period assessed.

Level of detail	Key criteria
Detailed	Adequate early pregnancy test data: <ul style="list-style-type: none">• At least 80% of cows that calved in the 12-month period have pregnancy test results, and• at least 80% of those cows have at least one early aged pregnancy diagnosis (i.e. pregnant for \leq 122 days, that is, just over 17 weeks) or non-positive pregnancy diagnosis (i.e. empty or doubtful/recheck).
Intermediate	Adequate AB data: <ul style="list-style-type: none">• Pregnancy test data are inadequate for a detailed report but at least 50% of cows have one or more AB inseminations recorded.
Basic	Adequate re-calving data: <ul style="list-style-type: none">• Pregnancy test and AB information are inadequate for a detailed or intermediate report, but at least 80% of cows that were not culled within 365 days of calving have re-calving information¹.

For an accurate detailed report:

- All cows should be pregnancy tested 11-14 weeks after the mating start date. Those not diagnosed pregnant at this test should be re-examined no more than 10 weeks later, and at least 5 weeks after the end of the mating period to ensure all pregnancies are detected. Where the mating period is longer than 18 weeks, the herd will probably require three pregnancy test visits
- All calving dates should be recorded accurately. If more than 50% of the fortnight's calvings happened on one day, these are classified as 'funny' calvings. If more than 25% of calvings in the selected 12-month period are 'funny', a report is not generated
- All cull and death dates should be accurately recorded.

Tips and traps

1. If the pregnancy tester is prepared to call a cow pregnant at any stage (including $<$ 35 days), Fertility Focus takes that as a correct diagnosis.
2. What is the purpose of the distinction between early aged and late aged? It is used only to determine whether the report is intermediate or detailed; late pregnancy tests are less accurate in identifying conception dates so if too many aged pregnancy tests are late, only an intermediate report is provided.

¹ For seasonal calving herds, a basic report is also generated if AB information is adequate for an intermediate report but the calculated values for the percentage of cows calved by week 6 and/or 3-week submission rate are implausibly low.

For most key indicators to areas for improvement, additional data are required:

Key indicator	Additional data required
Calving pattern of first calvers	Dates of birth for all first calvers
Calving pattern of whole herd	
Pre-mating heats	Pre-mating heats
3-week submission rate of first calvers	Dates of birth for all first calvers
Heat detection	Dates of birth for all cows
Non-cycling cows	Non-cycler treatments
Performance after week 6	Aged pregnancy test results including those towards the end of the mating period so that the end of mating date is approximately correct.



Terminology used by Fertility Focus to interpret the results from pregnancy diagnoses

Fertility Focus relies heavily on the results from pregnancy diagnoses; the level of detail provided from pregnancy tests will markedly influence the report that you receive.

Fertility Focus classifies pregnancy diagnoses as follows:

- **Aged pregnancies**

Cow was diagnosed pregnant and the stage of pregnancy was entered.

These diagnoses consist of:

- Early aged pregnancies (pregnant for \leq 122 days)
- Late aged pregnancies (pregnant for $>$ 122 days)

- **Non-aged positive pregnancies**

Cow was diagnosed pregnant but the stage of pregnancy was not entered.

- **Non-positive pregnancy diagnoses**

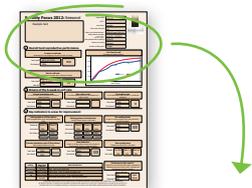
Cow was pregnancy tested and not diagnosed pregnant.

These diagnoses can be split into two groups:

- Empty: The cow was pregnancy tested at least 5 weeks after the end of the mating period and diagnosed non-pregnant.
- 'Doubtful/recheck': The cow is not detectably pregnant at pregnancy diagnosis but may, in fact, be pregnant because she has been inseminated or exposed to bulls within 5 weeks before the date of this pregnancy diagnosis.

The person recording the data distinguishes between empty and 'doubtful/recheck' pregnancy diagnoses; 5 weeks should be used only if the pregnancy tester can detect all pregnancies aged 5 weeks or more.

Quick checks before you use a Fertility Focus Report



In this section, we describe what to check to ensure the Fertility Focus Report results are correct using this example Report:

Fertility Focus 2017: Seasonal C

A Example herd B

1 Overall herd reproductive performance

6-week in-calf rate
Percentage of cows pregnant in the first 6 weeks of mating

Your herd 70% (70-71%) D ☆☆☆

Aim above 78%

Not-in-calf rate
Percentage of cows not pregnant after 91 weeks of mating

Your herd 12% (11-12%) ☆☆☆

Aim for 9%

Report date: 23/10/18

PTPT:

Herd Code:

No of cows included: 498 E

These cows calved between: 24/05/17 and 29/11/17

Mating start & end date: 01/10/17 - 30/12/17 F G

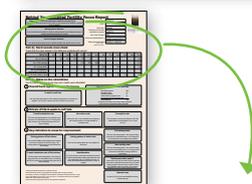
Next planned start of calving: 10/07/18

Duration of mating: 91 days

Duration of AB period: 91 days H

% of herd in calf
Cumulative by week of mating

Week of mating	Your herd (%)	Target (%)
0	0	0
3	46	55
6	70	75
9	82	80
12	87	82



Behind Your Detailed Fertility Focus Report

B **Report period: Cows calved between 24/05/17 and 29/11/17.**
This was the most recent period with sufficient herd records that enabled an analysis to be completed.

C **Calving system: Seasonal**
Your herd has been classified as seasonal calving because most calvings occurred in a single batch lasting less than 21 weeks.

D **Level of analysis: Detailed.**
Your good record keeping means a detailed analysis was possible for your herd.

Part A) Herd records cross check
Check that the herd records in the table are complete and correct.

2017/18	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
No. of calvings			261	164	73								498
No. of AB matings						515	80	36					631
No. of preg tests										475			475
No. of non-aged/late aged positive preg tests										37			37
No. of cows culled or died								2	3	27		5	37

I

Report date: 23/10/18

PTPT: A

Herd Code:

Calvings up to this date requested for analysis: 23/10/18

No of cows included: 498 E

These cows calved between: 24/05/17 and 29/11/17

Mating start & end date: 01/10/17 - 30/12/17 F G

A**Have you got the correct herd?****B**

Check the season being reported. If you were expecting a report for a more recent mating period, ensure that adequate data are included for that period. See 'What data are required for a Fertility Focus Report?' and 'How does Fertility Focus decide which mating period to analyse?'

C

Is a seasonal calving report appropriate? If the herd is actually split calving, check page 2 to see if all calving dates have been included.

D

If you were expecting a detailed report with an actual 6-week in-calf rate but a lower status report was printed, check page 2 to see:

- if all pregnancy test results have been included
- that most positive pregnancy tests were aged
- that all AB inseminations have been included.

E

Check the number of cows included. This is the number of cows that calved within a window of 130 days before to 59 days after mating start date less those culled before mating start date, and less those that conceived before mating start date (based on their pregnancy test results).

For calculations of 3-week submission rate, non-return rate and conception rate, cows that have a mating (AB insemination or natural service) recorded prior to mating start date are also excluded.

Check page 2 to check that all calvings have been included.

- One way to check this is to compare this number to the number of cows present at the first herd test after mating start date.

F

Check the mating start date. This is calculated based on the earliest AB insemination or natural service dates that are recorded in the database. In the absence of insemination data, mating start date is based on early pregnancy test results, or if these are not available, on recalving dates. For more details, see "How are the mating start and end dates calculated?"

- Confirm with the herd manager that this is the correct date. The herd's breeding company representative may be able to help solve any discrepancies.
- Ask whether the herd used natural services exclusively at the start of the mating period and if so, whether these natural services were entered into the dataset. If natural services were used exclusively at the start of the mating period and these were not entered, the mating start date used in calculations will be erroneously late. Ensure those services are entered.
- If the mating start date on the Fertility Focus Report is earlier than expected, investigate whether some cows were inseminated before the main period of mating commenced, for example:
 - cows dried off and inseminated earlier with heifers
 - cows synchronised
 - contract matings
 - some 'pet' cows came on heat and were inseminated early.
- If the mating start date on the Fertility Focus Report is later than expected, check:
 - that all AB inseminations have been included by looking on page 2
 - whether the mating period commenced with unrecorded natural matings.

- G** **Check the mating end date.** This is calculated based on AB insemination dates and pregnancy test results. For more details, see “How are the mating start and end dates calculated?”
- If bulls were run after the AB period, does this date approximately match the date that bulls were removed from the milking herd?
 - If not:
 - check page 2 to see if all aged positive pregnancy test results have been included
 - ensure that aged pregnancy testing is performed at the final pregnancy test to better identify the mating end date.

- H** **Check the duration of the AB period.** The end of the AB period is defined as the date of the last AB insemination that is not followed by another AB insemination within 7 days.

The duration of the AB period is the number of days from mating start date to the end of the AB period.

- If the duration of the AB period is not correct, check that the total number of inseminations entered on page 2 is consistent with other AB records.

