

Section 7



Dairy Cow Reproduction

by Stephen Butler



Introduction

In a spring calving herd, cows should calve close to the time when grass begins to grow rapidly. This will maximise production from grazed grass, by far the most profitable feedstuff. If most of the herd calve within a compact period of six to eight weeks, farmers will have more time to focus on general herd management.

- 1 What is the benefit of compact calving?
- 2 How do I improve my herd's calving pattern?
- 3 How should I manage maiden heifers?
- 4 What should I include in a breeding plan for a compact calving season?
- 5 What can I do to ensure a successful breeding period?
- 6 How can I best identify and deal with problem cows?
- 7 What feed issues are important during the dry period and early post-calving?

Dairy Cow Reproduction

1 What is the benefit of compact calving?

Key fact

A cow calving in May will generate €400 less profit than a cow calving in February, due to higher feed costs and reduced yield. For every 100 cows, compact calving is worth on average €10,000 – €12,000 (€100 – €120 per cow/year).

2 How do I improve my herd's calving pattern?

Key fact

The first step is to generate large numbers of early calving heifers. Then cull late calvers. To simply maintain the herd you must have 25 heifers entering the herd per 100 cows. To improve the calving pattern 30+ heifers must be entering the herd.

Key considerations

- Achieving a compact calving pattern is not easy, and will require sustained effort over a number of years.
- A compact calving pattern allows calving and breeding tasks to be clearly separated, allowing you to concentrate on one job at a time and achieve better results for both.
- Doing AI yourself has advantages and disadvantages. It can save money and increase flexibility but it can also be time consuming.

3 How should I manage maiden heifers?

Maiden heifers should be managed and bred to calve at the very start of the calving period. This will maximise their chances of staying in the herd for longer and increase their lifetime productive performance. This is only possible if heifers have reached puberty (i.e., have commenced cycling normally) by mating start date (MSD). Puberty in heifers is closely linked to body weight and body condition score.

Why use AI on maiden heifers?

1. They are high fertility animals.
2. They are the highest genetic merit animals.
3. You will be producing early calved heifer replacements from heifers.

4. It is easier to get earlier compact calving with AI than with bulls.

Heifer synchronisation

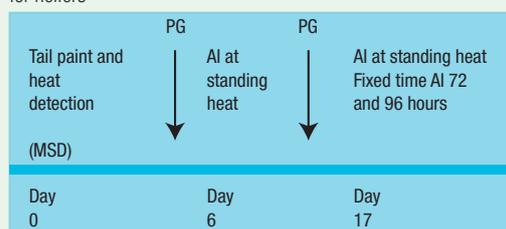
Synchronisation should be used as a management tool to maximise the number of heifers that become pregnant as quickly as possible after MSD. The most popular and cost-effective synchronisation protocols for heifers involve intramuscular injections of prostaglandin. Synchronisation protocols work very well for heifers that have started cycling, but will not work in non-cycling heifers. Heifers must reach target weights outlined in the chapter on heifer rearing.

How to

Synchronise heifers:

- On MSD, tail paint all heifers and inseminate following observation of heat during the first six days of the breeding season.
- All heifers not inseminated in the first six days receive a prostaglandin injection on day six and are inseminated following observation of heat in the next 3–5 days.
- Heifers that failed to come into heat following the first injection of prostaglandin receive a second injection 11 days later (i.e. on day 17).
- Heifers are again inseminated at a standing heat, or receive fixed time AI at 72 and 96 hours after the second injection.
- This protocol generally results in submission rates close to 100% and conception rates to first service of 70%.
- Heifers should be inseminated to a high EBI easy-calving AI bull.
- If possible, observe for repeat heats, and again inseminate to a high EBI easy-calving AI bull.
- Once the period of AI use is over, introduce an easy-calving stock bull.

Overview of prostaglandin (PG)-based synchronisation protocol for heifers





4 What should I include in a breeding plan for a compact calving season?

For most spring calving systems, the breeding season will begin between mid-April and the first week of May. Choose your MSD so calving the following spring coincides with planned turn-out to pasture. After MSD, the aim is to get as many cows pregnant as quickly as possible. The breeding season can be divided into three periods: pre-breeding, AI use and natural service bulls.

