

AI Mating Guide for Dairy Farmers

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LIVESTOCK IMPROVEMENT

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**Have you
ordered your
semen?**

Get your semen
order in early to
ensure you secure
the bulls you prefer.

For your AI mating season, we have put together this step-by-step insemination guide to help you through this important phase of any block calving system.

Part 1 - Preparation

Are your facilities ready?

Facilities should be safe, accessible, convenient, comfortable and sheltered from the weather for both yourself and the cows.

Good quality facilities will ensure you have the best possible opportunity for getting your cows in calf the first time around.

We recommend having two people present during insemination to help with cow handling and to keep the cows calm.

Is your loading area and flask ready?

Ensure a suitable bench or table is available for preparation and loading the AI applicator.

It should be clean and in a convenient working position, well-lit but away from direct sunlight, rain, dust or pungent chemicals.

- Is your semen flask filled with liquid nitrogen and ready to receive semen deliveries?
- Have you consolidated existing semen stock to ensure ample room is available for the new order/s?



AI equipment and consumables

Check all your AI equipment to confirm it is present and in good working order.

- AI applicators are straight, and where applicable have their locking polos.
- Scissors are sharp, tweezers and forceps are present.
- Is the thawing pot clean, undamaged and filled with fresh water?
- If using a heated thawing pot check it is functioning correctly and heating water to the correct temperature.

Confirm the temperature with a calibrated thermometer.

Ensure all equipment is thoroughly cleaned.

AI applicators can be stripped and cleaned thoroughly with boiling water prior to and throughout the season.

Always store your AI equipment in a clean dry location out of direct sunlight.



Clean AI applicators thoroughly

Do you have ample consumables on hand?

- AI sheaths
- AI gloves
- Lubricant
- Paper towels/wipes
- Do you have a suitable rubbish bin available to correctly dispose of used gloves, paper wipes and sheaths?



Are you ready?

It is worth taking some time now to review AI practices, as attention to insemination technique and adherence to best practice can help improve conception rates.

This includes everything from semen storage and handling through to cow handling, timing of insemination and AI technique.

Consider practicing your AI technique on cows in heat before mating starts. This can be done without using semen by placing a sheath over the AI applicator.

Check your practices against the recommendations to make sure everything is set up for success.

Consider attending an AI course if you have not done one in the last two years, or if you would like to increase confidence with your technique.



Only remove sheaths as you need them

Do you have a mating plan in place?

A specific mating plan for your farm will help you and your staff stay on track and achieve key targets.

- Have you reviewed last mating season and identified areas for improvement?
- Are all staff aware of the mating plan and their individual responsibilities?
- Have you set your planned start of mating date (PSM)?
- Pre-mating heat detection should start at least 35 days prior to PSM.
- How frequently are you going to body condition score (BCS) your cows? How are your cows tracking? Target a BCS (NZ) of 4 or more by mating.
- What are you planning to do with your heifer mating?
- What are you planning to do with your non-cycling/ anestrus cows?
- Is everyone (e.g. vet, semen provider, technicians) aware of any synchrony programme dates?
- How are you going to identify which cows are going to which AI bull?
- If applicable, do you have a suitable team of natural mating service bulls ready for after the AI period?

Mating records

Are you set to record each mating each day?

- Notebooks
- Mating charts
- Electronic software systems.

Part 2 - Heifers and Cows

Success with inseminations is a three-part process involving:

The farmer
(heat detection)



The technician
(semen placement)



The cow
(cycling correctly/on heat)

Are your cows and heifers ready?

Many factors contribute to a cow having strong heats and mating success once she is in the milking herd.

Early calving cows have more time to resume cycling post-calving and those meeting body condition score targets at calving have higher 3-week submission rates.

Well-grown heifers that reach 15 and 24 month liveweight and body condition targets are more likely to calve early and get back in-calf quickly, as well as produce more milk.

Post-calving, there are actions that can be implemented to improve the chances of cows getting in-calf.

