Practical Beef Cattle Nutrition

HYBU CIG CYMRU
MEAT PROMOTION WALES

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- Effective promotion of Welsh Lamb and Welsh Beef and red meat products in Wales
- Build strong differentiated products
- Improve quality and cost-effectiveness of primary production
- Strengthen the red meat supply chain
- Effective communication of HCC activities and industry issues

This booklet forms part of a series of publications produced by HCC's Industry Development team.

The Industry Development team deal with a range of issues that include:

- Technology Transfer
- Research and Development
- Market Intelligence
- Training
- Demonstration Farms
- Benchmarking

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1. Introduction

Feed often accounts for over 70% of the variable cost of beef cattle production. Efficient feeding can have a positive influence on the productivity and profitability of beef production, and a major impact on the health and welfare of all animals. In this booklet, we have compiled a practical guide to practical feeding of beef cattle under typical farming conditions. However, grassland and grazing management is covered elsewhere.

Cattle are ruminant animals and rely on a mutually beneficial relationship with bacteria, protozoa and fungi in their rumen to help them digest the fibrous foods they consume. Therefore diets need to be formulated with the idea of feeding the rumen to feed the cattle (see technical note 1, page 15). Nutrients are needed for body maintenance, physical activity, growth, milk production, reproduction and health. All of the nutrient needs must ultimately be met from the diet, although some mobilisation of body tissues can provide some nutrients and energy over short periods, e.g. in early lactation.

This is all underpinned by specific technical notes, which can be found at the back of the booklet.

2. Basic Diet Formulation

Knowing the quality and analytical composition of your feedstuffs is a vital component in beef cattle rationing. Typical composition figures for some common feedstuffs are given in technical note 2.

Home-grown forages should always be sampled and analysed before formulating diets to make sure that forage contribution is maximised and expensive concentrate input is kept to a minimum. Having higher quality silage increases the voluntary feed intake (VFI) (see technical note 3) therefore reducing the need for expensive concentrates.

You should always seek professional nutritional advice when formulating complex rations for cattle.

Ensure adequate feed space if feeding restricted quantities of feed to ensure all animals can feed, e.g. suggested trough space allowance are 500 mm for store cattle and 750mm for suckler cattle.

2.1 Feed planning

Effective feed planning estimates the total amount of feeds required for the winter feeding period. In essence this is a relatively simple calculation and is based on the following formula:

To give the feed total for each ration and class of cattle calculate:

feed used per head per day x number of cattle x days in feeding period

Then add together:

the total amount for each class of cattle = the overall total farm requirement

A simple, winter feed planning calculation for a spring calving suckler herd rearing its own replacements and selling store animals in the spring is shown in Table 1 below.

Table 1. Example of a whole winter feed planning calculation

	Daily amount fresh weight (kg)		No of cattle		No of days	Totals (t)
Grass silage						
Suckler cows	27.2	x	100	x	180	490
Heifer replacements	22.0	x	24	x	180	95
Store cattle	20.0	x	76	x	180	274
						859
Concentrate (e.g. barley and rapeseed meal based)						
Heifer replacements	2.5	x	24	x	180	10.8
Store cattle	1.5	x	76	x	180	20.5
						33.3
Minerals						
Suckler cows	0.1		100		180	1.8
						1.8

Estimating the amount of home produced feeds, particularly forage availability on the farm, is essential when calculating how much feed needs to be bought for the winter feeding period.

(See technical note 4 for space requirements for storage of various feeds, see technical note 5 for estimates of quantities of forage in large bales).

3. Feeding Suckler Cows

In essence, suckler cows need to do three fundamental things:

- produce sufficient milk to maintain good calf growth
- achieve target body condition scores (BCS - a measure of fat deposition)
- conceive again to ensure next year's calf crop

Meeting BCS targets (see Figure 1) through efficient feeding is important as it has been shown that excessively thin or fat cows produce poor milk yields, under-weight calves and have difficulty getting back in calf again. (Note: Pregnancy diagnose cows and cull barren cows to prevent extra feeding costs for no output.)