- I** **Check that all culls and deaths have been entered.**

How to interpret a Fertility Focus Report

Overall herd reproductive performance

The overall herd reproductive performance in seasonal calving herds can be described using 6-week in-calf rate and not-in-calf rate. You should consider both when assessing the herd's overall reproductive performance.

Detailed report

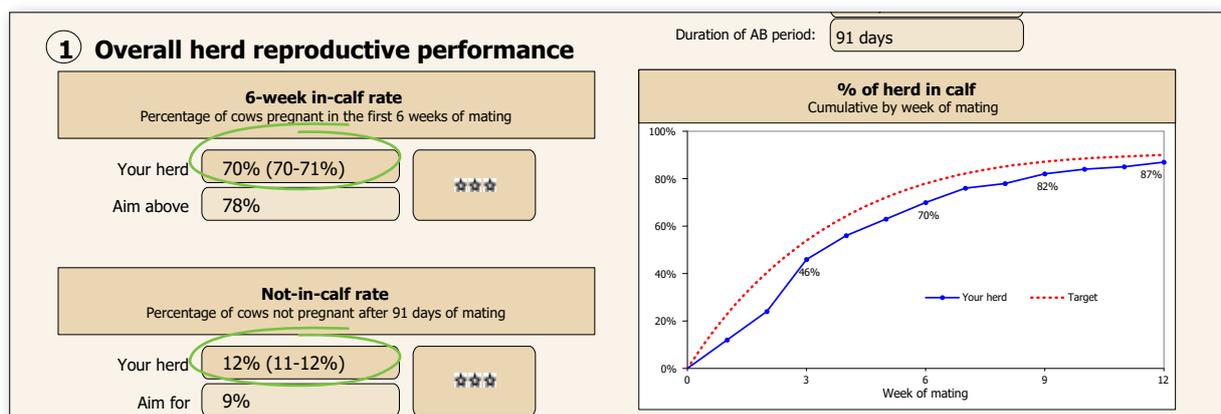
In a detailed report, the 6-week in-calf rate and the not-in-calf rate are calculated using conception dates based only on positive pregnancy diagnosis results. Conception dates are not allocated based on non-return to service or re-calving dates. For details about how conception dates are calculated, see "How conception dates are calculated".

The 6-week in-calf rate and not-in-calf rate are calculated using the Kaplan-Meier survival analysis procedure. See "The Kaplan-Meier method" to understand how this works.

Cows without positive pregnancy diagnosis results contribute to 6-week and not-in-calf rate calculations until the end of mating or, if they were culled or died during the mating period, until the day before that date. Empty and 'doubtful/recheck' pregnancy diagnoses do not alter the contribution of these cows.

The ranges in 6-week in-calf rate and not-in-calf rate

Detailed Fertility Focus Reports also show a range for 6-week in-calf rate and not-in-calf rates in parentheses. These are the best and worst case scenarios after culling is taken into account; they are determined by the extent and timing of culling.



In the example above, the best and worst case scenarios for not-in-calf rate are 11% and 12%, respectively, and for the 6-week in-calf rate are 71% and 70%, respectively. This means that the not-in-calf rate in this herd could have been as low as 11% and as high as 12%, depending on culling in the herd. Similarly, the 6-week in-calf rate could have been as high as 71% and as low as 70% depending on culling. These are relatively narrow ranges; this indicates that uncertainties due to culling were relatively minor in this herd.

How are the best and worst case scenarios determined?

Conception date is known for cows diagnosed pregnant with the stage of pregnancy entered. We also know that cows diagnosed empty 35 or more days after the end of mating did not become pregnant.

But there is uncertainty about cows culled without being diagnosed pregnant, and cows culled without being diagnosed empty after the end of the mating period.

Would they have become pregnant had they remained in the herd? Did they become pregnant before being culled?

The range in not-in-calf rates describes the best and worst case scenarios had these cows remained in the herd and been pregnancy tested.

The best case scenario (the lower limit) is the not-in-calf rate for the herd assuming these culled cows¹ became (or would have become) pregnant on their last AB insemination date. For these cows that were not inseminated, the best case scenario assumes they conceived on the day after the end of the herd's AB period².

The worst case scenario (the upper limit) is the not-in-calf rate for the herd assuming the culled cows were not pregnant when culled and would not have become pregnant had they remained in the herd.

The range for 6-week in-calf rate is determined similarly.

The best and worst case scenarios are calculated in the same way as the 6-week in-calf rate and not-in-calf rate, using the Kaplan-Meier survival analysis procedure.

For 6-week in-calf rate, if the best and worst case scenario values are both identical to the calculated 6-week in-calf rate, no range is reported. Similarly, no range is reported for not-in-calf rate if the best and worst case scenarios are both identical to the calculated not-in-calf rate. Best and worst case scenarios would be identical if no cows were culled without either being diagnosed pregnant or being diagnosed empty after the end of the mating period.

¹ That is, cows culled up to 282 days after the end of the mating period without being diagnosed pregnant, and without being diagnosed empty after the end of the mating period.

² Under all scenarios, cows not inseminated and culled during the AB period without being diagnosed pregnant are assumed to have not conceived.

6-week in-calf rate

Tips and traps

1. Check that the mating start date is correct. If this is incorrect, 6-week in-calf rate may be affected substantially.
2. If cows that conceived after the AB period were diagnosed as '6 weeks pregnant', '7 weeks pregnant', '8 weeks pregnant', etc (or '35 days', '40 days', '45 days' etc or using any other increment), and the herd's AB period was less than 6 weeks, the 6-week in-calf rate can be affected by the date of pregnancy diagnosis. For example, if the first pregnancy diagnoses were performed 13 weeks and 1 day after mating start date, pregnancies in cows diagnosed as '7 weeks pregnant' will just miss out on contributing to the herd's 6-week in-calf rate. The cumulative in-calf rate graph plots the in-calf rates at the end of each week (i.e. days 7, 14, 21 etc) and interpolates between these points. If there is a marked increase in in-calf rate from week 6 to week 7 combined with an AB period of less than 42 days, calculate the days from mating start date to first herd pregnancy test, and consider the pregnancy stage increments that were used.
3. The reported 6-week in-calf rate may be too low when the Fertility Focus Report is generated immediately after the first herd pregnancy test and the pregnancy tester has erred on the side of caution by calling cows conceived 35 or more days as doubtful or recheck.



1. Herd managers may calculate not-in-calf rate as the number of cows diagnosed empty at the final herd pregnancy test divided by the number of cows present in the herd on that date. This 'empty rate' calculation is often lower than the actual not-in-calf rate reported by Fertility Focus. Be able to explain differences in these results to herd managers.
 - a. Check the 'Records available for not-in-calf rate' on page 2 to understand more about the cows that were not diagnosed pregnant. Refer to the example on page 19. Look for doubtful and recheck cows that had no further pregnancy diagnoses, and for cows not pregnancy tested; these cows will affect the herd's not-in-calf rate¹. If some of these cows were, in fact, pregnant, the reported not-in-calf rate will be too high. Encourage managers to ensure all non-culled cows not diagnosed pregnant are pregnancy tested at the final herd pregnancy test. Ensure that the final pregnancy test is at least 5 weeks after the end of the mating period to ensure all pregnancies are detected.
 - b. Find out how many cows were culled during the mating period by checking 'No. of cows culled or died' on page 2. Culls during the mating period are often cows less likely to be pregnant. Disregarding these cows can cause bias, resulting in unduly low not-in-calf rates. Fertility Focus accounts for these using the Kaplan-Meier survival analysis procedure. This approach allows more valid comparisons where culling patterns differ. See "The Kaplan-Meier method" to understand how this works.
2. Check on page 2 that culls were recorded. The not-in-calf rate can be over estimated if cows culled before pregnancy diagnosis are not entered.
3. Check that the mating end date is correct. If mating duration is incorrect, the stars for not-in-calf rate and 'aim for' may be incorrect.

The mating end date is set as the latest date of:

 - the last recorded mating on or before the 147th day (21 weeks) of the mating period,
 - the last date with 2 conceptions followed by at least 30 days with no conceptions, provided that date is on or before the 147th day (21 weeks) of the mating period or
 - the last date with one conception that is on or before the 147th day (21 weeks) of the mating period that is followed by at least 30 days with no conceptions and has at least one conception on each of 2 or more other days in the 6 preceding days.

Only conception dates based on positive aged pregnancy diagnoses are used to determine mating end date (ie non-aged positive pregnancy diagnoses are not used).

If the mating end date is incorrect, you can force it to be correct by adding a mating on mating end date for a cow calved between 130 days before and 59 days after mating start date and not culled before the end of mating date.

4. If the final herd pregnancy test is 35 days after the end of mating date but fetal ages of less than 35 days are assigned erroneously, this can trigger an end of mating date that is erroneously late. This, in turn, will result in empties at this final pregnancy test being counted under 'Doubtful/recheck' rather than 'Recorded empty' on page 2. (These empties will still contribute to 6-week and not-in-calf rate calculations.)

