OPTIONS FOR PURE DAIRY-BRED MALE CALVES

A Technical Review

Prepared for

By Promar International

TABLE OF CONTENTS

SECTION 1. INTRODUCTION

1.1 Context

In the year to July 2011, there were approximately 360,000 dairy-sired male calf registrations, compared to c. 470,000 dairy heifer registrations[1]. The difference between the sizes of these populations, over 100,000 head, represents the number of dairy sired animals lost to the beef industry, and is explained by a combination of:

a) the use of sexed semen in dairy herds to reduce the number of dairy-sired bull calves born

b) dairy-sired bull calves that are destroyed on farm and not registered (usually due to a perceived lack of profitability in rearing them as beef cattle, often associated with high cereal prices).

This effect was greater than in the previous 12 month period to July 2010, during which there were c.78,000 fewer male dairy-sired calf registrations than female[2]. This likely reflects the impact of the high cereal prices seen during the period on pure-dairy beef enterprise viability.

This data highlights the importance of finding sustainable and economically viable production systems and routes to market for male dairy-sired calves all the more.

The opportunities therefore are:

a) through increased uptake of sexed semen (or other similar practise) in the dairy sector, to reduce the number of dairy-sired male calves born, therefore increasing the supply of crossbred calves to the beef sector and improving returns to dairy farmers from calf sales

b) improving the financial viability of rearing and finishing dairy-sired male calves through the identification of alternative production and marketing systems which offer better physical performance and financial returns on a more consistent basis

[1] Figures derived from EBLEX Beef Briefing 11/07 – *Calf Registrations Confirm Stabilising Supply* – EBLEX Senior Market Analyst, Debbie Butcher

[2] Figure derived from EBLEX Beef Briefing 10/07 – *National Beef Calf Supply Stabilises* – EBLEX Senior Analyst, Mark Topliff

1.2 Objectives

This report examines production systems for finishing male dairy-sired calves, with an emphasis on alternatives to traditional intensive systems dependent on high cereal inclusion rations. It is based on a review of existing research findings.

It is intended to aid farmer decision making in reviewing the options for these animals, taking into account practical and technical implications, as well as considering the financial feasibility of alternative production systems where possible.

The report covers:

- Veal production
- Dairy-bred steers
- Dairy-bred bulls

SECTION 2. DECISION FACTORS

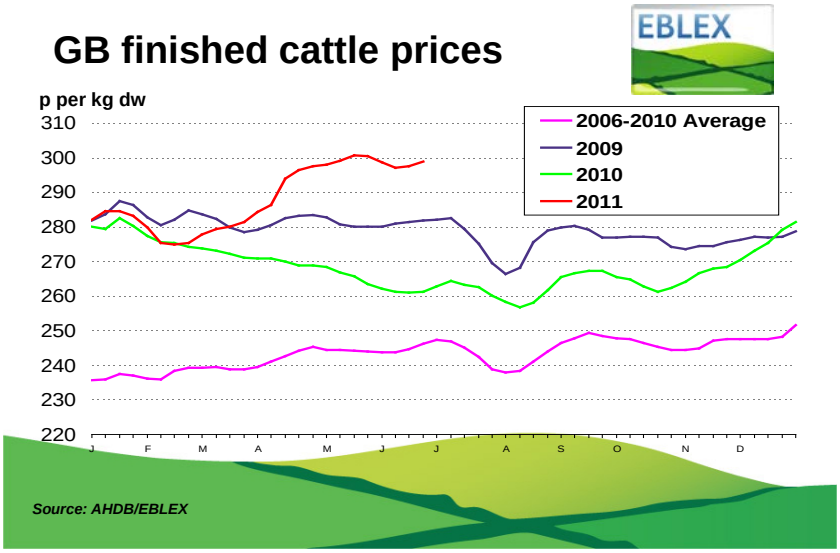
2.1 Finished cattle price trends

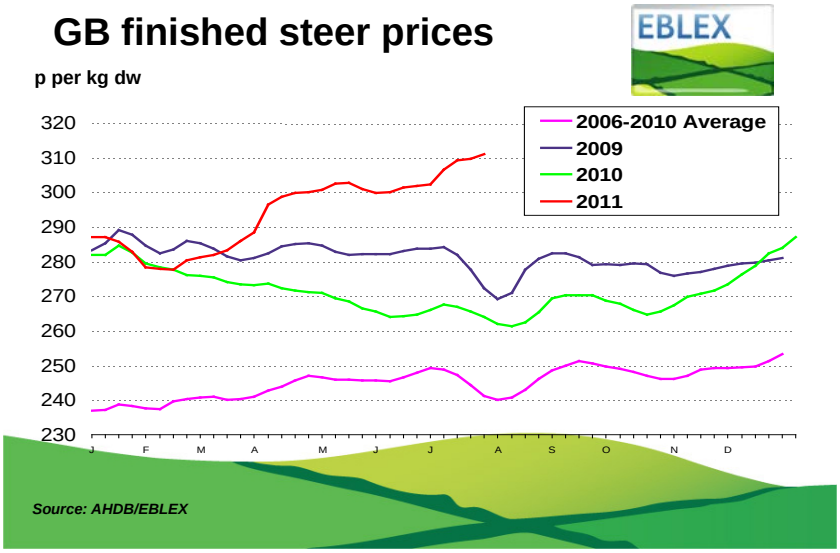
In recent years, there has been a noticeable dip in finished cattle prices during July and August, with prices recovering in September. This is illustrated below. The same trend being observed for steers, heifers and bulls.

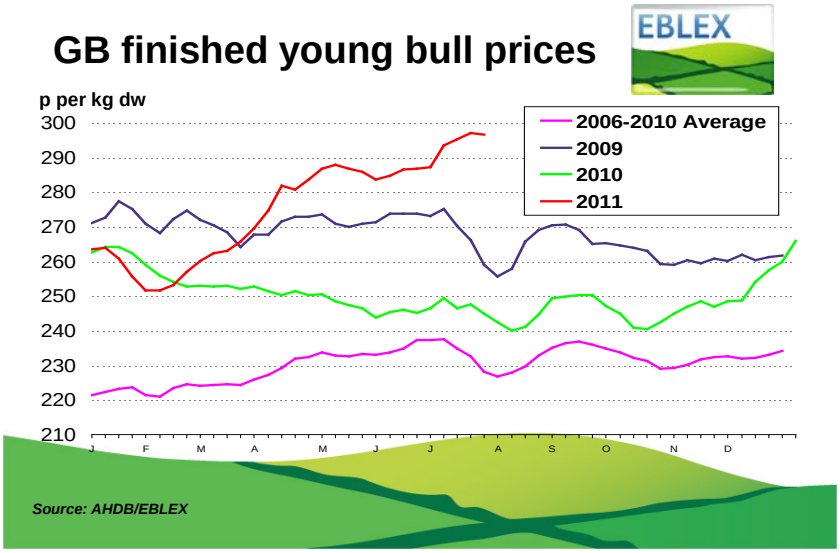
Producers may wish to try and avoid marketing cattle during this period in order to try to maximise their returns. For this reason, when selecting a production system, the calf's birth date and therefore expected finishing date for each production system should be taken into consideration. However, in some production systems, a July – September finishing date can allow lower cost finishing from pasture, therefore still allowing an acceptable margin.

