



Weaner management in northern beef herds

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Key messages for managing weaning and weaners

Some general principles can be applied to weaning strategies and weaner management.

- Calves are taken from their mothers mainly for the benefit of the cow.
- When the need to produce milk is stopped, the cow's nutrient requirement is reduced, allowing her to regain condition.
- When the need to produce milk is stopped, it is equivalent to feeding the cow with 2kg of grain or 3kg of fortified molasses each day.
- Lighter stocking in breeder paddocks maximises the opportunity for the cows to maintain good body condition.
- The cow needs to have a body condition score of 3.5 or higher at calving to maximise the chance of getting pregnant again while rearing her calf.
- A cow must get pregnant within 75 days of calving to produce a calf every year.
- Weaning to maintain the cow's body condition will improve reconception for the next mating. It is too late for the current reconception.
- With seasonal mating, calves are normally weaned at four to eight months of age between April and June.
- With year-round mating, calves are at a wide range of ages at the first muster (April–June); weaning all calves over 100kg allows the cows to recover body condition and better survive the dry season.
- If the wet season fails, all calves can be weaned younger under both seasonal and continuous mating systems.
- Hay is the main feed for weaners in the yard. Good quality hay must always be available from the first day of weaning.
- Calves weaned under 150kg should gain at least 100g per day, and will need supplements of highly digestible protein and energy if pasture quality is insufficient.
- Heifer calves retained as breeders should be fed to gain at least 100g per day over the dry season after weaning.
- Weaning is the time for educating young animals to set them up for ease of handling throughout their lives.
- Weaner education includes being worked calmly through the yards and being tailed out from the yards to the weaner paddock and back for five to seven days.
- Weaner paddocks should be rested over the year to accumulate a body of good grass and herbage; they should not be used as holding paddocks for sale or sick stock, or for the working horses.

1. Why wean?

In an ideal world of fertile soils, good rainfall and lush pasture, there may be no need to wean other than to manage pregnancy in weaner heifers. The calf could stay with its mother until it is sold weighing 300kg at 10–11 months of age, and the cow then drops another calf. Farms in southern states can produce vealers of this weight and age off rye grass–clover pastures.

But little of the breeding country in northern Australia is like this. The climate is strongly seasonal and highly variable, the soils are mostly infertile and the grazing is generally of native grasses.



It is not easy to get a calf every year off native pastures under the highly variable climate of northern Australia.

Leave the calf on its mother during the dry season and it might grow a bit faster while suckling some milk, but the cow is putting much of its resources into producing that milk and is losing weight. Her condition becomes too poor to conceive again; she may produce a calf only every second year—or die.

Weaning is of direct benefit for the cow, and of indirect benefit for the calf.

Weaning is a well-established practice in northern Australia. The emphasis in this book is two-fold:

1. to describe best management practice for feeding and educating weaners
2. to promote weaning of young light calves under difficult conditions to reduce mortality and improve fertility in the breeders.

Maintaining body condition of the cow

The nutrition available from pasture is a major constraint on cattle production across the grazing lands of northern Australia—although there are considerable differences between regions. Mitchell grass in semi-arid regions is considered more nutritious than black speargrass under higher rainfall, while light stocking in the drier regions allows cattle to select better diets.

Even during the growing season, native grasses on poor soils are often too low in protein, energy and phosphorus for optimal growth, and a cow feeding her calf may struggle to maintain her own body condition. During the long dry season, the protein and energy in the mature and dry pasture are so low that a lactating cow will lose weight dramatically—during drought times she may not survive.



The cow will lose condition in order to feed her calf if the nutrition is poor.

Removing the need to produce milk for its calf in the early dry season is equivalent to giving the cow a supplement of up to 2kg of grain or 3kg of fortified molasses every day.

Main benefits of weaning

Weaning is the single most effective management tool available to 'look after' the body condition of the breeding cow.

Weaning allows:

- the cow to regain condition so that she has a better opportunity to produce a calf every year.
- young stock to be educated for easier management in future life.

The advantages from weaning the calf are:

- The dry cow will be able to maintain her weight with little or no supplement.
- She may need some protein supplement but no extra energy supplement.
- Small calves eat less supplement than large cows.
- Calves in the yards and smaller weaner paddocks are easier to feed than cows and calves in a large breeder paddock.
- Less total supplement fed means less cost.

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.

Body condition score (BCS)

Body condition of the cow can be assessed on a scale of 1 to 5—with a body condition score (BCS) of 1 being poor, BCS 3 being moderate/store and a BCS 5 being fat.

At the end of the dry season (which is often the start of a major calf drop):

- If the cow is in BCS 1–2, her ovaries may be dormant. She will probably not cycle and conceive again while lactating during the following growing season.



BCS 1 = no calf next year

- If the cow is in BCS 3, she should start cycling soon after calving.
- If the cow is in BCS 5, she has usually not reared a calf for some time and is a poor breeder.

The importance of body condition at the end of the dry season on the conception rates of lactating cows during the coming growing season is shown in Table 1.1.



BCS 3+ = better chance of conceiving within the desired time

Table 1.1. The effect of body condition at the end of the dry season on subsequent pregnancy rates of lactating cows

Cow body condition at the end of the dry season BCS (1–5 scale)	Description	Likely pregnancy rate in the coming growing season*
1	Poor	Up to 25%
2	Backward	50%
3	Moderate (store)	70%
4	Good	85%
5	Fat	95%

* This assumes good nutritional conditions during mating. Rates will be lower under poor seasonal conditions and with young cows.

Body condition drives cow fertility

To produce a calf every year, the cow must get pregnant again within 75 days of calving. To provide the best chance for conception, she must be in good condition (body condition score 3 or better on a scale of 1–5) when she calves.

Breeder and grazing management

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

Weaning rates even more important now

Profitability has always been of overriding importance in any beef business. It is driven by high weaning rates and low mortality rates in the breeder herd.

However, many extensive herds in northern Australia in past decades have had weaning rates below 60% and breeder mortalities in excess of 10%; few cull cows were sold and nearly all heifers went into the breeder herd. Enterprises remained viable because their turn-off was based on older steers that had time to put on weight.

Productivity has improved greatly in recent decades with better management, better adapted breeds and the appropriate use of supplements. The main market in the far northern region now is for younger live export steers and heifers, while the local market also requires younger animals. Weaning rates need to be at least 75% for beef businesses to be profitable.

Higher productivity can be achieved by good weaning management and by adequate feeding of the smaller weaners.

Grazing management strategies include:

- Adjusting stocking rates so that the cows and calves can select nutritious leaf from the bulk of the pasture.
- Periodically spelling breeder paddocks over the growing season to allow the good grasses to recover.
- Spelling weaner paddocks to accumulate good feed.

With good nutrition, most cows will cycle while lactating.

Plan for body condition

The target is a body condition score of 3 or better at calving.

Planning the cycle of body weight and condition of the breeder cow throughout the year is the key to higher fertility and low mortality.

On very large properties, seasonal mating is often not practical if all bulls cannot be mustered with 100% certainty and if it is difficult to put out bulls during the wet.

Continuous mating can create its own problems. Dry cows will naturally conceive with the flush of new grass when the wet season starts. These will then calve in the middle of the next dry season and will lose too much condition feeding the calf before the next wet season. They then invariably fail to get back into calf until weaned. Thus the calf drop will gradually get out of phase with the grass season for a couple of years before synchronising again.

Instead of a calf every year, these breeders will typically produce two calves in three years at best.

Management control under continuous mating is by weaning small calves (100kg and over) in first and second round musters.

Timing mating

On properties where seasonal mating is practical, calves should drop just before the wet season so that peak milk demand from the growing calf coincides with peak pasture growth and quality.

Thus calf drop is planned for late August and September in southern coastal Queensland where rainy weather may begin as early as late September, but is planned for October–November in parts of northern Australia where the monsoon storms come typically in mid-December.

Timing weaning

After the grasses flower late in the growing season, the quality of pasture declines markedly; it can soon become too poor to maintain the condition of a cow producing even a few litres of milk. She could then be in BCS 1–2 by the time of a ‘normal’ weaning based on the calf’s age, and would be unlikely to get back into calf until well into the next wet.

The calf should be weaned before the cow loses too much condition so that she can reconceive at the next mating.

Early weaning

Early weaning refers to the weight (age) of the calf and not to the time of the muster.

Industry terminology is:

- Radical weaning – under 100kg (under 3 months old)
- Early weaning – 100–150kg (3–4 months of age)

Traditionally calves have been weaned when four to eight months old.



These calves should have been weaned months ago; then the cows would have been in better condition and would be needing less supplement.

All calves over three months of age can be weaned in April–May, and those over two months old at a second muster in August–September. These small weaners must be fed and managed well.

Weaning in April–May can save the cow 10–15kg liveweight per month—equivalent to about one BCS in three months.

If the first weaning round is left until later in the year when cows may already be in poor



Dry paddocks with little grass. These calves should have been weaned months ago before the cows lost condition.

condition, it will save only about 5kg liveweight per month. This may keep the animal alive, but will do little to improve conception rates.

Supplements

Protein supplements such as licks or blocks during the dry season can help maintain cow body condition—but rarely increase weight—and lactating cows may still lose weight. Energy supplements such as fortified molasses can overcome weight loss but it is cheaper to supplement the weaner on its own than the cow and calf.

Supplements for weaners are described in Chapter 6.



Urea-based supplements help maintain the body condition of adults and larger weaners but rarely increase weight without extra true protein—which is expensive.



Whole system

Weaning calves down to 100kg is one tool in a whole-system breeding program. Other tools include selecting cows and bulls for higher fertility, culling cows that will calve out of season, and controlled mating to achieve a tighter calving period.

2. The calf's stomach

The calf is not born as a ruminator; its ruminant digestive system develops as it ages. Thus the stage of rumen development will govern the type and quantity of feed that the calf needs.

If the quantity or quality of its feed is not good enough, any nutritional deficiencies may have to be supplied from supplements.

For weaners, the aim is almost always to gain weight; how much to gain will depend on its age, weight, sex, any expected compensatory growth and ultimately on the final market.

The ruminant digestive system

Ruminants can digest fibrous material such as grass. The ruminant has three 'pre-digestion chambers'—the reticulum, the rumen and the omasum—before the abomasum or true stomach (Figure 2.1).

Rumination

In the simplest description, grass leaf goes down the oesophagus into the reticulum and rumen. Later in the day when the animal is resting, it regurgitates a 'bolus' of coarser material to chew as cud. This is 'rumination'.

The chewed-up fibre is swallowed back into the rumen, which is a large fermentation vat of liquid and microorganisms ('bugs'). The digested short fibres and rumen bugs flow into the omasum which extracts much of the water; the residue then flows to the abomasum where digestion is similar to that in the monogastric stomach. Much of the animal's protein comes from digestion of the rumen bugs.

When born, the calf has a small and non-functional rumen and so cannot digest grass. Suckled milk by-passes the rumen and proceeds directly into the abomasum for more efficient digestion through an 'oesophageal groove'.

The oesophageal groove

The oesophageal groove allows milk to pass directly from the oesophagus to the abomasum or true stomach for the most efficient digestion (Figure 2.1).

This groove acts like a tube formed by two lips that are raised when the calf suckles. If the oesophageal groove does not close, as can happen when the calf drinks milk directly from a bucket, the milk may leak into the rumen where it ferments. This wastes the nutrients and can cause the calf to scour.

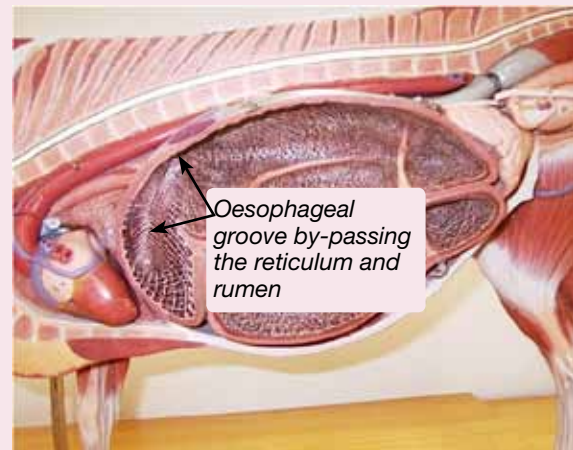
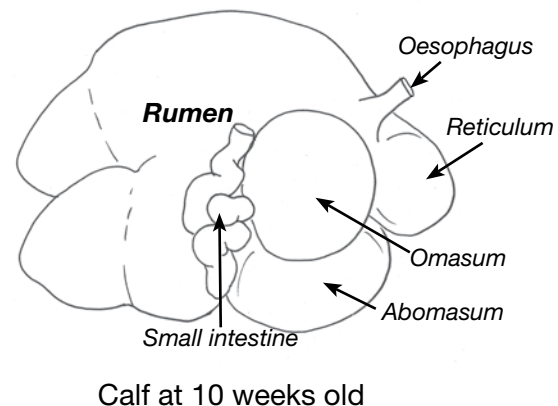
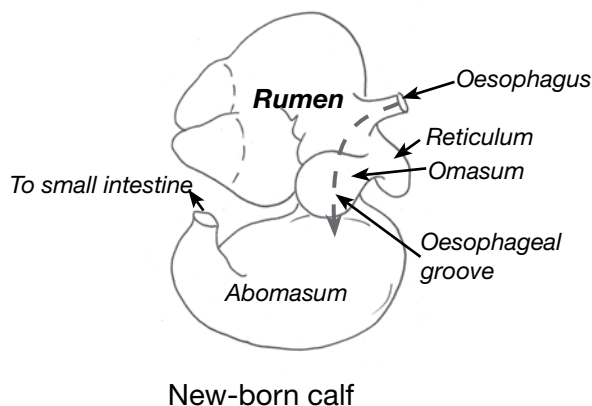


Figure 2.1. The rumen of the young calf develops as it begins to eat fibrous feed



Until the calf is weaned, milk, even in small quantities, supplies the best of the calf's nutrition. All calves which are removed from their mothers under six weeks of age must have milk or milk replacer.

The rumen

The rumen and reticulum start to develop within a few weeks when the calf eats fibrous feed, with the rumen microorganisms ("bugs") being transferred from adult cattle with which it is grazing. Under normal paddock conditions, the rumen will be fully functioning by the time the calf is three months old.

Once the calf is weaned, its rumen will expand quickly but the grazing weaner must then obtain all of its nutrients from a pasture-based diet high in roughage.

Change diet gradually

The mix of the various types of microorganisms in the rumen depends on what the animal is eating. In grazing cattle, the bugs are mainly those that break down plant fibre; in cattle on grain diets, the bugs are mainly those that digest starch. Changes in diet must be made gradually so that the numbers and types of bugs have time to adjust.

A rapid change from a fibre diet to one high in starch results in the rumen contents becoming too acidic. This causes severe metabolic disorders or even sudden death. Acidity is buffered by the animal's production of saliva, which is stimulated by fibre in the cud.

Nutrients

The weaner needs energy, protein, minerals and vitamins; energy and protein are the most important for growth but must be in balance. Under the rule of limiting factors, there is little benefit in supplying large quantities of energy if there is insufficient protein in the diet for the rumen bugs to use it efficiently.

Water

Water is not a nutrient but is vital for rumen fermentation and all body functions.

Energy

Energy is a measure of a substance's ability to produce an action or effect; it is not a tangible compound such as starch or protein. The main sources of energy are carbohydrates (starches and sugars) and fats.

Metabolisable energy is the energy in a feed that is finally available to the animal to use for maintenance, growth, lactation and pregnancy.

Protein

Protein for ruminants can come from two sources of nitrogen: true (organic) protein from forages, grains and protein meals; and non-protein-nitrogen (NPN) from inorganic compounds such as urea. NPN can be used only by rumen microorganisms; calves under 4–6 weeks of age do not have functioning rumens and cannot use NPN.