¹ 'Culled without pregnancy test' counts cows culled up to 282 days after the end of the mating period without any pregnancy tests recorded.

6-week in-calf rate and not-in-calf rate

Tips and traps

1. Look out for wide ranges. If the range is wide, a substantial number of cows were culled during the mating period and you should interpret the reported 6-week in-calf rate/not-in-calf rate cautiously. Ask the herd manager what is known about the reproductive performance of the cows culled during the mating period. If these were generally cows less likely to be pregnant, 6-week in-calf rate and not-in-calf rate values nearer to the worst case scenario ends of the ranges are better indicators of the herd's reproductive performance.
2. If the reported 6-week in-calf rate and/or not-in-calf rate are near to the worst case scenario value, most culling was late in the mating period. If the reported 6-week in-calf rate and not-in-calf rate are near to the best case scenario value, most culling was early in the mating period.

Records available for not-in-calf rate calculation

1 Overall herd reproductive performance													
6-week in-calf rate	Records available for not-in-calf rate												
Your report has been based on the mating and pregnancy test results you supplied. The ACTUAL 6 week in-calf rate is shown for your herd.	<table border="1"><tbody><tr><td>Recorded pregnant</td><td>682</td></tr><tr><td>Recorded empty</td><td>51</td></tr><tr><td>Doubtful/recheck*</td><td>0</td></tr><tr><td>Culled without pregnancy test</td><td>20</td></tr><tr><td>No record of cull or pregnancy test</td><td>7</td></tr><tr><td>Cows analysed</td><td>760</td></tr></tbody></table>	Recorded pregnant	682	Recorded empty	51	Doubtful/recheck*	0	Culled without pregnancy test	20	No record of cull or pregnancy test	7	Cows analysed	760
Recorded pregnant	682												
Recorded empty	51												
Doubtful/recheck*	0												
Culled without pregnancy test	20												
No record of cull or pregnancy test	7												
Cows analysed	760												
	*Includes cows whose most recent empty diagnosis was less than 35 days after mating end date.												

Records available for Fertility Focus to calculate the not-in-calf rate using the Kaplan-Meier procedure are presented on page 2 of the report, as in the example above. There are no 'doubtful/recheck' cows in the example above because the report was generated after the final pregnancy test, which was at least 35 days after the end of mating date, and all previous doubtful/recheck cows were pregnancy tested again at that time.

Refer to 'Tips and traps' on page 18 for guidance on using this information.



The cumulative in-calf rate graph

This graph displays the percentage of the herd in-calf at the end on each week (i.e. days 7, 14, 21 etc) and interpolates between these points. The target line is also shown; this is a smoothed line running close to the 6-week in-calf rate target of 78%, and through the targets at 3 (53%), 9 (90%) and 12 (94%) weeks of mating. This graph allows a rapid visual assessment of the herd's in-calf rates compared with targets.

Tips and traps

1. Look for changes in the line slope around the end of the AB period. If the line slopes up to the end of the AB period then is markedly flatter after that, review bull management. If the line slope increases markedly after the end of the AB period, review heat detection and AB management.



Star ratings

The Fertility Focus Report includes star ratings for most results. For 6-week in-calf rate and not-in-calf rate, a five star result indicates that the herd's result would be placed in the best 25% of herds in the NZ Monitoring Fertility study (6-week in-calf rate) or is very good performance (not-in-calf rate). A three star result indicates that the herd achieved an above average result, and a one star result indicates the herd's result is below average and that the cause should be investigated.

How star ratings are allocated for in-calf rates¹

	1 star if worse than	3 stars	5 stars if equal to or better than	Aim above/for
6-week in-calf rate	68%	68% to <73%	73%	78%
Not-in-calf rate				
Mating period duration (weeks)				
6	32%	32% to >27%	27%	22%
9	20%	20% to >16%	16%	13%
12	14%	14% to >12%	12%	10%
15	11%	11% to >10%	10%	8%
18	10%	10% to >8%	8%	7%
21	9%	9% to >7%	7%	6%

¹ For not-in-calf rates, star ratings are generated based on equations that use the exact mating duration. For mating durations of exactly 6, 9, 12, 15, 18 and 21 weeks, where the not-in-calf rate is very close to the value shown, stars may differ from that indicated due to small differences in equations and rounding.

Star ratings for 6-week in-calf rate were based on results from the NZ Monitoring Fertility study as reported in the 2003 Fertility Monitor Report; the overall average was 68% and the average of the top quartile was 78%.

Mating period durations and in-calf rates at time points other than 6 weeks were not measured in that study.

The recent version 3 upgrade to the Fertility Focus software and report includes revised in-calf rate and not-in-calf rate targets and triggers, for the period after week 6 of mating. These are based on large Fertility Focus report datasets in 2017 from Minda.

Intermediate or basic Fertility Focus Report

For intermediate and basic reports, 6-week in-calf rates are just estimates.

The screenshot shows a report interface with the following elements:

- 1 Overall herd reproductive performance** (Section Header)
- 6-week in-calf rate** (Percentage of cows pregnant in the first 6 weeks of mating)
 - Your herd: 73%
 - Aim above: 78%
 - Star rating: ★★★★★
 - Note: Your herd's 6-week in-calf rate has been estimated. Supply results of early aged rectal pregnancy testing for greater accuracy.
- Not-in-calf rate** (Percentage of cows not pregnant)
 - Your herd: [Empty field]
 - Aim for: [Empty field]
- Duration of AB period: [Empty field]
- % of herd in calf** (Cumulative by week of mating)
 - Note: A graph of % herd in calf through the mating period could not be plotted. Supply the results of early aged rectal pregnancy testing.

For intermediate reports, 6-week in-calf rate is estimated based on:

- % of herd calved in first 6 weeks,
- 3-week submission rate, and
- non-return rate.

Non-return rates are calculated using AB inseminations 24 or more days before the end of the AB period. If there are less than 50 such inseminations and/or if the calculated non-return rate is above 80%, the 6-week in-calf rate is estimated using an alternative equation that uses only % of herd calved in first 6 weeks and 3-week submission rate.

For basic reports, 6-week in-calf rate is estimated based on the percentage of cows that recalved in the first 6 weeks of the calving period in the following year without being induced.

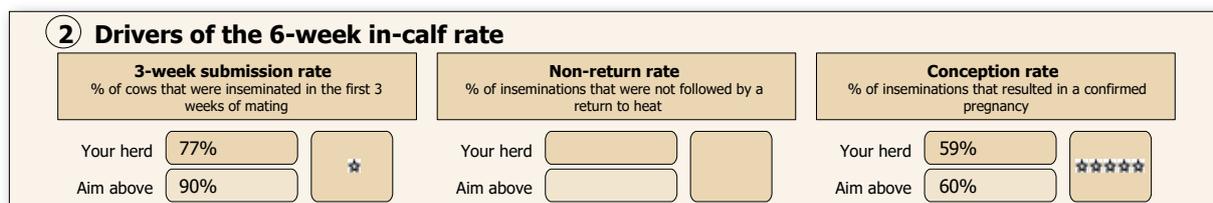
Not-in-calf rates are reported on intermediate reports only if enough cows have either a non-aged or late age positive pregnancy diagnosis, or a 'doubtful/recheck' pregnancy diagnosis.

The same star ratings are used as in detailed reports (see above).

Tips and traps

1. The 6-week in-calf rates on intermediate or basic Fertility Focus Reports are just estimates. They can be meaningfully compared to the 'Aim above' figure or to 6-week in-calf rates from detailed Fertility Focus Reports but should be considered only rough estimates of the herd's actual 6-week in-calf rate. For intermediate reports, about 61% of estimated 6-week in-calf rates are within (i.e. \pm) 5% of the actual value, and about 92% are within (i.e. \pm) 10% of the actual value.
2. Don't compare estimated 6-week in-calf rates to estimates from previous years in the same herd or from other herds; estimated 6-week in-calf rates are too imprecise for such comparisons to be meaningful.
3. A high non-return rate due to missed heats after the third week of mating can result in an unduly high estimated 6-week in-calf rate.
4. If the 3-week submission rate is inflated due to false positive AB inseminations, estimated 6-week in-calf rate can be too high.
5. The estimated 6-week in-calf rate in basic Fertility Focus Reports may be too high if induced cows calved in the first 6 weeks of the herd's calving period and their inductions were not recorded.

Drivers of 6-week in-calf rate



3-week submission rate

The 3-week submission rate describes the percentage of cows that received at least one AB insemination or natural service in the first 3 weeks of the mating period.

The submission rate is not reported if the AB period ended before day 21 of the mating period. (The end of the AB period is defined as the date of the last AB insemination that is not followed by another AB insemination within 7 days). Cows that have their first mating recorded prior to mating start date are excluded, as are those that were culled in the first 21 days of the mating period (regardless of whether these cows have been AB inseminated or naturally mated). For the remaining cows, the 3-week submission rate is the proportion of cows mated for the first time (by AB insemination or natural service) between and including mating start date and mating start date + 20 days.