It is not unusual to see a price differential between steers and bulls on a price per kg carcase weight basis. This is a result of bulls tending to attract lower prices compared to steers (in the order of 5-10p/kg DW) at an equivalent classification.

All cattle will be judged and valued according to the requirements of the customer. It is important to understand what these are, and aim to finish animals according to these needs.







2.2 Farm infrastructure

The available infrastructure on the farm will influence which systems can be deployed. It is necessary to consider the timing and duration of the period the cattle will need to be housed in each production system; are there suitable buildings available? In systems reliant on housing, the cost of straw bedding, and the availability of adequate manure or slurry storage and handling facilities, in addition to suitable land for spreading are important considerations.

It is not advisable to attempt to mix groups of bulls due to the risk of injury and potential mortality from fighting, as well as a potential check in performance. Pens must be designed to eliminate the need to mix groups of animals throughout the production system.

Buildings should also minimise the need for farm staff to enter the pens, particularly where bulls are concerned. Ideally all feeding and bedding should be possible from outside the pens, and gates, races, crushes and yard areas should facilitate easy and safe movement, handling and loading of animals.

2.3 Available feeds

Clearly feed costs vary from season to season. Feeds should be reviewed on the basis of their cost per unit of energy or protein. The feasibility of various feed types may change from year to year depending on their cost relative to the beef price and each other. If cereal prices are very high – consider co-products or other alternative feeds where they are available and cost effective. Some producers may be able to access alternative feeds such as waste vegetables, potatoes or bread. However, most producers are restricted to what is available from feed companies, and clearly cereal based co-products or other alternative feeds and blends are affected by fluctuations in grain commodity markets. Home grown feeds and forage may be a good option if land and other resources such as storage facilities are available. The true cost of the overall ration should be calculated, including the cost of any home grown feeds and forage.

2.4 Key points

Calf selection

- It is essential calves have received adequate colostrum during their first week of life
- Choose calves that are bright and healthy, and at least 50kg in weight at 2 weeks old
- Weight for age is a good indicator of future growth potential
- It is worth investing in a well bred, healthy calf which is far more likely to perform well

Bull systems

- Most major buyers require that bulls are finished before they are 16 months of age
- Comparable physical performance to traditional intensive cereal-based production systems can be achieved from a well managed co-product based ration, finishing at around 13 months of age – i.e. achieving average daily live weight gains of 1.3-1.4 kg from birth to slaughter

- Bulls require a high energy (usually starch rich) diet to achieve fast growth rates and adequate finish. Cereals, root crops, and co-products from food processing are all suitable starch sources. It is always important to ensure the ration is balanced for micronutrients, contains adequate long fibre to promote rumination and is designed to meet specific growth targets.

- Maize silage can provide an excellent home grown forage for beef finishing systems, but it must be well made and of high quality to achieve good growth performance, and requires protein supplementation

- Most buyers prefer to purchase bulls under the age of 16 months. Where bulls are finished on forage based systems this requires achieving a lifetime growth rate of at least 1.1 kg/day.

- Some producers have investigated grazing bulls for part of their lives. This is common in New Zealand, although bulls would be older at slaughter, typically at least 18 months of age. In the UK, achieving adequate finish from grass before 16 months requires carefully managed supplementation, and in the majority of cases an indoor finishing period following grazing.

- Research in Ireland has shown that bulls fed ad lib concentrate while grazing prior to indoor finishing perform as well as bulls fed the same diet housed all the time. For some producers, this may present the opportunity to save costs associated with housing. Other evidence also suggests performance of bulls outdoors is highly sensitive to weather – therefore flexibility is required to bring bulls in if necessary, and the field choice should be made carefully to avoid sites that are too exposed or become very wet

- If considering grazing bulls, producers must be aware of the law concerning bulls grazing close to public access, and the need for adequate fencing to contain bulls from neighbouring stock

Steers

- When fed the same diet, steers usually have poorer feed conversion performance than bulls during finishing, resulting in higher feed costs per unit of live weight gain. Steers also tend to produce less well conformed carcases

- However, castration allows greater flexibility in production systems, since steers can be taken to an older slaughter age and are easier to handle

- Steer production often fits in well around other enterprises on the farm, and can offer the potential to utilise poorer quality pasture effectively, especially where environmental stewardship payments can compensate for slower finishing times

- Steers can also be finished intensively indoors, usually following a grazing season and at an older age than bulls

- Finishing steers earlier – aged up to 18 months – rather than later at 2 years or more, allows faster revenue generation and lower working capital, especially in the absence of headage payments

SECTION 3. CALF REARING

3.1 Introduction

Successful calf rearing is essential for the animal's future performance. There are a range of options producers may consider for calf rearing, which will be discussed later. Whichever system is chosen, results are dependent on attention to detail and sound stockmanship. Since calf rearing can be highly labour intensive compared to later stages of development, choice of calf rearing system is often dependent on labour availability.

3.2 Regulations

Calves should be reared in group conditions. UK regulations stipulate that calves must be kept in groups after 8 weeks of age. Where individual stalls or pens are used prior to 8 weeks, these must allow calves visual and tactile contact with one another. Individual pens must have a minimum width at least equal to the height of the calf measured at the withers in a standing position, and the length must be at least equal to the length of the calf measured from the tip of the nose to the caudal edge of the pin bone. In group conditions, the following space allocation is required at a minimum:

- At least 1.5m^2 per calf up to 150kg liveweight
- At least 2m^2 per calf at 150-200kg liveweight
- At least 3m^2 per calf over 200kg liveweight

Calves must have appropriate bedding, and access to a clean, comfortable, well drained lying area. Calves must be provided with a minimum daily ration of fibrous feed after 2 weeks of age. The quantity should be raised in line with growth from a minimum of 10g/day at 2 weeks old to 250g/day at 20 weeks. The diet should contain sufficient iron to ensure blood haemoglobin level of at least 4.5 mmol/litre. Fresh water must always be provided in addition to any milk replacer being fed.

3.3 Calf selection and source

The quality of the calf itself is a key determinant in its future performance in any production system. Not all calves are viable to rear for beef. Calves must be in good health, have reasonable conformation for beef, and be a good size (weight). Guidelines for calf weight for age are provided below. Dairy-sired male calves cost significantly less than Continental crosses or other beef crosses, so they do present a potentially profitable opportunity. However, some calves are more suitable for beef production than others.

It is essential that calves have received sufficient dam's colostrum in order to thrive. A minimum of 2 litres of colostrum in the first 6 hours of life, and a further 2 litres within 12 hours is deemed sufficient. As a guide, 20 minutes of continuous suckling should ensure this. However, it is far more reliable to carry out a blood test to measure blood immunoglobulin levels. This must be carried out in the first 7 days of life.

Calves should remain on their farm of birth until they are 7 days old and the naval is completely healed. Ideally purchase calves in batches of the same age from one source. As much information as possible on the health status of the herd of origin should be sought (including vaccination policy), as well as if possible, the genetic merit of the calf (sire identity at least). It is often possible to obtain more of this type of information for calves purchased directly from the farm of birth, however some specialist calf dealers often also collect such information, and procure calves from well known reliable sources.

