BEEF BRP MANUAL 7

Better Returns Programme

# Feeding growing and finishing cattle for Better Returns

**The information in this book was compiled by: Mary Vickers, AHDB Beef & Lamb and Karen Stewart, Scotland's Rural College (SRUC). BRP is grateful to all those who have commented and contributed to this production.**



This publication is available from our website at beefandlamb.ahdb.org.uk.

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Better Returns Programme

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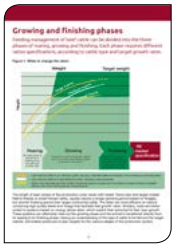






Beef production systems are many and varied but should be based on an understanding of the available resources and cattle type, with a clear aim to meet market requirements and generate a profit.

This manual explains the different requirements of the growing and finishing stages of an animal's life, providing valuable guidance on rationing for these separate phases.

Driving feed efficiency is crucial in all growing and finishing systems and the factors to focus on are discussed, along with transition management and the attention to detail that is required to optimise cattle feed intake.

Beef production is all about producing what the market wants and rationing factors that affect carcase quality are explained.

This manual complements a number of others which focus on managing forages and feeds to improve returns from beef cattle in a range of production systems.


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Better Returns Programme

# Growing and finishing phases

Feeding management of beef cattle can be divided into the three phases of rearing, growing and finishing. Each phase requires different ration specifications, according to cattle type and target growth rates.

**Figure 1: When to change the ration**


The length of each phase of the production cycle varies with breed, frame size and target market. Native breeds or small framed cattle, usually require a longer growing period based on forages, but shorter finishing period than larger continental cattle. The latter are most efficient on rations containing high quality feeds and forage that facilitate fast growth rates. Similarly, bulls are better suited to systems based on energy dense diets, which exploit their potential for fast, lean growth. These systems can effectively miss out the growing phase and the animal is transferred directly from its rearing to its finishing phase. Having an understanding of the type of cattle to be fed and the target market, will enable producers to plan targets for the various stages of the production system.

# Matching cattle type to feeding system

## Choosing a feeding system will depend on the resources available on the farm, the target market requirements and the type of cattle being fed.

Table 1: Factors determining feeding system

| **Resources and target market** | |
|---|---|
| Resources and market drivers | System type is determined to a large extent by available feed, land, buildings, machinery, labour, finance, but also by the target market. Many processors have stipulations regarding time spent grazing, slaughter ages and slaughter weights, so it pays to talk to buyers before deciding on a production system. Not all farms are suited to finishing cattle and some may be better off targeting weaned calf or store cattle production. |
| **Stock** | |
| Gender | Bulls tend to have higher growth rate potential than steers and heifers with greater lean tissue deposition. Heifers, in contrast, tend to deposit more fat at a younger age than males, so they may need to be fed a growing ration for longer before finishing than steers or bulls. |
| Type | Smaller breeds, eg native breeds, are usually early maturing and of small frame size. They are well suited to forage-based systems, targeting moderate rates of gain. Continental breeds are usually larger framed and tend to require higher feeding levels to achieve the required level of carcase finish and are most efficiently finished in systems that exploit their potential for fast growth rates. |
| Genetic potential | There is huge variation in the genetic potential of cattle within the same breed for growth and carcase traits. Breeding tools, such as estimated breeding values (EBV) for these characteristics, can provide information to inform feeding systems. |

A semi-intensive beef system usually involves a period at grass, a housed winter period and a finishing period when the cattle are also often housed. Farms that have a source of cereals or by-products and straw are more likely to operate an intensive system, while farms in grassland areas are likely to operate semi-intensive or extensive systems. It is important to recognise that variable and fixed costs per head are likely to increase with the number of days the cattle are on the farm and that feed conversion efficiency reduces as cattle grow older and heavier.

Table 2: Summary of beef finishing systems

| | **Age at slaughter (months)** | | | |
|---|---|---|---|---|
| | 12 | 18 | 24 | 30 |
| Feed Conversion Ratio (FCR) (kg DMI/kg LWG) | 5 to 7 | 12 | 16 | 20 |
| Expected lifetime feed costs | Low/medium | Medium | Medium | High |
| Expected lifetime fixed costs | Low/medium | Medium | Medium | High |

# Maximising dry matter intake

Maximising dry matter intake (DMI) is vital to optimise performance of growing and finishing cattle and relies on:

## Formulation of the ration

- Very wet or dry rations can reduce DMI, as can highly fibrous rations, which fill up the rumen and are slowly fermented. In mixed rations containing forage, aim for a dry matter (DM) range of 40-55%. Minimise dust in dry rations by adding a liquid feed such as molasses

