

## Setting directions

---

### Key actions

- Assess the fertility and fecundity of your herd using body condition scoring and for calves liveweight.
- Consider early weaning, primarily for the cow's welfare and promote re-conception.
- Select healthy, fertile bulls for mating to achieve good conception rates.
- Maintain the best herd structure suited to the environment, natural resource/feedbase and climatic conditions.

### Why is herd management and weaner throughput important?

Sales from a beef business include stock bred on the property, cull cows and any purchased trading stock. Increasing the number of cattle sold each year has a major impact on the profitability of arid zone beef enterprises.

#### **Increase throughput to increase profit.**

There are two main components of weaner throughput:

1. Number of weaners produced and the total saleable kilograms of product from the enterprise.
2. Carrying capacity of the land and vegetation resources and the stocking rate applied (discussed in **Module 1: Setting directions**, **Module 2: Managing your feedbase** and **Module 3: Managing your natural resources**).

However, the primary factor influencing beef cattle production in the low rainfall arid zone is the highly variable pasture availability experienced in the zone, there is no regular seasonal pattern making it unreliable and unpredictable. This can make it difficult to produce to consistent production targets (such as lines of weaners) within each season, and season after season.

Standing pasture can vary from very low amounts with very low nutritive value to being so abundant that it cannot be consumed by livestock. Managing consistent production targets under such conditions can be difficult so grazing management has traditionally relied on using conservative stocking rates.

Some herd management strategies in low and/or highly variable rainfall zones to help improve productivity include:

- a limited joining period for heifers, to set them up for calving at the most suitable time of the year and then continuous mating from the second joining onwards. This reduces operational costs (mustering to add or remove bulls) and increases overall calf production in an environment where predicting the timing of peak cow condition each year is very difficult.
- a continuous mating approach in extensive areas where rainfall and pasture growth is uncertain. It is still possible for many cows to achieve weaning one calf per year but any extended dry period reduces the number of individuals achieving this.
- selection of healthy, fertile bulls for mating to achieve normal conception rates and a condensed calving pattern/period.
- supervise calving for maiden/first calf heifers, to increase the number of live calves born. The time and expense of monitoring all calving in an extensive pastoral grazing situation with continuous mating is not feasible. Cows in extensive grazing conditions that have difficulty calving and are not monitored are unlikely to survive.
- culling cows that are neither lactating nor pregnant at weaning is a useful approach to remove low productivity breeders from the herd. However, culling a cow for failing to rear a calf, when the failure is because of the arid zone environment (that is, due to the combination of herd management and prevailing seasonal conditions) will not increase the long term productivity of the herd. In fact, many highly productive animals can be unnecessarily culled if this culling criteria are strictly applied.
- use age, weight and body condition scoring of cows as indicators for earlier weaning.
- aim to wean calves when the efficiency of pasture use is greater for the calf alone than the cow-calf combination. The time of the year is also important in weaning decisions. Handling and weaning calves during the hot summer months must be avoided where possible. At these times, high mortality rates can eliminate any economic advantage of early weaning.
- use yard weaning to lift cattle productivity. Yard weaning is not a well-defined practice in the arid zone and means different things to different producers but the general principles of reducing the impact of weaning (especially if the process of weaning includes dehorning, castrating and branding) have application due to the low rainfall experienced in the arid zone.
- use higher heifer retention rates to increase selection pressure on the cow herd.
- take advantage of periods of excess pasture growth following rainfall and/or floods by purchasing weaners/growing livestock.
- take advantage of restocking periods to improve the genetic composition of the herd.

### How does this module assist you?

This module will help you:

- increase the throughput of weaners bred on your property
- manage your culling strategy for weaner heifers and mature cows
- understand how nutrition drives fertility and allocation of energy to maintenance, growth and then reproduction in that order is the major

limiting factor

- recognise the biological constraints imposed on different stock classes and the allocation of a limited resource, such as feed, to the most sensitive stock, such as reproductive heifers and growing stock. This is especially important in relation to the arid zone where the predominantly native pastures are naturally low in energy, protein and phosphorus, definitely too low for optimal growth. This means that a cow feeding her calf will struggle to maintain body condition or if lactating may even lose weight and not survive.

### Linkages to other modules

The throughput of animals is also linked with issues discussed in **Module 1: Setting directions**, **Module 2: Managing your feedbase** and **Module 7: Meeting market specifications**.

Genetic improvement of fertility, mothering ability and growth are discussed in **Module 4: Cattle genetics**.

The management of common reproductive diseases that infect beef herds is outlined in **Module 6: Herd health and welfare**.

### Further information

*Weaner management in northern beef herds*

### Principles of herd management and weaner throughput

- Manage the herd to maximise fertility and weaner throughput.
- Match livestock requirements to pasture production by managing livestock feed consumption and allocating high quality (nutritious) pastures to maximise reproductive function and turnoff of sale cattle. (Note: if a calf is left on its mother during a dry, and non-growth, period for the pasture, the calf might grow faster but the cow is likely to be putting much of its nutrition into producing milk and will be losing weight and condition, reducing the likelihood of re-conception.)
- Weaning is the single most effective management tool available to look after the body condition of your breeding cows because weaning allows:
  - the cow to regain condition and have a better chance of producing a calf every year
  - young stock to be educated for easier management in the future.
- Manage weaner cattle after weaning to achieve target growth rates by maximising nutrition and manipulating feed allocation. This may include a period of yard weaning, followed by placement in the paddock with the best feed to ensure future performance.
- On occasion weaners may need to be allocated to new paddocks (particularly if they are large paddocks) with older, coacher cattle, who can show weaners the location of watering points and pastures.
- Where possible, return cows to the same paddock, or new paddocks with the same cohort of cows, after weaning. This is particularly important in large paddocks and with first calf heifers, as the animals will be familiar with the different land types and the location of watering points in that particular paddock. Consider coacher cattle if allocating animals to new paddocks.