Rumen bugs need nitrogen to utilise starches and other carbohydrates for their own growth and reproduction. Protein that is used in the rumen is referred to as rumen-degraded protein (RDP) while protein that escapes breakdown in the rumen is called by-pass protein or undegraded protein (UDP).

These rumen bugs eventually pass through to the stomach (abomasum) where they are digested by the animal into amino acids that are absorbed into its body. Microbial protein is a major source of protein for the animal.

Minerals and vitamins

Both the weaner and its rumen bugs need minerals. The most important minerals are phosphorus (for synthesising protein and bone development), sulphur (as part of some protein molecules) and calcium (for bone growth).

Ruminants normally get their vitamins from the diet or from rumen bugs. Fat-soluble vitamins, such as Vitamin A from green feed, can be stored in the body's fat and liver, but water-soluble vitamins, such as Vitamin B, are synthesised in the rumen, and cannot be stored.

Nutrient requirements

The requirements for energy, protein, minerals and vitamins can be calculated from the animal's size and its target growth rate using feeding standards.

Energy

The energy value of a feed is expressed as megajoules of metabolisable energy per kilogram dry matter (MJ ME per kg) while the animal's energy requirement is expressed as MJ ME per day. Some old or overseas standards may express energy as calories.

Energy

The energy requirement of beef cattle is expressed as megajoules of metabolisable energy (MJ ME).

1 megajoule (MJ) = 1,000,000 joules

1 calorie (Cal) = 4.184 joules (J)

Protein

The protein value of a feed is expressed as crude protein percentage (CP%)—which may include NPN. Protein from NPN sources such as urea is expressed as Equivalent Protein per cent. An animal's protein requirement is expressed in grams per day (g/day).

Calves under 150kg generally cannot get enough protein from microbial protein to gain weight. Calves of 150–250kg cannot get enough protein to grow at even 0.5kg/day from rumen-degraded protein (RDP) only, and so need some undegraded protein (UDP). Normally this UDP comes from milk, but some can also come from good quality green pasture.

When the calves are weaned, they could meet their UDP requirement for growth if on good quality green feed, but protein meals must be included in the ration if the pasture cannot provide sufficient UDP.

Tables in the Appendices show the daily intake of protein and energy required for a range of growth rates on a range of feed qualities.

Can the small weaner eat enough?

The quality and palatability of the feed will determine how much the weaner will eat—its voluntary feed intake. On low quality hay or pasture, it may not eat enough to meet the target growth rate.



This is as much poor quality hay or grass a small weaner can eat each day. It is not enough to promote growth.

Feed intake

Feed intake is expressed as the weight of feed **dry matter** eaten as a percentage of the animal's liveweight. (Dry matter is used to take account of the varying water content of feeds).

Voluntary feed intake ranges from as low as 1% of liveweight for animals on mature dry pasture and up to 3% on a feedlot ration; it is governed by the rate that the feed is digested in the rumen.

The animal can eat more only when some of the food already in its digestive system has passed through; intake is directly proportional to the digestibility of the feed.

Thus a 100kg weaner in the yard will usually eat considerably less than 3kg of dry feed per day. To gain 0.5kg per day, all the feed offered must be of high quality and palatable.

The situation is similar for a small weaner grazing mature grass in the paddock. It will need a supplement to gain weight.

3. Pasture and grazing management for weaners

Calves are generally weaned at the start of the dry season when the grasses have seeded and pasture quality (protein and digestibility) is dropping quickly.

Pasture growth and quality on any property will depend on the soil's basic fertility and amount and distribution of rainfall. In lower rainfall regions with a pronounced dry season, grasses tend to 'hay off' so that their quality declines more slowly than in regions which experience winter rain or dews. However, by late in the dry season, the quality of all pastures is usually at or below maintenance level.

No year is average; too much rain during the growing season may increase quantity but reduce quality; too little may do the reverse, while no rain means no growth at all. Winter rain may produce good-quality herbage or spoil hayed-off pastures. This variability of seasonal rainfall, and the timing of any frost, must be taken into account when trying to match pasture supply and quality with animal demand.

As weaners need good nutrition, they should be put into paddocks with the best quality

pasture. Spelling the weaner paddocks over the wet season helps improve pasture condition, ensures there is fresh feed for the weaners and reduces the potential problem of both internal and external parasites and diseases such as coccidiosis.

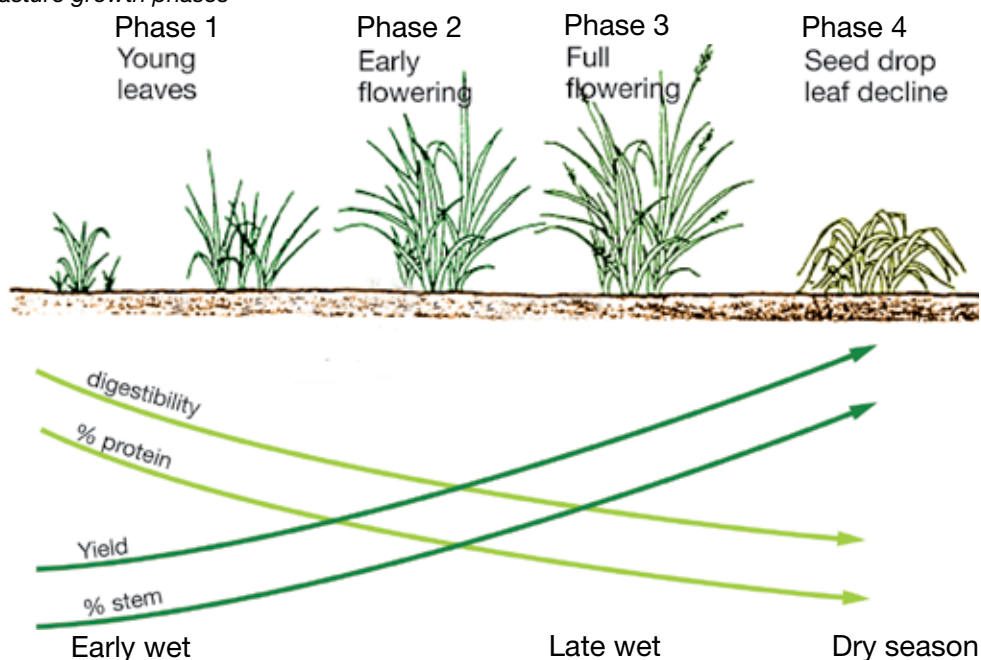
Weaner paddocks should not be used as dumping or holding paddocks for sale cattle, bulls, or the working horses.

In continuously mated herds, feed will also be needed for the second-round weaners. Weaning paddocks should not be overgrazed on the first round, or fresh paddocks should be reserved.

The digestibility of pasture varies greatly. Lush young pasture (Phase 1) may be as high as 65% digestibility; old mature pasture (Phase 4) may be as low as 45%. Calves are generally weaned around April when pastures are in Phase 3 with declining nutritional value or in May–June (Phase 4) when the feed has already declined (Figure 3.1 and Table 3.1).

Weaners under 150kg generally need a supplement to gain weight unless the pasture is of high quality.

Figure 3.1. Pasture growth phases





Pasture phase 1 – early wet season, peak milk production, palatable feed for growing calf



Pasture phase 3 – late wet season, grass going to seed



Pasture phase 4 – dry season, pasture quality low, supplements needed for weaners and pregnant cows, new calf drop

Table 3.1. Approximate nutritional value of pasture in different growth phases

Pasture growth phase	Description	Dry matter digestibility* (%)	Energy (MJ ME/kg DM)	Crude Protein (%)
Phase 1	Early, rapid growth	65	9	10–15
Phase 2	Beginning to grow stem, mostly green leaf	55–60	7–8	8–10
Phase 3	Flowering and seed set, growth slows, 10–30% green leaf	50–55	7	6–8
Phase 4	Seed matures and falls, no growth, no green leaf	45–50	5–6	3–6

*Digestibility is based on the dry matter of the feed

Improved pastures for weaners

Fully-sown improved pastures make excellent weaning paddocks, while oversowing a legume into the native pasture can improve pasture quality and quantity, and so reduce the need to feed supplements.



Oversowing a legume such as stylo will greatly improve the feed value of a native pasture.

Animal selection

Pasture quality is highest early in the growing season but declines (Figure 3.1) rapidly once the grasses seed. Although overall levels of protein and energy in maturing pastures may appear low, weaners may be able to select enough green leaf within the dry mass if the stocking rate is suitably low. If there is more than 30% green leaf in the whole pasture, the animal can select a diet of almost 100% green leaf as long as the stocking rate is low.

Assessing pasture quality

Pasture quality is a vague term. To determine it, look at the ratio of leaf to stem, amount of green leaf, absence of fungal attack on hayed-off leaf, and presence of legumes or palatable 'herbage' growing with winter rainfall.

Leaves of grasses and palatable legumes can be plucked by hand from the dry mass of pastures, and analysed for protein and digestibility by a laboratory. But these pasture samples do not accurately represent what the animals are eating, and the value of this method of assessing the animals' diet is low in relation to the time and cost of sampling.

Assessing diet quality

The most reliable way to check the quality of the diet that the animal is eating and therefore to be able to fine-tune supplementation, is to use Faecal NIRS (Near Infrared Reflectance Spectroscopy) testing.

This involves collecting samples of fresh cattle dung and having them analysed using NIRS. NIRS provides an indirect measure of the protein and digestibility level in the diet, and this digestibility level can be used to determine the energy level.

Pasture quality in any season can be defined quantitatively (Table 3.2).

Table 3.2. Pasture quality as defined by dry matter digestibility (DMD) and crude protein (CP) content

Pasture quality	DMD (%)	CP (%)
Very good	>60	>8
Good	55–60	7–8
Marginal	50–55	6–7
Poor	<50	<6

Regular NIRS testing can be used to determine when animals should be given supplements of protein only or protein plus energy. Interpretation of the analyses is best discussed with a local adviser.

Forage crops for weaners

Forage crops are a valuable option for weaners where they can be grown. The most useful forage crops over winter after an autumn weaning are oats and some temperate legumes, but this will depend on the region's soil types and seasonal climate patterns (of rainfall, temperature and frost). Suitable legumes may include lucerne, butterfly pea and lablab. Stands of leucaena provide excellent forage for weaners until frosted. Stand-over high-sugar forage sorghums can be useful in autumn but may be too tall and coarse for small weaners.



Leucaena is excellent quality forage for growing weaners but gets frosted in winter. It often comes away before the grass in spring.

4. Weaning strategies

Factors to be considered in planning and implementing weaning strategies include:

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

Deciding what size to wean down to 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.

Type of country

Weaning calves at a younger age will help to keep the breeders in better body condition.

This applies on all classes of country but, on good country, cows are 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. Earlier weaning will allow the cows to maintain better body condition under drought conditions.



Don't wait—wean earlier if the rains fail.

Breeder age

First-calf heifers and young cows will lose more weight and therefore have lower re-conception rates. Many producers wean these first-calf heifers and young breeders first and wean their calves down to a younger age.

Mating system

Continuous mating – In continuously-mated herds with year-round calving, having two rounds of weaning reduces the number of cows that are lactating for long periods and particularly over the dry season.



Continuous mating results in calves of mixed size at first weaning.

Controlled mating – In control-mated herds with a 3–5 month calving period, typically only one weaning is required. However, some late, lighter weaners will require special management.

The duration of the joining period determines the spread of weaner weights; a longer joining period usually leads to more light calves at weaning.

Wean only the numbers and types of weaners that can be adequately managed.

Overall weaning management

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.

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

Questions that need to be asked include:

- What is the condition of the weaner paddocks, were they spelled?
- Are there adequate staff?

- Do staff understand which calves are going to be weaned from particular breeder groups?
- Are the facilities and equipment in good order – yards, gates and fences repaired, water supplies, troughs for water and supplement, hay racks in place?
- Are there sufficient stocks of good-quality hay and supplements?
- Are there stocks of current animal health products?



Are the yards and water supply in good condition?

Yard weaning

Infrastructure

The yards should have adequate space for weaners to move freely, and with no protrusions that can cause injury or bruising. Weaners of 100–200kg need 3–4 square metres per head. If the weaners are confined for extended periods, shade should be provided.

Weaners have to be held in secure, confined spaces, particularly in the first two days of weaning and in the evenings when they are more likely to take fright from strange noises or animals, and try to break out of the yards. Make sure all gates are securely chained; wiring gates will prevent accidental opening by weaners playing with chains.

Dogs should not be allowed to wander near the yards.

Plants such as button grass and pigweed that commonly grow in yards can be poisonous if consumed in large quantities and particularly if stock are hungry.

Feeding and watering facilities

Hay feeders and troughs should preferably be up off the ground for good hygiene and to reduce the risk of spread of disease such as coccidiosis. Ideally, feed troughs should not be located close to the water troughs; this reduces feed fouling the water, and provides more space for the weaners to reach and eat the supplement.



Hay feeders keep good-quality hay clean and reduce waste.



A rail around the molasses trough may reduce the chance of a sticky start to weaner life.



Hollows and boggy areas around troughs should be built up to give small or weak animals easy access.

Trough space must be long enough for all animals to eat without bullying. Table 4.1 shows guidelines for trough spacing, but these may need to be adjusted to allow for animal type, temperament, supplement intake, mob size and pen layout.

Table 4.1. Trough spacing

Feed type	Trough space
Weaner pellets, meals, protein meal	15–20cm/head
Fortified molasses eg MUP, M4U, M8U	One 1.5m diameter round trough per 100 head
Dry lick	One 1.1m diameter round trough per 100 head

Weaners kept in the yards for up to a week while being tailed out will be quieter in the future but the duration depends on the yard space available.



Troughs should be long enough for all weaners to eat.

Weaner paddocks

Weaner paddocks should have been rested to allow growth of nutritious grasses. They must be securely fenced so the animals can be controlled and educated; electric fencing can help train weaners to respect fences.

In smaller paddocks, weaners can find watering points and supplement troughs more easily. In large paddocks, weaners should be introduced to the watering points or they may hang in the corners and perish.

Smaller-sized and close-by weaner paddocks are easier to monitor and muster for health



Rest the weaner paddock to accumulate a good body of grass—and check the fencing.

treatments such as booster vaccinations. The paddocks should be stocked lightly to allow weaners to select the best herbage.

Weaner management

Weaner management involves:

- reducing stress for the cow and the weaner
- training the weaners
- possibly feeding weaners for the next few months.

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 them as far away as feasible so that they cannot hear each other.

A less stressful strategy is to leave the cows close to the yards for 3–4 days after weaning. After this, they are happy to go away without much fuss, but this poses management issues.

Stress at weaning time may cause problems with disease and parasites. Key factors in managing stress at weaning include:

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

How heavy is that weaner? Brahman cross



British breeds



Nutrition

At weaning, the calf is stressed by separation from its mother, and forced from a diet with milk to one based solely on forage.

Weaners need to be fed good-quality hay and supplements immediately upon weaning to maintain an active rumen. A delay of more than 24 hours can result in reduced or changed rumen bug activity, and it can take up to three weeks for normal rumen function to return. Each weaner must be allowed 2–3kg of good-quality hay each day.

How weaners are fed will affect how they will grow over the next months, and may also affect their long-term growth, health, meat quality and reproductive performance.

Segregating on size

Segregating weaners into groups based on size or weight minimises bullying of smaller animals by larger ones and allows all to get their fair share of feed.



Segregating weaners on size allows for more cost-effective supplementation.



It also allows for more cost-effective supplementation with each class being fed their appropriate nutrients (Table 4.2). For example, feeding more highly palatable and expensive supplements needed for smaller animals to weaners above 150kg will increase costs markedly.

