



Hybu Cig Cymru
Meat Promotion Wales

Beef finishing systems

Options for beef farms in Wales



About HCC

Hybu Cig Cymru - Meat Promotion Wales (HCC) is the organisation responsible for the development, promotion and marketing of Welsh red meat. We work with all sectors of the Welsh red meat industry - from the farmers through to the retailers, to develop the industry itself as well as develop profitable markets for Welsh Lamb, Welsh Beef and pork from Wales.

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

The Industry Development team undertake a range of activities that include:

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

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Introduction

Cost-effective and efficient beef finishing systems are essential to maximise output and profitability. This booklet provides a practical guide highlighting the key elements of beef finishing systems suitable for farms in Wales.

The nature of livestock farming means that there are many variables such as soil type, grass quality, altitude and breeds. This means that there are many possible systems of finishing beef cattle.

However there are basic principles of growth, nutrition, genetics, health and management that apply to all systems. This booklet will outline these principles to inform what systems can be successful and how they can be managed for efficiency and profitability.

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Introduction to beef finishing systems

Beef finishing systems are generally classified into three different categories, intensive (12-15 month finishing time), semi-intensive (15-20 months) and extensive (more than 20 months). Intensive systems are more reliant on concentrates whilst extensive systems are usually more based on forage and grass.

Continental cattle, especially entire bulls are better suited for intensive systems with traditional native breeds or heifers being more suited for extensive systems where a slower growth rate allows them to reach acceptable weights without getting too fat. There is, however, considerable variation within breed. Therefore knowing the sire's growth and fat depth Estimated Breeding Value (EBV) can also be used to determine the suitability of an animal for a particular finishing system. Generally intensive systems will have better feed conversion and higher liveweight gains, higher feed costs per day but lower feed requirements overall.

A semi-intensive system involves periods at grass, a middle winter with a housed finishing period. The location of a farm and its ability to produce or source different feed types may also play a part in determining the finishing system. Farms that have a source of cereals or by-products such as biscuit meal and straw are more likely to operate an intensive system whilst farms in grassland areas will operate semi-intensive or extensive systems.

Range of systems

In Wales most beef finishing will be carried out on forage based systems with grazed grass and high quality silage being the main source of nutrition. Within these system diets will be supplemented with high energy concentrates during the final finishing period.

Summary of beef finishing systems

	Time to finish (months)			
	12	18	24	30
Feed Conversion Rate (FCR) (kg DMI/kg LWG)	5 to 7	12	16	20
Feed costs (per tonne fresh weight)	High	Medium	Low	Low
Expected lifetime feed costs	Low/medium	Medium	Medium	High
Expected lifetime fixed costs	Low/medium	Medium	Medium	High



Importance of efficiency

Margins can be tight in beef production and any advantage that is gained by good management will result in a more profitable system. Examples of this are:

- Calf health and welfare
- Choosing the right genetics for performance
- Matching the breeds/type of cattle to the system
- Making the best quality silage
- Grassland management
- Choosing the correct supplementary feeds
- Buying inputs at the right price
- Keeping control of costs
- Selling cattle before the cost of production exceeds the value added

Sources of beef cattle for finishing

Suckler bred

Suckler bred animals will have at least three quarter beef genetics which should ensure good carcass conformation and improved killing out percentage. The range of breeds and crosses found in Wales means that there is a large variation in the size and potential of suckler bred animals for beef finishing.

Some farms will breed their own cattle for finishing. This gives control over herd genetics, health status and acclimatising cattle to dietary changes. There may also be other advantages to finishing home produced cattle such as decreasing the risk of a TB breakdown.

Traditionally Welsh suckler herds calve the majority of cows in spring so this dictates the availability of calves or stores for beef finishing. Spring calving systems tend to be lower cost (for keeping the cow) which is why they are favoured. Cattle can be purchased at various stages but most common are weaned calves in the autumn or stores at 10-11 months the following spring.

Dairy bred

Dairy bred cattle are an important source of beef in Wales. Conventional dairy herds tend to calve all year round so calves are available at all times although there are increased numbers of spring block calving herds emerging. There are also opportunities to purchase pure dairy bull calves or beef cross calves for finishing. An extra step involved in a dairy beef system is calf rearing

which can either be done on the farm of origin or by specialist calf rearers. Pure dairy bulls are generally better suited to intensive bull beef systems for processing beef.



Effect of breed and sex on efficient finishing

Continental beef breeds are termed later maturing. This means they are faster growing and can be taken to heavier weights. Native British breeds are generally termed as early maturing which means they grow slower and will achieve the required levels of finish at lighter weights. Similarly the sex of the animal also plays a part in its rate of maturity. Bulls are deemed later maturing with heifers early maturing. Holstein Friesian cattle are generally medium to late maturing.

Later maturing animals or bulls are suitable for intensive systems where they can grow quickly to heavy weights. Early maturing cattle or heifers need to be on a semi-intensive or more extensive system where, in order to achieve desired weights they need to be grown slower for a longer period of time.

When looking at breeds for finishing systems it is also important to take into account developments in the genetics of beef breeds as well as EBVs. Some native British breeds have incorporated genetics from Canada and USA which have made the breed larger and later maturing. Similarly individual animal's EBVs for growth rate and fat depth also affect the rate of maturity of the animal.