### Procedures for herd management and weaner throughput

- Procedure 1 - Maximise the number of live calves per breeding female
- Procedure 2 - Wean as early as possible, without compromising calf growth rate
- Procedure 3 - Implement a female culling and replacement policy to maintain best herd structure

## Setting directions

Profitability in beef production is driven by stocking rate, carrying capacity and herd fertility which are all a function of feed quality (nutrition) and quantity.

### Fertility

Basic components of female fertility in the arid zone are:

- When available pasture permits target liveweights and body condition to be achieved, first calving as a 2 year old in the low rainfall arid zone can be accommodated. However, timing of first calving should be based on an assessment of heifer liveweight and body condition score targets rather than by a particular age to avoid breeder mortality. Young heifers calving during periods of low quality, or low availability, pasture and in low body condition may not conceive again for some time, may not gain sufficient body condition to support the second calf if she does conceive or may not survive.
- Conception occurs throughout the year, if continuously mating, but is often concentrated around periods of favourable pasture availability.
- Dystocia losses in two year old heifers should be minimised.
- Heifers should achieve liveweight and body condition targets at their first mating and subsequent calving. First calf heifers failing to conceive again quickly are one of the most inefficient parts of an extensive beef cattle herd.

### Nutrition

Nutrition is the key to understanding what really drives efficient reproduction.

The nutrition available from the native pasture is a major constraint on cattle production across the grazing lands of the arid zone, although there are considerable differences between regions, (see **Module 2; Managing your feedbase**).

To keep the cow in good condition, breeder and grazing management must match feed requirements to feed availability in terms of both quality and quantity. Planning involves management of the breeder herd, their nutritional demands and pasture quality.

Nutrition also influences the onset of puberty in heifers and the ability to exhibit oestrus (the recurring period of sexual receptivity and fertility, or being 'in heat') and then to get in calf quickly either as heifers or return to oestrus post calving in first calf heifers.

Adequate nutrition, principally energy, over and above maintenance and growth requirements is required to drive the onset of oestrus, in both young growing heifers and older cows. Older cattle that have no growth requirements can allocate more energy to reproductive processes than rapidly growing heifers that have high requirements of both energy and protein for growth.

Significant phosphorus deficiencies in arid pastures can also be a major limitation to reproduction by young heifers as this mineral is required in large quantities for bone development. Supplementation of phosphorus may be required and a key sign of phosphorus deficiency is if cattle are observed chewing bones.

The energy intake for pregnant heifers must be adequate to maintain growth for herself, and also the development of the uterus during pregnancy.

This requirement is around:

- 40MJ/day for maintenance
- 34MJ/day for each kilogram of body weight gained by the heifer during growth up to the point of calving.

The developing foetus requires:

- an extra 5MJ/day up to the fifth month of pregnancy
- 8MJ/day at six months pregnancy
- 11MJ/day at seven months
- 15MJ/day at eight months
- 20 MJ/day at nine months.

Table 1: Energy (MJ) and protein requirements per day for different livestock classes.

Breeder cows	350kg	400kg	450kg	500kg	550kg	Protein
Dry cow	48	52	57	61	66	6%

Pregnant, last 3 months	60	65	69	74	78	6%
Lactating cow and calf, 0-3 months	74	80	85	90	95	10-11%
Lactating cow and 150 kg calf	111	118	125	133	140	10-11%
<b>Growing cattle</b>	<b>150kg</b>	<b>200kg</b>	<b>300kg</b>	<b>400kg</b>	<b>500kg</b>	<b>Protein</b>
Maintenance	22	26	35	45	55	8%
Gaining 0.5 kg/day	37	44	57	71	82	10-12%
Gaining 1 kg/day	50	59	76	93	108	13%

Older cattle may have body reserves that can be used in times of energy deficit and the loss of 1kg of body weight will release around 29MJ of energy that can be allocated to the reproductive process over and above what has been consumed.

Dry cattle can gain weight rapidly as feed quality improves early in the growing season but lactating cows often only maintain, or may even lose, condition as they allocate nutrition to supporting a calf as well as restoring reproductive processes.

The key indicators of reproductive performance are body condition score for cows (see **Tool 5.02**) and liveweight for heifers (see **Tool 5.01**).

Body condition of the cow can be assessed on a scale of 0 to 5 with a body condition score (BCS) of 1 being poor, BCS 3 being moderate/store and a BCS 5 being fat. These scores are a good guide to the cow's reproductive potential. For example, a cow in:

- BCS 1-2 may have dormant ovaries and will probably not cycle and conceive again while lactating during the following growing season
- BCS 3 should start cycling soon after calving.
- BCS 5 has usually not reared a calf for some time and is a poor breeder.

To keep the cow in good condition, breeder and grazing management must match feed requirements to both feed availability and feed quality. Planning involves management of the breeder herds' nutritional demands and the quality of pasture. Breeder management strategies include:

- timing mating so that the calf's highest milk requirement in its second and third month is matched to peak pasture quality
- weaning to remove the nutritional stress on the cow as pasture quality declines
- supplementing to reduce specific diet deficiencies.

### Guidelines for heifer management and nutrition

Management for joining for first calving heifers and their subsequent performance is entirely governed by controlling the liveweight prior to their first pregnancy, through to pre-weaning, post-weaning and joining, and then from joining to calving.

#### Critical mating weight (CMW) for heifers

The concept of a target weight for joining that exceeds the weight required for the onset of puberty will ensure that all heifers are actively cycling and are fully fertile when first exposed to a bull. This will ensure that the maximum number of heifers conceive in the first oestrus cycle during the joining period.