Tips and traps

1. The reported 3-week submission rate will be falsely low if some cows (e.g. non-cyclers) are run with bulls and services not recorded.
2. Older cows in the herd may have been deliberately withheld from AB inseminations, perhaps because they have been identified for culling at the end of the current season. This practice reduces 3-week submission rate; it can have particularly important effects if an unusually high proportion of cows are withheld.
3. False positive AB inseminations can result in a high 3-week submission rate even though herd cycling rate and/or heat detection sensitivity are low.

Non-return rate

The non-return rate is reported only for intermediate reports. The non-return rate is the percentage of inseminations where the cows did not return to heat by the end of the AB period. It is determined using only AB inseminations that occurred 24 days or more before the end of the AB period (the 'denominator'). The number of AB inseminations used in the denominator and the range of dates of these inseminations are printed on page 2 of the report.

Each of these 'eligible' inseminations is then classified as either a 'success' or a 'failure'. Failure occurs when an eligible AB insemination is followed by any type of mating, or simply a recorded heat, from the second day after the 'eligible' insemination to the end of the AB period. The remainder are considered successful AB inseminations.

The non-return rate is calculated as the number of successful AB inseminations (the 'numerator') divided by the total number of AB inseminations included (the 'denominator').

Records of natural services or heats after the end of the AB period are ignored in calculating the non-return rate.

Non-return rates can be used:

- to estimate the herd managers' ability to achieve a conception from each oestrus event, or
- to estimate the number of AB inseminations used for the number of AB conceptions achieved (i.e. to describe how efficiently AB and semen were used in the herd).

When no cows receive two ABs on the same day or ABs on consecutive days, and no false positive ABs occur, the same non-return rate can be used for both of these purposes.

However, when substantial numbers of cows receive two ABs on the same day or ABs on consecutive days, non-return rate should not be used to assess the efficiency of AB and semen use.

Fertility Focus prioritises using non-return rates for the first purpose (ie to estimate the herd managers' ability to achieve a conception from each oestrus event). So the methods of calculating non-return rate have been defined for this purpose. When calculating non-return rate:

- when there are two inseminations on the same day, one of these is not included as an 'eligible' insemination, and
- when an AB insemination is followed on the next day by another AB insemination, the AB insemination on the second of those days is not included in the denominator
- when an AB insemination is followed by an AB insemination, natural service or heat on the following day, the event on the second day is not considered a return. In other words, when determining which AB inseminations had returns, only returns from the second day after the AB insemination to the end of the AB period are considered
- non-return rates will not be generated when sufficient pregnancy diagnoses have been entered to produce a conception rate.

1. Before interpreting non-return rates, check the date range for inseminations included in non-return rate calculations. Non-return rate is based on AB inseminations early in the mating period and this may not reflect the performance for the entire AB period. For example, non-return rate may be based largely on inseminations following non-cycler or synchronisation treatments.
2. Non-return rate is dependent on heat detection performance and can be an inaccurate estimate of conception rate if heat detection is poorly performed:
 - Low heat detection sensitivity can result in a high non-return rate even though the conception rate is low (i.e. missing return heats up to 24 days before the end of the AB period will inflate the estimated 6-week in-calf rate);
 - Conversely, false positive inseminations can result in a low non-return rate even though the conception rate to genuine heats is acceptable.



Conception rate

Conception rates are reported only for detailed reports. The conception rate is the percentage of AB inseminations that resulted in a pregnancy as determined by pregnancy testing.

Inseminations are included only if they were on or between mating start and end dates, and the cow had one or more pregnancy diagnoses (early or late aged, empty or doubtful/recheck) on or between 35 and 122 days later.

Each of these inseminations is classified as either a 'success' or a 'failure'. For an insemination to be classified as successful, an early or late aged pregnancy diagnosis interpreted in combination with any relevant services must indicate that conception occurred on the insemination date. (See "How conception dates are calculated" for more details.) Otherwise, the insemination is considered a 'failure'. Non-aged positive pregnancy diagnoses are disregarded when conception rates are determined.

Conception rates can be used:

- to describe the herd managers' ability to achieve a conception from each oestrus event, or
- to describe the number of inseminations used for the number of AB conceptions achieved (i.e. to describe how efficiently AB and semen were used in the herd).

When no cows received two ABs on the same day or ABs on consecutive days, and assuming no false positive ABs occurred, the same conception rate can be used for both of these purposes.

However, when substantial numbers of cows receive two ABs on the same day or ABs on consecutive days, conception rates calculated for the first purpose should not be used to assess the efficiency of AB and semen use.

Fertility Focus prioritises using conception rates for the first purpose (i.e. to estimate the herd managers' ability to achieve a conception from each oestrus event). So the methods of calculating conception rate have been defined for this purpose. When calculating conception rate:

- when there are two inseminations on the same day, one of these is not included as an 'eligible' insemination, and
- when an AB insemination is followed on the next day by another AB insemination, the AB insemination on the first of those days is not included in the denominator.

Tips and traps

1. To obtain a crude index of the number of inseminations used per conception in the AB period:
 - Look up the number of AB inseminations on page 2
 - Calculate the approximate number of conceptions in the AB period as the percentage pregnant to AB (from the graph) multiplied by herd size
 - Divide number of inseminations by the number of conceptions in the AB period
2. Conception rate may be underestimated in a Fertility Focus Report generated immediately after the first herd pregnancy test if the pregnancy tester has erred on the side of caution by calling cows conceived more than 35 days as 'doubtful/recheck'.
3. AB inseminations followed only by a pregnancy test less than 35 days later (and no further pregnancy tests) must be excluded from conception rate analyses, regardless of the pregnancy test result, to avoid biased conception rates. This is because ABs followed by a negative pregnancy test less than 35 days later (and no further pregnancy tests) may well have been successful but the pregnancy was too small to be detected. But conception dates from pregnancy tests less than 35 days later are still used when calculating 6-week in-calf rate, not-in-calf rate etc.

Star ratings

Star ratings for the drivers of 6-week in-calf rate are allocated as follows.

How star ratings are allocated for 3-week submission rate, non-return rate and conception rate

	1 star if worse than	3 stars	5 stars if equal to or better than	Aim above/for
3-week submission rate	81%	81% to <88%	88%	90%
Non-return rate	If $\geq 64\%$, "Satisfactory"; otherwise "Seek advice"			
Conception rate	53%	53% or higher	58%	60%



Key indicators to areas for improvement

3 Key indicators to areas for improvement

Calving pattern of first calvers
Well managed heifers get in calf quickly and calve early.

Calved by	Week 3	Week 6
Your herd	39%	89%
Aim above	80%	95%
	★	★

Calving pattern of whole herd
Did late calvers reduce in-calf rates?

Calved by	Week 3	Week 6	Week 9
Your herd	47%	78%	95%
Aim above	67%	88%	98%
	★	★	★

Pre-mating heats
A high % of well managed cows will cycle before the start of mating.

Your herd	0%	★
Aim above	85%	

3-week submission rate of first calvers
Well managed heifers cycle early

Your herd	82%	★★★★
Aim above	90%	

Heat detection
A high % of early-calved mature cows should be inseminated in the first 3 weeks of mating.

Your herd	87%	★
Aim above	95%	

Non-cycling cows
Treated non-cyclers get in calf earlier.

Treated	By MSD	Wks 1-3	Wks 4-6
Your herd	0%	0%	0%

Rating	What does it tell me?	What should I do?
★★★★★	Top result	Ideal - keep up the good work!
★★★	Above average	Getting there - focus on getting the details right.
★	Below average	Plenty of room to improve - seek professional advice.
	No result	Not enough information provided - seek help with records.

Performance after week 6
Expected not-in-calf rate helps assess management affecting performance after week 6 (including bull management and herd nutrition).

Not-in-calf rate		
Your herd	12%	OK
Expected	14%	

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Calving pattern of first calvers

Late calving heifers have reduced reproductive performance. The calving pattern of first calvers is described by the percentage of two year old heifers that were calved by week 3 and 6 of the herd's calving period.

The herd's planned start of calving date is assumed to be 83 days before the herd's mating start date. The proportions of two year old cows (22-34 months at calving) that calved prior to the herd's planned start of calving date plus 21 days (week 3) or plus 42 days (week 6) are calculated.

Birth dates and calving dates of these first calvers need to be recorded for inclusion in this calculation.

If a high percentage of two year old replacements calve during the first six weeks of the herd's calving pattern, this reflects that the heifers were cycling well at the time of mating, and that good AB practice or sufficient bulls were used to ensure satisfactory reproductive performance. For this to be achieved, it is likely that these heifers were well grown at the time of mating.