Characteristics of early and late maturing breeds

	Early maturing	Late maturing
Mature size	Smaller	Larger
Birth weight	Lighter	Heavier
Gestation length	Shorter	Longer
Ease of calving	Easier	Harder
Potential growth rate	Average	Higher
Carcase weight	Lighter	Heavier
Carcase fatness	Fatter	Leaner
Carcase conformation	Average	Higher
Daily feed intake	Average	Higher
Concentrates in ration	Lower	Higher
Length of finishing period	Shorter	Longer

Typical breed performance and finishing systems

Breed	Bulls		Bullocks		Heifers	
	Age (mths)	Weight (kg)	Age (mths)	Weight (kg)	Age (mths)	Weight (kg)
Holstein/Friesian	12-14	550	15-18	600		
Charolais	12-14	650-700	15-18	650-700	18-20	600-625
Belgian Blue	12-14	625-675	15-18	650-675	18-20	600-625
Simmental	13-14	625-675	15-18	650-675	18-20	600
Limousin	13-14	625-650	15-18	625-650	18-20	575-600
Aberdeen Angus			18-20	575-600	20-24	550-575
Beef Shorthorn			18-20	575-600	20-24	550-575
Hereford			18-20	575-600	20-24	550-575
Welsh Black			18-22	575-625	20-24	525-575

Intensive	Semi-intensive	Extensive
12-14 months	15- 20 months	Over 20 months



Using Estimated Breeding Values (EBVs)

EBVs are calculated for pedigree bulls and cows for a number of traits. These can be for maternal traits such as calving ease, gestation length and birth weight or growth and carcass traits. Identifying bulls by using desired EBVs as part of the selection process will result in progeny performing better in the chosen traits than those with poorer EBV figures.

Breeding own calves for finishing

If producing home bred cattle for finishing some of the EBVs that should be considered when purchasing breeding bulls are:

- High positive calving ease direct
- Negative gestation length
- High 400 day weight
- Positive muscle depth
- Fat depth. In some breeds a positive fat depth is more desirable as it enables stock to be finished easier as they will lay down fat earlier.

Purchasing store cattle for finishing

If purchasing store cattle or calves for finishing the EBVs of these cattle are mostly unknown. It may, however, be possible to find out from the vendors what bulls were used and look up the EBVs of these bulls online on breed society websites. In order to do this the bull's full UK ear tag number is required.

With more structured and co-operative beef systems becoming common it is possible to know the EBVs of the sires used. Examples already exist of structured beef systems where dairy cows are inseminated by specific bulls through private arrangements between farmers.



Phases of growth

Rearing phase

This phase takes a calf from birth until it is weaned off milk. Bucket reared calves will be weaned earlier and have larger rumens than suckled calves. Liveweight gain in this phase is very efficient. Cattle on an intensive finishing system will be put on a finishing diet immediately after the rearing phase.

Growing phase

This is a period of continuous steady growth and is commonly associated with many semi-intensive beef systems. After rearing calves are "grown on" to add frame and weight before an intensive finishing phase. The aim is to grow cattle at 0.6 to 0.9kg/day in this phase.

Finishing phase

This is the final phase of an animal's growth while it is "finished". This is a period of rapid weight gain to maximise meat yield as well as putting on the desirable amount of fat cover.

Cattle will be growing at 1.0 to 1.4kg/day on a diet that is high energy (over 12.2 MJ/kgDM ME) including a high starch content of over 33% and a crude protein level of 12 to 15%. It is also important that there is sufficient long fibre available for digestion and to prevent health issues such as acidosis.

Minimising unproductive periods

Many extensive beef systems incorporate a store period which is when cattle are grown at 0.5 to 0.8kg/day to grow frame and scale before the finishing phase. One of the benefits of the store period is that it is a relatively cheap period of growth utilising home grown fodder. This can also lead to compensatory growth when cattle are then put on a better diet either at grass or during the finishing phase.

Generally intensive and semi-intensive beef systems do not have a store period so it is essential to keep the stock growing at a reasonable rate all through their life to achieve the required targets. An important issue is to minimise any growth checks wherever possible. Growth checks may happen when an animal is subjected to a change of diet, housed or weaned, all of which can be stressful occurrences.

Some management or nutritional practices used to avoid growth checks include:

- Gradual changes to diet whenever possible e.g. creep feeding, building up to ad-lib feeding
- Gradual weaning of suckled calves and ensuring that weaning does not coincide with health treatments and a sudden change of diet
- Ensuring that fresh clean water and a source of long fibre is always present
- Before turning store cattle out to grass reduce the concentrates fed over a 1-2 month period so the cattle are turned out leaner (store condition) rather than carrying more fat
- Implementing a planned health programme

Liveweight Gain (LWG) and Feed Conversion Rate (FCR)

The most crucial factor to financial success is the cost per kg of liveweight gain. This is a combination of several factors including:

- The cost of the feed
- Liveweight Gain
 - Determined by the breed and sex of the animal, its genetic merit and diet
- Feed Conversion Efficiency
 - How many kg of feed are required per kg of liveweight gain. The kg of feed required for growth increases as the animal gets heavier due to the maintenance requirement of the animal increasing
 - Concentrate diets will cost more per tonne but will result in a better Feed Conversion Rate
 - Genetic component to feed efficiency. Some animals can grow faster with the same feed input than others. It is hoped that an EBV for Residual Feed Intake will be available in the future



Animal nutrition in finishing systems

Efficient feeding can have a positive influence on the productivity and profitability of beef production. Accounts analysis has shown that feed and forage account for over 70% of the variable costs in a beef finishing system. It is important that any feed or forage is utilised effectively.

Feed quality

Knowing the analytical composition of the feed is vital for beef cattle rationing. Home-grown forages and cereals should always be analysed before formulating diets to make sure that the forage contribution is maximised and purchased concentrate input is kept to a minimum. Feeding higher quality forage will reduce concentrate use.

Rations for 450kg steer to achieve 1kg/day of liveweight gain with different silage qualities

	Poor silage (9.5 ME, 9-10% CP)	Average silage (10.5 ME, 10-11%CP)	Good silage (11.5 ME, 12-14% CP)
Silage (kg Fresh Weight (FW))	19	24.5	28.5
Barley (kg)	4.7	3.3	2.2
Cost/kg	£1.23	£1.14	£1.06

Assumes silage at £25/tonne and barley £160/tonne

Maximising Dry Matter Intake (DMI)

In order to maintain performance and reduce days to slaughter and production costs it is important to maximise the DMI. To achieve an increased DMI:

- Well made, palatable forage of high quality should be available
- Feed must be kept fresh, it is advisable to clean troughs three times a week
- Ensure clean water and long fibre are accessible at all times
- Any cattle housing should have dry bedding and good ventilation
- Over-processing cereals should be avoided
- Surface of troughs should be smooth and clean
- Avoid driving over feed with machinery



Forages for beef cattle

Home grown forage will form the basis for feeding on most beef farms in Wales with grass silage being the predominant forage. However, there is a large variation in quality depending on the stage of cutting, the quality of the grassland available and the attention to detail during the ensiling process. Red clover silage is ideal for cattle that require higher protein forage.