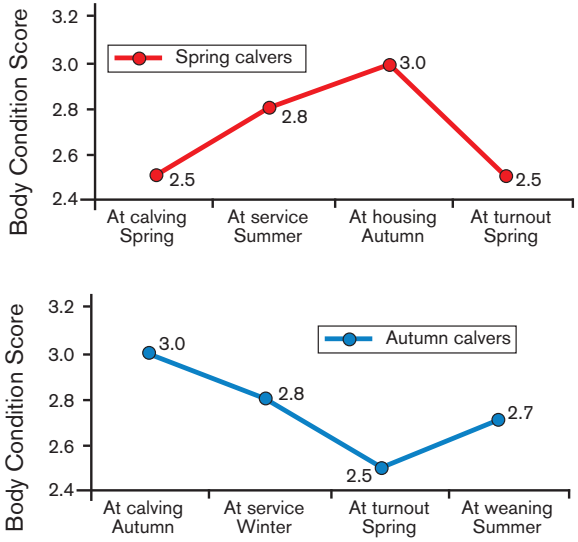


Figure 1. Typical BCS for spring and autumn calving suckler cows and heifers

The efficient management of suckler cow systems should be targeted at utilising cheap feed resources (e.g. grass) to lay down BCS at appropriate times of the year and then allowing BCS to reduce slightly at times of year when feeds are expensive (e.g. winter).

General points

- Manage the cow to achieve the correct target body condition score (BCS) at various key stages in the production cycle.
- Most suckler cows are capable of mobilising some body fat to meet daily energy needs if required.
- In practice this means that at some points of the production cycle energy will be undersupplied.
- While at other points in the cycle the cow can consume more energy than she requires on a daily basis so that BCS levels can be restored.
- However, protein, minerals, trace elements and vitamins do need to be supplied at an adequate level on a daily basis.

3.1 Winter diets for in calf cows

Table 2. Typical winter diets for non-lactating 650 kg cow.

	Feed options			
Feedstuffs *(kg per tonne)*	**Silage (only)**	**Silage + Straw (ad lib)**	**Straw (ad lib) +WDG[1]**	**Straw (ad lib) +SBP[2] + MG[3]**
Grass Silage	27.2	15.0	-	-
Barley Straw	-	6.2	8.5	5.0
Sugar Beet Pulp	-	-	-	2.0
Maize Gluten	-	-	-	2.5
Wheat Dark Grains	-	-	2.5	-
Minerals	0.1	0.1	0.1	0.1
Diet cost (pence per day)	**43**	**50**	**66**	**66**

Prices: Grass Silage - £15/t; Barley Straw - £40/t; [2]Sugar Beet Pulp (SBP) - £100/t; [3]Maize Gluten (MG) - £95/t; [1]Wheat Dark Grains (WDG) - £120/t; Minerals - £250/t

3.2 Winter diets for cows with calves

Table 3. Typical winter diets for 600 kg suckler cow yielding 10 litres of milk

	Feed options		
Feedstuffs *(kg per head per day)*	**Silage**	**Straw + WGD[1]**	**Straw +SBP[2] + MG[3]**
Homemix Concentrate	2.0	3.0	-
Grass Silage (ad lib)	40.0	-	-
Straw (ad lib)	-	6.0	6.0
Sugar Beet Pulp	-	-	2.0
Maize Gluten	-	-	6.0
Wheat Dark Grains	-	5.0	-
Minerals	-	-	0.1
Diet cost (pence per day)	**82**	**117**	**103**

Prices assumed: Homemix concentrate (Table 4): £110/t; Grass Silage - £15/t; Barley straw - £40/t; [2]Sugar Beet Pulp (SBP) - £100/t; [3]Maize Gluten (MG) - £95/t; [1]Wheat Dark Grains (WDG) - £120/t; Minerals - £250/t

General points

- Different basal ingredients can be used depending on availability and price.
- When homemixing concentrates include a suitable mineral supplement according to recommended instructions (see table 4).
- After mating, the concentrate supplement can be reduced and the forage components of the diet increased until cows are turned out in spring.
- Planning these rations well in advance should make sure that winter diets for autumn calving cows allow animals to milk well, conceive and produce top quality calves for weaning the following spring/summer.