## Keep feeds fresh and palatable

- Some ingredients are more palatable then others. Poor storage of feeds can predispose them to moulds, which not only reduce intake but can cause health problems
- Consistency is also important, as it will take time for the rumen microbes to adapt to any changes

## Continuous access to a clean and comfortable feeding area

- Do not let the feed barriers prevent cattle eating as much as they want. Check they are high enough and wide enough to allow easy access with no sharp edges
- Smooth surfaces are easier for the cattle to eat from and keep clean. Avoid pitted, rough concrete feeding surfaces
- Clean feed troughs out regularly, at least weekly, to avoid the build-up of old or heated feeds
- Allow access to feed all the time. Push up and feed regularly enough to ensure fresh feed is always available to the cattle
- Allow sufficient feed space so that all cattle can be fed at once if not feeding *ad-lib* rations

## Clean fresh water

- Intake of water is positively correlated to feed intake
- Site water troughs to avoid feed or bedding contamination, but where cattle can reach them easily
- Clean water troughs regularly, at least weekly

**Look out for rub marks on cattle necks which indicate the feed rail is too low**

**A well-designed and managed feeding area is as important as what is fed**

# Improving feed efficiency

Feed is a major cost in all beef production systems and taking steps to improve feed use efficiency will improve margins. Nutritional, genetic and management factors all influence feed use efficiency.

Areas to consider:

## Gender

- In general, bulls are more efficient than steers, which are more efficient than heifers

## Liveweight and growth rate

- Feed efficiency reduces as growth rate declines and as animals get heavier, because an increasing proportion of energy goes towards maintenance rather than production, compared to lighter, fast growing cattle

## Genetic merit

- Breeding tools are being developed to enable cattle selection based on feed efficiency and in doing so identify cattle which consume less feed yet achieve the same rate of gain as other, less efficient cattle

## Animal health

- Common problems like worm burdens and pneumonia reduce intake and depress performance
- Biosecurity is vital. Take measures to avoid buying-in disease problems
- Health planning with your vet will enable a proactive approach to herd health management – even sub-clinical disorders can reduce performance

## Stress

- Manage the transition between units carefully to minimise stress and growth checks
- Avoid mixing cattle of different size and age to minimise bullying and the spread of disease
- Ensure feed and water are fresh and always available
- Ensure good air quality and ventilation

## Nutrition

- Fibre in the diet is important for rumen health. Long fibre, eg straw, is important in intensive finishing rations and a source of digestible fibre such as sugar beet pulp or soya hulls at 10% fresh weight of the ration, is also helpful
- Manage ration formulation and transition carefully to avoid digestive upsets
- Maximise intake by careful ration presentation and avoiding dusty rations
- Feed efficiency deteriorates with increasing length of the finishing period, so avoid overly long finishing and carefully select cattle for slaughter to avoid excessive fat deposition
- Minerals and vitamins should be balanced to complement the diet

## Feed management

- Much feed can be wasted during harvest, transport, storage and feedout. Attention to detail during these stages is crucial

Improving feed efficiency reduces feed cost/kg gain

# Feeding growing cattle

## Growing beef cattle means feeding to achieve steady continuous frame growth.

Growing animals have a relatively large appetite relative to their liveweight. They thrive on high levels of good quality forage, as long as there is enough rumen degradable protein to fuel microbial activity in the rumen.

Table 3: Ration guidelines for growing cattle

| Nutrients, in total ration DM | | Notes |
|---|---|---|
| Dry matter intake (DMI) | ~ 2-2.5% liveweight | The lower end of this range relates to grass silage based rations |
| Target daily liveweight gain (DLWG) kg | 0.7-1.2 | Dependent on cattle type, system and target market |
| Metabolisable energy (MJ ME/kg DM) | 9.5-11.5 | Dependent on cattle type, system and target market |
| Crude protein (CP) % | 12-16 | Crude protein requirements will be determined by the animal's genetic potential for growth. Intensively fed bulls will require more CP than steers and heifers on a more forage based ration |
| Neutral detergent fibre (NDF) % | >40 | Most growing diets contain forage which provides digestible fibre. Avoid very mature herbage, which has poor digestibility and will limit performance |
| Starch and sugar % | <20 | Limiting the starch and sugar content of the diet will avoid cattle becoming over fat or too light in weight, which will be particularly important for smaller framed cattle and heifers |

This information is a guide only and advice from a professional nutritionist is recommended when formulating rations.

High levels of starch are not recommended in this period, as this can lead to unwanted fat deposition, especially in small to medium framed, native type cattle. Heifers, especially from small framed breeds, need to be managed carefully to ensure they grow sufficient frame size before finishing, to enable them to reach the target carcase weight range.