Table 1. Effect of submission rate and conception rate on % herd in-calf in the first six weeks

		Conception Rate (%)			
		60	50	40	30
Submission Rate (%)	90	79	70	59	47
	80	73	64	54	42
	70	66	58	48	38
	60	59	51	42	33

Pre-breeding heat detection

Pre-breeding heat detection should begin four weeks before the planned MSD. This is a good time to improve heat detection skills, to train new staff to correctly identify cows in heat, or to try alternative heat detection aids. All heats should be recorded.

By mating start date (MSD), you will be able to anticipate when cycling cows will next come on heat (i.e. week 1, 2 or 3 of the breeding season), and you will also have a list of all cows that have not yet been seen in heat.

- Apply tail paint of one colour (e.g. red) to all milking cows 28 days before the planned mating start date. Apply red paint to late calvers as they enter the milking group.
- Check the tail paint on all milking cows **twice weekly** until MSD. Depending on weather/rain conditions, cows may need to be topped up with red paint.
- Record all cows that have had tail paint removed through mounting, and paint with a different colour (e.g. green).
- At MSD, any cows with red paint are unlikely to have been in heat during the preceding 28 days. Cows with green paint have been in heat at least once during the same period.

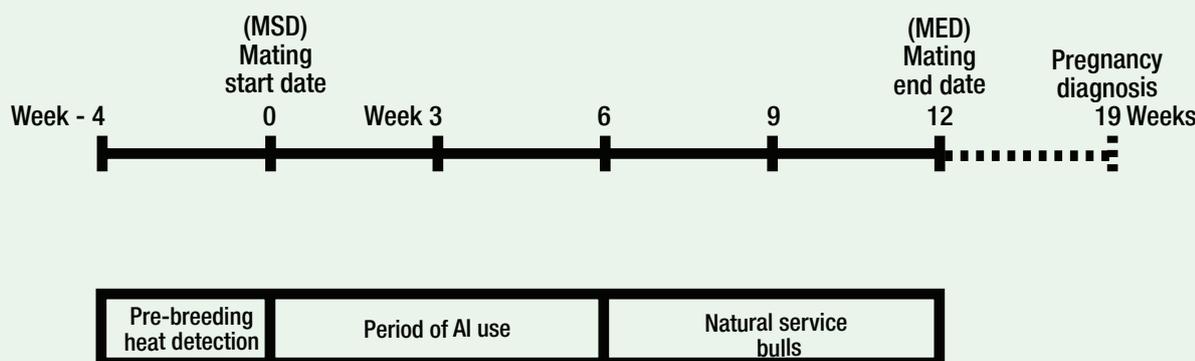
5 What can I do to ensure a successful breeding period?

Once breeding begins:

From MSD onwards, heat detection efforts need to be stepped up for the period of AI use, which should be at least six weeks.

- Observe cows for at least three periods of 30 minutes each day, ideally this should take place when cows are generally inactive (i.e. lying down, ruminating). This improves the chances of spotting restless cows that are more likely to be in heat. Two hours after the morning milking, early afternoon, and again at two hours after the evening milking are ideal times for heat detection.

Figure 1. Breeding programme for compact calving.



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- Switch to a new colour paint after cows have been inseminated (e.g. blue). This will allow you to rapidly get a picture of how your submission rates are progressing.
- Cows with blue paint have been inseminated.
- Cows with green paint were detected in heat before MSD and you should know roughly when to expect them to return to heat.
- Cows with red paint have not yet been inseminated and have not been observed in heat.



- If possible, rotate the bulls used with the cows. After a week of activity, libido will be restored by resting for several days.
- Where herd size allows, keep more than one bull with the milking herd at a time.
- Monitor bulls carefully for signs of body condition loss, lameness, lethargy, etc.
- Observe bulls to ensure that they are serving correctly.
- Foot-bath bulls.
- Be safety conscious – ensure bull management protocols are followed.

How to Review reproductive performance

Reproductive performance should be reviewed periodically throughout the breeding season. For each animal, record on a breeding chart age, number, date calved, pre-breeding heat date, first service date and bull used, second service and bull used and calving difficulties (see ICBF Chart below). We will focus on the key time-points identified for reviewing reproductive performance in Figure 1.

How to Ensure success with bulls

Make sure bulls are in good body condition, and have reached the correct body weight for their breed and age well in advance of the breeding season. Purchased bulls should be sourced from clean herds, screened for infectious diseases, and vaccinated with the same vaccination programme as the cows. Buy bulls at least 2-3 months in advance of when you plan to use them.