4. Feeding Growing Cattle

4.1 Creep feeding calves

The benefits of creeping feeding are:

- Higher weaning weights (typically higher by around 25 kg)
- Less stress at weaning as similar concentrate feed is available
- Fewer pneumonia problems after housing
- Higher feed intake post weaning
- Higher growth rate post weaning (typically around 10 kg extra)

General points

- A wide variety of feeds can be used as creep feeds from specially designed compounds to simple straights, such as maize gluten feed or cereal-based homemixes (see Table 4).
- Calves mainly require energy from the creep feed as enough protein is usually available from grass and the cow's milk.
- If protein is lacking increase the crude protein content of the creep feed to 140 g/kg on a fresh weight basis.
- After an initial period of restricted feeding to avoid excessive intakes and potential rumen acidosis (see technical note 6), creep feeds can be offered ad lib through large hoppers to make feeding easier.
- Calves can be consuming between 2-4 kg of creep by weaning depending on the size of the animal and on the amount of time before it is weaned or housed.

Table 4. A typical home-mixed calf creep feed and homemix concentrate for suckler cows, stores and finishing animals

Feed	kg per tonne		Composition
Barley	950	850	DM* (g/kg)
Minerals	25	12.5	ME* (MJ/kg DM)
Molasses	25	165	CP* (g/kg DM)

*DM = dry matter, ME = Metabolisable Energy, CP = Crude Protein

4.2 Store animals

The basic principle of feeding store cattle through the winter is to minimise costs by using inexpensive, usually home-grown forage to grow cattle at liveweight gains (LWG) of 0.5-0.7 kg per day. Then rely on compensatory growth during the summer months to allow maximum LWG using the cheapest feed of all – grass.

(Note: some producers will reduce or remove the concentrate portion of the diet completely approximately 6 weeks before turnout to help condition the rumen microflora to high forage diets and help to maximise compensatory growth at grass.)

Table 5. Examples of typical store diets for a 350 kg steer over the winter period, gaining at 0.6 kg per day.

	Feed options		
Feedstuffs *(kg per head per day fresh weight)*	**Silage**	**Straw + WGD[1]**	**Straw +SBP[2] + MG[3]**
Homemix Concentrate	1.5	-	-
Grass Silage (ad lib)	20.0	-	-
Straw (ad lib)	-	4.5	3.5
Sugar Beet Pulp	-	-	1.5
Maize Gluten	-	-	2.5
Wheat Dark Grains	-	3.5	-
Minerals	0.1	0.1	0.1
Diet cost (pence per day)	**45**	**63**	**56**

Prices assumed: Homemix Concentrate (Table 4): £110/t; Grass Silage - £15/t; Barley Straw - £40/t; [2]Sugar Beet Pulp (SBP) - £100/t; [3]Maize Gluten (MG) - £95/t; [1]Wheat Dark Grains (WDG) - £120/t; Minerals - £250/t

4.3 Heifer replacements

The feeding regime needed for rearing heifer replacements from the weaned calf, for a purchased bulling heifer or for those at in–calf heifer stage, is highly dependent on the age at which heifers calve for the first time.

General points

- If calving heifers at 30–36 months of age, they can be grown relatively slowly with average weight gains of approximately 0.5-0.6 kg per day. Grazing during summer and average quality grass silage during the winter months should give this level of growth.
- If calving heifers at 21-24 months of age, then higher average growth rates are needed of approximately 0.75-0.9 kg per day. Grazing with good grassland management during the summer and high quality forage plus some concentrates (see Table 6) in the winter may need to be fed along with winter forage to maintain overall growth rate.

Table 6. Examples of typcal diets for a 350 kg heifer replacement over the winter period gaining at 0.8 kg per day

	Feed options		
Feedstuffs *(kg per head per day)*	**Silage**	**Straw + WGD[1]**	**Straw +SBP[2] + MG[3]**
Homemix Concentrate	1.5	-	-
Grass Silage (ad lib)	22.0	-	-
Straw (ad lib)	-	5.5	3.0
Sugar Beet Pulp	-	-	2.0
Maize Gluten	-	-	4.5
Wheat Dark Grains	-	4.0	-
Minerals	-	0.1	0.1
Diet cost (pence per day)	**60**	**73**	**77**

Prices assumed: Homemix Concentrate (Table 4): £110/t; Grass Silage - £15/t; Barley Straw - £40/t; [2]Sugar Beet Pulp (SBP) - £100/t; [3]Maize Gluten (MG) - £95/t; [1]Wheat Dark Grains (WDG) - £120/t; Minerals - £250/t

5. Feeding Finishing Cattle

Typical finishing systems for both spring born suckler and dairy bred calves are shown in Figure 2. The figure shows the diet types that animals will need from birth to slaughter. Figure 3 also shows typical finishing systems and diet types for autumn born suckler and dairy bred calves throughout the key spring, summer, autumn and winter feeding periods.