**Always match the amount of concentrates to the quality of the forage supplied. Good quality forages will require less concentrate supplementation than poor forages.**

### Forage quality fuelling cattle growth

Grower rations are generally based on fresh or conserved forages (grazing, grass silage, wholecrop, straw and combinations of these). They can be supplemented at least once a day with dry or moist feeds to add energy, protein, minerals and vitamins. Grass silage is a common basal forage and its quality will have a major impact on the rate of supplementation required and cost of production.

Table 4: Impact of silage quality on concentrate feed levels, assuming 400kg continental steer gaining 1kg LW/day

| Grass silage quality (MJ ME/kg DM) (All 30% DM) | Concentrates required to meet target performance (kg/head/day) | Cost per kg gain (£) |
|---|---|---|
| **Poor** (9.5) | 5.5 | 1.52 |
| **Moderate** (10.5) | 4.2 | 1.36 |
| **Good** (11) | 3.0 | 1.23 |
| **Excellent** (11.5) | 1.5 | 1.11 |

*Price assumptions: grass silage £35/tonne fresh weight, concentrates £200/tonne)

Analysing silage early will ensure rations are formulated correctly, avoid cattle failing to meet targets and wasting money on a higher specification concentrate than is required. More information on making grass silage and interpreting forage analysis results can be found in beef and sheep BRP Manual 5 **Making grass silage for Better Returns** at **beefandlamb.ahdb.org.uk.**

Achieving good rates of growth during the growing phase is important to avoid large amounts of feed being solely used to maintain the cattle and not increasing their value. Target growth rates will depend on the production system. Where the cattle are going out to grass the following spring, it is advisable to reduce the amount of concentrates fed for six to eight weeks prior to turnout, with a period of four weeks when no concentrates are fed, to precondition the cattle to a grazed grass diet.

Table 5: Example of growing cattle diets for a 400kg LW continental cross steer growing at 1kg/day

| | Grass silage based diet (kg) | Grass silage/ red clover silage based ration (kg) | Grass silage/ wholecrop based ration (kg) |
|---|---|---|---|
| Grass silage (10.6 MJ ME/kg DM, 12% CP) | 16 | 10 | 9 |
| Wholecrop barley (10.4 MJ ME/kg DM, 9.5% CP) | | | 9 |
| Red clover (11 MJ ME/kg DM, 17% CP) | | 7 | |
| Barley | 3.5 | 3.5 | 2.8 |
| Rapeseed meal | 0.3 | | 0.5 |
| **Diet provides MJ ME/kg DM (Total MJ ME/day)** | **11.6 (93)** | **11.6 (94)** | **11.4 (94)** |
| **CP % in DM** | **13** | **13.5** | **13** |

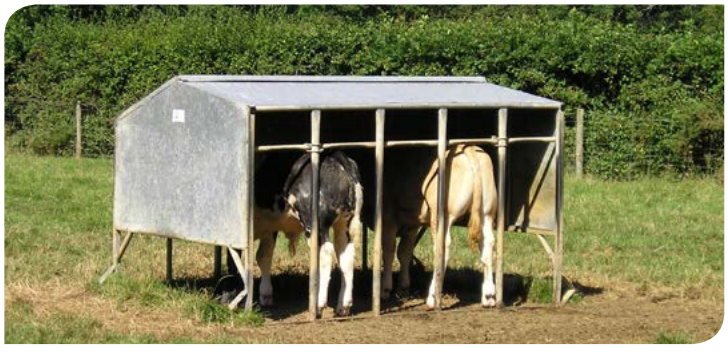
Note: Where concentrates are not mixed with the forage, they should be fed at no more than 0.5kg per 100kg liveweight in one meal.

For guidance on feeding replacement heifers see BRP Manual 11 - **Managing replacement heifers for Better Returns** at **beefandlamb.ahdb.org.uk.**

# Creep feeding suckled calves

Creep feeding can have a number of benefits including:

- Heavier weaning weights, typically 25kg
- Less stress at weaning due to familiarisation of the calves to a different feed
- Reduced pneumonia incidence after housing
- Faster growth rate post weaning
- Can help maintain cow body condition



While creep feeding is important for calves moving onto intensive finishing systems, even cattle kept for later finishing or as replacements, will benefit from a reduced weaning growth check and lowered risk of pneumonia after housing.

Extra weight at weaning should be maintained through to turnout and eventual sale, with savings in feed and other finishing costs. Replacement heifers due to calve at two years old may also benefit, because they are more likely to meet the growth targets required of them. Although care should be taken to avoid them becoming over-fat.