Table 4.2. Weaner management groups and supplement requirements

Weaning weight (kg)	Supplement requirements
Under 60	Milk replacer and high-quality baby calf meals/pellets
60–100	Highly palatable calf meals or pellets
100–150	Supplements needed if pasture quality is too poor for required growth
>150	Supplements needed only if pasture quality is too poor for required growth

Handling

Up to weaning time, calves have had relatively little handling or contact with humans. Good handling and training in the yards for up to a week will minimise the stress of weaning. Tailing weaners out in the weaner paddock will set the animals, and stock handler, up for an easier life in both the paddock and the yards.



Handling weaners through the yards trains them for life.

Selection for temperament within the herd is important for general herd management as well as for good presentation of sale animals.

Monitoring and checking

Weaners in the paddock should be checked for a day or two for general health and to ensure they are coming in for water and supplements.

All weaners should be checked regularly and fed supplements if they start to lose weight.

Disease and parasite management

Before weaning, most calves would have had the protection of maternal antibodies from colostrum. Susceptibility changes with the stress of weaning, close confinement and the drastic change in diet.



Close confinement in the yard and weaning stress increase the risk of disease and parasites.

Access in the yards makes weaning a good time to begin many disease and parasite management programs.

Pregnancy testing and foetal ageing for weaner management

Foetal ageing can be used to forecast the numbers and weights of calves at weaning the following year. This enables better planning by:

- evaluating when to wean, eg how soon can a breeder group be weaned with calves over 100kg
- identifying the weaner management groups to be handled, eg 100–150kg, 150–200kg, over 200kg
- estimating the numbers of weaners in each management group.

Table 4.3 shows estimated calving data for a first-calf cow group on an extensive property.

Table 4.3. Cow and calf numbers, losses, calving dates, ages and weights (pregnancy diagnosed (PD) in June, weaned in April the following year)

Pregnancy test in June		Results at weaning next April			
Status (months)	No. of cows June	No. of cows April	No. of calves	Calf ages (months)	Mean calf wt (kg)
4	380		335	3.6	113
5	504		445	4.6	136
6	642		566	5.6	159
7	205		181	6.6	181
8	67		59	7.6	204
9	28		25	8.6	227
Mean					148
Total	1,826	1,789	1,611		

Cow loss (PD to weaning) 1%; foetal and calf loss (PD to weaning for surviving cows) 10%; weaner weight based on birth weight 31kg; growth rate on dam 0.76kg/day.

Selling weaners

If calves are going to be sold as weaners, it is generally best to sell them as soon as practical after weaning, or to keep them for three to four weeks to allow them to recover. If sold immediately off their mothers, they may have bloom but have had little handling and training.

Trucking to growing properties

Weaners should have access to good-quality, palatable hay at the point of trucking and immediately after they arrive at their destination. This will reduce stress, keep their digestive systems working, and prevent engorging on possibly toxic plants around the yards.

On many extensive properties, calves are not processed before weaning because of the cost of extra mustering and handling. If weaners are to be trucked to a 'growing' property, they should only be branded and ear-tagged with an NLIS tag. At the growing property, they are dehorned and castrated after recovering from the journey.

This strategy can help prevent setbacks due to the stress associated with castration, dehorning and trucking and the risk of infection if they have to be plunge-dipped.

5. Weaner health

Weaning is a time of great stress for the weaner. It is also an opportune time to check for internal and external parasites and to start good health management.

The weaner is stressed by being separated from its mother and by the loss of milk in its diet. In addition, stress and close confinement with other animals in the yard makes the calf more susceptible to infectious and non-infectious diseases.

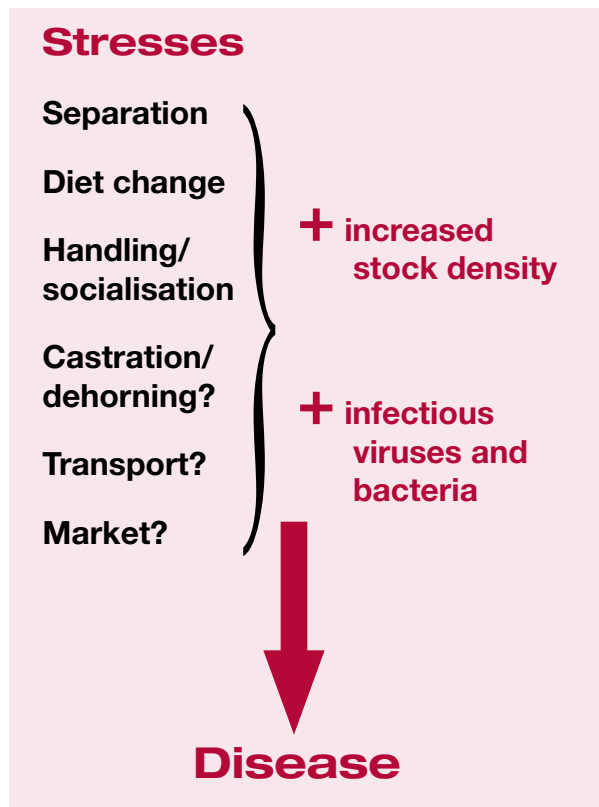
Animal health programs can start while the weaners are confined in the yard. Recommended programs vary from region to region and depend on the climate, stocking rate, pasture quality and the local history of endemic diseases.

Key point

Good herd health starts in the weaning yard.

Stress management

Stress reduces the animal's immune system and is the trigger for many of the disease problems.



Stress at weaning can be reduced through:

- branding, dehorning and castrating before weaning
- good nutrition
- calm stock handling
- avoiding overcrowding
- minimising poor environmental conditions such as dust, heat, lack of shade and boggy yards
- treating existing health conditions;

and, in the long term, by selecting for good temperament.

Animal welfare

(For more detail on branding, castrating and dehorning, read MLA's book 'A guide to best practice husbandry in beef cattle: branding, castrating and dehorning'.)

Basic animal welfare standards must be met during weaning; stock handlers must know how to minimise stress when working the cattle, to recognise early signs of distress and disease, and how to take prompt action.

Surgical procedures should not be carried out if the weaners are wet or the yards are muddy and until animals are ready to be turned out to pasture.

Yards

Yards should be well-drained, clean with no chemical residues, not muddy or too dusty, and with some form of shelter or shade for the weaners. There should be adequate space with hay feeders and troughs for supplements and for clean water.

Risk assessment of diseases

Before starting a disease prevention program, check which diseases pose the greatest risk to the weaners. For some diseases, there is little risk with well-managed weaners as they will build up immunity over time.

Other problems, such as worms, may become issues during weaning and so the weaners should be carefully monitored.

Disease management

Coccidiosis

Coccidiosis or post-weaning diarrhoea (PWD) can be common in weaned calves. *Coccidia* (tiny protozoa parasites) normally inhabit the intestinal tract without causing significant problems, but can reproduce rapidly when the immune system of the calf is compromised by the stress of weaning. Damage to the lining of the intestines is seen as bloody or black diarrhoea. The disease is usually self-limiting but, if untreated, chronic damage and scarring of the intestine may affect long-term growth.

To manage coccidiosis:

- Feed good-quality hay as soon as animals are weaned.
- Feed from troughs or hay racks to avoid contamination from dung on the ground.
- Reduce the stress of weaning on the calf. Provide dry yards with shade and plenty of clean water.
- Include a coccidiostat such as monensin in the calf ration for an intake of about 25 mg/head/day. But over-dosing is toxic, and even small amounts can kill horses.
- Calves with severe or chronic PWD can be treated individually with a product that contains a coccidiostat, an antibiotic and anti-diarrhoeal powders.
- Rotate weaning yards to reduce the build-up of oocysts if larger numbers of weaners are being processed all year round.

Parasite management

External parasites

Buffalo fly

Buffalo fly irritate cattle, cause sores and can interrupt feeding but are usually not a problem in weaners.

Control

Manage fly populations with sprays (knapsack or firefighter) or with back rubbers.

Control measures are described in the MLA's *Recommendations for integrated buffalo fly control – Revised edition*.

Ticks

Ticks are little problem on pure Brahman and crossbred cattle but can be serious on British and European breeds.

Control

Cattle ticks can be controlled by strategic treatment with modern pesticides that are effective against both ticks and internal parasites.

Pasture spelling is also a useful tool when combined with the strategic chemical treatments. Weaner paddocks should be spelled for reasons of both nutrition and tick control.

Tick fever

Cattle ticks can transmit three serious blood-borne tick fever organisms. British and European breeds are especially susceptible, but *Bos indicus* cattle also need protection. Adult cattle of all breeds are more susceptible than weaners.

Control

Calves born and raised in tick country acquire immunity to tick fever from their mother and this generally lasts 3–9 months. Immunity can be maintained by natural challenge. However, in many areas the cattle may not be adequately challenged, and 3-germ tick fever vaccine is given at weaning for reliable long-term protection.

As immunity after vaccination takes some weeks to develop, animals from tick-free areas should ideally be vaccinated at least 30 days before being introduced to tick-infested areas. Alternatively, they should be vaccinated on arrival and monitored for 30 days.

Tick fever

Do not vaccinate just before trucking as the stress can induce a vaccine-induced tick fever.

Do not assume that because the calves have been reared in tick country that they are immune to tick fever. Most (80%) cases of tick fever occur in cattle that have run in tick country all their life.

Lice

Cattle lice are endemic in Australia, and weaners in poor condition are more susceptible to infestation. Lice are spread by direct contact with other infected animals, and often in the cooler months, but rarely affect productivity. Rubbing due to the irritation can cause hair loss around the butt of the tail, neck and shoulders.

Control

There are many commercial insecticides for control of cattle lice.

Internal parasites

Nematodes (round worms such as Barbers Pole) and platyhelminthes (flat worms of fluke and tapeworm) can cause loss of condition, scours and anaemia in weaners up to 18–24 months of age—after which the animals become immune.

These parasites are a greater problem in high-rainfall environments, following wet weather and where pastures are intensively stocked. As the intermediate host for liver fluke is a snail, the problem is restricted to wetter, swampy areas in south-east Queensland. The Northern Territory is currently free of fluke. Treatment is recommended only where a problem is known to exist.

Diagnosis

Most calves will have worms but treatment will be cost effective only when they are heavily infected. Animals with heavy worm burdens show clinical signs of ill thrift, loss of condition, bottle jaw, rough coat and a green scour, but sub-clinical worm burdens result in lower than expected weight gains. While this can cause substantial economical loss, unwarranted treatment can be expensive.

Worm egg counts

Faecal egg counts are the best method to determine if drenching is necessary. Faecal samples should be collected from at least 10 representative animals in the mob and submitted to a laboratory for examination. The significance of the egg numbers detected will depend on the species of parasite present.

Control

It is virtually impossible to eliminate internal parasites. Control measures should include strategies to provide 'clean safe spelled' pastures in conjunction with effective anthelmintic treatment.

Treatment

Anthelmintics can be administered as pour-ons, injectables or oral drenches. Generally a single dose of anthelmintic and moving treated stock to a 'safe' paddock is all that is required.

Ringworm

Ringworm is a fungus that attacks the hair follicles resulting in white patches of thickened skin. It is contagious and quite common in animals in close contact. Ringworm is usually self-curing but bad cases can be treated with a fungicidal wash or spray.

Infectious diseases and vaccinations

The risk of problem diseases and their control will depend on the climate, region and production system.

Advice should be sought from the local beef advisor, stock inspector or veterinarian on managing these diseases.

Appendix 3 summarises management and vaccination against some major diseases that can be implemented at weaning, how they affect the herd, and how to test and manage for the disease. Two vaccines need to be considered in most cases: 5-in-1 vaccine is recommended in all situations and botulism vaccine is recommended in phosphorus-deficient regions and where botulism is known to be a problem.

Vaccination records

All vaccinations given to cattle should be recorded with date of vaccination, vaccine used, batch number of the vaccine and number of stock vaccinated.

This information is valuable for future health management and may be useful when negotiating contracts with purchasers if it can be established that the stock have been part of a good herd health program.

6. Feeding weaners

The main feed for weaners while in the yard is hay, but lighter and younger weaners need additional supplements such as protein meals.

On-property stocks of palatable, good-quality hay and supplements must be sufficient to feed all the weaners for the appropriate period.

Purchasing hay

Good quality hay has a high proportion of leaf to stem, is green and sweet smelling.



Good palatable hay – greenness and sweet smell indicate quality.

Hay containing legume leaf is usually more nutritious and digestible than hay made from grass alone, but too much legume (as in pure lucerne hay) can cause scouring in weaners.

In northern WA, cereal (barley and oaten) hay is commonly fed to weaners, being reasonably priced and palatable.

Be careful when purchasing hay from areas with widespread declared weeds such as parthenium or giant rats tail grass. Weedy hay will be less nutritious—and a biosecurity risk.

Feeding in the yard

Palatable hay must be available in the hay racks so that weaners begin eating as soon as they come into the yards. This will prevent a rapid decline in populations of rumen bugs.

Most calves will lose some weight from stresses immediately after weaning, but soon recover with good nutrition. Feeding after this will determine performance.

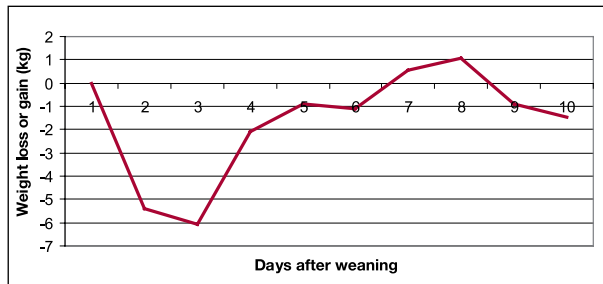


Figure 6.1. Weaners fed hay may lose some weight initially as their digestion adjusts but soon recover.



Can they eat enough if quality is poor? The heap on the left is how much poor quality hay a weaner of 100kg would have to eat to gain 0.5kg/day; the small heap on the right is how much it could eat.

Key points

The best types and amounts of fodder and supplements to feed will depend on:

- local availability and cost
- economic benefit for the target market
- animal welfare considerations.

Feeding supplements in the yard

Some classes of weaners will need to be fed supplements while in the yard. Most weaners will be in the yards for 5–7 days while being trained and for any other procedures, but smaller animals may need to remain in the yard for some weeks on high protein and high energy rations.

General recommendations for feeding weaners include:

- Allow 15–20cm of trough per weaner.
- Feeding weaner pellets and protein meals twice a week minimises bullying and labour costs.



Feeding twice a week ensures there is plenty of feed, and reduces bullying and costs.

- Make any changes in the amount or type of feed gradually to prevent digestive upsets.
- As calves grow, they should be moved into the appropriate weight group to allow a change to a cheaper ration.



Segregating weaners on size reduces bullying and allows all to get a fair share of the appropriate ration.

- Keep accurate records of supplements fed to determine if intakes are adequate and cost-effective.

Feeding in the paddock

The need for protein and energy supplements will depend on weaner weight, the quality of the pasture in the weaning paddocks and on target growth rates. Even if the paddocks are rested, the quality of the grazing will depend on the region's soils and climate.

Good weaner paddocks should have abundant (>70%) 3P (perennial, productive, palatable) pasture species, preferably with some legume. In regions with some winter rainfall, herbage provides good-quality feed.

Table 6.1. Pasture quality

Pasture quality	Dry matter digestibility (%)	Crude protein (%)
Very good	>60	>8
Good	55–60	7–8
Marginal	50–55	6–7
Poor	<50	<6

Dry matter digestibility provides an indication of energy level; crude protein as assessed by faecal NIRS.

Dry season pasture quality is frequently too poor for weaners to even maintain weight without extra protein and energy.