Maize silage is a good crop for finishing cattle, being high in energy and starch. Maize is seen as an expensive crop to grow; it can be cost effective however due to the

potential for high yields and maize fields can either be cropped continuously or as part of a rotation.

There are many options for harvesting cereals as wholecrop. The preferred method will depend on what storage facilities are available, what contractors can offer in terms of equipment and what suits the system. The various types of wholecrop silage give harvesting flexibility which is important in Wales given the wet summers and late harvests that can occur.

Typical feed values of common forages

	DM%	ME MJ/kgDM	CP%	Best suited for
Good quality grass silage	25-35	11.0 to 11.5	12-14	Finishing cattle
Average quality grass silage	20-25	10.0 to 10.5	10-12	Store cattle
Red clover silage	30-35	10.5 to 11.0	14-17	Growing stock
Maize silage	30-32	11.0 to 11.5	9-10	Finishing stock
Fermented wholecrop	30-40	10.0 to 11.0	9-10	All stock
Cracked wholecrop	60-70	10.0 to 11.0	9-17	All stock

Relative Feed Values (RFV)

When purchasing a feed it is useful to compare its RFV. This compares different feeds to barley for energy (ME) and rapemeal for protein (CP%). To calculate the RFV the following information is needed; price per tonne, Dry Matter%, ME (MJ/kgDM) and CP%. RFV's are usually found in the farming press but if you know the cost of feed it is simple to work out the RFV of different feeds.

Example -
comparing barley & beet pulp for energy cost

- Barley costs £150/t fresh wt. At 86% DM & 13.2 ME this means you get 11,352 MJ for £150 or 100 MJ costs £1.32.
- If beet pulp is £175/tonne and is 89% DM & 12.5 ME then you get 11,125 MJ for £175 or 100 MJ costs £1.57.
- In this example, barley is the cheapest source of energy. However you also need to look at the composition of the diet – barley is high in starch, beet pulp is a source of digestible fibre as well as practical issues such as storage, mixing and whether or not you are able to take large bulk loads which are cheaper.

Often it is easier to purchase a compound feed or blend but knowing the full inclusion of ingredients will allow for a comparison of the cost of energy and protein.



Cereal treatment options

Given the typical Welsh climate and the relative lack of harvesting and drying equipment it is common for cereals to be harvested moist but treated to preserve and/or enhance the grain. This again gives harvesting flexibility, a wider harvest window but still allows the straw to be baled which is valuable on livestock farms.

Propionic acid treatment

This is used when treating grain at moisture content of up to 24%. This will kill off yeasts, moulds and bacteria. Grain treated with propionic acid will still require processing before feeding to cattle.

Water, minerals and trace elements

Water

Water is an essential part of any ration. While some wet feeds contain water a suitable source of clean water should always be provided.

- Cattle require between 5-7 litres of water per kg Dry Matter
- Cattle will often drink together after feeding so water supply must be adequate to cope with the peak demand
- Water supply must be adequate, clean, accessible and uninterrupted
- Water troughs should be inspected daily and any straw or dung removed

Minerals & Trace Elements (TE's)

Correct mineral and vitamin supplementation is critical if production is to be maximised and health maintained. However, before attributing substandard animal performance to mineral or vitamin deficiencies, it is vital that other possible dietary and management factors are examined.

Feed processing

It is important that if processing grain on farm then it should not be over processed. To ensure this does not occur grain should be rolled or bruised to around half its usual thickness and no finely ground flour should be present in the diet. This presents a chance to save money

Urea treatment

This allows moist grain of 30-40% moisture content to be preserved by adding urea at harvest. Urea is converted to ammonia which preserves the grain and makes the seed coat more digestible (allowing grain to be fed whole). It also increases the crude protein to 17-18% and deters vermin. The treated grain needs to be covered in a pit or ag-bag but does not need to be rolled or consolidated.

Crimping

Moist grain of 30-45% is treated with an additive and passed through a crimping machine. The crimped grain ferments, producing an acid which preserves it. No further processing is required. Crimped grain requires consolidation and sheeting.

General points

- Feeding an excess of one mineral or TE can affect the availability of others. If supplementation is needed then feeding a high quality mineral/TE mix is recommended.
- General purpose minerals are recommended for cattle on a forage system while special mineral mixes are available for cattle on intensive systems.
- Mineral & TE levels should be checked on a regular basis (using soil testing, feed analysis or blood sampling), and mineral supplementation should be adjusted for any specific deficits or excesses.

on processing costs but more importantly reduce the risk of acidosis which is a dietary upset caused by a rapid fermentation of starch in the rumen. Some whole grains should be present in the dung of the animal. This is normal and does not mean that feed is being wasted.

Concentrate feeds for finishing cattle

Common concentrate options for finishing cattle

	DM%	ME MJ/kgDM	CP g/kgDM	Palatability	Max inclusion % in DM
Barley	86	13.2	12.1	Good	50 ¹
Wheat	86	13.8	12.8	Good	30
Maize	86	14.3	8.5	Good	40
Oats	86	12.2	11.0	Good	50
Barley dark grains	89	12.7	26.0	Good	35
Wheat dark grains	89	13.5	32.0	Good	40
Maize dark grains	89	14.8	28	Good	30
Maize gluten	89	12.5	21.7	Moderate	45
Wheatfeed	89	11.5	17.3	Moderate	50
Malt pellets	89	11.5	23.5	Moderate	25
Brewers grains	23	11.7	24.0	Good	45
Pot Ale Syrup	45	14.0	37.0	Good	20
Biscuit meal	88	15.0	9.5	Very good	30
Peas	86	12.8	24.0	Moderate	30
Beans	86	13.8	29.0	Variable	30
Lupins	86	14.3	38.0	Moderate - Good	15
Soya bean meal	88	13.8	52.0	Good	15
Rapeseed meal	88	12.1	38.5	Moderate	20
Soya hulls	89	11.9	12.2	Moderate	25
Palm kernel meal	89	12.3	18.0	Poor	20
Sunflower meal	88	9.5	36.0	Good	20
Molassed sugar beet pulp	89	12.5	10.0	Very good	45
Citrus pulp	89	12.5	7.0	Variable	30
Cane Molasses	75	12.6	6.0	Very good	20