Figure 2. Typical finishing systems for spring born calves

System		Spr	Sum	Aut	Win	Spr	Sum	Aut	Win	Spr	Sum
12 mths	Suckler	Suckling		Conc*							
	Dairy	Milk	Conc								
18 mths	Suckler	Suckling		For**:conc		Grazing:conc					
	Dairy	Milk	Forage	For:conc		Grazing:conc					
24 mths	Suckler	Suckling		Forage		Grazing		For:conc			
	Dairy	Milk	Forage	Forage		Grazing		For:conc			
30 mths	Suckler	Suckling		Forage		Grazing		Forage		Grazing	
	Dairy	Milk	Forage	Forage		Grazing		Forage		Grazing	

(*conc= concentrates, **for=forage)

Figure 3. Typical finishing systems for autumn born calves

System		Spr	Sum	Aut	Win	Spr	Sum	Aut	Win	Spr	Sum
12 mths	Suckler	Suckling		Conc*							
	Dairy	Milk	Conc								
18 mths	Suckler	Suckling		Grazing		For**:conc					
	Dairy	Milk	For:conc	Grazing		For:conc					
24 mths	Suckler	Suckling		Grazing		Forage		Grazing:conc			
	Dairy	Milk	Forage	Grazing		Forage		Grazing:conc			
30 mths	Suckler	Suckling		Grazing		Forage		Grazing		Grazing:conc	
	Dairy	Milk	Forage	Grazing		Forage		Grazing		Grazing:conc	

(*conc= concentrates, **for=forage)

5.1 12-14 month systems (suckled calves and dairy bred)

An efficient system relies on:

- cereal-based concentrates type diets offered on an ad lib basis;
- achieving maximum growth over the shortest time period possible at maximum feed conversion ratios (FCR) to obtain optimum profit margins (see technical note 7);
- rapid turnover of cattle through the housing facilities to make maximum use of fixed cost resources;
- male animals left entire tend to grow faster, convert feed more efficiently and produce heavier carcasses of better conformation compared to steers;
- ensuring heifers do not become overfat.

Table 7. Examples of typical home-mixed cereal based intensive rations for 12-14 month finishing system

Feedstuffs *(kg per tonne inclusion)*	**Feed**		
	1	2	3
Barley	825.0	670.0	790.0
Rapeseed Meal	125.0	130.0	-
Sugar Beet Pulp	-	150.0	-
Wheat Dark Grains	-	-	160.0
Minerals	25.0	25.0	25.0
Molasses	25.0	25.0	25.0
Diet cost (£ per tonne fresh weight)	**91.0**	**94.0**	**93.0**
Nutritive value			
DM* (g/kg)	860.0	870.0	860.0
ME* (MJ/k DM)	12.7	12.5	12.9
CP* (g/kg DM)	150.0	150.0	150.0

Prices assumed: Barley: £82/t; Rapeseed Meal: £115/t;: Sugar Beet Pulp £105/t; Wheat Dark Grains: £120/t; Minerals: £250/t; Molasses: £93/t.
*DM = dry Matter, ME = Metabolisable Energy, CP = Crude Protein

General points

- Make straw available ad lib to minimise acidosis (for ruminants at least 25% of the diet should be fibrous).
- Keep dust down and ensure fresh feed to stimulate voluntary feed intake.
- Include cheap by-products feeds only where appropriate.
- Always include minerals and keep water bowls clean and fresh.
- Ensure adequate feeding space – between 500 mm and 750 mm per head.

5.2 16-18 month systems (suckled calves and dairy bred)

For spring-born calves it is important to ensure that all calves are finished off grass during their second summer as it is expensive to re-house cattle before slaughter. Autumn-born calves should be finished while housed, so good quality home-grown forage should be utilised to reduce concentrate feeding.