Timing will depend on calf age, growth potential of calves and grass availability. Normally, creep feeding would start six to ten weeks prior to weaning. However, bulls to be finished on *ad-lib* cereal diets should start being creep fed earlier, at around 12 weeks before weaning. With very milky cows, or in situations where it is tricky to creep feed, starting four to six weeks before weaning will still help reduce the weaning check. As a rough guide, allow 100-150kg of creep feed per calf for a six to twelve week period.

**Table 6: Examples of simple creep mixes (kg/tonne)**

| A | B |
|---|---|
| 375kg barley | 600kg barley |
| 300kg distiller grains | 235kg sugar beet pulp |
| 300kg sugar beet pulp | 140kg soya bean meal |
| 25kg minerals | 25kg minerals |
| Note: The beet pulp can be gradually reduced by half, in favour of more cereals nearer weaning time | |

Ideally, creep feeds should include some rumen-friendly feeds such as sugar beet pulp, oats or soya hulls, which can help minimise acidosis problems. Oats can be fed whole to calves up to the age of around eight months. Ensure creep feed contains supplementary vitamins and minerals to optimise health and productivity. Crude protein level is usually recommended at around 14% as fed, but higher levels may be justified for bull calves.

# Transition management

Transition management can reflect a number of different situations when cattle diets change. For beef cattle it usually occurs when cattle move between farms or when their diets change, such as from a growing ration to a finishing ration. If not managed well, this can result in a period of reduced growth rate, as the rumen adapts to the new diet and the cattle to their new environment.

Planning is the key to changing successfully from one ration to another.

In the case of changing to finishing rations, they generally contain less forage and more supplementary feeds than growing rations, which leads to increased rumen acidity and potential health problems. The rumen microbial population has to change from being based on fibre-digesting bacteria to supporting a large population of starch-digesting bacteria.

The finishing ration should be introduced gradually to the growing ration, so that the high energy feeds are fed in increasing amounts each day over a period of around two weeks, while the amount of forage available is reduced at the same time. The length of the change over period depends on the extent of the difference between the rations. Where large amounts of concentrates are being introduced the time period should be extended to make the change slowly. If feeding from a trough, the ration should be fed in two meals per day (of no more than 2kg concentrate), then three meals per day, increasing amounts fed until the cattle do not clear up all the feed. Then they can be transferred to *ad-lib* hoppers if required. Fresh, clean straw should be provided in racks during the transition to *ad-lib* cereal feeding when other forages are reduced, to stimulate rumen function.

# Bought-in cattle

Cattle, tired after a journey, should be penned separately from other stock in a draft-free, well bedded pen, with plenty of space and good access to palatable forage-based feed with long fibre and clean water.

After 12-18 hours rest:

- Check ear tags and weigh each animal
- Health check in accordance with the farm's health plan
- If necessary, treat and consider if isolation is appropriate
- Vaccinate

Then group animals by weight and type. Gradually introduce them to their new ration before moving to new accommodation.

# Feeding finishing cattle

## Feeding finishing cattle relies on a short period of maximum liveweight gain to meet market specification.

Finishing cattle efficiently relies on maintaining high DMIs and fast liveweight gains.

**Table 7: Ration guidelines for finishing cattle**

| Nutrients in total ration DM | | Notes |
|---|---|---|
| Dry matter intake (DMI) | 1.7-2% liveweight | During finishing, appetite falls in relation to bodyweight so intake should be encouraged through feed access, freshness and palatability. |
| Target daily liveweight gain (kg) | >1.3 | Liveweight gain decreases towards the end of the finishing period. Pure continental bulls will be able to achieve faster growth rates than this, up to 2kg/day, while heifers may be better suited to slower rates of gain to ensure the minimum carcase weight is achieved without excessive levels of fat deposition. |
| Metabolisable energy (MJ ME/kg DM) | >12 | Energy, particularly from starch, is vital to drive liveweight gain in finishing. Increasing the energy content of the ration will increase the rate of growth and fat deposition. Levels should be chosen to match cattle type and market specification. |
| Starch and sugar (%) | >25% | Feeds rich in starch and sugars are common components of finishing diets but they need to be managed carefully to avoid digestive upsets. Native breeds and heifers may finish on rations with lower starch and sugar levels. |
| Crude protein (%) | 12-14 | Crude protein levels are lower in finishing rations than in growing rations, but follow the same trend of slightly higher levels required for continental bulls versus steers and heifers. Finishing Holstein bulls show no growth rate response to increasing CP levels above 14% in the DM. |
| Long fibre (%) | 10-12 in intensive rations | Inclusion of long fibre is important for intensive rations, where cattle will eat around 12% of DMI as straw. This equals around 1-1.5kg/day for finishing cattle and is best supplied in either separate racks or mixed into the complete ration. Avoid relying on bedding to supply adequate long fibre in the diet. |
| Oil (%) | <6 | Oil can be a useful rich energy source but excessive oil in the ration can depress intake. |