¹Higher in a barley beef system

Cereals	Cereal co-products	Pulses	Oilseed co-products	Other co-products
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Producing more beef from grass

General grassland management

Improving grassland management and utilisation is increasingly important for both finishing cattle at grass or increasing growth and weight for store cattle. The HCC publication “Grassland Management” covers general grassland management issues in more detail.

Weight gained at grass generally costs 25% to 33% of weight gained on housed diets. Therefore achieving high daily gains from grass represents an opportunity to significantly reduce the costs of production. There is a double benefit – firstly good grassland management can increase liveweight gains at grass from 0.6kg/hd/day (common in many set stocked systems) to at least 1.0kg/hd/day and secondly the cattle then have less weight to gain from a more expensive housed diet.



Rotational grazing

Rotational grazing is estimated to increase grass Dry Matter production by 10-20% over poorly managed set stocked systems. This arises as the grass is rested and allowed to fully express its yield potential. Grass quality will also be improved and the percentage of grass utilised will increase.



A simple rotational system for beef cattle

Adopting a simple and cheap rotational grazing system for growing cattle can result in daily liveweight gains of over 1.0kg/hd/day at a cost of under 50p/kg. One method is to subdivide larger fields with a single strand electric fence while leaving the smaller fields as they are. Each paddock should ideally be grazed for no more than 2-3 days and given a 20-25 day rest period before the next grazing. The more paddocks available then the higher the utilisation. For this system there will have to be a good water supply to each paddock. The area given each day should be based on the following principles

- Dry Matter intake of 2.5% of liveweight, e.g. 400kg beast = 10kgDM/hd/day
- Pasture cover on entry to the paddock should be around 2,500kg DM/ha or 8-12cm. Any higher will risk the grass becoming stemmy and poorer quality
- Desired residual on leaving the paddock should be 1,500kg DM/ha or 4-5cm. Any lower will limit intakes and result in slower regrowth of the grass

Basic grass budget for growing cattle

Number of cattle	50
Liveweight of cattle (kg)	400
Group Dry Matter requirements/day (kg DM)	500 (50 cattle x 400kg x 2.5% of bodyweight)
Pasture cover pre-grazing	2,500kgDM/ha (8-12cm)
Pasture cover post-grazing	1,500kgDM/ha (4-5cm)
Available DM/ha	1,000kg
Size of paddock required	0.5 ha/day or 1 ha for 2 days

As cattle grow feed budgets should be adjusted for increasing dry matter demand. In addition if cattle are in a paddock for longer than 3 days then the grass growing while they are in the field needs to be taken into account, especially during periods of rapid grass growth.

Flexibility

By measuring the grass cover weekly and calculating a grass budget, outlined information will be gained which can help with the management of both stock and grass, such as:

- Any surplus of grass can be taken out for silage
- When grass is abundant some fields can be taken out for re-seeding
- Shortages of grass will be predicted and extra fertiliser can be applied or buffer feeding fed (or accept stock performance will be lower)
- Grass quality will remain higher and livestock performance will be more consistent through the season



Acclimatising cattle to a forage diet

Prior to turning cattle out to grass it is beneficial to reduce the amount of concentrates fed, thereby increasing the proportion of forage in the diet. This will reduce any growth check at turnout. Trials have suggested that reducing concentrates in this way resulted in cattle that were better acclimatised to a forage diet at turnout so suffered a reduced check at

turnout. Cattle were fed the following patterns of concentrates for the 150 days before turnout:

- Constant - 2kg/hd/day for 150 days
- Increasing rate - 1kg for first 50 days, 2kg for middle 50 days & 3kg for last 50 days
- Decreasing rate - 3kg for first 50 days, 2kg for middle 50 days and 1kg for last 50 days

Adopting a high/low feeding system for store cattle

Feed level	Weight at housing (kg)	Weight at turnout (kg)	Total concentrates used (kg)	Total silage used (tonnes)	% silage in diet at turnout
Constant	300	425	300	3.2	75
Increasing	300	420	300	3.1	60
Decreasing	300	420	300	2.9	90

A further benefit is that feeding higher levels of concentrate in the early winter period is an efficient use of feed as the stock will be more efficient at converting feed at a younger age. In addition it helps the rumen to develop from a predominantly milk diet to a concentrate and forage diet. This is especially important in suckled calf systems.

Turning cattle out to grass

As well as acclimatising the diet of cattle to more forage there are some other tips to manage turnout:

- Once ground conditions are suitable turn out a small group of lighter cattle
- Turn cattle out hungry so they will graze not roam
- If turned out onto high grass cover at the beginning of the season then more grass will be wasted. Let the cattle acclimatise to grass while the grass growth is lower
- Keep cattle moving every couple of days onto fresh grass. This will mean they are grazing high quality grass and will not become restless
- Graze silage fields once before shutting them off. This will result in a slightly lower first cut but of higher quality. The reduced silage yield will be less than what would be required to keep cattle indoors
- Getting a longer grazing season will reduce costs of winter feeding & housing and will increase the weight gained at grass





Compensatory growth

Compensatory growth is seen when stock are moved from a period of restricted feed intake or a poorer quality diet (resulting in gains of under 0.7kg/hd/day) onto a period of unrestricted, high quality feed such as spring grass. However a similar effect can also be seen when cattle are moved from a poorly managed grazing system onto a high quality finishing ration. Where grazed grass is cheaper exploiting compensatory growth at grass gives a better chance of reducing the total costs of production.

