

A Guide to Rearing Beef from the Dairy Herd



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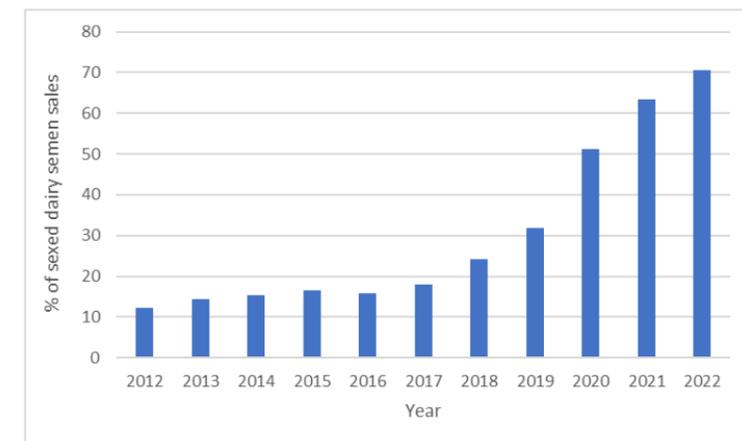
Section 1: Introduction

In recent years the dairy industry has come under increasing pressure to reduce the number of unwanted dairy bull calves. As of 2023, Red Tractor Assurance Standards for Dairy has banned the routine euthanasia of dairy bull calves. This has driven dairy farmers to alter their breeding strategies. As a result, there has been an upsurge in the use of sexed dairy semen to breed dairy heifers from the best animals for herd replacements, combined with increasing use of beef sires on the remainder of the herd.

Using a beef sire on a percentage of the dairy herd can increase the value of the calves not kept for herd replacements, as they are more marketable and desirable to sell on to other farmers to rear and finish them. With the national suckler herd currently in decline, there is increased scope in the supply chain to produce more beef calves out of the dairy herd.

Sexed semen usage in the dairy industry has increased dramatically over the last few years to produce heifer replacements from the most fertile and genetically superior animals in the herd. This means that the remainder of the herd can be served to beef semen to produce a higher value calf. Data provided by AHDB indicates that now over 70% of all dairy semen sales are sexed (Figure 1).

Figure 1: Use of dairy sexed semen in the GB dairy herd from 2012 to 2022.



Source: AHDB.

While sexed semen is more expensive, at around double the cost of conventional semen, this extra cost is more than offset by the production of a higher value beef cross calf.

The aim of this booklet is to give a comprehensive guide to rearing and finishing beef calves out of the dairy herd and includes information on sourcing calves, welfare, housing, management and nutritional requirements. Financial considerations and marketing options are also discussed.

Dairy beef enterprises would suit those that have additional shed space, resources and labour to successfully rear calves. Labour is particularly important when rearing young calves still on milk. Attention to detail in terms of health, hygiene and nutritional management is critical to getting calves off to a good start to maximise performance and prevent scours and pneumonia, the main causes of calf losses.

Section 2: Selection and Sourcing of Dairy Bred Calves

Beef sired dairy calves are typically purchased from the dairy farm or auction market between 10 to 21 days old by the rearer. Ideally calves are sourced directly from a farm with a known health status to ensure the risk is minimal to prevent introducing disease to other cattle on the farm.

Considerations when purchasing calves include:

- **Target weight for age with good conformation**
- **Good coat condition; shiny and supple (with no sign of dehydration)**
- **Bright-eyed, alert and no sign of discharge from the eyes, nose or mouth**
- **A clean, dry naval**
- **No signs of scour**

When buying dairy bred calves directly from a farm, there is an opportunity to ask questions about the health and disease status of calves, which may not be as easy when purchasing calves at a live auction.

1. Colostrum Intake

Find out about the farm's colostrum management, including how much is fed and how quickly the calves receive colostrum after birth. It is worthwhile asking if the colostrum is quality tested.

It is essential to buy calves which are known to have received adequate colostrum as soon as possible after birth. There is a clear relationship between immune status when calves are very young and subsequent lifetime performance.

2. Sire Identification

Ask the calf producer about the sires used to produce the beef calves, in particular the breed and bull identification. For some abattoirs, the registered pedigree sires are required for contracts to receive the premium, with the main breeds offering a premium being natives such as Aberdeen Angus, Beef Shorthorn and Hereford.

3. Type of Dairy Cow

Knowing the source herd's breed and type of cow will give a good indication of the calves' future frame size and conformation. This will affect carcass weight and conformation and may result in the animal not meeting the desired specification for the processor.

4. Health Status

It is important to know the health status of the source herd where the calves have come from to be aware of the disease risks that these calves may have been exposed to. If possible, ask vendors for more information on any routine vaccinations or treatments the stock may have had.

If you are unsure about the calves' health after assessing their physical appearance, take a rectal temperature, which should be within the normal range of 38.5 and 39.5 °C. When purchased calves arrive on the rearing unit, a strict biosecurity protocol must be followed. This should be discussed with the farm vet.

5. Weight for Age Vs Liveweight

When purchasing calves, they should be well-grown for their age. When assessing the earning potential of dairy calves for beef production, it is a good idea to think about weight-for-age as an indicator rather than liveweight alone.

Section 3: Transport and Arrival

The movement of calves from the dairy farm or market can be extremely stressful for the animals, even over short journeys. This emphasises the importance of limiting any further stress during this post-transport period. The stress induced by the transport of calves can lead to dehydration and body weight loss. Before the journey starts make sure animals are fed, watered and calm.

