Running a Small Beef Herd

THIRD EDITION

Fiona Baker

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1

The economics of beef production

Like most agricultural commodities, beef is subject to price fluctuations due to changes in supply and demand in both domestic and world markets. The price paid in the saleyard for a beast influences the price the end user pays for a piece of meat, and this can influence how much beef is consumed. Figure 1 compares beef prices per animal compared to the consumption of beef per person in a year.

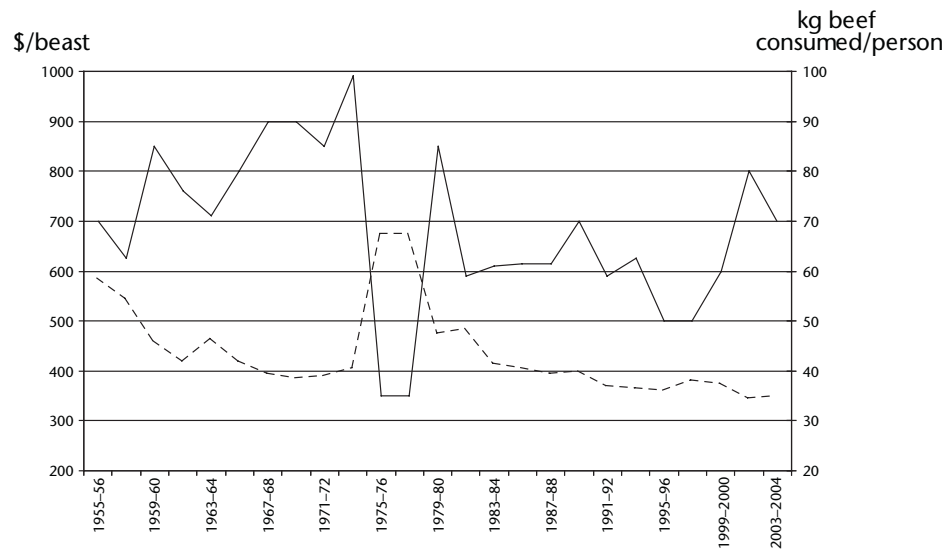


Figure 1. Apparent effect of beef price (solid line) per animal on beef consumption (dashed line). (Adapted from ABARE data, with $ per beast adjusted to 2004 prices.)

Australian beef is especially sensitive to the world market given the high proportion of product exported. Between 2000 and 2005, two-thirds of Australia's beef product was exported. This figure is more likely to increase than decrease into the future.

The United States is the world's largest producer and consumer of beef and is considered the price setter in the international market. Therefore, the strength of the Australian dollar against the US$ will have a big effect on the domestic price of beef. Outbreaks such as Mad Cow or Foot and Mouth disease can also have a profound effect on the international market when consumer confidence crashes. The effect domestically is especially significant when the outbreak is in one of Australia's key markets such as Japan or Korea.

Domestic factors also have a large influence on animal prices. The quality of a season can affect the supply of animals, with the market flooded when the season turns bad, pushing prices down, or animal numbers are low when it is time to restock. Even in a normal year, there will be cycles in prices that relate to supply and the season. Winter prices are traditionally highest as 'well finished' cattle are in short supply. Conversely, prices are at their lowest when the supply of finished cattle is greatest in the summer. The average price difference between high and low between 2000 and 2005 was around 15% (Eastern Young Cattle Index August 1996 to August 2007).

Information on the market can be found through numerous sources. The Meat and Livestock Australia's (MLA) National Livestock Reporting Service (NLRS) is probably the most comprehensive source of information and is reported in rural newspapers and radio and is also available through the internet (see Appendix 5). Stock agents or consultants can also be a useful source of market information.

As with most other agricultural commodities, beef prices have fallen steadily in real terms over time and have not kept pace with rising costs. As a result of this cost-price squeeze, commercial beef producers have needed to continually improve their efficiency to be able to run a financially viable business. While price is a crucial component in the profitability of a beef enterprise, the factors of production level and cost of production are two components that we have a lot more control over. It has been in these areas that farmers have made gains in order to remain viable. Strategies such as increasing scale to reduce unit costs, or increasing unit production through better management (e.g. better pasture management allowing for an increased stocking rate) continue to shape the farming community.

Over the past 40 years the eating habits of Australians have undergone many changes. Reasons for these changes include new cultural influences, health considerations, changes in relative prices of different foods and substitutes, product marketing and so on. While beef/veal continues to be one of the most popular meats, it has both enjoyed and suffered the effects of these changes.

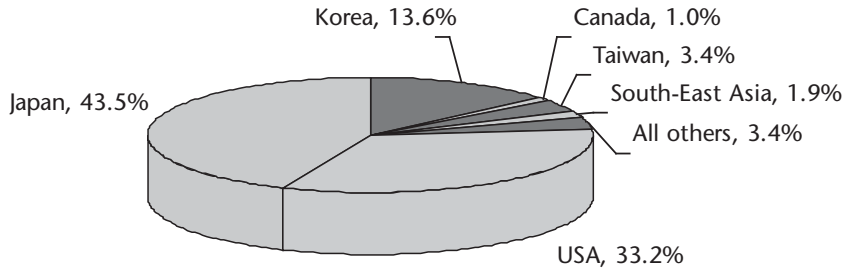


Figure 2. Australian beef exports 2005–2006 (by weight). (Source: ABARE. Does not include live exports.)

Budgeting – can cattle production pay?

Beef production requires a high capital outlay and there may be a period of six months to two years before any cattle are sold. In the case of cows and calves you are unlikely to get your initial outlay on stock back until the sale of the cow's second calf, at least two years later.

Make sure that you prepare short- and long-term cash flow and planning budgets. Small farms often find it difficult to make sufficient returns to cover all costs and still provide money to live off, regardless of the enterprises they run. This is usually a result of scale and overcapitalisation resulting in very large overhead costs. Even if a property is purchased for lifestyle reasons, it is nice when costs are covered. Maybe consider strategies such as leasing machinery, contracting services or going halves with a neighbour before purchasing machinery.

A quick budget that can be used to calculate the profitability of an enterprise is called a 'gross margin'. Gross margins only take into consideration the expenses and income that relate directly to the enterprise and are useful to compare systems that could use the same capital, for example, spring calving versus autumn calving or cow/calf systems versus steer finishing. They do not include overhead, labour or finance costs. (See Table 1.)

In Table 1, the farm generates $7416, but this figure does not take into account overheads such as rates, maintenance, fertiliser and pasture improvement, which will further reduce the profit. If we use a conservative figure for overhead costs of $100/ha (with a holding of 50 ha) and assume there is no interest cost or account for owner/operators time, this comes to $5000, so we are left with a total income before tax of $2416.

The outlay required to set up this 50 hectare (125 acre) farm would be at least $175 000 (i.e. $150 000 for the land and $25 000 for the herd) and up to and over $1 million, depending on:

- location (i.e. proximity to cities)
- soil type
- rainfall
- availability of water (both stock water and irrigation).

Table 1. An example gross margin for a 25 cow and calf enterprise, using 2007 figures

Physical details	
Calving rate	90%
Deaths: cows	2%
Deaths: calves	2%
Area grazed	50 ha (125 acres)
Income	
Sale of vealers: 11 males: 280 kg @ 180c/kg liveweight = $504 each 7 females*: 260 kg @ 170c/kg liveweight = $442 each	 $5544 $3094
Sale of cull cows: 3 cull cows: 500 kg @ 120c/kg liveweight = $600 each	 $1800
TOTAL INCOME (A)	$10 438
Expenses	
Selling costs (21 head sold): Agents commission @ 5% Saleyard fees @ $9.80/hd for weighed animals and $6.70/hd for unweighed animals Cattle transaction levy @ $3.50/hd Cattle compensation tax @ $1.50/hd Transit insurance @ 0.35% of total sales	 $522 $196 $73 $32 $37
Animal health costs: Veterinary @ $6/head (48 head) Drench @ $4.50/dose (10 young cows) Vaccination 70 doses @ 41c (22 calves × 2 doses = 44; 25 cows × 1 doses = 25; 1 bull × 1 dose = 1)	 $288 $45 $29
Bull replacement $2000 (new bull) $800 (sale of old bull) = $1200 $1200/4 years	 $300
Feed 10 bales hay/cow @ $6/bale = $60/cow	$1500
TOTAL EXPENSES (B)	$3022
GROSS MARGIN (A – B)	$7416
Gross margin/ha (50 ha)	$148
Gross margin/DSE (534 DSE)	$13.90

* four female calves are kept as future breeders (replacements)

Table 2. Change in profitability of steer fattening with different purchase prices

Purchase price/kg	Selling price/kg	Gross margin/steer	Gross margin/DSE
170c	180c	$136	$17.00
180c	180c	$110	$13.80
190c	180c	$84	$10.50

Note 1. The above figures are net of all selling expenses and animal health costs for keeping the mob of steers used in the example (50 head). These costs were calculated at approximately $250/hd.
Note 2. The above figures assume that the steers are purchased in January (nine months old) from the weaner sales at approximately 260 kg. They are kept for nine months and sold in December at approximately 460 kg.

Profitability of buying and selling steers

Buying and selling steers may be a more suitable enterprise for the absentee owner than cows and calves, since there are comparatively less demands on time in running steers. The 50 hectare property in this example is able to run about 50 weaner steers.

The profitability of this enterprise depends heavily on the buying and selling price. You will need to be a good judge of liveweight if you are buying steers based on $/head price. If you pay $470 for a 260 kg steer, you are paying $1.81/kg; however, if you pay $500 for the same animal you are paying $1.92/kg. Table 2 demonstrates the difference in the profitability per steer depending on the sale and purchase prices.

Stud production or stocking the more alternative or unusual breeds are often attractive options to smaller landholders as an attempt to increase gross margins. Extra care should be taken with such ventures as they often require much higher input without the guarantee of extra income.

Warning. The above figures are only guides. The carrying capacity (how many cattle the property will carry) for each property varies depending on rainfall, soil type, pasture species, fertiliser applications and grazing management. See Chapter 3 for further information on carrying capacity of a property.

2

The importance of soil health and fertility

Why is it important to look after our soils? In a way we are actually farming our soils. Traditionally we have just thought about what we run *on* our soils – but what about what we run *in* our soils?

The top 10 cm of soil contains:

- 80–90% of the soil microbe and earthworm activity
- 75% of the available nutrients
- 20–25% of the plant roots
- 50% of the soil organic matter.

Consider the living organism portion of our soil, which includes ants, beetles, millipedes, slugs, snails, earthworms, spiders, centipedes, nematodes, protozoa, algae, fungi, yeasts, moulds and bacteria. Let's just look at earthworms and soil moulds. Earthworms can weigh between 16 kg/ha and 1200 kg/ha, and soil moulds 1000 kg/ha to 1300 kg/ha. If we take the average density of these two organisms (earthworms: 600 kg/ha and moulds: 1150 kg/ha) and add them, we have 1750 kg/ha of animal mass living below the ground. And that's not counting the rest of those living organisms listed above.

So what does this mean? To put it into perspective, if we have a farm that can carry 1.5 cows/ha, and each cow weighs 500 kg, we will be carrying 750 kg/ha above the ground. This is compared to the 1750 kg/ha or the equivalent of 3.5 cows/ha below the ground of just soil moulds and earthworms. The message from

Figure 3. Healthy soil with good root growth and plenty of organic matter.

this is: our stocking rate *below* the ground is much higher than *above* the ground. So to have a healthy system, we have to look after and feed our soils.

Soil types differ from one another because they have different proportions of inorganic particles (rock fragments and minerals), organic matter, living organisms and pore spaces. The way these components are arranged, the composition of their parent material and how the inorganic particles have been affected by weathering influences their properties and results in different soil types.

Australian soils are old and weathered, so much of the nutrient has been leached. Many of our soils therefore have low fertility. Also, nutrients are removed by farming. Each time we sell animals or produce (hay, silage and grain) from the farm, we are selling nutrients. And every time we cut hay or silage and do not feed it back on to the same area, we are exporting nutrients (Figure 4). If we buy in feed sources we are not just buying feed for animals to consume, but we are importing nutrients onto the farm. But the question is how much are we importing and exporting? Table 3 provides easy to use estimates for the quantities of nutrients contained in various products.

For example, based on Table 3, if you are selling 30 steers, each weighing 250 kg, how much phosphorus are you exporting? Thirty steers × 250 kg weight = 7500 kg (7.5 t) meat; meat contains 8 kg phosphorus per tonne; 8 kg phosphorus × 7.5 t meat being sold = 60 kg phosphorus exported off the farm.

Table 3. Nutrient estimates contained in various products

		Weight of nutrient per quantity of product (kg)			
Product	**Amount**	**Nitrogen**	**Phosphorus**	**Potassium**	**Sulphur**
Meat	1000 kg	28	8	2	8
Hay (70% grass, 30% clover)	1 t DM	20–35	2.0–3.5	15–25	2–3
Lucerne or clover hay	1 t DM	30–45	2.5–3.5	20–30	2.0–3.5
Oaten hay	1 t DM	20	2	15–20	1–2
Pasture silage	1 t DM	30	4.3	27	4
Wheat, oats, barley, triticale	1 t DM	17–23	2–3	4–6	1.5–2
Greasy wool	1000 kg	170	0.26	15.8	28.5

DM, dry matter.

You need to replace this exported phosphorus, in order to maintain current fertility levels. Don't forget to do the calculations for potassium and sulphur as well. If you are calculating nutrient removed for any of the products measured as t DM, you first must convert the product to a dry matter weight. For example, 12 t of hay, which is approximately 85% dry matter, would become 10.2 t DM (12 t × 0.85).

Soil testing

The current fertility of the soil needs to be assessed to help determine whether to maintain the current levels or increase them. The most accurate way to assess the current fertility of your soil is to have a soil test taken.

Figure 4. Cutting hay removes nutrient from the system (if you are not feeding it back on the same paddock) that needs to be replaced.

When selecting a laboratory to have your soil tested through, you should consider whether the laboratory has NATA accreditation. NATA (National Association of Testing Authorities) is an association that sets and maintains a high standard for the methodology of laboratory practices and technical advice. This is the highest accreditation a laboratory can achieve. You can find details of accredited laboratories at http://www.nata.com.au.

If the laboratory you are looking at using does not have NATA accreditation, the following questions need to be asked:

- Has the laboratory got ASPAC (Australasian Soil and Plant Analysis Council) accreditation for *all* the tests they offer, or at least the tests you need? ASPAC aims to enhance standards of analysis and assist standardisation of soil and plant analytical methods across laboratories.
- Have test methods been field calibrated in your State for pastures?
- What is the cost of a soil test?
- What is the turn around time from sending the sample in to receiving the results?
- What is the quality of the advice likely to be?

Local fertiliser agents and agronomists are available to come and take soil samples for you. However, you can take soil samples yourself, but what should you be doing?

- Sample at the same time each year because nutrient levels can vary throughout the year. Late winter to early spring are usually the recommended sampling times.
- Sample the following areas separately as the results from these areas are likely to be different:
  - major soil types;
  - areas with different fertiliser histories; and
  - areas that are regularly cut for hay or silage.
- Sample along a transect (the same path through a paddock) each time you take a soil test. You can mark out a transect by painting fence posts at each end of the transect.
- Ensure soil cores are taken to a depth of 10 cm. Soil cores need to be collected to a standard depth if the results are to be interpreted reliably. In most of Australia (excluding Tasmania) the soil sampling depth is 10 cm for pasture soils. In Tasmania the depth is 7.5 cm.
- Take approximately 30 cores along the transect using a soil corer. Soil corers can be borrowed from most Department of Primary Industry offices and major fertiliser companies.
- Avoid obvious dung and urine patches, stock camps, stock tracks, fertiliser dump sites and silage or hay storage areas.

Table 4. Organic carbon percentages (%) over a range of conditions

Organic carbon levels	Pastures Low rainfall	Pastures High rainfall
Low	<1.9	<3.1
'Normal'	1.9–2.8	3.1–6.2
High	>2.8	>6.2

So what do the results from my soil test mean?

Soil type. The soil type describes the colour and texture of the soil. These are indicators of the properties of the soil and are taken into account when interpreting other results.

Organic carbon. Organic carbon is a measure of the organic matter in the soil (Table 4). Organic matter adds nutrients and assists in improving soil structure.

Soil pH. Soil pH is a measure of the alkalinity or acidity of the soil. A pH value of 7 is neutral; values below 7 are acidic and those above are alkaline. In most Australian soil tests, the pH of the soil is shown as either pH in water or pH in calcium chloride ($CaCl_2$). The pH value in $CaCl_2$ can be 0.5–1.1 units lower than the pH(water) value. The pH(water) value readily reflects current soil conditions, but is subject to seasonal variations. The $CaCl_2$ test is useful for long-term monitoring of pH and is less subject to seasonal variations. Aim to keep the pH level above 5.3 (pH water) or 4.5 (pH $CaCl_2$).

Available phosphorus. Phosphorus is essential for plant growth and vital for early root formation and growth. In Victorian pasture soils it is usually tested using the Olsen Phosphorus (Olsen P) test (Table 5). This test is a measure of the plant available phosphorus and is measured in milligrams per kilogram (mg/kg).

Available potassium. Available potassium is measured by the Colwell or Skene methods. The values are very similar, except in alkaline soils and those recently limed. Potassium is needed for a wide range of important processes within the plant including cell wall development, flowering and seed set. The level of available potassium depends on soil type (Table 6). When soil potassium levels are high, potassium inputs can be reduced or deleted from the fertiliser regime until levels fall.

Table 5. Levels of Olsen P and levels of plant available phosphorus

Olsen P (mg/kg)	Availability
Below 12	Low (except for native pastures)
12–20	Ideal
20–25	High
Above 25	Very high

Table 6. Levels of potassium (mg/kg) appropriate to soil types

	Sands	Sandy loams	Clay loams	Clays	Peats
Low	<50	<80	<110	<120	<250
Moderate	50–100	80–120	110–150	120–180	250–350
Ideal	101–150	121–200	151–200	181–300	351–600
High	>150	>200	>200	>300	>600

Available sulphur. Sulphur is essential for nitrogen fixation by legumes. It is usually measured by the CPC test or the Blair (KCl 40) test, and reported in mg/kg. Sulphur is considered adequate when the levels are above 3 for a CPC test or 8 for a KCl 40 test.

Phosphorus buffering index. When phosphorus is applied to soils as fertiliser, it reacts with the soil and becomes less available for plant uptake. The extent to which these reactions take place depends on the phosphorus buffering capacity of the soil.

The Phosphorus Buffering Index (PBI) test allows you to make more accurate phosphorus fertiliser decisions based on your soil type. Different soil types have different phosphorus buffering capacities, so require different amounts of fertiliser to maintain and/or raise levels. A soil with a high buffering capacity will require more phosphorus fertiliser than a soil with a low phosphorus buffering capacity (Table 7).

Cation exchange capacity (CEC). The cation exchange capacity reflects the soil's capacity to absorb and hold cations (positively charged ions). It provides an indication of the amount of nutrients available in the soil and their ratios, and is useful for determining soil structural problems. The CEC of the soil is dependent on the amounts and types of clay and organic matter present. The cations generally reported are exchangeable calcium, exchangeable magnesium, exchangeable sodium and exchangeable potassium. Some laboratories include exchangeable aluminium also.

Table 7. Phosphorus buffering index (PBI) classes

PBI class	PBI result
Very low	0–70
Low	71–140
Moderate	141–280
High	281–840
Very high	> 840

(Adapted from Making Better Fertiliser Decisions for Grazed pastures in Australia, DPI Ellinbank, 2007.)

Exchangeable cations are reported in meq/100 g soil and as a percentage of total cations. When interpreting soil test results, it is more relevant to look at the percentages of the cations, to ensure they are in balance rather than actual amounts. The higher a soil's CEC, the harder it becomes to change factors like pH and the less leaching of ions is likely to take place. The following cations are reported on your soil test:

- *Exchangeable calcium* should be the most dominant in the soil, even at a low pH. The desirable range is 65–80%. Calcium is present in the soil solution and is part of the structure of several soil minerals.
- *Exchangeable magnesium* is usually present in sufficient quantities attached to clay minerals. It should be the second highest in proportion of the cations, in the range 10–20%. If it is more than 20% of the sum of cations, it may cause a potassium deficiency.
- The desirable range for *exchangeable potassium* is 3–8% of the total cations. If it is more than 10% of the cations, it may cause a magnesium deficiency.
- *Exchangeable sodium* should be less than 1%. If sodium cations make up 6% or more of the CEC, then the soil may be sodic and susceptible to dispersion (a soil structural problem). Gypsum can help alleviate this problem in the short term.
- *Exchangeable aluminium* should be less than 1%. High aluminium levels can be toxic to plants and can be lowered by applying lime. Aluminium levels generally fall to harmless levels once the pH(water) exceeds 5.6–5.8.
- A *calcium to magnesium ratio* of 2:1 or less indicates reduced soil stability. Well structured soils have a calcium to magnesium ratio greater than 2:1; the amount of calcium cations is more than twice than the amount of magnesium cations.
- The *magnesium to potassium ratio* should be greater than 1.5:1 (that is, the amount of magnesium should be one and a half times greater than the amount of potassium). A ratio less than this indicates an increased chance of Grass Tetany.

Salinity

Saline soils have levels of soluble salts in the root zone that are high enough to adversely affect plant growth. Salinity is determined by measuring the electrical conductivity (EC) in the soil and is reported in decisiemens per metre (dS/m). Ideal levels are less than 0.2 dS/m.

Different pastures have varying tolerance to salt, but in some situations the concentrations of salt can be too great for plants to survive. The salt tolerance of plants is based on a different test (the electrical conductivity of a saturated extract method, EC_e) and is also measured in dS/m. Salt levels are satisfactory for pasture species if the EC_e is under 1 dS/m.

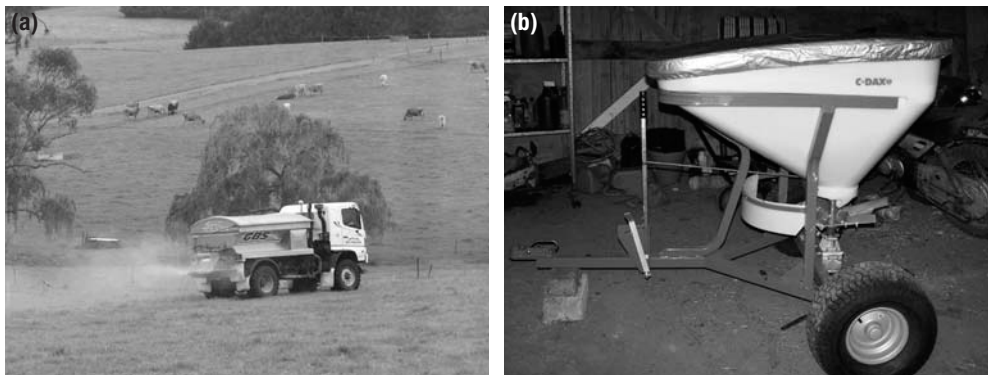


Figure 5. Fertiliser companies can spread your fertiliser for you (a) or you can spread it yourself using a tow behind spreader (b). This one hooks on behind a 4-wheel motorbike.

Plants are more susceptible to salt during their germination and seedling stages than in later stages of growth.

How do I use all this information?

To ensure you are not applying too little or too much fertiliser, you should complete a nutrient budget for your property. This takes into account nutrients that are being removed, brought in, or tied up by the soil system and your current and target soil fertility levels. These differ for each property.

The Department of Primary Industries in Victoria runs 'Fertilising Grazed Pastures' courses that teach you how to calculate a nutrient budget. Contact your local Beef or Grazing Extension officer who will be able to put you in contact with the right person. Other State Departments of Primary Industries run similar programs. Contact your local office for details or look on the State Departments' websites.

3

Feeding your cattle

Pasture and carrying capacity

The amount of pasture produced and therefore the number of cattle that can be carried on your property are influenced by:

- rainfall
- soil type
- pasture species
- soil fertility (including fertiliser applications)
- temperature
- grazing management.

Paddocks that have regular applications of fertiliser such as superphosphate will produce a better quality pasture with a lower number of undesirable weeds. By increasing the fertility of the soil, desirable pasture species will out compete the weeds. Native pastures will not produce the quantity or quality of grass and will not be able to carry as many cattle as a pasture that has been sown with improved pasture species such as phalaris, cocksfoot, ryegrass and clover.

Land in areas of high rainfall (such as Gippsland) will produce much greater quantities of pasture than land in low rainfall areas such as the Mallee. Pasture growth is reduced considerably during summer and early autumn because of lack of water and during the winter because of cool temperatures (see Appendix 4 for typical pasture growth curves). The aim should be to fit your animals' requirements to the pasture grown by purchasing and selling at the right time or calving at a time when pasture growth matches cow and calf nutritional requirements.

Pasture quality

The quality of the pasture is just as important as the quantity of pasture available to animals. High quality pasture has high energy and good protein levels, both of which are important for growing animals. Green, actively growing pasture is the highest quality pasture. Old dry stalks in late summer/autumn are the poorest quality pasture.

Once the pasture goes to seed, the quality drops off rapidly. Aim to graze your pastures to keep them in their active pre-flowering, growing phase for as long as possible.

To ensure good quality species remain in your pasture, it is important to undertake rotational grazing. This means moving the animals around the property, giving paddocks or areas of paddocks a rest before returning to graze. The length of your rotation changes throughout the year as the rate of pasture growth changes.

Animals will grow faster and fatten more quickly on the greener pasture shown on the right in Figure 6 (see page 35) compared to the dry pasture shown on the left due to its higher energy and protein levels. If steers were grazing the two paddocks shown in Figure 6, steers in the greener pasture could gain over 1 kg/head/day while steers in the paddock to the left of the fence would struggle to maintain their weight.

Carrying capacity

We can describe the productivity of the land in terms of its carrying capacity. To place a quantitative measurement on the carrying capacity of a farm, we use the Dry Sheep Equivalent (DSE) system.

A dry sheep is taken to be a two-year-old merino weighing 45 kg, not lactating (dry) and maintaining weight. Land that is rated at 1 DSE/ha can carry one 45 kg wether (castrated, male sheep) all year round on 1 hectare of that land. An unfertilised native pasture may carry 5 DSE/ha, while an improved or sown pasture may carry 12–16 DSE/ha and an irrigated pasture may carry up to 27 DSE/ha, all depending on rainfall, and management imposed on those pastures.

You can determine your sustainable carrying capacity using the following equation:

$$\text{DSE/ha} = a + b + c$$

where a = –8.3 for paddocks less than 20 hectares in size, or –11.05 for paddocks of more than 20 hectares; b = the growing season expressed in months (how long the grass stays green and actively growing); c = Olsen Phosphorus (mg/kg) as taken from your soil test.

For example, my farm is 40 ha with paddock sizes of about 3 ha. My grass stays green and growing for 10 months of the year, and my Olsen P from my soil test is 15 mg/kg. So my DSE/ha = –8.3 + 10 + 15 = 16.7.

Table 8. DSE for different classes of livestock on a daily feed requirement basis

Class of livestock	Liveweight			
Steers/heifers	**140 kg**	**200 kg**	**300 kg**	**400 kg**
Rate of weight gain:				
Maintenance (not gaining weight)	3	4	6	7
0.5 kg/day	4.2	6	7	8
1.0 kg/day	5.7	8.5	11	13
Cows	**500 kg**	**550 kg**	**600 kg**	
Pregnant, last 3 months	11	12	13	
Lactating cow and calf, 0–3 months	13	14	15	
Lactating cow and 150 kg calf	18	19	20	
Cow/calf unit weighted average for year	14	15	16	

Source: Prograze™ 2003.

How does this apply to cattle? Different classes of cattle are given different DSE ratings according to their energy requirements. A 550 kg cow and calf unit weighted across the year is ranked at 15 DSE. A 200 kg steer growing at 1 kg/day requires far less energy/day and is ranked at 8.5 DSE. Therefore, if a property had a carrying capacity of 16.7 DSE/ha, it could carry around 1 cow and calf to every 1 hectare or two steers to the hectare. Table 8 provides a comparison of the energy requirements of different age and weight cattle relative to that of a dry sheep.

Supplementary feeding

Cattle eat about 2.5 per cent of their liveweight in dry matter each day. Therefore, a typical 550 kg beef cow would eat about 14 kg of 'dry matter' or dry feed each day. (Note that green pasture is about 80 per cent moisture, so the cow actually needs to eat about 70 kg of green pasture/day.) In addition to pasture, cattle will require some supplementary feed in times of feed shortage.

There are two major components in an animal's diet: energy and protein. Energy is required to keep animals alive. It is essential for maintenance, growth, pregnancy and lactation. In addition to energy, protein is required for most bodily functions and is required for enzyme, hormone, and tissue synthesis. Young, growing stock and lactating females have higher requirements than dry females and mature steers.

Different feeds have different levels of energy and protein. For instance, green pasture is high in protein and energy while old mature pasture is very low in protein and low to medium in energy. Grain is higher in energy than most other feed and is generally medium to high in protein depending on the type of grain.

Table 9. Energy and protein requirements for different classes of stock

Class of livestock	Total daily energy requirements (MJME)	Minimum energy level of diet (MJ/kg DM)	Minimum protein level of diet (%)
Steer/heifer calves (80 kg)			
0.5 kg/day	22	9.2	13.0
1.0 kg/day	31	12.9	18.3
Steer/heifer calves (140 kg)			
0.5 kg/day	37	8.7	12.0
1.0 kg/day	50	11.6	13.0
Steers/heifers (200 kg)			
0.5 kg/day	44	8.0	11.0
1.0 kg/day	59	10.7	13.0
Steers/heifers (300 kg)			
Maintenance	35	4.6*	8.0
0.5 kg/day	57	7.5	10.0
1.0 kg/day	76	10.0	13.0
Steers/heifers (400 kg)			
Maintenance	45	4.8*	8.0
0.5 kg/day	71	7.6	9.0
1.0 kg/day	93	9.9	13.0
Cow and calf units			
500 kg pregnant cow, last 3 months	61–74	5.7–6.9	6.0
Lactating 500 kg cow and calf, 0–3 months	90	8.4	10.0
Lactating cow and 150 kg calf	127	10.0	11.0

* Cattle on these diets may not eat to full appetite because of the very poor quality (low ME values) of these particular diets.
MJ, megajoule (a unit for measuring energy); MJME, megajoule of metabolisable energy (energy that the animal requires each day).
Source: *Drought Feeding and Management of Beef Cattle*, DPI Victoria, March 2007.

To ensure stock are receiving adequate levels of energy and protein, two sets of information are required. The energy and protein requirements of livestock (Table 9) and the energy and protein levels in various feeds (Table 10).

Example. It is early autumn, there has been no 'autumn break' (autumn rains) and cows and calves are on a fairly bare paddock with no green grass. Is oaten hay a good supplement to feed to them?

From Tables 9 and 10 it can be seen that they require an energy level of 8.4 MJ/kg and a protein level of 10% in their diet. Oaten hay will supply 8–9 MJ/kg of

Table 10. Energy and protein levels in some common feeds

Feed	Dry matter (DM%)	Energy (MJ/kg DM)		Protein (%)
Pastures				
Grass-dominant pasture:				
Immature	23	11		25
Mature	40	7		5
Phalaris:				
Young, immature	20	10		17
Mature	35	7		7
Clover-dominant pasture:				
Immature	15	11		30
Mature	30	4		7
Lucerne:				
Immature	17	11		30
In full bloom	24	8		15
Hay				
Grass-dominant hay:				
Cut at flowering	80	10		9
Cut 2 weeks after flowering	85	9		8
Clover hay:				
Cut at flowering	80	9		13
Lucerne hay:				
Pre-flowering	85	9		15
Flowering	90	8		14
Oaten/wheaten hay:				
Cut at flowering	85	9		7
Milk stage	87	8		5
Ripe seed	90	8		3
Silage				
Grass-dominant silage	45	10		14
Legume-dominant silage	45	10		15
Straw				
Oaten/wheaten straw	90	5		2
Cereal grains and seeds		Whole	Processed	
Barley	90	8.4	13	11
Lupins	90	11	13	30
Maize	90	13	13.5	9
Oats	90	10	11	9
Wheat	90	9	13	12
Triticale	90	13	13	12

Note the difference in energy value of whole versus processed grain.
Source: *Drought Feeding and Management of Beef Cattle*, DPI Victoria, March 2007.

energy, and only 3–7% protein. The energy level is fine but the protein level is much too low for these cows to maintain weight and their calves to grow adequately. By adding lupins (with an energy level of 13 MJ/kg and a protein level of 30%) to their diet, the energy level will be increased slightly and the protein level will be increased substantially.

However, if there was some green pasture in the paddock they would be receiving most of their protein and some of their energy requirements from the young green shoots and under these circumstances oaten hay alone would be a suitable supplement.

Feed shortages – assessing your options

Feeding cattle through feed shortages can be very expensive, just as selling cattle on a depressed market can be very costly. Everyone's situation is different – your level of debt, cash flow, number of stock and amount of feed on hand will all influence your decisions. The best decisions are often those taken early in a feed shortage.

For example, a choice can be made to either purchase hay and grain before the price rises too high (as commonly occurs during a drought) or to sell cattle before everyone else decides to sell and therefore receive a higher price for your stock. In addition, you will not have the expense of feeding them through a feed shortage and your pastures will recover more quickly.