Compensatory growth occurs because:

- Dry matter intake is higher in stock that are lean not fat
- The efficiency of lean meat growth is four times higher than for fat deposition

In order to get the full benefit from compensatory growth, grassland management must be good (e.g. rotational grazing) and the grazing season must be long enough (e.g. earlier turnout) to ensure that the weight that is foregone in the restricted period is fully compensated for. However, as the cost of weight gained at grass is much less than on other diets then the overall financial margin could be higher even if the weight is not fully regained.

Supplementing cattle at grass

While grass in spring and early summer is as high quality as any purchased concentrate and considerably cheaper, there may be instances when it is beneficial to supplementary feed cattle at grass. For example:

- Feed straw if the cattle's dung is loose
- Feeding finishing cattle concentrates in late summer before the need to house them again
- As grass has excess protein then feeding a high energy/low protein concentrate (mainly cereals) will help the rumen bacteria to utilise the crude protein in the grass into growth and reduce the amount of nitrogen excreted by the animals
- In periods of poor grass growth then supplementing with forage or concentrates will keep the stock growing although a full cost/benefit calculation should be done

Importance of healthy stock

The importance of healthy livestock cannot be over emphasised. Two of the most critical aspects are:

- A planned preventative health programme with the farm vet
- A safe source of livestock and good quarantine measures

While the following section will cover some of the main health issues affecting finishing cattle more information can be found in the HCC booklet 'Herd Health'.

Health issues at grass

Trace elements

One reason for trace element deficiencies on beef farms in Wales is the geology and soil type. As the main diet will be home grown forage then any deficiencies of the soil are manifested in the livestock. The main trace elements that need to be considered on Welsh livestock farms are; Copper, Cobalt, Selenium & Iodine. Before attributing substandard animal performance or health issues to trace element deficiencies, it is vital that other possible dietary and management factors are examined.

Supplementation can be via oral drenches, injection, bolus products and pasture dressing. For cattle there are many bolus products that contain several trace elements and these should be considered as a preferred option, on veterinary advice, as they are slow release, targeted and labour saving.



Worms and fluke

Lungworm

Young cattle at their first grazing are at risk of husk caused by lungworm although suckled calves may pick up immunity whilst suckling. If severe, husk can cause sudden death although more common is a loss in growth rates. These losses and the danger of subsequent pneumonia mean that preventative treatments should always be the first choice. Vaccination prior to the first grazing season will provide life long immunity and has been proven to be cost effective.

Stomach worms

Stomach worms are caused by roundworm infestation during the grazing season. It can severely affect cattle growth rates at grass and also in winter if not treated. Severe outbreaks can cost £50/head in lost production so preventative measures should be taken. Young cattle in their first grazing season are most at risk and should be covered by a suitable worming programme.

Liver fluke

This is a common condition in wet areas resulting from the infestation of the liver by the liver fluke. The lifecycle of the liver fluke requires an intermediate host, the mud snail which is commonly found on wet ground. The young fluke infest the grass which is eaten by livestock. The fluke then burrow through the liver causing great damage before becoming adults.

Cattle are generally more robust than sheep and because of the housed period are relatively straightforward to treat. However the wet summers and milder winters that have been experienced in recent years mean that it is a disease that should be covered in a farm's health plan.

In addition to chemical treatment then drainage, fencing of wet areas and ensuring that sheep are treated appropriately can help to keep fluke under control. The same liver fluke affects sheep and cattle so any resistance to Triclabendazole (the only flukicide that will kill immature fluke) resulting from misuse in sheep or purchasing sheep with resistant fluke will also affect its use in cattle.

Health issues at housing

Acidosis

Acidosis is caused when the rumen pH is upset by a quick release of starch from the diet. Severe cases can cause death but more common is a sub-acute form that reduces growth potential by 20-30%.

Steps to minimise the risk of acidosis include:

- Ensure that cereals are just cracked and not too dusty
- Ensure that stock that are to be fed ad-lib are built up gradually over a 2-3 week period and that once a feed is available ad-lib that it never runs out. If it does run out there is a danger that some stock will gorge themselves when feeders are re-filled
- Ensure there is always long fibre such as clean straw available to help promote rumination and the production of saliva to buffer the acidity
- Feeding high levels of cereals with low pH silage should be avoided
- Ensure clean water is available at all times

Respiratory disease or Pneumonia

Pneumonia is a condition that is caused by a number of viruses such as RSV, PI3, IBR & BVD. Respiratory disease occurs due to the interaction between these viral causes, the environment and the animal's immune status. In addition to the treatment costs (£30+ for mild cases) the losses of production from lower growth rate mean that the true cost could be much higher.

Steps to minimise respiratory disease include:

- Sourcing healthy or pre-vaccinated stock
- Standard protocols for vaccination and quarantine of purchased stock
- Reducing stress caused by moving, mixing, handling stock or several veterinary treatments at the same time
- Ensuring ventilation is correct in buildings including factors such as air flow, air inlet and outlet, minimising moisture by mending down pipes and leaking water troughs, drainage, dry bedding, minimising draughts
- Good nutrition, hygiene and management
- Appropriate stocking densities in sheds

Finishing systems

Typical management systems

There are many combinations of systems possible with a large number of variables such as dairy or suckler bred, season of calving, bull, steer or heifer. The following tables give an outline of the typical management of a range of systems during the seasons of the year.