Young calves require enough space to be able to lie down during transit. Compatible groups should be selected to avoid stress. For example, young calves should be separated from older/larger animals. The following table illustrates the space requirements for calves during transit.

Table 1: Travelling space requirements for calves.

Size of calf	Space requirement
Small (50kg)	0.30–0.40 m ² /animal
Medium (110kg)	0.60–0.70 m ² /animal

Source: Teagasc.

The rearer should attempt to minimise any stressors placed on the calves immediately after arrival. It is recognised that transport of calves, changing their environment, exposure to loud and unusual noises and mixing into new social groupings all cause stress responses that can lower their immune status. The negative impact of these unavoidable stressors can be reduced by ensuring calves have a 'soft landing' into a quiet, comfortable environment, where they are handled quietly by all stock-workers and receive optimal nutrition (ideally based on a similar ration as at the source dairy) and ad lib clean, fresh water.



Section 4: Health, Welfare & Mixing Calves

A protocol should be drawn up with the farm vet for new calves arriving on the farm. This would include the prevention and treatment of pneumonia and other infections such as scours. Protocols for mixing calves to minimise stress and disease risk, biosecurity and stock welfare should also be in place.

Effective health planning is a farm specific risk management tool aimed at achieving a low risk of animal disease and a continuous improvement in the health and welfare of animals within the system. A farm specific plan should be produced by the farmer in conjunction with their vet to assess the potential risks to calf health and agree meaningful actions to minimise or avoid these risks.

Within dairy beef systems there are multiple stress factors that can increase the risk of poor calf health, such as:

- **The young age of the calves when leaving the source farm (young animals are generally most susceptible to disease challenge)**
- **Restricted milk feeding in early life (dairy systems often use restricted milk feeding in early life to encourage starter feed intake)**
- **Transport (potentially multiple journeys)**
- **Mixing with other calves from different farms and of different ages (leading to further direct stress and exposure to multiple pathogens)**

Mixing of stock from multiple herds presents a risk to the health of the calves at the rearing unit. While this may be unavoidable on some units, the risk it poses should be well understood and managed.

When calves from different units are mixed, it not only causes a stress response in the calves (reducing immunity), but it also exposes them to different strains of disease-causing agents that they may have limited or no immunity to.

The risk from mixing intensifies with the increasing number of source dairy herds involved (so mixing calves from five different herds is worse than mixing from two herds). Whenever possible, avoid mixing calves at the same time as carrying out stressful management procedures such as transport, vaccinations, weaning and a change of diet.

Section 5: Housing

There are many different housing systems available for calf rearing, such as hutches and pens, which can house individuals or a group of calves. Regardless of which accommodation is used on farm, there are four main principles for housing that should be followed:

1. Clean

Excellent hygiene in the calf house is crucial in the successful development of the young calf. The material used in the construction of the calf housing should allow for it to be easily cleaned and disinfected. Bedding should be topped up as required to ensure a dry lying area. Once the bedding material has been removed between individuals or batches of calves, the housing should be washed and disinfected. It should also be dry before any new calves enter.

Be aware that only certain disinfectants are licensed for use against cryptosporidium and the parasite is highly resistant to chlorine-based disinfectants. Always follow manufacturers guidance on product usage. It is also good practice to have a disinfectant foot dip outside the calf shed for workers and visitors to use before entry and on exit.

2. Dry

As well as ensuring that the housing is dry after cleaning and disinfecting, the general environment for the calf should be dry as well. Therefore, good drainage is important to control the moisture levels within the housing. Calves should always be provided with sufficient dry bedding material. A moisture problem can be identified by kneeling on the bedding for 30 seconds. Dry bedding will result in dry knees, similarly wet or damp bedding, will result in wet knees, indicating that fresh bedding is required. Similarly, if the calves' knees are wet or they have bedding or manure stuck to them, more fresh bedding should be provided.

Water troughs should be regularly checked for leakages and general building maintenance should be good, e.g., no blocked gutters.

3. Draught-Free

Adequate ventilation in the calf shed is crucial for calf health and minimising health risks such as pneumonia. It provides fresh air, reduces moisture and humidity and removes stale, damp air. However, air speed must be controlled to reduce drafts and prevent calves from getting a chill. Air speed at calf height should be no more than 0.25m/s as drafts can cause stress and reduce immunity. As air speed increases, the calf's lower critical temperature increases, meaning that more energy is required for them to keep warm.

4. Comfort and Space

The minimum space requirements for calves in group housing are shown in Table 2. Care must be taken to ensure rearers meet the appropriate welfare codes and quality assurance standards of their processor/retailer.

Table 2. Space allowances for group-housed calves.

Weight of calf (kg)	Age (months)	Minimum (statutory) area (m ²)	Recommended area (m ²)
45	0	1.5	2.0
46-99	0-2	1.5	3.0
100-149	3-5	1.5	4.0
150-199	5-7	2.0	5.0

Source: NADIS.