Figure 7. Cattle may require supplementary feeding at certain times of the year.

Table 11. Suggested supplementary feed rations during feed shortages

	Hay	Grain:Hay 50:50		Grain:Hay 70:30		Hay:Grain 70:30		Silage
	kg	kg grain	kg hay	kg grain	kg hay	kg hay	kg grain	kg
Adult dry stock (450 kg): maintenance	8	3	3	4	2	5	2	14
Pregnant cow (450 kg) last 3 months: maintenance	9.5	4	4	5	2	6	2.5	17
Lactating cow (450 kg) + calf (0–3 months): maintenance	12*	4.5	4.5	6	3	7	3	21
Weaner steer/heifer (250 kg): 0.5 kg/day weight gain	7*	3	3	3.5	1.5	4	2	12.5*
Yearling steer/heifer (350 kg): 0.5 kg/day weight gain	9*	4	4	5	2	5.5	2	16*

* These rations may not meet the protein requirements of the animals to achieve the stated level of performance. Check the level of protein in the feed you are feeding your animal by getting a FeedTest done. Contact your local DPI office for further information. The figures in this table are expressed as an 'as fed' basis rather than a dry matter basis.
Source: Drought Feeding and Management of Beef Cattle, DPI Victoria, March 2007.

Table 11 gives quantities of grain and hay to feed to different classes of stock on a daily basis during feed shortages (full hand feeding kg/head/day).

Introducing grain

Grain should be introduced to cattle very slowly to allow the microbes in their rumen (stomach) to adjust to the new feed. Start with 0.5 kg/head/day for the first 3 days, then increase by 0.5 kg/head every second day until full ration is reached. If grain is given too quickly, severe digestive upsets will occur. This is called acidosis or grain poisoning and it can lead to death. If an animal is severely affected, isolate it and call your vet.

In milder cases, reduce the quantity of grain fed until all animals return to normal then gradually increase the quantity of grain again. Usually when animals get sick on grain, they take a long time to recover. It is better to pull them out of the mob and feed them separately until they recover.

Cattle will be more prone to acidosis when fed wheat, barley or maize because of their low fibre content. The safest grains to feed are oats and lupins due to their higher fibre content. Always ensure straw or hay is fed at the same time as feeding grain as this will provide the fibre needed and reduce the risk of acidosis.

Processing grain

Processing (milling) grain improves its digestibility to cattle. Digestibility refers to the proportion of the feed eaten that is retained and used by the animal. A highly

Table 12. Digestibility of grain (%)

	Whole	Processed
Wheat, triticale	63	88
Barley	53	85
Oats	77	81
Lupins, peas	76	86

Source: Hints on Feeding Grain to Cattle. Agricultural Note No. AG0564, DPI Victoria.

digestible feed will usually be digested more quickly allowing for greater intake, and hence greater animal production. Grain can be coarsely cracked using a roller mill. The finer the grain is ground, the greater the risk of grain poisoning. In addition, the more dust particles in it the less palatable it will be.

Hammer milling is not the preferred method of processing grain for cattle as the grain tends to be ground too finely. Oats need not be rolled as its digestibility is increased by only five per cent, while the digestibility of wheat is increased by around 40 per cent after processing.

A word of warning. While rolling barley and wheat will increase their digestibility substantially, for practical reasons this practice is not recommended. The high cost of the machinery, the labour intensiveness and the short storage life of the processed grain makes this practice not very worthwhile when carried out on a small scale. Table 12 is a guide to the improvement in digestibility that can be achieved by processing some commonly fed grains.

Frequency of feeding

During the initial period when grain is being introduced, it should be fed daily until the full ration has been reached and all cattle are consuming their share. Once stock are accustomed to eating the grain and are on full rations, they can be fed every day or second day if required (with twice the daily amount fed every second day).

Feeding in troughs

It is best to feed grain in troughs to prevent wastage and minimise the intake of soil, as there are a number of potentially dangerous pathogens in the soil. Various forms of troughs can be improvised (Figure 8). For example, two rows of logs can be placed on the ground about 450–600 millimetres apart and joined with old corrugated iron used as flooring. Other options include 200 litre drums or tractor tyres cut in half.

Allow 300–600 millimetres of trough space per head to ensure all animals are able to reach the feed at once. This is important because some cattle will dominate

Figure 8. Examples of simple home-made troughs.

other cattle preventing 'shy-feeders' from accessing the feed adequately. Shy-feeders are cattle that are bullied into standing back until the more dominant animals have had their fill. There may not be much feed left by the time they get a chance to feed! Shy-feeders are best separated from the rest of the mob and fed in a small group by themselves.

Feeding on the ground

If no troughs are available and the grain is fed out on the ground, it is best done by placing the grain in heaps rather than trailing it out as for sheep.

It is not recommended that rolled (processed) grain be fed out on the ground as too much is likely to be wasted, particularly in wet conditions.

Water supply

Cattle must be provided with good quality water (preferably from a trough) at all times (Figure 9). Table 13 shows the amounts of water required for different types of stock.

In summer the requirement may increase during periods of high temperatures. Troughs supplied with water pumped from creeks or gravity fed from dams will need to be checked three times a week in case of mechanical failure. Daily checks of water are required over summer.

Table 13. Water consumption for different stock types

Stock type	Consumption (L/day)
Weaners (250–300 kg)	Up to 55
Dry stock	Up to 80
Lactating first calf heifers (350–400 kg)	Up to 90
Lactating cows (500 kg)	Up to 100

Water containing up to 3200 ppm of total soluble salts and up to 400 ppm of magnesium is suitable for cattle of all ages. Non-lactating older cattle can tolerate up to 9600 ppm total soluble salts and up to 600 ppm of magnesium provided that it is introduced gradually.

Figure 9. Examples of water troughs. Top, round concrete trough; Bottom, old bath tub plumbed into farm water system.

4

Responsibilities of owning livestock

As a livestock owner, you have a responsibility to keep your stock in good health and prevent them straying from your property (Figure 10). Many problems arise through lack of supervision. The responsible absentee owner should organise for a neighbour or someone to check stock through the week. Calving cows will need to be checked at least daily. It is your responsibility to provide adequate feed, water,

Figure 10. Stock contained behind a simple single-wire electric fence (a good option for internal fencing).

protection and preventative health care for your livestock. Stock must also be protected from unnecessary or unreasonable pain, suffering or injury.

Animal welfare

The *Model Code of Practice for the Welfare of Animals – Cattle*, states that:

- Stock must have access to drinking water of a suitable quality and quantity (refer to Chapter 3 for further information).
- Cattle must have access to, or be provided with, feed at levels consistent with their wellbeing. Consideration should be given to the animals age, bodyweight and the extra nutritional demands associated with growth, pregnancy, lactation, exercise and climatic extremes (refer to Chapter 3 for further information).
- If the quality and/or quantity of pasture is limited and no supplements are being fed, the stocking rate must be reduced and the remaining animals monitored closely to ensure they maintain satisfactory body condition.
- Sheds, pens, yards, lanes, ramps and other areas where cattle are forced to congregate should be constructed and maintained to minimise stress, injury and disease. The design and construction of such areas should minimise dust and noise (refer to Chapter 7 for further information).
- Cattle should be handled quietly. The use of goads and dogs for the handling and moving of cattle should be limited to the minimum necessary to complete the procedures. The use of unreasonable force in twisting an animal's tail (that may result in breakage or dislocation) to cause it to move is unacceptable (refer to Chapter 14 for further information on cattle handling).
- Any injury, illness or distress observed must be treated appropriately and promptly.
- To minimise pain and injury, all horned cattle should be dehorned as young as possible, preferably prior to weaning. With animals that have not been dehorned, inward growing horns likely to penetrate or contact facial features should be trimmed appropriately.
- Care should be taken to minimise calving difficulties by the adoption of proper management practices such as:
  - selection of heifers for mating only when they have reached the minimum target weight for the breed;
  - avoidance of over-feeding or under-feeding pregnant cows and heifers;
  - avoidance of mating heifers to bulls known to sire large birth weight calves;
  - supervision of cows and heifers close to calving where possible, and early intervention where required (refer to Chapter 10 for further information).
- Appropriate preventative measures should be used for diseases that are known to be common in the district or are likely to occur in the herd. A suitable plan for vaccination and internal and external parasite control should be devised

and followed for each property where appropriate (refer to Chapter 13 for further information).
- Sick or injured cattle should be treated promptly and appropriately, and preferably isolated from other cattle.

The DPI together with the RSPCA and police investigate reports of alleged cruelty to animals. Some of the activities that constitute cruelty are:

- overloading or overcrowding animals in a truck;
- knowingly or negligently carrying out or omitting to do an act with the result that unnecessary, unreasonable or unjustifiable pain or suffering is caused to an animal;
- omitting to provide animals with proper and sufficient food, drink and shelter and/or
- failure to provide appropriate treatment for a sick or injured animal.

A conviction for cruelty to animals can result in severe penalties including the possibility of imprisonment.

Impounding of Livestock Act 1994

The *Impounding of Livestock Act 1994* is administered by your local shire. Contact the shire ranger if you find stray animals on the road, in your paddocks, or if you lose stock. If stock are found straying, and ownership can't be determined, they will be taken to a pound and notices will be put in the local paper advertising the details of the impounded stock. Upon claiming your stock you will be required to pay feed costs and impounding fees. If no one claims the stock they will be auctioned.

Where stock stray onto a highway and cause damage or injury, the question of whether or not the owner of the stock has been negligent will depend on a detailed examination of the circumstances of each case.

Exotic diseases of cattle

An outbreak of an exotic disease such as Foot and Mouth Disease has the potential to devastate Australian livestock industries. You should report any unusual disease signs to your nearest government or private vet, stock inspector or the Emergency Disease Watch Hotline on 1800 675 888.

Ban on feeding animal materials to cattle

A person must not feed animal material or manufactured feed containing animal material to cattle or other ruminants. This ban is in place due to concerns about Mad Cow Disease or Bovine Spongiform Encephalopathy (BSE). It is a slow,

progressive, degenerative disease of the central nervous system in cattle and it eventually kills the animal.

The disease is found in the United Kingdom and Ireland and some cases have been reported in other countries. There has never been a case of BSE in Australia. To ensure Australia remains free of BSE, table scraps or any other waste foods containing animal-based products must not be fed to ruminants.

Everybody handling feedstuffs has a special responsibility to closely examine product labels. Under no circumstances should a ruminant animal be fed a feedstuff labelled with a warning that the feedstuff contains material that must not be fed to ruminants. For further information refer to Agriculture Note 'BSE and the Ruminant Feed Ban' (AG1118) at www.dpi.vic.gov.au.

Identification and transfer of cattle

The National Livestock Identification System (NLIS) is Australia's system for identifying and tracking cattle for food safety, disease control and market access purposes. All cattle must carry an NLIS device (ear tag or bolus/ear tag combination) at the time of dispatch from a property to a saleyard, scales, abattoir, knackery, agricultural show or to another property. If cattle arriving on a Victorian property have lost their NLIS device, they must be identified with an orange Post Breeder device issued for use on that property within 30 days of their arrival, or if they are to be moved, before dispatch (see Chapter 9 for further information on ear tagging cattle and NLIS tags).

Cattle movements must be recorded on the NLIS database. The database can be found at http://www.mla.com.au/nlis. If cattle are bought through a saleyard or an agent, they should record the transfer details of the cattle to your property. However, it is the responsibility of the person receiving the cattle to ensure that this has been completed. If buying cattle directly from another property, you must update the database with the stock details within 7 days. You must report the following information to the database:

- microchip or NLIS number for each animal
- date of movement
- Property Identification Code (PIC) of the property of last residence
- Property Identification Code (PIC) of the property to which the animals have moved
- National Vendor Declaration (NVD) serial number if an NVD was sent with cattle.

National Vendor Declarations

This declaration should be completed by the vendor for every consignment of cattle for sale or slaughter. Although National Vendor Declaration (NVD) forms

are voluntary, they are being demanded by industry. Producers use the NVD/Waybill to declare valuable information about the food safety status of the livestock being sold. Buyers rely on the NVD/Waybill for accurate information on the livestock purchased and processors rely on the information to ensure only the safest food enters our food chain.

Most saleyards and abattoirs will not accept cattle for sale without an NVD. The declaration allows the abattoir to provide assurances concerning the presence of chemical residues and hormonal growth promotants in meat.

When purchasing cattle it is wise to ask the vendor to supply a National Vendor Declaration form to provide you with background information about the cattle's origin and previous chemical treatments. A false declaration is illegal and can result in prosecution. The forms are available through Meat and Livestock Australia (MLA) and information can be found at http://www.mla.com.au/nvd.

Interstate livestock movement

If you are considering sending cattle interstate you should contact your local Animal Health DPI Officer and ask about current requirements for certification. Each State has its own requirements and in some instances testing for disease prior to stock movement is necessary.

Withholding Period (WHP) and Export Slaughter Interval (ESI)

Most drenches, lice treatments, growth promotants and antibiotics have a Withholding Period (WHP) and Export Slaughter Interval (ESI). The WHP is the minimum period that must elapse between the last administration or application of a product and the slaughter or use of the animal or its products for human consumption. The ESI is the time that must elapse between administration of the product to the animal and its slaughter for export. Information about use of chemicals must be included on National Vendor Declarations.

Withholding periods and ESI by law must be included on the containers of the product (Figure 11). A regularly updated list of WHP and ESI for veterinary chemicals can be found at http://www.apvma.gov.au.

To produce quality beef it is essential to read the instructions, use correct dosage rates, apply properly and observe the withholding period of any treatment used. A very important element is recording which animals have been treated and the product and dose rate they have been treated with. If you fail to observe the withholding periods, unacceptable levels of chemical residue could be detected in the meat from your animals at slaughter.

If residues are detected in an animal at an abattoir, the vendor could incur the cost of slaughtering and disposing of the contaminated carcase. If that carcase has

Figure 11. Vaccine label showing the withholding period before stock are allowed to be processed for human consumption.

been packed in a container with other carcases, the whole container could be condemned and the vendor could be up for the cost of the entire container of meat.

If unacceptable residues are detected in any Australian meat sent to overseas markets an immediate ban would be placed on all imports from Australia.

5

Systems of beef production

Steer fattening

Steer fattening is the simplest form of beef production (Figure 12). It generally requires the least management input, so is the recommended system for people who have not run cattle before. All animals can be run in one paddock as there are no bulls and no calving cows or heifers to manage. Weaner steers (7–12 months old) in store condition are purchased in summer or autumn, grown out and fattened for sale during early summer of the same year (at 16–21 months of age).

The main considerations are:

- Buying the type of steers with the potential to grow and fatten under your conditions (see Chapter 6 for the different breeds of cattle).
- Having sufficient pasture. Most of the fattening will occur during spring. Some hay may be needed to avoid weight loss during winter.
- It is important to rotationally graze to ensure good growth rates of the steers.
- Parasite control must be used to maximise growth (refer to Chapter 13 for further information).

Cow and calf systems

Cow and calf systems are the most common form of beef production in southern Australia, and are based on each cow rearing one calf per year. These calves may be sold as vealers (to be slaughtered) straight off their mothers at 8–10 months of age.

Figure 12. Hereford steers being run as part of a steer fattening system.

Alternatively, if they do not have adequate fat cover for slaughter they may be sold as store weaners or retained and grown out to heavier weights. Some heifer calves will need to be kept as replacements for cows culled from the breeding herd.

Vealers, as distinct from store weaners, are produced from cows with medium to high milk production. However, without an adequate supply of good quality pasture, these high milking cows tend to lose weight rapidly. This may make it difficult for them to get back in calf again without a large amount of supplementary feeding. Therefore, vealers are best produced in regions with relatively high rainfall and a long pasture growing season.

A cow and calf breeding system is a complex form of beef production, as it involves running cows and calves, replacement heifers and at least one bull (or alternatively, running an artificial insemination program). Success depends on a high standard of management to maintain herd health and fertility, and to achieve rapid calf growth (Figure 13).

Foster calves and multiple suckling

Calves born to dairy cows are taken off their mothers at 1 or 2 days of age, and these can be artificially reared on milk replacers until weaning at 8–10 weeks of age.

Another system of rearing dairy calves is to suckle two or more calves on one good milking cow. Foster calves are allowed to suckle the cow until they are three or four months old, when they are weaned and fattened on pasture. The cow's own calf is normally allowed to stay with the cow until it is ready for slaughter at 8–10 months of age. Alternatively, both the foster and natural calves can be weaned, and more foster calves purchased for rearing on the cow.

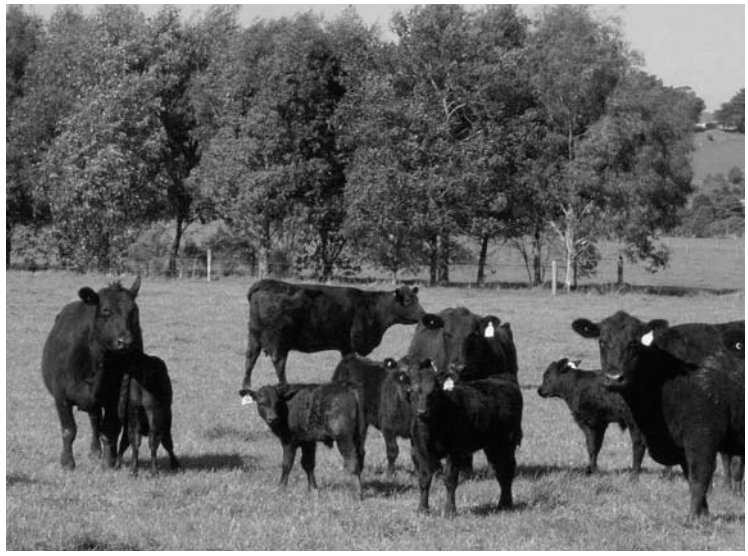


Figure 13. An Angus cow and calf system.

Multiple suckling and artificial rearing are labour intensive forms of beef production, and are rarely practised commercially. However, they may have application on small properties where the availability of labour is not a problem. Fostering calves onto dairy cows is not a job for the inexperienced. It takes a great deal of patience and time both in fostering the new calf onto a cow and observing the cow and calves to ensure both calves are being allowed to suckle.

There are a number of ways to foster an extra calf onto a cow. The most common method is to put the cow in a crush and restrain her in a head bail. Open the sides of the crush and encourage the calves to suckle, one on each side of the cow. She may kick at the foster calf to prevent the calf from suckling. You may need to position the foster calf so it can gain access to the cow's teats from a rear position. This will need to be done three to four times a day until you are sure the cow is allowing both calves to suckle in the paddock.

It can take from a couple of days to a month for a cow to accept a foster calf and some cows will never accept a foster calf, which leaves you the job of bucket rearing the calf for 8–10 weeks.

Lot feeding

Lot feeding involves confining cattle (usually yearlings) in small yards and feeding a balanced ration that enables them to grow and fatten in 120 days or less. Feedlot rations are comprised mainly of processed grain (60–80 per cent), protein concentrates and hay.

Figure 14. Steers being fed in an on-farm 'opportunity feedlot'.

Small scale lot feeding has not become widespread in Australia because of marginal and often negative profitability. Under our conditions, pasture is generally the cheapest cattle feed available. The profitability of lot feeding is extremely sensitive to both feed costs and cattle prices.

In some years, for short periods at certain times of the year (usually late winter), 'opportunity feedlots' can be profitable (Figure 14).

Bull beef

Bull beef production is a popular enterprise for many properties in Australia. The bull beef industry is largely based on a partnership of specialised producers. These include dairy farmers who supply suitable bull calves, calf rearers who rear dairy calves to specific weights and beef producers who grow out bulls on pasture and supplements to slaughter specifications.

Bull beef production adds great value to dairy or dairy cross bull calves by growing them out to beef. Bulls grow faster, have a superior conversion from live weight to carcase weight, and produce leaner meat than steers. Because they are hand reared, they are generally easy to manage. Suitable bull calves are selected and reared on milk-replacer, pasture and supplements to slaughter specifications.

Figure 6. Fertilised, rotationally grazed pasture (right) compared with set stocked, unfertilised pasture (left).

Figure 15. Red Angus bull. Red Angus cattle have the same attributes as the Black Angus, just with a red coat. They are generally well-tempered, and have good maternal and carcase qualities.

Figure 16. Bazadaise cow and calf. Bazadaise are a French breed that are heavily muscled, have a good temperament, are fertile and are suited to both hot and cold climates.

Figure 17. Balancer cow. Balancer cattle are Gelbvieh cattle (a European breed) crossed over British breeds such as Hereford, Murray Grey and Angus. They have high growth, good muscling and easy calving.

Figure 18. Poll Hereford cow. Poll Herefords are a British breed of medium size, known for their good fertility and moderate muscling. They can be used in the vealer, yearling, steer and bullock markets.

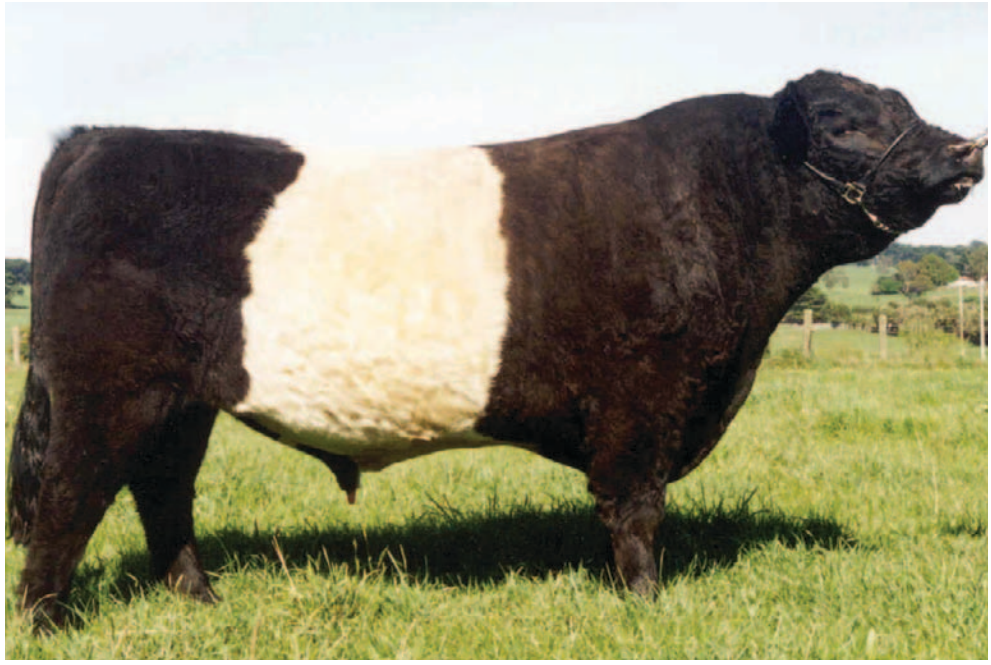


Figure 19. Belted Galloway. A British breed with excellent maternal characteristics, good temperament and are naturally polled. They are well suited to the cooler climates due to their double coats.

Figure 20. Murray Grey. Murray Greys are an Australian breed with links to the Angus and Shorthorn breeds. They are a versatile animal good in both grass feeding situations and in feedlots. An easy calving breed.

Figure 21. Angus cow and calf. Anguses are a British breed that is naturally polled, easy calving and good to use in a cross-breeding program with European breeds.

Figure 45. NLIS Breeder devices made by Allflex. The tag on the right with the top cut away shows the coil of copper wire used as an antenna and the small microchip. The microchip is found under the 'bump' on the front of the tag.

Figure 46. NLIS Breeder device in the form of a bolus/ear tag combination, made by Rumitag. The ear tag component of this combination must be attached to the right (offside) ear.

Figure 47. Example of NLIS Post Breeder devices as made by Allflex. Notice the 'Do Not Remove' notice on the back of the tags.

Figure 48. This animal has been tagged incorrectly as two NLIS devices have been placed in the ear. Cattle should only have one NLIS device for life.

Figure 49. A well-placed NLIS ear tag. It is well into the ear and facing forward. On cattle with very hairy ears, a well-placed tag will be very hard to see from the front of the animal.

Figure 50. A poorly placed tag. The tag is facing the wrong way up and is toward the top of the ear. It is likely this cow will catch the ear tag on a fence or branch and the tag will pull out.

Figure 51. A poorly placed tag. Although this Post Breeder tag is facing the correct way, it has been placed too close to the end of the ear and is very likely to get snagged and be ripped out.

Figure 80. Example of a composite breed. This Balancer's heritage comes from Gelbvieh and Hereford.

Figure 81. A Murray Grey bull. The Murray Grey is now thought of as a pure-breed, but is actually a composite, with the original animals coming from a cross between an Angus bull and a Shorthorn cow.

6
Breeds of cattle

There are over 195 recognised breeds of cattle in the world, all of which are classified by appearance. There are two breed types: *Bos taurus* and *Bos indicus*. *Bos indicus* breeds originate from southern Asia and are distinguished by their hump, loose skin and floppy ears. These cattle are most suited to tropical conditions and are found predominantly in northern Australia. *Bos taurus* breeds originate from Europe and are humpless. The *Bos taurus* group are divided into two further divisions, British breeds (such as Hereford, Angus and Shorthorn) and European breeds (such as Charolais, Simmental and Limousin). Table 14 describes and gives the characteristics of the most popular breeds found in southern Australia.

The British breeds are generally early maturing, that is, they fatten on less feed. They tend to have high fertility and good eating quality if managed well. European breeds tend to be more muscular and take longer to finish off or lay fat down, so require more feed of a higher quality.

For a more detailed look at the characteristics of 26 different breeds of cattle, including growth rate and mature size, muscling, age at puberty, milk production and ease of calving, see Appendix 1. Other breeds not mentioned in Appendix 1 include: Afrikaner, Bazadais, Beefalo, Beefmaster, Belgian Blue, Belted Galloway, Braunvieh, British White, Dexter, Dutch Belted, Gelbvieh (Gelp-fee), Highland, Lowline, Piedmontese, Pinzgauer, Romogmola, Salers, Sussex, Tarentaise, Tuli and Wagyu.

Which breed of cattle should I run?

The breed of cattle you choose to run will depend on your ultimate goal. But the environment in which the cattle will be living, as well as the market you will be trying to sell into need to be considered.

If your purpose in running cattle is simply to eat the grass in your paddock, then the simplest system would be to buy and sell steers on an annual basis through your local saleyard or a local breeder. The breed you choose may not be of great importance and could change from year to year depending on price and availability. Alternatively, you may be interested in one of the newer or more unusual breeds and want to start with a few pure-bred animals and breed up from there.

Whatever your end goal, if you have not owned cattle before it would be wise to gain some experience by purchasing, handling, growing out and breeding one of the more common breeds before you finally settle on a breed you would like to run.

There are many breeds of cattle available to choose from (Figures 15–21, pages 35–38). Table 14 shows some of the most popular, traditional breeds. New breeds are entering Australia all the time and new breeds are being created. Cross-breeds (see Chapter 12 for more detailed information on cross-breeding) are a combination of two breeds with different strengths resulting in hybrid vigour and therefore improved performance. Breed societies are a valuable source of information, however, don't forget that one of their aims is to promote their own breed!

The economically important characteristics of beef cattle are growth rate, calving ease, milk production, carcase composition, feed conversion efficiency and temperament. The temperament of the animals is also very important to your ease of handling. Wild, skittish animals aren't much of a joy to work with!

Independent research data on the breed you are interested in is the best way to identify its characteristics. Also look around the district and see what other breeds farmers are using, and how well they perform.

Other breeds

There are numerous other breeds that do not appear in Table 14. Four that are proving popular with the smaller landholder are Lowlines, Dexters, Highland cattle and Galloways.

Lowlines were developed from a research project at Trangie Research station in NSW. Lowline cattle have an Angus heritage, but have been bred for a smaller frame size. This allows the farmer to target niche markets looking for smaller cuts of beef. Mature Lowline bulls are about 110 cm high and cows 100 cm, with adult weights of about 300 kg. Lowlines are known as easy calvers and are naturally polled (no horns). They have the ability to produce tender, small cuts of well-marbled beef from a pasture base with the right management.

Dexters are the smallest naturally occurring British breed, with cows being about 102 cm at the hip and bulls 107 cm. They are classed as dual purpose, producing both meat and milk, and are good mothers. They are usually black in colour, but can be red or dun. The carcase of the Dexter averages about 55% dressing out and produces small, lean, tender cuts of beef.

Table 14. Description and characteristics of the most popular cattle breeds in southern Australia

Breed type	Breed	Origin	Description	Mature size	Milking ability	Market suitability
British breeds	Hereford	England	Red/brown and white; horned	Medium	Low	V, S, HS, MX
	Poll Hereford	United States	Red/brown and white; polled	Medium	Low	V, S, HS, MX
	Angus	Scotland	Black; polled	Medium	Medium	V, S, HS, MX
	Shorthorn	England	Red, roan or white; polled or horned	Medium	Medium	V, S, HS, MX
	Murray Grey	Australia	Silver-grey to dark grey; polled	Medium	Medium	V, S, HS, MX
European breeds	Charolais	France	White to light straw; well muscled; lean; horned	Large	Low	V (under high nutrition), cross-bred vealer, S, HS, TX
	Simmental	Switzerland	White face, brisket, belly, legs and tail; shades of red/yellow on the body; horned; well muscled; lean	Large	High	V (under high nutrition), cross-bred vealer, S, HS, TX, MX
	Limousin	France	Red; well muscled; horned or polled	Medium	Low	Cross-bred vealer, S, HS, TX
Dairy breeds	Fresian	Holland	Black and white; horned	Large	High	Cross-bred vealer, MX
	Jersey	Channel Islands	Fawn, red or silver grey; horned	Small	High	Cross-bred vealer, MX
Bos indicus (tropical breeds)	Santa Gertrudis	USA 3/8 Braham 5/8 Shorthorn	Red; loose skin; floppy ears; polled or horned	Medium	Low–Medium	Cross-bred vealer, S, HS, MX, TX
	Brahman	USA mixture of Indian and British breeds	Grey or red; hump large on back; floppy ears, loose skin; horned	Large	Medium	Cross-bred vealer, S, HS, MX, TX

Market suitability key: V, vealer (suit vealer market 250–350 kg liveweight); S, steer (suit market 300–450 kg liveweight); HS, heavy steer (suit market 450–700 kg liveweight); MX, maternal cross (suit crossing with another breed to be used as a cross-bred mother); TX, terminal cross (suit crossing with good maternal female for all offspring to be sold as slaughter cattle).

Highland cattle (originally from Scotland), have very shaggy, typically red coats, and prominent widely spaced horns. They can survive very well in marginal conditions but do require good feed for moderate growth. Eye problems are rare in this breed. Using Highland cattle in a cross-breeding program results in hybrid vigour and well growing steers. Meat from a Highland tends to be lean but well-marbled and with plenty of flavour.

Galloway cattle include the Galloway, Belted Galloway, White Galloway and Miniature Galloway. They are a naturally polled breed, easy to manage with a good temperament and long living. They create strong hybrid vigour when used in cross-breeding. The double coat of this breed ensures it can withstand extremes in temperature and climate. They are an extremely fertile breed, known for their ease of calving, and the cow provides an excellent supply of milk to the calf. Carcase-wise the Galloway breed tends to be high yielding, producing plenty of muscle but with the required fat cover.

7

Fencing and cattle-handling facilities

Good fences are essential for cattle production. Cattle are good 'fence destroyers', as they tend to rub with great force and can push over and through old fences. Three classes of animals will successfully negotiate all but the best fences. One class is bulls in search of cows, either yours or the neighbours, and the other classes are cows in search of their calves and calves in search of their mothers immediately after weaning.

Non-electrified cattle fences usually consist of up to eight strands of wire, generally including one or two strands of barbed wire. These are most suitable for boundary fences. Generally it is preferable these days not to have barb wire on internal fences. A prefabricated wire such as ringlock and hinge joint can be used if sheep are also run on the property. Wooden end assemblies and posts are the most commonly used, however, steel and concrete end assemblies are also available (Figure 22). A non-electric fence made almost entirely of steel posts is not well suited to cattle as they will push it over.

Electric fencing is the cheapest and most effective method of controlling cattle. Outriggers off an existing fence are a quick, cheap and excellent way of making boundary fences stock proof (Figure 23). For internal fencing, one or two electric wires are adequate in most circumstances. This presents a huge cost saving compared to conventional fencing.