Body condition

- Manage body condition score post-calving. Aim to keep loss below 1 (NZ) BCS unit between calving and mating.
- Transition diets should be carefully managed.
- Targeted supplementary feeding can be used to minimise periods of negative energy balance, putting your cows in a better position to resume cycling, show strong signs of heat and conceive. Studies have shown that cows in energy deficit may show weaker or no signs of oestrous, (Burke et al., 2010).

Cow health

- Keep a close eye on cow health and treat all sick cows promptly.
- Ensure nutrition is appropriate and transition between diets is smooth. Avoid mineral deficiencies - talk with your nutritionist or vet.
- Identify and preferentially manage 'at-risk' cows early, using interventions like preferential feeding and veterinary checks/treatments for uterine infections and anoestrous cows. Some farmers put cows that have had a setback onto once-a-day milking (OAD) to relieve the pressure.
- Whatever you decide to do, act earlier rather than later. e.g. Lameness and mastitis should be minimised and cases treated quickly. For specific interventions, 4-6 weeks of OAD milking pre-mating, uterine health checks 4 weeks post-calving and anoestrous treatments 10 days prior to the planned start of mating are considered timely. The earlier you intervene, the more time she has to recover. Ask your vet for advice relevant to your situation.



Part 3 - Heat Detection

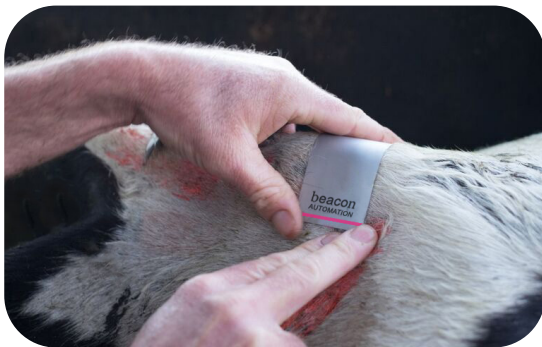
Have you ordered your heat detection aids, and does your team know how to apply, maintain, and interpret them?

Make sure your team is fully trained and confident in using your chosen heat detection system so you can get the most from your reproduction programme.



HEAT SEEKER™

HEAT SEEKER™ heat detection aids are our premium patches for easy and accurate identification. The technology enables the dye to bleed right to the edges making them highly visible and indicating the length of time a cow has been on heat.



ScratchE™

Beacon ScratchE™ detectors are cost-effective and efficient aids. When mating activity occurs the silver layer rubs off to reveal a fluorescent colour.



Pre-mating heat detection

Start early, at least 35 days prior to PSM.

Apply patch and observe pre-mating heats to give yourself an opportunity to make decisions by understanding what proportion of cows are not cycling before your PSM. You can also use that period to ensure everyone is on the same page as far as identifying which cows are on heat.

Know the importance of heat detection.

Calculating the cost of a missed heat

Poor heat detection can be costly to your farming business.

The cost of a missed heat can be easily calculated using the following equation. Beyond the financial impact, there is also the added cost of cows calving later than expected, leaving less time to recover and get back in-calf early the following season.

Additional days in milk

(days in oestrous cycle – 21 on average)

x

Production

(Litres or kgMS)

x

Payout

(\$)