Cold Stress and Calf Jackets

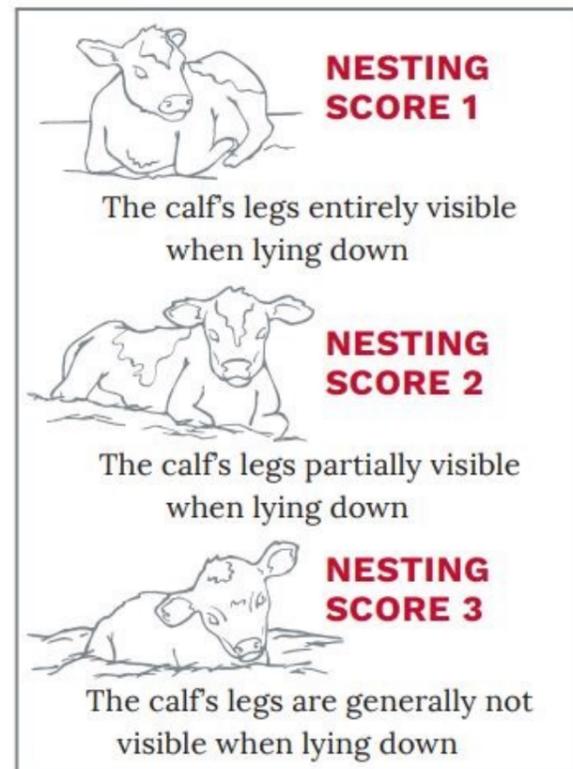
The temperature in the calf shed will be greatly influenced by the outside temperature, and in cold weather the inside of the shed is only likely to be 1-2°C warmer than the outside temperature.

New-born calves do not have adequate fat reserves to help regulate body temperature and their high surface area to body size means they lose heat quickly in cold temperatures. The lower critical temperature of a calf under three weeks of age is 10° to 15°C (depending on airspeed) and below this, extra energy is required for the calf to keep warm.

During periods of cold weather, ensure there is sufficient bedding for nesting behaviour. The legs of a well bedded calf should not be visible (Figure 2).

Sand, sawdust and paper will suffice as bedding during the warmer summer months but in winter, straw is best for thermal comfort.

Figure 2. Nesting scores for assessing adequacy of bedding.



Source: <https://CalfCare.ca>

Calf jackets are a great way to keep calves warm, meaning more energy is available for growth and to fight infection. Calves under one month of age will benefit the most from calf jackets.

Tips for using calf jackets are as follows:

- Make sure the calves' coats are completely dry before fitting a jacket
- Ensure the straps do not rub and adjust for growth as calves get bigger
- Between calves, disinfect jackets with a licensed product for cryptosporidium, then wash at 60°C to kill cryptosporidium eggs
- If jackets become wet, change them so the calves do not chill. Also ensure calves are not sweating under their jackets, again leading to chilling at night-time. Remove during the day if sweating, then replace at night
- Remove jackets in the morning and not later in the day



Heat Stress

The upper critical temperature of a calf is 25°C and above this, extra energy is required for the calf to keep cool. Heat stress will result in a drop in milk and feed intake. With a 20-30% increase in requirements for maintenance, immune function declines, leading to greater susceptibility to disease and dehydration. Infrastructure should be provided to minimise the onset of heat stress e.g., fans in housing.

Figure 3 on the following page shows good design of calf housing, with plastic sheeting on gates to stop cross contamination of groups if situated next to an adjacent pen. The plastic sheeting is easily washed and disinfected and also provides shelter from draughts but allows air flow to move above calf height. There are self-locking yokes at the feed trough which allows for easy handling of calves if needed. The concrete floor is at a 2% gradient to allow urine and any water to drain away from underneath the straw into a tank. The shed is easily washed after each batch of calves. The roof structure was built so that the shed can be used for other purposes if needed. Igloos are favoured as they give calves a more sheltered microclimate and they can be easily moved, washed and disinfected after use. The automatic feeder is positioned for easy access and can be easily removed once calves are weaned off milk.

Figure 3: Calf igloo with fixed structure roof and pen area, with automatic feeder.



Group Housing

Group management can play a role in disease risk when calves come onto the farm. There is evidence to suggest that as groups of calves get larger, the risk of significant disease outbreaks increase. There are likely to be several factors involved, and there is not an 'ideal' group size as this will vary with individual farm circumstances.

Mixing age groups of calves is known to increase the risk of respiratory disease and the age range of groups should therefore be kept to the minimum possible. This extends to sharing airspace with older cattle, which should be avoided to prevent disease.

Continuous throughput groups also present a significantly higher risk of disease than when managing groups as 'all-in all-out' batches. In well-managed systems, where all other risk factors are effectively and consistently controlled, continuous throughput groups may achieve very low rates of disease occurrence, but in any system where disease rates are not optimal these should be changed to batched groups as a priority.

Group housing, where all calves arrive at the same time within one shed and remain as a group until they leave, has been shown to facilitate learning behaviour in calves. Calves reared in groups tend to have higher starter feed intakes and weight gains. Behavioural and social development are also enhanced, meaning that group housed calves can more easily adapt to new environments, a benefit when calves are weaned and moved to another area on the farm (or within the same shed) or potentially mixed with other calves.

Section 6: Nutrition to Weaning

Dairy beef calves typically leave the dairy farm at one to three weeks of age and have a reliance on milk in their diet until eight weeks, with some farmers keeping calves on milk until ten weeks. Therefore, the rearing farm will be required to feed milk to the calves on a daily basis until they reach a minimum of eight weeks.

Milk Feeding

Calves should be fed a minimum of 750g of a high-quality calf milk replacer (CMR) per day, gradually increasing to between 0.9–1.2kg a day. Table 3 below shows the recommended minimum calves should be receiving. Most milk replacers have a minimum inclusion rate of 12.5% or 125g of CMR to 875ml of water to make one litre. For an enhanced plane of nutrition 150g of CMR to 850ml of water to make one litre should be used (15% inclusion).

Table 3: Suggested quantities of milk replacer and starter feed intake based on an eight-week weaning age.