An efficient system relies on:

- creep feed suckled calves to maximise weaning weight;
- avoiding excessive store periods that severely restrict growth;
- ensuring excellent grassland management at all times (for all classes of cattle);
- matching grass availability, grass quality and stocking rate to optimise liveweight gains;
- worming and vaccinating cattle if needed;
- feeding concentrates at grass to finishing cattle if required.

Table 8. Examples of typical diets for a 350 kg steer over the winter period, gaining at 0.8 kg per day

	Feed options		
Feedstuffs *(kg per head per day)*	**Silage**	**Straw + WGD[1]**	**Straw +SBP[2] + MG[3]**
Homemix Concentrate	2.5	-	-
Grass Silage (ad lib)	24.0	-	-
Straw (ad lib)	-	6.5	4.0
Sugar Beet Pulp	-	-	2.0
Maize Gluten	-	-	5.0
Wheat Dark Grains	-	4.5	-
Minerals	-	0.1	0.1
Diet cost (pence per day)	**64.0**	**83.0**	**86.0**

Prices assumed: Homemix Concentrate (Table 4): £110/t; Grass Silage - £15/t; Barley Straw - £40/t; [2]Sugar Beet Pulp (SBP) - £100/t; [3]Maize Gluten (MG) - £95/t; [1]Wheat Dark Grains (WDG) - £120/t; Minerals - £250/t

(Note: Table 8 is applicable to spring-born calves during their first winter, while Table 9 should be used to formulate the concentrate ration for winter-born calves in their second winter.)

5.3 20-24 month systems (suckled calves and dairy bred)

An efficient system relies on:

- minimising the cost of expensive winter diets;
- maximising the growth that can be achieved off summer grazing;
- reducing creep feeding if the growth can be achieved from cheap grass at a later date, which requires good grassland management;
- worming and vaccinating cattle, if needed.

For the spring-born calf, a cheap store diet can be formulated from good quality basal forage (e.g. grass silage) or the example diets given in Table 4 would also be suitable

during their first winter after weaning. These spring-born calves would then go on to graze during their second summer and be finished on a forage and concentrate diet during their second winter (see Table 9). For autumn-born calves concentrates may need to be fed during their last summer to ensure they finish at grass to prevent the extra costs of housing.

Table 9. Examples of typical diets for a 500 kg steer over the 2nd winter finishing period, gaining at 1.0 kg per day

	Feed options		
Feedstuffs *(kg per head per day fresh weight)*	**Silage**	**Straw + WGD[1]**	**Straw +SBP[2] + MG[3]**
Homemix Concentrate	2.0	-	-
Grass Silage (ad lib)	34.0	-	-
Straw (ad lib)	-	8.0	3.5
Sugar Beet Pulp	-	-	3.0
Maize Gluten	-	-	5.5
Wheat Dark Grains	-	5.0	-
Minerals	-	0.1	0.1
Diet cost (pence per day)	**73.0**	**95.0**	**99.0**

Prices assumed: Homemix Concentrate (Table 4): £110/t; Grass Silage - £15/t; Barley Straw - £40/t; [2]Sugar Beet Pulp (SBP) - £100/t; [3]Maize Gluten(MG) - £95/t; [1]Wheat Dark Grains (WDG) - £120/t; Minerals - £250/t

5.4 24-30-month systems (suckled calves and dairy bred)

This method of finishing cattle will probably diminish in popularity due to CAP reform as the subsidies are de-coupled from production. Emphasis will change from maximising subsidy claims to maximising efficiency and market value. The Feed Conversion Ratio (FCR) for these animals is poor (see technical note 7), which increases the total feed costs and there is a higher fixed cost requirements. However, it may still be applicable for some producers, particularly in upland areas who wish to finish cattle without purchasing many feeds onto the farm.

6. Water Requirements

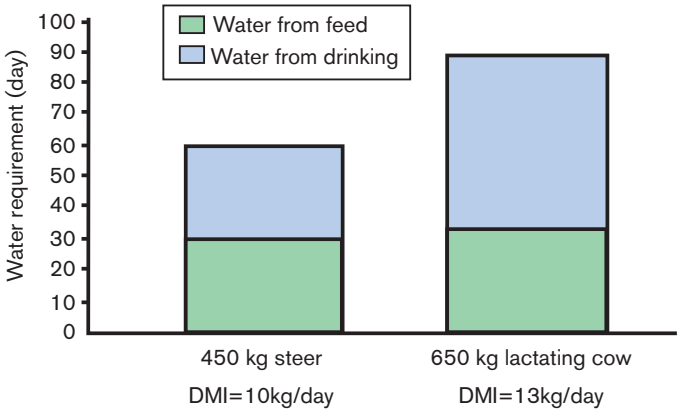
Water is the major and most essential nutrient for all animals.