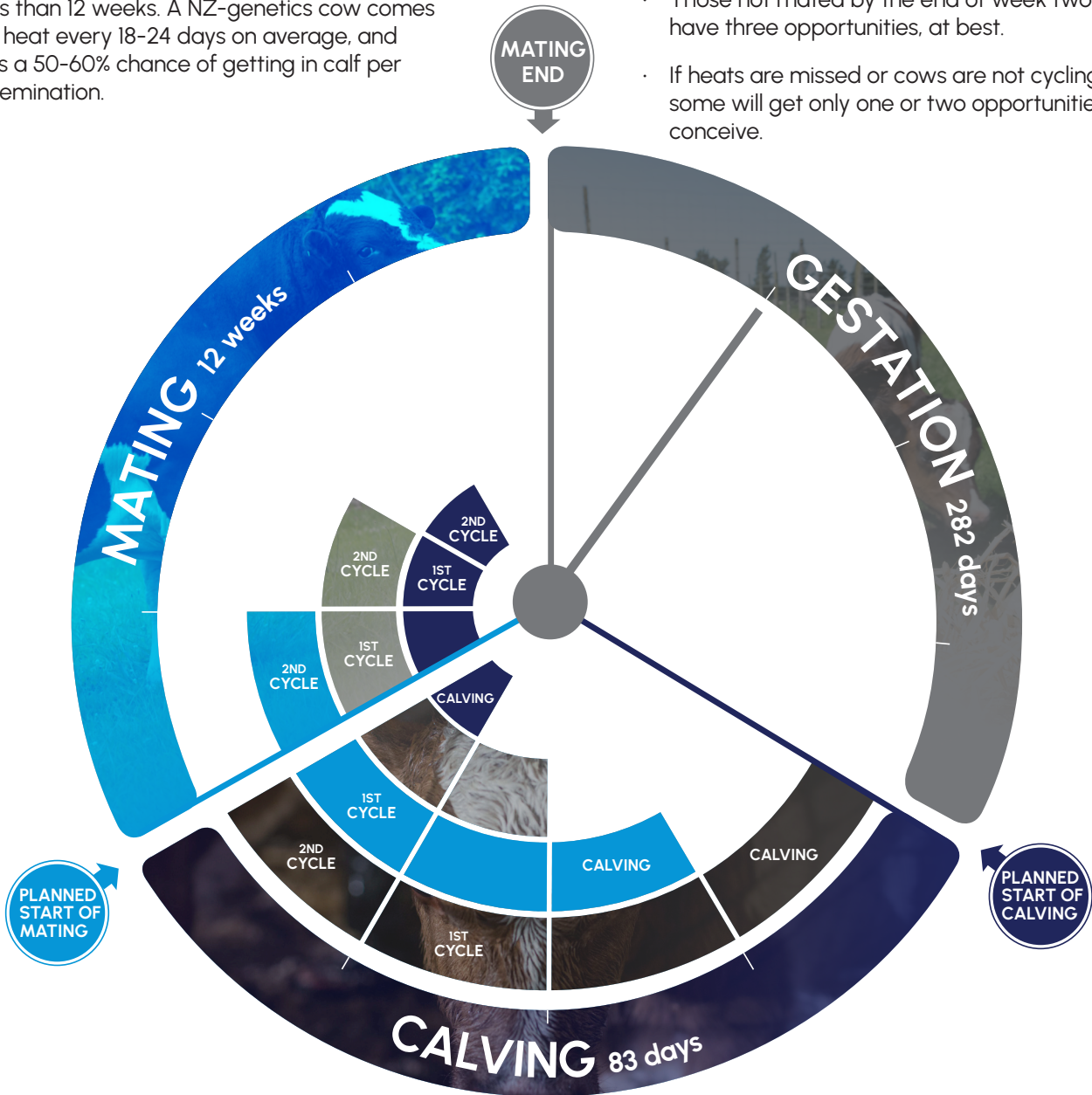
'Race against time' for block calving cows

In block calving systems, cows are in a race against time. There are 12 weeks between the start of calving and start of mating, meaning cows need to calve, resume cycling, be mated and conceive within 12 weeks to retain a 365 day calving interval.

This effectively limits the mating period to less than 12 weeks. A NZ-genetics cow comes on heat every 18-24 days on average, and has a 50-60% chance of getting in calf per insemination.

With many New Zealand farms having a mating period length of around 11 weeks, there are a limited number of opportunities to get in calf. In such a herd:

- Cows mated in the first two weeks of mating will get up to four opportunities.
- Those not mated by the end of week two only have three opportunities, at best.
- If heats are missed or cows are not cycling, some will get only one or two opportunities to conceive.



EARLY CALVERS:
FIRST 3 WEEKS
(Should cycle twice before PSM)

LATE CALVERS:
THIRD 3 WEEKS
(Likely to have their first cycle after PSM)

MID CALVERS:
SECOND 3 WEEKS
(Should cycle once before PSM)

VERY LATE CALVERS:
FOURTH 3 WEEKS
(Possibly only cycle once during AB)

Oestrous cycles

Standing heats last for about 12-18 hours in cattle (range 2-28 hours), with ovulation occurring, on average, around 28 hours after the start of standing heat. While most cows are easy to pick on heat, a percentage of them can be quite difficult. It is important to have a system in place to help detect the more difficult cows, such as paddock checks and secondary heat detection aids.