Week of life	1	2	3	4	5	6	7	8
Milk replacer volume (litres)	5	6	6	6	6	5	3	2
Milk replacer powder @12.5% inclusion (g)	625	750	750	750	750	625	375	250
Milk replacer powder @15% inclusion (g)	750	900	900	900	900	750	450	300
Calf starter daily intake (kg)	Minimal 0.1	Minimal 0.1-0.2	0.2	0.3-0.5	0.5-0.7	0.8-1.0	1.0-1.5	1.5+

Source: Information adapted from Teagasc and NWF Agriculture.

Calves should be achieving a minimum daily liveweight gain of 0.8kg, with the aim of over 1kg depending on desired time frames and weights.

Calf Starter Feed

Calf starter feed should be of high quality with palatable ingredients to encourage early intake. Aim for a minimum of 18% crude protein (on a fresh weight basis) and a metabolisable energy content no less than 12MJ/kg DM.

The physical form of the starter feed is very important to maximise intakes. Calves do not like finely ground mixtures and will tend to have higher intakes with pelleted or coarse mix feeds. Small quantities of feed should be provided daily to keep feed fresh. As well as providing a quality starter feed (see Figure 5 as an example), water and forage are also important for rumen development and all three should be available for calves as they arrive on the rearing unit.

Figure 4: Calf starter pellets, nuts or a blend/coarse mix with little meal present are ideal starter feeds for calves.



Calves will perform best on high-quality feeds which contain palatable ingredients, an example of which is given below. Generally, the lower the fibre and ash, the higher the energy content of a feed.

Figure 5. An example of a high-quality starter feed label for calves. Analysis is on a fresh weight basis.

Analytical constituents			
Crude oil: 4%	Crude fibre: 5.7%	Calcium: 1.1%	Sodium: 0.6%
Crude protein: 18%	Crude ash: 7.7%	Phosphorus: 0.5%	Magnesium: 0.2%
Composition			
Distiller's dark grains (maize or wheat), wheatfeed, maize, wheat, hipro soyabean meal, sugar beet pulp, molasses, calcium carbonate, sodium chloride, trace element and vitamin premix.			
Additives (per kg)			
Vitamin A: 12,500iu	Vitamin D: 3000iu	Vitamin E: 150iu	
	Vitamin B ₁ : 10mg	Vitamin B ₁₂ : 30mcg	
Iron: 250mg	Manganese: 100mg	Zinc: 100mg	Copper: 80mg
	Cobalt: 0.9mg	Iodine: 6.3mg	Selenium: 0.6mg

Forage for Calves

Calves still on milk should have ad lib access to clean straw. Ideally this should be provided from racks and not from bedding alone. Feeding high-quality hay can make calves appear pot-bellied and restrict starter feed intakes, which will slow rumen development. If hay is fed, it should be of a low quality so that the intake of forage is limited to 3–5% of the total daily dry matter intake. At higher intakes, gut fill will limit the intake of starter feed and hence restrict rumen development.

Figure 6: Straw offered ad lib from racks.



Chopped straw is thought to have a more beneficial effect on rumen development and starter feed intakes than long straw. It should be chopped to 2.5cm in length. Forage at this stage will provide physically effective fiber to help develop the muscles in the rumen wall and cause the rumen to expand, as well as stabilise rumen pH.

Calves should not be fed fermented forages (grass silage or wholecrop) before 12 weeks of age as the rumen is not fully developed. They can then be slowly transitioned onto a silage-based diet (if not intensively reared on a barley beef system).

Water

Water is an essential nutrient for calves, even in the first few days of life. A lack of water will reduce growth performance and suppress the immune system, making calves more susceptible to disease. Water goes directly into the rumen and creates the optimal environment for fermentation. Without water, rumen development is slowed. Providing water in addition to milk replacer can increase growth by 38% and starter intake by 31% and a rule of thumb is that it takes 4 litres of water to digest 1kg of starter feed.

Water requirements for calves are shown in Table 4 below. Water that is in the milk or milk replacer does not contribute to rumen development as milk bypasses the rumen via the oesophageal groove and passes directly into the abomasum for digestion. In hot temperatures, water intake can increase by up to one third.



Table 4. Water requirements for calves of various weights.

Weight of calf (kg)	Litres required per calf per day
50	3-4
80	9-12
300	20-25

Source: Information adapted from AHDB.

Section 7: Weaning & Growing

Weaning

Weaning is one of the most stressful times for a calf and this transition must be managed carefully to avoid a growth check. As a rule of thumb, calves should have doubled their birth weight by weaning at eight weeks of age and be eating a minimum of 1.5kg of concentrates for three consecutive days. Weaning often begins at around six to seven weeks of age when targeting the calf to be fully weaned by eight weeks of age.

Milk should be gradually reduced over 7-14 days before being fully weaned off milk. This method of step-down weaning is a low stress method, which allows the calf to bridge the nutritional gap with concentrate and forage. By reducing milk gradually, calves are encouraged to eat more concentrates, allowing for a smoother transition. It is important to make sure that solid feed is as attractive as possible; palatable and replenished daily, as we are asking a calf to be weaned a lot earlier than the six to eight months they would do naturally if left on the dam.

During the weaning process it is very important to minimise disease risk and to maximise calf liveweight gain. If calves are being fed straw or hay pre-weaning it is important to keep this forage the same through the transition and then introduce silage slowly.

Calves should be transitioned slowly onto grazed grass with concentrate feed offered to ensure requirements are being met until intake of grass is adequate. As with all animals it is very important that access to fresh water is provided at all stages.