Typical finishing systems for spring born cattle

System	Source	Spr	Sum	Aut	Win	Spr	Sum	Aut	Win	Spr	Sum
12 months	Suckler	Suckling		Concentrates							
	Dairy	Milk	Concentrates								
18 months	Suckler	Suckling		Forage/conc		Grazing/conc					
	Dairy	Milk	Forage	Forage/conc		Grazing/conc					
24 months	Suckler	Suckling		Forage		Grazing		Forage/conc			
	Dairy	Milk	Forage	Forage		Grazing		Forage/conc			
30 months	Suckler	Suckling		Forage		Grazing		Forage		Grazing	
	Dairy	Milk	Forage	Forage		Grazing		Forage		Grazing	

Typical finishing systems for autumn born cattle

System	Source	Aut	Win	Spr	Sum	Aut	Win	Spr	Sum	Aut	Win
12 months	Suckler	Suckling		Concentrates							
	Dairy	Milk	Concentrates								
18 months	Suckler	Suckling		Grazing		Forage/conc					
	Dairy	Milk	Forage	Grazing		Forage/conc					
24 months	Suckler	Suckling ¹			Grazing	Forage/conc		Grazing			
	Dairy	Milk	Forage	Grazing		Forage/conc		Grazing			

NB: It is increasingly rare and inefficient for autumn born cattle to be taken beyond 2 years of age as this would result in a costly third winter feeding period.

¹For extensive systems autumn born calves can be left to suckle their mothers for 9-10 months

Physical and financial targets and practical issues

The following sections give basic physical and financial details of the most common beef finishing systems. For dairy bred cattle it assumes the purchase of a 3 month old, reared calf. It also assumes that for farms that breed their own cattle for finishing that the purchase price is a transfer value and the gross margin refers to the finishing system only.

Data is sourced from SAC Farm Management Handbook, NBA information and other relevant sources.

Intensive beef systems

Intensive 12-14 month systems for bulls

Physical	Suckler bred bulls		Dairy bulls		Beef X dairy bulls	
Start weight (kg)	300	7 months	110	3 months	120	3 months
Liveweight gain (kg/day)	1.6		1.4		1.5	
Finished weight (kg)	630	14 months	540	13 months	580	13 months
Carcase weight (kg)	360	57% KO	290	53% KO	320	55% KO
Diet	Concentrate	1.7t	Concentrate	2t	Concentrate	2.1t
	Straw	300kg	Straw	600kg	Straw	670kg
Financial	£/hd		£/hd		£/hd	
Sale price	1,260	£3.50/kg DW	900	£3.10/kg DW	1,100	£3.44/kg DW
Purchase price	600	£2.20/kg LW	250		400	
Output	600		650		700	
Variable costs	450		550		600	
Gross margin (GM)¹	150		100		100	

¹GM does not include fixed costs such as labour, machinery & buildings costs

Practical issues for performance and efficiency

- Secure a market beforehand and ensure market specifications are met or price penalties will be incurred
- Select calves sired by bulls with high EBV's for growth and carcass traits
- Good health & biosecurity essential
- Ad-lib straw available to minimise acidosis
- Fresh clean water available at all times
- Adequate feeding space- 500-750mm/hd
- Handle every 2 weeks towards the end of finishing to monitor growth
- Sell once minimum carcass specifications are met
- Safety precautions for farm staff

Semi-intensive beef systems

Semi-intensive 18-20 month finishing systems

Physical	Suckler bred steers		Suckler bred heifers		Beef X dairy steers	
Start weight (kg)	280	7 months	260	7 months	120	3 months
Liveweight gain (kg/day)	0.97		0.74		1.0	
Finished weight (kg)	600	18 months	550	20 months	570	18 months
Carcase weight (kg)	330	55% KO	300	54% KO	300	53% KO
Diet	Concentrate	550kg	Concentrate	300kg	Concentrate	875kg
	Silage	4.5t	Silage	3.9t	Silage	5.3t
Financial	£/hd		£/hd		£/hd	
Sale price	1,240	£3.75/kg DW	1,125	£3.75/kg DW	1,080	£3.60/kg DW
Purchase price	670	£2.40/kg LW	600	£2.30/kg LW	420	
Output	570		525		660	
Variable costs	350		300		450	
Gross margin (GM)¹	220		225		210	

¹GM does not include fixed costs such as labour, machinery & buildings costs

Practical issues for performance and efficiency

- Purchase cattle from as few sources as possible with known health status
- Preventative health programme helps maintain target growth
- Store period should be minimised, keep cattle growing but acclimatisation to grass is advisable by reducing concentrates pre-turnout
- Good grassland management, e.g. rotational grazing to maximise growth rates
- Finish spring born cattle off grass to avoid housing for a second winter. This will require some concentrate feeding in late summer
- Handle cattle regularly as they approach finishing
- Autumn born cattle should be finished inside so a high quality forage is required to reduce concentrate use

Extensive beef systems

Extensive 24 month beef finishing using native breeds

Physical	Suckler bred steers		Suckler bred heifers	
Start weight (kg)	270	7 months	250	7 months
Liveweight gain (kg/day)	0.65		0.55	
Finished weight (kg)	600	24 months	550	22 months
Carcase weight (kg)	330	55% KO	300	54% KO
Diet	Concentrate	400kg	Concentrate	350kg
	Silage	5.5t	Silage	5.2t
Financial	£/hd		£/hd	
Sale price	1,240	£3.75/kg DW	1,125	£3.75/kg DW
Purchase price	650	£2.40/kg LW	575	£2.30/kg LW
Output	590		550	
Variable & forage costs	400		350	
Gross margin (GM) ¹	190		200	

¹GM does not include fixed costs such as labour, machinery & buildings costs

Practical issues for performance and efficiency

- Purchase cattle from as few sources as possible with known health status
- Preventative health programme helps maintain target growth
- Maximise growth rates at grass by good grassland management. A store period in this system is advisable and can give good compensatory growth at grass
- Handle cattle regularly as they approach finishing
- Look for marketing options that give premium prices for native bred/extensive systems

Other beef systems

Finishing heavy stores

Some finishers operate a system where heavy store cattle are purchased and put through the system every 2-3 months. Purchasing is opportunistic and experience is required in recognising cattle that have profit potential. Waste and by-product feeds may well be used with an emphasis on getting good value feeds based on relative values.

These systems have good profit potential but run the risk of disease as cattle will be sourced from many different farms or markets. In these systems having a health plan is essential and regular monitoring of growth rates is required so stock can be sold as soon as they are showing signs of reduced growth and reduced efficiency.