#### Management of heifers from weaning to joining to reach Critical Mating Weight (CMW)

CMW is defined as the weight at which 85% of heifers fall pregnant over 45 days (two cycles).

- Fertility at first oestrus is 21% lower than the third oestrus so it is important to ensure all heifers are cycling in unison before mating.
- Selenium is important to reproductive efficiency and achieving high conception rates, (NB Selenium is naturally low in the native pasture plants of the arid zone).
- Maximise number of heifers to reach CMW 2-3 cycles before joining.

#### Importance of a tight calving span in heifers and cows

How a heifer calves in her first gestation in relation to the herd calving span, determines the relationship of that cow to the herd for the rest of her life. Heifers that calve early in the calving season often continue to do so for the rest of their life.

Tight calving spans allow even calf drops, even lines of sellable cattle, easier management, and use of labour, and a herd that consistently reproduces within a 365-day time frame.

## Management of heifers from joining to calving

- It is critical to keep heifers growing from joining to calving to obtain maximum pelvic size for the calving process.
- Heifer condition score and energy intake at calving determines the ability to return to oestrus and maintain a 365-day calving interval.
- Cattle with a low body condition score at calving and then poor nutrition post calving will fail to cycle.

### Use cow body condition scores and heifer liveweight as indicators of herd fertility

Genetics, as reflected through various EBVs, also has a minor role in breeding for herd fertility:

- Selecting sires with a high EBV for scrotal circumference results in earlier onset of puberty in their heifer progeny.
- The EBV which estimates the days to calving will also help to decrease the interval between calving and conception by decreasing the gestational length.
- Calving difficulties are reduced by selecting sires with a low score EBV for gestation length.
- A low EBV for birthweight will decrease calf size for that generation but cannot guarantee dystocia will be avoided, as most cases of dystocia are a result of a failure to maximise maternal pelvic size through poor nutritional management rather than birthweight. Managing nutrition is a far more immediate way to manage calving ease. Also in the long term if the heifer grows properly she should have easy calving in the future.
- If the phenotype of the herd, especially heifers, is high yielding with a larger mature body size, they tend to be mature later with a later onset of oestrus.

Manage fertility to maintain a calving interval <365 days

## Calving to conception interval

The time between calving and conception has a major impact on the overall reproductive performance of beef herds. To achieve the same calving period every year (ie. a 365-day calving interval), cows must mate and conceive by around day 82 after calving. This puts considerable nutritional demand on cows to return to oestrus and lactate.

If this 365-day interval is not maintained, over time the mean calving date will become later and as a result the calving period will change. This may mean more late calves are born, more will cows fail to join on the next joining and drop out empty. The late drop calves have less growing days to weaning. It also pushes the period of greatest nutritional demand away from the pasture's most productive time.

There is strong evidence that body weight, particularly body condition score of cows at calving, has a substantial effect on the post-partum anoestrus interval. Increases in condition score during late pregnancy through the provision of good nutrition, particularly energy, can reduce the interval between calving and first oestrus for all cows except those in good condition where it has no effect. A similar outcome can be achieved through the provision of good nutrition during early lactation.

As Table 2 indicates, the real challenge in maintaining a 365-day calving interval lies with the heifer population. Only 68% of heifers are cycling within the 82 day timeframe required to maintain the calving interval of 365 days.

Table 2: Return to oestrus post calving.

Days after calving	First calf heifers return to oestrus (%)	Old cows return to oestrus (%)
40	15	30
50	24	53
60	47	72
70	62	82
80	68	89
90	79	94
100	91	96

Source: Meril Opportunity of a Lifetime

Some important considerations for calving heifers in order to improve their return to oestrus within 80 days of calving are:

- first calf heifers take longer to return to cycling post calving
- heifers with dystocia take longer to return cycling
- heifers are particularly sensitive to body weight at calving and post calving nutrition and this is reflected in slow return to oestrus
- prioritise resources to meet the needs of heifers in the lead up to and following calving. This might mean putting them in your 'best paddock' prior to their first joining and/or calving and/or providing supplementary feed/nutrition post calving. Some considerations to working out your 'best paddock' for first calf heifers may be include the type of pastures, the distance between water points and nutritious pastures, water quality and topography
- to increase conception rates, remember it is important to join all females and have them conceive on a rising plane of nutrition.

If possible, heifers should be joined 2-3 weeks before the main herd as this allows an additional 2-3 weeks for them cycle post calving and to slot into the main herd to maintain a tight calving pattern.

Heifer performance is critical. Underperforming animals are inherently less fertile, can fail to achieve maximum pelvic size leading to dystocia and can fail to get into calf quickly as second calvers.

The effects of nutrition on reproductive efficiency in the older cows is much less apparent and allows re-allocation of the limiting factor in production, namely to feed to younger cattle.

### Select cows capable of conceiving within two mating cycles

In seeking to strictly maintain a 365-day calving interval, high culling rates of underperforming cows may be required, which in turn increases the number of replacement heifers required to maintain the breeding herd.

This practice results in a higher proportion of quality pasture being used for maintenance of the breeding herd because of the amount of pasture needed to grow females up to first mating. The benefits of higher heifer retention rates do, however, far outweigh the perceived downside of having to allocate quality feed to breeders.

### What to measure and when

- Conception rates from natural mating or when an artificial insemination (AI) program is implemented through pregnancy testing.
- Body condition score of cows at regular intervals according to the seasonal conditions – monitor after weaning of the last calves, from six weeks before calving, and then from calving to mating.
- Nutritional deficiencies that may limit oestrus and heifer growing including energy, phosphorous and other trace elements (selenium etc).