Cattle-handling facilities

To manage and care for cattle properly you will need to handle the cattle a number of times in the year. This will include handling them for drenching, vaccination,

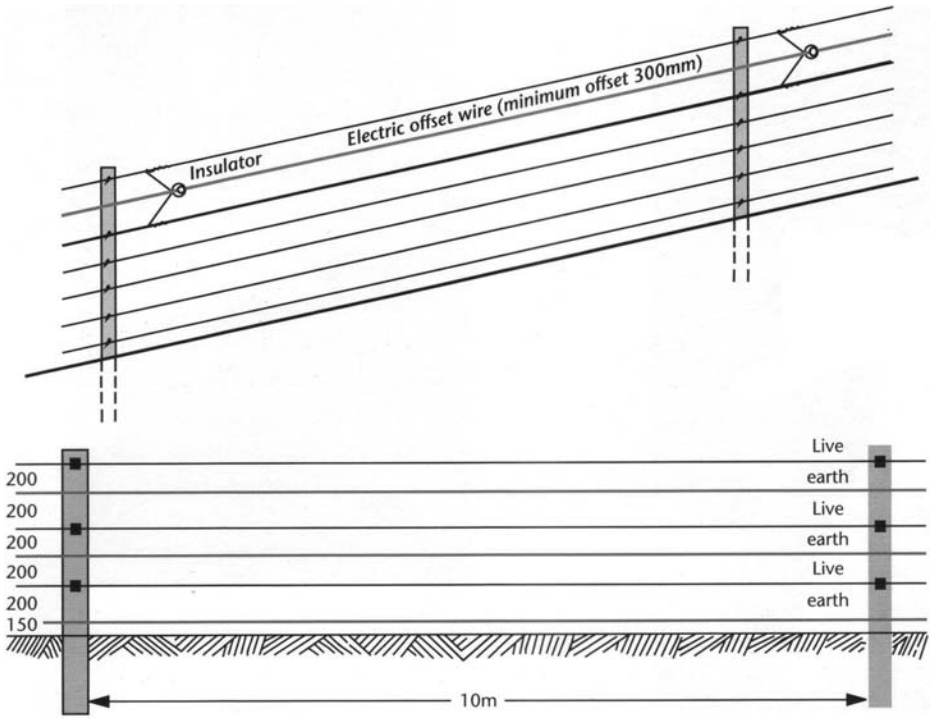


Figure 22. An offset electric wire used to upgrade an existing fence.

dehorning, ear tagging, castration and loading for sale. For these tasks to be completed successfully, a good set of cattle yards is required. The yards need not be elaborate but must be functional – well designed and solidly constructed.

Design considerations

If the design of the cattle yards does not take into consideration the way cattle behave, problems will occur. For further information on cattle behaviour and handling, refer to Chapter 14.

When designing cattle yards the following points should be considered:

- Cattle move toward light or a point of escape.
- Shadows or irregularities at ground level will cause them to baulk.
- Cattle move better around a curve than in a straight line and like to continuously circle (Figure 24).
- If the yards are on a sloped site, cattle will move more easily through an uphill race rather than a downhill one.
- Cattle are sensitive to noise and may baulk at noise ahead (this includes mechanical equipment, radios, barking dogs, etc.) if they are not familiar with the noise.

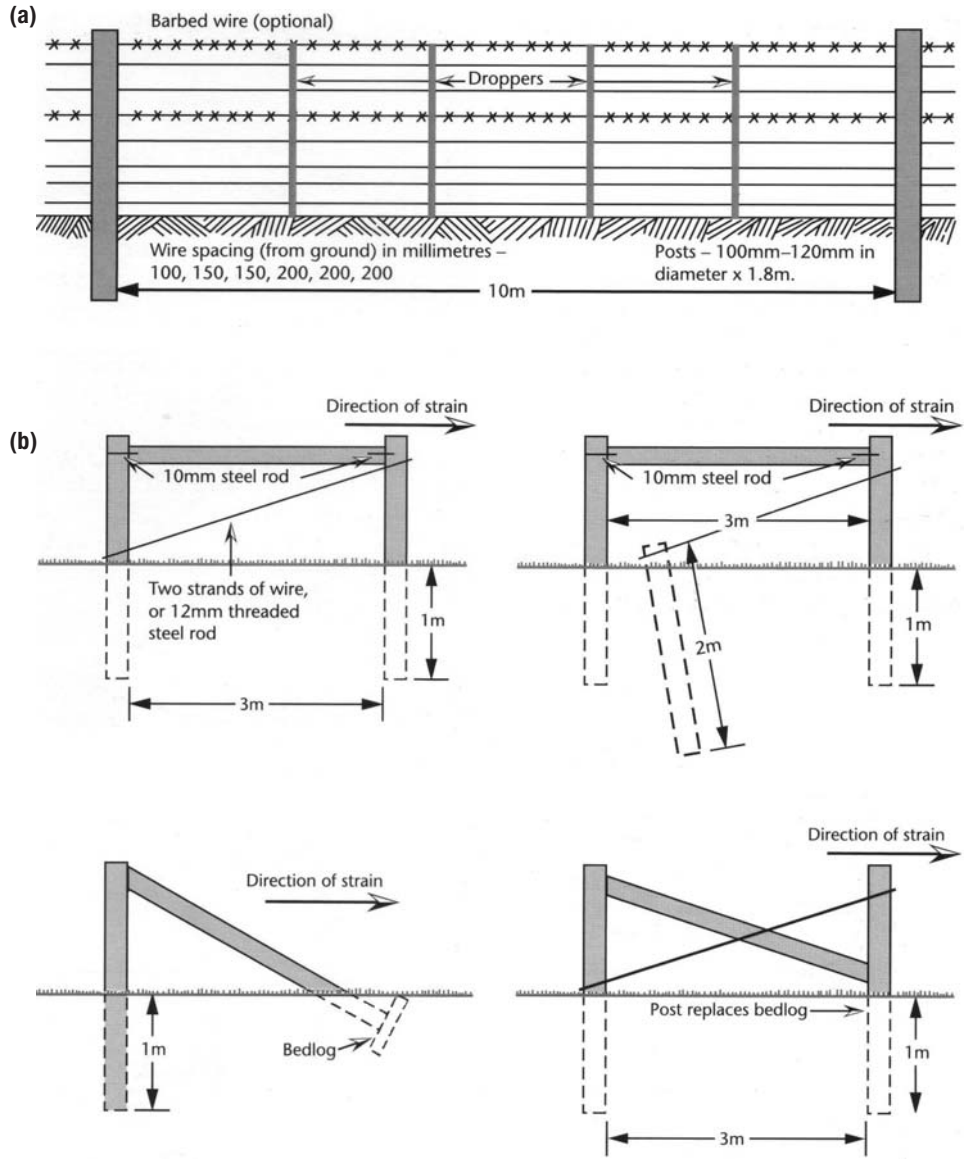


Figure 23. Traditional plain wire fence (a). End-assembly diagrams (b).

- Corners should be avoided where possible as cattle congregate with their heads in corners. It is time consuming and often dangerous trying to move them out of the corner.

If you are constantly hitting or prodding your cattle to get them to move in the yards the design may need improving. Hitting or prodding can result in costly bruising to the carcase of the animal. Cattle yards should be designed and

Figure 24. Curved race. Note the solid panel on the outside of the bend, this helps minimise distractions to the cattle, assisting them to move through the race.

maintained with quality assurance and operator safety in mind. Poorly maintained or designed yards with projections such as bolts and wire, protruding latches or loose boards can cause bruising and hide damage to your animals.

A main feature of a cattle yard is a funnel-shaped forcing yard leading into a race with a head bail at the end (Figure 25). Certain measurements, such as the race width, are critical (Figures 26 and 27). The race width should be 675–700 mm. If the race is less than 675 mm wide, large animals (large framed cows and bulls) won't fit through. On the other hand, if it is wider than 700 mm, younger animals can turn around in the race and become stuck or hamper the flow of stock through the race. The suitable width for a straight race is 675 mm and for a curved race is 700 mm. The width at the beginning of a curved race should be slightly wider (750 mm) than the rest of the race to prevent cattle knocking their shoulders as they enter the race. A guide to the total race length required is found in Table 15.

Materials

When choosing materials to build cattle yards, consider strength, noise and value as a 'visual barrier'; steel yards have a reputation for being noisy. Secondhand conveyor belts attached to the inside of yards and ramps have been used successfully as visual barriers and are good for reducing the noise level. A good combination is probably steel posts set in concrete (either railway line or steel pipe with a minimum diameter of 75 mm) and hardwood rails (150 mm × 50 mm).

Figure 25. Funnel-shaped forcing yards allow for easier movement of cattle into the race. This set-up could be improved by filling in the outside panels of the yard and race to minimise distractions to the stock.

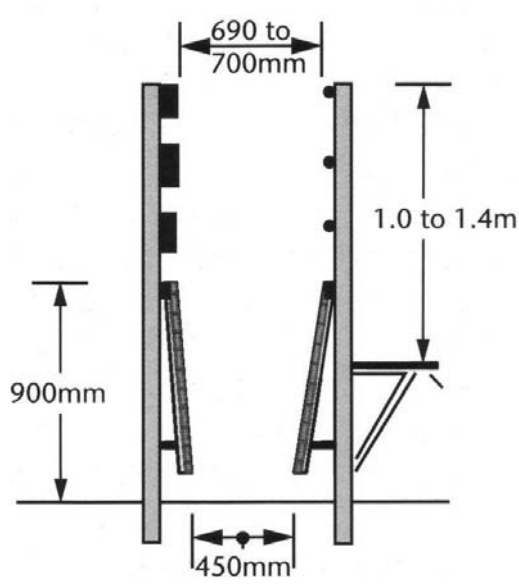


Figure 26. 'V' race internal measurements. Source: SCA Report No. 35, 'Farm Cattle Handling', 1991.

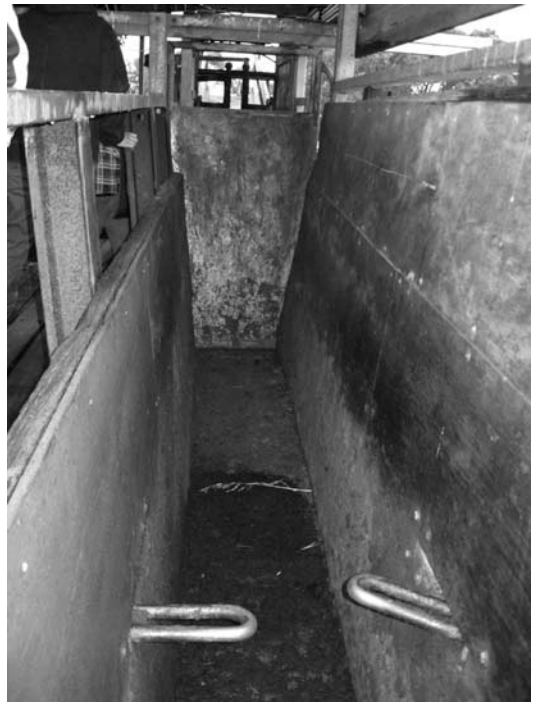


Figure 27. A V-shaped race prevents animals turning around. This race also has backing bars protruding into the race. As the cattle push on these they swing forward, springing back into place behind the animal, preventing the animal from backing down the race.

Hardwood posts can also be used but should have a minimum diameter of 200 mm to ensure strength.

Bail heads

Bail heads can be purchased separately or as part of a crush (Figure 28). An efficient bail head is an aid to good management. Most tasks such as vaccinating or

Table 15. Total race length required (excluding crush)

Number of cattle in mob	Minimum race length (metres)	Optimum race length (metres)
1–10	3	–
10–50	5	7
50–150	7	15
150–300	8	15
300+	12	15

Source: SCA Report No. 35, 'Farm Cattle Handling', 1991.

Figure 28. A bail head attached to a crush.

drenching can be done in a race but there are always a few animals each year that need to be restrained in a bail head (for example, for eye treatment). You may prefer to use the bail head as a matter of course for all animal treatments to ensure personal safety and ease of working. Walk-through type bail heads that can operate from the front or rear are the most functional.

Scales

Scales are an important item for people who are serious about knowing what is happening with their stock, especially when it comes to marketing. They can be used for monitoring growth rates of young stock to ensure that they are achieving the required weight gain so they will meet the market target weights.

Scale set-ups can be simple or complex. Simple set-ups allow you to view the weight of each individual animal. Complex systems can be set up so that the electronic ear tag of the animal is read automatically and stored on the indicator along with its weight and can allow you to enter extra information relevant to the animal (Figure 29). Of course the more complex the system, the more expensive it is.

Figure 29. A complex weighing system in which the ear tag and weight are read automatically and stored in the indicator. Extra information can be added, or performance can be checked. This system will show the change in weight since the last weighing.

Loading ramps

A functional loading ramp (Figure 30) is an absolutely essential tool to be able to remove cattle from, and bring cattle to, your property. The minimum length for a ramp is 3 m, but ramps of 3.6–4.6 m are preferable. A level section of 800 mm to 1 m long at the end of the ramp will allow a smooth flow of cattle onto and off the truck. Cattle prefer to step out of a truck onto a flat surface rather than onto a sloping surface.

Figures 30–33 show some examples of cattle yard plans. Some key things to remember are to ensure they are large enough for the number of animals you plan to put through, or ensure that you include a holding yard/paddock close to the yard for additional animals. Don't forget to use a funnel-shaped forcing yard into the race and try to ensure a curved race for ease of handling. External panels of the yards/races ideally should be solid or filled in to minimise outside distractions to the animals. Spring loaded latches on the gates are quick to use and prevent the cattle from knocking them open.

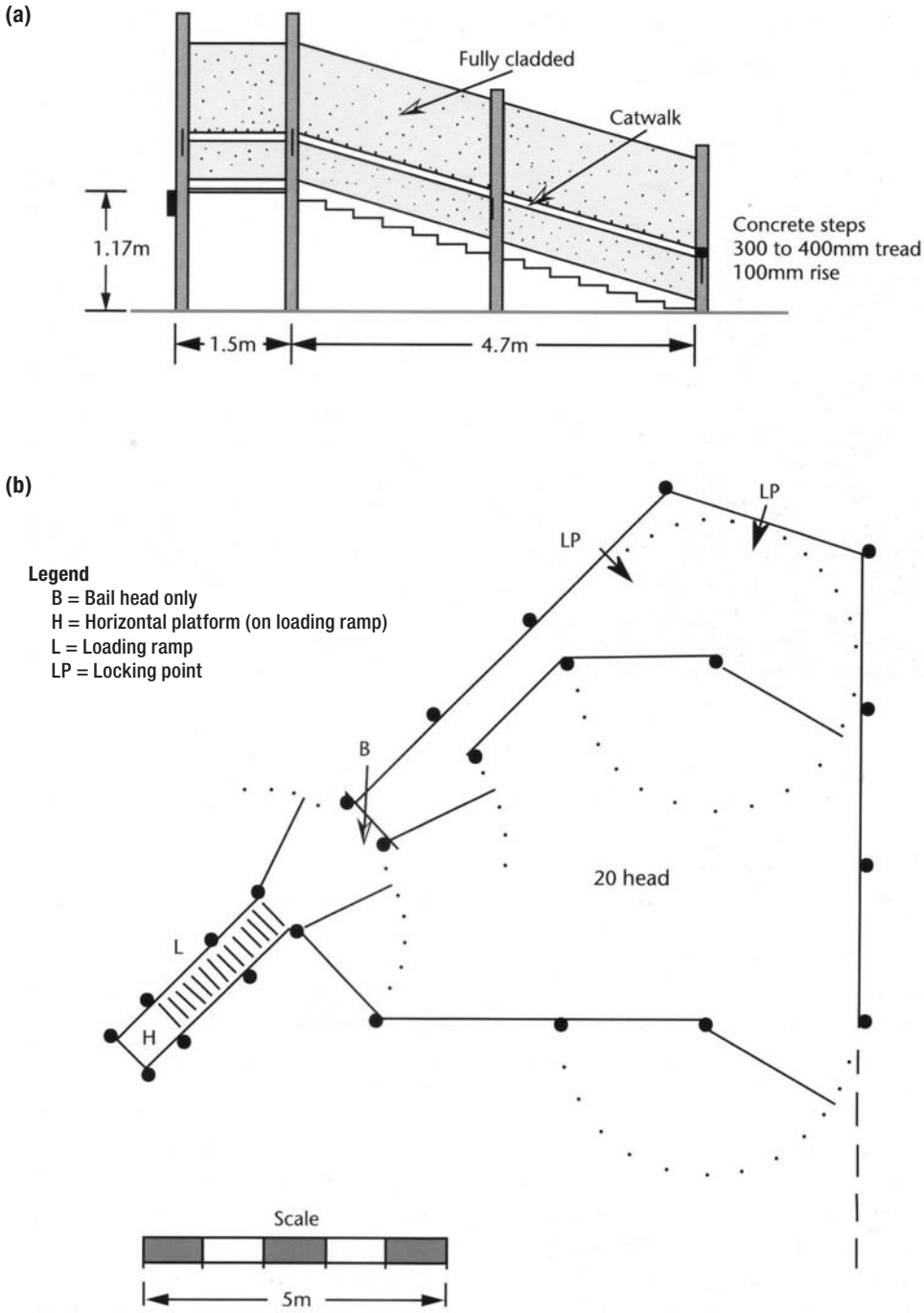


Figure 30. A stepped loading ramp for loading cattle onto a truck (a). A small handling facility designed to handle a maximum of 20 head (b). The bail head in the closed position prevents stock moving up the loading ramp; the open position allows use of loading ramp.

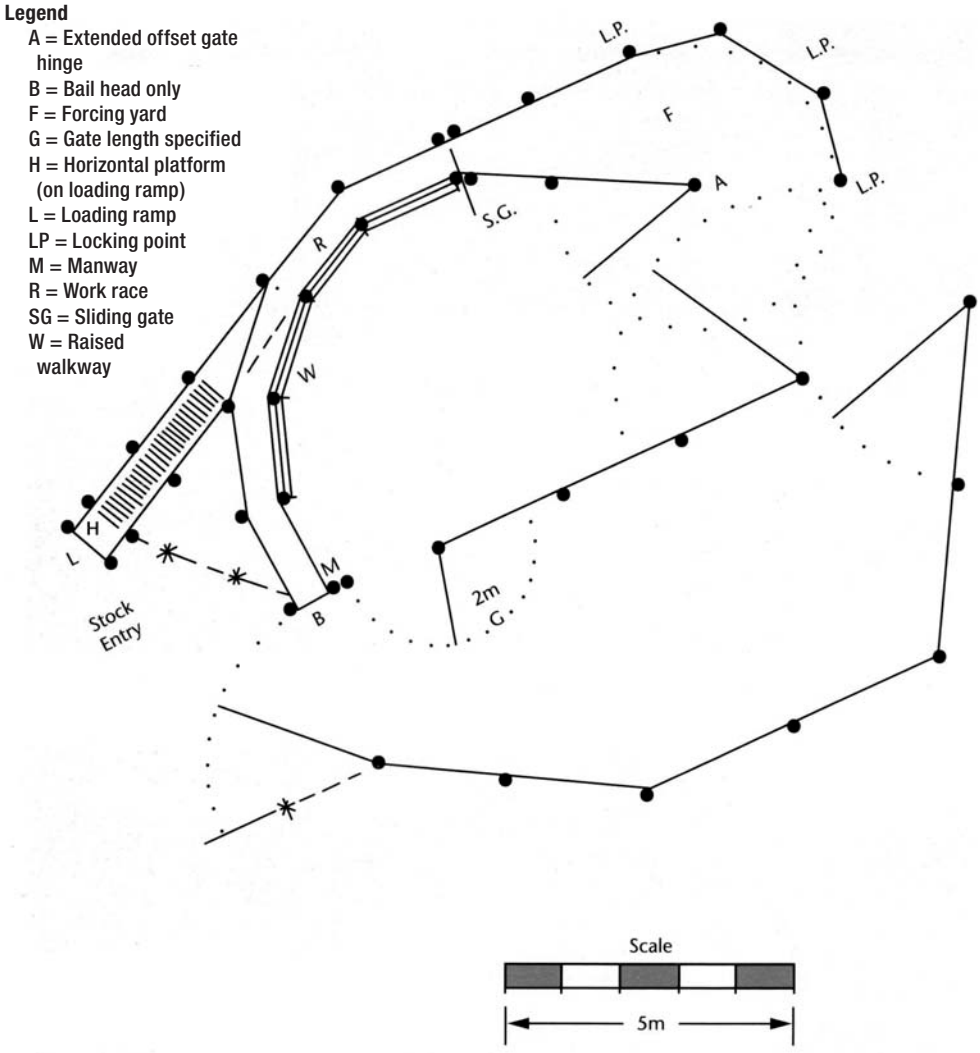


Figure 31. A functionally efficient, small handling facility for 35–40 head. It features a curved work race, walk-through bail head and two-way draft.

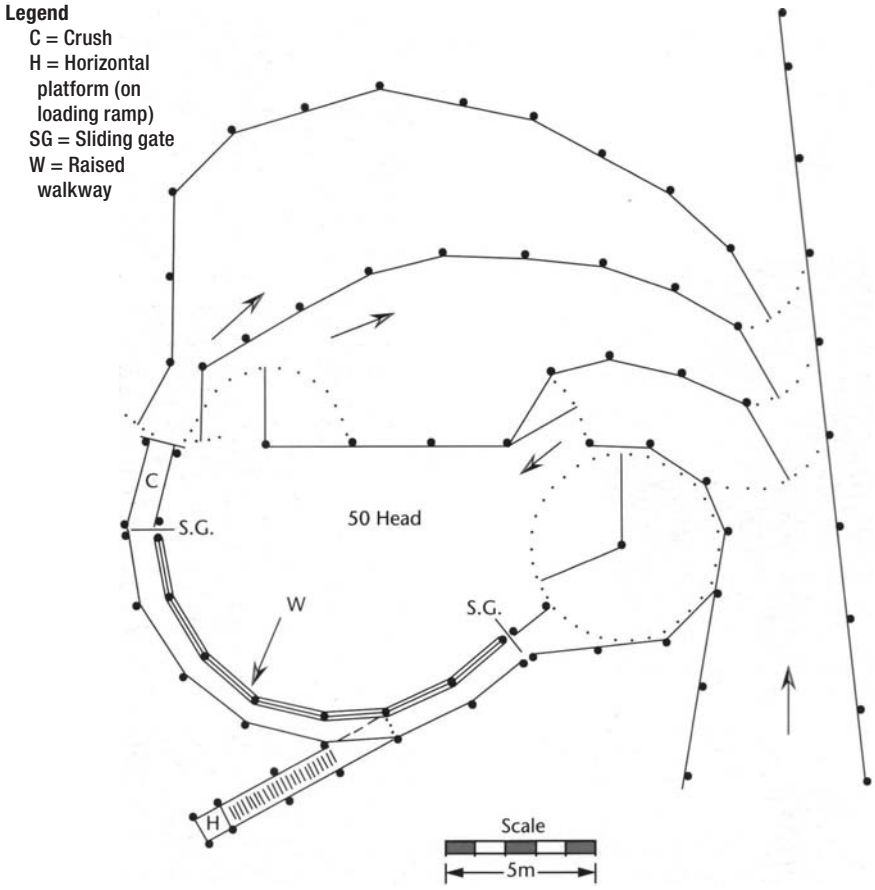


Figure 32. A proven yard design, successfully used in several sites in Victoria (and other States) for 50–300 head.

Figure 33. A reasonable set of yards for a small herd. There is a funnel-shaped forcing yard and short, curved race behind the crush. There is a drafting gate in front of the crush allowing the cattle to be drafted two ways if required.

8

Buying cattle

The quality of stock you purchase largely determines the quality of the end product, and the profitability of your enterprise. Most store stock (breeding cattle or steers to be fattened) are bought and sold by auction at saleyards (Figure 34).

Figure 34. Sale of young stock at an undercover saleyard.

If you intend buying breeding stock, remember that cattle in saleyards are often there because of infertility, poor feet, poor milk production or a history of difficult calving, unless it is a special sale such as a dispersal sale. It is generally safer to purchase breeding cows direct from a farmer, at a special heifer replacement sale or through a stock agent. There is much less risk associated with the purchase of store steers at the market.

The age and type of cattle you buy will depend on available finance and your attitude to risk. It is important that you buy a line of cattle that is as uniform in size and general appearance as possible, particularly when store steers are purchased. Buyers are normally prepared to pay premiums for even lines of cattle. It is also important to ensure the cattle are lifetime traceable and have the required NLIS electronic ear tags attached.

To purchase cattle in Victoria, you need to have a Property Identification Code (PIC). There is no charge associated with gaining a PIC and to register you need to fill out an application form. These can be downloaded from the DPI Victoria website or call 1800 678 779 and have one sent to you. For further information on PICs refer to the Information Note titled 'Property Identification Codes (PICs) Explained', AG1248 on the DPI Victoria website.

Some things to consider before purchasing cattle are:

- What is the purpose for these cattle?
  - commercial breeding or stud herd
  - show cattle
  - fattening to sell
- What will be the end market for these cattle?
  - domestic supermarket trade, heavy steers
  - breeding animals
- Will these cattle be suited to your environment?
  - Do you have high quality or poor quality pastures?
  - Are you in a low, medium or high rainfall zone?
  - What is your pasture growing season? (This will be related to your farm's rainfall. Higher rainfall areas will have longer growing seasons.)
- What is your level of management expertise?
  - cross-breeding, calving down a large mob of heifers, or running an embryo transfer program all require varying degrees of management and skills
  - growing out steers is a simpler alternative.

Purpose

The cattle you buy must be suited to the purpose you have in mind for them. For example, if you intend to produce and sell vealers (280–300 kg liveweight) the cows will need to have medium to high milk production and the bulls will need to be

Figure 35. Two different maturing animals. The steer on the right is an early maturing beast, so will start laying down fat earlier than the animal on the left (a later maturing beast). Later maturing animals tend to be taller at the same age when compared to early maturing types.

well muscled and early maturing. This early maturity is important when producing vealers. Early maturing animals finish growing and lay down fat at a younger age and will therefore be ready for selling earlier (Figure 35). However, if early maturing animals are kept for too long they will become overfat and receive a discounted price in the market place. Conversely, late maturing animals are still growing rapidly and are not laying down as much fat at the same age as early maturing animals.

Some breeds of cattle are later maturing than others. (See Appendix 1 for the age at puberty of different breeds of cattle.)

In general, British breeds are earlier maturing than European breeds. However, there are some very big differences within any given breed. For example, many Angus herds produce great vealers at 280 kg liveweight, however, other Angus herds produce quite late maturing cattle that are used in the feedlot industry and are destined for the Japanese market at liveweights of around 800 kg.

If your aim is to grow out steers to heavier weights (450–500 kg liveweight), having cows with high levels of milk production is not as important. You will require animals with good muscling that are capable of growing rapidly and fattening at the desired age and weight.

Markets

Before buying cattle, you may want to gather some information on the types of cattle for sale and the prices being paid. Each market has its own requirements or specifications and they are largely expressed in objective or measurable terms. The AUS-MEAT language is used to objectively describe the quality aspects of meat and livestock such as carcase weight, fat depth, fat colour, meat colour and marbling in carcases and muscling and fat depth in live animals. 'AUS-MEAT' stands for the 'Authority for Uniform Specification of Meat and Livestock' and is the national organisation responsible for quality standards and accurate descriptions of meat and livestock in Australia.

AUS-MEAT language is used by producers, abattoirs and the food service industry. Market specifications for retail customers are generally based on the following criteria that vary in importance according to different markets:

- carcase weight
- fat depth (measured in millimetres at the p8 site on the rump)
- sex
- age by dentition (number of permanent teeth)
- meat quality factors such as meat colour, fat colour, degree of marbling (intramuscular fat)
- presence of hormonal growth promotants (HGPs)
- minimum residue levels (MRL) (i.e. chemical levels in the meat).

See Appendix 3 for full descriptions of the various domestic and export markets for cattle in Australia. The weekly livestock market reports in the major rural newspapers describe the prices of various categories of livestock using this language. These market reports are generated by the National Livestock Reporting Service (NLRS). The primary function of the NLRS is to collect, analyse and distribute data relating to the red meat industry throughout New South Wales, Victoria, South Australia, Tasmania and Queensland by reporting:

- sale prices for livestock at selling centres
- sale prices for livestock sold direct to abattoirs
- skin and hide prices of livestock
- wholesale red meat prices
- slaughter capacity utilisation for the states.

This information can be accessed via rural newspapers or at http://www.nlrs.com.au. When prices are quoted, cattle will be described by their liveweight range, muscling (A–E muscle score) and fat depth (1–6 fat score). For example, a moderately muscled, finished steer would be a C3, where C refers to the muscle score and 3 refers to the fat score.

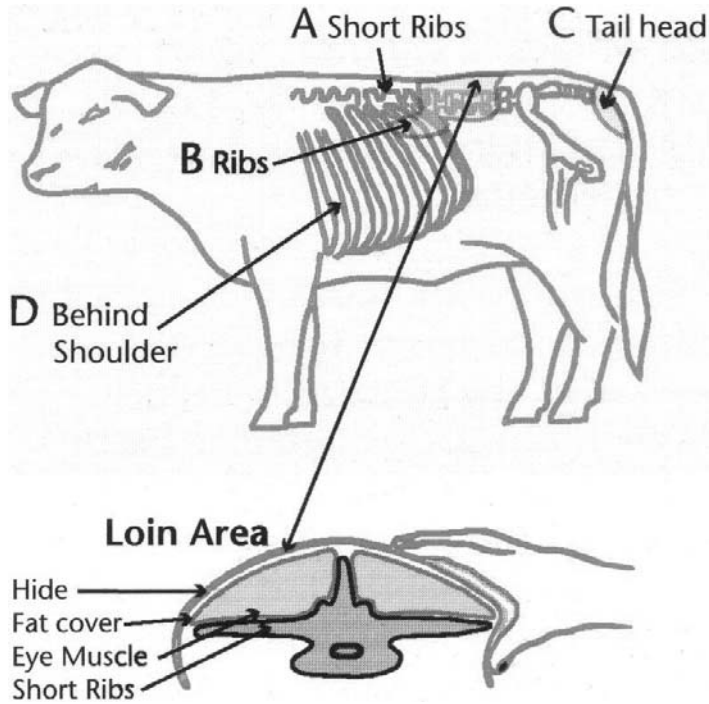


Figure 36. The degree of fat cover around the tail head and short ribs can be assessed using the fingers and thumb on the live animal.

Fat cover

A key thing a buyer looks for when purchasing cattle for slaughter is fat cover (Figure 36). Cattle need to have adequate fat cover at slaughter to ensure high quality beef. Animals that are too lean will be tougher to cut. Animals that are too fat require a great deal of fat to be trimmed from the carcase and cuts of meat to make them saleable to the consumer.

The terminology for cattle trading has long used expressions such as 'sappy', 'poor', 'fresh', 'store condition', 'forward store condition' and 'backward store' to describe the condition or fat cover of animals. However, we now have a standardised national approach to livestock description, bringing store and fat cattle descriptions into one classification. They are now described objectively in millimetres and converted to a fat score as shown in Table 15.

As cattle fatten:

- the ribs become less visible,
- the tail head softens with mounds of fat increasing either side of the tail and
- the brisket, flank, cod and twist fill out, giving cattle a square appearance compared to roundness in muscle shape.

Table 15. Description of fat scores

Fat thickness P8 rump site (mm)	AUS-MEAT fat score	Description
0–2	1	Very lean, almost emaciated; no fat around tail head; all bones very sharp to touch.
3–6	2	The individual short-ribs (site A)* are sharp to the touch; no tail head fat (site C)*; hip bones and ribs (site B)* are clearly visible and prominent.
7–12	3	'Good condition': short ribs can be individually felt, but feel increasingly rounded; ribs clearly felt, but not visible; hip bone still quite hard; light deposits of fat around tail head (site C)* and flank.
13–22	4	'Moderately fat': short ribs only felt under firm pressure; moderate fat cover around tail head; hip bones carrying some fat cover (see Figure 39).
23–32	5	'Fat': short ribs cannot be felt or need very firm pressure; ribs and hips well covered; tail head fat as large mounds either side of tail.
33+	6	'Extremely obese': the bone structure of the animal is no longer noticeable and the tail head is almost completely buried in fatty tissue.

* Site A, B and C can be found on Figure 26

The tail head, flank, brisket and cod (see Figure 37) are all sites where there is no muscle. If these areas are filled out, then they will be filled with fat, not muscle (Figure 38). Therefore, they are ideal sites to assess fat cover.

Muscling

Muscling is another of the key factors buyers consider when purchasing cattle for slaughter. It is directly related to the amount of lean meat on the animal. More

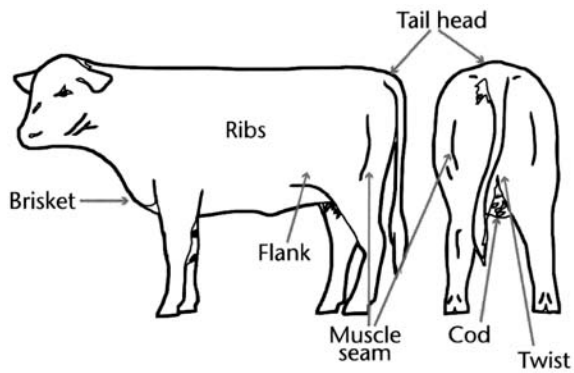


Figure 37. Reference points for visual assessment.