### Bull beef

Producers of bull beef should ensure they have identified a market for their cattle. Bull beef production systems can be highly feed efficient and rely on feeding the cattle to achieve fast rates of growth. Steers can be fed on similar rations but generally have slightly reduced growth rates compared to bulls.

- Keep group sizes small – no more than 20
- Avoid mixing batches, which leads to fighting and riding
- House bulls away from other stock, particularly breeding stock

Table 8: Example of finishing cattle rations for steers and bulls

| | 550kg continental steer, DLWG 1.3kg | | 550kg continental X dairy bull, DLWG 1.5kg | |
|---|---|---|---|---|
| | Grass silage (kg) | Grass silage & maize silage (kg) | Cereals (kg) | Maize silage (kg) |
| Grass silage (10.6 MJ ME/kg DM, 12% CP) | 15 | 10 | | 20 |
| Maize silage (11.2 MJ ME/kg DM, 9% CP) | | 10 | | |
| Barley | 7.5 | 5.5 | 9.8 | 4.5 |
| Beans | | | | 2 |
| Rapeseed meal | | 0.5 | 1.2 | |
| Straw | | | *Adlib* (approx. 1.5kg) | |
| **Diet provides MJ ME/kg DM (Total MJ ME/day)** | **12 (132)** | **11.9 (133)** | **12.1 (130)** | **12.1 (135)** |
| **CP % in DM** | **12** | **12** | **13.6 (concentrate only)** | **13.0** |

## Finishing heifers

Heifers tend to deposit more of their liveweight gain as fat. It is important they are fed to grow sufficient frame size before they move to a finishing ration. Heifers are well suited to forage based systems and may finish off grass. Alternatively, they can be fed similar finishing rations to steers, but may need a shorter feeding period to achieve target fat cover.

## Minimising acidosis problems

Energy dense finishing rations can increase the risk of acidosis in finishing cattle.

Tips to avoid acidosis include:

- Do not grind cereals into fine particles – crack the grain
- Ensure gradual adaptation to high concentrate diets, over at least two weeks
- Always offer a source of long fibre, eg straw, in a rack to encourage rumination. Intake is likely to be 1-1.5kg/day
- Never let *ad-lib* feed hoppers run out so that animals gorge when they are refilled
- If not feeding cereals *ad-lib*, feed in small meals throughout the day. Avoid meal sizes greater than 2.5kg/head/day for dry cereals
- Consider including neutralising agents such as limestone flour or sodium bicarbonate in the ration
- Consider grain moisture content, as moist grains, which will need to be treated with a suitable preservation method, tend to be easier to roll without shattering

# Water

Water is the most essential nutrient for cattle. A supply of clean, fresh water is essential to optimise DMI. Troughs should be inspected daily and cleaned out if contaminated with bedding, feed or dung.

Water allowances for cattle are based on the amount of DM the animals eat. The higher their DMI, the higher their water requirements. Water is provided from the ration as well as drinking water, with cattle fed drier rations having to drink more than those on wetter rations. However, it is vital that cattle always have access to clean, fresh water.

**Table 9: Water requirements of beef cattle (litres/kg DMI)**

| | Ambient temperature °C | | |
|---|---|---|---|
| | <16° | 16-20° | >20° |
| Calves (up to six weeks old | 7.0 | 8.0 | 9.0 |
| All other cattle (not lactating cows) | 5.4 | 6.1 | 7.0 |

For example, during the summer (at 16-20°C) a 400kg steer might eat 2% of its liveweight, ie 8kg DM/day as grazed grass. With a water requirement of 6.1litres of water/kg DM, this gives a daily requirement of 49 litres/day. Assuming grazed grass has a DM content of 20%, the amount of drinking water required would be a minimum of 17 litres of water (49-32litres (from grass) water/day).

## Vitamins and minerals

Cattle need at least 15 different minerals to support good health and productivity. The amount of vitamins and minerals recommended for inclusion in the diet depends on a variety of factors, including environment, production level, breed, liveweight and animal status. An important factor to consider is mineral interactions. Individual minerals are not often independent and supplying a particular mineral in excess can influence the availability of other minerals. For example, the presence of molybdenum (Mo) and sulphur (S) can affect the availability of copper (Cu).