General points

- Cattle require between 5 - 7 litres of water per kg dry matter consumed (see Figure 4).
- The water content of foods is very variable and can range from as little as 6% in concentrates (normally 12-14% moisture) to over 90% in some root crops.
- Cattle will drink together (normally after feeding) so the water supply must be adequate to cope with peak demand.
- All stock must have an uninterrupted supply of fresh, clean and easily accessible water at all times.
- Water tanks and troughs should ideally be inspected daily and if contaminated with straw or faeces they should be cleaned out.

Figure 4. Typical water requirements (litre per day) for beef animals (DMI=dry matter intake)

7. Minerals, Trace Elements and Vitamins



Correct mineral and vitamin supplementation is critical if production is to be maximised and health maintained. However, before attributing substandard animal performance on mineral or vitamin deficiencies, it is vital that other possible dietary and management factors are examined (e.g. lower than expected energy levels in grass silage).

General points

- Some types of vitamins such as the B vitamins are synthesised by microbes in

the rumen of cattle, and therefore do not need to be supplemented in the diet.

- Some vitamins need to be supplemented, especially vitamins A, D, and E during the winter months as there is a loss of vitamins during the storage of silage, hay and grains etc.
- Rations will be deficient in trace elements and vitamins and need supplementation.
- Rearing and growing diets may need extra calcium and phosphate but have sufficient sodium and chlorine.
- In general maize and straw diets are low in sodium.
- Mineral supplements in suckler cow diets should provide adequate calcium, phosphate, sodium and magnesium as well as the full spectrum of trace elements and vitamins A, D and E.
- As with forage analysis, soil mineral levels usage should be checked on a regular basis (using soil testing, feed analysis or blood sampling), and mineral supplementation adjusted for any specific deficits or excesses.
- When feeding straights (eg rapeseed meal or maize gluten) specific minerals may be needed.
- Diets high in cereals need a specific mineral balance.

8. Conclusions

Time and advice is needed for planning and formulating diets for the various age groups of cattle. This booklet gives practical advice on how to improve diet formulation and important points that need to be taken into consideration.

Efficient use of resources, such as home-grown forage, can increase the profitability and productivity of the unit, as the concentrate costs can be reduced while the liveweight gain or body condition score is maintained. The importance of correct supplementation and water supply also need to be realised.