It is likely you know the signs of heat, decision-making points and your farm mating and recording processes well.

Does everyone else on your team know it as well as you?

Useful information is available on the DairyNZ website: **Cow Reproduction and Mating Overview**

<https://www.dairynz.co.nz/animal/cow-reproduction-and-mating/cow-reproduction-and-mating-overview/>

Missed heats and invented heats

High levels of heat detection efficiency lead to better conception rates. The more cows you identify on heat and successfully mate, the higher the pregnancy rate will be.

Two types of heat detection efficiency errors occur:

- Heats can be missed
- Heats can be falsely identified i.e. 'invented'

The missed heat is the more costly error to the farmer as it results in 21 lost days in milk next season, later-born calves and less recovery time for the cow before the following mating period commences. Invented heats costs include wasted semen and studies show it can risk pregnancy loss in $\geq 15\%$ of pregnant cows.

Insemination of a cycling cow should result in a greater than 50% conception rate, whereas a missed heat or an invented heat has a 0% chance of conception!

Successful heat detection systems involve careful observation, the effective use of heat detection aids and good drafting, mating and recording processes.

What to do if you are unsure

It is not always clear-cut, but these simple guidelines can help.

If you see the cow standing to be mounted or with a fully activated heat detection aid, you can assume she is on heat.

If you are unsure, you can:

Draft her out with the other bulling cows and take time to look for further signs. Is she interested in the sexually active group?

- Check when she was last on heat. If she has good secondary signs of heat and was last mated 18-24 days ago, you could inseminate her.
- If she has not been mated before you could mate her, but record a (?) beside the mating on your chart for future reference.
- If her last mating was < 18 days before, but was marked with (?) and you are more certain of heat this time, mate her.
- Paddock-check records may give you additional information.

Watch out for heat detection fatigue

Fatigue can occur, especially after several weeks of heat detection. Heat detection becomes more difficult as:

- Fewer sexually active cows will mean less mounting activity.
- Other workload demands can divert staff focus at a busy time of year.
- People tire after a long period of focus, especially if they were recording pre-mating heats as well.

What are your strategies to help monitor performance, encourage concerns to be raised early and to keep staff fresh and focused?



Part 4 - Flasks

Semen flask storage & care

Proper storage and care of your semen storage flask will ensure many years of ongoing reliable service and that your semen straws remain viable until retrieved for mating.

Liquid nitrogen maintenance

Ensure your semen flask is full of liquid nitrogen when delivered.

As evaporation rates vary depending on how often the flask is opened, it is important to always refit the flask neck cork and to check the liquid nitrogen level each day.

Lower the measuring dip stick to the bottom of the flask and allow it to cool. Withdraw the dip stick and read the level of frost, indicating nitrogen level.

Contact your liquid nitrogen supplier as the level approaches 10cm on the dip stick to arrange a top up.

Location

Locate your flask in a well-lit and ventilated area, ideally in the immediate vicinity of where you will load the AI applicators, inside the parlour office or vet room is best.

While it may be tempting to keep your flask in the parlour or where your bulk tank is housed, we advise against these locations because of the high moisture levels and the use of sanitation chemicals in the area. If you are unlucky, an escaped cow could also knock the flask over.

Ensure there is sufficient light above the flask so you can see well down into the neck tube, allowing reference to the frost line when retrieving straws.

It is important your flask is not placed directly on concrete, as moisture, minerals and abrasion from the concrete can corrode the aluminium outer shell. Use a wooden pallet or a couple of boards of dimensions about 5 x 10 x 50 cm (H x W x L) to raise your flask off the floor.

Specially designed lockable storage boxes, both wooden and plastic, can be purchased or built to store your flask securely and safely.

Keep the flask locked when not in use, for your own security and to prevent potential serious injury to others, including children.