Weaner steers averaging 200kg and grazed on speargrass country. Above, those supplemented with only a salt-urea dry lick lost weight quickly at end of dry season, and became susceptible to parasites. Below, these received a molasses-based supplement (MUP type mix) and gained weight.



Key points

Weaners under 150kg should be fed (good pasture or supplement) to gain weight.

Weaners above 150kg should at least maintain weight.

Weaners under 200kg losing more than 10–15% of their weight are at risk of permanent set-back.

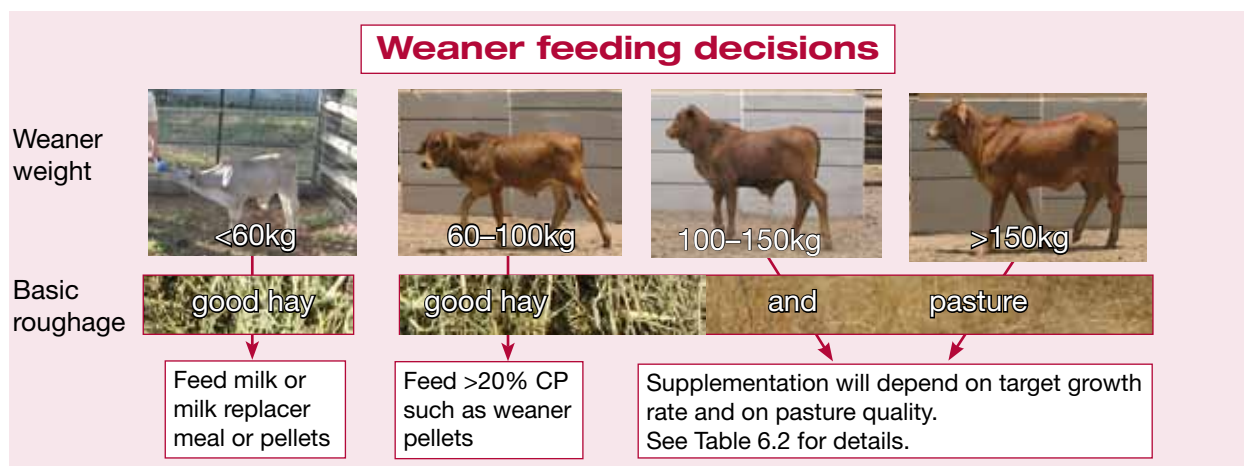


Table 6.2. Weaner supplements and intakes for various growth targets on pastures of different quality

Weaner weight (kg)	Pasture quality	Growth target ¹ (kg/hd/day)	Supplement types	Recommended daily intake (kg/hd/day)
Under 60	Good hay	0.4	Milk replacer and high quality calf meals ²	1–1.5
60–100	Good hay or good to marginal pasture	0.25	Calf meals or pellets ²	1–1.5
100–150	Poor pasture DMD <50% CP <6%	0.2	Weaner meals or pellets ² , grain mixes	1–1.5
			Protein meals	0.5
100–150	Marginal pasture DMD 50–55% CP 6–7%	0.2	MP, MUP ^{3,4}	1–1.5
			Protein meals	0.5
100–150	Good pasture DMD 55–60% CP 7–8%	0.2	Fortified molasses – MP, MUP ^{3,4}	1–1.5
			None	
150–200	Poor pasture	0.1–0.2	Weaner meals or pellets, grain mixes	1.5
			Protein meals	0.5
			Fortified molasses – MP, MUP, M8U ^{3,4}	1.5–2.0
150–200	Marginal pasture	0.2	Protein supplements (dry licks, blocks and liquid supplements) ⁵	Sufficient to provide 75g protein/head/day
150–200	Good pasture	0.2	None	
Over 200	Poor pasture	0.1	Protein supplements (dry licks, blocks and liquid supplements)	Sufficient to provide 75g protein/head/day
		0.2	Fortified molasses – MUP, M8U ³	1.5–2.0
Over 200	Marginal pasture	0.2	Protein supplements (dry licks, blocks and liquid supplements) ⁵	Sufficient to provide 75g protein/head/day
Over 200	Good pasture	0.2	None	

¹On poor quality pastures, weaners may not achieve target growth rates at recommended supplement intake.

²Proprietary mixes should be fed according to manufacturers' recommendations. ³MP=Molasses+protein meal;

MUP=Molasses+urea+protein meal; M8U=Molasses+8% urea. ⁴100–150kg weaners may not consume the recommended level of fortified molasses. ⁵Weaners may not consume sufficient supplement to supply 75g protein/head/day. Protein meal is often added to improve palatability of licks and blocks. Inclusion of a coccidiostat eg monensin is recommended for proprietary and homemade weaner meals or pellets, grain mixes and fortified molasses mixes.

See Appendices 1 and 2 for more details about rations and alternative feedstuffs.

Compensatory growth

Not all animals show compensatory growth to the same degree once the nutritional restriction is removed. The amount of compensatory gain depends on the quality of wet season feed and on the age or stage of maturity of the weaner. Very young weaners may never compensate fully if they lose weight after weaning.

Compensatory growth

Compensatory growth is the greater-than-expected weight gain that can occur when animals are on good feed following a period of slow growth or weight loss due to poor nutrition.

The amount of compensatory growth depends on how long and how severe the weight loss was, at what age or stage of maturity the weight loss occurred, and the quality of feed after this.

Compensatory growth reduces the benefit of dry season supplementation with its unpredictability complicating supplementation strategies and marketing.

Age of turn-off has a major influence on the importance of dry season growth and compensatory gain. If early turn-off is required, animals may not have time to achieve target weights. Similarly, a short growing season may prevent animals achieving the growth required.

The potential for effective compensatory growth was illustrated in a large-scale trial in Western Australia (see case study *Large early-weaning trial at Halls Creek, WA*).

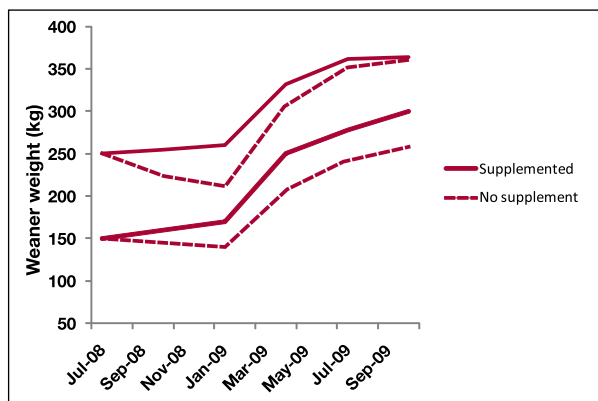


Figure 6.2. Weight gains of supplemented and unsupplemented light (150kg) and heavy (250kg) weaners over 15 months. Final differences between light and heavy weaners reflect their age.

Heavier weaners (250kg) that received no supplements showed compensatory growth and caught up with supplemented animals after 15 months (Figure 6.2) whereas light weaners (under 150kg) that were not supplemented never caught up with their supplemented peers, and would have reached target weights later.

Supplements in the paddock

- How well the weaners grow will depend on the quality of the pasture and the supplement fed.
- Weaner paddocks should be on the best country, and rested over the wet season.
- Weaners under 150kg on poor pasture cannot get sufficient protein from urea-based blocks or licks, nor do they receive energy from these blocks or licks. They should be fed a high-energy and high-protein supplement.
- Weaners weighing more than 150kg may need protein supplements to gain weight. On poor pastures, they may require a high energy and protein supplement.
- Urea licks or blocks should not be allowed to run out. Weaners may gorge the licks when replenished, and could get urea poisoning.
- Weaners that are losing excessive weight should be segregated, have their health checked and should be given better quality feed.
- Growth targets of weaners will be influenced by the market target and the cost of supplements. It may sometimes be more economical to accept lower growth and resulting later turn-off.
- Replacement heifer weaners should be fed so as to reach target weights of 300–325kg at two years of age.

Animal welfare

Animal welfare considerations are becoming increasingly important. There is legislation against stock, including calves, being deliberately malnourished.

Rearing baby calves

A motherless calf may be humanely euthanised or taken home to be hand reared. Orphan calves often show signs of dehydration, depression, lack of appetite or scouring. If the calf is to survive, proper care during the first 24 hours is critical.

Dehydrated calves

The calf should be rehydrated before getting any milk. Feeding a dehydrated calf with milk often results in scours and possibly death. Electrolyte mixtures are commercially available or can be mixed at home from one teaspoon table salt, ½ teaspoon baking soda and 125mL glucose in 1.2 litres of water. Electrolyte should be fed for at least 24 hours before milk is given.

Colostrum

Colostrum provides passive immunity to disease and helps build up vitamin and mineral levels. The new-born calf should get colostrum within the first 36 hours of birth—either from a mother or artificial sources. A supply of frozen colostrum can be kept in the freezer, while some milk replacers also contain colostrum. Once the calf has received colostrum, it can be fed solely on whole milk or milk replacers.

Milk replacers

Milk replacers should contain at least 20% true protein and 10% fat and no more than 10% starch and sugars (sucrose).

Milk replacers should be reconstituted and fed as directed by the manufacturers (usually 1kg of powder to 10 litres of water and fed at a daily rate of 10% of calf body weight).

Increasing the proportion of powder is often recommended for once-a-day feeding to reduce the total volume required.

Teat or bucket feeding?

Calves may be fed from a bucket or on teat feeders—both have advantages and disadvantages.

Initially, it may be easier to get calves to feed from a teat. Teat feeding helps to close the oesophageal groove for the milk to flow directly to the true stomach (abomasum) for

better digestion (see Chapter 2); it may also stimulate saliva production and maintain fluid intake in scouring calves. Teats have to be kept clean and replaced when they deteriorate.

If a bucket is used, its base should be placed at least 30cm above the ground to help the oesophageal groove to close. To train a calf to drink from a bucket, back it into a corner, stand astride its neck and place two fingers moistened with milk into its mouth. Then move the hand into the milk.

Whatever method is used, each calf must receive a measured amount of milk daily. Teat feeders are more suited to feeding large numbers of calves but, once a calf is older, it may drink more from the bucket than from a teat.

Scours

Scouring can quickly lead to death. A scouring calf should be taken off milk for at least 24 hours and fed electrolytes. If scours continue, treatment with commercial medication may be warranted—in consultation with a vet. (See Chapter 5 on Weaner health).

Scour medication should be kept on hand as early treatment can mean the difference between cure and the loss of the calf.

Isolate sick calves.

Water

Calves will begin to drink water between one and two weeks of age and, by six weeks, may drink four to five litres a day. Feeding milk once or twice a day does not supply enough water and fresh, cool water should be available at all times. Calves eating meal may foul the water trough necessitating regular cleaning.

Feeding routine

- When rearing a large number of calves, it is best to draft them according to their size.
- Do not over-feed calves, especially during their first three weeks of life. As a guide, milk intake per day should be calculated at 10% of the calf's body weight; thus a 30kg calf should be fed 3L of whole milk per day.

- Start baby and weak calves on 250mL of milk, five times a day for the first 24–48 hours and work up to 2L twice a day.
- The best milk temperature is between 35° and 38°C, but it may be fed as cold as 6°C.
- Solid feed such as good-quality hay and concentrates can be introduced from one to two weeks of age.
- Once-a-day feeding may begin at two to three weeks of age if the calf is healthy and eating well. The full ration of milk should be given in the morning with plenty of cool, fresh water provided for the rest of the day.
- Calves fed once a day usually have a good appetite for dry feed and are easier to wean onto solids.

Solid feed

- The calf should have access to hay and concentrates from one week to stimulate rumen activity. The rumen is usually functioning well by 10 to 12 weeks.
- Milk or milk replacer should be fed until at least five weeks of age or until the rumen has developed properly.
- The calf can be fed high-quality baby calf meals or pellets after about five weeks.
- Avoid giving excessive green grass in the first 6–8 weeks of age to prevent any digestive upsets.
- Concentrates can be introduced by placing a small amount in the milking bucket. As the calf finishes drinking, rub a little concentrate on its muzzle to encourage the calf to taste it.
- By three weeks of age, a calf should be able to digest small amounts of grain, meals and hay and, where possible, be given access to young green pasture.
- Depending on the quality of the pasture, supplementary hay and concentrates may be needed until the calf is at least 120kg liveweight.
- Calf concentrates should be highly palatable, coarse-textured, high in energy (12MJ ME/kg or better) and protein (over 16%) and low in roughage (less than 15%).

- A simple home-mix could consist of four parts cracked or crushed grain (oats, barley, maize or wheat) and one part linseed, soybean, peanut, copra or cotton seed meal. A small amount of molasses may be added to make the mix more palatable.
- Adding products containing monensin will assist rumen activity and help prevent coccidiosis. Monensin can be toxic and so should be fed according to the manufacturers' recommendations. It is not recommended for inclusion in urea-based supplements as it is difficult to evenly mix the small quantities required.
- Monensin is toxic to horses and other monogastric animals, including dogs.
- Calves need both rumen-degradable and by-pass protein from a natural source such as protein meals.
- Non-protein-nitrogen sources such as urea are not suitable for young calves.
- Good grassy lucerne is best for young calves—very high quality lucerne may cause scouring.
- If pasture is scarce or of poor quality, supplement it with good quality hay.

Weaning off milk

- If the calf has been offered solids from one week of age, it might be weaned off milk after five weeks of age.
- Weaning should be based on concentrate consumption of at least 650g of meal a day—not on age. As some calves will reach the target consumption earlier, it is best to feed concentrates separately with more than one calf.
- Weaning can be abrupt or by reducing milk over a one-week period.
- The weaned calf will require intensive management. Poor management and poor nutrition at this early age may result in a stunted calf that will never recover.

Information on managing calves after weaning off milk is given earlier in this chapter.

7. Weaner training

At the time of weaning, calves have had relatively little handling.

Educating and training calves well at weaning will make them easier to work in both the paddock and the yards throughout their lives. This results in less loss of time and money and less frustration.

Making the weaners' first experience of the yards as pleasant as possible by steady handling and providing feed and water reduces the stress of weaning. Keeping weaners unstressed in yards allows them to establish social orders in confined spaces, increases immunity to common health conditions and de-sensitises them to noises and movements of people and vehicles. It also allows them to learn to eat new foods such as hay, pellets or supplements.



Make the first experience as pleasant as possible with good feed and water and quiet handling.

Calm handling

The first step is mustering the calves with their mothers and walking the mob calmly into the yards. Drafting and handling in the yard should also be carried out as calmly as possible, with calves to be weaned drafted into a yard with a clean water trough and hay on offer.

Working weaners through the yards on foot three to four times over a week will familiarise them with people on the ground.

Weaners should be given 'free run' through the yards, but also taught to 'block up' at a shut gate, ie coming into the round yard before a

gate is opened, or coming to a shut gate in the race. They should not be worked in only one direction through the yards.



Weaners should be worked quietly from yard to yard and through the race.

Pupils and teachers

Having a few quiet, trained, older animals with the new weaners is a good way of helping them settle down more quickly and provides a lead for them to follow, especially when they are turned out into their paddock. But work with only one class of weaners; a few older animals with bad temperament in the mob will affect the behaviour of the whole group.

Stockmanship

Cattle read body language, and should be shown clearly where they will move to. Handling them calmly and confidently without sudden and loud movements gives them more confidence in the handlers.

The right type of dogs—that herd or block and do not bite—will teach the mob to stay together. But do not allow dogs to run uncontrolled around the yard.

Tailing out

Weaners can be let out of the yards as a mob after a couple of days. They are tailed out in a paddock and then yarded at night at least three to four times.

They should be introduced to, and become accustomed to, all types of handling—using horses and motorbikes. There are tales of



Tailing out a mob of weaners—held in the lead and pushed in the tail.

steers that have been mustered only by motorbike on one property charging stock handlers on horses at their next location.