Minimum weight targets for Holstein bull calves are provided below[3]:

Age (weeks)	Target liveweight (kg)	Liveweight gain (kg/day)
1	48	
6 (weaning)	73	0.7
12	102	0.7
15	119	0.8

In a trial carried out on behalf of EBLEX[4], it was investigated whether calf conformation at purchase was a reliable indicator of subsequent performance in beef production. Two groups of pure dairy bull calves were selected, and judged at approximately 10 days old to be likely to achieve either a carcase grade of O or P in a conventional 13-15 month bull beef system.

Average start weights of the calves in group O were 57kg and in group P 48kg, and they were aged between 8 and 26 days old. Mortality during rearing and finishing was far greater in the P group (25%) compared to the O group (6.3%). Although there were no statistically significant differences in average carcase weights and conformation traits between the two groups, performance was far more variable in group P, which showed a greater range in performance for both carcase weight and liveweight gain. Average values for carcase weight, value and conformation were higher in group O than group P, but as stated, these were not statistically significant. Although the starting liveweight was not a reliable indicator of future

[3] Dawson L (ed) undated. Blueprint for rearing dairy-origin calves. DARDNI, AFBI, CAFRE

[4] Investigating dairy calf selection as an estimate of finished carcase conformation and returns from different quality pure dairy calves, EBLEX April 2010

performance, "weight for age", i.e. liveweight divided by age in days, had a significant positive correlation to both lifetime daily live weight gain and carcase weight.

3.4 Calf rearing systems

3.4.1 Milk replacer

A range of milk powders are available, each with their advantages and disadvantages on nutritional content and cost. Some milk powders are suited to specific rearing systems, so it is important to match the powder to the system employed.

The two broad types available are skim based powders and whey based powders. As the name suggests, skim powders contain 40-60% skimmed milk powder – a high inclusion of milk protein – and tend to be more costly. Whey based powders often contain a higher proportion of non-dairy proteins. Both can be used successfully in an appropriate production system. Milk replacers containing a mix of skim and whey based powders are also available.

Skim based powders are suited to both once and twice a day feeding. Whey based powders are best suited to twice a day feeding. Milk-derived proteins are important during the first 2-3 weeks of life. After 3 weeks of age, a higher level of plant-derived proteins can be tolerated with no ill-effects.

It is also important to understand the nutritional content, such as protein and fat levels. Protein content of 20-23% is considered adequate to sustain optimum growth, with no benefit in increased protein levels beyond 23%. Protein content below 20% will reduce live weight gain. Fat / oil levels tend to fall into the range of 16-22%. Higher fat milk replacers may suppress concentrate intake, so are not suited to systems requiring early weaning.[5]

3.4.2 Feeding systems

Options include whether to rear calves in individual pens or in groups (note Section 2.2 Regulations above), teat feeders or buckers, once or twice a day feeding or ad-lib systems, including automated feeders. All systems can be equally successful provided they are well managed.

[5] Dawson L (ed) undated. Blueprint for rearing dairy-origin calves. DARDNI, AFBI, CAFRE

A comparison of results for once and twice daily calf rearing systems using individual pens are provided below[6]:

	Once daily	Twice daily
LIVE WEIGHT (kg)		
Start	50	47
3 weeks	55	54
Weaning (6 weeks)	69	70
12 weeks	122	123
DAILY LIVE WEIGHT GAIN (kg)		
Start – 3 weeks	0.23	0.35
Start – weaning	0.47	0.56
Weaning – 12 weeks	1.25	1.27
Start – 12 weeks	0.86	0.91
FEED INTAKES (kg)		
Milk replacer	23.0	22.9
Concentrates (birth – weaning)	30.6	27.4
Concentrates (birth – 12 weeks)	170.3	166.0
LABOUR TIME (minutes)		
Morning & afternoon	30.9	61.2
Minutes per calf per day	1.40	2.78
Minutes per calf to weaning	58.8	116.8
FEED COSTS (£)		
Once a day CMR @ £1,600/t	36.80	
Twice a day CMR @ £1,350/t		£30.91
Concentrates @ £172/t	29.29	28.55
Total feed costs to 12 weeks	66.09	59.46
Feed cost / kg gain	0.92	0.78

Results from further comparison of twice daily feeding (individual pens) and computerised machine (group) feeding systems are shown below[7]. Both groups of calves were fed the same quantity of milk replacer.

[6] Marsh SP and Collinson AR (2008) Effect of rearing dairy-bred beef calves on once or twice per day milk feeding systems to weaning at 6 weeks old. *Proceedings of the British Society of Animal Science.* Paper 161

[7] Marsh SP and Warnock W (2008) Computerised machine rearing systems for group housed dairy-bred bull calves. *Proceedings of the British Society of Animals Science.* Paper 129

	Twice daily	Machine
LIVE WEIGHT (kg)		
Start	45	47
Weaning (6 weeks)	62	63
11 weeks	102	102
DAILY LIVE WEIGHT GAIN (kg)		
Start – weaning	0.39	0.37
Weaning – 11 weeks	1.16	1.13
Start – 11 weeks	0.74	0.71
FEED INTAKES (kg)		
Milk replacer	19.0	19.0
Concentrates (birth – weaning)	25.4	23.7
Concentrates (birth – 11 weeks)	138.2	133.9
LABOUR TIME (minutes)		
Morning & afternoon	61.56	28.96
Minutes per calf per day	3.62	1.70

In both trials, 18% CP concentrates were offered. The calves entered the trial at 4 days old having been fed colostrum from within 6 hours of birth.

Comparing once a day to twice a day feeding, the twice daily fed calves recorded a significantly higher DLWG from start to 3 weeks. There were no significant differences in live weights throughout the trial, or in feed intakes. Labour input was reduced by almost 50% on the once a day system compared to twice daily feeding. However, feed costs increased by £6.63 / calf on the once daily system.

Comparing twice daily to machine feeding systems, there were no significant differences in live weights, DLWG or feed intakes. Labour inputs were reduced by 53% with the machine fed (group reared) calves.

Further information about calf rearing can be found at www.holsteinbullcalves.co.uk

3.5 Weaning

Concentrates should be introduced relatively early on to encourage intake. Many producers offer concentrate from a few days of age to encourage calves to begin to consume it. They should be highly palatable (frequently molasses is included) and of a high nutritional quality (18% CP is typical). Sources of starch fed to young calves have been shown to encourage rumen development in calves. Intake should gradually increase so that the calf is consuming at least 1kg per day for three consecutive days, when it can be weaned. This level of intake should be achieved by 6-8 weeks. A source of forage should also be offered, usually straw or

hay, to encourage rumen development. At the same time, the proportion of milk replacer in the total diet should decrease as intake of concentrate and forage increases. Fresh water must be made available throughout – milk replacer does not substitute for water.

SECTION 4. VEAL PRODUCTION

4.1 Definition

Legislation banned the use of veal crates in the UK in 1990, and Europe-wide in 2006. A combination of regulations and voluntary schemes ensure high standards of animal welfare, leading to a high welfare premium product. Modern veal is a delicate pink colour, as opposed to the traditional white product, due to the inclusion of adequate iron and roughage in the diet. Because of this, it is often marketed as "Rose veal" in the UK.