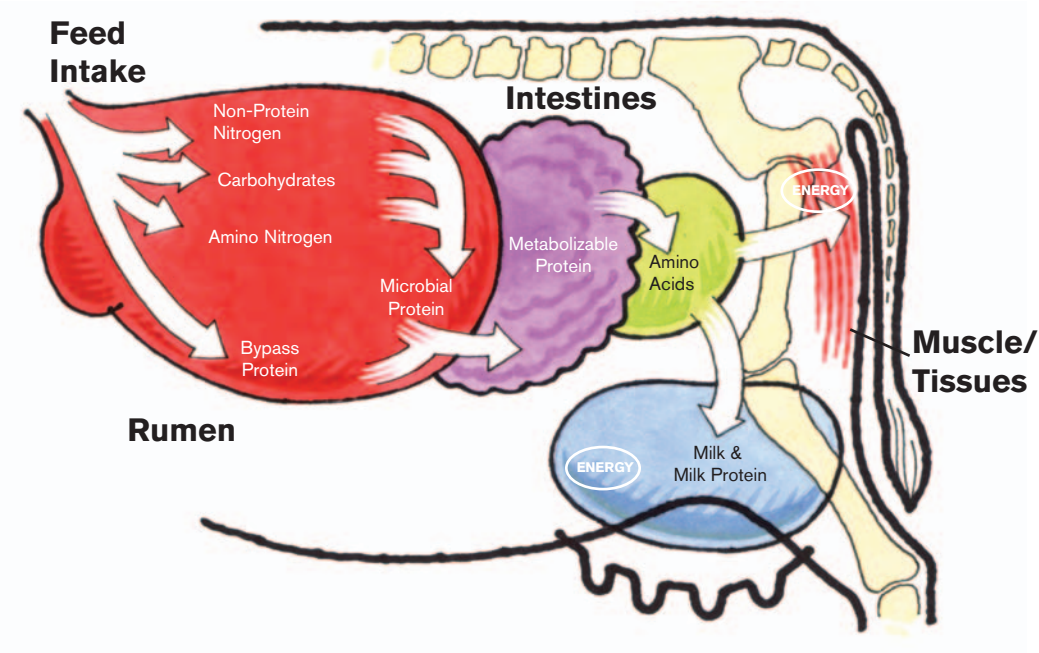
9. Technical Notes

9.1. The Rumen

The rumen is a fermentation chamber where feed and microflora (bacteria, protozoa and fungi that live in the rumen) interact to produce various compounds that provide energy and protein to the cattle and the microflora. The microflora are essential as they produce the enzymes needed to break down cellulose (found in fibrous plant material) as cattle do not have this digestive ability. The products that are created from

the digestion by the microflora in the rumen are used by the cattle to meet their own energy and protein needs.

Figure 5. The basic processes within a rumen



Carbohydrates, such as fibre, starch and sugars, are mainly broken down into volatile fatty acids (VFAs); mainly acetate, propionate and butyrate. These are absorbed across the rumen wall to provide energy for the animal.

Protein comes in two forms depending on whether it can be degraded by the microflora in the rumen or not.

Degradable protein is broken down by the microflora into amino acids, which are used by the microflora themselves for growth and reproduction. When the microflora die they leave the rumen and can be digested and absorbed in the stomach and small intestine of the cattle to meet their requirements for amino acids, which are the building blocks of muscle and milk protein. So the animal benefits indirectly from rumen degradable protein.
Rumen undegradable protein can be used directly as it goes into the small intestine where it is digested and absorbed by the animal's own digestive enzymes. Note: For

animals at a relatively high productivity level (young rapidly growing animals or early lactation cows), the supply of undegradable protein supplied in the ration may need to be higher than that normally supplied by common forages and cereal based concentrates to ensure requirements are met.

9.2 Composition of common feedstuffs

Table 10: Common feedstuffs and their nutritive values

Feedstuffs	DM* (g/kg)	ME* (MJ/kg DM*)	CP* (g/kg DM*)
Forages			
Silage (average)	220	10.5	120
Silage (good)	250	11.0	140
Silage (big bale)	300	10.0	100
Hay	840	8.6	85
Straw (barley)	860	6.5	40
Maize Silage	320	10.8	80
Wholecrop Silage (cracked)	650	10.5	100
Cereals			
Barley	860	13.2	120
Wheat	860	13.6	120
Oats	860	12.0	92
Maize	860	13.8	100
Straights			
Sugar Beet Pulp	880	12.5	110
Field Beans	860	12.8	286
Rapeseed Meal	880	12.0	400
Soyabean Meal	880	13.3	500
Wheat Dark Grains	880	13.5	340
Maize Gluten Feed	880	12.9	220
Succulents			
Potatoes	200	13.3	93
Swedes	120	14.0	90
Draff/Brewers Grains	230	11.1	220

*DM = Dry Matter, ME = Metabolisable Energy, CP = Crude Protein

9.3. Typical feed intake ranges for beef cattle

Promoting voluntary feed intake (VFI) is a vital component of beef cattle profitability

since higher feed intakes lead to increased production, lower feed costs and shorter finishing times.