Cleaning

Keep your flask clean and dry. If necessary, you may clean the flask exterior with mild soap and water, rinse carefully. It is important to avoid getting water down into the neck cork as this can freeze the neck cork solidly in place, not allowing nitrogen gas to escape. The build-up in pressure can rupture the flask with disastrous results.



Moving the flask

Handle the flask as little as possible - place it where needed and leave it there. If it must be moved, lift using both handles to keep it relatively level, and get assistance for longer distances, as a full flask weighs about 28 kg.

Avoid rough handling or dropping, as this can damage the seal between the neck tube and inner liner, resulting in vacuum loss.

Signs of failure include rapid frost build-up around the outside of the neck tube. If this is observed, transfer the semen inventory to another flask as soon as possible, as the affected flask may dry within hours.

Semen stock & delivery

If your flask is held on farm, ensure it is full of liquid nitrogen well in advance of any semen deliveries.

Where possible ensure existing semen stock is consolidated to allow room for expected deliveries.

Clearly identify the storage location of each bull's semen on a reference sheet to enable the location to be quickly determined.

Transporting liquid nitrogen

Liquid nitrogen flasks must be securely tied down in the bed of a pick-up truck when transporting.

Flasks should come with the mandated safety labels fitted from the supplier.

Safety & first aid

Ensure adequate ventilation in the area where your flask is stored.

Keep a pair of safety glasses beside your flask and wear them. Liquid nitrogen can cause serious damage to your eyes.

Skin contact with liquid nitrogen will cause freezing of the tissue, much like severe frostbite. Flush the area with cool or lukewarm water. For severe burns or blisters, seek medical care immediately.

We recommend wearing suitable protective gloves when skin contact with liquid nitrogen is likely, especially when topping up the liquid nitrogen level.

In a spill situation, nitrogen becomes a gas and displaces oxygen. Any person exposed to a spill may display symptoms of oxygen deficiency - headache, dizziness and eventual unconsciousness. CPR must be performed quickly on a person found in this state.

Part 5 - AI Loading & Insemination

Protect the semen.

The success of your AI mating season starts at your flask. Correct semen handling procedures from flask to cow are critical for good conception rates.

Your cows will not get in-calf if you compromise the semen, no matter how good your heat detection or insemination skills may be.



Equipment & Consumables

Ensure all your AI equipment is clean and ready to load and that you have the required consumables on hand and ready to go.

Once the straw is cut and loaded, you will need to inseminate the nominated cow without delay.

Ensure your flask and thawing pot are set up in a logical sequence to minimise the transition and exposure to atmosphere time from flask to thawing pot.

Identifying & Retrieving Straws

The use of cryogenics enables bull semen to be stored indefinitely in liquid nitrogen at temperatures of -195°C .

When exposed to temperatures warmer than -75°C , damage can occur to the semen in a matter of seconds, compromising sperm viability and subsequent conception rates.

Identify the location of the required straw/s from the inventory list you prepared earlier.

There is a visible frost line located 4 inches below the top of the flask neck tube.

Raise the canister no higher than the frost line and retrieve the required straw/s with the tweezers.

Using tweezers instead of your fingers reduces the temptation to raise the canister above the frost line, reduces the cold burn effect to your skin and keeps the straw frozen for longer.

It is advisable to initially retrieve and thaw only one straw so that you can confirm it is the correct bull before retrieving additional straws.

If you are unable to retrieve the required straw/s within 10 seconds, lower the canister to the bottom of the flask and allow the contents to chill for 20 seconds.

Thawing

Only thaw as many straws as you can confidently inseminate within a 10-minute window of thawing for

conventional straws and 5 minutes for sexed semen straws.

Flick the straw immediately following its removal from the flask to dislodge any retained liquid nitrogen before placing it into the thawing pot.

This can help to prevent the plug blowing out.

Every effort should be taken to minimise the exposure time to the atmosphere during the transition from flask to thawing pot.

Thaw straws in water at ambient temperature or in a heated thawing pot for at least 30 seconds.

Exposure above

-75°C can damage semen within seconds

Consult your semen supply company for their specific thawing recommendations.