Macro or major minerals such as calcium (Ca), phosphorus (P) and magnesium (Mg) are required by the animal in larger amounts compared to trace minerals and are also found in higher concentrations in the body. There are eight essential trace minerals required by the ruminant and these include copper (Cu), selenium (Se), cobalt (Co), iodine (I), zinc (Zn) and manganese (Mn).

- A trace element deficiency should be confirmed by independent testing and advice before buying and feeding supplements
- Diagnosis of a deficiency should be confirmed by monitoring the response to supplementation
- Increased levels in tissue or blood may not always be related to cost effective improvements in performance
- Over-supplementation could waste money and make matters worse, due to imbalance or undesirable interactions in the animal
- It is advisable to consult a nutritionist or vet about the required type and level of supplementation within a herd
- Supplementary mineral requirements vary, but particular attention should be paid to cattle on intensive systems, as cereals tend to be low in specific micronutrients

# Making the most of grass

## Grazing

Grazed grass is often the cheapest feed, if managed well. The use of modern grass varieties, along with appropriate types of clover in the sward can bring big yield benefits, as well as reducing nitrogen fertiliser requirements. Target growth rates at grass depend on type of stock, pastures and length of grazing season, but growth rates of 0.8-1.0kg per day across the whole grazing season are achievable.

Controlling sward height is key to maintaining pasture quality for grazing cattle. Sward height at turnout is crucial for determining grass utilisation throughout the season. Aim to stock fields more heavily during the spring, then reduce stocking rate later in the season to keep control of sward height and grass quality. Electric fences can be used to shut off areas that can either be grazed later in the season or cut for silage or hay.

Sward heights are allowed to increase as the season progresses, as grass growth falls and to provide a buffer to ensure feed quantity is maintained, especially as the animals grow and intakes increase.

**Table 10: Target sward heights for growing and finishing cattle**

| Period | Rotational pre-grazing height (cm) | Rotational post-grazing height (cm) | Continuous (cm) |
|---|---|---|---|
| Turnout-May | 10-12 | 5-6 | 5-6 |
| June-July | 10-14 | 6-7 | 6-7 |
| Aug-Sept | 10-15 | 7-8 | 7-8 |

More information on managing grazing can be found in beef and sheep BRP manual 8 – **Planning Grazing Strategies for Better Returns** at **beefandlamb.ahdb.org.uk.**

Good grazing management can reduce cost of production through extra grass availability, higher stocking rates, improved growth rates and a longer grazing season, all increasing weight gain at pasture.

## Finishing cattle on grass

High levels of grass quality and quantity must be maintained to finish cattle at grass. Later maturing continental breeds of cattle can be difficult to finish off grass and may need supplementary feeding during late summer/autumn to reach an acceptable weight and level of fat cover. However, heifers and earlier maturing native type cattle are more suited to forage based finishing.

Finishers can be kept out on a full *ad-lib* finishing ration as long as the ground is dry enough to avoid poaching and there is a dry area to lie down. Moving troughs and feed trailers regularly will help to minimise poaching. It is advisable to offer straw as a source of long fibre, as on wet days cattle may consume a high proportion of their total intake as concentrates and suffer problems with acidosis.

Feeding rates of 0.5kg concentrate per 100kg liveweight are recommended for grazing animals near finishing. Therefore, a 500kg animal would require about 2.5kg/head per day. However, where grass supply is poor, higher feeding rates may be required, to achieve finishing targets. Suitable concentrate feeds should be high in energy, at least 30% starch and sugar, with 12-14% CP in the DM. When high levels of supplementary feeding is required, it is likely that the cattle are better suited to being housed and finished inside.

# Feeding for carcase quality

## Increasingly, farmers need to produce beef to meet defined market specifications and in doing so maximise sale values.

| Main market | Target age (months) | Gender | Carcase weight (kg) | Classification | |
|---|---|---|---|---|---|
| | | | | Conformation | Fat |
| Butchers | 16-24 | Heifers, steers | 240-320 | R or better | 4L (some 4H) |
| Supermarket | 16-30 | Heifers, steers | 270-400 | O+ or better | 3 or 4L |
| | 12-16 | Young bulls | 280-380 | O+ or better | 3 or 4L |
| Manufacturing beef | 12-30 | Heifers, steers, bulls | 260+ | -O or better | 3 or leaner |

Note: Target specifications will vary. Check the latest criteria for the desired market outlet.

Many aspects of feeding management are related to carcase quality.