Structured/Co-operative beef systems

Increasingly there are structured dairy beef systems where cattle are sourced from regular dairy farms and specialist calf rearers. The cattle would be finished according to set procedures and diet. These systems have the benefit of having a consistent system with defined targets and a known margin in mind. They require trust between individuals and a commitment to the contract rather than sell cattle opportunistically if the conventional markets are buoyant. These systems are ideal for those wanting a secure contract and have improved biosecurity levels.

Rosé Veal production

Rosé Veal is a pink meat produced from calves slaughtered under 8 months of age while Rosé Beef is the product from older cattle up to 1 year of age. Rosé Veal differs from traditional white veal as iron and fibre is provided in the diet. The market for veal is small but can be developed locally if suitable dairy calves are available. Ideally a contract should be in place before commencing although there is always the option of finishing the cattle conventionally as beef if the original plan to produce Rosé Veal or Rosé Beef does not come to fruition.

Some considerations for Rosé Veal/Beef systems are:

- Source healthy calves that have been fed adequate colostrum, ideally direct from the farm of origin to minimise any stress and disease.
- A suitable vaccination and disease control programme should be planned with veterinary input and adhered to.
- Decide upon the milk feeding system, ad-lib or twice a day, teat or bucket and the type of milk powder to be used.
- A 6-7 month old system produces small carcasses of up to 150kg from 300kg cattle. Calves may be offered milk replacer for their whole lives, supplemented with concentrates, rising to 2kg/hd/day at 6-7 months of age. Ad-lib straw should be fed throughout to provide fibre. Average weight gains of 1.2 to 1.4kg/hd/day should be targeted with calves expected to consume about 375kg of milk powder and 150-175kg of cereals.
- A longer 10 month system produces carcasses of 200kg from 400kg cattle. In this system calves may be weaned at 5-7 weeks of age, weighing 80kg once they are consuming adequate levels of starter pellets (1kg/day). They will then be put on a finishing diet which is high protein and starch to encourage muscle growth as opposed to frame. Again straw should be offered to promote rumination. After weaning calves should grow at 1.3 to 1.5kg/hd/day to reach 400kg.

Making money from finishing cattle

Successful and profitable cattle finishing relies on appreciating the factors affecting profitability, good budgeting, risk management and achieving the targeted levels of physical performance.

Key factors affecting profitability

- The finished cattle price (mainly affected by weight and classification)
- The purchased cattle price (mainly affected by weight, sex, breed and age)
- Feed cost (grain and forage price, ration mix and quality)
- Feed conversion efficiency (ration quality and quantity, animal health, breeding, genetics and sex)

In most cases, overall profitability is less sensitive to other direct costs (vet & med, tags, marketing cost, haulage, diesel, electricity, interest and other sundries). As for fixed costs, the key question is: Would the machinery and labour costs be significantly different if the finishing enterprise stopped? If yes, an estimate of these fixed costs must be taken into account.

Of the key factors affecting profitability, the purchase and sale prices of cattle are most important. Therefore thinking in terms of the “finisher’s margin” (sale price less purchase cost) is a useful starting point for budgeting. Where buying heavyweight stores, profitability is particularly sensitive to the purchase price. By comparison, margins from buying lighter stores are more sensitive to the finished price because of the longer period involved.

Feed cost is the biggest cost affecting the margin. Feed costs increase where feed conversion is a problem (poor rationing, health problems). Feed conversion efficiency is especially important for heavy cattle because of their high maintenance requirements. Home produced grain and straw should be costed at its opportunity cost (i.e. if sold to neighbour) rather than its cost of production. Monitoring DLWG by regular weighing is essential on a finishing system to ensure targets are met and decisions can be taken based on actual data.

Finishing cattle involves two big decisions, namely how much to pay for stores and when to sell. Some simple budgeting can help with these decisions.



What to pay for stores?

While there are wide ranges of finishing systems extending from finishing dairy bulls on barley to organic steers largely on forages, they can all be budgeted with the following tool. The table below shows the break even budget for a finisher that wants to buy suckler bred yearling steers.

Break even store price calculator

Store weight		350	kg at purchase
Expected slaughter weight		650	kg at sale
Weight to be gained		300	kg
Cost of liveweight gain ¹		1.80	Average cost of liveweight gain (£/kg)
Total cost of liveweight gain	b	540	£
<hr/>			
Expected killing out %		55	
Expected carcass weight		357.50	kg
Expected slaughter price		3.80	£/kg deadweight
Expected carcass price	a	1,358.50	£
<hr/>			
Break even store price ²	a - b	818.50	£
Break even store price		2.34	£/kg

¹The cost of liveweight gain will vary from farm to farm so it is important that each farm knows their own costs of production

²Need to build in a profit element

The budget is most sensitive to the expected price per beast at slaughter, which depends on three factors; the general market price, the carcass weight and its classification. While the HCC website and publications has information on market prices and trends ultimately it is up to the producer to make a judgement.

This price must then be customised to match the predicted weight and classification of the beast when finished. There is a large difference in the per kg deadweight price of a U grade suckler bred steer

compared to a purebred Holstein bull. So knowing what type of cattle the processing companies want, their trimming specifications and how their pricing grids work are essential.

The estimated cost of gain is also important especially where buying smaller, younger lighter stores (e.g. weaned dairy crossbreds) as these animals will be on the farm longer. The table below suggests some typical costs per kg of liveweight gain in a range of finishing systems (Source: QMS Enterprise Costings 2013).

Cost of liveweight gain under different beef systems

System	Cost of liveweight gain (£/kg LW)
Cereal based finishing	£1.28 to £2.10
Semi-intensive forage based	£2.08 to £2.28
Extensive forage based	£1.96 to £2.04

The following template can be used to calculate your own cost of gain per kg.