Veal is legally defined as the meat from cattle aged less than 8 months at slaughter. However, under an amendment to the Beef Labelling Guide Rules the term "Rose veal" can be used to describe meat from animals aged up to 12 months, if certain conditions are met, and independently verified. The rules for labelling meat from cattle slaughtered under 12 months of age are as follows[8]:

- Meat from cattle aged under 8 months must be labelled "Veal" and state "Age on slaughter: up to 8 months"

- Meat from cattle aged over 8 months must be labelled "Beef" and state "Age on slaughter: 8-12 months"

- The term "Rose veal" may also be applied to meat from animals under 12 months old, if it is produced under an approved system:

    - Fed an ad-lib, varied diet which must include straw and ad-lib concentrate or meal after the age of 8 weeks

    - Reared in a welfare-friendly environment (loose housed in open yards)

- However, if the animal is aged over 8 months, the compulsory term "Beef" must also be used.

4.2 Market opportunities

The market for veal in the UK is small, but both home-produced and imported product is available. The foodservice sector is a major customer, but consumers may also purchase veal at some supermarkets as well as specialist online retailers and direct from producers via farm

[8] *Source: Rural Payments Agency, personal communication August 2011*

shops or farmers markets. The market for veal is much greater in Europe, and some UK produced veal is exported to the Continent.

In the UK veal is a premium product with a relatively small customer base. However demand for high welfare veal is growing, as evidenced by the growth of companies specialising in British and Irish high welfare veal production and marketing. Within the UK market, there is some evidence to suggest that increasingly white veal is being replaced by rose veal; particularly as awareness of modern veal production systems and welfare standards increases, and consumers develop a better understanding of the product itself and how to use it.

It is imperative for producers to first identify a secure market for their veal, and to ensure they fully understand the requirements of their customer(s) for production standards and carcase quality.

Producing veal under contract is a good option as this provides security of end market, provided the contract specifications are met. Production systems for contract veal production are designed to meet the needs of a specific end customer, and there are typically pre-determined pricing structures which give the producer additional security. Support is also generally provided in terms of nutrition and veterinary regimes.

Alternatively some producers identify their own customer, such as a specialist wholesaler for instance, or market direct to consumers via a website or farm shop. These options require considerable additional effort away from the core activity of rearing animals, but can be successful if appropriate resources and skills are available. The same basic rules apply – understand customer requirements and produce according to an agreed specification. Consider the need to find a sustainable market for the whole carcase, not just the premium cuts; this can make the difference between a profitable long term venture and a loss making exercise.

4.3 Production systems

4.3.1 Calf selection and early life

Successful veal production begins with a healthy, high quality calf. Calf selection is critical – not all calves are suitable to rear.

- Pure dairy-bred male calves (Holstein and Holstein-Friesian types) are most commonly used in veal production systems

- Select calves from a known source, with as much information about breeding, rearing and health history as possible

- It is vital they have received sufficient colostrum early in life – ideally 2 litres within the first 6 hours and a further 2 litres within 12 hours. This can be determined by a blood test which confirms the level of colostral antibodies

- Calves should be alert, healthy and presented in clean condition

- Calves should weigh at least 50kg at 2 weeks of age

Work with your vet to develop a suitable vaccination and disease control programme. In particular, this should provide for prevention of common diseases such as pneumonia, as well as internal and external parasites. Some producers also provide micronutrients via multivitamin injections.

Although Holstein-Friesian bull calves can sometimes be purchased cheaply, it is worth paying a premium for a high quality calf, which offers better conformation, size and health status. Such a calf has far better prospects in a veal, or any beef production system. Established veal producers will pay up to £70-100 for a high quality calf depending on finished veal prices.

Calves are not normally castrated for veal production, since this will reduce lifetime performance. If disbudding is required, this should be carried out early on to avoid stress later which could also set back growth.

Ensure the building has good ventilation and air flow, and allows for the safe and efficient handling and management of calves, as well as ease of access for mucking out and other tasks. Ideally calves should remain in the same groups throughout the production system – this prevents stress and helps in disease prevention and control. It also allows for closer monitoring of growth targets in batches of calves of the same age.

4.3.2 Production systems

Current welfare standards allow for a range of veal production systems. A key consideration is the target age and weight at slaughter: this will inevitably determine the feeding system required to achieve this performance.

Current UK practice falls broadly into 2 categories:

- A 6-7 month system, producing smaller carcases of up to 150kg from 300kg liveweight animals. This system is based on feeding milk replacer throughout the animal's life.

- A 10 month system, producing carcases of 200kg from 400kg liveweight. In this system, animals are weaned and finished on a high starch diet.

It is important to agree with the customer the type of end product and production system required.

4.4 Finishing systems

4.4.1 6-7 month system

In this system, calves are fed on milk replacer for the duration of their lives. Given the dependence on ad-lib milk feeding, automated group feeders are usually employed to efficiently manage the system and maximise intake. This is supplemented as they grow with concentrates or rolled cereal, rising to about 2kg/day at slaughter. Ad-lib straw is provided throughout to ensure calves have constant access to sufficient fibre.

This diet has a high metabolisable energy (ME) content, principally provided through the milk replacer, which has an energy content of 15MJ/kg DM, whereas the cereal typically has 13MJ/kg DM (ME). High ME in the diet ensures fast growth rates, with liveweight gain averaging 1.2-1.4kg/day over the duration of the system. During the course of its life each calf can be expected to consume around 375kg of milk replacer and 150-170kg of rolled cereal.

Calves are slaughtered as close to 6 months of age as possible, with a liveweight of 270-300kg and a killing out percentage of 52%, with a carcase weight of 100-150kg.

4.4.2 10 month system

Weaning

Calves are finished over a longer period of time, and this system includes weaning. Calves start on milk replacer, supplemented with a concentrate blend (often in the form of starter pellets or coarse mix) and ad-lib straw. During the first 12 weeks to weaning, a calf will consume up to 25kg of milk replacer. In order to encourage concentrate intake, the proportion of milk replacer in the total diet should be slowly reduced towards weaning age, so that concentrate intakes are at least 1kg per day at weaning, and calves weigh in excess of 100kg. During the first 12 weeks to weaning a calf will consume up to 125kg of concentrate. An example is provided below:

Barley & soybean meal ration (kg/tonne) (12.7MJ ME / kg DM, 16.4% CP)

- Rolled barley 850kg
- Soya bean meal 130kg
- Vitamins 20kg

Finishing

Following weaning, calves consume a high starch diet, which encourages high growth rates and lean muscle deposition. The faster the animal can be finished the better, with growth rates quickly accelerating to 1.3-1.5kg / day.

The finishing ration could be a protein and cereal blend fed with maize silage, or higher cereal inclusions fed with straw. Co-products from the food processing industry may also be used successfully, provided adequate starch levels are maintained. Grass-based forage is best avoided due to lack of starch. Ad-lib straw should always be offered to reduce the risk of acidosis. Depending on the exact make up of the ration, up to 1.6 tonnes of concentrate will be consumed up to a slaughter age of 10 months. By this time, the live weight will be 410-420kg with target carcase weights of 205-215kg. Killing out percentage should be in excess of 50%. The majority of carcases are graded –O and at fat class 2.

4.4.3 Case Study

Graham & Sarah Whiting, Liskeard, Cornwall

Graham and Sarah have an arable and beef farm on 350 acres of owned land and 350 acres of rented land, managed under ELS. They use their own home grown cereals for feeding to the cattle. Beef cattle are reared on contract for Blade Farming, under both bull and veal contracts. The farm carries 240-300 head of cattle per year.