This tailing and yarding is not only a crucial part of the education process but it can save feed costs. After a few days, they should walk out calmly and put their heads down and start eating. They can then progress to settling on the water in their paddock, or being left in a holding paddock for a further week as they get used to living without their mothers.



Weaners should be handled with, and so become accustomed to, horses, bikes and other vehicles.



Truck familiarity

As all cattle will be trucked at some stage, it can be good practice to take weaners for their first truck ride at weaning time. This allows them to learn to load and travel as a group without the usual time constraints. A short and smooth ride will teach them that trucking is not a negative experience; this avoids the situation where their first truck ride is the one taking them to the sale yard—and where you are being paid on the results of their first trip.



Weaners can be made familiar with trucking without the rush against tight schedules.

Last operations before release

Procedures such as dehorning and castration should be the last thing in the weaner training schedule but preferably would have been carried out a couple of months before weaning. Although there may be no proven benefit, this earlier action reduces the stress at weaning.

Doing these procedures last before turning the weaners out onto pasture avoids exposing them to tetanus and other germs that may exist in cattle yards, and ensures that they are already settled enough to go out into the paddock and continue to eat and drink as they recover.

Checking the weaner paddock

Check the weaner paddock daily for a couple of weeks after weaners are turned out to ensure they are coming to water and supplements and that none have escaped.

Time spent on weaner education will continue to pay dividends for the life of the animal in terms of time saved and productivity increased. For breeding females, this could be for the next eight or more years.

8. Longer term benefits

Growth in the dry season after weaning can affect future productivity, health, meat quality and heifer performance.

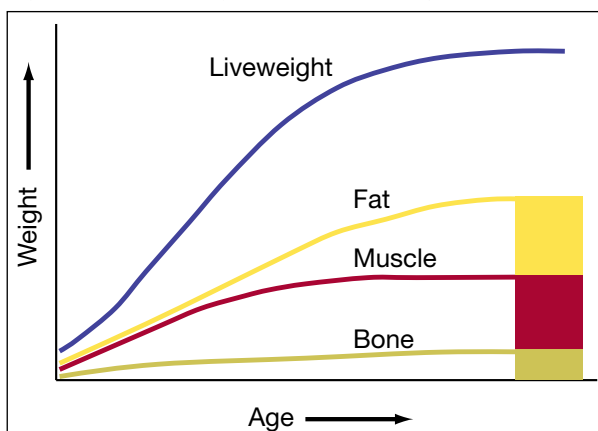
Poor weaner growth can result in:

- more animals being held over and delayed turn-off
- more cattle failing to meet market specifications
- more culls such as 'poor doers', 'woody' or 'poddy' animals.

Weaner growth

As the weaner grows, the proportion of weight gain that is bone, muscle or fat changes. The amount of bone is relatively consistent; in younger animals, most of the weight gain is muscle. As the animal matures, the proportion of the weight gain from muscle declines and the proportion from fat increases (Figure 8.1).

Figure 8.1. Relative growth rates of body tissue



If an animal grows poorly after being weaned, the growth pattern can be affected. After a period of weight loss or low weight gain, the animal typically puts on some compensatory gain when its diet improves.

The earlier in life the growth restriction, the poorer the subsequent performance. Animals sold soon after the start of the wet season will have had less opportunity for compensatory gain.

If animals cannot fully compensate for loss of potential weight gain after weaning, they will

Compensatory growth

Compensatory growth is the better-than-expected growth seen in animals following a period of very low weight gain or weight loss.

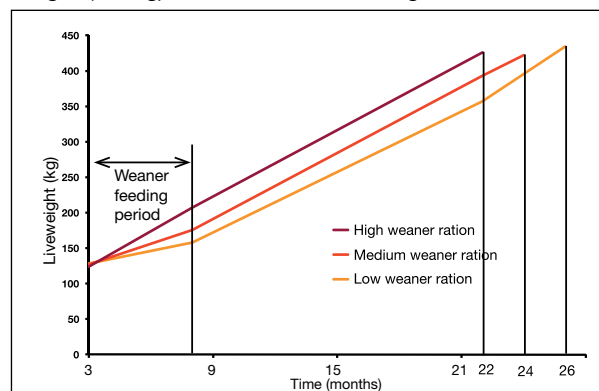
The amount of compensatory gain depends on the animal's age, the severity of weight loss and on the quality of feed.

If very young weaners lose much weight (>15%), they may be permanently stunted—or die—whereas older weaners are able to compensate.

be lighter when sold or have to be held longer to achieve the same weight. This often means that they will not meet dentition or ossification specifications for the desired market. Delays in turn-off mean that more animals are being run on the property and the stocking rate is increased unless the breeding herd is reduced.

Figure 8.2 shows that faster-growing weaners reach feedlot entry weight earlier.

Figure 8.2. Months required to reach feedlot entry weight (420kg) after different weaner growth rates



The effects of weaning and feeding persist when the animals go into a feedlot. After 90 days in the feedlot, educated animals may have an estimated net value of \$25/head more than cattle that have been weaned into the paddock with minimal handling. This results from better growth rate, less respiratory disease and lower health treatment costs.

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 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 grade to 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 MSA later.

Pre-weaning nutrition is generally less important although calves with low weaning weights may take too long to reach market specifications to attract premium prices. Suckling calves generally gain at least 0.6kg per day. 'Light weight at weaning' is more due to age than growth rate and, at earlier turn-off, younger calves do not have time to reach target weight.

Breeding properties that rely on native pastures for weaners must produce an animal over 300kg at 18 months for sale to backgrounders and finishers if good meat quality is the target. Table 8.1 shows the post-weaning gains required to achieve target turn-off weights for store animals 12 months after weaning.

Table 8.1. Steer growth rates required to achieve target weights 12 months after weaning

Weaning weight (kg)	320kg target weight		450kg target weight	
	Gain (kg)	(kg/day)	Gain (kg)	(kg/day)
100	220	0.60	350	0.96
140	180	0.49	310	0.85
180	140	0.38	270	0.74
220	100	0.27	230	0.63
260	60	0.16	190	0.52

For slaughter animals, the age of turn-off which enables animals to meet dentition and or ossification specifications has to be considered as well as weight targets.

Growing replacement heifers

Of equal importance is the impact of weaner heifer growth on breeder herd performance. The age at which heifers will be joined must be considered when planning their nutritional management program (Table 8.2). Yearling-mated heifers have little time to reach the target mating weight. Although heifers to be mated as two-year-olds have more time, they have to go through two dry seasons before joining and are usually running on harder country. They must not lose weight during the dry season if they are to achieve target mating weights.

Table 8.2. Heifer growth rates required to achieve a minimum target mating weight of 300kg

Weaning weight 1 st May (kg)	Weight gain to reach 300kg (kg)	Average daily gain required to reach 300kg (kg/day)	
		Yearling mating 1 Dec (214 days post-weaning)	2-yr-old mating 1 Dec (580 days post-weaning)
100	200	0.94	0.34
140	160	0.75	0.28
180	120	0.56	0.21
220	80	0.37	0.14
260	40	0.19	0.07

Better growth of replacement heifers allows:

- more animals at the target weight from which to select
- greater opportunity for yearling joining
- heavier culls before and after mating.

9. Economic impacts

The economic impact of improving weaner management practices depends on current herd management practices, the fertility of the country and pasture quality. The exact benefit is difficult to establish because the various strategies can have many results.

On low-fertility country where cow survival, weaning rates and post-weaning growth rates are a concern, improved weaner management has been shown to significantly increase business profitability.

In extensive, continuously-mated herds, the strategy of weaning those calves born late in the wet season at a younger age and lighter weight—commonly referred to as 'early weaning'—will improve overall herd performance. 'Early weaning' is now recommended as 'normal' practice in these regions.

With control-mated herds on more fertile country, calves are often weaned at older ages and heavier weights, but herd performance might still be improved if they were weaned earlier in autumn.

Weaning even earlier at lighter weights is a valuable drought management practice following a poor wet season with little prospect of carry-over winter feed.

Early weaning

Calves that are young and small at the first muster can be either weaned early and given some supplementary feed or left with their mothers until the next muster.

This section describes the benefits and costs of early weaning and improved weaner management in general terms.

The impact

Where an early-weaning strategy is implemented, the herd structure will change with fewer cows needed to produce the same number of calves.

Within a couple of years, the proportion of these small calves will decline—particularly at second-round musters—and calving will be better aligned with seasonal grass growth.

Better branding rates

Once an early-weaning strategy has been implemented, overall branding figures would be expected to rise by 5–10%. The branding rate in first-calf cows would be expected to rise from 40–50% to 50–65%.

Weaning rates will rise from better conception rates and lower calf losses from birth to weaning.

Breeder mortalities may fall from 6% to 5%. If the cows that die are those trying to feed small calves during the dry season, it could be expected that 6% of calves would also die. As current management practices record only branding figures, losses between birth and branding can only be guessed.

Increasing the number of calves weaned at the first-round muster will result in more dry and early-pregnant cows during the next wet season. These cows should be able to improve their condition in the following early dry season and therefore will need less supplementation.

Other benefits from weaning the under-150kg calves will come two to three years after the strategy was implemented; the calving season becomes more concentrated, more calves are born in time to grow over the wet and the proportion of calves that have to be weaned early is expected to drop from around 40% to 15%. This will then reduce the costs of early weaning and, with pregnant cows segregated on foetal age, can reduce the costs incurred at the second muster.

First-calf cows

Over time, better concentrated calving will allow more maiden heifers to be heavy enough to mate when they are introduced to the breeding herd. This will also result in a higher conception rate synchronised with the preferred time of the year.

In an extensive breeding herd, 40% of cows are two-, three- or four-years old, and it is the failure of many of the first-calf cows to get back into calf that lowers overall branding rates to around 65%. Early weaning gives

these animals a chance to regain condition, and start cycling again.

The extra costs

The extra costs in the first year of the new strategy will arise if extra facilities are needed to hold and feed the small weaners—extra trough space for hay, pellets and for water, extra feed storage sheds, machinery and vehicles to load and distribute supplements, and extra yards to allow size-segregated weaners to be fed different rations.

Weaner feeding costs will rise in total with the higher cost of feeding high-protein rations for longer. However, these costs will fall as the number and proportion of calves that have to be weaned early will decline over the two to three years after implementation.

A worked example

An example is described with production parameters being 'best estimates' for typical northern Australian extensive properties.

In an attempt to quantify the financial benefits of early weaning on extensive properties, a financial study was based on properties with and without early weaning. The production parameters were derived from herds running in the Mitchell grass regions of northern WA, and used in herd and financial models. Costs are based on ABARE data for this region; changes in livestock performance are based on data from the Heytesbury weaning trial (described in their case study).

The example properties were set to run self-replacing herds of 6,400 breeding cows with 10% of the breeding herd culled each year and 80% of steers sold at about 18 months of age.

Changes in herd performance with early weaning were:

- Herd branding of 62% was raised to 67%.
- The proportion of calves weaned early fell from 40% to 15% after early weaning had been fully implemented.
- Feeding calves under 150kg cost \$40/head compared to \$24/head for 'normal' weaners.

- Costs of feeding supplements to the breeder herd were reduced by 15%.
- Labour costs at weaning increase but the total labour costs of the property are reduced by 10% within 3–4 years.
- Extra facilities for holding and feeding early weaners were costed at \$150,000.

When properties with and without early weaning were compared, the property implementing the early weaning strategy showed economic benefits of:

- 19% improvement in profit
- 10% improvement in gross margin per adult equivalent
- 8% increase in beef output.

Any reduction in weaner feeding costs would greatly improve profitability.

Benefits of early weaning

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.

10. Case studies

Rearing small calves

Robyn Richardson of Mt. Florance Station, Tom Price, WA describes her system of rearing calves. She says that it is not difficult most of the time, but it takes time and costs money.

My system

"I give baby calves milk for 3–4 weeks, feeding little and often if they are weak or dehydrated.

Some hay is available from the start. Once they start eating it well, I provide 1kg/head/day rising to 1.5kg as they get a bit older.

After those 3–4 weeks when milk stops, I place some calf pellets (which include milk powder) on top of the hay. The calves quickly develop a taste for them, and within three days they are each getting 1kg of pellets a day.

Depending on how individual calves are going, I continue to feed hay and calf pellets for up to two months, after which I reduce the pellets to 0.5kg of pellets per day and increase the hay. I sometimes feed 'shipper pellets' to these older calves for the next 3–6 months—or until it rains.

If there are a number of calves, I always separate them into similar feeding types whether on milk or dry feed. Never mix shy feeders with the 'pigs'.

And I never let them near my lawn around the house!"



Weaners on pellets along a good length trough.

Robyn's other tips

- Rearing calves is expensive; it costs between \$150 and \$200 to rear a calf in this Pilbara region. Be aware of this before you start. Know what each calf is costing.
- Do not be put off by the condition of the calf in the beginning; they are tough and can overcome even the worst starts given the opportunity.
- The baby calves starting on milk and then hay and pellets do not look terrific until around three months old (when the rumen is functioning efficiently) but are strong enough and generally eat heartily.
- The biggest problem comes as they get older and require more feed. There needs to be a 'back-up plan' to look after them until the rains come. Consider a small patch of forage sorghum to provide the feed.
- Reared calves are at greater risk if the season fails again. Keep them close by so you can supplement them with some hay if the summer season fails.
- Coccidiosis is a serious problem and will kill quickly. Isolate and treat any sick calves.
- Calves in poor condition are prone to warts and ringworm but seem to get over them as they get older.
- Injured or dog-bitten calves can be saved but will need a course of antibiotics. Robyn uses a hose to irrigate the wounds, and gives an application of backliner if the wound is flyblown with maggots.
- So long as the calves are not torn apart, they can heal—but be mindful of the reduced market price for a scarred animal.

Educating weaners at Halls Creek, WA

Heytesbury Beef's Flora Valley Station (833,000ha) includes Nicholson and Gordon Downs and lies some 115 km east of Halls Creek, WA. This cattle breeding operation is managed by Laurie and Kirstin Curtain.

The country

Most of the property has open black soil plains and downs growing Mitchell grass and Flinders grass, but runs onto the soft desert country of the Tanami to the south and into gravelly red spinifex hills to the north.

In good years, the black soil pastures are burned early in the dry season to provide green pick and control woody weeds.

Rainfall

Rainfall is strongly summer-dominant with about 80% falling between October and March. Annual rainfall at the homestead averages 560mm but falls to 355mm towards the southern part of the property. Maximum temperatures in the wet season often exceed 40°C and in the dry average 26–27°C.

Livestock

The Flora Valley herd is predominantly Brahman with some infusion of Charolais. The general breeding focus is on improving the fertility of the herd.

Herd management

Gordon Downs and Nicholson are the breeder blocks with breeders set stocked and not supplemented. Flora Valley holds all weaners and grower cattle.

Joiner heifers get a phosphorus lick towards the end of the dry season.

The breeding herds are mustered twice each year, with the first round between April and June and the second from October to December.

Markets

Flora sells 18–22-month-old steers up to 350kg through Darwin for the live export market. The main sale months are June to September. Spayed heifers are sold twelve months older (35 months) weighing 380–420kg.

Mating

Mating is continuous. Laurie says *“Controlled mating would be ideal but there is always an issue of not removing all the bulls. A safe bull paddock away from the breeders would also be essential, preferably electrified. This would give you more opportunity for bull management such as semen testing.”*

Weaning

Most weaners are prepared on the breeding blocks before being trucked to Flora Valley.