You should also observe the breeding herd for evidence of female activity (cycling) prior to the commencement of mating.

### Further information

Contact your state departments of agriculture for more information.

### Manage bulls for high conception

Carefully consider the number of bulls allocated to mating groups or herds. Insufficient bulls for the number of cows in a herd can lead to lower pregnancy rates and reduced throughput of animals meeting market specifications. Bulls should be monitored closely during mating, if possible and practical.

General guidelines for bull ratios are:

- extensive grazing in pastoral zone – maximum 4 bulls/100 cows
- minimum of 2 bulls/100 cows or per herd.

Assess all bulls every year prior to mating and only use those that pass assessment guidelines (as described in 'Bull assessment guidelines' section below).

- Join each bull to a maximum of 50 cows. There is no minimum, but joining sound bulls to less than 40 cows is wasteful and increases costs of bull purchases.
- Observe all herds during the joining period to ensure that the bull is working and has not been injured during mating or fighting with other bulls.
- Have bulls in reserve (at least 20%) to replace injured bulls as soon as they are identified and consider extending the joining period in that herd.

Manage bulls carefully pre-mating to achieve high conception rates

Additional costs may be incurred because of:

- the need to replace bulls more often
- the potential spread of infectious diseases that may reduce the fertility of cows and increase enterprise costs through treatment and/or

eradication of the diseases.

Fertility can be significantly decreased by poor bull management. Common sources of low bull fertility and conception include:

- bulls in poor condition prior to mating when the semen is produced. They may also not be strong enough to mount cows effectively
- insufficient effective bulls for the number of cows in the mating herd
- using too many bulls, which encourages fighting and is wasteful (but be sure to retain access to a replacement bull)
- mixed ages of bulls in mating groups, which can affect conception while social dominance is being established
- large mating paddocks where bulls and cows become separated
- overly fat bulls (condition score 4 or 5) and unfit bulls due to lack of exercise. Over-fatness can interfere with the heat exchange function of the testicles resulting in infertility with low sperm output
- venereal disease such as vibriosis and trichomoniasis.

### Bull condition score

Body condition score (see Tool 5.01) is a key factor when monitoring the general health and nutritional well-being of bulls. It is also a means of assessing whether young bulls have been overfed before purchase and may fail semen and serving ability tests.

The ideal condition for a bull prior to mating is condition score 3

Options for adjusting the condition scores of bulls include:

- increasing or decreasing pasture available and/or pasture quality for bulls before mating
- replacing bulls if condition score is below the suggested limit at the start of mating.

### Bull physical soundness

Bulls that are about to be mated need to be assessed as being physically sound, not carrying reproductive infectious diseases and having acceptable levels of libido and semen quality. See below for bull assessment guidelines.

Assess bulls for physical soundness pre-mating.

### Bull assessment guidelines

Bulls must pass all physical tests specified in the Australian Association of Cattle Veterinarians' publication, *Evaluating and Reporting Bull Fertility*. The physical attributes evaluated include:

- front and hind feet claws and soles
- angle of pasterns in front and hind legs
- hind limb conformation from the side (normal, sickle hocked, post legged, swollen or puffy hocks)
- hind limb conformation from rear (normal, bow legged, cow hocked)
- stance and gait abnormalities
- spine and limb defects
- head examination from front and side for alignment, absence of swellings and normality of eyes
- scrotal skin pliability, thickness and inflammation
- scrotal palpations for fat, freedom of movement, head, body and tail of epididymis, shape of testes, hernias
- prepuce, sheath and umbilicus
- penis, including palpation through skin, protrusion of penis and examination of erect penis; there are a potentially large number of penile and prepuce abnormalities

Infectious disease assessment as set out by the Australian Association of Cattle Veterinarians is summarised in **Module 6: Herd health and welfare**.

Table 3: Guidelines to minimum scrotal circumference in healthy bulls.

Age	<i>Bos taurus</i> bulls and <i>Bos indicus</i> -derived bulls	<i>Bos indicus</i> bulls
12-15 months	30cm	24cm
18 months	32cm	28cm
2 years and older	34cm	30cm

### Serving ability

It is important to know the serving ability of each bull. The serving ability test is a useful procedure, but it does require a trained person to use careful application of animal husbandry skills to obtain a meaningful result. The close observance of a bull during a serving ability test allows observance of sexual behaviour and libido, mounting behaviour, exteriorisation of the penis and ejaculation. Many problems are detectable on serving ability testing that may not be apparent just on a physical examination

A serving ability of 2 or 3 in 10 minutes is essential for high conception

Guidelines to serving ability:

- minimum serving ability – 2 or 3 servings in 10 minutes
- minimum time since bulls exposed to excessively hot conditions – 60 days before mating

Preparation of bulls for mating should include:

- mating bulls of highest serving ability to heifers so that they get in calf at their first joining. Cows that calve early in their first season tend to be early calvers for the rest of their lives.

Join high serving ability bulls

Preparation of bulls for mating should include:

- Selecting bulls for mating that meet the specifications set out in the AACV publication, *Evaluating and Reporting Bull Fertility*.
- Planning mating groups eight weeks before joining and running bulls together before mating to allow social groupings to establish. Mixing bulls either shortly before or during mating can reduce conception rate due to distraction when fighting and possible injury to bulls.
- Vaccinating bulls appropriately to keep the herd protected against diseases that affect fertility, as described in Module 6: Herd health and welfare.
- Joining experienced bulls, rather than young bulls, with heifers.

### What to measure and when

- Ratio of bulls per 100 cows before mating each year
- Body condition score of bulls before mating until the end of mating
- Semen examination when infertility is suspected
- Libido tests completed before mating.