Calves are supplied by Blade, and are aged between 2 weeks and 1 month old when they arrive at the farm. Graham & Sarah note that the calves being born on several different farms presents a disease risk. Mortality can vary among calves of different farms of origin, and Graham & Sarah emphasise the importance of ensuring they have received adequate colostrum in the first week of life.

Calves are reared in batches of 20 on automatic milk machines for a period of 6 weeks (regardless of age), before moving to weaning pens up to 2-3 months of age, and then on to the finishing unit. They are housed on straw bedding throughout, and have access to concentrate from day one, and are offered ad lib straw. Calves remain in their batch throughout the production system, and are slaughtered on a batch basis under the Blade contract.

Feeds

During the rearing phase, each calf will consume 25kg milk replacer and 230kg concentrate to 12 weeks of age.

The finishing diet consists of barley, with rapeseed meal, soya bean meal, wheat distillers, NIS (nutritionally improved straw), grain maize, molasses, mineral and yeast. This is fed through a mixer wagon.

Grain maize is fed to ensure there is sufficient starch in the ration to enable the calves to deposit lean tissue early in life and achieve an acceptable finish at 10 months of age. This makes the ration more costly than for bull beef.

Veterinary regime

A rigorous vaccination programme is implemented on farm. Calves coming from different farms are at greater risk and exposure to disease, and pneumonia can be a problem. The farm also has Blackleg. They are treated with Rispoval intranasal followed by Rispoval 4 (2 doses) to protect against pneumonia causing pathogens. They are given antibiotics in their milk during the first 7 days on farm, and then an anti-coccidial drug. Calves are dehorned, wormed and given a fly treatment.

Infrastructure

Despite being slaughtered at a relatively young age, safety is a concern when handling and working around the young bulls. The farm policy is that two people must be present when handling the cattle, and no-one enters the pens unless absolutely necessary. To minimise this, bedding down is carried out with a straw chopper. Handling infrastructure includes a race with a crush and weigh scales.

Pens must be designed and laid out to ease movement and handling of the animals in a safe and efficient manner. They must be of a sufficient size to allow the cattle to grow over the finishing period and stay in the same batch.

Growth targets

Calves are weighed at weaning and at 7 months old. The average weight gain is 1.3kg per day from arrival on farm to slaughter. Target slaughter age is 10.5 months at 400kg live weight and 200kg carcase weight.

Carcases typically grade at -O, occasionally O+. There are some P grades, which are penalised on price.

Gross margin – per head

Calf		£80
Weaning cost (to 12 weeks)	25kg milk replacer @ £1300/t	£33
	230kg concentrate @ £210/t	£48
	Vet & Med	£25
	Straw	£10
Rearing / Finishing cost (12 weeks +)	1.5 tonnes feed[1] @ £191/t	£287
	Straw	£25
Haulage		£20
Miscellaneous (commissions, levy etc)		£30
Total costs		**£558**
Carcase	200kg @ £2.90 /kg	**£580**
GROSS MARGIN		**£22**

[1] based on a charge for home grown barley of £140 / tonne

Developments in beef prices are not always reflected in the veal price. This can make veal relatively less attractive to produce than bull beef. Under these conditions, the Whitings have the option to suspend their veal production enterprise in favour of young bull production. The farm infrastructure is well suited to both production systems, which allows an element of flexibility provided outstanding contracts are fulfilled.

Lessons

- A rigorous disease prevention routine is essential, especially when calves are sourced from more than one farm of birth
- The veal enterprise fits well with the bull beef enterprise on the farm, and benefits from access to home grown cereals
- There is a need to ensure pens and other farm infrastructure are well planned, allowing animals to be reared in fixed batches and managed safely and efficiently

- Growth rates should be monitored to ensure the cattle are performing according to growth targets and expectations. The ration provided should be formulated to meet these targets – starch is key to early carcase finish

- Producing under contract provides the security of selling for a known price fixed at the start of the contract (provided product specifications are met). However, it is nonetheless important to understand the production costs and returns of the enterprise. When selling for a known price, it is advisable to also buy inputs on a forward basis so that margins can be predicted with confidence

SECTION 5. DAIRY-SIRED BULLS

5.1 Introduction

Intensive beef systems for dairy sired calves are traditionally based on high cereal inclusion in the ration to promote high growth rates, but when cereal prices are high, margins are put under pressure. Dairy bulls can also be finished on alternative diets. Most commonly these are based on maize silage supplemented with a protein blend, or co-products from the food processing industry as a substitute for cereals, although alternatives are available.

An important consideration is the requirement by many abattoirs for bulls to be under 16 months of age at slaughter. Older bulls can produce beef which is less acceptable to the consumer. Growth rates therefore need to be high enough to ensure the animals can be finished within this time frame (at least 1.1kg/day for slaughter at 550kg LW).

Bulls are susceptible to stress, which adversely affects meat quality. Transport distances to the abattoir should be minimised, and effective handling and loading systems should be in place on farm as well as at the abattoir. Slaughter should be arranged for as soon as possible after arrival, so it is advisable to liaise with the abattoir first.

Bulls are also susceptible to stress and aggression if mixed in different groups. Bulls should be maintained in the same batches throughout the production system to avoid injuries and stress which will have a negative impact on performance.

5.2 Alternative feeds for intensive systems

Intensive systems can be classified as finishing in 12-14 months. In order to achieve the high growth rates required, the diet must contain high energy levels from starch, replicating traditional barley beef rations. Protein levels of the ration should be in the order of 12-14% crude protein in the dry matter. Mineral, and where necessary vitamin, supplementation is important. Cattle should always be offered a source of "long fibre", whether from silage or ideally straw, in order to support healthy rumen function. If offering straw, it is recommended to be fed in racks or other feeders as opposed to used for bedding only.

When considering alternatives to diets based on a high inclusion of cereals, there are a number of factors to consider, including:

- The potential for producing home-grown feeds and forages – availability of suitable land and opportunity cost

- The availability of co-products from the food, beverage and biofuels industries – this can vary regionally depending on proximity to processing sites

- Storage and handling of the feed on-farm, and its subsequent stability; any capital costs associated with implementing the required feeding system

- The overall nutritional balance of the ration, including the type and quality of forage

- The true cost of the ration

A vast range of alternative feeds could be considered, and some of these are discussed below. Typical analyses of selected feeds are included, but this is not intended to be an exhaustive list. Refer to other sources such as the EBLEX BRP Mini Feeds Directory, and your nutritionist.

Vegetables and roots

Potatoes, carrots, parsnips, swedes, turnips and fodder beet are among root crops that can be fed to livestock. These may be grown on farm or bought in, often either rejected for packing or canning for human consumption, or surplus volume. The availability of some feeds varies regionally, e.g. carrots are mostly grown and processed in East Anglia. Availability is typically dependent upon the harvest time for the crop, although they may also be released later from store. Most roots can be stored at low cost in outdoor clamps constructed from bales. Note potatoes should be kept in the dark or covered to prevent greening.