Laurie says that it is important to have a dedicated weaner educator, and Flora Valley employs Estelle Taylor, and her team of dogs, for this. *“You need to outline their responsibilities carefully. The weaner educator provides correct feed and water so the weaners are ready to go on to be educated. The weaner training program works by exposing animals to the stresses they will be exposed to later in life.”*

Weaners have access to hay and fresh clean water as soon as they arrive at their weaning yard. The water troughs are cleaned meticulously before the weaners arrive and while they are in the yards. The aim is one 500kg square bale of grass or sorghum hay per 50 head distributed throughout the yard to allow all weaners access.

The weaner complex at Flora Valley consists of a set of yards and nine ‘small’ paddocks averaging 500ha. These paddocks are spelled during the wet season, and are used to educate the weaners and to allow them to recover after branding.

Weaner education program

Day 1

Calves are drafted through the yards to be weaned; they may be trucked that day or given a day to settle down.

Day 2

The educator goes into a yard, without dogs, moving through the mob slowly to give weaners time to stand up, and getting them used to people moving through them. Using ‘pressure and release’ techniques, she starts and stops single beasts—at the same time picking up hay bale twine. Estelle says, *“It only takes 10–15 minutes and kills two birds with one stone.”*

Estelle does this on foot for an hour or so. She then brings her dogs in and starts moving the weaners from corner to corner by gathering the cattle up and putting them down one side of the fence; the dogs create barriers making it comfortable for animals to be in the mob but uncomfortable when they come out. She does this on all four sides of the yard and then turns them around and goes back the other way. This can be done with any size mob but needs sufficient room for cattle to move freely—the major factor being yard space.

The ‘four-corners’ exercise teaches the weaners to collect up and move as a mob, and teaches them to stop, start and to walk straight. Estelle stays alongside the front of the mob influencing the lead, with the dogs on the side influencing the middle and the tail of the mob. This can take between 15 minutes to an hour depending on the mentality of the mob. The total time taken decreases as the mob settles and learns to tolerate pressure and that moving from pressure gives relief.

Estelle gives them a break and then does a similar exercise on horseback.

She then spends the afternoon on foot moving the mob through a series of yards, focussing on achieving calm and fluent movement through gateways. She stays in the lead, controlling the rate of flow while the dogs move the mob, positioned on the wing and tail. At this stage, she is not too concerned about the speed

they flow, more for them to move through as a mob, safely and without jamming up.

If the weaners are settled enough, she then walks them out into a laneway using either horse or motorbike with the dogs. Estelle takes them out, pulls them up, and makes sure they have all stopped. She stops and starts them a few times and walks them a few hundred metres before turning them around and yarding them again. Her definition of ‘settled enough to let them out’ is that the mob is moving fluently around the yard, responding well to dogs and movement of the mob has slowed.

The weaners are put back onto hay and fresh water at the end of the day.

Day 3

Estelle repeats the previous morning’s session in the yards before letting them out into a grass paddock using horse or motorbike with dogs. She makes sure that they pull up, put their heads down and eat. She then stays out with them until satisfied that they are all settled and will not start walking the paddock. If necessary, she will stay with them until yarding up again.

Estelle has found that in the early stages of education the cattle usually will not graze for much longer than two hours and then will start looking for a drink. This grazing period increases over time.

As soon as the weaners become restless and start to wander, Estelle gathers them up and yards them again, sometimes using the chopper to give them exposure.

Day 4 and 5

Weaners are out on grass for most of the day. At some stage, Estelle will also put them through a race and yards, provided they move from a soft block and know how to stop, start and walk straight. Race work is only done when they have had at least a full day on grass and are therefore more settled.

The weaners graze in the paddock each day before being yarded at night until the stock camp is ready to process them—which could be any number of days. The animals are then trucked to the yards where they are processed.

Processing

All weaners are bang-tailed, vaccinated against botulism, treated with a pour-on for parasites, and drafted according to gender. All weaner steers over 140kg are drafted off and given a 400-day HGP. Weaners lighter than 140kg, along with 'woody' weaners, are drafted off and put into a small paddock where they are supplemented. These smaller weaners are not usually processed until the end of the round when they should be heavier and healthier.

Weaners branded in the previous round are walked directly to their designated paddocks and remain there until they are mustered the following year.

While the previously-branded weaners are being walked away, the cleanskins are branded. Weaners that are freshly branded are walked to small weaner paddocks within the weaner complex and are supplemented until the wounds have healed. Males and females are kept in separate paddocks. When these weaners have healed, which can take up to six weeks, they are mustered and walked away to their designated paddock until the following season.

Branding, dehorning and castration

All animals are dehorned using scoop dehorner. Care is taken to make sure all of the horn bud is removed, and the wound is neat and even before being covered with Stockholm tar.

Heifers are ear-marked, branded and dehorned. Males are castrated surgically with scalpels, using clean cuts and plenty of antiseptic.

All weaners are let out of the cradle straight into a holding paddock with fresh water and hay. As soon as a mob of weaners have been branded, they are walked to a weaner paddock as previously mentioned. The farthest walk is 10 kilometres.

All handling, including walking, is done using good stockmanship. After they are walked to the weaner paddock, they are not left until they are settled and contentedly grazing (heads down and moving slowly) or camped up, and they know where the water is. They

are usually walked away early in the morning so they have the whole day to settle in. It helps that cattle naturally camp up during the middle of the day, which is when they usually arrive at their destination. These weaners are monitored each day to check that they are all walking in to the trough for water each day and that they are not camped in the corner of a paddock for too long. Troughs and fences are checked every day as well as looking for any sick weaners.

Points to note

The 'pressure and relief' technique is used to teach the weaners to tolerate pressure and appreciate relief. Throughout their education, weaners are only moved at walking pace. Dogs are used whenever possible and weaners are exposed to horses, dogs, motorbikes and even helicopters.

Nutrition and stress are major factors that will affect cattle.

Benefits of weaning

"Weaning is important to encourage your breeders to cycle again. It's about getting the balance right between the quality of the season and weaning weight." says Laurie.

In a good season with plenty of feed around, Laurie weans calves down to 120–130kg in the first round. He then weans lighter in the second round to look after the cows at the end of the dry season as the pasture is low quality.

In a poor season with below-average rainfall, he may wean down to 100–110kg at the first round to take the pressure off the cows by eliminating the need to supply milk until second round and also to encourage the cows to cycle again while there is still some green pasture.

Benefits of weaner education

Laurie has been at Flora Valley for six years and says, *"In my first year, we didn't have the weaner educator, but have since had one every year. Before that, the stock camp did it. Having a dedicated weaner educator has resulted in a much better attitude and behaviour of the breeders, and this has improved the speed and efficiency of drafting."*

Large early-weaning trial at Halls Creek, WA

In the early 1990s, Heytesbury Pastoral Company studied the effects of early weaning in large-scale trials on its Flora Valley station in the East Kimberley region. These trials were carried out by Steven Petty between 1990 and 1999 and involved many thousands of weaners.

Flora Valley station alone is 650,000ha, mainly of Mitchell grass and Flinders grass on black soil. The adjacent properties run a breeding herd of some 10,500 females. More details about the properties are given in the case study 'Educating weaners at Halls Creek, WA' on page 34.



Mobile feed bins used to supplement whole cotton seed to the early weaners.

Background

Reproductive rates in northern herds are frequently low (around 65%) with cows having two calves every three years. The main cause of these low branding rates is the poor quality of the native pasture during the dry season. Cows having to feed a calf during this dry season lose weight and condition, and may not get back into calf until the grass grows again at the start of the next wet season. This leads to the cow again calving out of season, and again increases the likelihood of both cow and calf dying. The aim is for cows to calve so that their peak lactation coincides with peak pasture quality during the wet season.

The trials

An initial early-weaning trial running from 1990 to 1994 was followed by the whole-station trial between 1997 and 1999.

Herd results from early weaning at Flora Valley were compared with the results from herds under similar management conditions, but without early weaning, on other Heytesbury properties.

When the cows were mustered between March and June, all calves heavier than 60kg were removed and drafted into two groups—those weighing less than 150kg and those weighing more than 150kg. Calves under 150kg were taken to the feeding yards and placed on a high-quality ration. Calves under 60kg were returned to their mothers and sent back to the breeder paddocks.

The breeders were drafted as wet or dry, and the dry cows were pregnancy tested into three groups: breeders that would calve before the second-round muster over September and October, those that would calve after this muster, and non-pregnant breeders. Empty dry breeders were culled. The breeders that had been in calf at the first round were mustered in the second round and the calves branded and returned to the cows.

Much of the cost at Flora Valley occurred in the first year in setting up the infrastructure for an efficient early weaning complex. This included a feeding facility in the yards, fencing for early weaner supplementation paddocks, good water supply with water medication, storage and equipment (loaders, trucks, feed bins and troughs) to deliver the supplements in bulk and graded roads.

The supplements

The main aim of feeding first in the yards was to get the early weaners quickly adapted to a dry supplement and hay before being fed in the paddocks.

A highly palatable weaner pellet (containing a coccidiostat) reduced the adaptation phase from four weeks to two, and so greatly reduced this pre-feeding cost. The pellets were provided ad lib to the weaners with some copra meal and whole cotton seed added to familiarise the weaners to the next ration.



Cheaply-made rolled steel supplement feeders

After the pre-feeding phase in the yards, the weaners are fed the supplements in the weaner paddocks of Mitchell grass. They could continue to be fed in the yards but providing the extra hay over this time greatly increases the cost. The weaners in the paddock also performed better than those in the yards.

The findings

The introduction of early weaning resulted in a number of significant improvements to the productivity and profitability over three to five years. The full benefits did not occur immediately but became stronger and stronger as the herd dynamics changed.

Higher branding percentage

The introduction of early weaning in the initial trial (1990–1994) increased the branding percentage from 69% to 84% (an increase of 15%). With early weaning on a whole-station basis (1996–1999), the branding percentage increased from 68% (1992–1996 average) to 78% (1997–1999 average), a 10% increase over the four years of the project. However, about half of this increase had to be attributed to general improvements in management as it also occurred on the comparison station.

Better synchronised calf drop

Early weaning concentrated the calf drop, synchronising it with the wet season and grass growth. The level of synchronisation

increased over the early stages of the project (Figure 10.1) but decreased when second round weaning was introduced.

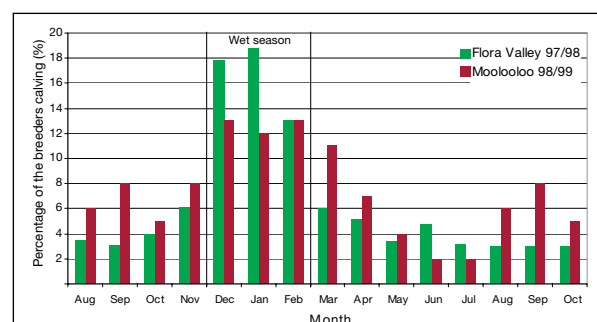


Figure 10.1. Calving distributions of breeders on Flora Valley during the second year of the early weaning project and of typical breeders (Moolooloo) weaned twice a year at 150kg

Advantages from better synchronisation include:

- More breeders calving over the wet season results in a shorter interval between calving because the breeders are in better condition and get back into calf at the best time of year (Figure 10.2).

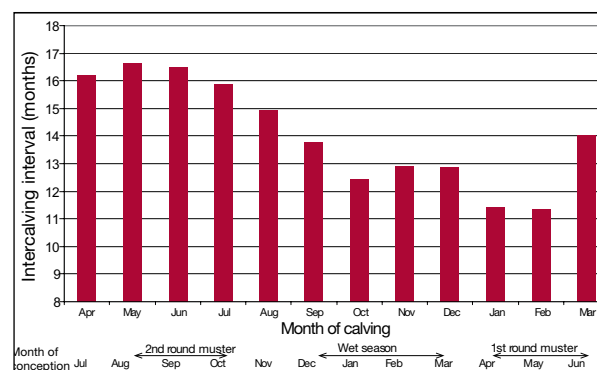


Figure 10.2. The impact of the time of calving on the subsequent intercalving interval of breeders

- There are fewer calves in the early weaner weight range. In the early-weaning project, the number of calves that had to be early weaned decreased from 5,200 in 1997 to 2,051 in 1999.

Early weaning increases breeder synchronisation only when used in the first mustering round.

Lower mustering costs

Early weaning the calves in the first mustering round and drafting cows on pregnancy status means that only a quarter of the paddocks need to be mustered in the second round.

This results in considerable savings in aerial mustering costs and allows staff to carry out development and maintenance at this time.

As long as the early-weaned calves are fed and managed properly, they will grow at the same rate as the heavier weaners, and will have similar weight for age (Figure 10.3). They may be lighter at any particular date but that is because they are younger.

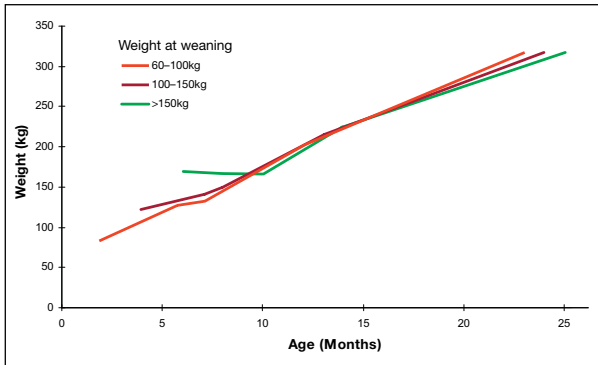


Figure 10.3. A typical weight-for-age schedule for early weaned calves and calves weaned weighing heavier than 150kg

Weaners that have been fed supplement in a trough adapt rapidly to supplements later when being trucked, and to feedlot diets.

Early weaned calves grew as well and, as heifers, were as fertile as those weaned at heavier weights (Figure 10.4).

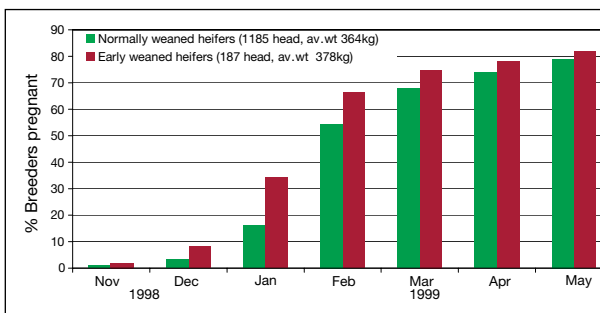


Figure 10.4. The conception rate of early-weaned heifers and heifers weaned heavier than 150kg

Cost-effective

A successful early weaner management strategy was developed to manage the early-weaned calves. Experience gained during the trial significantly reduced the costs per kilogram of weight gain (Table 10.1).

Table 10.1. Cost and cost per kilogram weight gain for the early weaned calves (1997–1999)

Year	No. of weaners	Labour (\$)	Supplement + hay (\$)	\$/kg LWG
1996	3,200	32,270 ¹	135,205	0.97
1997	5,200	31,860 ¹	186,245	0.73
1998	2,200	20,170 ¹	70,792	0.56
1999	2,051	14,300 ²	73,254	0.63

¹includes all labour for trial

²commercially focused (no experimentation)

The weight gain of the weaners declines over the dry season as pasture quality drops (Figure 10.5), while supplementation with high quality protein becomes less cost effective as they grow larger. It may be more economical to maintain their condition over the September to December period with a lower level of supplementation.

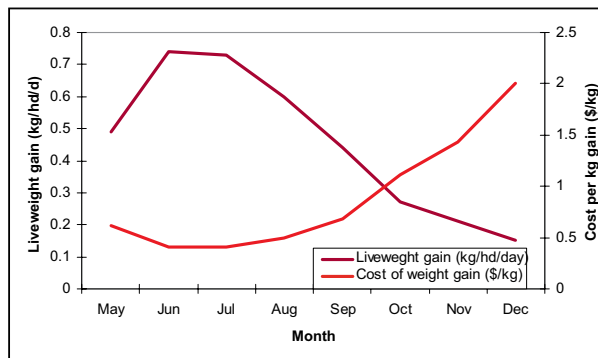


Figure 10.5. The average monthly weight gain and cost of weight gain for 60–100kg weaners supplemented with 1kg copra meal/head/day while grazing Mitchell grass pastures (1999 prices)

Simple management strategy

The early weaning management strategy is simple, robust and practical. It must be used in good, average and poor rainfall years, and will result in consistently higher levels of breeder production.