Tips and traps

1. Even if yearlings were mated before the herd's mating start date last year, Fertility Focus still assesses their calving pattern relative to the herd's mating start date this year. Times from first calvers' calving dates to the herd's mating start date this year have large effects on their reproductive performance. So calving pattern relative to the herd's mating start date this year is more relevant for determining the first calvers' reproductive performance in the current year.
2. If yearlings were mated before the herd's mating start date last year, they may have high percentages calved by weeks 3 and 6 relative to the herd's mating start date this year but still be under grown.
3. If birth dates were recorded for only some first calvers, only these heifers will contribute to these measures. Check that the number of first calvers on page 2 is correct.

Calving pattern of whole herd

Late calving cows have lower 6-week in-calf rates and higher not-in-calf rates.

The calving pattern can be described by the percentage of cows that were calved by week 3, 6, and 9 of the herd's calving period. One and three star results indicate that the herd is likely to suffer reduced reproductive performance due to too many late calving cows.

Only records of calving dates are needed to report the calving pattern for a herd.

The herd's planned start of calving date is assumed to be 83 days before the herd's mating start date. The proportions of cows that calved prior to the herd's planned start of calving date plus 21 days (week 3) or plus 42 days (week 6) or plus 63 days (week 9) are calculated.

Tips and traps

1. If the herd's mating start date changed from the previous year, the calving pattern reported by Fertility Focus may differ from that based on the herd's planned start of calving date (ie last year's mating start date plus 282 days).
 - Time from calving date to mating start date has large effects on reproductive performance. So calving pattern relative to the herd's mating start date this year is more relevant for determining reproductive performance in the current year.
2. Batch entering of calving dates to a single date will cause trouble (eg where 200 cows are all entered as calving on, say, the 20th Sept). These calving dates are considered spurious by Fertility Focus and it will not run.
 - If more than 50% of the fortnight's calvings happened on one day, these are classified as 'funny' calvings. If more than 25% of calvings are funny, a report is not generated.

Pre-mating heats

Cows that have cycled before mating starts have better reproductive performance than those that have not. A high level of pre-mating oestrus activity is a pre-cursor to achieving a high 3-week submission rate and a good conception rate.

Fertility Focus calculates the pre-mating cycling rate as the percentage of cows that have had at least one pre-mating heat.

The group of cows considered when calculating the pre-mating cycling rate is the same group used when calculating 3-week submission rate. Cows that have their first mating recorded prior to mating start date are excluded, as are those that were culled in the first 21 days of the mating period (regardless of whether these cows have been insemination or mated). The number of cows in this group recorded as having a heat prior to mating start date is counted and divided by the total number of cows in the group. The pre-mating cycling rate is not reported if the AB period ended before day 21 of mating.

Tips and traps

1. Herd managers quite often make the mistake of counting the same cow twice if she has two pre-mating heat records when calculating pre-mating cycling rate, thus inflating the calculated percentage of the herd with pre-mating heats. Fertility Focus counts the number of cows that have had at least one pre-mating heat, and never counts the same cow twice.
2. The reported pre-mating cycling rate will be an underestimate if the pre-mating heat detection period was less than 3 weeks, or if only some of the pre-mating heat records have been entered.

3-week submission rate of first calvers

The 3-week submission rate of first calvers is an indicator of how successful the calf and heifer management has been, and how this group is performing in the milking herd.

The submission rate of first calvers (two year old cows, 22-34 months at calving) is calculated using a similar method to the 3-week submission rate for the herd.

A high percentage of first calvers submitted during the first three weeks of the mating period can indicate that most were cycling at mating start date. For this to be achieved, it is likely that these heifers were well grown at the time of first calving, their body condition and nutrition at time of mating was satisfactory, and most calved well before the herd's mating start date.

The 3-week submission rate of first calvers may also reflect the results of early non-cycling treatment of first calvers.

Tips and traps

1. If a high percentage of heifers are treated for anoestrus, the 3-week submission rate for first calvers can be high even when they have been reared poorly and/or poorly managed in early lactation.
2. A high rate of false positive inseminations during the first 3 weeks of mating can mask a non-cycling problem with first calvers.

Heat detection

The opportunity for a cow to conceive to an AB insemination comes approximately every 21 days and requires diligent heat detection.

The rate at which early calved, mature cows are inseminated is a good indicator of heat detection sensitivity (assuming false positive inseminations were not common). The 3-week submission rate for early calved, mature cows is calculated using a similar method to the 3-week submission rate for the herd.

Early calved, mature cows are those that calved more than 8 weeks before mating start date (ie early calved cows) that were more than 46 months of age at calving (or age unknown, presumed to be mature cows).

These cows should commence normal oestrous cycles well before mating commences. That means that a large percentage should be detected on heat in the first 3 weeks of the mating period if an effective heat detection program is in place. A low submission rate in this group of cows indicates that heat detection practices should be reviewed.

Birth dates, calving dates and insemination dates are required for this statistic to be calculated.

Tips and traps

1. A low value for the heat detection indicator could be due to a non-cycling problem that is severe enough to affect even the early calved mature cows. Be sure to eliminate this possibility before emphasising a need to improve heat detection.
2. Older cows in the herd may have been deliberately withheld from AB inseminations, perhaps because they have been identified for culling at the end of the current season. This practice will tend to underestimate this indicator of heat detection efficiency; it can have particularly important effects on this indicator if an unusually high proportion of cows within this group are withheld.
3. A high rate of false positive inseminations during the first 3 weeks of mating could mask indications of poor heat detection using this measure.

Non-cycling cows

Fertility Focus calculates the percentages of cows that received their first non-cycling treatment within each of three time periods: before mating start date, in the first 3 weeks of mating, and in weeks 4 to 6 of mating. Information about non-cycling treatments complements the pre-mating cycling rate indicator, and helps inform interpretation of other key indicators, such as submission rates and conception rate.

For example, a low submission rate could indicate an unsolved non-cycling problem that should be addressed in future with recording of pre-mating heats and consideration to the use of non-cycling treatments. Alternatively, a low submission rate could indicate low heat detection efficiency (i.e. missing too many heats). A high conception rate would support this latter possibility.

On the other hand, a high submission rate with a poor conception rate can indicate overly heavy reliance on non-cycling treatment. Again though, heat detection might also be to blame here with too many false positive heats. The alternate possibilities need to be investigated with the herd manager.

The group of cows considered when calculating the percentage of cows treated for non-cycling is the same group as used when calculating 3-week submission rate. Cows that have their first mating recorded prior to mating start date are excluded, as are those that were culled in the first 21 days of the mating period (regardless of whether these cows have been inseminated or mated). The percentage of cows treated for non-cycling is calculated as the number of cows in the group recorded with a first treatment, within each time period, divided by the number in the group.

Tips and traps

1. These measures are accurate only if all non-cycling treatments are recorded and included in the data file. No record of non-cycling treatment information on the Fertility Focus Report does not necessarily mean that non-cycling treatments were not used; these may not have been recorded and included in the data file.
2. For cows treated on two or more separate occasions, only one treatment is used in these analyses. So if a lot of cows are treated more than once, the total number of non-cycling treatments will be higher than that indicated from the sum of the percentages in the three periods.

Performance after week 6

The herd's reproductive performance after week 6 of mating can be assessed using the 'expected not-in-calf rate'. Expected not-in-calf rates are only included on detailed reports.

The expected not-in-calf rate for a herd is calculated based on the 6-week in-calf rate for the herd and the duration of the mating period. If the not-in-calf rate is higher than expected, this indicates a problem with the mating program after the first 6 weeks. This is usually when bulls are running with the herd; when this is the case, bull management should be reviewed. Herd nutritional management can also affect performance after week 6, and should be reviewed if the not-in-calf rate is higher than expected.

Expected not-in-calf rates are calculated using equations closely based on the following.

Expected not-in-calf rates for various 6-week in-calf rate and mating durations

6-week in-calf rate	Total duration of mating (AB period plus bull mating period; weeks)				
	9	12	15	18	21
20%	51%	36%	29%	23%	20%
30%	45%	32%	25%	21%	18%
40%	39%	27%	21%	19%	16%
50%	34%	24%	19%	17%	15%
60%	26%	19%	15%	14%	13%
70%	19%	14%	11%	10%	9%
80%	13%	10%	8%	7%	7%
90%	8%	7%	6%	6%	6%

Tips and traps

1. If a Fertility Focus Report is generated immediately after the first herd pregnancy test, disregard the expected not-in-calf rate. In these circumstances, the expected not-in-calf rate is likely to be inappropriate because it is only based on the early part of the mating period, and because the true pregnancy status of many cows may not yet be defined. To assess the herd's reproductive performance after week 6 of mating, generate a Fertility Focus Report after the final herd pregnancy test 5 weeks or more after the end of the mating period.

Summary of star ratings

How star ratings are allocated for in-calf rates¹

	1 star if worse than	3 stars	5 stars if equal to or better than	Aim above/for
6-week in-calf rate	68%	68% to <73%	73%	78%
Not-in-calf rate				
Mating period duration (weeks)				
6	32%	32% to >27%	27%	22%
9	20%	20% to >16%	16%	13%
12	14%	14% to >12%	12%	10%
15	11%	11% to >10%	10%	8%
18	10%	10% to >8%	8%	7%
21	9%	9% to >7%	7%	6%

¹ For not-in-calf rates, star ratings are generated based on equations that use the exact mating duration. For mating durations of exactly 6, 9, 12, 15, 18 and 21 weeks, where the not-in-calf rate is very close to the value shown, stars may differ from that indicated due to small differences in equations and rounding.