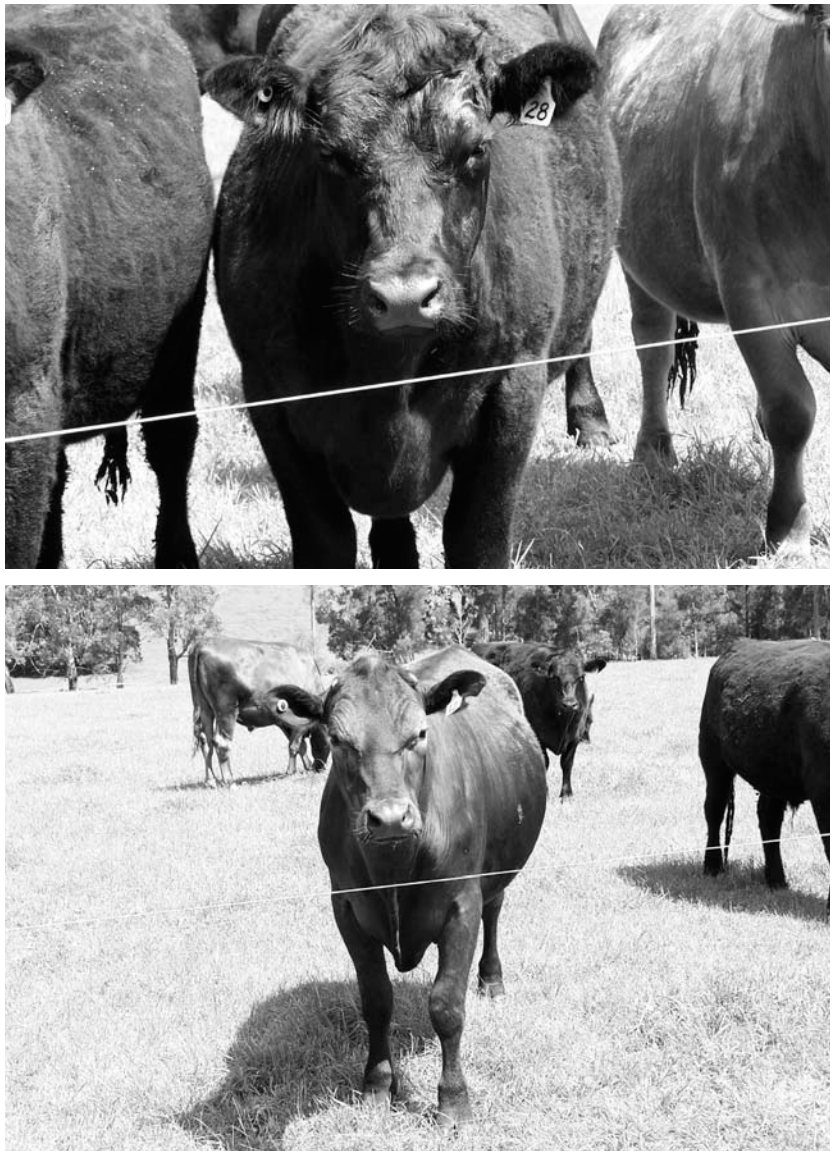


Figure 38. Look at the animal on the top. Notice how filled out the brisket area is; it is very wide at the base and looks 'heavy'. This is all fat. Compare it to the animal on the bottom. The brisket is much narrower and has a pinched area of skin hanging down. Not much fat has been deposited in this brisket.

heavily muscled animals have a higher lean meat yield. As with fat depth, muscling is also given a scoring system.

The AUS-MEAT language defines the measure for muscle shape on the carcase as the fullness or roundness of the butt. This can be related to the live animals and is scored on a scale of A to E, with 'A' being extremely heavily muscled animals

Figure 39. The cow on the right has a fat score of 4. You would need firm pressure to feel the short ribs and can see fat cover around the tail head. The hip bone is carrying a cover of fat, but you can still see where it is. Compare it to the cow on the left, with has a fat score of 2.

such as some of the European breeds and 'E' being very poorly muscled such as the dairy breeds (Figures 40–44).

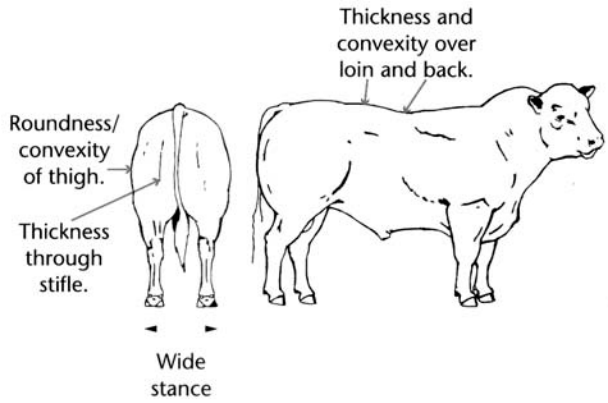
Indicators of muscling in order of importance are:

- thickness and roundness of the hindquarters
- width through the stifle (lower hindquarter)
- width across the back and the loin
- stance and width through the stifle (i.e. how wide apart the animal stands, or the width between the hind legs and width between the forelegs).

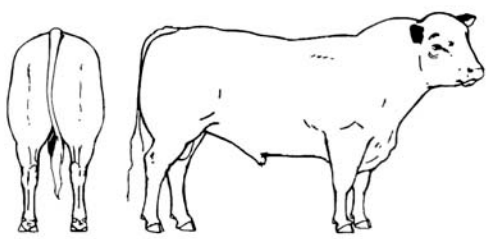
Observe cattle from behind to assess thickness through lower hindquarter (stifle area). Heavily muscled stock are thickest here and they also stand with their legs further apart than lightly muscled stock.

Environment

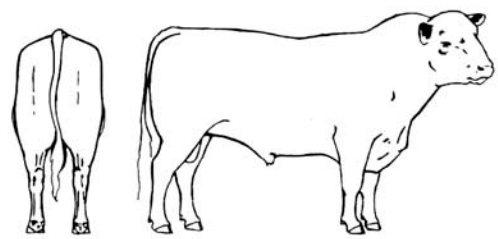
Some breeds are better suited to particular environments than other breeds. The British breeds and *Bos indicus* cross-breeds are more suited to lower rainfall areas than the larger European breeds or dairy crosses. As a result, these breeds maintain their ability to conceive and fatten and are therefore more profitable in lower rainfall environments.



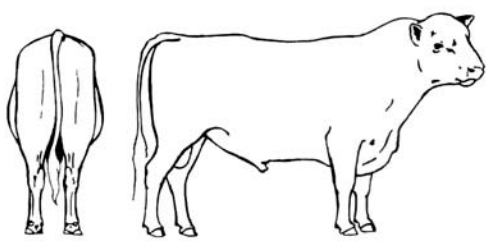
Muscle Score A – Very heavy muscle. Extremely thick through stifle area, muscle seams evident, 'Butterfly' top line, thick and bulging forearm, stands very wide.



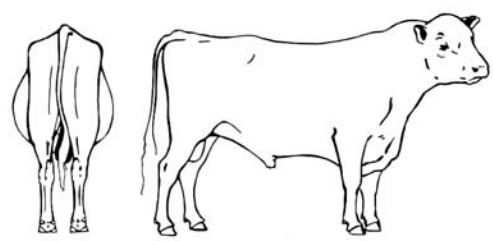
Muscle Score B – Heavy muscle. Thick stifle, rounded thigh from behind view, some convexity in the hindquarter from side view, flat and wide over top line, stands wide.



Muscle Score C – Medium muscle. Flat down the thigh when viewed from behind, flat tending to angular over the top line.



Muscle Score D – Light muscle. Narrow stance, flat to convex down the thigh, thin through the stifle, sharp and angular over the top line (except when very fat).



Muscle Score E – Very light muscle. Dairy type, very angular, sharp 'tent topped' over the top line, virtually no thickness through the stifle, concave thigh, stands with feet together.

Figure 40. Descriptions of the five different muscle scores.

Figure 41. B muscled animal.

Figure 42. C muscled animal.

Figure 43. D muscled animal.

Figure 44. E muscled animal.

Management

How much time are you realistically able to give to your beef cattle operation? If you don't have much time, fattening steers will be a more suitable project than running cows and calves. Another question to ask is, 'How much experience do you have with handling and managing cattle?'. Again, if your experience level is low, fattening steers is a good way to start.

The other important considerations when buying cattle are health, structural soundness and temperament. If you have never purchased cattle before, take someone experienced with you, such as your local stock agent or a trusted farming neighbour. This will be a great learning opportunity.

Health and structural soundness

Ask about the cattle's drenching and vaccination history. What is their Johne's Disease status? Are they physically sound? Check eyes for cancers. If steers, are they properly castrated? Sometimes one testicle can be missed when they are castrated using a rubber ring. Check soundness of the jaws, feet, legs and general skeletal structure. Make sure animals walk freely. Animals that walk with stiff legs, limps or take short steps rather than stretching out as they walk could have arthritis or some structural fault. It takes experience to be able to spot these things.

Are they well grown for their age? Check the udder soundness (attachment, shape, teat damage, abnormalities) of any females you intend to use for breeding and ask about pregnancy status. See Chapter 11 for more detail on structural soundness.

Bull soundness

Check whether the bull breeders you are buying from conducts breeding soundness examinations on the bulls they sell. A veterinarian can carry out an examination of the bull to assess its ability to breed. An examination of the testicles will determine if there are problems with sperm production. Soft spongy testicles are an indication of poor sperm production. The size of the bull's testicles is highly correlated to his fertility, particularly in terms of sperm production and the fertility of his male and female offspring. A minimum scrotal circumference of 32–34 cm is required, but aim for 35 cm at 18–24 months of age for most breeds.

The vet will also examine the legs, feet and hips for arthritis and the penis for damage or abnormalities. The fact that a bull has sired calves in the past is not a reliable guide to his current fertility.

Temperament and cattle-handling

Cattle respond well to kind treatment and especially remember experiences of bad treatment. Their temperament can vary according to breed and previous handling. When you bring home a new mob of cattle that have had little handling, keep them in a confined area for 4 to 7 days with adequate water and feed them good quality hay. Have a small grassed paddock with conventional fencing with an outrigger electric wire on the inside to train new stock to respect electricity.

This will enable them to get used to you and quieten down. As they start to quieten down, walk through them, stand quietly in the yard, let them come to you. This will prove to be a good investment of your time. Training cattle will improve their temperament and reduce labour requirements for handling. A few animals may be unresponsive to training and should be culled.

9

Methods of identification

Ear tagging

All cattle in Australia have to be ear tagged with an approved National Livestock Identification System (NLIS) device. The NLIS is the system Australia has adopted for identifying and tracking cattle for food safety, disease control and market access purposes. Cattle are reliably identified and can be tracked from their property of birth, through to slaughter. Work is being done now to allow further tracking of animals right through to the consumer.

All cattle must be tagged with an NLIS device at the time of leaving a property, whether they are going to sale, slaughter, agistment, show or the knackery. Cattle (whether dead or alive) must not leave a property without carrying an ear tag!

There are two types of NLIS devices: Breeder and Post Breeder devices. Breeder devices are white and are used to identify the property where the animal was born. Post Breeder devices are orange and are used for animals that have not been identified with a breeder tag, or have lost their breeder tag *and* are no longer on their property of birth. Both types of tags are available in the form of an ear tag, *or* an ear tag/rumen bolus combination (Figures 45–47, page 39). Rumen boluses are administered orally to an animal using an approved applicator. They typically cannot be administered to calves under the age of three months of age. Retention rates of boluses are excellent; it is virtually impossible to remove a bolus from a living animal. However, some abattoir and feedlots do not like to buy cattle identified with boluses, so check with who you are planning to sell to before deciding to use these.

National Livestock Identification System devices contain a microchip that is encoded with a unique, unalterable number. This number can be easily read electronically in a fraction of a second with a suitable reader. This number is called the RFID (Radio Frequency Identification Device) or electronic number. The tags are also printed on the outside with a number known as the NLIS number. The RFID and NLIS number are not the same, but are linked automatically on your database when your tags are sent out to you.

The outside, or NLIS number (e.g. 3ABCD123XBC00023) consists of the following components:

- An eight character Property Identification Code (PIC) corresponding to the property to which the tags were issued (e.g. 3ABCD123).
- A letter indicating the manufacturer of the tag (e.g. X, Allflex; E, Aleis; L, Leader; M, Rumitag).
- A letter indicating the tag type (B, Breeder; E, Post Breeder; C, Breeder bolus; F, Post Breeder bolus).
- A letter indicating the year of supply (this coding follows the stud breeder code system, i.e. 2007=C).
- A five character serial number in which the first character can either be a number or letter.

You can specify the last five digits when ordering your tags if you wish them to start at a specific number. You are also able to order matching management ear tags. This way you double tag your stock so if either tag is lost you can still identify the animal.

The RFID or electronic number within the microchip, has 16 characters in the following format:

- a three numeric manufacturer's code (971, Aleis; 982, Allflex; 951, Leader; 964, Rumitag)
- a space
- a 12 digit individual chip number (e.g. 982 000001234567).

Cattle are easiest to tag as calves 5–24 hours after birth. They are slow to run and it is easy to identify to which mother they belong. Cows are generally very protective of their calves immediately after birth and care should be taken to avoid being attacked by the cow at this time. If it is not possible to tag calves at birth, the other option is to tag calves in the race at marking or mother them up. To mother up the cows and calves, separate the cows from the calves for half a day, then let a couple of cows at a time in with the mob of calves. The calves will be hungry for a drink and once the cow and calf are reunited you can note the calf and cow tag numbers.

When tagging cattle, the NLIS devices must be attached to the animal's right or offside ear. If there is already an NLIS device present, *do not* remove it *nor* place a second device in the ear (Figure 48, page 40). The microchip component on the

ear tag must be placed on the inside of the ear, close to the head. This assists in minimising the chance of the ear tag being lost from the animal's ear (Figures 48–51, pages 40–41).

Further information about the regulations of the NLIS can be found at http://www.dpi.vic.gov.au.

NLIS tags and farm management

National Livestock Identification System devices contain microchips that can be read electronically by producers who decide to purchase a suitable reader. Hand-held readers are cheaper than panel readers and are a good alternative for those who do not scan their cattle often. Panel readers are more expensive, and can be used to automatically read the NLIS tags on cattle moving through a race. By linking a reader with a computer or a scale indicator, beef producers can use NLIS tags to improve the management of their herds (Figure 52). Tags can also act as a backup if cattle are also identified with a larger management ear tag and this tag is lost.

NLIS technology can be used for the maintenance of herd and pedigree records, to better utilise carcase feedback information downloaded from the NLIS database, and when used in conjunction with suitable liveweight scales to accurately and quickly weigh cattle. Previous and current performance of the stock can be displayed in these integrated systems. Information on reader and software suppliers is available on the Victorian DPI website at http://www.dpi.vic.gov.au/nlis.

Figure 52. Producers learning about the function and benefits of using a panel reader in their cattle management systems.

Producers are occasionally required to transfer cattle on to and off their NLIS database. If cattle are purchased or sold through a saleyard or an agent, the transfers are done on the farmer's behalf. However, if purchasing the stock privately, the purchaser must transfer the stock to their PIC within 7 days. To access the NLIS database, go to http://www.nlis.com.au. For information on how to transfer cattle and what to do on the database, visit http://www.dpi.vic.gov.au/nlis. The NLIS database contains the linked numbers of all the ear tags of your stock and you can export a file of these numbers to your own computer to assist with data management of your herd.

There are two other common methods of permanently identifying cattle: ear tattooing and freeze branding.

Ear tattooing

Ear tattooing is a popular form of permanent identification widely used in the stud industry. Animals can be identified by the year of their birth and their own unique number. For example, the number 92–125 tattooed on an animal indicates that the animal was born in 1992 and its number is 125. The tattooing numbers are made up of a series of fine, sharp spikes. They are inserted into a plier-like instrument,

Figure 53. Example of freeze branding on a dairy cow. Generally the number on the freeze brand matches with the ear tag number of the cow.

the ear is spread with a special tattoo paste, and the pliers are squeezed together to tattoo the inside of the ear.

One major disadvantage of a tattoo is that it can only be read when the animal is restrained in a race or crush.

Freeze branding

Freeze branding is a technique widely used by the dairy industry in conjunction with ear tagging. The advantage of freeze branding over tattooing is that the resultant brand can be read from a distance. Disadvantages include the fact that a skilled operator is required to perform the task of freeze branding and that the brand may not be very clear on animals with white or mottled skin. The brand is dipped in liquid nitrogen or dry ice to freeze it and it is then held firmly against the animal's side. The hair that grows back after freeze branding is white, so it is a particularly clear marker on black-coated cattle (Figure 53).

10
Husbandry practices

Vaccination

When vaccinating young calves it is best to get into the race with them and use your knees and body weight to restrain the calf against the others or the side of the race. When vaccinating adult cattle, push them close together in the race and stay on the outside of the race. Vaccinate over the top rail to avoid getting your arm or hand crushed. Where possible, choose a dry, still day because dusty conditions or wet hides increase the risk of infection.

Ensure that syringes or vaccinating guns and needles are kept clean and a good quality vaccinating gun is used. Wash them using a weak antiseptic solution or methylated spirits. Keep the vaccine cool; it needs to be refrigerated from when you buy it to when you use it. Follow the instructions on the pack and give the correct dose.

Most vaccinations are given by subcutaneous injection (i.e. just under the skin, not into the muscle) and it is recommended that cattle receive all their subcutaneous injections on the neck. Vaccinating on the neck will reduce potential carcase damage to the more valuable cuts of meat in case you accidentally inject into the muscle. To vaccinate subcutaneously, pinch the skin between the thumb and forefinger and holding the syringe flat against the animal's body with the other hand, push the needle into the raised flap of skin (Figure 54). Take care not to push the needle through the double flap of skin.

Figure 54. Vaccinating calves. Remember to pinch the skin on the neck and pull it out slightly to allow you to easily vaccinate subcutaneously.

Drenching

Drenching for internal and external parasites can be administered in three ways, depending on the product used:

- orally
- subcutaneous injection
- poured onto the back (pour-on backline treatment).

With oral drenches, care must be taken to ensure that the drench goes down the throat and not down the windpipe. To do this, lift the head slightly above the level position and place the barrel of the drench gun well into the mouth towards the base of the tongue (Figure 55). Don't be in too much of a hurry – give the animal time to swallow. A hooked drench gun is an easier way to drench cattle orally than a straight drench gun.

Make sure the equipment to be used is clean and in good working order. Injectable drenches should be given subcutaneously; follow instructions for dosage rates as stated on the pack.

Pour-on products (also known as backline treatments) are the simplest to administer as they require a dose to be applied as a line down the back of the animal where it is absorbed into the bloodstream through the skin.

Figure 55. Drenching a calf. Make sure you tip the head back slightly to ensure the drench goes down the throat not the windpipe.

Dehorning

Dehorning cattle can be avoided by breeding polled (no horned) cattle. Some breeds of cattle are naturally polled and the use of these cattle in your breeding program will remove the need to dehorn. Cattle with horns should be dehorned because they are easier and safer to handle and cause less bruising and hide damage to each other.

Dehorning causes pain and some stress, so this should be minimised by carrying out the operation early in life. Young calves are easier to handle, lose less blood and suffer less stress and setback than older cattle. Calves should be dehorned at marking time. There are people trained to do this procedure; having someone experienced perform this task will minimise any pain caused. Ask your local agricultural vet for recommendations of who could do this in your area.

There are a number of methods available for dehorning calves. A popular method uses 'cup and scoop dehorners'. The blades of this instrument cut under the horn bud and complete removal of the horn is achieved. It is absolutely essential that a ring of hair be removed with the horn bud to ensure that all horn-producing cells at the base of the horn are removed. Failure to do this results

in regrowth of 'false horns' that twist and curl and are likely to grow back in towards the head. It should be completed in dry weather and in an environment where dust and fly numbers are minimised. Dehorned animals should be monitored over the following weeks to ensure any infections are treated promptly.

Castration

Male calves not required for breeding should be castrated because:

- steers are easier to manage than bulls;
- it prevents them from impregnating their female siblings;
- they fatten more easily than bulls; and
- they don't suffer from the buyer discrimination in the marketplace that normally applies to bulls.

Non-breeding bulls should be castrated early in life to minimise the stress and setback involved. In most commercial herds, calves are castrated between two and four months of age, at the same time as vaccinating, dehorning and identification procedures are carried out. It is becoming more common to identify calves at birth and so producers are tending to castrate the male calves at this time. Bulls over 6 months must be castrated by a vet using a local anaesthetic.

The simplest method of castrating young calves is with an elastrator, an instrument designed for stretching a specially made rubber ring over the scrotum (Figure 56). This method can be used on animals from birth to 2 months of age,

Figure 56. An elastrator used for castrating young bull calves. The rubber ring is placed over and above the descended testicles. The rubber ring contracts, cutting off the blood supply to the testicles below.

but care must be taken with very young calves to ensure that both testicles have descended into the scrotum when the rubber ring goes on. This method relies on the pressure of the ring cutting off the blood supply to the testicles, causing the scrotum to wither and die while it is still attached to the animal.

Calves over two months of age are better castrated using a very sharp knife or a scalpel, whether in the standing position or lying on their sides. When large numbers of calves are to be castrated, a calf cradle is well worth the expense. If you have not seen the practice carried out before, make sure you get an experienced person to help you. All the reading in the world can't replace first hand experience. If you are on friendly terms with a neighbour, ask if you can visit while they are marking their calves to see how the operation is performed. Some stock agents will come out and assist in this process. If you are in doubt about what to do, talk to your local agricultural vet.

When using the knife method, instruments should be disinfected. A clean cut should be made along the bulge of the testis to the bottom of the scrotum to allow good drainage out through the scrotum. Cut the membrane that surrounds the testes, and squeeze each testis out. Pull the exposed testis so that the two cords to which it is attached can be seen. The thin cord (nerves) should be cut cleanly, fairly high up, but the thick cord contains blood vessels and should be scraped until it is severed rather than cut. Alternatively, the cord can be broken by stretching it with the right hand while holding the top of the cord with the left hand. The second testis is removed in the same manner. This results in very little bleeding as the blood vessels close over very quickly.

For older calves and young bulls a burdizzo can be used. This crushes the cords supplying blood to the testicles, causing the testicles to wither. But remember, any bull over 6 months must be castrated by a vet using a local anaesthetic.

Freshly castrated calves and their mothers should be placed in a clean paddock and watched closely for a few days. It is a wise policy to vaccinate calves with 5-in-1 vaccine at the time of castration.

Animal identification

A good habit to adopt when marking calves and vaccinating cattle is to ensure that each animal has permanent identification with an NLIS (National Livestock Identification System) device (Figure 57). Remember, it is a regulation that all cattle (regardless of age) leaving the property must be identified. If the animal was bred on your property, an NLIS Breeder tag (white in colour) is used. When you know an animal has been purchased, and it does not possess an NLIS tag, a Post Breeder tag (orange coloured) must be applied. (See Chapter 9 for further information.)

Figure 57. Tagging at birth with a NLIS device is a good practice because it is easy to identify who the calf's mother is. A management tag can be applied later – perhaps at their first vaccination.

Weaning

Weaning is the process of separating a calf from its mother so it is no longer able to suckle. It is usually carried out when the calf is between 7 and 10 months of age, depending on pasture availability. Early weaning may need to be considered in dry years, allowing the calf to be fed on higher nutrition feed to ensure adequate growth. The cow will then dry off and only requires maintenance rations.

Lactating cows require 1.6 times more feed than dry (nonlactating) cows. Therefore, if pasture is scarce it is more efficient to wean calves earlier, say at around 7 months of age. In this way calves and cows can be fed separately rather than feeding the cow large quantities to produce milk for her calf. Calves can be weaned younger than 7 months of age. If you are planning on doing this, refer to your local Department of Primary Industry website and look for information notes on early weaning for tips to help make it successful.

The major target for productive beef herds is to produce one calf per cow per year, so the main reason for weaning is to ensure the cow has a good chance of coming on heat again and getting pregnant within 55 days of calving.

Cows should be in fat score 3.5 and heifers in fat score 4 or slightly above at calving. This will allow them to come on heat as soon as possible after calving to maximise their chances of getting in calf. Cows with large calves (9–10 months old) still suckling will be losing weight and may not come on heat again early enough to conceive. Older cows and first calvers in poor condition, have greater difficulty in returning to heat than cows in good condition.

Weaning should be carried out in the cattle yards. Bring the whole mob of cows and calves into the cattle yards, then cows and calves can be separated from each other by drafting the cows through a gateway from one yard to another leaving the calves behind. If you have not done this before, it is easier with two people. One person can push the cows through and the other can block the gateway if any calves try to sneak through with their mothers.

This is the ideal time to weigh calves and record their liveweights. Weighing calves at weaning helps you to know which cows have done a better job at rearing their calves. If multiple bulls have been used, it will let you know which bulls sire higher growth and therefore more profitable calves.

Weaning onto a truck

One method of weaning is to wean the calves onto a truck. That is, sell them straight off their mothers. Bring the whole mob of cows and calves into the cattle yards prior to the truck arriving, draft calves from cows and put the calves to be sold in a separate yard.

Yard weaning

If you are keeping some or all of the weaned calves, they can be left in the cattle yards with good feed, water and shade for up to a week. Daily feeding of good quality hay or silage will quieten them down. Yard weaning allows for handling and education, such as working weaners through gates, races and hand feeding. Part of this weaning method can include letting the calves wander out into a paddock next to the yards during the day (from about day 4), and moving them back into the yards during the night. This allows them to become used to entering and exiting the yards and can make them easier to handle in the future. Yard weaning is also a good way to identify animals with unsuitable temperaments. Calves that are still flighty at the end of a week's handling and education should be sold.

Paddock weaning

If you do not have the facilities or the time to be able to yard wean, you will need to move the calves to a secure paddock, preferably with electric fencing, away from their mothers. There are two main methods of paddock weaning: abrupt or gradual separation. With abrupt separation, cows and calves are moved as far apart from each other as possible. The disadvantage is that you have cows bellowing for

their calves at one end of the farm, and calves bellowing for their mothers at the other for a few days. The more determined animals will also jump or break through fences to get back to each other. Gradual separation involves placing the cows and calves in adjoining paddocks for a few days, before moving the cows away. The fence between the paddocks should ideally be an electric fence to deter the cows or calves from moving between the paddocks. The cows will move around their paddock to graze and water, allowing the calves to get used to them not being by their side.

Calves will forget about their mothers more quickly than their mothers forget about them. Feeding the weaners hay two or three times a week for the first few weeks will quieten them down and get them used to human interaction.

Other tasks at weaning

While the cows are in the yards it is a good time to run them through the race and carry out any husbandry procedures required before the next calving, for example:

- Cull (sell) cows that:
  - are not pregnant
  - are unsound
  - have broken mouths (teeth falling out due to old age)
  - have lame/bad feet
  - have bad udders
  - have Cancer Eyes
  - have calving difficulties (see your calving records to identify which cows had difficult births)
  - are poor producers (refer to calf weights).

Figure 58. Cows and calves pondering which weaning method will be used on them in a few months time.

- Drench younger cows with a strategic drench.
- Replace ear tags that may have fallen out.
- Record any comments on the cows, including their condition and their calf's liveweight.

Prior to weaning, ensure you have planned which paddocks the cows and calves will be moved to and what husbandry procedures will be carried out. This will simplify the weaning process (Figure 58).

11

Breeding management

Age at first mating

Male and female cattle normally reach puberty at 12–14 months of age depending on their liveweight. Heifers should not be mated until they weigh at least 270 kg for British beef breeds and 320 kg for European beef breeds. Heifers are usually joined (mated) at 15 months of age to calve for the first time at 2 years of age. (See Appendix 2: Approximate liveweight at various ages for different breed types.) Bulls can be used from 15 months of age on a small number of cows (20–30) but should not be used heavily until 2 years of age when they can be joined with 50–60 cows at a time, depending on the bull's fertility and libido.

Female breeding cycle

Cattle are able to breed at any time of the year. Cows have an oestrus or heat cycle of 21 days, and usually remain on heat for about 24 hours, during which time fertilisation can take place. When cows are on heat you will notice them trying to mount each other. The cow on heat will stand to be mounted by many of her herd mates and she will try to mount others as well. Signs of heat include:

- saliva on her back and ruffled hair on the tail head (from other cows mounting her)
- mucous discharge from the vulva
- restlessness and bellowing.

Gestation length can vary slightly from animal to animal and also from breed to breed. The average gestation length is 283 days (approximately 9 months) (Table 16).

Table 16. Service and birth dates

Date of service	Birth date	Date of service	Birth date
January 1	October 10	July 2	April 10
8	17	9	17
15	24	16	24
22	31	23	May 1
29	November 7	30	8
February 5	14	August 6	15
12	21	13	22
19	28	20	29
26	December 5	27	June 5
March 5	12	September 3	12
12	19	10	19
19	26	17	26
26	January 2	24	July 3
April 2	9	October 1	10
9	16	8	17
16	23	15	24
23	30	22	31
30	February 6	29	August 7
May 7	13	November 5	14
14	20	12	21
21	27	19	28
28	March 6	26	September 4
June 4	13	December 3	11
11	20	10	18
18	27	17	27
25	April 3	24	October 2

Pregnancy testing

To identify pregnant cows, veterinarians often use the rectal palpation method. They feel for a pulse in the artery supplying blood to the uterus, changes to the shape of the cow's uterus and for the calf's head. Another method gaining popularity is imaging ultrasound. The scanning probe is inserted into the rectal tract of the cow. The operator can then locate the reproductive tract and determine the pregnancy status, stage of gestation and number of foetuses the cow is carrying.

The optimum time for pregnancy testing is 40–110 days after conception. Before or after this time it is much more difficult to determine the pregnancy status due to the way the calf sits in the uterus. Heifers are the most important class of females to pregnancy test because it is uneconomic to keep non-pregnant heifers until after all heifers have calved. If you choose not to pregnancy test, you will have to wait until they have finished calving to identify non-pregnant cows. Non-pregnant cows should not be kept and rejoined but sold at an opportune time. Continuing to feed cows who will not produce one calf every year is unprofitable.

Pregnancy

Cows and heifers should not be allowed to get too fat during pregnancy, particularly during the last 2 months. Over-fat cows are likely to have calving difficulties. (See 'target fat scores' below for further information on fat scores at different times of the year.)

Length of joining

Mobs of calves of similar age, size and condition will be highly sought after and receive a higher price than a mob of calves of varying age, size and condition. You can achieve this goal by having your calves born over a short period of time. This means restricting the joining period (the time the bull is with the cows) to 8–9 weeks. If you keep the bull in for 3 or 4 months, calves will be born over a 3 or 4 month period. This leads to a large variation in the weights of calves. Calves born at the end of the calving period can be up to 120 kg lighter than the calves born at the beginning of the calving period. If the calves are all of a similar age and weight, marking, weaning and vaccinations can be done at the same time for the entire herd.

Target fat scores

In early lactation (late autumn/early winter in an autumn calving cow), unless the cow is on very good feed, she will lose weight as her energy requirements exceed her intake of energy. It is normal for lactating cows to lose weight and fat cover at this time. They use the energy in their fat to put into milk production. However, if the cow is in poor condition at calving, she will be very slow to return to heat and get in calf.

For a cow to calve at the same time each year, she must have conceived by day 84 post-calving. If she conceives later than day 84 post-calving, she will calve later than the previous year.

Two factors have a substantial effect on the time taken for cows to come on heat after calving: the condition or fat score of the cow at calving and the level of nutrition the cow receives between calving and rejoining. The higher the fat score

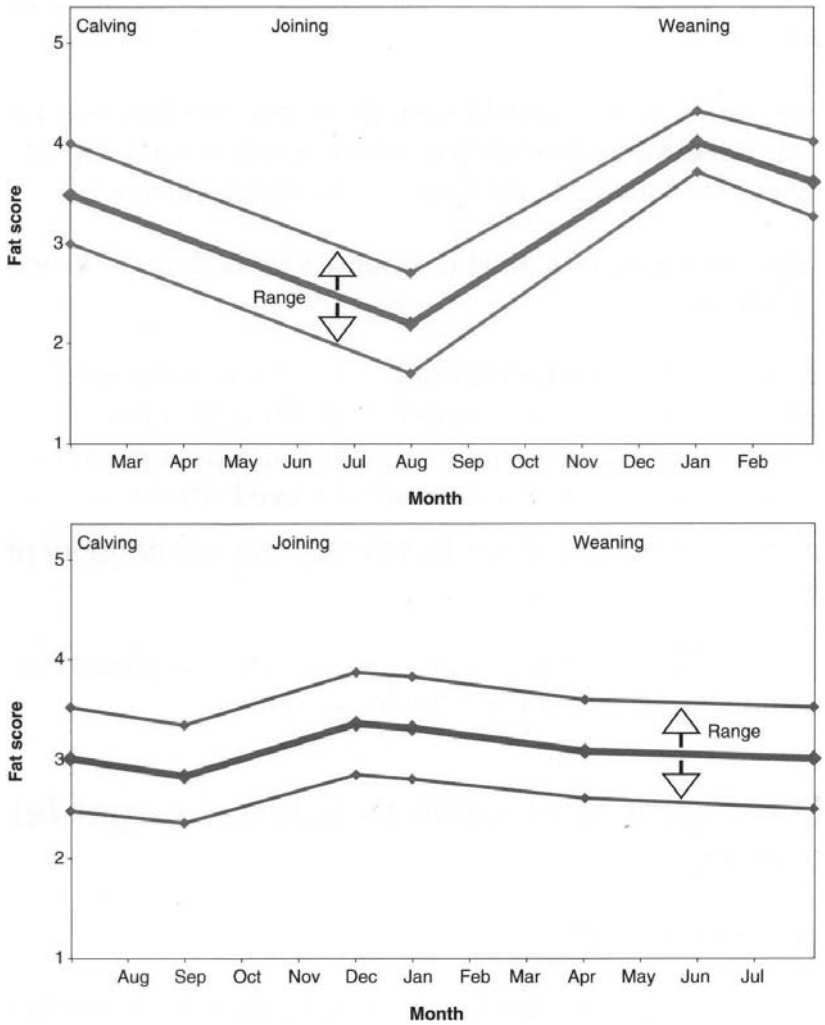


Figure 59. Target and range of fat scores for cattle reproduction, with autumn calving (top) and spring calving (bottom). (Source: Prograze Manual 2005.)

at calving, the greater the cow's chance of coming on heat within 55 days from calving, which is when she will be put out with the bull to ensure the target of one calf/cow/year. The appropriate fat score targets for autumn calving and spring calving cows are shown in Figure 59.