The main reasons for calves experiencing a post-weaning growth check are stress from a change in the housing environment, mixing of unfamiliar calves, a change in feeds offered and a low concentrate intake before weaning. If calves are eating substantial amounts of forage and not enough concentrates, then energy demands will not be met to achieve the target growth rate.

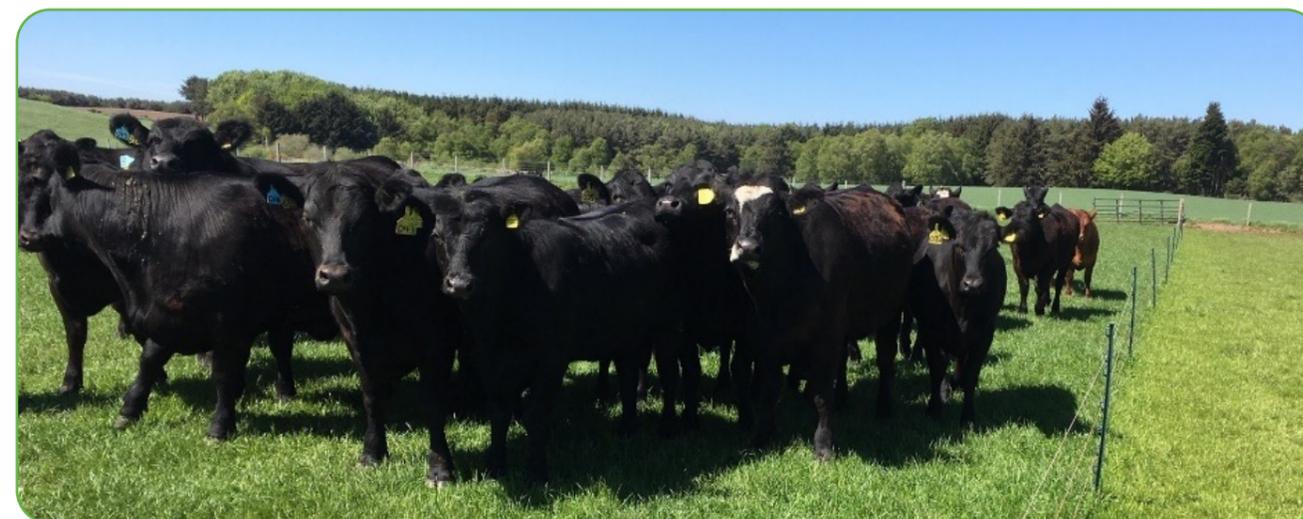
Once weaning has taken place, the growing system will be dependent on the farm and time of year. Some producers will keep cattle inside on forage-based rations with concentrate feed to maximise growth rates. Other producers will utilise grazing techniques such as rotational grazing, strip grazing, or set stocking, with the latter usually complimented by concentrate feed.

Nutrition

When grazing, the management strategy applied will depend on grass availability and weather conditions. Utilising grazed grass is an extremely cost-effective way to put weight on growing cattle. On a rotational grazing system calves under eight months of age should be offered grass with a pre-grazing cover of 2,300 to 2,700kg DM/ha (or 8 to 10cm in height), and remove them from the paddock when grass is at 1,800kg DM/ha or 5cm in height. This will help maximise growth in young animals, as they will find it easier to graze lower entry covers of higher nutritional quality. Trying to graze them down to a lower residual may compromise intake and liveweight gain. Older cattle or sheep can follow on to bring the residual down to the target 1,500kg DM/ha. Identify sheltered sites close to the steading for younger animals during their first grazing season.

As calves are selective grazers, they should be offered fresh leafy grass and not remain in the same paddock for long periods. A "calf paddock" where calves remain for the summer is not recommended. Water is very important so make sure water troughs are of adequate size with sufficient flow, looking to achieve 10 litres per animal per hour.

Figure 7: Example of growing cattle rotationally grazing.



If producers are looking to house growing cattle and feed them forage and concentrates, then it is vitally important to get forage tested so that it can be balanced accordingly with concentrates to optimise liveweight gain. Nutritional targets for growing rations are given in Table 5. These cattle should be priority for the best quality silage.

Table 5. Targets for nutrition of growing cattle.

Nutrient	Target level	Comments
Dry matter intake, DMI (kg)	2 to 2.5% bodyweight	e.g., 400kg animal will eat between 8 to 10kg DM. Will vary depending on silage quality and NDF content.
Forage content (% DM)	>30%	Applies to grass silage/wholecrop based diets. Important for good rumen function.
Metabolisable energy, ME (MJ ME/kg DM)	10.5 to 11.5	Depends on breed, sex, feeding system and target market.
Crude protein, CP (% DM)	12 to 15%	Younger animals need higher protein for growth. Weaned calves should be on around 14% and reduce to 12% after six weeks. Intensively fed bulls should be rationed closer to 15% as they need higher CP than steers on a silage-based ration.
Neutral detergent fibre, NDF (% DM)	> 40%	This will help maintain rumen health but the higher the NDF, the poorer the digestibility and the higher concentrate level required to achieve target growth rate.
Starch (% DM)	< 20%	Important to avoid native breeds and heifers laying down fat too early.
Target daily liveweight gain (kg)	0.7 to 1.2	Depends on breed, sex, feeding system and target market.

Source: SAC Consulting and AHDB.

Section 8: Finishing Systems

There are a variety of different ways to finish beef calves from the dairy herd, ranging from intensive bull beef to more extensive forage-based finishing systems. There are different management requirements for the different systems and so it is important to consider all options and focus on what would suit your farm or business the best.