### Artificial insemination as a mating option

If artificial insemination (AI) is used, the correct procedures are required to ensure high conception and calving rates. Results from an AI program are optimised by managing:

- **Cow/heifer selection.** All females in an AI program must be on a rising plane of nutrition and have had sufficient time post calving to return to oestrus. As a guide to best results, maiden heifers are under less stress than mature cows, but mature cows are easier to get in calf than first time calvers if nutrition is adequate.
- **Heat detection.** The accurate detection of standing heat and the resulting timing of insemination are critical to the success of an AI program. Clear identification of individual animals, record keeping, visual observation for signs of heat and where necessary the use of heat detection aids are all critical factors in an AI program.
- **Oestrus synchronisation.** Oestrus synchronisation simply implies the manipulation of oestrous cycles of heifers/cows to cause them to exhibit standing oestrus around the same time. This can greatly reduce the number of days needed to detect a group of animals in standing oestrus. Hormones common to many protocols are prostaglandin F<sub>2α</sub> (PG), gonadotropin releasing hormone (GnRH) and progestins.
  - Prostaglandins – a hormone (administered by injection) that shortens the reproductive cycle by removal of the corpus luteum from the ovary between day 4 and day 17 of the normal oestrus cycle.
  - Progesterone implants – placed under the skin behind the ear or in the vagina such as the intra vaginal CIDR (Controlled Internal Drug Release). The implants are usually left in place for 11 days. This postpones the onset of oestrus until two days after removal.

Synchronisation of females will fail in the animal that is anoestrus with no ovarian activity and not cycling.

### Potential problems associated with CIDRs

Controlled Internal Drug Release (CIDR) is an intravaginal device that contains progesterone and acts like an artificial corpus luteum. There are normally few problems associated with CIDR treatment.

CIDRs should not be inserted in cows that are less than 21 days postpartum because the probability of inducing cyclicity is low. CIDR insertion should be performed as cleanly as possible in order to reduce the risk of spreading disease.

When removing CIDRs it is not uncommon to detect a whitish discharge which is due to vaginal irritation from the wings of the CIDR and does not necessarily mean the animal has a vaginal infection. A difference in conception rate or pregnancy rate has not been detected between CIDR-treated animals that do or do not have a discharge.

- **Care when handling semen.** Semen is a live biological product that must be handled correctly and stored at the correct temperature with liquid Nitrogen. It is susceptible to temperature shock and exposure to sunlight, water, blood and poor hygiene.
- **Insemination technique.** The retro/vaginal technique of insemination gives the best results. Insemination can be done approximately 12 hours after the onset of observed oestrus. Fixed time insemination can occur with different programs involving CIDRs and specific hormone injections and reduces the labour and time taken up in inseminations that are timed to observed oestrus



## Proper artificial insemination technique

High pregnancy rates to fixed-time AI (FTAI) are dependent upon a series of events including proper storage and thawing of semen as well as depositing semen in the correct location (uterine body).

When synchronising heifers or cows for FTAI an important question to ask is “How many animals can be inseminated properly in a designated period of time?” The answer to this question will determine how many heifers or cows you synchronise and whether you will require assistance with the insemination process.

Representatives of AI companies are available to assist with the entire oestrus synchronisation and AI process. They can assist you with choosing an appropriate FTAI protocol, administration of the oestrus synchronisation products, sire selection, purchase of semen, and insemination.

If you are conducting the AI process, remember that the location of semen placement within the reproductive tract will have a significant impact on pregnancy rates. It is important to deposit the semen in the body of the uterus (target area) and not the cervix. Deposition in the cervix will significantly reduce the pregnancy rate to FTAI; whereas, placing the semen beyond the uterine body into one or both of the uterine horns is not beneficial.

During the artificial insemination process it is important to know where the tip of the AI catheter is at all times. Some helpful tips when performing AI include:

- pay careful attention to the storage of semen
- make sure the thaw unit is at the correct temperature (37°C)
- follow the AI company’s recommendations for thawing semen.

If an AI program is being considered, carefully assess the benefits and costs of the options. Calculate the costs of the various options in terms of \$ per calf born to enable a comparison of mating systems. Attending a special AI training course is also recommended to gain the knowledge and skills to obtain the best results.

## Setting directions

---

Deciding what size, or age, to wean at requires balancing the economics of the costs of infrastructure, feeding and management against the benefits of reducing breeder mortality and time taken to get back into calf.

Factors to consider in planning and implementing your weaning strategy include:

- type of country
- seasonal conditions and time of year
- ages of breeders
- mating system
- target markets.

### Type of country

Weaning calves at a younger age will help keep breeders in better body condition. This applies on all land types and land condition classes but on country in good condition, cows are also generally in better condition and therefore some weight loss may be acceptable. On poor country where cows are generally lighter, managing body condition is much more important.

### Seasonal conditions

Flexibility in weaning times is critical for managing poor seasonal conditions (eg. periods of no rain, lack of annual plant growth and/or low perennial growth). Earlier weaning will allow cows to maintain better body condition in these conditions.

### Duration of joining period

This determines the spread of weaner weights and a longer calving period usually means a greater number of lighter calves at weaning. It is important to only wean the number, and types, of weaners that can be adequately managed. Continuous mating, as practiced in the arid zone, usually results in calves of mixed sizes.

### Guidelines to determining the best calf weaning age

As a principle, the sooner calves are weaned the greater the potential turnoff of young cattle. Earlier weaning is the single most important way to increase weaner throughput as this allows better allocation of feed to reproduction and turnoff.

The keys to maximising the benefits of weaning age to throughput and productivity are to:

- identify the time when the efficiency of pasture use will be greater for the calf alone than for the cow and calf together. This is normally around six months into lactation when the higher quality pasture required to maintain cows and produce a relatively small amount of milk is better consumed directly by the weaned calf.
- implement a weaning strategy that ensures no setbacks to calf/weaner growth occur.