How star ratings are allocated for 3-week submission rate, non-return rate and conception rate

	1 star if worse than	3 stars	5 stars if equal to or better than	Aim above/for
3-week submission rate	81%	81% to <88%	88%	90%
Non-return rate	If $\geq 64\%$, "Satisfactory"; otherwise "Seek advice"			
Conception rate	53%	53% to <58%	58%	60%

How star ratings are allocated for key indicators to areas for improvement

	1 star if worse than	3 stars	5 stars if equal to or better than	Aim above/for
Calving pattern of first calvers				
% calved by week 3	77%	77% to <79%	79%	80%
% calved by week 6	93%	93% to <94%	94%	95%
Calving pattern of whole herd				
% calved by week 3	62%	62% to <66%	66%	67%
% calved by week 6	84%	84% to <87%	87%	88%
% calved by week 9	96%	96% to <97%	97%	98%
Pre-mating heats	65%	65% to 75<%	75%	85%
3-week submission rate of first calvers	81%	81% to <88%	88%	90%
Heat detection	90%	90% to <93%	93%	95%
Performance after week 6	Message is based on whether not-in-calf rate is above or below the expected not-in-calf rate			

Changes to calving pattern targets based on large MINDA datasets are included in the version 3 upgrade to Fertility Focus software and report.



How are mating start and end dates calculated?

Fertility Focus 2017: Seasonal

Example herd

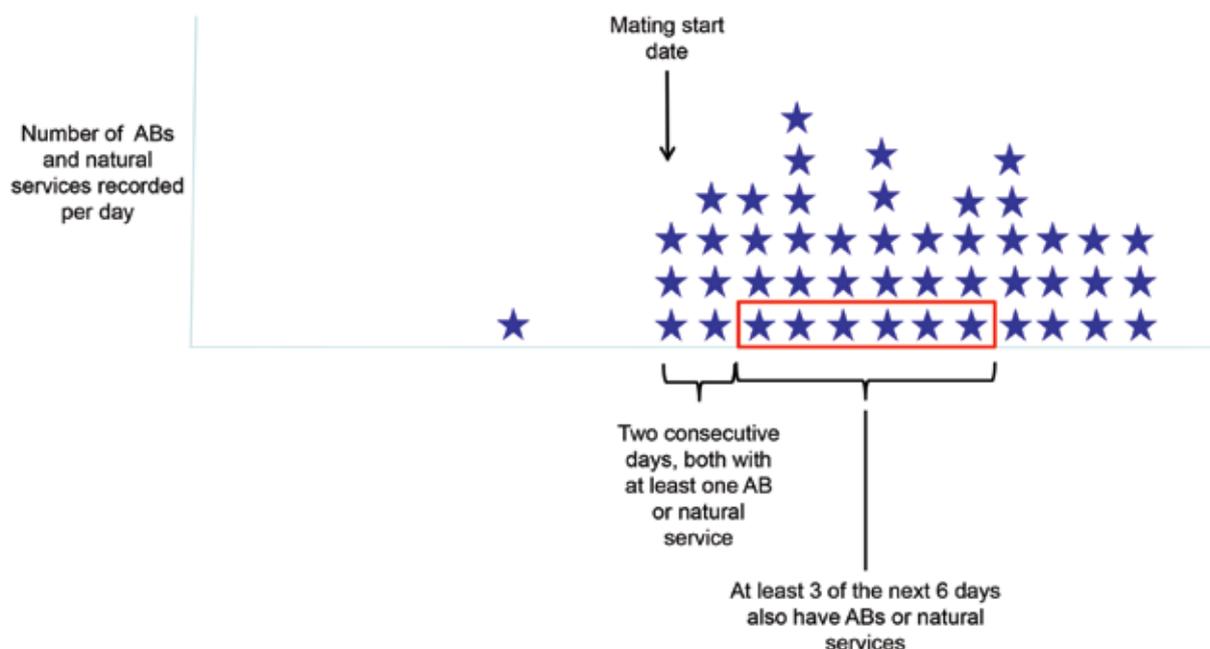
Report date: 21/12/18
PTPT:
Herd Code:
No of cows included: 498
These cows calved between: 24/05/17 and 29/11/17
Mating start & end date: 01/10/17 - 30/12/17
Next planned start of calving: 10/07/18
Duration of mating: 91 days
Duration of AB period: 91 days

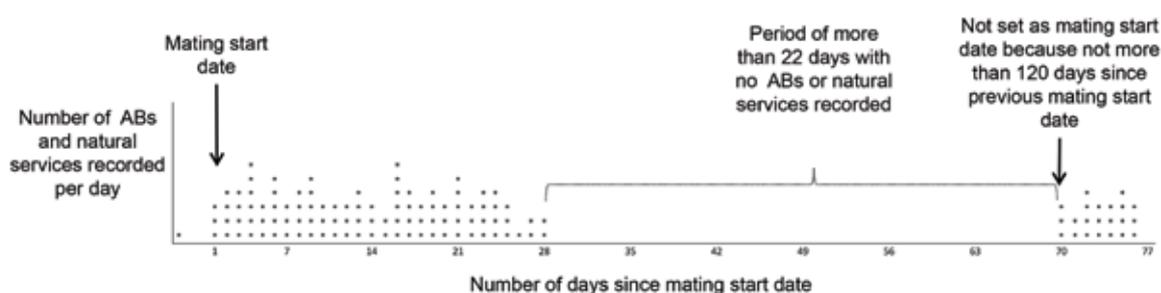
incalf FERTILITY FOCUS Version 3.01
DairyNZ

1 Overall herd reproductive performance

Mating start date

The mating start date is the first of two consecutive days, both with at least one AB insemination or natural service, where at least 3 of the next 6 days also have AB inseminations or natural services (see figure below). A new mating start date is allocated only after a period of more than 22 consecutive days with no AB inseminations or natural services, more than 120 days since the previous mating start date for seasonal calving herds or 90 days for split calving herds. The most recent mating start date during the 12 month analysis period is used as the basis of the report.





This is varied in small herds (<150 cows calved in the selected 12 month period), where the mating start date is the first day with at least one AB insemination or natural service where at least 3 of the next 6 days also have AB inseminations or natural services.

It is also varied in herds using whole or part herd oestrus synchrony programs. If $\geq 50\%$ of calvings in the selected 12 month period (whether included in analyses or not) have an AB on the same date and this date is ≥ 1 day and ≤ 24 days before the mating start date as determined above, this date becomes the mating start date.

If no mating information is available but pregnancy diagnosis information is available, the mating start date is defined as a date with 3 or more conceptions more than 30 days after the previously recorded conception.

For basic reports, the mating start date is estimated based on the planned start of calving date in the subsequent year. The planned start of calving date in that year is determined as the first day of the second of two consecutive weeks when the number of calvings increases, when the previous week contained no calvings. When the number of calvings in the second week is less than the first week after a week with no calvings, then the planned start of calving is considered to be 3 days after the start of the first week. The mating start date is then calculated as the planned start of a calving period minus 282 days.