The following points should be considered when feeding roots and vegetables:

- Beware of soil contamination, which can introduce soil-borne diseases

- Do not feed rotten or otherwise spoiled roots

- Protect from frost, since freezing and thawing will damage the roots and lead to spoilage

- Have they been washed? – while this obviously reduces soil contamination, it will also substantially reduce keeping quality

Liquid and wet feeds

Liquid feeds are stored in tanks or drums and need to be thoroughly mixed with the other ingredients in the ration. Liquid feeds can aid overall palatability of the ration, suppress dust, as well as providing a nutrient dense energy or protein boost to the diet. Molasses and

distillery products are the most common base for liquid feeds, and a range of proprietary liquid blends have been developed by feed companies to help balance specific diets.

Cereal & maize co-products

These products are generally high in protein as opposed to energy.

A range of co-products from milling, brewing and distilling processes are fed to cattle. These include both dry products often processed into a pellet or meal, as well as moist products such as brewers grains which must be ensiled to prevent spoilage. The analysis will vary depending on the process from which the feed is derived, and the source.

In general, products from dry milling are high in fibre and contain moderate to high levels of protein, such as wheatfeed. Wet milling (maize) products can be very high in protein, such as maize gluten meal, while maize gluten feed still has good protein levels but more fibre. The wet feed corn steep liquor is also produced as part of this process.

The brewing and distilling process can use wheat, barley or maize and provides brewers and distillers grains, which can be dried and pelleted (sometimes called distillers light grains) or ensiled as a moist feed. These provide moderate to high levels of protein and high fibre content. The liquid fraction from the process, pot ale syrup, can either be used as a liquid feed or is combined with the grain fraction and dried, to form high protein distillers dark grains.

Co-products from food processing

The bakery and confectionery industries in particular produce a range of useful co-products, such as bread, breakfast cereal and biscuit derived feeds.

The composition and analysis of these products varies depending on their source, but they can provide an excellent energy source high in starch, and depending on the product sugar and oil levels can also be high. Low fibre content means it is important to feed with a good source of long fibre. Storage life can be limited due to the high oil content in some products.

Blends

A large number of compound feed products are available from feed companies using alternatives to cereals. As with all feeds, it is important to ensure the total ration, including the forage, is carefully balanced to meet the nutritional requirements of your animals in order to optimise performance. This will vary depending on breed type, sex and stage of production. The advantage of purchasing a blend is that there is no mixing of ingredients to

be done on farm to make up the ration, which may suit some producers with limited capacity to store a range of ingredients, or where no machinery for weighing and mixing a ration is available.

The table below[9] provides an indication of typical analyses for a selection of the feeds discussed. Analysis can vary depending on source, so always check the analysis of each delivery and adjust the ration accordingly.

(dry matter basis)	DM %	ME MJ/kg	CP %	NDF %	Oil %	Starch %	Sugars %	Storage	Availability
Potatoes	20.5	13.5	11.0	13.3	0.2	62.0	8.0	Good storage life in purpose built facilities. Otherwise limited storage on farm, especially if processed.	Bought in (close to growers / processors) or home grown. Maincrop lifted July – October
Carrots	13.0	12.6	9.5	10.5	1.5	10.2	30.0		Bought in close to growers / processors or home grown. Harvest Sept – Feb
Fodder beet	18.0	12.1	7.0	17.5	0.8	2.0	65.0	Dry conditions e.g. straw bale clamps	Bought in or home grown. Harvest generally Oct – Nov
Pot ale syrup	45.0	14.0	37.0	0.7	0.2	1.0	2.0	Liquid – drums or tanks	Local to distilleries
Cane molasses	75.0	12.6	6.0	0	0.2	0.0	65.0		Widely available
Brewers grains	23.0	11.7	24.0	56.5	7.1	5.0	1.5	Well consolidated clamp	Widely available, tends to be produced more in the summer
Maize gluten feed	89.0	12.5	21.7	40.0	4.0	21.0	3.0		Widely available
Biscuit blends	88.0	15.0	9.5	20.0	11.0	49.0	9.0	High oil content reduced storage life	Widely available
Bread	65.0	14.0	14.0	10.0	3.3	69.0	4.7	Limited storage life	Generally close to processors
Breakfast cereal blends	90.0	14.0	12.0	11.0	2.0	52.0	6.0		Widely available

[9] Adapted from the BRP Mini Feeds Directory.

Performance of bulls finished on a co-product based ration

A trial at Harper Adams University College[10] compared bull performance when finished on a diet based on barley with those finished on a diet based on Trafford Gold and other co-products. Trafford Gold is a co-product from Cargill's wheat distillery, which produces starch, wheat gluten and alcohol for the food and drink industry. It is a moist feed which is ensiled and typically contains 50% dry matter, 22% CP in DM and 13.4 MJ / kg DM. The bulls in the trial were Holsteins, Angus x Holstein and Limousin x Holstein.

Diets:

1. *Barley*

   68.75% rolled barley
   7.5% soya bean meal
   7.5% rapeseed meal
   10% sugar beet feed
   5% molasses
   1.25% minerals

2. *Trafford Gold*

   58% Trafford Gold
   29% processed bread
   13% sugar beet feed
   Minerals top dressed onto the ration daily

Both diets are balanced to 17.4% CP, and fed ad-lib.

[10] Marsh, S (2009) Evaluation of Trafford Gold, bread and Sugar Beet Feed mix on the performance of intensively fed bulls. HAUC

	Barley	Trafford Gold
Animal performance		
Start weight kg	326	339
Slaughter weight kg	550	572
Days to slaughter	191	184
DLWG kg	1.19	1.28
Age at slaughter (months)	13.78	13.72
Carcase weight kg	281	291
Killing out %	51.1	50.9
Feed intakes, kg as fed (kg DM in brackets)		
Trafford Gold mix		2,625 (1,481)
Minerals (top dressed)		23
Barley mix	1,704 (1,435)	
FCR (kg DM / kg gain)	6.40	6.42
Feed costs (£)	**£124 / tonne**	**£75 / tonne**
Feed cost / bull	212	203
Feed cost / kg gain	0.95	0.86

Bulls fed the Trafford Gold mix produced heavier slaughter weights, although all other animal performance results shown above were not significant, nor was FCR. Although FCR appears relatively poor, it must be noted that the bulls started the trial at c.330kg, i.e. after the main growth phase was completed.

At the prevailing feed costs at the time of the research (2009: barley £95 / tonne, Trafford Gold £60 / tonne) the overall rations were calculated to cost £124 / tonne for the barley mix and £75 / tonne for the Trafford Gold mix, resulting in a saving of feed costs of £9/ bull and 9p per kg gain for the bulls fed the Trafford Gold based finishing diet.

The study shows that co-product based diets for intensively finished bulls can match cereal fed performance, and provide the potential for feed cost savings.

Top tips for optimising cattle performance on intensive diets:

- Regularly check the analysis of ingredients whose nutritional composition may vary, e.g. co-products
- Check the analysis of the total ration is appropriate for the age and stage of your cattle
- Make sure feed is available at all times
- When using a TMR system, ensure all ingredients are well mixed and/or chopped as necessary

- Check dung consistency and for any undigested grain or other feed material
- Always offer clean, fresh water
- Ensure a source of long fibre is always available, separate from straw bedding
- Ensure the lying area is clean and dry
- Weigh animals regularly to ensure they are meeting growth targets, and monitor their body condition to avoid finishing over fat
- Balance the ration for minerals and vitamins to allow optimal performance

5.3 Bull finishing from maize or grass silage or other forage

Home grown forage can provide an efficient and cost effective feeding system for finishing beef cattle, but care must be taken to balance the ration so that target growth rates are met. Choice of crop and variety will depend on the land and soil type, as well as the availability of supplementary feeds to create a balanced ration to meet the needs of finishing stock. Some crops may be made into silage as bales or in a clamp, depending on machinery and storage available.