### Use higher quality weaner pastures for consistent growth

Weaning age and projected liveweight gains post-weaning depend on pasture availability and quality.

Ideally, weaning needs to take place when pasture height and availability are best for maximum intake by the weaned calf and the pasture has a nutritional quality of more than 11.5MJ per kilogram of dry matter (MJ ME/kg DM) and at least 15% crude protein.

Native pastures do not consistently achieve that level of nutritional quality, so it is important to be aware of the overall nutritional value of the pasture in your paddocks, and place weaners on the best nutrition available.

In general, use the combination of age and weight of calves, and condition score of cows, as the basis for a decision to wean calves early. This is particularly important in the arid zone when there is a limited quantity of high quality pasture available.

As a general rule, the earlier the age of weaning, the better the nutrition, in terms of energy and protein, required for the weaners. In most instances, reliance on the native pasture alone will not be adequate and a high quality supplement will be required.

### Early weaning

Early weaning is a useful management strategy in the arid zone as it allows much better allocation of a limited feed resource and can be implemented to improve throughput of sale.

It has been reported that early weaned cow-calf pairs were 43% more efficient in converting digestible nutrients into calf weight gain than were conventionally weaned cow-calf pairs.

Early weaning of calves also provides substantial benefits to the cows through reduced weight loss during lactation, higher body conditions scores and significantly shorter calving intervals.

Weaning should involve a period of at least one week in the yards. Calves that are not yarded can be difficult to manage later and may suffer more stress if finished in a feedlot, or at sale or slaughter.

Weaning management involves planning for the muster, the yards, cow-proof fencing, stocks of hay and other supplements, the weaner paddocks and transport.

Questions to consider include:

- What is the condition of the weaner paddocks?
- Are the facilities and equipment in good order (yards, gates and fences, water supplies, troughs for water and feed supplement, hay racks in place)?
- Are there sufficient stocks of good-quality hay and supplements?
- Are there stocks of current animal health products?
- What animal husbandry practices will also be carried out at time of weaning?

### Reducing stress

Both mother and calf are stressed when they are separated; the cows are going to call for their calves and try to return. While the calves are locked in a sturdy and secure yard, the cows may try to break the fence of their paddock so it is best to move to an area from which they cannot hear their calves.

Key factors in managing stress at weaning include:

- providing the right nutrition
- segregating weaners based on size
- regular and calm handling
- monitoring every day for a couple of weeks
- vaccinating against relevant diseases.

Calves can be weaned successfully at 100 days of age and from weights as low as 100kg as long as they are provided high quality feed. The feed offered to early weaned calves must be of high nutritional quality. This is particularly important for weaners which are dehorned, castrated, branded and/or ear marked.

Table 4: Energy and protein requirements/day.

Live weight Steers/heifers	Growth Rate	Intake Max	ME MJ/day requirement	Minimum ME required	Crude protein %
200	0	5.5	26	4.8	8
	0.5		44	8	12
	1.0		59	10.7	13
300	0	7.6	35	4.6	8
	0.5		57	7.5	10
	1.0		76	10	13
400	0	9.4	45	4.8	8
	0.5		71	7.6	9
	1.0		93	9.9	13

The likely benefits of early weaning and good weaner management on the breeder herd include:

- better overall breeder condition
- higher conception rates
- fewer mortalities
- lower cost of supplements for breeders

- more females for sale
- more concentrated calving in continuously-mated herds
- more maiden heifers heavy enough to mate.

Extra costs will include:

- more expensive supplementary feed
- more labour for tending small weaners
- increased infrastructure for yarding and feeding weaners.

### What to measure and when

- Estimates of age and weight of calves at 100 days from when the last calf was born.
- Any harmful effect on cow health and udder damage to high milk yield cows.
- Quality and quantity of pasture available for weaned calves is adequate.

### Guidelines to yard weaning calves

Yard weaning is a simple and effective procedure that has good implications for lifting weaner productivity.

Use dedicated yards to wean calves

Cattle that are yard-weaned are more familiar with stock yards, water troughs, feeding routines and people. By exploiting the fact that weaning is a critical learning time, young cattle can be well prepared for a productive future. Yard-weaned groups of cattle also have the major advantage of having stronger social bonds between individuals. While training cattle during yard weaning, their individual temperament (confidence) can be assessed and flighty (shy) cattle can be identified for removal or special treatment.

Weaning is an important learning phase for cattle

The benefits of yard weaning are fully realised if cattle later go on to feedlots. In the feedlot, a healthy and productive feeder steer has to:

- accept confinement and go on to concentrate feed and water quickly
- adapt easily to the initial social/psychological and metabolic stress involved
- achieve high feed conversion rates and weight gain through good adaptation individually and as a feeding group
- have strong resistance to respiratory disease, partly as a result of social compliance and group cohesion
- accept the presence of people, vehicles and horses at close quarters.

The following requirements must be met to implement yard weaning as a management tool:

- well built, weaner-proof yards with solid opaque pen sides (rubber belting 1.2m wide is ideal)
- a reasonably sloped, well drained, non-bog surface
- pen stocking density of 4m<sup>2</sup>/head for 180–260kg calves; and 2.5m<sup>2</sup>/head for 100–170kg early-weaned calves
- weaners kept in the yards for 5–10 days, with the aim to have the majority back onto quality pastures as quickly as possible
- good quality drinking water supplied in a trough
- shy feeders removed and managed as a separate group to prevent rapid and excessive weight loss
- routine human contact each day, for example walking quietly through the yard at least two or three times each day
- in general, keep dogs away from the weaning yard.