This is especially applicable for sexed semen straws. Avoid temperature fluctuations between loading and insemination.

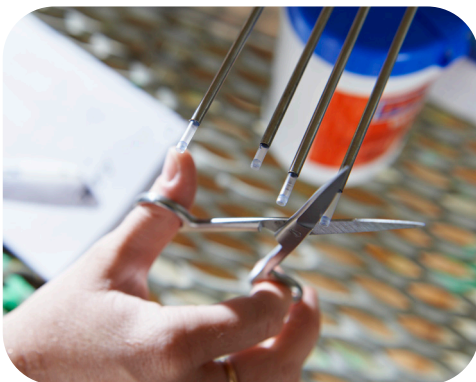
If in any doubt, reconfirm recommendations prior to the start of mating.



Loading

Only handle the straw by the crimped end, to minimise temperature fluctuations.

On removing the straw from the thawing jar, flick gently to remove water and then gently wipe the straw dry with an insemination wipe or paper towel. Any exposure to water can compromise semen viability.



When dry, load the straw into the prepared AI applicator and cut it at right angles with sharp scissors in the air space within the end of the straw. Cover immediately with a fresh sheath.

Hold the loaded AI applicator upright (vertically) and gently prime it by advancing the plunger until the semen reaches the tip of the straw, ensuring any trapped air is expelled.

Protection & hygiene

Remember that from now on it is critical to protect the straws in your loaded AI applicators.

- Keep the loaded applicators free of contamination and out of direct sunlight. Placing them inside a new AI glove will help achieve this.
- As always, clean your scissors between bulls/breeds by wiping them with an insemination wipe to eliminate cross contamination.

Wipe down your equipment with isopropyl alcohol wipes after finishing AI to keep them clean. Regularly remove the AI applicator plunger and clean.



DIY AI Technicians carry their AI applicators in a wide variety of ways.

Think about how you carry yours.

Are you ensuring the best possible hygienic protection for the semen?



Insemination

Patience, practice and proper hygiene are the keys to artificial insemination success.

Work with the cow and not against her. Remain calm and relaxed and she will usually do the same for you.

Key steps:

- Wipe the lips of the cow's vulva clean of lube, mucus, dirt and faeces using a clean paper towel or wipe.
- Put on your AI glove and lubricate well. Gently insert your hand into the rectum by forming a cone with your fingers.
- Guide the AI applicator to the entrance of the cervix.
- Using the hand in the rectum, gently manipulate the cervix onto the AI applicator.

Ensure a clean entry through the vulva can be made with the AI applicator. You can open the lips by gently rolling your left fist down and backwards in the rectum.

Direct the AI applicator upwards at an angle of 45° to avoid entering the urethra.

Follow the progress of the AI applicator with your hand in the rectum.

Do not push your hand towards the cervix ahead of the AI applicator.

Gently work the AI applicator into the start of the cervix at the OS, often felt as a gritty sensation on the tip of the AI applicator.

With your left hand manipulate the cervix onto the AI applicator while maintaining a slight forward pressure on the AI applicator.

You should feel a release in resistance as the AI applicator just passes through the cervix and into the uterus.

Roll your left hand over the cervix and with forefinger (at 90 degrees) gently check for correct placement of the AI applicator tip, 1mm into the uterus.

If positioning is correct, slowly and steadily push the plunger in to deposit all the semen into the body of the uterus just through the cervix.

Wait momentarily before slowly withdrawing the AI applicator and then your left arm.

Executing the insemination process efficiently reaps the rewards of all your hard work getting the cow to that point.



Part 6 - Records, Monitoring & Review

Mating records

The record keeping you take throughout this season's mating will be key to accurately assessing your mating results and your ability to identify potential improvements for next season.

Accurately record all AI and natural mating details against each cow as soon as possible after serving.

Each AI semen straw has details printed on it including: Bull name, Bull code and batch number.

Monitor your three-week submission rate.

This is the percentage of the herd that have received one AI insemination over the three-week period.

Industry targets are 30% for of the herd per week, assuming no synchronisation programmes.