Whilst young bulls have better feed conversion efficiency and produce leaner carcasses with higher kill out percentages than steers, they require higher levels of management and can be more expensive in terms of fixed and variable costs. Steers and heifers have a degree of flexibility in their finishing system and can utilise grassland.

Key considerations that will determine what system is the most suitable include:

- **Housing availability – particularly for bull beef as they require enough room to see them through to finish in the same stable group**
- **Availability of bedding materials and cost**
- **Feed and forage availability and cost**
- **Handling systems**

Young Bulls Under 16 Months

Beef sired dairy calves kept entire must be finished before reaching 16 months of age. This bull beef system is one of the most efficient ways of finishing cattle, with high growth rates. Over 550kg the daily gain of bulls begins to decline, yet their feed intake increases, leading to a considerable drop in efficiency. This system is very sensitive to grain price due to the high cereal diet required. The bulls can eat in the region of 1.8–2.5T/head in their lifetime.

The bulls should be housed year-round to take advantage of their higher performance capabilities. Once weaned the bulls should be housed in groups (once groups are established mixing should be avoided). The bulls should be transitioned off the weaning concentrate and onto a 15% CP (in DM) cereal-based ration which can be fed ad lib up to seven months of age when the protein can be reduced to 14% CP to take them through the final finishing period (see Table 6 for example rations).

Fresh straw should be provided ad lib and bulls will eat in the region of 1–1.5kg (approximately 12% of their total dry matter intake). Molasses can be fed in the diet as an energy source but also to dampen the dust produced in an intensive cereal diet.

Table 6. Example post-weaning and finishing diets for bulls.

Feeds	Post-weaning ration (kg/T)	Finishing ration (kg/T)
Barley	675	750
Sugar beet pulp or soya hulls	150	100
Hipro soya	100	75
Molasses	50	50
Intensive beef mineral	25	25
Analysis		
Crude protein % DM	16	14
ME (MJ/kg DM)	12.8	12.8

Key performance targets are as follows:

- Target lifetime growth rate of 1.4kg/day
- Target liveweight 520–620kg at slaughter
- Target deadweight 260–320kg
- Grading -O / +O 2/3

Key considerations:

- Ensure you have a market for these bulls. Talk with your buyer well in advance as some processors will not handle young bulls
- Price penalties may apply if bulls are under 12 months or over 16 months when slaughtered
- Minimum carcass weights of 260kg need to be achieved to avoid any price penalties
- Minimum fat class 2 to avoid penalties
- Keep bulls in peer groups and avoid mixing
- Avoid stress prior to slaughter to reduce the risk of dark cutting meat
- Adequate handling facilities to ensure safety when working with bulls
- Regular weighing
- Sell poor doers early

Be careful of acidosis with intensive cereal diets. Acidosis is usually associated with the ingestion of large amounts of highly fermentable, carbohydrate-rich feeds, which can result in the excessive production and accumulation of acids in the rumen. Signs include diarrhoea, weight loss and reduced feed intake. In extreme situations, acidosis can lead to bloat and death.

Steers and Heifers Under 24 Months

Steers and heifers can be targeted to finish at 24 months or less, with a target slaughter weight of 620kg and a deadweight of 310–330kg. An example for the management, growth targets and nutrition of spring-born calves is shown in the following table.

Table 7: Target weights, growth rates and dietary guidance.

Management point	Weight	Diet change
Weaning	85–120kg dependant on breed and sex	
1 st summer at grass	Weight gain of 110kg over the summer (0.6–0.8kg/day)	Supplementary feeding offered at turnout and before housing of around 1kg/hd/day
Housed for winter (store diet to grow frame)	195–230kg (target minimum 0.7kg/day)	Silage based diet with 2–3kg/hd/day
Turnout to grass for 2 nd summer	345kg, weight gain of 1kg/day	
Housed for 2 nd winter	565kg	High quality silage plus 5–6kg/hd/day concentrates

Good grassland management is essential to achieve target growth rates over both summers with little supplementation (rotational grazing would be beneficial in this system). For cattle over eight months of age sward heights should be no more than 12cm at turnout (maximum 3,000kg DM/ha) with the aim of achieving a target residual closer to 4cm (1,500kg DM/ha).

Silage analysis is important on this system to ensure concentrate supplementation is cost-effective and will meet the protein and energy requirements for the target growth rate (see Table 8 for guidance on nutritional parameters for finishing cattle). The higher the quality of the silage, the greater the savings on concentrate feeds. An appropriate mineral and vitamin supplement is essential (as it is with all types of feeding systems) to correct deficiencies in the base ration and aid overall health and performance.

Table 8. Targets for nutrition of finishing cattle.

Nutrient	Target level	Comments
Dry matter intake, DMI (kg)	1.8 to 2.0% bodyweight	e.g., 600kg animal will eat between 10.8 to 12kg DM. Will vary depending on silage quality and NDF content.
Forage content (% DM)	25 to 35%	Applies to grass silage/wholecrop based diets. Important for good rumen function. On straw-based rations, straw should make up 12% of the total dry matter.
Metabolisable energy, ME (MJ ME/kg DM)	>12.0	The higher the better to drive liveweight gain and reduce time to slaughter. Ideally forage above 10.5ME.
Crude protein, CP (% DM)	12 to 14%	Slightly lower than on growing rations and work to slightly higher protein levels for continental bulls compared to steers and heifers.
Starch (% DM)	Silage/ wholecrop based: 20-35% Straw based: 30-45%	Intensive straw-based diets will have a higher starch content due to higher inclusion of cereals. Care must be taken to avoid overprocessing cereals which can cause acidosis. Dairy bred animals will finish better on higher starch diets. Higher starch levels can be fed when utilising urea treatments with cereals to produce an alkaline feed.
Target daily liveweight gain (kg)	1.3kg+	Depends on breed, sex, feeding system and target market. Higher liveweight gains of closer to 2kg can be achieved on intensive cereal-based diets.