### Further information on yard weaning

- [Tips & Tools: Yard weaning methods for preparing feeder cattle](#)

### Handling at weaning

Positive contact between humans and weaners minimises management problems down the track

Weaned calves should be encouraged to approach humans with a memory of positive associations. Grouping calves in a small area at weaning with regular handling boosts socialisation between animals and with humans, and reduces subsequent stress associated with handling and transport. Well-behaved stock will generally create fewer management and occupational health and safety problems.

Negative or insufficient positive contact between humans and calves at weaning can result in the animals remaining frightened of human activity. This can cause increased stress during handling and transport, high pH and dark-cutting meat. Insufficient contact with humans can also lead to cattle not adapting well to more intensive feeding such as in droughts or feedlots.

### Weaner pastures

High quality feed produces rapid liveweight gains in weaner cattle

Depending on the seasonal conditions at weaning, the liveweight of weaner cattle may be maintained until feed conditions improve or they can be weaned onto high quality pasture for rapid growth rate. As a guide for best pastures liveweight gains in weaners should be of a nutritional

quality of at least 11.5 MJ ME/kg DM and 15% crude protein. If high quality pastures are not available at weaning and weight gain is desired, consider providing a feed supplement to boost the nutritional quality of the pasture, but ensure that the cost of a supplementary feeding option does not exceed the benefits.

### **What to measure and when**

- Monitor pastures at least weekly, and more often if seasonal conditions are deteriorating. See Module 3: Managing your Natural Resources for information on the assessment and monitoring of land condition and pasture quantity/quality.

### **Impact of weaner growth on meat quality**

Saleyard and abattoir prices now favour good weight-for-age cattle; the best prices are for milk and two-tooth cattle at domestic and export slaughter weights. Meat tenderness is affected by animals repeatedly losing and gaining weight, and is detected through the assessment of carcass ossification (a measure of carcass maturity) during MSA grading. Abattoirs with Meat Standards Australia (MSA) grading will pay a bonus for cattle that satisfy MSA requirements.

Good weaner management is the key to producing an animal with the potential to meet MSA grading. Weaners need to be grown as fast as economically possible. Weaners that grow poorly in their first year or are under about 220kg liveweight at 12 months of age have little chance of grading to MSA specifications later.

Pre-weaning nutrition is generally less important although calves with low weaning weights may take too long to reach market specifications and possibly attract premium prices.

Pastoral producers should focus on turning off the animal without it putting on too much weight as that pasture could be used to raise another calf/animal instead. Backgrounders and/or feedlotters are going to be interested in getting lighter weight animals with good frames because that way they get more compensatory gain once the animal is fed a high quality diet.

For slaughter animals, the age of turn-off can also be critical to meet dentition and ossification specifications in addition to target turn-off weights.

## Setting directions

### Guidelines for culling heifers and cows

Cull as early as possible, but also at a convenient time, commonly stock is culled at the same time calves are weaned. The initial culling is based on the female being empty at pregnancy diagnosis or having calving difficulties at the previous calving.

If pregnant, then cull on physical factors such as unsound feet and legs, damaged or lost teeth, over 10 years old (or required age structure of the breeding herd for desired rate of genetic progress), history of inability to wean a calf or of calving difficulty.

To achieve the targeted rate of genetic progress and change in herd structure, a clearly defined culling policy is needed for older cows.

Achieving a balance between the number of older cows in their optimum productive years, for example between their third to sixth gestation, and the influx of new generation heifers as replacements needs to be carefully considered.

### What to measure and when

- Presence of foetuses at pregnancy diagnosis.
- Fat deposition rates to avoid fatty udder syndrome.
- If pregnant, check physical factors such as structural soundness, teeth, age, ability to wean a calf and history of calving difficulty.

### Determining culling rate

High culling rates are possible only when the heifer retention rate is well in excess of 60-80%, if aiming to maintain the breeding herd number. High culling rates are also possible if aiming to reduce stocking rates due to poor seasonal conditions or other reasons.

### Culling consists of removing unwanted cows from herd based on:

- poor performance (the same poor performing cow repeats it next year)
- low fertility and late calvers
- aged cows
- other reasons (eg cancer in the eyes, teats, hips and feet).

### Mathematical model

To explain how the productivity of a breeding herd declines over time, let's start with 500 heifers and assume:

- 88% pregnancy rate after 3 oestrus cycles
- 2% annual cow mortality
- 3% of the cows which calve fail to wean a calf
- no herd replacements.

Table 5: Attrition Rates

Yr 0	1	2	3	4	5	6	7	8
500 Heifers	415	344	286	237	197	163	135	112

Table 5 shows the natural rate of attrition before any culling for production takes place. After 8 years, only 112 of the initial 500 initial heifers remain.

This means that, assuming a fertility rate of 88% and a heifer retention rate of 40%, only around 12 surplus old cows can be culled to maintain the herd of 500 breeding cows.

### What to measure and when

Determine the number of heifers to be retained in the breeding herd immediately after pregnancy diagnosis of the heifers.

## Setting directions

---

### Key actions

- Assess the fertility and fecundity of your herd using body condition scoring and for calves liveweight.
- Consider early weaning, primarily for the cow's welfare and promote re-conception.
- Select healthy, fertile bulls for mating to achieve good conception rates.
- Maintain the best herd structure suited to the environment, natural resource/feedbase and climatic conditions.

### Why is herd management and weaner throughput important?

Sales from a beef business include stock bred on the property, cull cows and any purchased trading stock. Increasing the number of cattle sold each year has a major impact on the profitability of arid zone beef enterprises.

#### **Increase throughput to increase profit.**

There are two main components of weaner throughput:

1. Number of weaners produced and the total saleable kilograms of product from the enterprise.
2. Carrying capacity of the land and vegetation resources and the stocking rate applied (discussed in **Module 1: Setting directions**, **Module 2: Managing your feedbase** and **Module 3: Managing your natural resources**).