Autumn calving cows in southern Australia should not be allowed to fall below fat score 3 at calving. As well as affecting fertility, autumn calving cows below fat score 3 at calving will have reduced calf weaning weights by 10–15 kgs. After joining, cows are less sensitive to low nutrition and the fat score can be allowed to drop further. Maintaining fat cows is inefficient and a waste of pasture and hay.

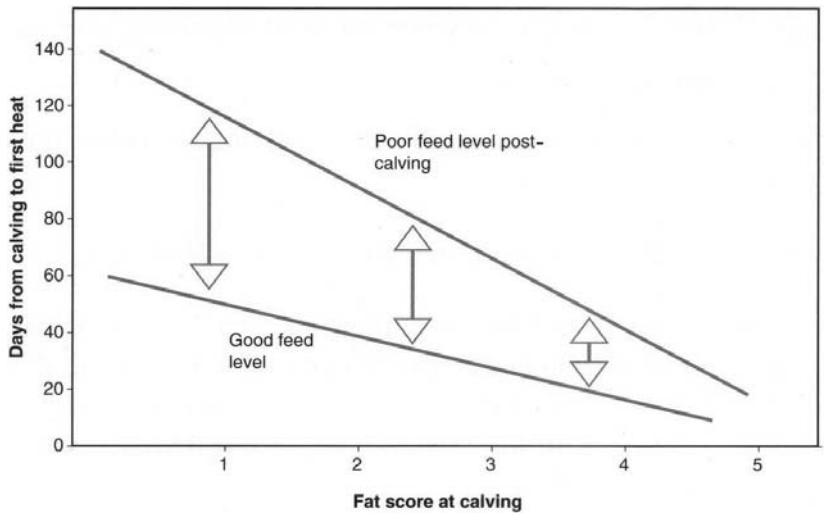


Figure 60. The relationship between fat score at calving and days to first heat (autumn calving). (Source: Prograze Manual 2005.)

Ideally though, you should not let the cow drop below a fat score of 2. Every kilogram of fat a cow puts on costs you money. If you can keep your cows within the ranges recommended you will be running your cows at an efficient level.

The level of nutrition the cow receives between calving and rejoining, combined with her fat score is very important in determining when she will start to cycle after calving, especially in autumn calving cows. Improving feed level post-calving will significantly improve the time to first heat for cows, especially for those cows that are in poorer condition (i.e. with a fat score 2.5 and below). Refer to Figure 60 to see how the fat score and nutrition can interact.

Calving

As a cow nears calving, there are signs you can look for that indicate how close she is to calving. The first change occurs in the udder, which usually starts to enlarge a couple of weeks before calving. This is known as 'bagging up', with the udder becoming very tight immediately prior to calving. A cow going through this process is said to be 'springing'. Anywhere from a couple of days to a week prior to calving, the vulva swells up and a string of mucus may be seen extending from it.

Twelve hours prior to calving, cows become quite restless and may refuse to eat. They often like to find a quiet corner away from the rest of the herd. Observing a cow on her own away from the rest of the herd is a good indicator that she is unwell or beginning the calving process. The calf should be born front feet first followed by the head and shoulders (Figure 61). Once the waterbag has broken,

true labour has begun and the calf will usually be born unassisted within 1 hour, although the time taken to calve can vary between animals.

The cow will often lie down in the final stages of labour to push the calf out. The afterbirth or placenta should come away from the cow within 2 days of birth. If she has not 'cleaned' (expelled the placenta) a veterinarian should be called because of the possibility of infection and resulting infertility.

Deciding when to assist

If the waterbag has broken and the calf is not visible within half an hour, the cow may need assistance. The quicker the cow receives assistance the better chance she has of recovery and her calf has of survival. If you have never assisted with a calving before, it is advisable to call your vet and watch how they do it before attempting this yourself. A good idea could be to spend some time with a knowledgeable neighbour when their herd is calving down.

If the front toes and nose are visible (correct presentation) and it has been over an hour since calving was first noticed, the calf may be too large for the cow to easily push out herself. Under these circumstances pulling on the front legs, in time with a cow's contractions, may be all that is required. The cow should be brought to the yards quietly and restrained in a crush or race. A clean rope slipped over each of the front legs makes pulling much easier. The direction of the pull should be outward and downward, coinciding with the cow's contractions.

The other cause of calving difficulty is malpresentation (calf in the wrong position). Figures 61–64 illustrate normal presentations and several

Figure 61. Correct presentation of the calf with front feet forward and head showing. The waterbag has broken.

Figure 62. Correct presentation with front feet and nose showing, with waterbag still attached over the calf.

Figure 63. Incorrect presentation. The calf is coming out in the posterior (feet first) position. A cow often requires assistance when calving down in this situation.

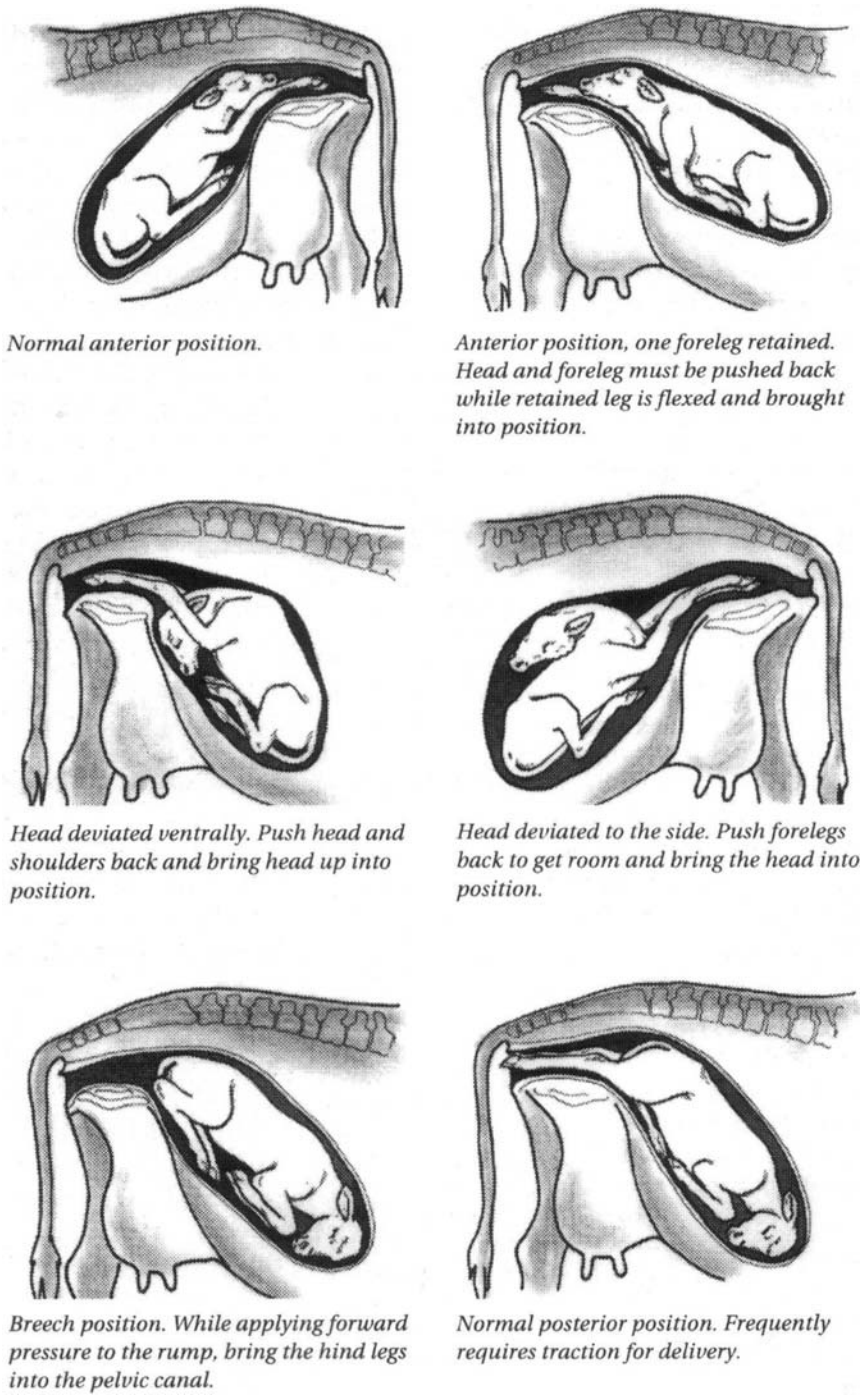


Figure 64. Diagram of different birth positions. (Source: Haynes, NB (1994). *Keeping Livestock Healthy*. 3rd edn. Storey Publishing: USA)

malpresentations. Because the possibilities are numerous and often quite difficult to handle, they are best left to a person with the training, experience and equipment to handle the situation.

If a calf has had an assisted birth it may have trouble breathing. Stimulate its breathing by rubbing its chest vigorously and remove any mucous around its mouth and nostrils. It may also have mucous in its lungs. Hold the calf by its rear legs or hang the calf over a rail in the cattle yards so that its chest and head are hanging downwards for a minute or two. This helps to clear the mucous from the lungs.

After a difficult birth, young cows in particular sometimes abandon their calves. It is wise to keep the cow and calf confined in a small area after assistance has been given. Sometimes it may be necessary to restrain the cow in a crush or race and allow her calf to drink several times a day for the first few days. They should not be allowed back with the main herd until the cow has accepted her calf and will allow it to suckle.

The importance of colostrum

It is vital for the calf to receive colostrum (the mother's first milk) during the first 12 hours of life, preferably within the first 6 hours. Colostrum has twice the total solids of whole milk and contains antibodies that provide the calf with immunity during its first weeks. For every half an hour after birth that colostrum feeding is delayed, antibody transfer decreases by 5%. A calf that does not drink until it is 6 hours old has already lost the opportunity for 30% of the possible antibodies entering the bloodstream.

If you have yarded a cow and her calf dies during a difficult birth take this opportunity to milk the colostrum from her and freeze it for future use. The first 2–3 litres obtained immediately after calving have the highest levels of antibodies. This is the only colostrum worth saving. It can be stored in one or two litre plastic bags, placed in flat trays and frozen. It will store in the freezer for up to 12 months. These bags can be thawed quickly in warm water as required. If in the future you lose a cow during the birthing process and the calf survives, you will have a ready source of colostrum for this emergency. Newborn calves require 2–4 litres (depending on their liveweight) of colostrum within the first 6 hours after birth.

Hand-rearing calves

Hand-reared calves are fed a milk replacer (powdered milk) according to their liveweight (around 10% of their weight as liquid milk per day is the recommended quantity) (Table 17). In addition they should be provided with access to clean drinking water at all times. Alternatively, if you live in a dairying area a local dairy farmer may have some milk that you could use for the calf, especially if they are

Figure 65. Examples of the bottles that you can buy for hand rearing a calf.

calving down at the same time. The freshly calved dairy cow cannot contribute to human milk for a number of milkings. The farmer therefore either uses this milk for their calves or has to discard it, and so may have some spare for you to use for your calf.

Calves are born with a non-functional rumen so all digestion must take place in the abomasum (or true stomach) and small intestine. Rumen development occurs through the digestion and fermentation of feeds such as concentrates (pellets) and roughages (hay and pasture) by the rumen microbes. A calf fed a milk only diet will grow rapidly initially but rumen development is restricted.

From 1 week of age, if calves are strong, healthy and kept warm and dry, they can be successfully reared on a once daily milk feeding program that includes calf pellets and hay. They should be encouraged to eat solid food in the form of calf

Table 17. Quantities of milk to be fed to hand-reared calves

Liveweight of calf (kg)	Whole milk per calf per day (L)	Whole milk powder per calf per day (g)*
30	4.1	550
40	4.6	620
50	4.9	660
60	5.3	720

*Milk powder should be mixed with warm water to manufacturer's directions.

pellets and small quantities of hay because it is the pellets rather than the milk that provides the bulk of the nutrients to keep the calf growing. Water should be available at all times.

It is still important that calves drink their allocation of milk. Lower milk intakes will limit calf performance because of the young animal's inability to eat enough pellets. Grazed pasture is not ideal roughage for milk-fed calves as it contains too little fibre and its very high water content limits their intake of energy.

Calves require protection from the wind and rain. Old chook sheds, stables, machinery or hay sheds can be converted to provide shelter for hand-reared calves.

Weaning hand-reared calves

Calves fed up to 6 L/day of milk can be weaned overnight. Those drinking more than 6 L/day may need to be weaned over two or more days. Milk should never be diluted with water during the weaning process, but rather less milk offered than the previous day. They can be weaned off milk once they are consuming 0.75 kg/day of pellets for two or three consecutive days. This usually occurs at 5 to 6 weeks of age and at liveweights of 50–60 kg. The intake of pellets should increase rapidly to greater than 1 kg/day following removal of milk, after which the calves are ready to go onto pasture, supplemented with pellets.

The aim of any calf rearing system should be to produce fully weaned calves weighing a minimum of 100 kg at 12 weeks of age. Early weaned calves (weaned at 5–6 weeks) generally do not grow faster than 0.5 kg/day during milk rearing, but can easily achieve 1 kg/day following weaning when offered unlimited pellets and limited roughage. *Warning*: Calves that are weaned early (6 weeks of age) will not be large enough to grow on pasture alone. Concentrates will need to be fed until they are at least 12 weeks of age to continue their rumen development. After 12 weeks of age, the type of supplements fed to calves will depend on the quality of the pasture available. Any young, growing animal requires a diet high in protein and energy, both of which are usually obtained from adequate quantities of high quality green pasture. If the pasture is short and green (as is the case in the middle of winter) or dry and stalky (as is the case in late summer and autumn) calves will still require supplements high in protein and energy until they are 9 months of age.

Bull selection

The goal of a bull is to get as many cows pregnant as possible within a limited period of time (6–9 weeks). To do this he must be fertile and sound. Try to purchase bulls that have undergone a breeding soundness examination by a veterinarian. In addition, your own bulls should be given a breeding soundness examination by your veterinarian before each mating season to determine if there are any defects of the testicles, penis, or legs that will prevent them from effectively

serving cows. Bulls can themselves have or develop structural defects between one mating season and the next. These are no longer capable of mating and are said to have 'broken down'.

A good manager will observe the bull mounting cows to be sure the bull is able to do the job. If at the end of the joining period you notice cows still mounting each other, it indicates that they are still coming on heat and have not conceived. Your bull may be at fault and should be checked out.

Another point to consider before purchasing a bull is how productive is he? Will he produce fast-growing calves that will reach high weaning weights or will he produce slow-growing, small calves? The most accurate way to obtain information on his performance is through BREEDPLAN figures.

Genetic evaluation and BREEDPLAN

BREEDPLAN is the Australian beef cattle performance recording and genetic evaluation scheme. Estimated Breeding Values (EBVs) are calculated using the performance of individual animals and any recorded relatives for a range of traits including: birth weight, milk production, growth, calving ease, gestation length, days to calving, scrotal size and several carcase characteristics. It is impossible to look at a bull and tell how fast his calves will grow or how well his daughters will milk.

Figure 66. Farmers assessing a bull for his potential. Both figures for EBVs and a visual assessment should be taken into account when assessing whether a bull will meet your needs.

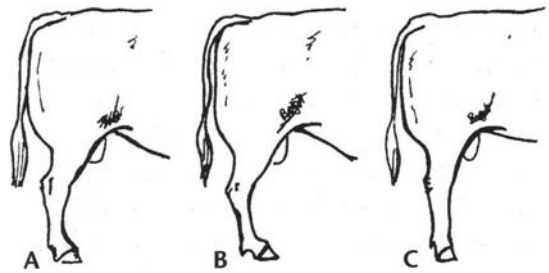


Figure 67. Hind leg structure, side view. (Artwork: Brigit Cumming.)

You need actual weight-gain measurements from the bull and his relatives to be able to accurately assess his genetic potential. BREEDPLAN does exactly this. BREEDPLAN figures are available for all the major breeds of beef cattle. Ask your bull breeder if their herd is on BREEDPLAN. BREEDPLAN figures should be used as a guide when purchasing bulls in conjunction with an assessment of the physical soundness of the bull and his fitness for your purpose (Figure 66).

Structural soundness

The structural soundness of a bull is as important as his fertility. A bull should stand squarely and show no deformities or unusual wear on his hooves. The structure of the hind legs is very important as the bull relies on the hind legs when mating. Heavily grain feeding young bulls for the show ring or for special bull sales can cause lameness due to the rapid growth it can cause. These bulls will look fantastic – huge, sleek and rounded, although they may be more rounded from fat rather than muscle! They can develop swelling in the leg joints and are more likely to develop arthritis in later life. These bulls are not in optimum condition for serving cows. Figure 67 shows three bulls side-on, and Figure 68 shows three bulls in rear view. The first bull (A in each of the two figures) has the correct leg structure, the second (animal B) is sickle hocked and the third has straight or 'post' legs (animal C). Post-legged bulls don't have the flexing and cushioning effect of a structurally sound bull and are more likely to experience hip arthritis.

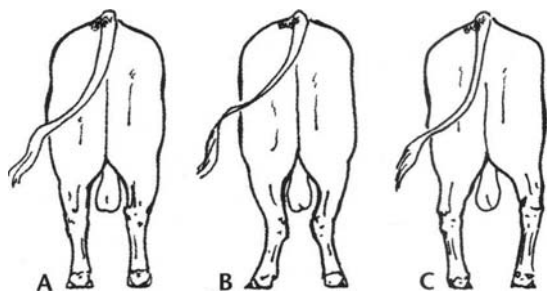


Figure 68. Hind leg structure, rear view. (Artwork: Brigit Cumming.)

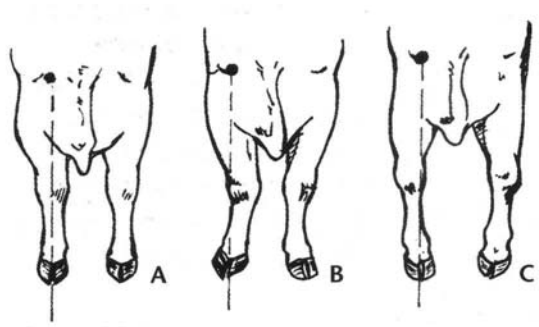


Figure 69. Front leg structure. When legs are turned in or out, extra strain is placed on the ligaments of the hock joints causing lameness. (Artwork: Brigit Cumming.)

They also suffer a higher incidence of broken or damaged penises. The opposite problem to the postlegged bull is the sickle-hocked bull, where the legs angle too sharply underneath. This is less of a problem than straight legs, but still not preferable.

When viewing cattle head on, a vertical line should be able to be drawn from the point of the shoulder to the middle of the claw, with the line passing through the middle of the knee (as demonstrated with animal A in Figure 69). The two most common faults with front leg structure are shown in animal B (knock kneed,

Figure 70. Cow with slight knock knee resulting in foot being turned out. This is a structural problem.

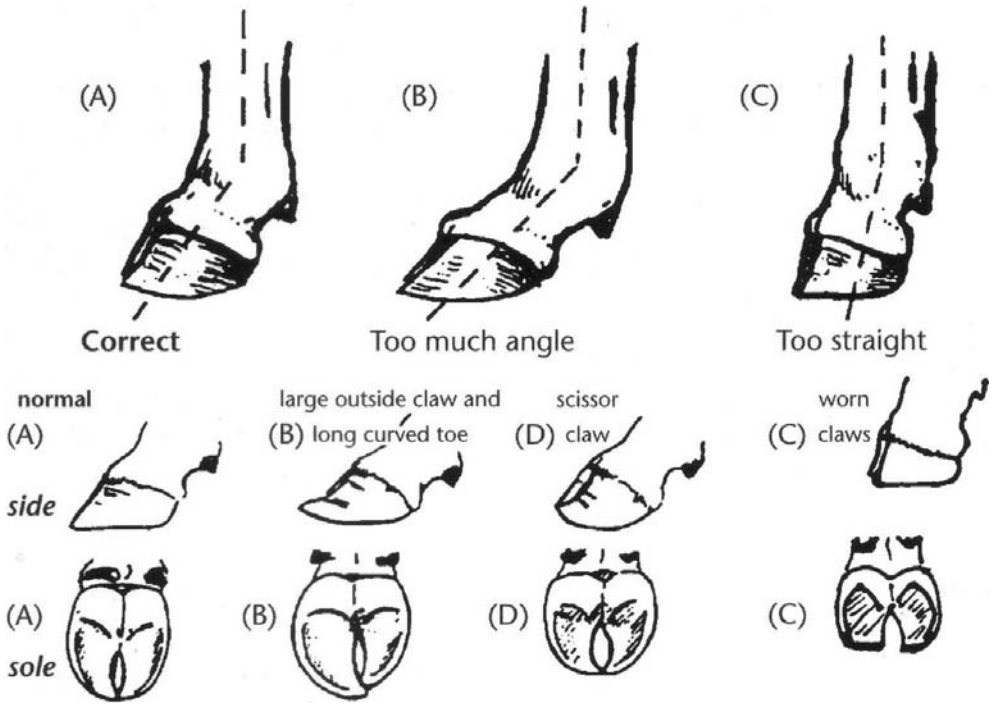


Figure 71. Hoof structure. Pattern angle of legs and associated claws: (A) correct structure, (B) sickle hocked, (C) too straight, (D) scissor claw which can be caused by too much angle. (Artwork: Brigit Cumming.)

Figure 70) and animal C (bow legged). Both these problems will lead to excessive strain on the knee joints, particularly as the animal carries more weight.

A tell-tale sign of leg abnormalities is overgrown hooves. Figure 71 shows hoof and claw abnormalities. Common problems in the hooves include:

- both hooves are not symmetrical in size and shape (Figure 71, animal B)
- long narrow hooves with shallow heels, often associated with sickle hocks (Figure 71, animal D and Figure 72)
- short hooves, worn at the toe, often associated with straight hind legs (Figure 71, animal C).

Artificial insemination

Artificial insemination (AI) is the process of using straws of stored semen from a bull and transferring the semen into the cervix of the cow via a long thin syringe. This is carried out by a qualified veterinarian or AI technician.

Artificial insemination has a couple of advantages for small herds. It is difficult to manage a bull on a small block when he is in use for such a short time

Figure 72. Too much angle results in a large outside, curved toe. The hair line at the rear of the hoof touches the ground when there is too much angle.

each year. With AI the need to keep a bull is eliminated. AI on small herds can be more economical than purchasing a bull. With AI a breeder with only a few cows has as great a selection of genetics as someone with a much larger herd. This can allow each cow to be matched to a different bull if required to correct and enhance traits.

Disadvantages of AI include difficulties in detecting cows in heat, increased handling of cattle, and possibly a lower conception rate. Labour is increased as someone needs to identify that cows are on heat and ready for insemination.

Leasing bulls

Leasing bulls is also an option. Again this means you do not have to carry a bull on the property all year round. When deciding whether to lease a bull, consider its breed and whether it will give you the traits you want. Find out if the bull has any EBV figures to base your assessment on.

Check whether the bull has been vaccinated against the common diseases. Ask who is responsible for the cartage of the bull to and from your property. Are there any assurances – what happens if they bull is infertile and what happens if the bull breaks down while on your property. What is the cost of leasing him?

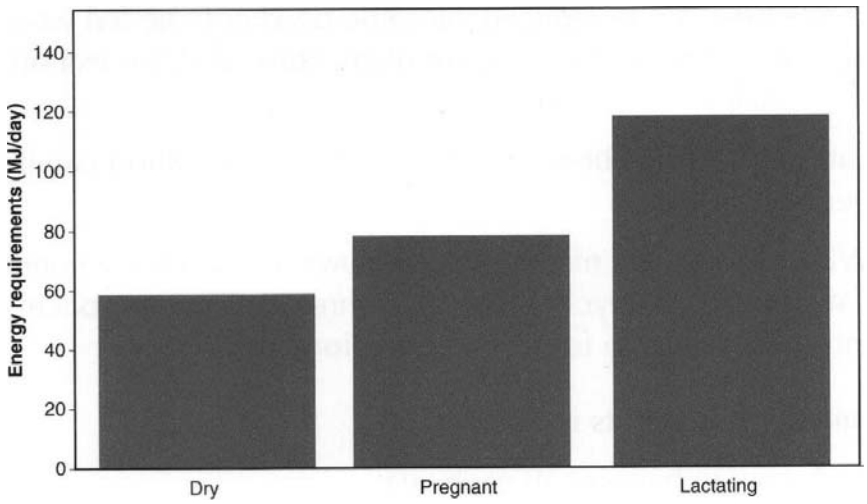


Figure 73. Energy requirements of a breeding cow. (Source: Prograze Manual 2005.)

Time of calving

The energy requirement of the cow and calf unit more than doubles from 2 months before calving to 6 months after calving (see Figure 73). This needs to be taken into account when deciding when you wish your cows to calve down.

Autumn calving

The best fit of feed requirements and pasture feed supply usually occurs when cows calve in the autumn and all calves are sold in December. This is a simple system and why more than half the cattle herds in Victoria calve during the autumn. In this way the nutritional demands of the cattle often match pasture production. However, feed production can often be quite low in winter and therefore supplementary feeding may be required during this time to ensure enough energy is supplied to the cow while lactating.

In southern Australia, the pasture growing season begins in autumn and ceases in late spring to early summer, with 60–70 per cent of total pasture production occurring in the early spring. (See Appendix 4 for pasture growth patterns.) Autumn calving is suitable for cross-bred herds (e.g. Friesian Angus cross cows) mated to a terminal sire (e.g. Limousine) for vealer production. Many autumn calving herds are producing vealers for slaughter or store weaners for other people to purchase and grow out.

Advantages of autumn calving include:

- In most years, autumn pasture growth can meet the cow's increasing feed requirements after calving and during mating.

- The flush of pasture in spring coincides with the increasing requirements of the rapidly growing calf.
- As feed quality and quantity deteriorate during the hot, dry summer months, the feed requirements of the herd are at their lowest for the whole year. The calves have been weaned and sold and the cows are dry.

Disadvantages of autumn calving include:

- If there is a late autumn break, supplementary feeding will be required.
- Vealers are sold at the time when there are a lot of other vealers being sold, thus the price received per kilogram is lowest at this time.
- It is predominantly a store or vealer producing system and offers less flexibility to target different markets.
- Grass Tetany is more of a problem with autumn calving cows.

Spring calving

Herds that calve in spring are usually targeting a different end market. Spring born calves are often early weaned and grown out to feedlot specification or store sales. Spring calving herds may be producing store or finished steers turned off at 15–18 months. They are born in August/September, weaned in April and sold after they have gone through their second spring the following November.

Advantages of spring calving include:

- Greater flexibility to target different markets.
- Little or no winter supplementary feeding because the cows are dry.
- Easier management of Grass Tetany.
- In areas of summer rainfall or on properties with irrigation, the spring growing period is extended and spring-born calves may grow as well as autumn-born calves.
- Suits straight-bred British breeds.

Disadvantages of spring calving include:

- Calving in spring compared with autumn reduces calf liveweight at 9–10 months of age (weaning). This is because the spring-born calf has to spend a few months on dry summer pasture, while the autumn-born calf is grazing an abundance of spring pasture during this equivalent stage of growth.
- Higher calving difficulty.
- Not suitable for vealer production.

See Table 18 for a suggested calendar of operations for an autumn calving herd. Of course some activities may need to be undertaken at different times due to the time of calving. Calving may occur earlier or later than the times listed here and so vaccinations, putting the bull in with the cows, and so on will need to be adjusted.

Table 18. Suggested calendar of operations for an autumn calving herd

Management	Health
January	
Monitor body condition to ensure following fat scores: Cows 3.5 Heifers 4	Drench young stock for worms
	Ensure quality and quantity of water supply
	Check for Pinkeye
Check liveweight of heifers for joining	Cull cows for Cancer Eye prior to calving
	Administer clostridial disease booster for cows and young stock
February	
Prepare for calving	Ensure good water supply
March	
Calving begins	Check cows daily for calving difficulties, assist when necessary
Supplementary feed if necessary	
Fertilise paddocks	
Breeding soundness examination of bulls	
Purchase new bulls, if necessary	
April	
Calving continues	Drench for liver fluke, if confirmed
Monitor cow condition for joining fat score of 3 in June	Drench replacement heifers and yearling steers for worms
Supplementary feed if necessary	If good autumn break, beware of Bloat
	Check cows daily for calving difficulties, assist when necessary
May	
Supplementary feed if necessary	Castrate, vaccinate calves for clostridial diseases
June	
Put bull with cows (record date)	Watch out for Grass Tetany, feed cows hay if at risk and apply Grass Tetany preventative treatments
Supplementary feed if necessary	

Management	Health
July	
Re-muster calves	Administer second dose of clostridial vaccine
Supplementary feed if necessary	Watch out for Grass Tetany
	Treat for lice, if necessary
	Look for lameness in cows
August	
Supplementary feed if necessary	Watch out for Grass Tetany
Take bull out from cows after 8–9 weeks (record date)	Drench replacement heifers for worms, if necessary
September	
Lock up paddocks if cutting hay	Beware of Bloat
	Check for possible abortions
October	
Pregnancy test cows and heifers	Beware of Bloat
November	
Explore marketing options for calves	
Select herd replacements	
Select at least 20 per cent more heifers than required	
December	
Wean calves	Check for Pinkeye
Monitor body condition of cows and heifers for calving	
Sell calves	
Sell cull cows	

12

Cross-breeding

Cross-breeding can give you the opportunity to increase the productivity of your beef herd. These increases in productivity are achieved through hybrid vigour, combining breeds to suit both your environment and end market, and through the complementarities of male and female breed traits (Figure 74).

Advantages of cross-breeding include:

- Hybrid vigour.
- Flexibility (you can alter particular characteristics to suit a specific purpose, such as catering to a particular market, to remedy a problem or to increase production).

Disadvantages of cross-breeding include:

- Management difficulties may occur depending on the cross-breeding system you opt to use (e.g. you could experience calving difficulties as using European sires can increase the risk of calving difficulties without good management).
- Requirements for physical resources (such as several breeding paddocks) may be high, particularly if more than one bull is required.
- Feed requirements needed to sustain production gains from hybrid vigour.
- It may take time for the full benefits to be realised.

Hybrid vigour

Hybrid vigour, also known as heterosis, is the difference between the performance of the progeny and the average of the two parent breeds. Generally, hybrid vigour

Figure 74. A herd of cross-bred cattle. All these cattle will be exhibiting degrees of heterosis (hybrid vigour) due to their mixed parentage.

will be greatest when the parents are genetically the least related such as in the case of a *Bos indicus* (i.e. Brahman)/*Bos taurus* (i.e. Hereford) cross. This cross will exhibit more hybrid vigour than a European (e.g. Charolais)/British (e.g. Angus) cross that will, in turn, exhibit more hybrid vigour than a British/British cross (Figure 75).

Heterosis is greater for some traits than others. Weakly inherited traits such as fertility, longevity, parasite resistance and environmental adaptation respond more strongly to cross-breeding than highly heritable traits such as growth rate. A trial in the USA showed that when straight-bred cows reared cross-bred calves there was an extra 8.5% (on average) increase in the weight of the calves. When these now cross-breed cows reared cross-bred calves there was an increase of 23.3% in calf weight (8.5% of individual heterosis due to the turnoff animal being a cross-bred, and 14.8% maternal heterosis due to the mother being a cross-breed) compared to a straight-bred cow raising a straight-bred calf. (Source: DPI&F Note Queensland, 'Breeding Methods for Cattle'.)

Maternal heterosis is exhibited by a cross-bred cow. A cross-bred cow will have higher milk production and be more fertile than a straight-bred cow. As a result her calf will be about 14.8% heavier at weaning than a straight-bred calf. When a cross-bred cow is mated to a third-breed bull, the calf gains the benefits of both the individual and maternal heterosis. Therefore, we expect a 23.3% (8.5% + 14.8%) increase in the weight of calf weaned per cow joined.

Combining desirable characteristics

Cross-breeding brings together a desired combination of genes from two parents more rapidly than can be achieved through selection within a breed. It could take

Figure 75. This cross-bred cow (Friesian × Angus) will exhibit maternal heterosis, with higher milk production and fertility than a straight-bred cow. Her calf should be about 15% heavier than a calf from a straight-bred cow if she is mated to an Angus bull. If she was mated to a different breed of bull (e.g. Hereford, Limousin, etc.), her calf would be expected to be 23% heavier than a calf from a straight breed.

generations to breed highly muscled steers within a pure British breed herd. However, this could be achieved in only one generation by cross-breeding British breed cows with a highly muscled European breed sire.