Source: SAC Consulting and AHDB.

When the cattle are nearing their target weight for slaughter, regular weighing is advised alongside handling to ensure cattle are sold for slaughter when they are ready to go.

This is a slow way to finish cattle and does tie up capital for a considerable period of time, and with the cattle being kept for two winters it is more expensive. Whilst daily feed cost looks low on this system, feed cost per kg gain will be high.

With age at slaughter having a considerable impact on the carbon footprint of a beef enterprise, it may be beneficial to consider increasing the performance of the cattle. By increasing ration quality with higher levels of concentrate supplementation over the first winter and by providing concentrates at grass during the second summer it may be possible to reduce the slaughter age to under 20 months.

Section 9: Financials

Planning is key for profitable beef production, with budgets based on achieving clear cut production targets and marketing objectives. A degree of flexibility is needed to be able to react to changes in animal performance and feed availability and cost.

Most cattle enterprises tie up a considerable amount of working capital and so an understanding of cashflow in the business will help to ensure all payments can be made on time and that marketing of animals is timed correctly.

Whilst the end beef price has an effect on profitability, by focusing on optimising animal performance and efficient utilisation of grassland and high-quality forage, producers are more able to maintain profitability regardless of the end price.

Margins in beef production, especially intensive bull beef, are very sensitive to:

- **Calf purchase price**
- **Feed price (feed costs are typically at least 70% of variable costs in a beef enterprise)**
- **Beef price**

When considering a dairy beef enterprise, it would be worthwhile to calculate the costs of production to your specific system and include both variable and fixed costs. In addition to a budget, it would be wise to apply a sensitivity analysis to some of the key input costs and output prices to illustrate the impact they would have on the profitability of the enterprise. For example: consider a £20/T fluctuation in feed barley price or a 2% increase in interest rates and the impact that would have both on cashflow and on overall profitability.

Section 10: Marketing

Careful consideration must be given to what market is being aimed at with finishing cattle and it is advised that a market or customer should be identified and communications with them are held to ensure that the animals being produced meet their specifications.

For dairy beef there are two clear options for marketing:

1. **An Integrated Contract Scheme with a retailer or processor who provides you with a contract price, specifications and protocols to follow to be eligible for the scheme.** Whilst this option provides clarity on the end price, it is still important to work out the costs involved in producing the animal to that specification and to understand the potential deductions that may occur from that contract price.
2. **In an open market liveweight or deadweight direct to processor.** This provides flexibility to the producer in terms of when the animal is sold, what weight it is finished at and its diet. With this option there is no security with the price; it is a spot price that will change weekly and the best way of preparing for that is regular communication with the buyers to understand price movements and potential waiting lists to have animals slaughtered.

Integrated Beef Systems for Beef from Dairy

Each retailer and beef processor have their own scheme, but there are various common components. The forward price given to the finisher at the time they buy the cattle to finish is underpinned by a commitment from the retailer and processor.

Figure 8: Supply chain flow chart.



These integrated supply chains have been used widely to supply native bred beef into retailers (Aberdeen Angus / Hereford / Shorthorn) alongside continental and dairy calves. In addition to retailers, some food service companies have become involved in these integrated beef supply chains. There are also non-retailer led schemes such as for Wagyu cattle where there is a market for the beef and so the breed has encouraged dairy farmers to use the semen to build up numbers available.

The dairy farmer through their milk processor or through the retailer they supply is often advised as to what semen to use (and often is free or discounted) to ensure that certain genetics are being used in their beef x dairy calves. By using the agreed semen, the integrated supply chain will guarantee to buy these calves from the dairy farmer, therefore securing an outlet for the calves.

The calves are often paid at a known base price (which follows the market price) and will have certain stipulations such as a minimum weight at collection of 50kg, where weight for age will be closely looked at. There may be bonuses available for calves over the minimum weight and for calves of better conformation. Calves should ideally be fed milk from a teat to avoid them having to be trained to feed from a teat when they reach the rearing unit.

These calves are then transferred to rearer units where the farmers are often paid a fee to rear the calves, as the scheme will own the calves at this point. The rearers will have daily liveweight gain and health targets to achieve. Most calves are in the rearer units until they are 12–16 weeks of age. Some schemes supply the milk powder, feed and medicines, leaving the rearer to supply the buildings, straw, water and labour and also make the investment into an automatic milk feeder machine.

For rearers, the benefits to being in an integrated scheme include having even batches of calves supplied, the calves are of a minimum weight and are healthy. The scheme also enables farmers to increase their throughput without the capital outlay of purchasing calves.

Once the calves have reached 12–16 weeks of age, they will move on to either a grower / finisher or a finisher who, depending on the scheme, will either buy the calf from the scheme or contract finish it. It is most common that the calf is purchased by the finisher in a contract that stipulates a forward price for that calf when it is finished. The cattle in these schemes will be finished according to set procedures and will have targets to achieve. The most common protocols in place for finishers in these schemes include:

1. Minimum length of time at grass
2. Components of the finisher ration

The finisher benefits from having a known finished price and so can budget feed and other variable costs to achieve a known margin.