### Fat cover

Fat deposition occurs as the cattle age and gain weight. Compared to lean tissue, it takes four times more energy to deposit 1kg of fat tissue. It is therefore important to assess the cover regularly on finishing cattle to avoid excessive fat, which is costly to produce and will be trimmed off by the processor.

Faster finishing will mean cattle move through fat classes more quickly. Animals finished at 1.2kg/day DLWG can take six weeks to go from 4L to 4H, whereas animals finishing at +1.5kg/day can take three weeks.

### Fat colour

Diet is a major factor determining fat colour. In particular, carotenoid pigments in green forage can cause a yellow colouration. Cattle fed cereal based diets have whiter fat than forage fed cattle. The yellowing effect on fat colour from different forages can be ranked in decreasing order as follows; grazed grass, grass silage/concentrates, wholecrop wheat and maize silage.

### Toughness

Age at slaughter can have a significant effect on meat quality, as well as feed efficiency. Older cattle generally produce tougher meat. To avoid undesirable toughness, it is recommended that heifers and steers are finished under 30 months of age, while young bulls should be less than 16 months of age.

### Shelf life

In general, grass-fed beef has a longer shelf life than concentrate-fed beef, due to its higher concentration of anti-oxidants. Feeding supplementary vitamin E with concentrate-based finishing diets can extend shelf life and protect flavour.

### Abattoir feedback

Always look at how cattle are classified to see if adjustments need to be made to the ration or selection of cattle pre-slaughter. Information about health conditions can also indicate issues with the ration, for example, liver abscesses can be caused by acidosis in the rumen.

# What is the dung telling you?

## Looking at the dung is a useful indicator of how well the rumen is functioning and how well an animal is digesting its diet.

| What the manure looks like | Possible dietary causes (not disease) |
|---|---|
| Loose manure | ■ High protein (total or soluble); pasture<br>■ Insufficient fibre in ration |
| Diarrhoea | ■ Spoiled, mouldy feed or silage<br>■ Ruminal acidosis |
| Foamy manure or mucin casts (pieces of gut lining that indicate gut damage) | ■ Ruminal acidosis<br>■ Increased hindgut fermentation |
| Large particles, undigested feed | ■ Not enough long fibre/forage<br>■ Cattle fed a total mixed ration (TMR) may be sorting feed<br>■ Ruminal acidosis |
| Manure variable in a feeding group | ■ Cattle are sorting feed; feeding slowly<br>■ Dominant cattle in the group eating more concentrate<br>■ Spoiled, mouldy feed or silage |
| Very dry dung | ■ Diet is too low in protein, potential risk of the rumen stopping working<br>■ Reduced water intake |

Source: Adapted from US Dairy Forage Research Centre, Wisconsin

If the rumen is working well, there should be:

- Few feed particles over 1.5cm long in the dung
- Little recognisable feed in the dung
- 70% of cattle not sleeping, eating or drinking should be ruminating

Other observations/measurements to evaluate successful ration formulation:

| | |
|---|---|
| **Cattle** | Observe cattle. Do they look well? Consider performance, coat, evidence of other health problems. Are all cattle coming forward to eat? |
| **Feed** | Check feeding area. Is feed within easy reach all the time? Is it free of moulds and not too dusty? Are cattle sorting out or refusing to eat certain feeds? |
| **Feed trough** | Check the feeding area is clean, smooth and free of old feed and dung |
| **Clamp/feed storage** | Check feed storage areas for evidence of feed spoilage and accurate weighing of feeds |
| **Water** | Check fresh water is clean, available and not contaminated with feed/bedding/faeces |
| **Housing** | Check housing is comfortable, clean, well ventilated and not overcrowded |
| **Employees** | Ensure employees have good stockmanship skills and watch how cattle respond to them |

# Diet formulation – optimising nutrient balance

Formulating cattle rations revolves around understanding how feeds behave in the rumen. Rumen function relies on the millions of microbes contained within it to ferment plant material and build microbial protein, which is then used by the animal to meet their own energy and protein needs.

The most important macro nutrients to consider for beef cattle nutrition are energy (mainly from carbohydrates) and protein. These nutrients can be present in feeds in different forms that make them available to the animal at different rates. A balanced release of carbohydrate and rumen degradable protein is required to fuel fermentation in the rumen and optimise cattle performance.