Calculating the cost of liveweight gain

	Example		Your figures	
Purchase weight	350	kg		
Purchase price	700	£		
Target weight	650	kg		
Total weight gain	300	kg		
Daily liveweight gain	1.0	kg/day		
Days on farm	300			
Costs	£/hd	£/kg	£/hd	£/kg
Feed	206	0.69		
Forage	50			
Vet & med	14			
Bedding	40			
Other costs	40			
Total variable costs	350	1.17		
Interest on capital ¹ @ 5%	43			
Fixed cost charge ²	150			
Average cost	543	1.81		

¹cost of purchase plus variable costs x 5%/yr (for 300 days)

²labour, machinery, depreciation, rent, other overheads

As the table above demonstrates, the most important cost is feed with the price of grain a major element of this cost given the high rates of concentrates included in most finishing rations. Being aware of the outlook for grain prices is consequently very important. The futures price, which is updated daily, provides a useful guide. It is possible to lower feed costs by making better forage or, if available, by using cheaper by-products.

The type of animal and quality of management will also affect the cost of gain. The potential growth of a beast is set by its breed, sex, age and condition on arrival. Whatever the type of store bought, feeding and health management is critical thereafter to achieving performance targets. Monitoring growth rates against targets by weighing is an essential tool on finishing farms.

Budgets deal with the future so should always be recalculated to test their sensitivity to the key assumptions. This can be done by calculating what happens to the break even price of stores based on worse and best estimates of the future cattle price, grain cost and DLWG. An important consideration which can be sometimes overlooked is the need to build in a margin to provide some profit, not just break even, as this would be in essence the farmer's salary.

The budgeting process explained above is equally useful to suckler (or dairy) farmers who are wondering whether to "sell store or finish" some or all of their own young cattle (or even cull cows).

When do I sell?

The correct time to sell a beef animal is when it has reached an acceptable weight and level of finish and that the value of the weight gained is higher than the costs of achieving this weight gain. These costs should include:

- Feed & bedding costs
- Other direct costs associated with producing the weight gain

The HCC booklet “From Gate to Plate” highlights the carcass classification requirements and a typical pricing schedule. This is important as it is possible to gain a conformation grade as the animal gets heavier but this may be outweighed by a price penalty if the animal falls into a higher fat class. Any potential price penalty should be avoided as there would be a cost of achieving the extra weight gain in addition to the penalty. As can be seen from the table below the penalties for overfat carcasses (4H and over) are higher than the incremental rises in price for an extra conformation grade.



Example of a pricing schedule (base price +/- p/kg)

	1	2	3	4L	4H	5L	5H
E	+5	+10	+10	+5	-15	-50	-50
U+	base	+5	+5	base	-15	-50	-50
-U	base	+5	+5	base	-15	-50	-50
R	-5	base	base	base	-15	-50	-50
O+	-10	-5	-5	-10	-20	-60	-60
-O	-20	-15	-15	-25	-40	-70	-70
P+	-30	-25	-25	-35	-40	-80	-80
-P	-30	-25	-25	-35	-40	-80	-80

N.B. Each processor will have their own variation on the pricing schedule. It is advisable to discuss this with the processor before supplying cattle.

An advantage of cattle finishing is the flexibility to sell at various stages. Indeed, even selling the animal back into the store ring may be a rational option under some circumstances. In most cases, however, the aim is to sell the beast for slaughter (be it at market or direct to abattoir) with the optimal level of finish. In general terms, the decision depends on whether the farm finishes a fixed number of cattle annually (e.g. a farm that retains 50 calves from own suckler herd) or buys stores on a regular basis to replace cattle sold finished (i.e. a continuous feedlot system).

Cattle should be sold when the cost of adding the final kilogram of weight equals the sale price of that kilogram. Up to that point each additional kilogram has a positive, albeit diminishing, margin.

Within any group of cattle daily weight gains can vary widely, so regular weighing in the final few months is essential. Modern handling systems that exploit EID technology may be a worthwhile investment if the system has sufficient scale.

Given their variation in DLWG and classification, finishing cattle should be treated as individuals. Only with young bulls is collective selling the preferred option, owing to the safety and performance problems caused by splitting and mixing groups.

As grain accounts for most of the marginal cost of finishing cattle, a large change in grain price will have a major impact on the optimal killing weight assuming little change in the finished cattle price. In a year when the cost of grain is high, national carcass weights tend to fall, as the cost of adding an extra kilogram is high relative to value of that kilogram. In extreme years, where the combination of low quality silage and expensive grain makes the ration very expensive, selling at the minimal level of finish and weight required is often the best option. Conversely, assuming the same cattle price, when grain is cheaper it is worthwhile growing the animal through a grade and up to the point just before grade or weight penalties apply. Most price grids have severe penalties for going overfat and/or overweight, so being able to accurately assess classification is an essential skill.

In the case of specialist farms that operate a continuous cycle of buying and selling cattle, the goal is profit per feed space rather than per animal. In most cases these farms will sell cattle a little earlier because the marginal cost of production is slightly higher.



Reducing the risk factors of cattle finishing

Finishing cattle is a risky business. Purchasing 50 suckled calves ties up around £50,000 of working capital. While the big risk is the general price of finished cattle decreasing, the likelihood of a disease outbreak can also affect finishing margins. The main options available to manage risk are outlined below:

- Before buying (or retaining own calves), budget to establish what price can be afforded, and test the worst and best case scenarios
- Store cattle should be bought from reputable sources with a known health status
- Discuss the implications of finishing young bulls with potential buyers
- Implement a preventative health plan with the help of the farm vet
- Grain should be bought forward and/or have the storage to stockpile when feed prices are favourable
- Cattle should be weighed frequently to monitor growth rates, this will allow for rations to be adjusted and health problems identified early
- The “when to sell” budget should be updated frequently and especially if prices and costs are fluctuating
- Cattle purchases and sales should be spread over the year to reduce market volatility
- Agreements with store producers should be considered and discussed to share the risk and rewards from finishing cattle
- Cattle could be bought and finished on contract. Currently integrated beef chains account for a relatively small share of the national kill, but this share is growing and likely to become more common in future. As with selling grain on contract, not all cattle need to be committed and a range of pricing options are typically available.

While the above points may not all be applicable the guidelines and principles outlined in this booklet will help to make finishing beef cattle more efficient and profitable.

Further information

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For further information on this booklet or the work of HCC please visit www.hccmpw.org.uk