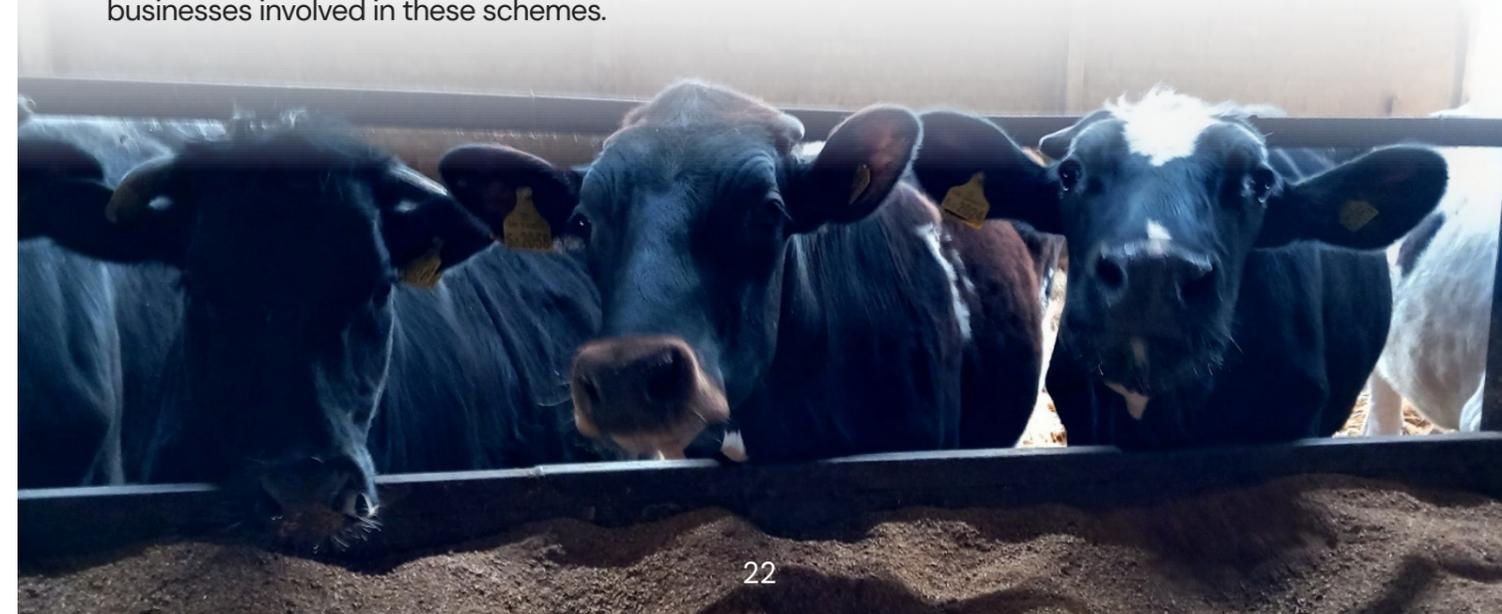
The processor benefits from an integrated system as they have a guaranteed supply of cattle of a known weight, breed and sex that they know will give them a consistent product for their customer. When looking at the kill data the scheme will identify what cattle have not met the specifications and feed that information back down the chain to make improvements for the next batch of calves.

The retailer / food service customer likes an integrated beef supply as it provides them with a uniform, consistent product.

It is becoming more common in these schemes for the calves to be fitted with EID tags to assist with data recording of performance and many of the milk machines now work alongside these tags to accurately manage automatic milk feeding.

The main benefit from the EID tag and the data recording in an integrated system is that the data will flow both up and down the chain and be used to make decisions regarding the beef bulls used in the dairy herd, as poor performers from certain genetics will be easily identified.

An integrated beef supply scheme with calves from the dairy herd assists many links in the beef supply chain to achieve some stability or known financial outcomes from their animals whilst also allowing the supply chain to be more transparent and share data both up and down the chain. For more details on forward contracts and integrated systems it is best to speak to the different businesses involved in these schemes.



Deadweight Prices

There are different levels of price penalties for poorer conformation carcasses and for over fat or too lean carcasses, as shown in the example price grid in Figure 9.

Figure 9: Pricing grid for abattoirs.

	1	2	3	4L	4H	5L	5H
E	-10	15	20	20	15	-10	R
U+	-10	15	15	15	8	-15	R
-U	-15	5	5	5	B	-20	R
R	-20	B	B	B	-5	-25	R
O+	-30	-10	-10	-10	-15	-30	R
-O	-40	-30	-20	-20	-30	-40	R
P+	-50	-40	-40	-40	-50	-60	R
-P	-70	-50	-50	-50	-70	R	R

B = Base price

R = Realisation

Source: Adapted from AHDB.

The penalties and the prices realised for different types of cattle emphasise the importance of understanding your market and the types of cattle required. Regular weighing of cattle in the finishing stages can aid with better marketing of the cattle to achieve better prices.

The aim for most dairy bred type cattle in the UK is to fall into the O grade category for conformation and be ideally a fat class 3. Dairy bred cattle tend to have a lower kill out percentage than beef bred animals due to the lower muscle to bone ratio.

To reduce the risk of damage to the carcase, which would result in excess trimming and waste, it is important to handle cattle carefully. The high-risk activities for bruising and abscesses include transportation, injection sites and the use of unclean needles. Animals that are stressed prior to slaughter are at higher risk of having dark cutting meat. This reduces the value of the carcase and the shelf life of the meat. This is especially common in young bulls but can affect all cattle.



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