Profitable management strategy

The introduction of early weaning has a positive impact on the biological herd production, the annual operating budget and the capital invested in a pastoral business.

This can best be understood by modelling all the herd and financial components. Introducing early weaning can require an initial investment in capital (about \$320,000 for a 10,000 breeder herd) but is often followed by higher productivity of the breeder herd and reduced operating costs.

Weaner management at Alice Springs, NT

Chris and Margo Nott manage Alcoota Station, 175km north-east of Alice Springs, on behalf of the Engawala Community. Alcoota breeds and finishes beef cattle on 240,000ha. Annual rainfall averages 300mm, but can vary between 65mm and 1,250mm; on average, about 25% of the rain falls between April and September. Frosts can occur between May and August.

The country

As is common for most stations in central Australia, the large area of Alcoota Station includes many different land types. The best types of country for cattle production are the clay plains with Mitchell grass and Flinders grass, and the sandy river plains with open eucalypt woodland over woolly oat, kerosene grass, curly windmill and buffel grass. More common are the undulating red mulga plains with woolly butt, wire and kerosene grasses.

The livestock

Alcoota Station's Santa Gertrudis breeder herd can be 1,800 head in good seasons, but the property is currently lightly stocked following a series of dry years.

As Chris Nott described, *"We want to lift production from our cows but with fewer numbers than we have had in years gone by."*



Santa weaners similar to those on Alcoota.

General management

Cattle production in central Australia is a low-input system. Alcoota Station adjusts its management practices depending on the season.

There is no permanent surface water on Alcoota Station, and this allows cattle to be trapped into water yards and holding paddocks. The cattle are not vaccinated, sprayed or dipped as it is south of the tick line. The main cost is providing supplements, and Chris has minimised this cost by installing twelve water medicators supplying a urea and phosphorus mixture. These water medicators are shifted with the cattle to different bores as paddocks get spelled.

Markets

The cattle turned off from Alcoota Station currently go to feedlots in New South Wales, Queensland or Victoria to be fed for 100 days for the domestic and Japanese Ox markets.

These feeder cattle are 18–24 months old and weigh 380–450kg. After the record summer of 2001–2002, there was enough grass to turn off bullocks. In 2002–2003, the Notts tried selling into the European Union (EU) market but found they were getting 3c/kg less than for their store cattle. As Chris Nott said, *"We would go EU tomorrow if we could add a backgrounding place to the business, to get the finish on the cattle that this market requires"*.

Mating

Mating in the breeder herd is controlled; the bulls go in at Christmas time and are taken out at the first-round muster. Chris Nott says, *"I just saw a bull in with some cows the other day, so it's not perfect but you keep working at it."* January and February are the wettest months at Alcoota Station producing good green pasture that puts the breeders on a rising plane of nutrition.

Weaning

If there is late summer rainfall, the first round of mustering has to wait for surface water to dry up, and weaning will start late. If no rain falls over summer, weaning may be early to allow the cows to regain some body condition. Since Chris Nott has been at Alcoota Station, weaning has been as early as March–April in dry years and as late as October–November in wet years such as 2000 and 2001.

Weaning involves a series of steps that minimise stress on the weaner and provides them with experience in being handled by humans.

Step 1

Calves are branded and castrated before being weaned. This period between the processing and weaning changes each year according to the season experienced over the summer period.

Step 2

Calves are weaned and transported back to the main house yards where they are held for a week, fed hay and handled. The weaners are moved through the yards and taken single file through the race three to four times during the week.

The Notts have also tried to provide more than just hay. For two years, they tried putting glucose through the house yard's water medicator to prevent the weaners getting black scours. In 2009, they changed to feeding copra meal. Chris Nott explains *"We tried this so that the weaners would get used to feeding out of bins, they would get more energy in their diet and prepare our heifer portion for being spike fed when they are adults."*

Step 3

The next step is tailing out. *"Once the weaners have settled a bit, we cut back their hay and tail them out in the laneways, they graze a lot better that way."* During the tailing out, the weaners are allowed to graze at a steady pace with stock handlers on motorbikes. This allows the weaners to get used to being walked and being handled with motorbikes and humans.

After being tailed out for a few days, the weaner steers and heifers are placed into their respective paddocks. Heifers selected



Weaners are allowed to graze at a steady pace with stockmen handling them on motorbikes.

for breeding will join the breeder herd at 12 months of age; the cull heifers are sold.

Calves that are too young to wean during the main muster remain with the breeders, and are later given nose rings for 'self-weaning'. The nose rings are removed at the next round of mustering when they are shifted to the weaner paddock.

Of the nose rings, Chris Nott said, *"Some work and some don't, but they help the heifers and it is not worth bringing just a hundred head in to wean, I'd much rather wean one big mob per year."*



Nose rings for self-weaning - "Some work and some don't." After two to four weeks, the weaner generally works out how to get a sip without a kick.

Benefits of weaning

Weaning allows the cows to regain some body condition. *"For us, weaning is all about handling our weaners and looking after the cow."* says Chris.

After destocking a large proportion of their breeder herd during the dry years of 2007 and 2008, the remaining females on Alcoota Station were young; weaning has benefited these females so that they have been able to keep growing and to produce their next calf.

Weaning at Georgetown, North Qld

Glen and Cheryl Connolly own and manage Blanncourt Station near Georgetown in north Queensland.

The country

The 21,200ha property was purchased in 1996 with 2,000 breeders. Breeders are run on the south side of the Gilbert River with weaners and growing cattle run on the north under closer supervision. About 1,100ha have been improved with buffel grass, urochloa, Verano and Seca stylo and butterfly pea, while Glen also grows some 800–1,200 tonnes of forage sorghum silage each year on the alluvial country for backgrounding steers and cull heifers.

Rainfall is strongly monsoonal, averaging 800mm a year.

The cattle

The breeders are high-grade Brahman but with Charolais bulls beginning to be introduced. The markets are live export or the store market with an option to background at home and then custom feedlot to sell to southern Queensland markets depending on economics at the time. All cattle are fed phosphorus during the wet season and protein (NPN) supplement during the dry season.

As Glen soon realised that the breeder paddock was always short of pasture towards the end of the dry season, he reduced breeder numbers to about 1,100 head over 4–5 years. Less grazing pressure has resulted in better weaning rates and more weaners.

Since the improved pastures have been established, the breeder herd is now up to 1,600 head, with 1,100 mature breeders on the southern side of the Gilbert and 500 first- and second-calf cows on the north side. The increasing area of improved pastures and the excess feed now available means that steers and cull heifers can be backgrounded before being sent away for feedlotting.



Calves drop around October. All cows are fed protein supplement (NPN) during the dry season.

Musters

Cows are mustered in May and September for weaning and processing (branding, dehorning and castrating males). Another muster in December is only for processing calves—not weaning.

The May muster removes calves that were processed in September or December rounds while any new calves are processed and returned to their mothers.



Weaners in May. Calves are mustered in May and September for processing or weaning, and in December just for processing.

Weaning

Calves over 120kg are weaned and kept in yards for five days while being fed sorghum or buffel hay. Every day they are worked through gates and yards, sometimes with the dogs.

Weaners are then let out onto improved pastures with M8U and yarded every night. Yarding can be with horses, dogs, bikes or on foot. Some days the weaners are also yarded during the day, let out after an hour or so and then yarded again at night.



All cattle receive phosphorus supplement during the wet season.

If weaners are settled after two to three weeks, they are separated. Males go into the steer paddock of improved pasture and are fed ad lib M8U until storms in December. Females are split into replacement heifers and culls and also put onto improved pastures and M8U.

The September weaning round removes all calves processed in May. Any little calves (under 100kg) doing it tough because the mothers have died or have dried off are removed for special treatment in their own paddock. They are fed high-protein pellets every day, grazed in a small paddock with improved pastures and have access to sorghum silage.

“A key management consideration for our property is having plenty of available pasture for all classes of cattle.” says Glen.



Weaners in May

Weaning in the Burnett, SE Qld

Bob and Joanna Creagh with their son Nick breed and finish beef cattle on their property 'Japarra', near Proston about 150km north of Dalby and 350km north-west of Brisbane.

The country

Their properties total 9,000ha of eucalypt woodland (narrow- and broad-leaf ironbark, box and spotted gum) and softwood scrub. The woodland country has native pastures of black speargrass, forest bluegrass and pitted bluegrass while the scrub country carries improved pastures of green panic, buffel grass, Rhodes grass and some leucaena.

Annual rainfall averages 600mm but has varied between 200mm and 875mm over the last 20 years.

The cattle

Over time, the Creaghs have changed from a predominantly Brahman herd to one with more European influence to achieve better weight gains, quieter temperament and quicker turn-off. They now run 400 Brahman-cross cows, mated to Charolais, Angus and Santa Gertrudis bulls. Bob's goal is to consistently produce high-quality two-year-old steers and heifers for the EU market, and to keep the breeder pregnancy rate higher than 90%.

General management

They purchased Japarra (4,000ha) which is predominately forest country in 1989. In 2000, they purchased 'Weir Weir' a 4,400ha block of forest and scrub country and, in 2005 and 2007, they purchased two scrub blocks totalling 750ha.

Originally Bob and Joanna were breeding and selling weaners but purchasing the scrub country has allowed them to finish steers and cull heifers for the EU market.

Until 2006, they had experienced only two good seasons; 2007 was the first year they have been able finish cattle for the EU market.

In the drought of 2004, they had to sell 200 of their 500 breeders just to survive but, with

the better seasons over the last two to three years, breeder numbers are back up to 500.

Mating

The bulls are put out in September–October and mating continues to the end of March. The starting date may be delayed by a month in poor seasons but the bulls are still taken out at the end of March. They plan to reduce the mating season by one month to the end of February now that they have breeder numbers up to 500 and can put more selection pressure on the cows. This will mean that the last calf will be born in the first week of December.

They brand during the first and second weeks of January. There may be up to six or eight really small calves in some paddocks but these are still branded and dehorned. Bull calves are castrated using Elastrator™ rings; for several years, this has been found to be 99% successful, causing less stress and no deaths.

Weaning

The season and condition of the cows dictates the time of weaning. In a poor season, calves are weaned in March at 100–200kg, but the better years have allowed a later weaning with calves averaging 220kg at weaning in April.



Weaners are from Charolais, Angus and Santa bulls over Brahman-cross cows and are for the EU market.

“We’ve been early weaning (down to 110kg) and seasonal calving for many years and find it unbelievably successful. Even when we’ve had to wean small calves, we’ve still been able to guarantee another good calf and early pregnancy for the next year.” says Bob.

The weaning policy is driven by cow condition and the need to get cows in calf early in the mating season.

Weaners are held in the yards for three to five days before being tailed out. Tailing usually involves working the calves through the yards and in the paddock. After about five days, the calves are let out into the holding paddocks during the day and yarded at night, and this is done for two to three weeks depending on the temperament of the group of calves and the time available. While in the yards, the calves are fed lucerne hay and palm kernel extract meal.

Managing for growth

According to Joanna, drafting the weaners into management groups according to liveweight accelerates their progress.

“For the last three years, after everything has grown so beautifully, we have been able to put the under-weights (below 190kg) on the leucaena. Before having leucaena, we had to feed them on Rhodes grass, panic grass and some palm kernel meal to increase their weights.”



Putting the lighter weaners onto leucaena has saved us from feeding protein meal for a couple of months.

“Because of the good seasons for the past three years, they are only now needing to get the palm kernel meal. Previously, in a bad season, they would have been on it months earlier. We have weaned down to 110kg and then fed them all the way through.” says Joanna.

Weaner health

Steer calves are vaccinated with 5-in-1 and heifers with 7-in-1 at branding, with the booster dose given at weaning. While the property is tick-free, their neighbours are ticky so all heifer weaners are given a three-germ tick fever vaccination at weaning. After weaning, the steers move to tick-free country so they are not vaccinated.



“With the good rainfall over the last three years, our weaners have averaged 220kg in April.” say Bob and Joanna.

Weaning in the Pilbara, WA

Richard and Lindy Climas have managed Mardie Station, 120km south-west of Karratha in the Pilbara region since 2000. Mardie Station runs 3,500 breeders producing feeder cattle suitable for the live export trade and for the short-fed local trade. Annual rainfall averages 278mm, predominantly in summer but it is highly variable and useful rain occasionally falls between May and July.

The country

Mardie Station has a total area of 225,000ha of which about half is considered to have high pastoral potential. This better country carries buffel and birdwood grass, Roebourne Plains grass and ribbon grass while the rest of the area is under soft and other spinifex with some buffel and native grasses.

About 30,000ha of some of the better country is covered in dense mesquite. Although cattle perform well in this area, it is difficult to muster with probably less than 90% of the cattle being recovered at any one time.

General management

The Mardie Station herd is now considered a commercial Droughtmaster herd.

Controlled mating of breeders is impractical for most of Mardie Station, and bulls are run with breeders all year round. Breeders are mustered at least once a year depending on the season and the condition of the cattle.

At mustering, calves over about 160kg are weaned in average years while lighter younger calves are marked and put back with their mothers. Cull females and any cleanskins missed in difficult areas (such as the mesquite) are drafted off into sale paddocks. Replacement heifers are run as a separate group from the main breeder herd, and not mated until April of the year following weaning.

Weaning

The season and the condition of the breeders largely determine the time of weaning musters and also the weight of the smallest calves weaned.

The first breeder muster is usually after mid-April because of the generally hot (and hopefully wet) conditions.

Post-weaning management

Mardie Station has sufficient fencing to run the keeper heifer weaners separately to the sale groups of males and cull heifers and cows. This simplifies management and improves marketing opportunities. While sale cattle are not necessarily run in different weight groups, Richard keeps an inventory of numbers in different weight ranges to help make the best use of any marketing opportunity.

Weaners are given urea-based supplements in drier years as required.

In some years with an extended dry season, Richard has weaned calves down to 40–50kg. Weaners under about 120kg were fed on calf pellets containing milk powder for a couple of weeks before being trucked south to a feedlot. *“The littlest blokes were only calves and loaded at 100 a deck and we didn’t lose one during a 14-hour trip.”* said Richard. While this was an expensive exercise, it ensured the survival and ongoing productivity of breeders on Mardie Station and proved that it could be done.

Richard has evolved the weaning process outlined on the next page during his time at Mardie Station and the cattle now have a reputation (with neighbours, helicopter pilots, contract musters, transporters and buyers) of being good to handle. He has successfully adapted the cattle handling principles promoted by the Low Stress Stock (LSS) handling group to suit his situation.