Bulls reared from forage will tend to finish in the range of 14-16 months, with growth rates lower than on more intensive systems depending on the level of supplementation. This can lead to increased risk of behavioural problems as bulls mature, which can lead to injuries from aggressive behaviour and riding. Building and pen design and layout needs to take this into consideration.

Feed quality and value depends on the quality of the crop grown and how well it is made into silage – clamp preparation, consolidating and sealing; bale handling and storage. For those crops, such as grass, where several cuts are made, nutritional value will change with each successive cut. Clamp management during feeding will also impact upon feed quality and waste levels. Resources such as the BRP Home Grown Forages Directory provide useful practical information on forage choice and production.

Grass silage

Feed quality is dependent on the quality of the sward and the species and varieties which make it up, as well as cutting date, and the management of the harvesting and silage making process. Good quality grass silage will have reasonable protein levels and energy in the form

of sugars. The addition of clover to the mix will further increase protein content. It lacks starch content and will need supplementing in order to achieve high growth rates. Supplementation of grass silage for beef production can be as simple as rolled barley as a starch source and appropriate minerals and vitamins, since good quality grass silage should provide adequate protein.

For first cut grass silage (clamp), harvested in May, aim for the following quality parameters:

Fresh weight yield	23 t/ha
Dry matter yield	5.7 t/ha
Utilisation	87%
DM %	25
ME MJ/kg DM	11.0
CP % DM	15

Maize silage

Maize is high in energy from starch but low in protein, and will need supplementation. Maize silage can be fed with grass or other silages, which often improves overall intake. It is a deep rooting crop which can aid soil structure, but consider the relatively late harvest period if on land that tends to become wet and take care to avoid soil erosion and run off.

Target quality parameters for maize silage are provided below:

Fresh weight yield	42 t/ha
Dry matter yield	13.5 t/ha
Utilisation	87%
DM %	32
ME MJ/kg DM	11.2
CP % DM	9
Starch % DM	30

A typical maize silage based ration for Holstein-Friesian bulls would include a 16-17% crude protein blend fed as a supplement. In this system, bulls should finish as close to 14 months as possible at 550kg live weight to produce a carcase weight of 280kg. Holstein-Friesian types should achieve a target carcase grade of –O3 on this diet.

Trials at Harper Adams University College beef unit have investigated the optimum level of supplementation of maize silage for beef. High quality maize silage (33.9% DM, 11.3 ME, 30.5% starch) was fed to Holstein bulls at either 50:50 or 75:25 on a dry matter basis with concentrates (barley, rapeseed meal, minerals). Both rations were balanced to contain overall 14% CP (in DM), and fed ad lib. The results are summarised below[11]:

	75% Maize 25% Concentrate	**50% Maize 50% Concentrate**
Age at slaughter (months)	15.3	15.2
Starting weight (6 months) (kg)	224	225
Slaughter weight (kg)	587	585
Days to slaughter	276	272
DLWG (kg)	1.32	1.33
Carcase weight (kg)	295.3	296.4
Kill out %	50.3	50.6
Feed intakes		
Maize silage (kg)	5,029	3,843
Rolled barley (kg)	325	1,147
Rapeseed meal (kg)	325	292
Minerals (kg)	41.4	40.8
Total finishing concentrates (kg)	691	1480
FCR (kg DM / kg gain)	6.39	7.20
Financial performance (£/bull)		
Carcase value	791	787
Margin over feed	609	557
Feed cost/kg gain	0.50	0.64

There were no significant differences in carcase traits, slaughter age, weight, daily live weight gains, carcase weight or kill out %. The results suggest that there is no further benefit from feeding greater than 25% concentrate inclusion with maize silage in a 14% CP (in DM) ration.

An additional 1,186kg of maize silage is fed and a saving of 789kg of concentrate is made in the 75:25 diet compared to the 50:50 maize to concentrate ration. At the costs prevailing at the time of the study (2009: barley £95/tonne, rapeseed meal £136/tonne, maize silage £55/tonne DM), a saving of 14p / kg gain was made by feeding 75% maize silage.

[11] Marsh S (2009) Effect of concentrate feed level on the performance of maize silage fed bulls. Harper Adams University College

The bulls were slaughtered at just over 15 months of age, which is reported to be approximately 1.5 months later than Holstein bulls on a traditional cereal system, and in line with recognised targets for silage beef.

Red clover

Red clover may be grown with competitive short duration ryegrass for silage, or as a monoculture, where it is typically made into silage bales, although it can be made in a clamp. Red clover does not tolerate grazing well due to its erect growth habit and susceptibility to crown damage from trampling, although more tolerant varieties are becoming available. It offers higher protein levels than grass silage, and additionally helps in improving soil fertility as a nitrogen fixer. Care should be taken when grazing rich clover pastures, since high intakes can cause bloat.

Red clover silage has a high CP of 16-20% and ME of 10-12 MJ/kg DM. Several varieties are available which balance productivity and increased disease resistance. For more details refer to the descriptive list for red clover at www.herbagevarietiesguide.co.uk.

Red clover silage is usually made using an innoculant to ensure adequate fermentation. It is susceptible to leaf shatter, so care must be taken in wilting the crop prior to picking up. Although high in protein, red clover is deficient in starch (typically no more than 2% of DM) so will require supplementation in order to achieve adequate finish and growth rates.

5.4 The potential to graze bulls for part of their lifetime

It is argued that maximising the amount of time cattle spend out at grass, and minimising the time spent housed, is a strategy which can significantly reduce production costs associated with the housed period (increased labour, feed, slurry/manure). This leads producers to consider the opportunity to graze bulls, minimising the amount of concentrates fed.

Before grazing bulls it is essential that producers understand the legalities of turning entire cattle outdoors. Section 59 of the Wildlife and Countryside Act 1981 states that bulls should not be at large in any fields which are crossed by public rights of way, *if they are of a recognised dairy breed*. Within this law there is an exception that bulls under 10 months old can be turned out, even if dairy bred.

Bulls can become aggressive as they mature, are often inquisitive and demonstrate sexual behaviour. Therefore fields need to be carefully evaluated with respect to public access, the robustness of perimeter fences or other boundaries and neighbouring stock (especially cows and heifers). Bull behaviours such as riding can be problematic as they can push each other through electric fencing. A backing fence is ideally required to deter such behaviour.

5.4.1 New Zealand – "TechnoGraze"[12]

There are different grazing options available to farmers including continuous, rotational or strip grazing. A concept from New Zealand called TechnoGraze is a version of rotational grazing, where bulls are grazed in very tight blocks and moved very regularly, providing more effective grazing of the pasture and a longer recovery period to promote higher leaf growth. Paddocks are sub-divided using a combination of permanent and temporary electric fences into cells usually less than 0.1 hectare. Bulls rotate among these cells in small groups of up to 20 animals.