- The number of bulls required will depend on (i) herd size; and (ii) the proportion of the herd already pregnant to AI.
- For a 100 cow herd, with AI for six weeks resulting in approximately 50-70% of the herd in-calf, at least two bulls will be required. If fewer than half of the herd is in-calf after six weeks of AI, three bulls will be required.

1. **Mating start date.** Based on pre-breeding heat detection results, you will know if your herd is hitting the target for proportion of the herd cycling by MSD. If the proportion of the herd cycling is lower than 70%, it is unlikely that the three-week submission rate target of 90% will be met. Also, look at what proportion of the herd have yet to calve at MSD. The target should be all cows calved. If more than one in ten have yet to calve, it will not be possible to achieve a compact calving pattern.
2. **Three weeks after MSD.** Review your submission rate. The target figure is 90%. Achieving a high three-week submission rate is a critical driver of fertility performance in seasonal calving systems.
3. **Six weeks after MSD.** All cows should have been bred to AI at least once (with repeats served more than once).

Cow Tag		Cow FB	Cow EB (E)	Milk (E)	Fert (E)	Cow's Site	Mil Grand Size	Lact No.	Date Calved	Calv EA	Proposed Bulls	Service Information								
											Bull 1	Bull 2	Bull 3	Pre-serve Heat	First	Second	Third	Fourth	Preg Test Result	
											Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
8E2104442034	704	106	19	72	RD31	GRV	4	05FEB11	1	BY2	OK	OK								
8E2104442036	706	78	23	34	DRC	PLD	4	02FEB11	1	SOX	OK	OK								
8E2104442035	715	48	11	37	RD31	JCA	3			OK	OK	OK								
8E2104442041	741	89	23	31	RD31	GRV	4	05MAR11		OK	OK	OK								
8E2104442040	749	28	15	13	RD31	ANN	2			LLX	OK	OK								
8E2104442042	752	37	31	19	RD31	ROO	3	24FEB11	1	RY2	OK	OK								

4. Mating end date. For a compact calving pattern next year, the breeding period this year should stop after 12–13 weeks of breeding. On many farms breeding periods last 3–4 weeks longer than this. The length of the breeding season is a compromise between the duration of the calving period next spring and the empty rate at the end of this year. Ideally, bull activity will be minimal by 12 weeks into the breeding season. If bulls are still active, it may be necessary to extend the breeding season. Target reducing the duration of the breeding season by one or two weeks per year until you have a breeding season of 12 weeks or less.

If you fail to meet the targets ask the following questions:

- Have all cows calved by MSD?
- What was the herd average Body Condition Score at MSD?
- Have you used tail paint effectively?
- Are you spending enough time detecting heat?

Key Performance Indicator



Pregnancy testing

The herd should be pregnancy tested approximately 5–7 weeks after mating end date (MED).

- confirm pregnancies for cows with AI dates early in the breeding season;
- confirm pregnancies for cows that became pregnant to the bull, and allow an estimate of the stage of the pregnancy and expected calving date;
- identify non-pregnant cows. The target for proportion of cows not-pregnant at the final pregnancy diagnosis is <10%. Based on the results of the pregnancy diagnosis, the six-week in calf rate should also be calculated. This is calculated by counting the number of cows that became pregnant in the first six weeks of the breeding season and dividing by the number of breeding cows in the herd. The target for compact calving systems is >70%.

6 How can I best identify and deal with problem cows?

Key performance Indicators



When to get worried about a cow

On every farm, a proportion of cows will be anoestrous (i.e., not displaying behavioural heat) at the start of the breeding period. The return to normal cyclic ovarian activity usually occurs by 30 to 35 days after giving birth. The first heat is often silent, and the first cycle after this heat is usually short (8–12 days). This means that most cows should have displayed behavioural heat by 38–47 days post-calving or earlier.

Failure to show signs of heat by 60 days after calving is called **postpartum anoestrus**. This can be due to either **true anoestrus** or **suboestrus**.

- Suboestrus is when cows have normal cyclic ovarian activity, but are not detected in heat due to weak or silent heats, or due to inadequate observation.
- True anoestrus is when cows have inactive ovaries.

How to



Trouble-shoot breeding problems

Genetic, management and husbandry factors can contribute to poor cow fertility. Some key areas are outlined below:

- Examine the genetic merit of the herd. What is the herd average EBI and the average fertility sub-index? This can be easily assessed using ICBF reports.
- Examine body condition score (BCS). The target herd average BCS at MSD is 2.9. If the cows that have not been seen cycling have low BCS, improve their energy status by increasing grass allowance and/or concentrate supplementation. Alternatively, consider reducing milking frequency to once a day for cows below target BCS.
- Is the diet properly balanced for energy, protein and minerals? Are grazing conditions adequate to allow the necessary grass intake?
- What is the health status of the herd? Were there problems with calving difficulty, retained membranes, metritis? If so, examine the cows that had problems and treat as necessary.