**Carbohydrate fermentation**

| Fibres | Starch | Sugars |
|---|---|---|
| Straw | Cracked cereals | Molasses |
| Low D-value silage | Crimped cereals | |
| Soya hulls | Biscuit blends | |
| Palm kernel | Potatoes | |
| High D-value silage | Rolled cereals | |
| Sugar beet pulp | Ground cereals | |

**slow** → **fast**

**Protein degradation**

| Digestible undegradable protein (DUP) | | Effective rumen degradable protein (ERDP) |
|---|---|---|
| Prairie meal (maize gluten feed) | Distillers grains | Rapeseed meal |
| Soyabean meal | Beans | Pot ale syrup |
| Lupins | Peas | Feed grade urea |

Crude protein provides a simple definition of protein content and is directly proportional to the amount of nitrogen in the feed. It can be further sub-divided into:

- **Effective rumen degradable protein (ERDP)**, which is the protein supply available from the rumen microbes. The majority of protein supplied to growing and finishing beef cattle comes from this source
- **Digestible undegradable protein (DUP)**, which is the digestible protein available from feed which escapes rumen degradation. This is a minor source of protein in beef cattle diets and of most importance in rapidly growing young cattle

Also consider fibre. As well as providing a source of energy in ruminant diets, fibre is required for efficient rumen function.

Fibre has a physical effect in the rumen, stimulating rumination and chewing and is often referred to as the scratch factor. Forage based rations will usually provide sufficient structural fibre for good rumen function. Intensive cereal based rations that are fed *ad-lib* will require supplementary long structural fibre. The best type of forage for this is straw, as it is rougher and small amounts will help maintain rumen function compared to softer silage or hay.

Many feeds provide digestible fibre such as sugar beet pulp and high D-value silage. This provides a rumen friendly source of energy.

# Common feeds and their composition

## There are a variety of feeds available. This table provides an overview of some of the more common ones.

In order to compare feeds it is important to consider differences in dry matter content, for example, when feeding crimped barley at 70% DM compared to feeding dry barley at 86% DM, 25% more will need to be fed. Protein levels on feed labels are often referred to on a fresh weight basis and moist co-products are often referred to in the dry matter, so it is important to check the information you are given when calculating the protein levels of a ration. Seek advice from a nutritionist if in doubt.

| Feed | DM % | Energy (MJ ME/kg DM) | Crude protein (CP % in DM) |
|---|---|---|---|
| Grass silage (good) | 32 | 11.5 | 16 |
| Grass silage (moderate) | 28 | 10.5 | 12 |
| Maize silage | 25-35 | 10.8-11.7 | 8-9 |
| Wholecrop barley (cracked) | 30-45 | 13.5 | 11.6 |
| Hay | 85.0 | 9.5 | 9 |
| Straw | 85.0 | 6 | 4 |
| Maize grain | 86.0 | 14.3 | 8.5 |
| Triticale | 86.0 | 13.4 | 12 |
| Potatoes | 20.5 | 13.5 | 11 |
| Barley | 86.0 | 13.2 | 12.1 |
| Biscuit blends | 88.0 | 15 | 9.5 |
| Molasses (cane) | 75.0 | 12.6 | 6 |
| Sugar beet pulp | 89.0 | 12.5 | 10 |
| Oats | 86.0 | 12.2 | 11 |
| Wheatfeed | 89.0 | 11.5 | 17.3 |
| Citrus pulp | 89.0 | 12.5 | 7 |
| Soya hulls | 89.0 | 11.9 | 12.2 |
| Palm kernel | 89.0 | 12.3 | 18 |
| Wheat distillers | 89.0 | 13.5 | 32 |
| Soya bean meal | 88.0 | 13.8 | 52 |
| Rapeseed meal | 88.0 | 12.1 | 38.5 |
| Beans | 86.0 | 13.8 | 29 |
| Pot ale syrup | 45.0 | 14.0 | 37 |
| Urea | 99.5 | 0 | 287 |

Details and rationing advice for a range of feeds can be found in the **BRP Mini Feeds Directory** at **beefandlamb.ahdb.org.uk**

# Other BRP publications available

## Beef BRP

Manual 1 – Choosing bulls to breed for Better Returns
Manual 2 – Marketing prime beef cattle for Better Returns
Manual 3 – Improving cattle handling for Better Returns
Manual 4 – Beef production from the dairy herd
Manual 5 – Feeding suckler cows and calves for Better Returns
Manual 6 – Improve beef housing for Better Returns
Manual 7 – Feeding growing and finishing cattle for Better Returns
Manual 8 – Optimising suckler herd fertility for Better Returns
Manual 9 – Controlling worms and liver fluke in cattle for Better Returns
Manual 10 – Better Returns from pure dairy-bred male calves
Manual 11 – Managing replacement heifers for Better Returns

See the AHDB Beef and Lamb website **beefandlamb.ahdb.org.uk** for the full list of Better Returns Programme publications for beef and sheep producers.

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