A high milk producing breed can be incorporated into the cross to supply good volumes of milk for the growing calf. For example, Hereford × Friesian cows may be sourced from the dairy industry where a dairy farmer has used a Hereford bull over some of the Friesian cows. The Hereford × Friesian heifers are reared and then could be mated to a Simmental bull to produce a well muscled, extremely fast growing calf that might reach weights of 350 kg plus at 9 months of age. Hereford × Friesian cows will have very high milk production and the introduction of a Simmental terminal sire injects muscling and a high growth rate into the offspring.

A terminal sire is a bull in which none of his offspring are retained for breeding. All calves, including the heifers, are sold. Terminal sires are usually selected for their very good carcase characteristics. Care should be taken when using terminal sires over smaller breed heifers due to the risk of calving difficulty from the possible additional size of the calf.

A word of warning: if you are thinking about using dairy or dairy cross cows in your breeding programs: dairy cross cows require a large amount of feed to maintain their milk production and prevent them losing too much weight. If their body weight falls below critical levels, they will be difficult to get back in calf. While they have the potential to produce very fast growing, heavy calves at weaning, they are not suitable for low to medium rainfall areas. They are more suited to the higher rainfall districts.

When selecting breeds for cross-breeding, a knowledge of individual breed characteristics is important. (See Appendix 1 for the characteristics of 26 different breeds of cattle.) The internet can also be a useful tool for researching the characteristics of the breeds you are interested in.

To remedy a problem

Cross-breeding can be used to remedy a problem such as eye cancer in Herefords. The combination of a lack of dark pigment around the eye and lack of hooding over the eye predispose Hereford cattle to eye cancer. By crossing Hereford cows with a breed that has good pigment and hooding over the eye, such as Angus, the problem can be quickly remedied in the next generation.

Bos indicus cattle originate from Asia and are therefore more tolerant of harsh tropical conditions than British or European breeds. A cross such as Brahman × Hereford combines the best of both breeds with regard to the high fertility and increased growth rate of the Hereford, with the tick and heat tolerant characteristics of the Brahman. This cross will outperform both straight *Bos indicus* and straight British breeds in semi-tropical conditions.

Complementarity of male and female traits

Some cross-breeding systems allow the breeder to match traits of the bull breed to traits of the cross-breed cow. Normally this means a bull breed is selected that will transmit rapid growth and desirable carcase traits to the progeny, while the cross-breed cow is selected to provide the maternal characteristics of fertility and milk production. This can increase the likelihood of producing a live, healthy calf that meets specifications within the desired time frame.

A poorly designed cross-breeding program results in bull and cow breeds that may not complement each other. For example, large terminal sire breeds bred to small, young cows can result in excessive calving difficulty and loss of cows and calves. Another example of a poorly designed system could be when a smaller bull breed (Murray Grey) is mated to a large cow breed (Charolais). This can result in an inefficient cow/calf unit in terms of feed conversion. With Charolais being a larger animal, the cow will have quite high feed requirements. However, her calf

will not have the genetic potential to grow to a large size because half of its genetics come from the genetically smaller breed, the Murray Grey.

Limitations of cross-breeding

Calving difficulties

Using European or *Bos indicus* sires over British breed females can double or triple the risk of calving difficulties without good management. If there is a large disproportion between the cow and bull with regard to frame size and the expected birth weight of the calf of the parent breeds, you will likely suffer from calving difficulties. This can be further compounded by inappropriate feed management during the cow's pregnancy.

Management difficulties

Most cross-breeding systems need a strong level of commitment due to the planning and extra management involved. Do your research on the different cross-breeding systems before making your decision to determine whether you are ready to commit to such a system. There are systems (particularly with small herds) requiring only one bull breed at a time that greatly simplifies management.

Difficulty in finishing (fattening) cross-bred cattle when feed is in short supply

For example, a supermarket specification for beef might be:

Carcase weight:	180–240 kg
Approximate liveweight:	340–440 kg
Fat depth:	6–9 mm
Dentition:	0–2, (0 preferred)
Butt shape:	A, B, C
Fat colour:	0–3 (creamy white)
Meat colour:	1–3
Eye muscle area:	>60 sq cm
Marbling score:	Not required

Note. Check with the meat buyers of individual supermarkets for their current specifications.

In the lower rainfall areas on poor pastures or in a tough season some straight European breeds and European cross-breeds will have difficulty achieving the minimum fat depth of 6 mm at 340–440 kg liveweight. Animals that have below 6 mm or above 9 mm fat at the p8 rump site will receive a lower price as they are not meeting that particular market's requirements. European breeds are leaner, more muscular and later maturing than British breeds. A European × British steer

(i.e. Simmental × Hereford) will require a longer period of time and more high quality feed to fatten than a straight British breed animal. Reducing the European content, or eliminating it altogether, may be necessary in lower rainfall areas to finish off an animal.

Another option is to look for different markets to supply that might better suit your system.

Market discrimination

There could be discrimination against cross-bred cattle by meat buyers because the animal doesn't have adequate fat cover, as can be the case with European crosses. Or perhaps they might discriminate due to the muscling of the animal as can be the case with dairy crosses rather than because it is 'cross-bred'. The dairy cross animal can often be very light on for muscling.

If the right combination of breeds is used and they meet the market specifications for weight, fat and muscle, cross-bred cattle can be highly sought after.

Cross-bred cows eat more

Research has shown that cross-bred cows do eat more. This is related to cow size and output rather than the fact that the cow is a cross-breed. The most efficient unit is a small maternal breed of cow mated to a larger terminal sire, provided the cow doesn't experience calving difficulty.

Planned cross-breeding systems

The potential gains from cross-breeding are large, but most of the success depends on good planning and the use of superior genetics to provide the traits identified for a specific breeding enterprise. The decision to cross-breed should be made because it will fulfil enterprise goals and breeding objectives. The breeds and cross-breeding system should be selected to match the environment. This includes not only the important elements of climate and pasture but also the effects of parasites, disease and the overall level of management.

It is wise to do your research and develop a written plan of your proposed cross-breeding program before launching into it.

The NSW DPI have produced a great PrimeFact 'Developing an Effective Breeding Plan for Your Beef Business'. It suggests a stepwise approach to planning and implementing a successful breeding program:

Step 1. List the traits of economic importance.
Step 2. List your future customers' requirements.
Step 3. List your future herd production targets.
Step 4. List your herd's current performance.
Step 5. List your breeding goals.
Step 6. Choose an appropriate breeding system to achieve your goals.
Step 7. List your criteria for selecting replacement bulls.

Step 8. Prioritise the selection criteria.
Step 9. Apply patience and consistency in implementing your breeding program.

Thinking these issues through may help you decide whether or not to implement a cross-breeding program, and, if so, which system to use.

There are essentially five forms of cross-breeding:

- two breed/two-way cross
- backcross
- three breed cross
- rotational cross and
- composite breeding.

Two breed/two-way cross

This is the most simplest of systems where two straight bred animals of different breeds are mated to produce what is termed F1 or first cross calves. In Victoria, a common cross under this system is the Hereford × Angus to produce Black Baldy calves.

First cross calves show signs of heterosis for traits such as growth, improved carcase, feed conversion and vigour. The two way cross results in about an 8.5% increase in calf weight compared to the parents. The heifer progeny from this cross often have increased sale value due to their potential as breeders, bringing in heterosis.

This system does not produce its own replacements, so replacement females would need to be bought in. If you did retain the female progeny for breeding, you will be moving out of the two-way cross into another cross-breeding system.

Backcross

A backcross system involves mating the hybrid first generation (F1) to one of the two parent breeds (Figures 76 and 77). For example, a Black Baldy female (Angus × Hereford) is mated to either an Angus or Hereford bull. Generally, in this system all the progeny from the backcross are sold for slaughter. Hybrid first generation replacement females are either bred on the property or bought in.

The backcross system is good for taking full advantage of heterosis for the maternal traits of fertility, milk and mothering ability. Half the possible heterosis for growth is passed on. Backcrossing is a good system for producing a consistent product.

Three breed cross

The three breed cross system is useful for producing an animal that will perform well in your environment and for the market you have targeted. The first two breeds of animal you choose pass on maternal heterosis and provide adaptation to

Figure 76. An example of an F1 cow (foreground) that could be used in the backcross system. In the backcross system, this cow would need to be mated to either an Angus or a Hereford bull. All progeny are generally sold for slaughter.

a particular environment. The breeding of these two animals produces the F1 females you will use as your breeding animals to produce the progeny for sale.

A third breed of bull (different to the breeds of the F1 female parents) is then used in the breeding program with the F1 female to produce animals for turnoff (Figure 78). Using the F1 female and a third breed of bull will produce a great lift in productivity of the herd. A three breed cross should result in a 23.3% increase in the weight of calf weaned per cow compared to a straight-bred animal.

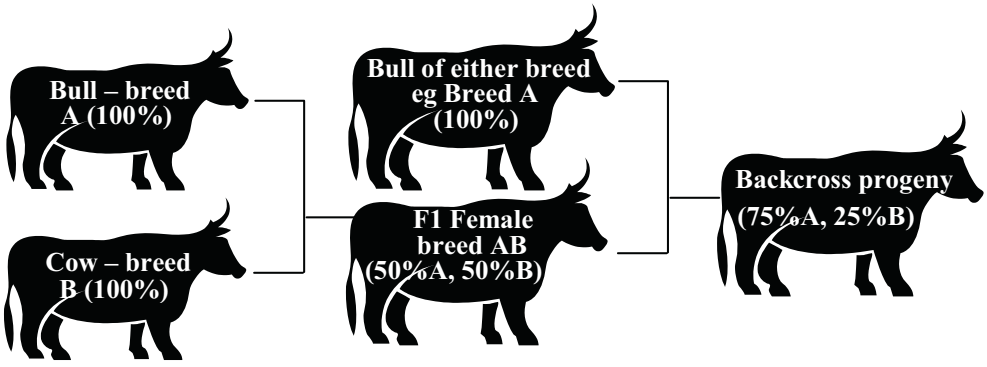


Figure 77. Diagram of the how the backcross progeny is produced.

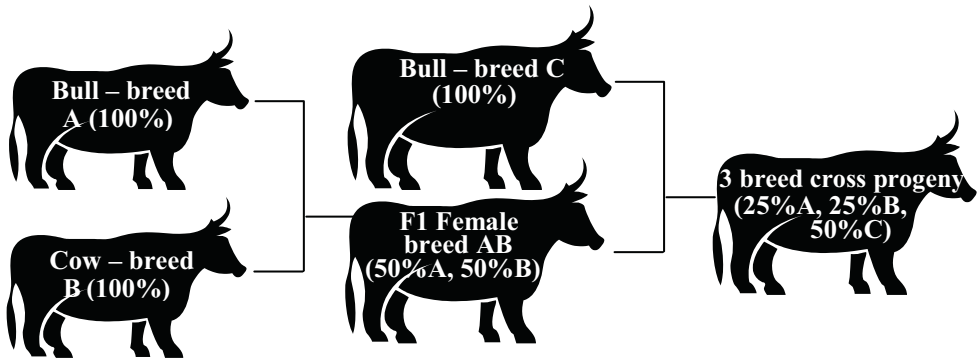


Figure 78. Diagram of the three breed cross system.

To simplify this system, if you did not have the room, or wish to run so many separate herds, you can buy in all your F1 female replacements instead of breeding them on your property. Ensure you know the breeding of the F1 females so you can be sure the bull you put over them is of a different breed, resulting in increased heterosis.

Rotational cross

A rotational cross system involves using pure-bred bulls, mated to cross-bred cows. The mating system is done in sequential rotation whereby pure-bred bulls are mated to cross-bred females bred from previous generations of pure-bred bulls and cross-bred cows (Figure 79).

A two breed rotational cross can result in about a 15% increase in weight of calves weaned per cow joined. A three breed rotational cross can result in a 20% increase in weight of calves weaned per cow joined. A four breed rotational cross can result in about a 22% increase in weight of calves weaned per cow joined. A two breed rotational cross system requires two joining groups and two sire breeds. The daughters by sire breed one (a Shorthorn bull for example) are mated to sire breed two (a Hereford bull for example) for the rest of their lives and vice versa. It suits herds requiring two or more bulls and is very simple to introduce to a straight-breed herd. Simply divide the herd in two, buy a bull of a compatible breed and join him to half of the herd. Join the original bull breed to the other half of the herd. The heifers from each of these joinings will move into the other herd and be joined to the opposite bull breed for the rest of their lives.

The three and four breed rotational cross becomes more complicated because additional bull breeds are introduced.

As with most successful breeding programs it is important to identify animals accurately and keep accurate records of parentage.

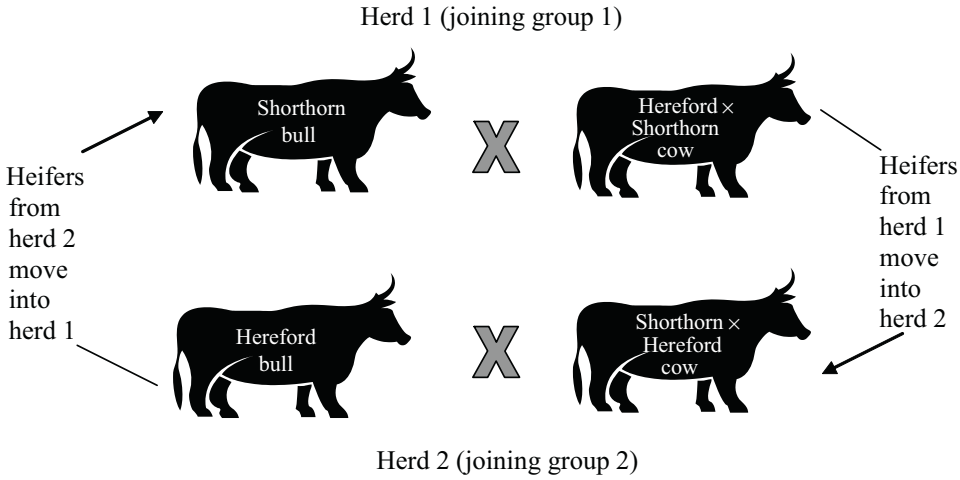


Figure 79. Diagram of a simple two breed rotational cross system.

Composites

A composite breed is a breed developed by crossing two or more existing breeds, then stabilising the cross by interbreeding for several generations. The aim is to increase efficiency and profit by combining the best features of a number of breeds and to maintain a large amount of the resulting hybrid vigour.

Many breeds that are now considered pure breeds are actually composites. Examples of composites are:

- Balances – originated from a cross between a Gelbvieh and an Angus, Hereford or Murray Grey (Figure 80, page 42).
- Murray Greys – originated from a cross between an Angus bull and Shorthorn cow (Figure 81, page 42).
- Beefmakers – 75% Hereford, 25% Simmental.
- Belmont Reds – 50% Africander, 25% Hereford and 25% Shorthorn.
- Santa Gertrudis – 5/8 Shorthorn and 3/8 Brahman.
- Braford – 5/8 Hereford and 3/8 Brahman.
- Mandalong Special – Charolais, Chianina, Polled Shorthorn, British White and Brahman (after four generations the breed was stabilised with a content of 58.33% European, 25% British and 16.67% Brahman).

Benefits of running a composite-breed herd

- *Hybrid vigour.* There will be a 9 to 19 per cent increase in the weight of calf weaned per cow joined depending on the number of breeds used in the composite. The more breeds used, generally the greater the hybrid vigour.

- *Ease of management*. A composite-breed herd can be run the same as a straight-breed herd.
- *Combining desirable traits*. This will improve performance or remedy a problem.

Possible problems with composites

Market discrimination against particular breeds or crosses can be a problem. As with any breeding program, check your end market requirements before you make your choices. Supply could also be a problem, particularly if there is only one breeder supplying bulls.

For more information on composites, see the Composite Beef Breeders Australia website at http://www.compositebeef.com.au.

13
Cattle health

Many health issues that affect cattle can be prevented or minimised with good management. The main points that enable and support good cattle health are:

- a suitable environment for the breed and class of cattle being raised;
- an adequate feed and water supply;
- an appropriate vaccination program and
- an appropriate worm control program.

Most cattle health problems occur when one or more of these points are not taken care of adequately. The first two points are covered in other chapters of this book. This chapter is an introduction to some of the more common diseases and conditions, and outlines some vaccination and worm control programs. It is important to find out the main cattle health issues known in your area and region to ensure you have these covered. This information can be sought from animal health advisers in government and industry, from veterinarians and local beef cattle producers. If you have particular concerns about the health of your cattle it is wise to call a veterinarian to discuss the problem.

Abortion

Abortion, especially on a large scale, should be regarded as a sign of potential trouble. Call your vet to check for disease. Cows can abort for many reasons at any stage of pregnancy. It is difficult to detect an aborted foetus in the paddock. You

are more likely to notice the cow starting to cycle or come to the bull again or, with later abortions, a vaginal discharge.

Some common causes of abortion are Leptospirosis or Vibriosis. Brucellosis, or contagious abortion, has been eradicated in Australia, however, we must remain vigilant in case of an unexpected outbreak.

Personal hygiene is essential when dealing with aborted material. Diseases such as Leptospirosis and Brucellosis are transmissible to humans.

Anthrax

Anthrax is a notifiable disease under the Stock Diseases Act. Contact your local vet if you believe that you have an infected animal. *Beware:* Anthrax is also transmissible to humans. Take precautions when handling suspected animals. Anthrax is caused by the spore-forming bacteria *Bacillus anthracis*, which can lie dormant for decades in the soil and will cause the sudden death of cattle. Outbreaks often occur during the summer months, but can happen at any time.

When eaten or inhaled by cattle, the spores will germinate and multiply quickly inside the animal. They invade the bloodstream in large numbers, causing fever and rapid death. Dark, tarry discharges are often observed coming from the external orifices of the dead animal.

Bloat

Bloat is a seasonal problem that is usually precipitated by the rapid consumption of lush legume pastures, generally in spring. Bloat results from the formation of a persistent foam in the rumen that stops the gas being belched out normally. As the pressure builds up in the rumen, death can result from respiratory and circulatory failure. Cattle with bloat will not be grazing, will have a distended left abdomen, appear distressed (eyes bulging), have rapid breathing and possibly have their mouth open with tongue protruding.

Mild cases can be treated orally with an anti-bloat preparation. Moderate to severe cases will need rapid veterinary attention. In emergency situations, vegetable oil (250–500 ml) has been known to bring some relief.

Mature pastures that have less than 30% clover pose very little bloat risk to cattle. Hungry cattle should not be put on 'at risk' areas. If you have to put the cattle on these areas, feed out grass hay a few hours before the cattle are to enter that area to help reduce their appetite.

Anti-bloat capsules, blocks, licks, hay and water treatments are available, but good pasture and stock management are usually adequate. The NSW DPI Primefact 'Bloat', at http://www.dpi.nsw.gov.au, outlines many of the products available to treat cattle.

Figure 82. A typical cancer of the eyeball, characterised by a pink, fleshy growth. (Source: NSW DPI PrimeFact 'Cancer Eye in Cattle'.)

Cancer Eye

Eye cancer is a tumorous growth on the eyeball or eyelid and is most common in white-faced cattle such as Herefords or Poll Herefords or other breeds that have unpigmented skin around the eye. The cancer begins as a tiny growth usually in the corner of the eye or on the eyelid and then spreads to the surrounding tissues (Figure 82). It is an offence under the Prevention of Cruelty to Animals Act to allow the cancer to develop to advanced stages.

Cattle with Cancer Eye should not be sent to a saleyard. If the tumour is small in size, the beast should be sold direct to an abattoir at the vendor's risk. The issue should be discussed with the abattoir before sending the animal. If the carcase is condemned, the vendor will be required to pay slaughter and disposal costs to the abattoir. More advanced cases should be sent to a knackery or destroyed in the paddock.

Small tumours can be surgically removed by a veterinarian. Guidelines regarding disposal of cattle with eye cancers are available with photographs from the DPI or your vet. The cancers develop from precursor lesions. As the cancer progresses a tumour develops and becomes ulcerated; bleeding and weeping are common. The cancerous tissue grows inwards and can progress to the lymph nodes, then on to the lungs and liver.

To minimise the chances of your cattle developing Cancer Eye, buy or breed cows that have good pigmentation around the eye and never breed from affected or treated animals. Control eye cancer by culling animals with the early signs of eye cancer to ensure they are not bred from.

Clostridial diseases

Clostridial diseases are caused by a group of bacteria that can live in the soil for years. They can also live in the gut of healthy animals, and be introduced via purchased cattle. The diseases are: Enterotoxaemia (Pulpy Kidney), Blackleg, Black Disease, Malignant Oedema and Tetanus.

Enterotoxaemia (Pulpy Kidney). Pulpy Kidney is usually associated with a sudden change in diet. It is most common in young animals 4–18 months of age in very good body condition. Often a flush of green feed or change into a better paddock will cause the clostridial bacteria to multiply in the gut and produce excess toxins that kill the animals. The first sign is a dead animal.

Blackleg. Blackleg tends to be seen more in young cattle. It causes a gas gangrene in the muscle. Often the leg muscle or the long muscle beside the spine are found affected, producing lameness and a gas crackling sound under the skin. The clostridial bacteria are picked up by the animal through eating contaminated feed or soil and can lie dormant in the animal until stimulated to multiply, often after bruising or wounding. As the bacteria grow and multiply, they produce toxins that destroy surrounding tissue. The toxins are absorbed by the animals and death occurs within 24–36 hours.

Malignant Oedema. Malignant Oedema is a clostridial infection of the soft tissue. A jelly-like fluid is produced between the muscles and under the skin. The infection can occur following dehorning, castration or wounding. Cattle die 2 to 3 days later.

Black Disease. Black Disease is a clostridial infection of the liver that can occur after damage caused by liver fluke. Death usually occurs within a few days.

Tetanus. Tetanus is a clostridial infection of deep wounds or after calving in cattle. Signs include general body stiffness and muscular spasms, sensitivity to sound and movement and restricted jaw movement. Most animals infected will die within 3–4 days. Tetanus can occur after castration or any puncture wound that results in deep muscle damage. Death follows paralysis of the chest muscles and inability to breathe.

Vaccination program for prevention of clostridial diseases

Clostridial diseases can be prevented by following a vaccination program using, for example, 5-in-1 (clostridial diseases) or 7-in-1 (clostridial diseases and Leptospirosis) vaccines.

Vaccination is cheap and effective and should be used by all beef producers. Remember, cattle that have never been vaccinated require two vaccinations in their first year usually 4–6 weeks apart and then an annual booster dose (Table 19).

Purchased cattle may not have been vaccinated, so it is best to vaccinate as soon as possible. Administer a second vaccination 4–6 weeks later and give an annual booster thereafter. Ensure that your vaccinating equipment is clean and delivers the correct dose. Use sharp needles to avoid carcase damage and avoid vaccinating in wet weather as infections may result.

External parasites (lice)

There are two types of lice: biting lice and sucking lice. Biting lice are the common lice found on beef cattle and sucking lice tend to be more common in dairying

Table 19. Vaccination program

Class of animal	Vaccination	Age/timing
Calves	1st vaccination	One month before marking (4–8 weeks of age)
	2nd vaccination	At marking (8–12 weeks of age)
Heifers	1st booster	12 months of age
	2nd booster	One month prior to calving
Cows	Annual booster	One month prior to calving
Bulls/steers	Annual booster	

areas. Lice populations can rapidly build up in autumn and winter, and usually peak in early spring. Cattle that are in poorer condition or on poor nutrition are more likely to build up larger burdens of lice.

They are not a major problem of cattle, in that they have very little effect on weight gains or milk production, unless cattle are severely affected. Treatment may be required when cattle rub against objects which results in hair loss or skin damage. However, the rise in temperature in mid to late spring and the increase in feed quality normally resolves the issue.

There are a range of products available to treat lice if required – both injectable and pour-on products. Ask your local agricultural vet or local rural supply store for advice on what is available. If the animals suffer from lice as an ongoing problem, a single treatment in late autumn will usually provide effective control.

Facial Eczema

Facial Eczema causes liver damage and photosensitisation (sunburn) in cattle, resulting in extensive losses through lowered production, interference with milking, forced culling and occasionally death. Cows become restless, seek shade, their production drops off and they appear uncomfortable. On affected cattle, the white areas redden and the skin thickens, may become severely sunburnt and may peel. Damage to teats and udders can also be severe. Facial Eczema occurs in autumn and must not be confused with spring photosensitisation that is associated with access to lush green pastures.

It is caused by a fungus (*Pithomyces chartarum*) that grows in dead grass litter that is always present at the base of pasture. The fungus spores contain a toxin called sporidesmin and, when eaten by livestock, causes damage to the liver. Outbreaks occur when climatic conditions are suitable for the production of large numbers of fungal spores on pasture. The fungus spores grow best when the humidity is high and temperatures at ground level (grass minimum temperatures) are above 12°C to 15°C for a few days.

If an outbreak does occur, consult your veterinarian. Veterinary treatment of cattle in the early stages of photosensitisation will relieve symptoms. Good shade,

feed and water must be provided and black ointment can be applied to white skin (especially teats) to block out ultraviolet rays from the sun.

Grass Tetany

Grass Tetany occurs when the magnesium level in the blood falls below a critical level. Over 80% of beef cattle affected are cows older than six years of age. Old, overfat cows are most at risk. The amount of magnesium present in the body fluids of fat cows is low compared to that of a normal cow.

Cows need a daily intake of magnesium, and this is done through grazing. Grass Tetany usually occurs when cattle graze short, grass-dominated pasture (that usually has a lower magnesium level than mixed clover and grass pastures) after calving down, especially if they are losing weight. Any factor that disrupts grazing may trigger Grass Tetany. Also, pastures that are excessively high in potassium can inhibit the uptake of magnesium by cows.

The first sign of Grass Tetany is often dead cows in a paddock. You can usually see froth around the mouth and nose and the ground is rubbed where they have thrashed around before dying. Deaths usually occur in winter when the weather is overcast, cold, wet and windy. However, they can occur in high-risk groups grazing short, grass-dominant pastures at any time of the year.

There are pouches of solution that you can buy from vets and rural suppliers to treat animals affected by Grass Tetany. These are injected under the skin and supply the animal with the vital magnesium they need to stay alive once affected. Feeding hay is a good preventative measure. Roughage in the rumen increases the absorption of magnesium by the stomach. Salt will also increase the absorption of magnesium, so salt licks placed around the paddock may be helpful. Causmag is the cheapest and most effective means of Grass Tetany prevention available. Causmag contains 55 per cent magnesium and is fed at a rate of 50–60 g/cow/day, diluted with water and poured over hay.

It is important to identify any high risk factors and manage these. High risk factors include:

- having a high percentage of older cows in the herd,
- older autumn-calving cows becoming too fat in spring or summer,
- cows losing weight while lactating in winter,
- soils naturally high in potassium,
- potassium fertiliser applications pushing soil and pasture levels too high in winter and
- pastures that are too short and grass dominant in winter (no legumes).

Further information on Grass Tetany can be found on your State's DPI website.

Internal parasites (Gastro-intestinal worms and liver fluke)

Worms

The main roundworm of importance in cattle is *Ostertagia*, more commonly known as the small brown stomach worm. Measures to control *Ostertagia* will also control other worms of lesser importance. *Ostertagia* and other roundworms mature in the gut and their eggs are passed onto the pasture (see Figure 83). An important feature of this life cycle is that it consists of two stages – the free living stage on pasture and the parasitic stage in cattle. Immature worms live in the stomach wall then emerge to become adult worms in the stomach lumen.

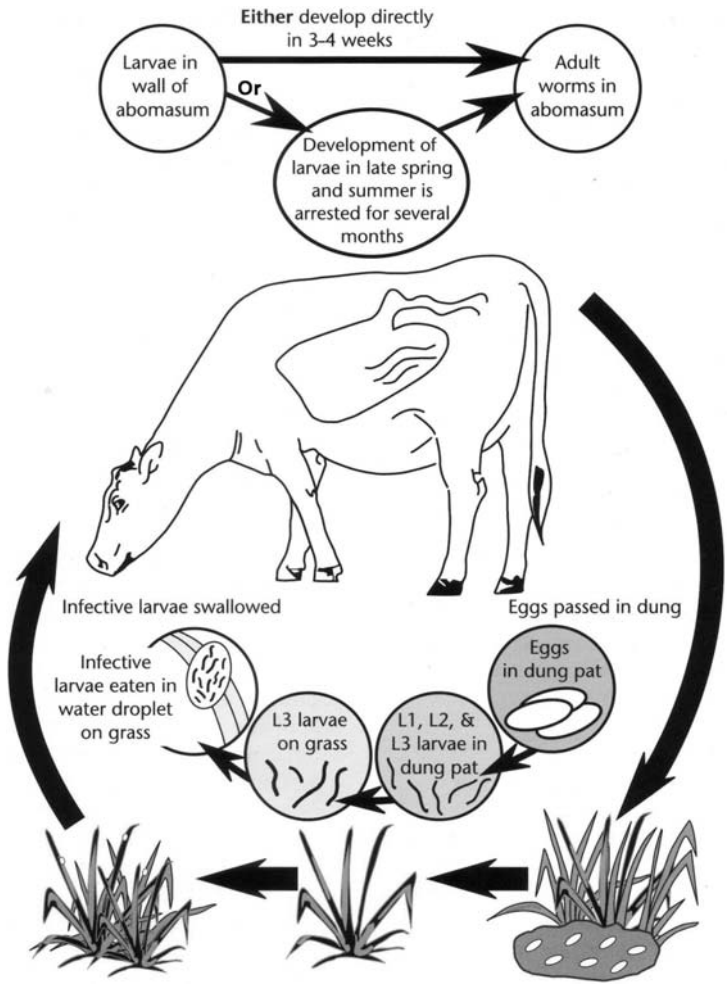


Figure 83. *Ostertagia* life cycle. L1= first stage larvae, L2 = second stage larvae, L3 = third stage or infective larvae.

Ostertagia presents itself as two types of disease:

- Type 1 disease usually occurs in calves and young cattle with high levels of adult worms in winter and spring. This disease follows rapid ingestion of large numbers of worm larvae from heavily contaminated pasture in autumn and winter. Beef cattle affected are generally up to 20 months of age. However, older animals can be affected, particularly if under nutritional stress.
- Type 2 disease usually occurs in cattle in the autumn/winter period, and usually coincides with the autumn break and the change of diet from dry to green feed. Thousands of immature (inhibited) worm larvae emerge from the stomach wall. Severe scouring, loss of weight and even death may result.

There are three groups of drenches available for use in cattle. All three are effective against adult worms in the abomasum, but differ in their effectiveness against developing larvae. For information on some of the treatments available for cattle, refer to the AgNote from DPI Victoria '*Ostertagia* in Cattle', found at www.dpi.vic.gov.au.

Young stock should not be exposed to high levels of infective larvae during late winter and early spring. Once drenched, stock should be moved to clean pasture. For a calendar for worm and fluke control for both autumn and spring calving herds, see the MLA website. Meat and Livestock Australia have produced 'A Regional Guide to Cattle Parasite Control in Australia', available at http://www.mla.com.au/cattleparasiteatlas/atlas.htm. This atlas contains a clickable map of Australia, where you can select your region and download a calendar, plus additional information on a few other parasites that may affect your region.

Liver fluke

Liver fluke are short, flat, parasitic worms that are found in the liver and bile ducts of affected sheep and cattle. The liver fluke cycle relies on a *Lymnaea* snail as an intermediate host (Figure 84). Not all areas of Australia are liver fluke prone, only those areas that have springs and wetlands to support the snail will be a risk to cattle.

Liver fluke in cattle rarely cause death, however, the disease may slow growth and reduce milk production, especially in young cattle. Cattle are more resistant to fluke than sheep and usually only young cattle require treatment. In most districts young cattle in fluke areas should be treated in February and maybe again in August in river valleys or areas with high fluke levels.

For further information on treatments for liver fluke in cattle, see DPI Victoria's AgNote, 'Control of Liver Fluke', available at http://www.dpi.vic.gov.au.