- Week 1 = 30%
- Week 2 = 60%
- Week 3 = 90%

Non-return Rate (NRR) and Conception Rate

Both non-return rate and AI conception rate can be used when assessing the success of the AI period.

- Cows that do not return to heat by day 24 after insemination are assumed to be pregnant and are called non-returns. The percentage of inseminations that do not return to heat is the non-return rate.
- Foetal ageing of pregnancies is necessary for conception rate calculations. The percentage of inseminations that result in a corresponding foetal-aged pregnancy is the conception rate.

Non-return rate information is available earlier than conception rate information. Both measures need to be interpreted with caution as many factors other than AI practices can influence results.

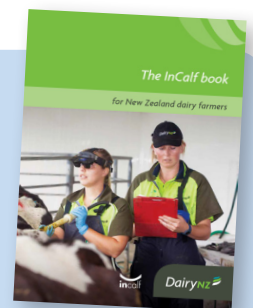
As a general rule, if the 2-24 day NRR is below 64% or the conception rate below 53%, further investigation is warranted.

The InCalf book for New Zealand Dairy farmers, recommends*:

'If you are a DIY technician a disadvantage is that, if the non-return rate or conception rate is low, it is difficult to determine whether your technique needs improving or whether factors other than insemination technique are reducing the conception rate.'

**(2017) page 121*

If you have any doubt, you should consider an insemination refresher course or have a professional technician do half the inseminations and compare your results. You will need at least 50 inseminations each to get a valid comparison.'



Note:

- Accurately record the identification numbers and dates of any cows returning for subsequent AI inseminations. You can start to monitor your non-return rate from day 28 onwards, which allows for 4 days of returns after day 24.
- You should have at least 50 eligible inseminations and ideally more than 7 days of returns included to gauge performance (i.e. at least 32 days of AI have occurred).
- Assess AI inseminations and AI period returns only. Returns recorded during the natural mating period are considered unreliable and are often under-estimated when bulls are working outdoors in a herd at pasture. It is easy to miss bull matings - some days as many as half of them can go undetected.
- Remember the NRR figure can fluctuate greatly over time and the more days of return information included the more representative the figure will be. 18-24 day NRR is usually higher than 2-24 day NRR because only heats that return in the 18-24 day window are considered.

Targets

- 2-24 Day NRR target > 64%
- 18-24 day NRR target > 70% (excluding sexed semen)
- Conception rate target > 52%

NON-RETURN RATE CALCULATION %

(Eligible Matings - Eligible Returns)	x 100
Eligible Matings	

Returns Interval Analysis % of Returns

This is a useful tool for analysing your pattern of returns and can be helpful in assessing heat detection accuracy.

TOTAL NUMBER OF RETURNS	TARGET (%)	100 RETURNS (%)
Short Returns (1-17 days) %	< 13	13
Normal Returns (18-24 days) %	<= 69	69
Long Returns (24+ days) %	< 18	18

Submission Rate of Early Calved Mature Cows

Heat detection efficiency can be assessed using the 3-week submission rate of early-calved mature cows. This is the percentage of early aged mature cows, (cows aged >3 years and calved within the first 28 days from the planned start of calving), that were submitted in the first 3 weeks of mating. The target is 95%.

Assess your herd's mating performance:

How was your submission rate?

What was your non-return rate percentage?

What does your return interval analysis tell you about your herd and heat detection?

What percentage of early-calved mature cows were submitted?

Spend the time to ensure the herd data you record is accurate and seek professional advice to help interpret results.

Here at LIC, we are always working on how we can help farmers make small improvements day in and day out. And just like you, we strive to do better in everything we do. Together we can deliver improvement on farm, better than ever before.

DIY AI MATING CHECKLIST:

- Semen ordered
- Semen supply company specific thawing recommendations on hand
- Facilities ready - refer page 3
- Loading area clean, away from direct sunlight, rain, dust or pungent chemicals
- Flask ready - refer page 3
- Consumables on hand - refer page 3 &4
- AI equipment clean and ready to load
- Are you set to record matings:
notebook, mating chart, electronically.
Refer to page 4
- Have you ordered your heat
detection aids - refer page 6