Well-handled and quiet weaners at Mardie Station

The weaning program at Mardie Station

Day	Activity	Comments
Monday	Muster breeders, calves, weaners. Yard up in the evening.	Muster into 'coacher mob' using helicopter, horses and bikes.
Tuesday	Draft off the weaners, sale cattle, cull cows and strangers. Vaccinate breeders and brand calves. Cows, calves and weaner mothers turned out into holding paddock to mother up overnight. Feed weaners hay in the yards at night.	Weaners drafted into 'keeper heifers' as one group, with cull heifers, mickeys and steers as another group. Temperament is one of the key selection criteria for keeper heifers at this initial draft. <i>"If they aren't quiet, they aren't keepers."</i> says Richard.
Wednesday	Initially work weaners in small groups of ~100 head on foot and with horses in the yard. Feed weaners in the yards.	Groups are run out of the main group and blocked up in bigger yards and worked through several yards before being let go in another yard. <i>"I used to do all this on foot but using horses as well makes it easier on the men and the weaners respond well to horses."</i> says Richard.
Thursday	Each mob (keeper heifers, cull heifers, males) are tailed out of the yard on feed in their groups usually three times during the day. Worked with horses and bikes.	Each mob is tailed out until it gets restless and is then yarded again, and the next mob is tailed out. This usually works out to be about 20 minutes initially and up to 1½ hours by the third trip out when they have settled down.
Friday and Saturday	Each group tailed out all day and yarded at night.	Weaners are walked around and blocked up and settled down on feed throughout the day.
Sunday	Process all weaners; dehorn, brand, castrate males, NLIS tag, etc and turn out in their different groups into holding paddocks to join weaners from earlier musters.	These groups of weaners may be mustered and worked through the yards several more times if time permits before they are turned out.

Conclusions

Richard and Lindy, together with their young children Darcy and Lilly, enjoy their cattle. *"We really enjoy our 'Fridays and Saturdays' of the weaning process when the weaners have settled down and we tail them out. Two of us can comfortably handle 200 to 300 and it is a pleasant experience watching the weaners respond to training."*

One of Richard's aims is to reduce hay feeding to a minimum as hay is expensive landed at Mardie Station. While he believes in feeding weaners well while they are in the yard, he believes he may be able to get them out of the yard sooner to let them eat the 'free feed' outside.

Richard's closing comment: *"Our weaner training and attention to cattle handling is really paying dividends—we have just clocked up another year without a compo claim. This is certainly a change from years gone by."*



Lindy tailing weaners.

Photographs by Lara Jensen, Dusty Tracks Photography

Appendix 1. Feeds and feeding

Metabolisable energy requirements

Table 1. Metabolisable energy requirements (MJ/day) of cattle for maintenance and growth

ME of diet (MJ/kg DM)	Liveweight (kg)	Liveweight gain (kg/day)			
		0	0.25	0.50	0.75
7	100	18	23	31	43
7	200	29	36	47	62
9	100	17	22	27	35
9	200	27	34	42	52
11	100	16	20	25	31
11	200	26	31	38	46

Protein requirements

Table 2. Rumen-degraded protein (RDP) and undegraded protein (UDP) requirements (g/day) of cattle for maintenance and growth

ME of diet (MJ/kg DM)	Liveweight (kg)	Form of protein	Liveweight gain (kg/day)			
			0	0.25	0.50	0.75
7	100	RDP	140	180	240	335
7		UDP			15	
7	200	RDP	225	285	365	485
9	100	RDP	130	165	215	275
9		UDP		5	35	50
9	200	RDP	210	260	325	405
11	100	RDP	125	155	195	240
11		UDP		15	50	80
11	200	RDP	200	245	295	360

The requirements for undegraded protein increase as the growth rate increases, then decrease. When enough energy is fed for high growth rates, the rumen microbes can produce enough protein to meet the animal's requirements.

Table 3. General description of protein and energy supplement mixes

Grain-based supplements supplying protein and energy	Fortified molasses-based supplements supplying protein and energy	Protein supplements
Dairy flakes Calf crumbles Weaner pellets Weaner meals Grain mixes	<p>Mixes with energy and NPN Molasses + 4% urea (M4U) Molasses + 8% urea (M8U)</p> <p>Mixes with energy and true protein Molasses + 3–4% urea + 5–10% protein meal (MUP) Molasses + 10–15% protein meal (MP)</p>	<p>All vegetable protein meals alone Copra meal, cotton seed meal, palm kernel extract/meal, soybean meal</p> <p>Dry licks, blocks and liquid supplements These supplements provide protein mainly from urea (non-protein-nitrogen); licks and blocks may include some protein meal, grain or molasses to improve palatability.</p>

Some sources of protein and energy

Table 4. Examples of protein and energy sources

Protein	Protein plus energy	Energy plus protein	Energy
NPN – urea, Gran Am, sulphate of ammonia	Protein meals	Grain	Molasses
No by-pass protein with NPN	Whole cotton seed	Whole cotton seed	
	Lupins	Lupins	

Table 5. Nutrient composition of feeds used as supplements (Note – as fed basis, not dry matter)

Product	Dry matter (%)	Met energy (MJ/kg)	CP (%)	By-pass protein (%)*	Ca (%)	P (%)
Cotton seed meal (solvent-extracted)	90	9.8	37	43	0.2	1.2
Canola meal (solvent-extracted)	91	9.7	34	28	0.6	0.8
Soybean meal (solvent-extracted)	90	11.0	45	35	0.2	0.8
Sunflower meal (solvent-extracted)	89	8.0	32	26	0.4	0.9
Barley	89	11.3	12	27	0.1	0.3
Corn	88	10.8	8	52	0.2	0.3
Oats	89	9.1	9	20	0.1	0.3
Sorghum	88	10.6	10	57	0.0	0.3
Wheat	89	10.7	12	22	0.1	0.3
Copra (expeller-extracted)	90	10.8	21	56	0.0	0.5
Peanut meal	90	10.8	41	16	0.1	0.7
Whole cotton seed	91	13.1	21	30	0.2	0.7
Palm kernel meal (expeller-extracted)	91	10.5	19	9	0.2	0.2
Lupin (sweet)	91	10.1	30	35	0.2	0.3
Lupin (albus)	91	10.8	36	35	0.2	0.3
Chickpeas	91	10.0	20	22	0.1	–
Mung beans	90	13.0	25	23	0.1	0.2
Faba beans	90	10.7	24	20	0.1	0.5
Linseed	90	12.1	37	40	0.5	0.9
Cotton hulls	91	5.2	4	30	0.1	0.1
Sunflower hulls	90	4.5	4	30	0.3	0.1
Molasses	75	8.7	4	–	0.9	0.1

* Percent of the crude protein; by-pass protein is included in the total crude protein. Analysis of meals may vary depending on the processing method.

Table 6. Nutrient composition of common feed additives

Additive	Phosphorus %	Calcium %	Sulphur %	Nitrogen %	Protein equiv. %	Sodium %
Urea	–	–	–	46	287	–
Gran-Am	–	–	24	20	126	–
Liquifert P (tech. grade MAP)	26	–	–	12	75	–
Sulfur (flowers of sulphur)	–	–	99.5	–	–	–
Dicalciumphosphate	17.5	23	1	–	–	–
Kynofos 21	21	18	–	–	–	–
Phosphoric acid (food grade)	26	–	–	–	–	–
Limestone	–	38	–	–	–	–
Salt	–	–	–	–	–	40
Zeolite	–	–	–	–	–	–
Bentonite	–	–	–	–	–	–

Table 7. Rations for weaners

Liveweight (kg)	Daily gain (kg/hd/day)	Nutrient requirements			Possible supplement	Amount to feed
		Protein (g/day) Rumen degraded	By-pass	Energy (MJ ME/day)		
100	0.25	165	5	22	Cotton seed meal OR Grain + protein meal mix*	1kg CSM + 1.5kg grassy lucerne hay 1kg + 1.5kg grassy lucerne hay
150	0.25	210	5	28	Cotton seed meal OR Grain + protein meal mix*	2kg + 1kg grassy lucerne hay 2kg + 1kg grassy lucerne hay

* This mix is made up of 2 parts of barley grain and 1 part of cotton seed meal (CSM).

Table 8. Some typical container weights

These weights are a guide only; check your own measuring containers. Accurate weighing will provide the most cost-effective supplementation.

Container	Weights (kg)					
	Molasses*	Urea	CSM	Grain	Gran-Am	Salt med coarse
20L container	27	15.5	13.5	11.5	18	24
9L or 2 gallon bucket	13	8.5	7	6	8	11
5L or 1 gallon bucket	6.5	4	3	3	4.5	5
4L square ice cream container	4.5	3	2.5	2	3.5	4

*Actual weights of molasses are higher as about 10% stays in the container unless it is drained for a long time. Molasses weighs approximately 1.4kg per litre (6.5kg per gallon).

Appendix 2. Ration calculation

Calculating cost of dry matter and nutrients

– using cotton seed meal (CSM) as an example:

Price: \$600 per tonne; Dry matter (DM): 90%; Protein: 37%; Energy: 11 MJ ME/kg

Dry matter

How much dry matter in 1kg of feed?

$$\frac{\text{Weight of feed} \times \% \text{ DM}}{100} = \frac{1\text{kg} \times 90}{100} = 0.9\text{kg or } 900\text{g}$$

How much to feed to get 1kg of dry matter?

$$\frac{\text{Weight of DM required} \times 100}{\% \text{ DM}} = \frac{1\text{kg} \times 100}{90} = 1.1\text{kg}$$

Cost of 1 tonne of dry matter

$$\left(\frac{1 \text{ tonne} \times 100}{\% \text{ DM}}\right) \times \text{cost/tonne as purchased} = \frac{1 \times 100 \times \$600}{90} = 1.1 \times \$600 = \$660 \text{ per tonne of DM}$$

\$ per tonne to ¢ per kg

$$\frac{\text{Cost/tonne (in cents)}}{1000} = \frac{66,000\text{¢}}{1000} = 66\text{¢}$$

Nutrient

Cost per kg of nutrient (on dry matter basis) eg protein

$$\frac{\text{Cost/kg of DM} \times 100}{\% \text{ of nutrient}} = \frac{66 \times 100}{37} = 178\text{¢/kg}$$

Cost of 75g protein

$$\frac{\text{Cost of 1kg of protein} \times 75}{1000} = \frac{178 \times 75}{1000} = 13.35\text{¢}$$

Cost of a ration

Example:

Ingredient	Price \$/tonne	Inclusion in ration		
		%	Weight (kg)	Cost (\$)
Molasses	200	87	870	174
Urea	700	3	30	21
CSM	600	10	100	60

Total cost per tonne = \$255

Cost per kg = 25.5c

Costing a feeding program

Example:

Number of weaners to supplement	500*
Supplement period	May to October*
Number of days	150*
Supplement	
Calf weaner pellets	120 days*
Cost	\$500/tonne (20% protein)
	\$0.50/kg
Cost of 1kg pellets/day for 150 days	\$0.50 x 150 = \$75#
Cost for 500 weaners for 150 days	\$37,500#

N.B. *These figures are assumptions for the purpose of the calculation. Use your own figures for length of feeding period and price per tonne. #These figures are calculated. Cost of labour is not included.

Appendix 3. Major diseases affecting

Risk and cause	Signs and symptoms
Botulism	
<p>The most important disease in phosphorus deficient regions.</p> <ul style="list-style-type: none"> • potentially high mortality rates • infection through bone and carcass chewing • no treatment available. 	<p>Sudden death. Animals go off feed and water. Slow, progressive paralysis (inability to retract tongue), difficulty breathing, lie on brisket with hind legs stretched out.</p>
Clostridial diseases – 5-in-1; 7-in-1	
<p>Found everywhere – spores survive in soil indefinitely. Tetanus – prevalence low but usually fatal. Most often seen after castration and branding. Blackleg – highly fatal – common on recently flooded country – young stock. Pulpy kidney – highly fatal disease – commonly seen after change to concentrate feeding – a must for stock entering a feedlot. Gas gangrene – severe wound infection associated with surgical procedures. Black's disease – associated with liver fluke infections.</p>	<p>Usually sudden death. Associated with anaerobic infection ie puncture wounds, muscle damage.</p>
Vibriosis	
<p>Venereal disease – causes infertility, early abortion and delayed conceptions. Widespread disease. Highest economic loss in controlled mated herds.</p>	<p>Usually no clinical signs. Poor conception rates – especially maiden heifers. Delayed conceptions. Repeat return to service.</p>
Leptospirosis	
<p>Widespread disease throughout Australia. Organism passed in urine – survives in melon holes and swamps – associated with wild pigs and rats.</p>	<p>Abortions in breeding females. In younger cattle, fever, inappetance, pass red urine, jaundice.</p>
Pestivirus/Bovine viral diarrhoea (BVD)	
<p>Widespread throughout Australia. Problems occur when carrier animals introduced to susceptible pregnant breeders.</p>	<p>Can cause abortion, dummy calf syndrome and infertility in breeding cattle. Transient disease in all other classes of animals. Immuno suppressant disease that leads to increased respiratory disease in feedlots.</p>
Bovine ephemeral fever (Three-day sickness)	
<p>Endemic in far north of Australia and along coast. Spreads south with big wet seasons. Mostly affects younger animals. Natural infection provides good immunity.</p>	<p>Temporary loss of condition Lameness Muscular stiffness Recumbency Occasional death Affected bulls are infertile for a minimum of six weeks, up to a lifetime.</p>
Tick fever	
<p>Transmitted by cattle tick. Calves usually acquire immunity at birth which wanes by weaning.</p>	<p>Loss of condition Fever Weakness Jaundice Brown urine Death</p>

g weaners

Vaccination program	Management
<p>Initial vaccination at branding or weaning 4–6 weeks apart followed by annual booster.</p> <p>OR</p> <p>One vaccination of long-acting vaccine and a booster 2–3 years later, as specified by manufacturer.</p>	<p>Supplement with phosphorus.</p> <p>Where practical remove and burn carcasses and carrion, particularly where animals commonly congregate, such as near watering points.</p>
<p>Manufacturer's recommendation is two shots 4–6 weeks apart – not always possible.</p> <p>Vaccinate all animals >2 months of age whenever possible – even if done at branding.</p> <p>Ensure all animals have had at least one 5-in-1 or 7-in-1 shot at weaning.</p>	<p>Problem worst in some yards.</p> <p>Dust control may help but vaccination is the best approach.</p>
<p>Vaccination usually commences in replacement heifers only and prior to joining.</p> <p>Killed vaccine – usually two shots 4–6 weeks apart.</p>	<p>Cull all empty breeders.</p> <p>Join maiden bulls with maiden heifers.</p> <p>Vaccinate all bulls.</p> <p>Vaccinate all weaner heifers going into the breeding herd.</p> <p>Vibriosis is often brought into a herd by neighbours' bulls.</p>
<p>Vaccinate heifers at weaning; initially, two vaccinations 4–6 weeks apart with annual booster at pregnancy testing.</p> <p>Killed vaccine – immunity relatively short lived.</p>	<p>Losses between pregnancy test and weaning indicate problem.</p> <p>Diagnosis often difficult if vaccination occurring.</p> <p>WH&S considerations.</p>
<p>Assess risk – studs and cattle traders have the highest risk.</p> <p>Vaccinate replacement heifers in high risk situations.</p> <p>Vaccinate animals prior to feedlot entry.</p>	<p>Natural infection provides permanent immunity.</p> <p>Quarantine all new cattle introductions – pregnant cows biggest risk.</p> <p>Test new bulls for PIs to prevent spread.</p>
<p>Frozen vaccine – immunity not permanent.</p> <p>Weaners seldom vaccinated except perhaps yearling replacement heifers.</p> <p>Vaccinate all older steers in latter stages of finishing if no previous exposure.</p> <p>Vaccinate all bulls.</p> <p>Two vaccinations initially, 2–4 weeks apart, with an annual booster.</p>	<p>Bulls must be vaccinated at least two months prior to joining.</p> <p>Sandflies/biting midges transmit the disease.</p> <p>Disease alerts often provide early warning.</p>
<p>Live vaccine.</p> <p>Best administered at weaning.</p> <p>Vaccine may cause clinical signs.</p> <p>Risk highest in marginal and low tick regions.</p>	<p>Vaccinate animals moving from clean to ticky country; cattle can be vaccinated prior to movement, providing that they are settled into their new paddocks and not disturbed within three days of vaccinating.</p> <p>Where animals get ill from tick fever, treat with Imizol®.</p>



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