Table 11: Typical dry matter and fresh weight intake of beef cattle

Type of cattle	**Diet Type**		
	Concentrates	Silage and Concentrates	Grass
Suckler Cows			
Non-lactating suckler cow (650kg)			
DMI* (% of LW)	-	1.2 - 1.7	1.5 - 1.8
FWI* (kg)	-	25 - 40	40 - 70
Lactating suckler cow (650kg)			
DMI* (% of LW)	-	1.6 - 2.5	2.0 - 3.0
FWI* (kg)	-	35 - 60	50 - 80
Growing and Finishing Cattle			
Store animals (300kg)			
DMI* (% of LW)	-	1.5 - 2.0	1.5 - 2.5
FWI* (kg)	-	12 - 30	30 - 50
Finishing animals (500kg)			
DMI* (% of LW)	1.8 - 2.5	1.5 - 2.5	1.5 - 2.5
FWI* (kg)	10 - 15	18 - 40	35 - 70

*DMI = Dry Matter Intake, LW = Live Weight, FWI = Fresh Weight Intake

9.4. Space needed for storing winter feed

Table 12. Space requirements for storage of various feeds

Feed	Typical space requirement *m3/tonne*
Wheat	1.35
Barley	1.45
Oats	1.95
Protein Straights	1.8-2.1
Beans	1.20
Potatoes	1.55
Draff/Brewers Grains	0.95-1.25
Hay (small bales)	6.00
Hay (round bales)	8.00
Straw (small bales)	9.00
Straw (round bales)	12.00
Grass Silage (round bales 500-600 kg)	2.3-2.7
Grass Silage (pit silos)	1.2-1.6

9.5. Quantity of forage

To estimate the amount of silage needed:

- 1.3 m diameter **unchopped silage bale** weights 450-500 kg *(1)*
- 1.3 m diameter **chopped silage bale** weights 600-700 kg *(1)*
- 1.3 m diameter **unchopped wheat straw bale** weights 220 kg *(2)*
- 1. 3 m diameter **chopped wheat straw bale** weights 230 kg *(2)*
- 1. 3 m diameter **hay bale** weights 275 kg *(2)*
- Large square bale *(3)* of **unchopped silage** weights 770kg
- Large square bale *(3)* of **unchopped wheat straw** weights 250kg *(4)*
- Large square bale *(3)* of **hay** weights 400kg *(5)*

(1) assumes silage has a dry matter of 22-25%, add 150kg per bale is DM is18%. (2) equivalent to about 15 small rectangular bales (3) large square bales = 2.5 x 0.9 x 1.2 metres (4) equivalent to about 17 small rectangular bales (5) equivalent to about 20 small rectangular bales

Note: A bale of barley straw is denser than wheat straw and is therefore heavier.

9.6. Acidosis

The rumen needs to be maintained at pH 6.2 – 6.5 pH so the microflora can function effectively. When high levels of concentrates are fed, the rapid degradation of starch and sugars can lead to a marked decline in rumen pH as a result of lactic acid production. This low pH, which is usually referred to as rumen acidosis, leads to a decline in microflora activity and numbers. There is a resultant decline in fibre digestion and lower feed intake, which reduces performance. It is important to bear the needs of the rumen microflora in mind as well as the needs of the animal itself.

9.7. Feed conversion ratio

Feed conversion ratio (FCR) is the amount of feed needed to produce one kg gain in liveweight. Typical feed conversion ratio (FCR) figures for the various different finishing systems are given in Table 12. The general effects of finishing system on feed costs on a per tonne basis and over the whole lifetime of the animal are also shown.

Table 13. Typical feed conversion ratio (FCR) and feed costs for different finishing systems over the lifetime of the animal

	Time to finish (months)			
	12	**18**	**24**	**30**
FCR* (kg LWG*/kg DMI*)	5-7	12	16	20
Feed Costs (per tonne)	High	Med	Low	Low
Total Feed Costs (over lifetime)	Low/Med	Med	Med	High

**FCR = feed conversion ratio, LWG = live weight gain, DMI = dry matter intake*

Table 13 shows that for cattle taking 12 months to finish that their FCR is 5-7, which means it takes 5-7 kg of feed to produce 1 kg of liveweight. While for an animal taking 30 months it takes 20 kg of feed to produce 1 kg of liveweight.

General points

- the longer the finishing period the poorer the FCR becomes, but more home grown forage can be used.
- the total feed costs increase as the FCR becomes poorer and the cattle are kept for longer.
- when deciding what type of finishing systems, the relationships between feed costs, FCR and fixed cost structure on the farm need to be assessed.
- production needs to focus on the efficiency and costs of converting feed into saleable beef.

Further information

For further information on any of the content in this booklet or on the work undertaken by HCC please contact HCC on tel: 01970 625050, email: enquiries@hccmpw.org.uk or visit www.hccmpw.org.uk.