However, the primary factor influencing beef cattle production in the low rainfall arid zone is the highly variable pasture availability experienced in the zone, there is no regular seasonal pattern making it unreliable and unpredictable. This can make it difficult to produce to consistent production targets (such as lines of weaners) within each season, and season after season.

Standing pasture can vary from very low amounts with very low nutritive value to being so abundant that it cannot be consumed by livestock. Managing consistent production targets under such conditions can be difficult so grazing management has traditionally relied on using conservative stocking rates.

Some herd management strategies in low and/or highly variable rainfall zones to help improve productivity include:

- a limited joining period for heifers, to set them up for calving at the most suitable time of the year and then continuous mating from the second joining onwards. This reduces operational costs (mustering to add or remove bulls) and increases overall calf production in an environment where predicting the timing of peak cow condition each year is very difficult.
- a continuous mating approach in extensive areas where rainfall and pasture growth is uncertain. It is still possible for many cows to achieve weaning one calf per year but any extended dry period reduces the number of individuals achieving this.
- selection of healthy, fertile bulls for mating to achieve normal conception rates and a condensed calving pattern/period.
- supervise calving for maiden/first calf heifers, to increase the number of live calves born. The time and expense of monitoring all calving in an extensive pastoral grazing situation with continuous mating is not feasible. Cows in extensive grazing conditions that have difficulty calving and are not monitored are unlikely to survive.
- culling cows that are neither lactating nor pregnant at weaning is a useful approach to remove low productivity breeders from the herd. However, culling a cow for failing to rear a calf, when the failure is because of the arid zone environment (that is, due to the combination of herd management and prevailing seasonal conditions) will not increase the long term productivity of the herd. In fact, many highly productive animals can be unnecessarily culled if this culling criteria are strictly applied.
- use age, weight and body condition scoring of cows as indicators for earlier weaning.
- aim to wean calves when the efficiency of pasture use is greater for the calf alone than the cow-calf combination. The time of the year is also important in weaning decisions. Handling and weaning calves during the hot summer months must be avoided where possible. At these times, high mortality rates can eliminate any economic advantage of early weaning.
- use yard weaning to lift cattle productivity. Yard weaning is not a well-defined practice in the arid zone and means different things to different producers but the general principles of reducing the impact of weaning (especially if the process of weaning includes dehorning, castrating and branding) have application due to the low rainfall experienced in the arid zone.
- use higher heifer retention rates to increase selection pressure on the cow herd.
- take advantage of periods of excess pasture growth following rainfall and/or floods by purchasing weaners/growing livestock.
- take advantage of restocking periods to improve the genetic composition of the herd.

### How does this module assist you?

This module will help you:

- increase the throughput of weaners bred on your property
- manage your culling strategy for weaner heifers and mature cows
- understand how nutrition drives fertility and allocation of energy to maintenance, growth and then reproduction in that order is the major

limiting factor

- recognise the biological constraints imposed on different stock classes and the allocation of a limited resource, such as feed, to the most sensitive stock, such as reproductive heifers and growing stock. This is especially important in relation to the arid zone where the predominantly native pastures are naturally low in energy, protein and phosphorus, definitely too low for optimal growth. This means that a cow feeding her calf will struggle to maintain body condition or if lactating may even lose weight and not survive.

### Linkages to other modules

The throughput of animals is also linked with issues discussed in **Module 1: Setting directions**, **Module 2: Managing your feedbase** and **Module 7: Meeting market specifications**.

Genetic improvement of fertility, mothering ability and growth are discussed in **Module 4: Cattle genetics**.

The management of common reproductive diseases that infect beef herds is outlined in **Module 6: Herd health and welfare**.

### Further information

*Weaner management in northern beef herds*

### Principles of herd management and weaner throughput

- Manage the herd to maximise fertility and weaner throughput.
- Match livestock requirements to pasture production by managing livestock feed consumption and allocating high quality (nutritious) pastures to maximise reproductive function and turnoff of sale cattle. (Note: if a calf is left on its mother during a dry, and non-growth, period for the pasture, the calf might grow faster but the cow is likely to be putting much of its nutrition into producing milk and will be losing weight and condition, reducing the likelihood of re-conception.)
- Weaning is the single most effective management tool available to look after the body condition of your breeding cows because weaning allows:
  - the cow to regain condition and have a better chance of producing a calf every year
  - young stock to be educated for easier management in the future.
- Manage weaner cattle after weaning to achieve target growth rates by maximising nutrition and manipulating feed allocation. This may include a period of yard weaning, followed by placement in the paddock with the best feed to ensure future performance.
- On occasion weaners may need to be allocated to new paddocks (particularly if they are large paddocks) with older, coacher cattle, who can show weaners the location of watering points and pastures.
- Where possible, return cows to the same paddock, or new paddocks with the same cohort of cows, after weaning. This is particularly important in large paddocks and with first calf heifers, as the animals will be familiar with the different land types and the location of watering points in that particular paddock. Consider coacher cattle if allocating animals to new paddocks.

### Procedures for herd management and weaner throughput

- Procedure 1 - Maximise the number of live calves per breeding female
- Procedure 2 - Wean as early as possible, without compromising calf growth rate
- Procedure 3 - Implement a female culling and replacement policy to maintain best herd structure





## Setting directions

---

Contact the Australian Veterinary Association to obtain copies of the Australian Association of Cattle Veterinarians' publication *Evaluating and Reporting Bull Fertility* and the associated 'Bull Reporter'.



## Setting directions

---

Access the [Calving Histogram Calculator](#), a tool to help identify the percentage of cows conceiving at each cycle.