Bovine Johne's Disease

Bovine Johne's Disease (JD) (pronounced 'yonees') is an incurable wasting disease of adult cattle caused by cattle strains of JD bacteria. The affected cattle scour

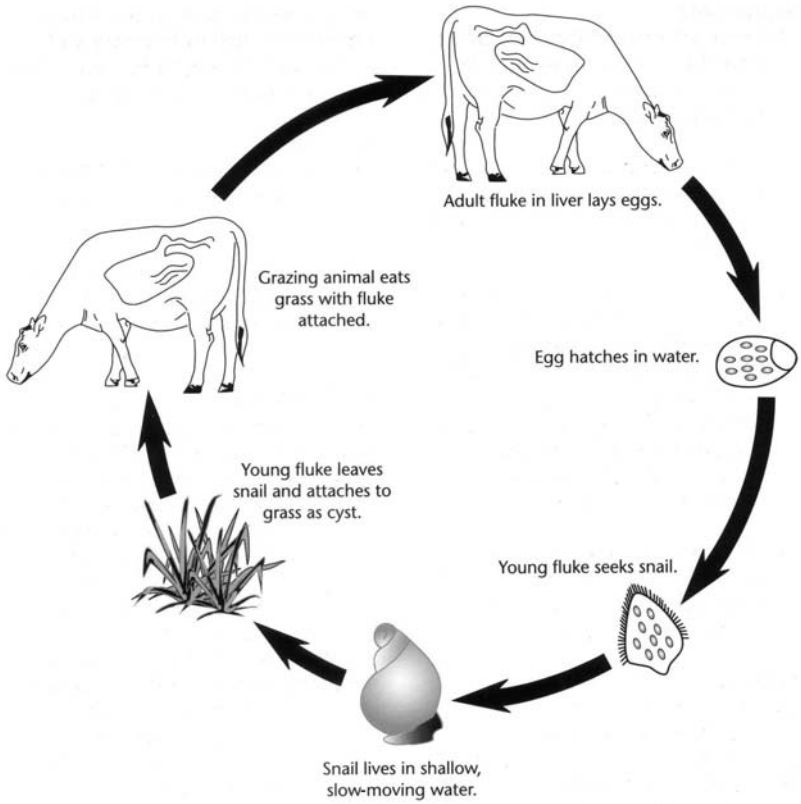


Figure 84. Liver fluke life cycle.

profusely and become emaciated over a period of weeks to months. The bacteria that cause JD can survive for 12 or more months in favourable environments such as wetter areas of farms. Cattle are usually infected when young (less than 12 months), but the clinical disease is usually not seen until they are four plus years of age. However, infected animals can shed the bacteria in their manure before showing clinical signs. The bacteria lodges and multiplies in the wall of the small intestine; inflammatory cells are produced by the animal in response. The gut wall becomes thickened and distorted affecting the animals ability to absorb water and nutrients. Affected with chronic diarrhoea, they lose weight, become emaciated (even though they still have a good appetite) and die.

There is no treatment for Bovine Johne's Disease. Stock should not be allowed to suffer. It is a notifiable disease and owners of infected herds have legal responsibilities regarding agistment of stock and the sale of the farm. If you suspect you have an animal or herd infected with Bovine Johne's, contact your DPI Animal Health officer or local agricultural vet who can help you develop and implement control options. For a brief outline of these options (that include

Figure 85. Example of cracked hoof that will cause lameness. This foot belongs to a 28-month-old Angus bull.

control only, test and cull, progressive depopulation or total depopulation) see DPI Victoria's AgNote, 'Control Options for Bovine Johne's Disease in Beef Herds', at http://www.dpi.vic.gov.au.

Lameness

The most common cause of lameness in older cattle is caused by cracked or abscessed hooves (Figure 85). It can often occur when the ground gets wet and muddy, as this can soften the hoof, leaving it susceptible to bruising or penetration causing infection. It is advisable to have lame cattle checked by a vet. An infection of the soft tissue inside the hoof usually clears after antibiotic treatment, but left untreated can cause permanent lameness. If there is no sign of a crack, check between the claws for foreign bodies like gravel or wire.

Limping can also be due to hip problems after calving or infection in the joints causing stiffness. Lameness often recurs if there is a structural fault with the feet. In bulls it may result in lowered pregnancy rates because they are less willing to mount cows; lame bulls should be treated and sold to an abattoir.

Lameness in very young calves usually means infection. Sometimes bacteria enter through the wet string (umbilical cord) and localise in the leg joints causing stiffness. Early and intensive veterinary treatment will be required.

Leptospirosis

Leptospirosis is a contagious bacterial disease that can be caused by two *Leptospira* organisms, which infect *both* animals and humans. Many infections may pass

unnoticed, but outbreaks can occur. The most severe outbreaks are usually due to the introduction of an infected animal to a previously unexposed and unvaccinated herd. Symptoms of infected cattle develop suddenly and include: red urine, decreased activity, rapid breathing, anaemia and pale or slightly yellow membranes at the mouth or vagina. It can also cause late abortion in cows, with or without the other symptoms.

Infected animals can carry the bacteria for long periods, shedding them in urine and at birth (or abortion) that contaminates the animals' environment. The bacteria can also be spread in contaminated water supplies, food, pasture and soil. Outbreaks are more common in wet years, as flooding after heavy rainfall has the potential to spread bacteria to previously uninfected farms. Because of the nature of the disease, Leptospirosis should not be considered as a problem of an individual animal, but as a problem of the herd. Cattle can be protected using a 7-in-1 vaccine. Calves are vaccinated when 6–8 weeks old and again 6 weeks later. Annual boosters should be given.

Unvaccinated cattle pose a risk to the farmer. Droplets of urine from an infected animal may come in contact with the eye or nasal passage of a human or through poor hygiene practices. In humans, Leptospirosis presents similarly to the flu, with muscular pain, headache, intolerance to light, vomiting, and abdominal pain may also occur. There is no vaccine for humans, so stock should be vaccinated to safeguard your own health.

Milk Fever

Milk Fever usually occurs in cows within 48 hours before or after calving. It is more common in older cows and fat cows, especially the heavy milk producers. It is a metabolic disease that is caused by a low blood calcium level. Some cows cannot cope with the sudden loss of calcium through their milk.

Often the first sign will be that the cows are agitated and there is a tremor in the muscles of the head and limbs. They tend to stagger and go down and cannot stand up. If the cow is not treated she will go down on her side, legs straight out, and die due to circulatory collapse.

Treatment should be given as soon as possible. Milk Fever is often treated with a '4-in-1' pack injected under the skin, ensuring the cow is left in a position where she cannot roll herself into trouble (i.e. don't let her lie head first downhill), and provide feed and water.

If you are finding that you are having a number of cows go down with Milk Fever, feed management in the fortnight prior to calving in the future will be important to help minimise the incidence. The feeding of hay prior to calving and restricting access to green feed results in acidic blood. This favours calcium mobilisation and helps prevent the occurrence of Milk Fever.

Pinkeye

Pinkeye is an infection of the surface of the eye and the surrounding membrane or conjunctiva. Affected eyes are weepy and inflamed. This may progress to cloudiness and then to a creamy yellow colour. Some eyes heal over after several weeks but some become pointed and rupture.

Pinkeye can reduce growth rates in young cattle. In most cases, cattle fully recover without treatment, but in some cases, they may be left with permanent blindness. Calves are often the worst affected with up to 80 per cent of the calf drop being affected in a bad year. Treatment of Pinkeye is only warranted if two eyes are affected or the cattle are being yarded for another reason. Because flies and dust spread the disease, excessive yarding to treat Pinkeye could result in increased spread of the infection to unaffected stock.

For advanced cases, a vet may prescribe a cream that is applied to the eye that contains antibiotics and drugs that will reduce the inflammation, or Pinkeye patches. Pinkeye patches offer protection from further irritation from sunlight, dust and flies. There are ready-made patches available or you can make your own using heavy cloth (e.g. denim) or a dust mask that can be glued onto the animal and will fall off after a few weeks.

There is also now a vaccination available for Pinkeye. Discuss with your local vet whether it would be beneficial for your herd to use the vaccine or not. The vaccine needs to be given 3–6 weeks before the onset of the expected Pinkeye season.

Warts

Warts are caused by a virus that affects young cattle in particular. They usually occur on the head, neck and shoulders, but can be found anywhere on the body. They are usually small and generally cause little trouble, although in severe cases large areas may become involved that bleed and can become infected or flyblown and require treatment. Warts on individual animals can be removed surgically or a vaccine could be produced by your vet from the warts themselves. If possible, try and isolate the wart-affected animals because the warts can spread between animals.

14

Cattle handling

Being a good cattle handler depends on the use of three elements: flight zone, point of balance and the right attitude. You have to give animals the time to assess situations before expecting a reaction from them. You need to respect an animal's ability to do injury, due to their strength and speed. And you have to have a positive attitude towards the care of the animal.

A natural instinct of cattle when threatened is to fight or flee. Thus, developing an understanding of their flight zones is a useful tool. Adopting principles based on cattle behaviour has led to many of the low stress cattle handling methods that are taught today.

Flight zone and point of balance

A flight zone is an area of 'safety' or personal space around an animal. If a person or predator enters the flight zone the animal will move away. This is done to re-establish a 'safe' distance. The size of the flight zone will depend on the temperament and tameness of the animal. Tame animals will have a very small flight zone – this can make them quite hard to move. As an animal becomes excited, their flight zone will increase substantially. Once an animal becomes excited, it may take 20–30 minutes for them to calm down and be able to be handled safely.

The point of balance is a position that influences an animal's movement. The point of balance in cattle is at its shoulder. If the handler is within the flight zone, cattle will move forward when the handler stands *behind* the point of balance. They will back up if the handler stands in front of the point of balance. To *stop*

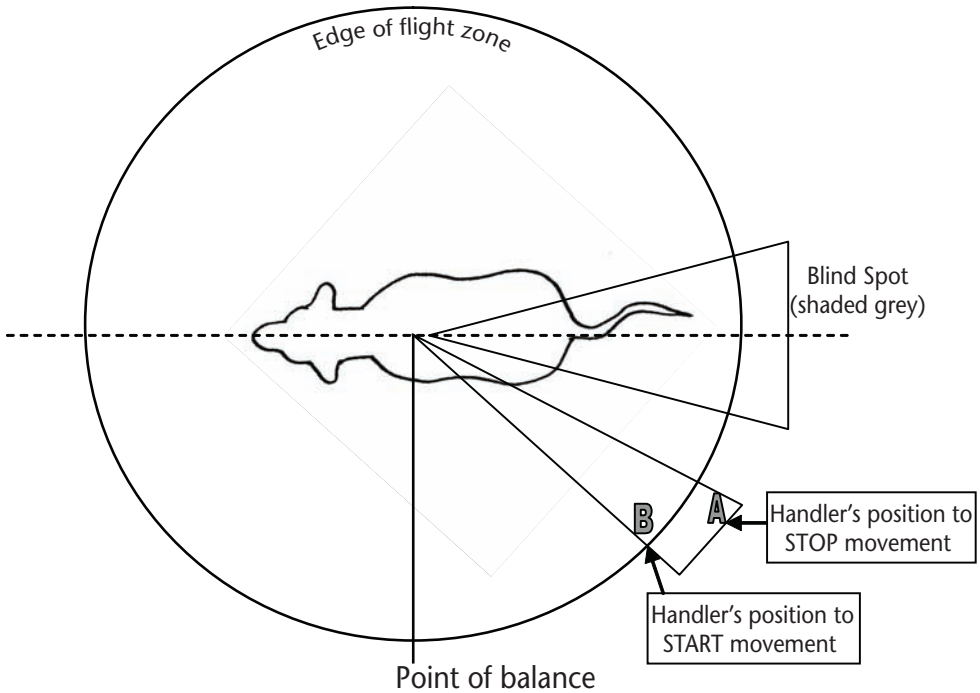


Figure 86. Understanding flight zone and point of balance. (Adapted from http://www.grandin.com.)

movement the handler needs to *step out* of the flight zone. An animal is best driven when the handler stands 45° to 60° from the point of balance as shown in Figure 86.

A handler who understands the concept of flight zone and point of balance will be able to move animals more easily. An animal will begin to move away when a handler enters the flight zone. If all the animals are facing the handler, this means the handler is outside the flight zone. When the handler enters the flight zone the animals will turn away. These principles can be used when moving cattle in open spaces or in yards.

Moving cattle along a race

To move cattle along a race, the handler enters the flight zone in front of the animal and moves in the opposite direction to the movement desired, generally from the front of the race to the rear. When the handler crosses the point of balance, the animal will move forward. This also applies when loading animals onto a truck (Figure 87).

Moving mobs of cattle

Mobs of cattle have collective flight zones. The handler can utilise this feature when trying to move a mob in an open area. To keep stock moving, the handler

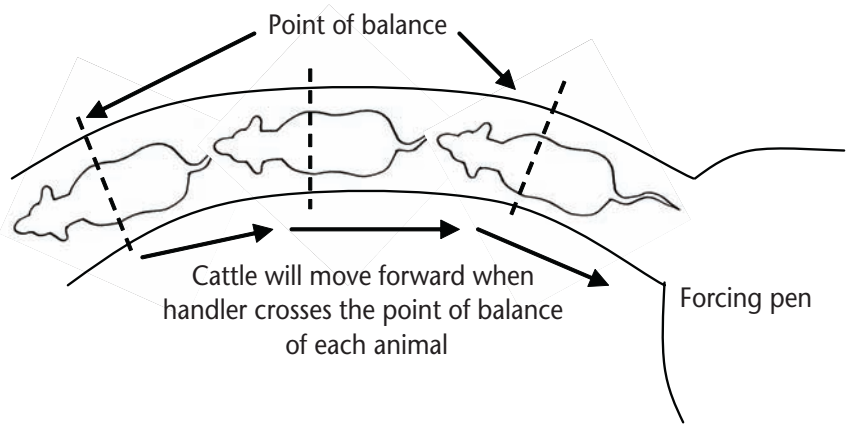


Figure 87. Moving cattle along a race. (Adapted from http://www.grandin.com.)

alternates between entering the collective flight zone and withdrawing. It is more effective to use alternative pressure on the flight zone than continuous pressure. The ideal method involves entering the flight zone when walking in the opposite direction of movement desired and retreat from the flight zone when walking in the same direction as the desired movement as shown in Figure 88.

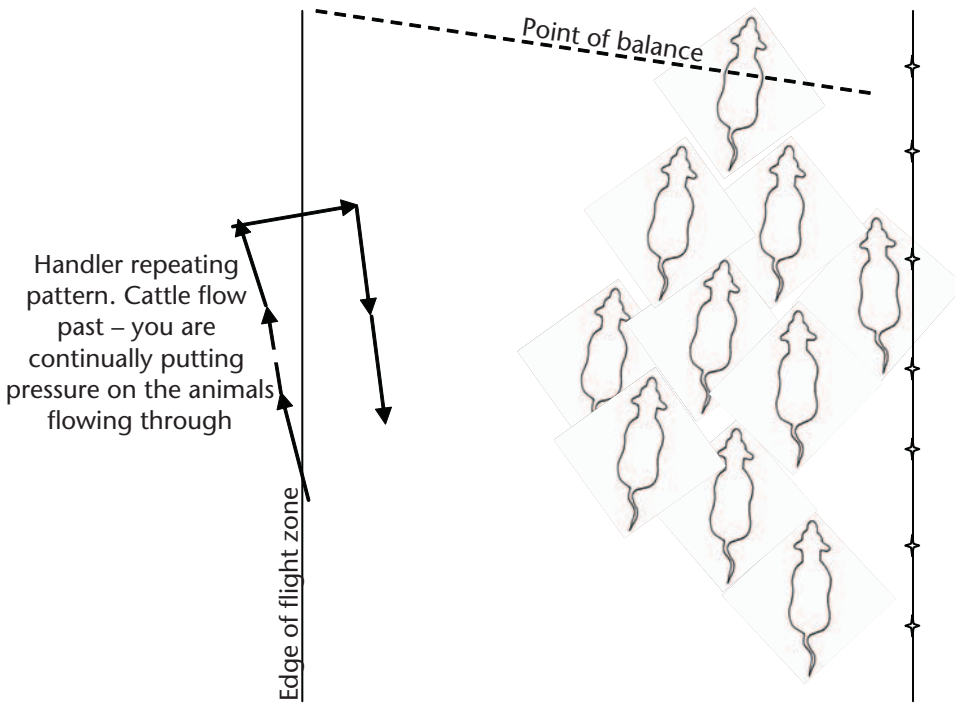


Figure 88. A method of moving cattle through paddocks. (Adapted from http://www.grandin.com.)

Moving cattle out of yards and sorting

Moving cattle through gateways can be done easily and quietly. The speed with which the cattle run through the gateway should be controlled by the handler to ensure they do not run wildly through. Stock must learn that you are in control of their movement.

When sorting cattle through a gate, eye contact should be made with the ones you want to hold back. Turn your eyes away from those that you want to let through. Use this in conjunction with point of balance and flight zone principles. Once the stock begin to move through the gate, stay on the edge of their flight zone. If the animals stop moving take a step forward into the flight zone and move away from where you want them to travel as seen in Figure 89. Once they are moving again, ensure that you step back out of the flight zone so the cattle feel they have an escape route through the gate. If too much pressure is put on them by the handler at the gateway, cattle will baulk and turn back into the yard looking for an alternate escape route.

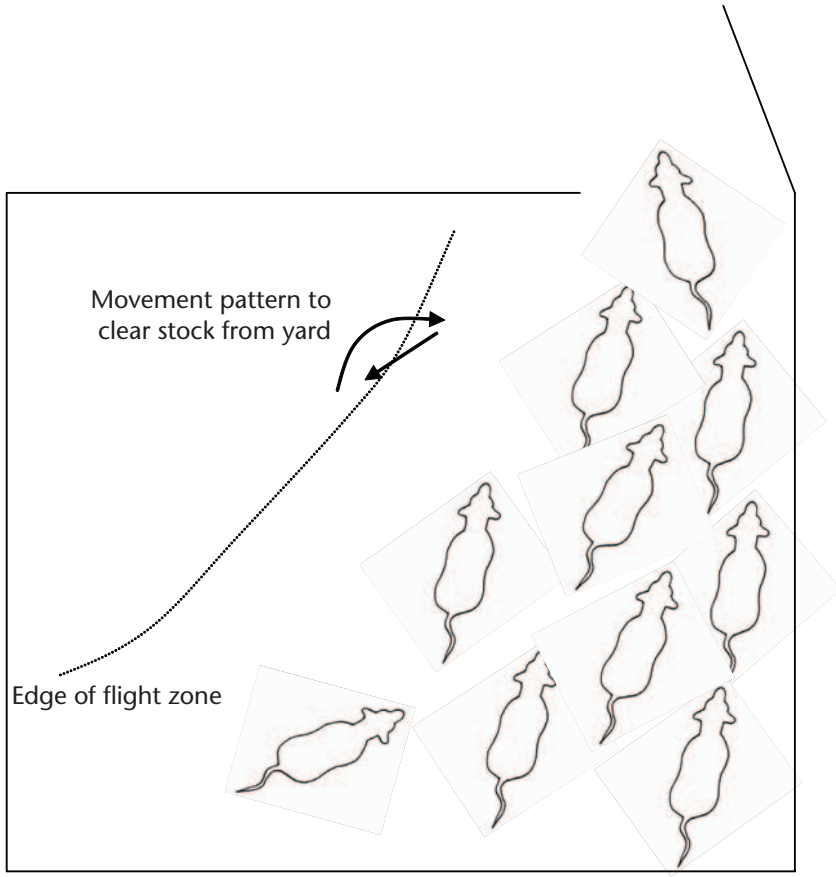


Figure 89. Suggested movement pattern for moving stock in yards. (Adapted from http://www.grandin.com.)

Remember not to overcrowd the yards when working with cattle. Ideally they should only be half full to allow sufficient movement.

Gathering and loose bunching

Gathering and loose bunching is the best method to move cattle in large open spaces such as paddocks (Figure 90). A large portion of the herd must be loosely bunched before you attempt to move them. Loose bunching can take anywhere between 5–20 minutes, depending on the size of the herd, the temperament of the cattle and the terrain. Loose bunching is accomplished by applying light pressure on the edge of the collective flight zone. This causes the cattle to huddle together somewhat.

To do this, start making a series of wide back and forth movements on the edge of the herd. The movement you are making should be a slight arc. Do not exceed more than a quarter circle in your movements. Do not circle around the cattle as this will cause them to scatter. The handler should continuously move back and forth. If you linger too long in an animal's blind spot it may turn back and look at you.

It is important to take your time. Up to 20 back and forth movements may be required before the herd are in a suitable loose bunch. Remember to move enough to the side so that the lead animals can see you.

Cattle that are off to one side of the herd (stragglers) will be attracted as the herd moves into a loose bunch. Do not chase stragglers. It is very important to resist the urge to press the cattle into loose bunching too quickly. Take time to

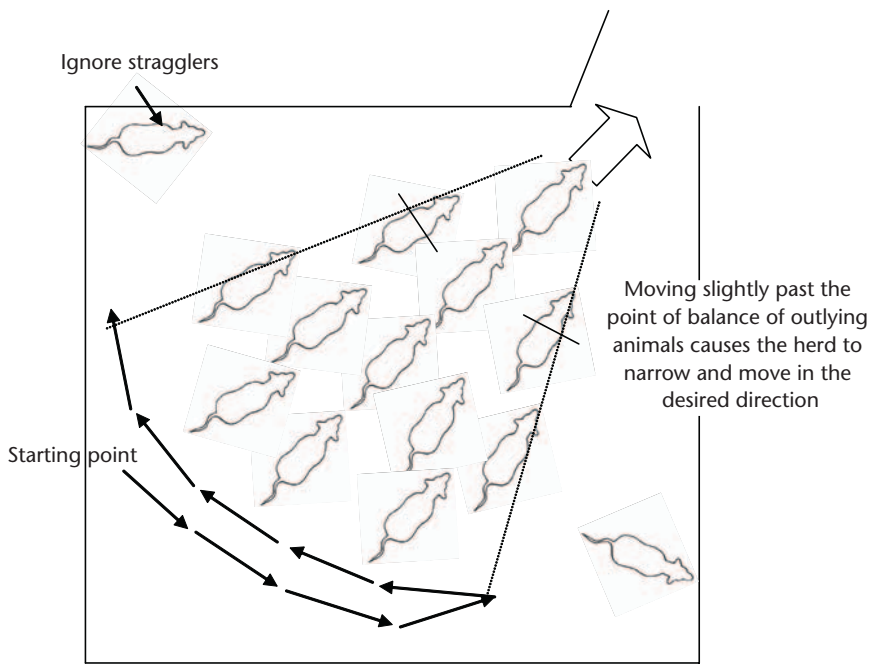


Figure 90. Gathering and loose bunching. (Adapted from http://www.grandin.com.)

allow the cattle to bunch together. If working with cows and calves, be patient, allowing time for the calves to find their mothers. As well as moving back and forth, the handler needs to press closer to the herd from time to time to induce movement in a forward direction.

There is both 'good' and 'bad' movement regarding shifting cattle. Cattle with 'good' movement can be easily moved in the desired direction. They will all be headed in the same direction and move smoothly. Good movement starts with one animal. The remainder of the herd will gradually follow.

'Bad' movements will prevent other animals from following in an orderly manner. There are two types of 'bad' movement:

1. running, cutting back and other panic induced movements; or
2. animals stop moving as an orderly stream in the desired direction.

When the herd starts moving in a circular motion, essentially going nowhere, this is an example of an extreme case of bad movement.

When cattle are unsure where the handler is, they will stop and look around, hindering good movement. They will turn around and look at a person or a dog that is in their blind spot or is outside the flight zone. Remember not to remain more than momentarily in any individual's blind spot.

To make the herd move, pressure has to be applied to both the collective flight zone and individual animals within the group. When the cattle respond to the pressure on the flight zone, the handler should change their direction of movement to relieve pressure. Continual forward pressure by the handler at this stage could place too much pressure on the animals causing them to scatter. By the handler relieving the pressure on the flight zone, the cattle are rewarded for moving in the desired direction. With low pressure now, they are more likely to continue with the desired movement. When the desired movement slows down, the handler must apply pressure again.

If you need to change the direction the cattle are moving in, move further out to the left of the herd and the cattle will move to the right, and vice versa. Remember to step out of the flight zone from time to time to relieve the pressure, especially if you are changing the position or the direction of the cattle.

If the cattle become stirred, just like in the yard scenario, it will take 20–30 minutes for them to settle back down.

Every time you work your cattle you are training them. You can train them to be easy to handle and have good movement. If you are not patient you may end up with difficult cattle that have bad movement.

15

Selling your stock

Several factors will affect the price that you will receive when selling your cattle. These include:

- the weight of the animal
- its sex
- age
- fat cover
- muscling
- the current supply level.

The weight and fat cover of your cattle will determine if they are ready to be sold. It also influences which market they can be sold into. Lightweight, finished vealers and yearling cattle (240–400 kg liveweight) are usually purchased by domestic supermarkets and butchers.

Store condition lightweight cattle may be purchased by feedlots and grass finishers. Heavier steers (400–550 kg liveweight) at 18–24 months often go to the domestic hotel and restaurant trade.

The heavier grass-fed or grain-fed cattle (500–700 kg liveweight) go to the Japanese market, while the South-East Asian, United States and Korean markets take a variety of weight ranges.

There are plenty of options available when it comes to marketing your stock. To choose the most appropriate option, you need to know the advantages, disadvantages, costs, and likely returns from the different marketing options.

Some of the major methods of selling your cattle include:

- paddock sales
- saleyard auctions
- over the hooks
- AuctionsPlus
- forward contracts
- alliances.

Paddock sales

Cattle are inspected by the buyer on the vendor's property and sold straight from the paddock. The price is generally negotiated on the spot, usually on a dollar per head basis. Many people advertise their upcoming paddock sales or stock for sale via paddock sales on their web pages. To find them try entering 'paddock sales' and 'cattle' into an internet search engine.

Advantages:

- For stock, it is relatively stress free because they are only being transported once.
- You can maintain the condition of the stock right up to the point of sale. The cattle don't need to stand around in strange yards for hours before being sold.
- Selling costs are minimal.
- Buyers know in advance the number and type of stock being delivered.

Disadvantages:

- There can be limited competition from buyers.
- You often receive no carcase or breeding feedback from buyers, especially if they are sold to another farmer rather than an abattoir.
- It is inefficient for buyers if small numbers are to be sold (with the exception of stud stock).
- There is potential for difficulties arising in agreeing on weights, perhaps due to the use of unregistered scales and non-defined curfews.

Saleyard auctions

Most cattle are still sold through the saleyard auction system. This can either be on a cents per kilogram (c/kg) or dollars per head ($/hd) basis, depending on the saleyard and the type of sale being conducted.

Advantages:

- Good competition between buyers who can compare the quality of what is on offer.

- All stock types and lots of any size can be sold, so it is a good outlet for small numbers of stock.
- The vendor can set a reserve price.
- Payment is guaranteed by the agent you are selling through.

Disadvantages:

- There are transport costs, saleyard dues and weighing fees that must be paid (see Table 21).
- There is no option for negotiation between buyers and vendors.
- The vendor receives limited feedback about their cattle (generally only the price and weight are provided with no carcase details, etc.).
- Stress from transporting and handling can cause meat quality issues in stock going for slaughter.
- The buyer often bases their decision to buy on a subjective assessment that might not reflect the true quality and value of the cattle on offer.

Over the hook sales

With this method of sale the cattle are delivered directly to the abattoir. You may choose to use an agent to assist in selling the stock, but this is not a requirement. Change of ownership takes place at the abattoir. Different abattoirs will have varying terms of trade. Generally the producer will pay for the transport to the abattoir. Stock are either sold on an agreed cents per kilogram carcase weight or via a price grid where premiums and discounts are calculated for different carcase attributes such as muscling and fat depth (Figure 91).

The actual carcase weight of the animal can vary depending on the carcase trim used. The carcase is weighed at the end of the chain while it is still 'hot', before going into the chillers. This is reported as the 'Hot Standard Carcase Weight'.

Advantages:

- The price received is not affected by subjective appearance values such as coat colour.
- Producers are supplied with feedback so they can see how carcase quality affects the price received.
- There is minimal transport and handling of cattle prior to slaughter.
- There is no price discounting (as often happens in the saleyard) for heifers meeting the same specifications as steer carcases.

Disadvantages:

- There is reduced competition if no comparisons are made between buyers.
- Variations can exist between abattoirs for carcase trim and feedback given.
- There will be heavy discounts for cattle that fall outside specifications.

Figure 91. Assessing carcase quality.

AuctionsPlus

AuctionsPlus is the leader in online, web-based auctions. It allows commodity transactions, reserve price setting and legal change of ownership without the seller, buyer or product having to come together physically at the time of sale.

The cattle are assessed prior to the sale by an accredited AuctionsPlus assessor. The sale is often 'on farm' (cattle remain on the property and the auction is run through the computer system) with the cattle details entered into a computer. AuctionsPlus also runs interface auctions where the auction is live online in real time, and is also run at the same time from a saleyard. Your online bid is immediately transferred to an AuctionsPlus agent at the saleyard who raises your bid with the auctioneer.

Cattle can be sold either on a dollars per head, cents per kilogram liveweight basis or on a cents per kilogram carcase weight basis (subject to adjustments for bruising of the carcase). Transport costs are paid by the purchaser and the vendor pays the cattle transaction levy. Sales are held most weekdays. Check http://www.auctionsplus.com.au to see when the next auctions are being held.

Advantages:

- AuctionsPlus suits geographically isolated producers.
- There are a range of buying and selling options.

- Often good information is available on the stock presale to help you make informed decisions.
- Sellers can set a reserve price on their stock.
- There are no transport costs for the seller.
- Payment is guaranteed.
- There is minimal transport of stock.

Disadvantages:

- Buyers have to adjust to using a computer and not viewing live animals.
- There needs to be confidence in the AuctionsPlus assessor.

Forward contracts

A forward contract is essentially a contractual agreement between two parties (such as producer and feedlot) to supply a given product at a given time for a given price. The contract will state:

- the number of cattle to be delivered;
- the age, sex, breed type, weight range and fat score of the contract cattle;
- when they are to be delivered and
- the pricing arrangements.

Advantages:

- You eliminate the risk of price fluctuation (you are given a guaranteed price).
- It allows you to confidently plan the purchase of cattle and feed.
- A guaranteed return can assist when negotiating loans and managing financial arrangements.
- Processors can guarantee continuity of supply and maintain the reputation and integrity of their product brands.
- Processors can clearly communicate their precise requirements to both producers and agents.

Disadvantages:

- You need to have a high degree of control over your production system to ensure you supply the specified product at the specified time.
- If you are unable to supply the stock as specified in the contract, you are required to supply any shortfall with an equal number of animals from an alternative source. This can lead to large losses in certain circumstances.
- Prices may move to a more favourable situation on the spot market, therefore reducing your returns.

Alliances

An alliance is a group of producers who have formed a collective to supply a consistent, high quality red meat product to the consumer. It is only achieved by all sectors of the industry working together for the financial benefit of everyone involved. For this to occur:

- the product needs to be accurately assessed,
- the price needs to be directly related to the quality of each product and
- the feedback on price and quality must be communicated from the consumer to the producer.

An example of an alliance is EnviroMeat based in Gippsland, Victoria. EnviroMeat is made up of 25 producers whose cattle are grown on farms where there is an environmental management system in place. The meat is MSA graded, so is guaranteed tender. By utilising the 25 farms, they can guarantee supply throughout the year.

Advantages:

- Price fluctuations are reduced.
- A consistent premium price can be achieved for a consistent premium product.
- Price reflects the retail value of the carcase rather than supply and demand.
- Good feedback is received that assists with future breeding or selection of cattle.

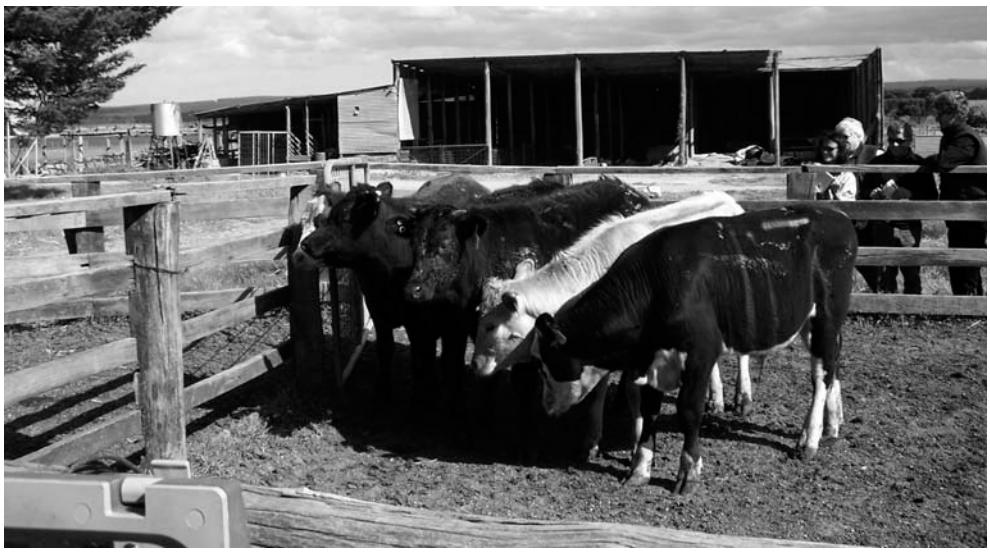


Figure 92. Farmers attending a course on beef marketing.

- Generally not all your stock are sold through the alliance, allowing you to access other markets.

Disadvantages:

- You need to have a high level of control over your production system to ensure you can supply the specified product at the specified time.
- Success in the marketplace for branded products requires consistency of supply.

Selecting a marketing method

There is no one best method for selling your cattle. Practical experience and extensive research indicates that some types of beef cattle suit a particular marketing method better than others. Table 20, matching cattle to marketing methods, could help in making a decision on which marketing method to use for your cattle. Ask your local Department of Primary Industries about courses they run on beef marketing. They can help you explore other options and help determine what is required of your stock.

Figure 93. EnviroMeat – an example of a successful producer alliance operating in Victoria.