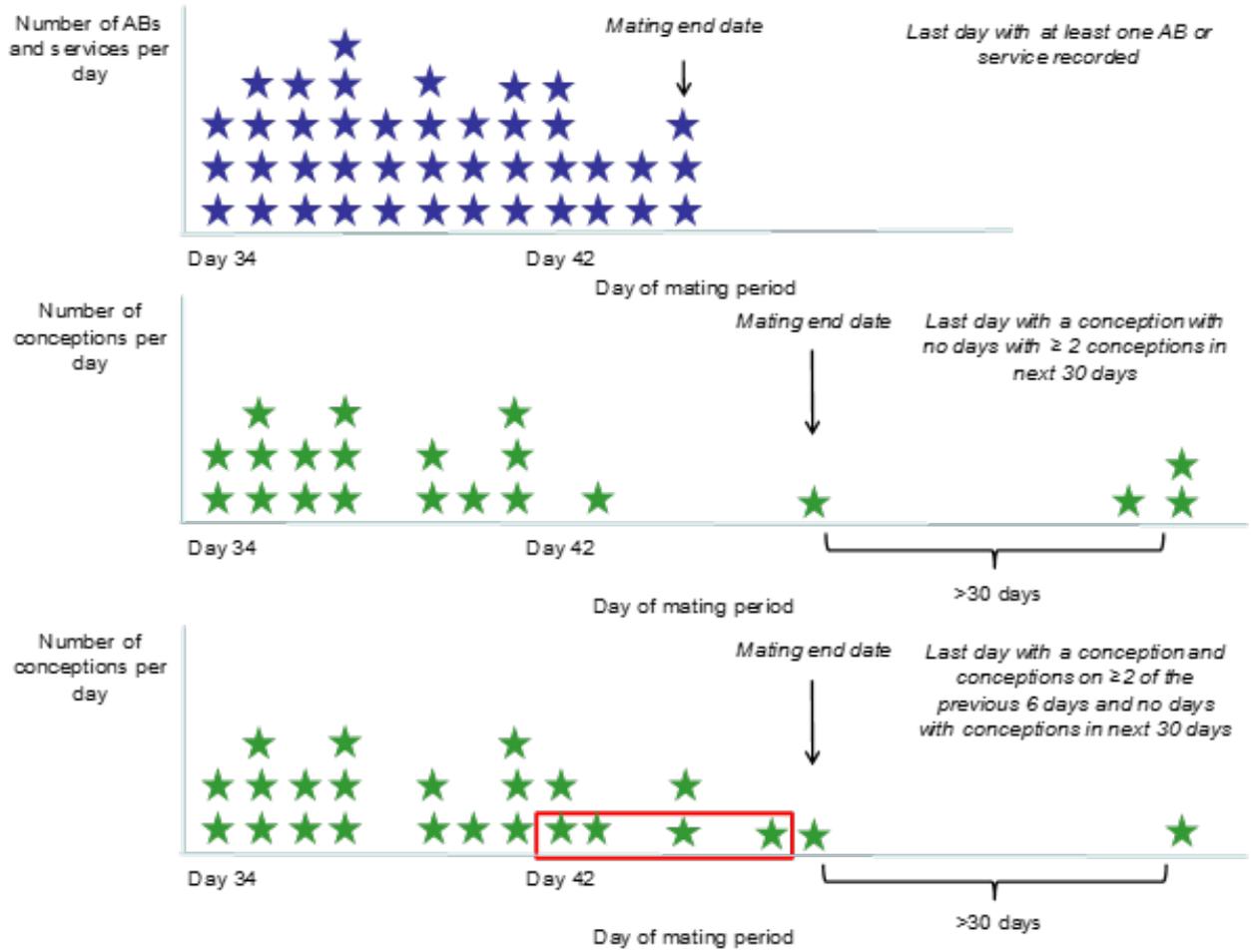
Mating end date

The mating end date is set as the latest date of:

- the last recorded mating on or before the 147th day (21 weeks) of the mating period, or
- the last date with 2 conceptions followed by at least 30 days with no conceptions, provided that date is on or before the 147th day (21 weeks) of the mating period, or
- the last date with one conception that is on or before the 147th day (21 weeks) of the mating period that is followed by at least 30 days with no conceptions and has at least one conception on each of 2 or more other days in the 6 preceding days.

Only conception dates based on positive aged pregnancy diagnoses are used to determine mating end date (ie non-aged positive pregnancy diagnoses are not used). The maximum allowed mating period is 147 days (21 weeks).

If the mating end date is incorrect, you can force it to be correct by adding a mating on mating end date for a cow calved between 130 days before and 59 days after mating start date and not culled before the end of mating date.



Duration of the AB period

AB period duration is calculated as the end of AB period date minus mating start date plus 1. The end of the AB period is defined as the date of the last AB insemination that is not followed by another AB insemination within 7 days.

How conception dates are calculated

Conception dates of aged pregnancies

Aged pregnancies are those where the cow was diagnosed pregnant and the estimated stage of pregnancy was recorded.

For these cows, the approximate date of conception is first calculated as date of pregnancy diagnosis minus the estimated stage of pregnancy in days.

If any services were recorded on this date or up to 14 days after this date, the conception date is redefined to the most recent of these dates. If no such services were recorded but one or more services were recorded between 1 and 10 days inclusive before this date, the most recent of these dates is selected as the conception date. If no such services are detected, conception date is set as date of pregnancy diagnosis minus the stage of pregnancy in days.

The figure below shows hypothetical service histories for four cows with aged pregnancies, and the dates of conception as selected by Fertility Focus (circled). For all cows, the approximate conception date (calculated as date of pregnancy diagnosis minus estimated stage of pregnancy) was 15th October.

Cow ID	AB insemination and natural service dates	Date selected as conception date
1	7 Oct 9 Oct 15 Oct	The service on the same date as the approximate conception date is selected as no services in the next 14 days
2	7 Oct 9 Oct 18 Oct 30 Oct	Most recent service up to 14 days after the approximate conception date
3	7 Oct 9 Oct	Most recent service up to 10 days before the approximate conception date
4		There was no service on or between 14 days before to 10 days after the approximate conception date, so conception date is set as date of pregnancy diagnosis minus the stage of pregnancy (i.e. 15th Oct).

Conception dates based on non-aged positive pregnancy diagnoses

Non-aged positive pregnancy diagnoses are those where the cow was diagnosed pregnant but the estimated stage of pregnancy was not recorded.

Conception dates are required for cows with non-aged positive pregnancy diagnoses to allow inclusion of these cows in the Kaplan-Meier calculations of 6-week in-calf rates and not-in-calf rates.

For cows with non-aged positive pregnancy diagnoses, the date of conception is defined as follows:

- The most recent service that is more than 35 days before pregnancy diagnosis is considered to be the conception date.
- If there is no such service, conception date is set as the day after the end of the AB period provided the pregnancy diagnosis is more than 35 days after the end of the AB period.
- Otherwise, the conception date is set as 35 days before the pregnancy diagnosis.

The figure below shows hypothetical service histories for three cows with non-aged positive pregnancy diagnoses, and the dates of conception as selected by Fertility Focus (circled).

Cow ID	AB insemination and natural service dates	Last day of AB period	Pregnancy diagnosis date	Date selected as conception date
1	9 Oct (36 days before pregnancy diagnosis) 18 Oct (circled) (26 days before pregnancy diagnosis)	29 Oct	23 Nov	The most recent service that is >35 days before pregnancy diagnosis
2		29 Oct	4 Dec (36 days after end of AB period)	30 Oct (circled) Day after the end of the AB period provided the pregnancy diagnosis is >35 days after the end of the AB period
3		29 Oct	23 Nov	35 days before the pregnancy diagnosis (i.e. 19 Oct)

Tips and traps

1. Once a cow is diagnosed pregnant by an aged pregnancy test (and hence her conception date is determined), that conception date is not altered by subsequent pregnancy test results. This is to ensure the reproductive measures are comparable between years and herds, as it avoids the inconsistencies in re-pregnancy testing of cows losing embryos or aborting. Some may be re-pregnancy tested, some sold without re-pregnancy testing, and some held until after they should have bagged up or calved then sold without re-pregnancy testing. If conception rates were altered by subsequent pregnancy test results, reproductive measures would not be comparable, for example, between a herd where all cows losing embryos or aborting are re-pregnancy tested and another herd where none are re-pregnancy tested.

The Kaplan-Meier method

The issue

In most herds, some cows are culled (or die) during the mating period before being diagnosed pregnant.

The final pregnancy statuses of these cows (ie what would have happened had they not been culled) are obviously unknown. These cows can cause difficulties when calculating the 6-week in-calf rate and the not-in-calf rate.

In most software, these cows are managed in one of two ways. Either:

1. it is assumed that, had they not been culled, none of these cows would have become pregnant, or
2. these culled cows are ignored.

This implicitly assumes that, had these cows instead remained in the herd, they would have had the same reproductive performance as the rest of the herd.

Unfortunately, both of these assumptions are usually incorrect. In contrast to the first assumption, had the cull cows not been culled, some may well have become pregnant. Considering the second assumption, herd managers consider reproductive performance when deciding which cows to cull; those thought to be not pregnant or late conceiving are often preferentially culled. When this occurs, the culled cows are very unlikely have the same reproductive performance as the rest of the herd.

So option 1 can result in not-in-calf rates that are too high, and option 2 can result in not-in-calf rates that are too low.

These biases can be particularly important when comparing not-in-calf rates between herds with different culling patterns, or within the same herd across years when culling patterns differed.

Why the Kaplan-Meier procedure?

The aim is to have the Fertility Focus Report describe the level of reproductive performance that has been achieved within the herd in a way that best allows comparisons between herds and between years.

So Fertility Focus uses the Kaplan-Meier procedure to minimise these biases. This procedure allows culls to contribute to the 6-week in-calf rate and not-in-calf calculations until the date they were culled or died.

Through accounting for culling, the Kaplan-Meier procedure (the best practice statistical technique) allows the herd reproductive performance to be measured most accurately.

How the Kaplan-Meier procedure works

The mathematics of the Kaplan-Meier procedure are described in the table below. The simplified example used is for a herd with 100 cows that were present at mating start date. No further cows calved after mating start date.

For simplicity, in this example, we divide the mating period into 3-week time periods commencing on mating start date. Fertility Focus actually does these calculations on a daily basis. The example herd has a 12-week mating period, and we divide this into four 3-week periods, commencing on mating start date.

The assumption is that all 100 cows are 'at-risk' of getting pregnant from mating start date. Cows 'at-risk' are those not yet pregnant but still in the herd (i.e. not culled) at the start of each 3-week period.