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- Are there infectious disease problems on the farm (BVD, IBR, leptospirosis, salmonella, neospora, mycoplasma, etc.)? Find out the disease status of your herd. Any necessary vaccinations should be carried out well in advance of the breeding season according to the manufacturer's guidelines. Use strict biosecurity to minimise risk of introducing disease.
- Is mastitis or lameness a problem? These can have a negative effect on fertility.

How to Solve weak/silent heats

Dealing with weak/silent heats should include: improving heat detection technique, and ensuring that observation periods are long enough (30 minutes) and frequent enough (3–4 times per day). Resumption of ovarian cyclicity after calving is influenced by nutritional status, BCS, milk yield, calving difficulty, uterine infection, breed, age, and concurrent disease.

How to Solve non-cycling cows

First examine nutritional status and body condition score. Cows have a much better chance of resuming normal ovarian cycles at BCS 2.75 or greater and on a rising plane of nutrition. Body condition score can be improved by increasing pasture allowance, increasing concentrate feeding, and/or reducing the energy output in milk by restricting non-cycling cows to once a day milking until they have been bred or confirmed pregnant.

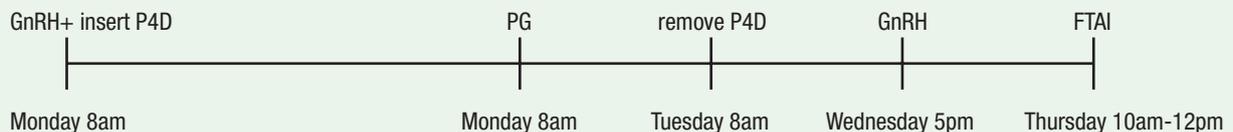
Synchronise non-cycling cows using hormones

Hormone treatments can be used to stimulate resumption of cyclicity, and are most effective if combined with increased energy intake.

The treatment outlined in Figure 2 stimulates a return to ovarian cyclicity, and also facilitates fixed-time AI (FTAI) at the end of the hormone protocol. Fixed-time AI means there is no requirement for heat behaviour, and hence heat detection is not required.

In the illustration, the protocol starts on a Monday and finishes with insemination 10 days later on a Thursday. GnRH = Gonadotropin releasing hormone; P4D = intravaginal progesterone releasing device (CIDR or PRID); PG = Prostaglandin; FTAI = fixed-time AI.

Figure 2. How to synchronise anoestrus cows using hormones



7 What feed issues are important during the dry period and early post-calving?

Setting cows up for good reproductive performance begins before calving. One of the most important factors that regulate fertility is body condition score (BCS). See also nutrition chapter.

Managing cows during the dry period and early post-calving
Setting cows up for good reproductive performance begins before calving. One of the most important factors that regulate fertility is body condition score (BCS), with values ranging from 1 (extremely thin) to 5 (obese).

Key targets for BCS	Average	Range
Dry-off	3.00	2.75-3.25
Calving	3.25	3.00-3.50
Start of breeding	2.90	2.75-3.25

- Cows should gain very little during the dry period, and hence should be close to the desired BCS at dry-off.
- Avoid over-conditioning of cows during the dry period.
- Cows with excessive BCS at parturition will lose a lot of condition after calving.
- Cows that are too thin at calving will also be too thin at MSD, and will have poor reproductive performance.

Key Risks



- Where silage only is being fed during the dry period, ensure that quality and quantity allowed are adequate for targeted BCS (and weight) gain. If inadequate, supplement with concentrate.
- Feed cows in early lactation to minimise BCS loss.
- The main trace mineral deficiencies that occur in Ireland are copper, selenium and iodine, with a lower prevalence of zinc, manganese and cobalt deficiencies. Deficiencies of these minerals are associated with poor reproductive performance, and also reduced milk production. Molybdenum also plays an indirect role, because high levels of molybdenum reduce the absorption of dietary copper.
- Ensure that all cows are fed dry cow minerals during the dry period, and supplemental trace minerals are fed during lactation, especially where pasture and other feeds used on the farm are marginal or deficient.

See nutrition chapter for further details on herd nutritional management.