Table 20. Suitablility of cattle for different marketing methods

Marketing method	Types of suitable cattle
Saleyards (c/kg liveweight)	Cattle of popular breeds or crosses
	Overfat cattle (they are less likely to be discounted)
	Cattle drafted out from 'over the hooks' consignments because they don't meet specifications
	Small mobs
	Attractive lines of breeding cattle
Saleyards ($/head)	Cattle in store condition (attractive to restockers and finishers)
	Small mobs
	Store cattle
	Stud stock
Paddock sales	Cattle suitable for live export
	Large mobs (truck load(s))
	Cattle with above average dressing percentages
Over the hook (c/kg dressed weight)	Cattle that meet the required specifications in terms of age, fat, carcase weight and meat colour
	Cattle of less popular breeds and crosses that meet specifications
	Cattle from producers wishing to get feedback
	Large mobs
AuctionsPlus	Cattle able to meet specifications required from buyers who operate regularly on AuctionsPlus
	Cattle not gaining weight rapidly at assessment
	Larger lines of store steers
	Cattle from producers who can produce a premium product and want a premium price
	Stud cattle
Alliances and forward contracts	Cattle from producers who want to build up a relationship with others in the meat chain to ensure a regular and reliable market for their cattle
	Cattle from producers who want the price to reflect the retail value of the carcase not purely supply and demand
	Cattle from producers who want feedback on their cattle
	Cattle from producers who have a high degree of control over the production system
	Cattle of a less popular breed that met carcase specifications

Table 21. Guide to the costs of selling cattle

Cost	Description	Approximate amount
Transit insurance	Insuring the cattle while in transit from your farm to their destination	0.35% of the total value of sale
Agents commission	The agents fee for co-ordinating the sale of your cattle	4–6% of the total value of sale
Saleyard fees	A fee charged by the saleyard to yard and weigh your stock	$4–$8 per head when unweighed; $5–$10 per head when weighed
Transaction levy	Meat and Livestock Australia (MLA) uses levy funds to provide marketing, promotion and R&D services to the Australian red meat industry	$5 per head
Cattle compensation levy	A state collected tax for the purpose of compensating owners of cattle with compensatable cattle diseases	Around 0.25% of the total value of sale

Factors that you may need to consider when selecting a selling method are:

- transport costs
- type of stock
- size of mob
- the best likely net return
- the risk involved by using a given method
- the importance of carcase feedback information
- whether or not you prefer to use an agent
- your agent's recommendation
- local experience
- your own preference
- your assessment and marketing skills
- the market trend at the time.

Marketing costs

Table 21 outlines of the cost of selling cattle. Saleyard fees can vary greatly from saleyard to saleyard. Many of the costs in the table may change over time and the selling system with the lowest costs may not necessarily return the highest prices. Sales without agents have no guarantee of payment; the agent's commission should be considered as a fee-for-service cost.

Appendix 1 Comparative ratings of economic traits of 26 breeds of cattle

	Age at puberty	Gestation length	Calf size	Milking ability	Mothering ability	Mature size	Longevity	Feed efficiency	Disposition	Cold tolerance	Pre-weaning growth	Post-weaning growth	Age of fattening	Muscling	Fertility	Calving ease	Horned or polled	Maternal	Terminal	Rotational
Angus	E	S	S	3	2	S	2	3	3	2	3	4	E	3	2	2	P	Y		Y
Beef Shorthorn	A	A	M	3	2	M	3	3	2	3	3	4	E	4	3	2	H	Y		Y
Blonde d'Aquitaine	A	L	L	3	3	L	3	2	3	3	2	2	L	2	3	4	H		Y	Y
Braford	L	A	M	3	2	M	3	2	3	4	2	3	A	3	4	2	HP			Y
Brahman	L	L	M	4	2	M	3	3	5	4	3	4	L	3	4	2	HP	Y		Y
Brangus	A	A	M	3	2	M	3	3	4	4	2	4	A	3	4	2	P	Y		Y
Brown Swiss	L	A	L	1	3	L	3	2	2	3	1	1	L	3	3	3	H	Y	Y	Y
Charolais	L	L	L	3	3	L	4	2	3	3	1	1	L	1	4	4	H		Y	
Chianina	L	L	L	4	3	L	3	2	3	4	1	1	L	1	3	4	H		Y	
Devon	A	A	M	3	3	M	3	3	2	3	2	3	E	3	3	3	H	Y		Y
Friesian	A	A	L	1	3	L	3	2	2	3	1	1	L	3	2	3	H	Y	Y	Y
Galloway	E	S	S	3	2	S	2	3	3	1	4	4	A	3	2	2	P	Y		Y
Hereford	A	A	M	5	3	M	2	3	2	2	4	3	E	3	2	2	H	Y		Y
Jersey	E	S	S	2	3	S	3	2	3	4	4	5	A	5	3	1	H	Y		

	Age at puberty	Gestation length	Calf size	Milking ability	Mothering ability	Mature size	Longevity	Feed efficiency	Disposition	Cold tolerance	Pre-weaning growth	Post-weaning growth	Age of fattening	Muscling	Fertility	Calving ease	Horned or polled	Maternal	Terminal	Rotational
Limousin	A	L	M	3	3	M	3	3	3	3	2	2	L	2	2	4	H		Y	Y
Maine Anjou	L	L	L	2	3	L	3	2	2	3	1	1	L	2	3	4	H	Y	Y	Y
Milking Shorthorn	A	A	M	2	3	M	3	3	3	3	3	3	A	4	3	3	H	Y		Y
Murray Grey	E	A	S	3	2	M	2	3	2	3	2	3	A	2	2	1	P	Y		Y
Poll Hereford	A	A	M	5	2	M	2	3	2	2	4	3	E	3	3	2	P	Y		Y
Poll Shorthorn	A	A	M	3	3	M	3	3	2	3	3	4	E	4	3	2	P	Y		Y
Red Angus	E	S	S	3	2	S	2	3	3	2	3	4	E	3	2	2	P	Y		Y
Red Poll	E	S	M	2	3	S	3	3	3	3	3	3	A	3	3	2	P	Y		Y
Santa Gertrudis	L	L	M	3	4	M	4	2	3	4	2	2	A	3	5	3	HP	Y	Y	Y
Simmental	A	L	L	1	2	L	2	1	2	3	1	1	L	2	2	4	HP	Y	Y	Y
South Devon	A	A	L	2	3	L	3	3	2	3	2	3	E	3	3	3	H	Y		Y
Welsh Black	A		M	3	3	S	3	4	3	2	3	4	E	4	3	2	H	Y		

Key: Y indicates suitable for this use. Age at puberty/Age of fattening: E, early; A, average; L, late. Gestation length: S, short; A, average; L, long. Calf size and mature size: S, small; M, medium; L, large.

In all columns carrying numerical grades:
1 is high or desirable, 5 is low or undesirable.

Comparisons of breeds on the basis of productive performance are given in:

Kellaway, RC (1971). 'Breeds and Breeding of Beef Cattle. Part 1. Production and Fitness Characters of Straightbred Cattle.' Australian Meat Research Committee (AMRC), Review No. 1. Sydney.

Kellaway, RC (1972). 'Breeds and Breeding of Beef Cattle. Part 2. Production and Fitness Characters of Cross-bred Cattle.' Australian Meat Research Committee (AMRC), Review No. 7. Sydney.

Mason, IL (1971). Comparative Breed Performance of the Large Cattle Breeds of Western Europe. *Animals Breeding Abstracts* **39**, 1–26.

Appendix 2 Approximate weight at various ages and for different breed types

Age	Average weight (kg) British breeds	Average weight (kg) European breeds
6 months	170	200
9 months	260	300
12 months	300	340
15 months	350	390
18 months	400	450
2 years	500	550
Adult cows	450–550	550–650

Appendix 3 Market specifications

You should consult with your potential customers to determine exact specifications as these can change over time. These tables are courtesy of the More Beef From Pastures manual, available from Meat and Livestock Australia (MLA), http://www.mla.com.au.

Table 1. Specifications for common prime beef markets

Characteristic	Market		
	Japan	EU	Local trade MSA
HSCW (kg)	300–400	260–338	160–220
Dentition (adult teeth)	0–6	0–4	0
P8 fat depth (mm)	10–40	6–22	3–10
Butt/muscle shape/score	A–C	A–C	A–C
Bruising	nil	nil	–
Sex	steer	steer & female	steer & female
Ossification score	–	–	<180
Marbling score	–	–	>0.5
Fat colour score	0–3	0–3	0
Meat colour grade	–	1b–3	1a–2
Eye muscle area (sq cm)	–	>85	70
Ultimate muscle pH	–	–	<5.71
Loin temperature (°C)	–	–	<9
Retail meat yield (%)	–	–	70
HGP status	–	free	Yes
Acceptable compliance (%)	–	90	85

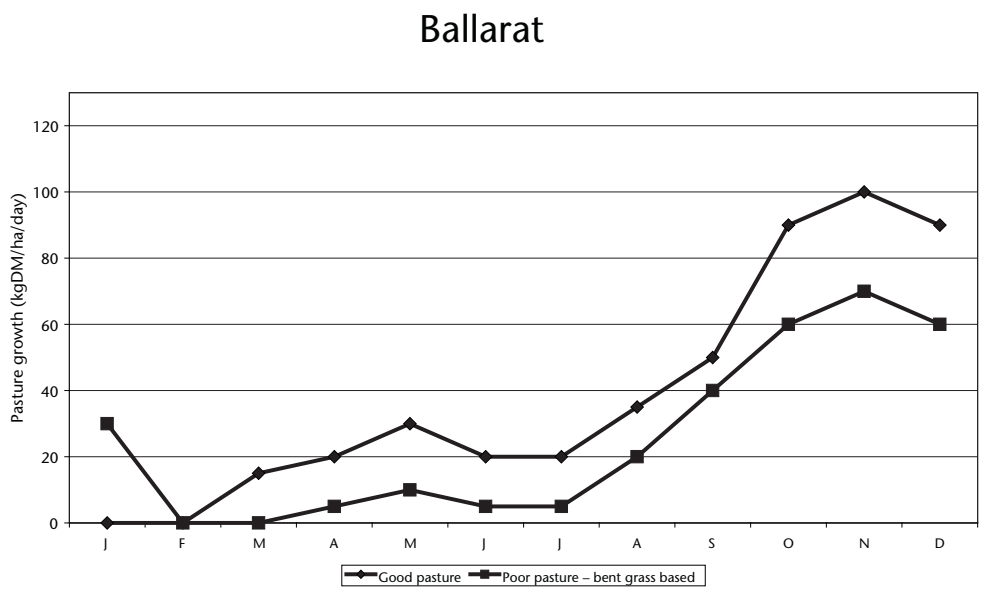
Table 2. Feedlot entry specifications

Characteristic	**Feedlot target**			
	Long-fed	**Mid-fed**	**Short-fed**	**Trade**
	220+ days	**120–150 days**	**100 days**	**70 days**
Sex	steer	steer	steer	steer & female
Dentition (adult teeth)	0–4	0–2	0–2	0
Breed	Angus, Murray Grey, Shorthorn	British breeds and British crosses	British breeds, *Bos indicus* crosses, Euro crosses	British breeds, *Bos indicus* crosses, Euro crosses
Empty entry weight (kg)	400–600	420–480	440–480	250–350
HGP status	Free	Free	Any	Any
Frame score	>4.5	>4.5	>4.5	–
Muscle score	C+	C+	C+	D+
Condition score	1–2	1–2	1–2	1–2
Temperament	Quiet	Quiet	Quiet	Quiet, weaned, yard broken

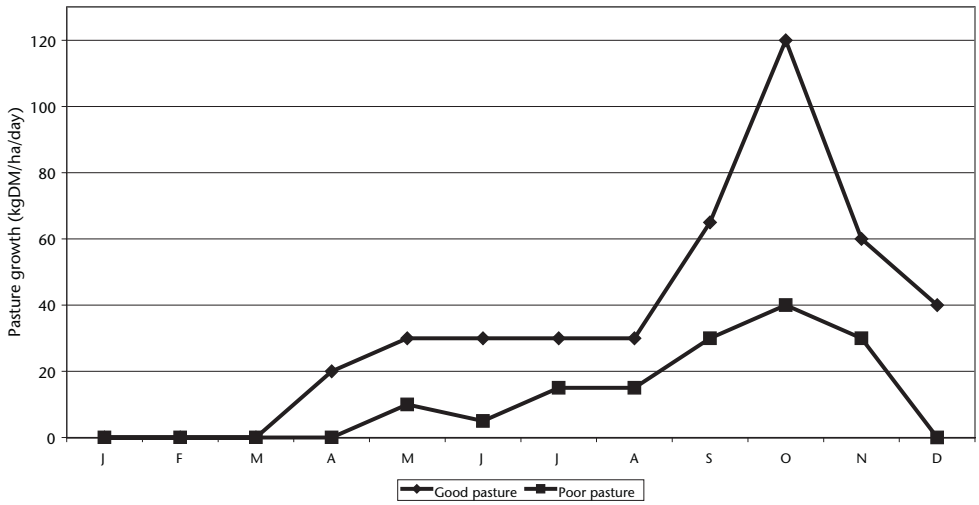
Table 3. Examples of breeding and store stock specifications

Characteristic	Breeding females	Store weaners
Breed	Angus	Hereford
No. head required	25	200
Liveweight	480	220
Frame score	4.5	5
Dentition (adult teeth)	2	0
Age (months)	24	7
Condition score	2.5	1
Butt/muscle shape	A–C	A–C
Bloodlines	Te Mania	–
Sex	Female	Steer and female
Pregnancy status	Pregnancy tested in calf (PTIC)	–
Calving date	25 July 03	–
Breedplan EBV	Yes	–
Marbling (%)	2.1	0.5
Feed conversion efficiency	8:1	–
Eye muscle area (sq cm)	–	–
Structural soundness	Yes	Yes
Temperament	Quiet	–
Health treatments	7 in 1	–
HGP status	free	free

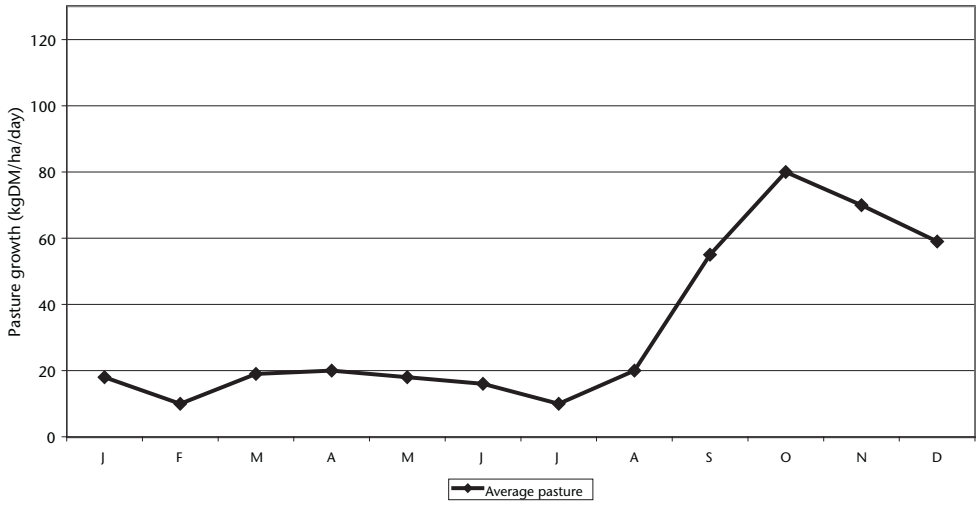
Appendix 4 Pasture growth rates (kgDM/ha/day) for different areas of Victoria



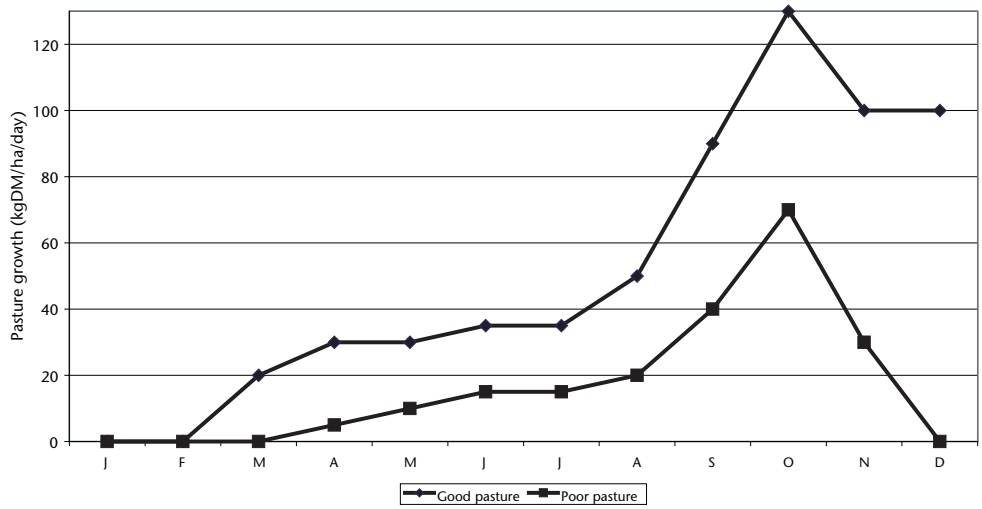
Balmoral



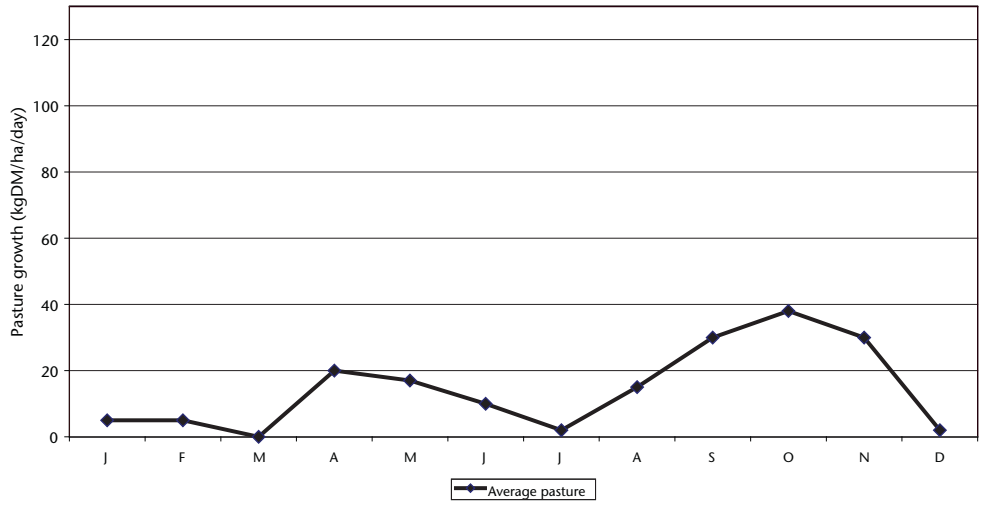
Ellinbank

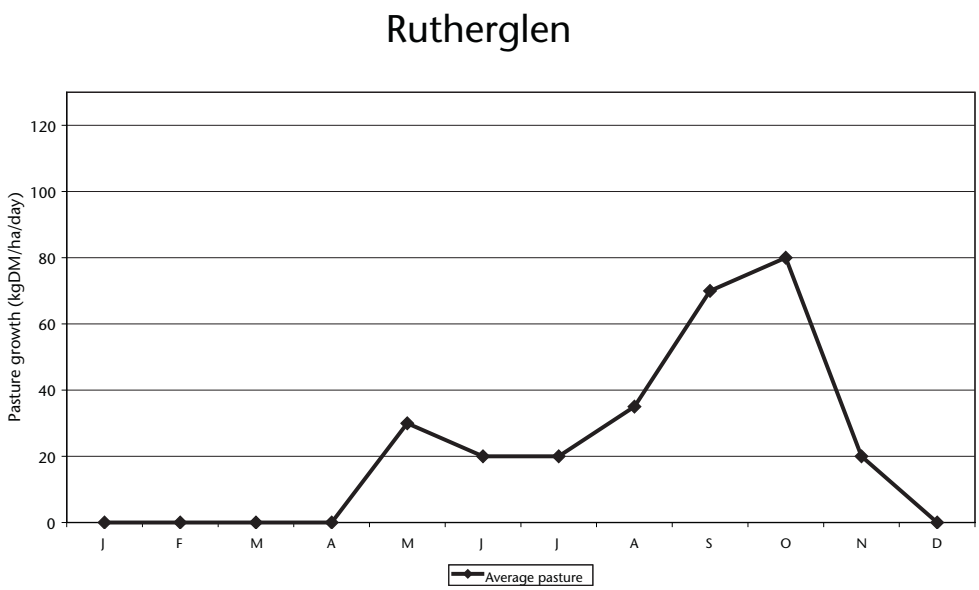


Hamilton



Maffra - dryland




Rutherglen
Pasture growth (kgDM/ha/day)
120
100
80
60
40
20
0
J
F
M
A
M
J
J
A
S
O
N
D
Average pasture

Appendix 5 Who can help?

Department of Primary Industries Victoria
Customer Service Centre 136 186
http://www.dpi.vic.gov.au

Department of Primary Industries New South Wales
02 6391 3100
http://www.dpi.nsw.gov.au

Department of Primary Industries and Resources South Australia
08 8463 3000
http://www.pir.sa.gov.au

Department of Primary Industries and Water Tasmania
1300 368 550
http://www.dpiw.tas.gov.au

Meat and Livestock Australia (MLA)
For information on markets, marketing, research and development, events in your area, MLA publications and industry programs.

General enquiries
1800 023 100

National Livestock Identification System database helpdesk
1800 654 743

National Vendor Declarations
1800 683 111
http://www.mla.com.au

National Livestock Reporting Service (NLRS)
A service offered through MLA that collects and reports on market data. Available reports:

Weekly livestock indicators
Daily livestock indicators
Individual saleyard reports
Over the hooks reports
Slaughter reports
Feeder cattle reports
State summaries
Hide report
Sydney wholesale report
http://www.mla.com.au/nlrs

RIST – Rural Industries Skills Training
An independent provider of rural training who offer a diverse range of short courses that have practical on farm applications (e.g. BeefCheque, Effective Breeding, Practical Beef Marketing). They also offer traineeships and apprenticeships.

03 5573 0943
http://www.rist.com.au

Australian Government Department of Agriculture, Fisheries and Forestry
The Australian Department of Agriculture, Fisheries and Forestry's role is to develop and implement policies and programs that ensure Australia's agricultural, fisheries, food and forestry industries remain competitive, profitable and sustainable. The website contains information on all aspects of farming and how to access various grants and assistance.
http://www.daff.gov.au

Landcare Australia
Landcare is a uniquely Australian partnership between the community, government and business to 'do something practical' about protecting and repairing our environment. More than 4000 volunteer community landcare groups (including Bushcare and urban landcare, Rivercare, Coastcare and sustainable agriculture groups) are tackling land degradation all over Australia.
http://www.landcareonline.com

Glossary

Acidosis An accumulation of acid in the rumen (stomach) of the cow; can be caused by cattle eating too much grain when they are not accustomed to it

Acre (ac) A unit for measuring land; 1 acre = 0.405 hectares

Afterbirth The placenta that is expelled from the cow after the calf has been born

Bobby calf A calf of either sex sold straight off its mother soon after birth

Bovine Spongiform Encephalopathy (BSE) Also known as Mad Cow Disease; a slow, progressive, degenerative disease of the central nervous system which eventually kills the animal. The disease is found in the United Kingdom and Ireland and some cases have been reported in other countries. There has never been a case of BSE in Australia

Brisket Chest area, fold of skin hanging on chest of animal

Bull An entire male bovine of any age

Bulling A cow that is 'bulling' is on heat (see 'heat' or oestrus)

Calf A young male or female bovine from birth to the age of about 12 months

Cod Scrotum after testicles have been removed by castration

Cow A female bovine after it has calved for the first time

Cull To sell or dispose of inferior animals

Dam The female parent

Drenching Treating an animal for internal parasites (worms and fluke); can be given orally, injected under the skin or poured on the back, depending on the product used

Dressing percentage The weight of carcase as a proportion of the liveweight (expressed as a percentage)

Dry cow A cow that is not giving milk

DSE (Dry Sheep Equivalent) The energy required to maintain a 2-year-old sheep weighing 45 kg that is not lactating and is maintaining weight; used as the basic unit to describe stocking rate

Dystocia Calving difficulty

Feeder steers Steers placed in a feedlot to be finished prior to processing

Forward store condition A subjective term used to describe the level of fat cover on an animal; forward store condition means the animal is almost ready for slaughter

Freemartin A sterile (infertile) heifer calf born as a twin with a bull calf

Gestation Length of pregnancy, time from conception to birth; approximately 280 days for a cow

Gross margin An economic analysis of the costs and income associated with a particular enterprise

'Heat' or oestrus Part of a female's reproductive cycle; ovulation and readiness for breeding take place when a cow is on heat; the heat period lasts 24–36 hours and returns every 21 days in sexually mature, non-pregnant females (see standing heat)

Hectare (ha) A unit for measuring land; 1 ha = 2.47 acres

Heifer A young female bovine before she has had her first calf

HSCW (Hot Standard Carcase Weight) A standard carcase with a standard fat trim and temperature at weighing. The weight of a carcase trimmed to AUS-MEAT specifications should be the same from all AUS-MEAT accredited abattoirs. This enables producers to compare prices between abattoirs when selling over the hooks

Improved pasture Pasture that has been sown down with pasture species that are more productive than native grasses

Lactation The process of milk production

Marking Castrating male animals. Usually combined with vaccination and identification, i.e. branding or ear tagging

Mastitis Inflammation and infection of the udder caused by bacteria

Native/unimproved pasture A pasture made up of indigenous species of grasses and clovers, which has not been sown down to improved pasture species

Oestrus See 'heat'

Placenta The sac in which the calf grows inside the uterus of the cow

Poddy calf A calf that is being artificially reared

Poll The top of a cow's head between the horns

Polled A genetically hornless animal

Roughage A feed that is relatively high in fibre, e.g. hay

Scours A term used for diarrhoea

Silage Green roughage preserved through fermentation either in individually plastic wrapped large bales or in trenches covered with plastic and soil

Sire The male parent

Springer A cow that is about to calve

Standing heat The time when a cow is the most fertile and stands readily for the bull to mount her; standing heat lasts 16–20 hours (see heat)

Steer A male, castrated when young

Store condition An animal not fat enough to slaughter

Terminal sire A bull where none of his offspring are retained for breeding; all calves, including heifers are sold; terminal sires usually have very good carcase characteristics and not very good maternal characteristics

Vealer A calf of either sex being fattened on its mother

Weaner A calf separated from its mother, usually 8–9 months of age

Wether Castrated male sheep

Further information

Factsheets available from the New, Small Rural Landholders area on the Victorian Department of Primary Industries website (http://www.dpi.vic.gov.au/):

- 10-point checklist when thinking of purchasing a rural property
- Small property agistment
- Handling drought on a small property
- Weeds on my property – who's responsible?
- Responsibilities of Victorian landholders
- Farm diversification decision making

Some of the Information Notes available on the Victorian Department of Primary Industries website (http://www.dpi.vic.gov.au):

- A circular cattle handling facility for 10–50 head
- A guide for hobby farmers on identification of cattle, sheep, goats and pigs
- Acid soils
- Acronyms and terms associated with NLIS
- Anthrax in animals
- Beef measles
- Biosecurity – a practical approach for beef herds
- BJD: keeping Bovine Johne's Disease out of a herd
- BJD: understanding Bovine Johne's Disease statuses
- BJD: what is Bovine Johne's Disease?
- BJD: why control Bovine Johne's disease
- Bloat prevention in pasture fed beef cattle
- Bovine Virus Diarrhoea – mucosal disease
- Bracken fern poisoning of cattle
- Breedplan and the bull buyer
- Breedplan: calving ease EBVs
- Breedplan: multibreed EBVs
- Breedplan: net feed intake EBV (a feed efficiency measure)

- BSE (Mad Cow Disease)
- BSE and the Ruminant Feed Ban
- Clostridial Diseases of Livestock
- Code of accepted farming practice for the welfare of cattle
- Condition scoring beef cattle
- Control of liver fluke
- Dexter cattle
- Early weaning of beef calves
- Eye cancer in cattle
- Facial eczema of sheep and cattle
- Feeding options for beef cattle
- Grass Tetany (Hypomagnesemia) in beef cattle
- Healthy soils in the landscape
- Highland cattle
- Hints on feeding grain to cattle
- Lameness in store weaner cattle
- Land classes for farm planning
- Leptospirosis
- Livestock cancers
- Lowline cattle
- Lumpy jaw
- Management of beef breeding cows
- Management of bulls at mating
- Milk fever (Hypocalcaemia) in cows
- Nitrate and nitrite poisoning of livestock
- NLIS requirements on agisted and/or leased land
- Organic farming: perennial pasture establishment
- Organic farming: perennial pasture management
- Organic farming: the certification process
- Ostertagia in cattle
- Pink-eye in beef cattle
- Pregnancy testing of beef cattle
- Pregnancy toxaemia in beef cows
- Property identification codes (PICS) explained
- Reading NLIS tags using a handheld reader
- Recognising foot and mouth
- Setting up a weighing system on farm
- Small farm: pastures
- Small farm: soil formation
- Small farm: soil physical properties – texture and structure
- Small farm: the living soil

- Small farm: water infiltration and drainage of soils
- Small farm: what is a healthy soil?
- Soil
- The basics of soil evaluation
- Warts on cattle
- What is LPA and how does it relate to the NLIS?
- What is soil?
- Zoonoses – animal diseases that may also affect humans

Publications available from the Victorian Department of Primary Industries website (http://www.dpi.vic.gov.au/science/ems, then click on 'environmental monitoring tools'):

- Groundcover/soil erosion
- Soil fertility monitoring tools
- Soil structure monitoring tools
- Soil acidity monitoring tools
- Sustainable livestock carrying capacity
- Phosphorus loss monitoring tools
- Nitrogen monitoring tools
- Livestock integrated pest management
- Water balance
- Herbicide resistance monitoring tools
- Groundwater salinity monitoring tools
- Paddock record keeping

Publications available from the Victorian Department of Primary Industries by phoning the Customer Service Centre on 136 186:

- Drought Feeding and Management of Beef Cattle – a guide for farmers and land managers. Cost: **Free** (this title is available as a PDF download).

Publications available from Meat and Livestock Australia (MLA) (http://www.mla.com.au):

- More Beef from Pastures – the producers manual. Purchase hard copy through MLA or download a copy from the website. It consists of eight modules covering: setting directions, tactical stock control, pasture growth, pasture utilisation, cattle genetics, weaner throughput, herd health and welfare, and meeting market specifications.
- Meat Standards Australia (MSA) tips and tools covering: what is MSA?; MSA requirements for handling cattle; how to supply beef in the MSA system; the

effects of tropical breeds of beef eating quality; the effect of marbling on beef eating quality; the effect of pH on beef eating quality; how MSA beef is graded; the effect of the pH temperature decline on beef eating quality; how tenderstretch affects beef eating quality; how ageing affects beef eating quality; the effect of cooking on beef eating quality
- MSA beef brochure – a booklet that outlines the MSA beef program
- Buy and sell MSA cattle – a quick reference guide for producers, agents and buyers
- Beef primal and sub-primal cuts poster
- How to cook a steak & beef cooking methods poster

Factsheets available from the New South Wales Department of Primary Industries website (http://www.dpi.nsw.gov.au):

- Beef cattle vaccines
- Beef cattle yards for less than 100 head
- Blackleg in cattle
- Bloat
- Botulism in cattle
- Bull health
- Cancer Eye in cattle
- Castrating calves
- Cattle breed types
- Cattle breeds: Angus
- Cattle breeds: Beef Shorthorn
- Cattle breeds: Belmont Red
- Cattle breeds: Braford
- Cattle breeds: Brahman
- Cattle breeds: Brangus
- Cattle breeds: Charolais
- Cattle breeds: Devon
- Cattle breeds: Droughtmaster
- Cattle breeds: Galloway
- Cattle breeds: Gelbvieh
- Cattle breeds: Hereford
- Cattle breeds: Limousin
- Cattle breeds: Maine Anjou
- Cattle breeds: Murray Grey
- Cattle breeds: Poll Hereford
- Cattle breeds: Santa Gertrudis
- Cattle breeds: Shorthorn

- Cattle breeds: Simmental
- Cattle breeds: South Devon
- Cattle lice
- Checking your bull is ready for joining
- Clostridial diseases in cattle
- Dark cutting beef – what is it?
- Dehorning cattle
- Dressing percentages for cattle
- Dung beetle – working for you
- Enterotoxaemia in cattle
- Frame scoring of beef cattle
- Full hand feeding of beef cattle – management
- Full hand feeding of beef cattle – quantities
- Grass tetany in cattle
- Grass tetany in cattle – treatment and prevention
- Handling cattle
- Live beef cattle assessment
- Liver fluke disease in sheep and cattle
- Lumpy jaw and wooden tongue in cattle
- Muscle scoring in beef cattle
- Photosensitisation in stock
- Pinkeye in cattle
- Round bale self-feeders for cattle
- Supplementary feeding of cattle
- Water requirements for sheep and cattle
- Weaning beef calves
- Welfare decisions for beef cows

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