For simplicity, in this example, we will assume that:

- the submission rate in each 3-week period (i.e. the percentage of cows 'at-risk' that are submitted in each 3-week period) is 85%,
- no cows are submitted more than once in each 3-week period, and
- conception rate is always 55%.

This means that, of the cows that are 'at-risk' at the start of each 3-week period, 47% ($85\% \times 55\%$) become pregnant during that period.

The Kaplan-Meier approach estimates the probability for the average cow that she will remain non-pregnant (or 'survive' in survival analysis terms) from mating start date to the end of each period. This probability equates to the not-in-calf rate for the herd as at the end of that period.

Let us instead assume that in the example herd, 1, 3, 5 and 2 cows were culled during each of the three-week blocks, respectively, and that none of these culls had been diagnosed pregnant before being culled. (These cows are referred to as 'censored' animals in survival analysis terms.) These cows are easily incorporated into the calculations (see table).

In this example, the 6-week in-calf rate is 71% ($1.00 - 0.29$) and the not-in-calf rate is 0.07 or 7%.

An on-line Kaplan-Meier calculator is available to explore other examples (www.vassarstats.net/survival.html).

Kaplan-Meier survival probability calculations in an example herd with cows culled

Time period (weeks of the mating period)	No. at-risk (of getting pregnant)	No. culled or died during period ¹	No. becoming pregnant during period ²	No. at-risk but not diagnosed as becoming pregnant during period	Probability for the average cow that she will remain non-pregnant from mating start date to the end of the period ³
1-3	100	1	47	53	(53/100) = 0.53 (100x85%x55%)
4-6	52 (100-1-47)	3	24 (52x85%x55%)	28	(53/100) x(28/52)=0.29
7-9	25 (52-3-24)	5	12 (25x85%x55%)	13	(53/100)x(28/52) x(13/25)=0.15
10-12	8 (25-5-12)	2	4 (8x85%x55%)	4	(53/100) x(28/52)x(13/25) x(4/8)=0.07

¹ Culled without being diagnosed pregnant first. Fertility Focus actually does these calculations on a daily basis, and these cows contribute up to the day before they are culled or die.

² Ascertained from subsequent pregnancy diagnoses

³ These are the Kaplan-Meier survival probability estimates.

Kaplan-Meier method



How the Kaplan-Meier procedure compares to other approaches

Not-in-calf rates

Results can differ markedly using other approaches.

Consider the example above where 11 cows were culled and not diagnosed pregnant before being culled.

Two alternatives to the Kaplan-Meier approach could have been used.

1. It could have been assumed that, had they not been culled, none of these cows would have become pregnant. Then we would have calculated not-in-calf rate as 15% (11 culls plus 4 non-pregnants / 100; much higher than the Kaplan-Meier estimate of 7%).
2. These culled cows could have been ignored. If we had ignored these culled cows and calculated not-in-calf rate based on the cows still in the herd at the end of the mating period (ie the culled cows do not contribute to the denominator), we would have 4 non-pregnant cows out of the 89 cows still in the herd at the end of the mating period, or 4%, lower than the Kaplan-Meier estimate of 7%.

Herd managers use a similar method to this when they calculate 'empty rate' as the number of cows diagnosed empty at the final herd pregnancy test divided by the number of cows present in the herd on that date. In this situation, cows culled before being pregnancy tested do not contribute to the calculations.

The difference between this 'empty rate' and not-in-calf rate as calculated by Fertility Focus can sometimes present a barrier to acceptance of the Fertility Focus Report. Adoption of the term 'not-in-calf rate' in place of 'empty rate' in the version upgrade of Fertility Focus (Version 2, 2013) is partly aimed at distinguishing the on-farm calculation (of 'empty rate') from the Kaplan-Meier estimate (of not-in-calf rate after 'x' days of mating).

6-week in-calf rates

The 6-week in-calf rate can also be affected by culls. Again consider the example above where 11 cows were culled during the mating period and not diagnosed pregnant before being culled.

1. It could have been assumed that, had they not been culled, none of these cows would have become pregnant by week 6. Then we would have calculated 6-week in-calf rate as 71% (71 cows pregnant by week 6/100), identical (after rounding) to the Kaplan-Meier estimate of 71%.
1. If the 11 culls are ignored, there are 71 cows pregnant by week 6 of the 89 cows that were not culled; $71/89 = 0.80$ or 80%.

These findings are summarised in the table below.

Results of various approaches to calculating not-in-calf rates where 11 cows were culled during the mating period without being diagnosed pregnant first

Approach	Culls ignored	Kaplan-Meier method	Assumed that, had the culls not been culled, none would have become pregnant
Calculated not-in-calf rate	4%	7%	15%
Calculated 6-week-in-calf rate	80%	71%	71%



Key points

- Under the Kaplan-Meier procedure, cows without positive pregnancy diagnosis results contribute to 6-week and not-in-calf rate calculations until the end of mating, or if they were culled or died during the mating period, until the day before that date. Those culled soon after mating start date contribute little while those culled near the end of the mating period contribute much more.
- Where cows are culled during the mating period without being diagnosed pregnant first, the Kaplan-Meier procedure results for 6-week in-calf rates and not-in-calf rates are intermediate between those obtained a) if culls are ignored and b) if it is assumed that the culls would not have become pregnant.
- The Kaplan-Meier procedure allows more valid comparisons of 6-week in-calf rates and not-in-calf rates between herds with different culling patterns.

How does Fertility Focus decide which mating period to analyse?

Fertility Focus starts the analyses by identifying the analysis date.

When printing a report from Fertility Focus, the analysis date is one of the first options encountered. The default value is the current date but you can change this to any date.

Fertility Focus does not necessarily print a report for the most recent 12-month period up to this date. Rather, it produces a report for the most recent 12-month period before the specified analysis date that contains sufficient information to provide a sensible report.

Fertility Focus assesses the 12-month period ending on the last day of the month of the analysis date. For example, if the analysis date was 16th July 2018, the first 12-month period assessed would be 1st August 2016 to 31st July 2017.

If there is sufficient information to provide a sensible report for cows that calved in that 12-month period, these are analysed.

If there is not sufficient information, Fertility Focus looks back, searching for the most recent 12-month period before the analysis date that contains sufficient information to provide a sensible report. For example, if the analysis date was 16th July 2017, the second 12-month period assessed would be 1st July 2016 to 30th June 2017.

Fertility Focus can look back through 36 consecutive 12-month periods, each period commencing 1 month before the previous.

You can print historical reports for previous years and seasons by changing the analysis date. For example, to print a report for the 2015/16 year, you could set the analysis date to 30th June 2016. Fertility Focus would then analyse data for calvings from 1st July 2015 to 30th June 2016. If there is adequate data, it would report for that year.

You can print reports for any previous year provided the necessary data are in the herd's data file.

Note that Fertility Focus considers all data including events in the dataset that occurred after the specified analysis date. For example, you may analyse historic data for a mating period commencing on, say, 20th October 2014, by setting the analysis date to 20th December 2014. This analysis will use any relevant data after 20th December 2014 including services, cull events and pregnancy tests. If there are such data, the Fertility Focus Report will differ from a report that was actually printed on 20th December 2014 (and so did not include events after that date).

Some key differences for split calving and year-round calving herds

Split calving

Fertility Focus analyses split and seasonal calving herds in a very similar way. Fertility Focus analyses each calving group separately; each Fertility Focus Report relates to just one of the calving periods in any particular year.

To obtain a report for an earlier calving group, specify an earlier analysis date.

Three key differences are as follows:

1. The cows that calved from 120 days before mating start date to mating start date, less those subsequently culled before mating start date are included. (This differs from seasonal calving herds where cows that calved from 130 days before mating start date to 59 days after mating start date, less those subsequently culled before mating start date are included.)
2. Carry-over cows from earlier calving periods are not included. This is because cows culled without a recorded cull date would be assumed to still be in the herd and to not have conceived, so spuriously reducing 6-week in-calf rate and not-in-calf rates.
3. A major addition is the not-in-calf rate after two mating periods. Fertility Focus selects cows from the previous calving period and reports the percentage still not diagnosed pregnant after two consecutive mating periods.

Year-round calving

Fertility Focus analyses year-round calving herds quite differently from seasonal and split calving herds.

Some key differences are as follows:

- 100-day in-calf rate is used in place of 6-week in-calf rate. 100-day in-calf rate describes the percentage of cows that conceive by 100 days after their calving date.
- 200-day not-in-calf rate is used in place of not-in-calf rate. 200-day not-in-calf rate describes the percentage of cows that have not conceived by 200 days after their calving date.
- 80-day submission rate is used in place of 3-week submission rate. 80-day submission rate describes the percentage of cows that are mated by 80 days after their calving date.

Key indicators to areas for improvement are quite different. For year-round calving herds, the key indicators are:

- Voluntary waiting period
- Mature cow submission rate
- Return intervals
- First calver milk production
- AB practices.

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