Pasture allocation is calculated to maximise productivity. Higher stocking rates and live weight gain per hectare are achieved from TechnoGraze than from other grazing systems. Set up costs can be high due to electric fencing and additional water troughs. A device mounted to a quad bike has been developed to allow for accurate, safe and fast movement of electric fences.

In New Zealand, bulls are often finished at an older age than in the UK, at 18 months or more and live weights of up to 600kg, although a range of systems are in place. This allows greater flexibility in New Zealand to extend the system if bulls are not finishing adequately, for example in years where pasture growth or quality is low.

Performance is variable however. For example, one farm recorded performance variability from 800kg live weight gain /ha in a poor year up to 1600 kg/ha in a good year. Sward quality and availability are key to the performance of the system – to a large extent influenced by weather conditions.

It should be noted that in New Zealand, beef from the dairy herd is derived from Friesian, Jersey and crossbred dairy cows as opposed to Holsteins which usually predominate in the UK. These animals are smaller and less extreme in conformation than the Holstein. Implementation of TechnoGraze varies according to the farm's climate and topography, which varies considerably throughout New Zealand. For this reason stocking rates vary (but are typically very high), as does the duration of the grazing season, from all year round whole life bull systems to purchasing yearling bulls at relatively heavy weights for a relatively short finishing period on TechnoGraze. This system has been used for bulls, steers, dairy and beef heifers, as well as breeding ewes and finishing lambs.

[12] Charlton JFL & Wier JH (2001) TechnoGrazing – a new grazing concept: Proceedings of the New Zealand Grassland Association 63: 33-36

5.4.2 UK experience

In more familiar UK rotational grazing systems, a minimum of 6 paddocks are recommended[13], with paddocks grazed for up to 4-5 days and then rested for 20-25days. The more the paddocks and shorter the time spent on each (i.e. smaller paddock size), the better. Paddock size will be determined not only by the size of the group grazing, but also the quantity and quality of grass, which will of course change throughout the season. Paddocks can be sub-divided using electric fences to facilitate more rapid movement of stock. Grass should measure 10cm when cattle are put on to a fresh pasture and they should be taken off at around 5-6cm. The paddock needs to be grazed adequately so to minimise the build up of stemmy herbage. If necessary, topping can increase forage quality. Maintenance of pasture quality is critical to maintaining consistent daily live weight gains; close attention to detail is essential.

The sward species and varieties mixture should provide high energy and protein. Careful selection of varieties is required. The inclusion of red clover may be considered due to its high protein, flexibility for both grazing and cutting, either in a mixed sward or stand alone. It also benefits as a nitrogen fixer, and improves soil structure through its deep rooting system. A mixed sward example might include 3kg/acre red clover plus 9 kg/acre ryegrass.

There are several strategies which producers may choose to take. Experience from one UK producer who has trialled various bull grazing systems suggests the following[14]:

- Autumn born bulls may be turned out in the spring onto high quality pasture (containing high energy in the form of sugars). Careful management of grass is needed from late spring to ensure targets for quality and quantity of grass in the summer months are met. During the summer it may be necessary to supplementary feed from hoppers in the field to avoid a reduction in growth rates due to declining pasture quality. Bulls may then be brought in to be finished inside over winter before they are 16 months old.

- Spring born bulls are more difficult to manage in a grazing system because they maybe too young to make good use of the grass during their first summer. However access to a grazing paddock with shelter may reduce disease incidence and need for bedding etc. Having spent their first winter inside and being around 12 months of age these bulls are getting near to slaughter weight and age and maybe best kept indoors for finishing during their second spring. They may also be too old to turn out safely.

[13] Weatherup N, Dawson L, McHenry P (not dated) Finishing dairy-origin beef Blueprint. Northern Ireland Red Meat Industry Taskforce

[14] A Quinney, personal communications

- A growth rate of 1.0kg/day may be achieved from good quality spring grass alone, although performance will be variable and depend on many factors such as grass quality, calf health and weather conditions. Often supplementary feeding is required to avoid a check in growth caused by declining pasture quality later in the season.

- Carcase grades will be poorer than for bulls finished more intensively, but this is compensated by potentially lower production costs. The system is dependent on high quality swards to minimise the quantity of concentrate fed.

- Performance is dependent on the weather, due to its influence on grass growth and quality, as well as bull comfort and poaching risk. In harsh conditions Holstein bulls, being less hardy than many other breed types, will have a higher maintenance requirement, reducing their growth rates. Therefore a degree of flexibility is required in this system, since it may be necessary to bring bulls inside if pasture growth and conditions are not adequate to finish bulls, even with supplementary feeding.

- An example gross margin per bull per day is provided below – illustrating the cost of a grazing system for bulls using pasture only compared to feeding them a traditional ration indoors. The performance below was achieved from Spring turnout (April 8th) onto good quality pasture, until pasture quality drops in July. This will vary according to conditions on different farms, and during different years.

2011 prices	**Barley/protein mix, indoor**	**Grazing**
Value of LW gain per day	***£1.75 (1.4kg/day)***	***£1.13 (0.9kg/day)***
Feed costs per day	£1.68	£0.02 (mineral feed blocks)
Straw	£0.20	
Water	£0.05	£0.01
Fuel	£0.04	£0.01
Wormer		£0.01
Fertiliser & manure (£55.22/ha)		£0.08
Gross margin per day	**£-0.22**	**£1.00**

The gross margin data is presented on a per day basis and reflects a finishing bull from pasture only, compared to one on a traditional indoor finishing diet. In both systems, the value of live weight gain is calculated assuming £1.25 / kg live weight, i.e. £2.50 /kg carcase weight and 50% KO. The analysis is based on achieving 0.9kg/day from pasture only. Any requirement for supplementary feeding would add significant cost. The indoor ration is based on a ration cost of £200/tonne, and a feed conversion ratio of 6:1. Using the same performance targets the indoor system would break even on a per day basis at a feed cost of approximately £170/tonne.

5.4.3 Comparing bull performance with or without grazing

Experiments at the Animal & Grassland Research and Innovation Centre, Teagasc have looked into the effects of introducing a grazing period into Holstein-Friesian bull systems. The concentrate fed was a barley (85%), soyabean (13%) mix with minerals (2%). The results are summarised below[15]:

Start weight kg	125	126	128
Treatment Start – day 112	Ad-lib concentrate indoor	Pasture + ad-lib concentrate	Pasture + restricted concentrate (grass only day 1-84, adaptation to ad-lib concentrate day 85-112)
Day 113-250	Ad-lib concentrate indoor		
Concentrate intake (kg DM)			
Day 1-112	559	511	112
Day 113-250	1019	1051	1030
Total: Day 1-250	1578	1562	1142
Live weight gain (kg/day)			
Day 1-112	1.39	1.42	0.80
Day 113-250	1.18	1.22	1.41
Total: Day 1-250	1.27	1.31	1.13
Final live weight (kg)	442	452	411
Carcase weight (kg)	237	237	215
Killing out %	53.6	52.4	52.4

In the above experiment, feeding ad-lib concentrate at pasture had little impact on total concentrate intake, live weight gain or carcase weight. Those on restricted concentrate intake during the first 112 days consumed similar amounts of concentrate during the finishing period, but a saving of almost 450kg was made during the initial 112 days. However, lower initial growth rates were not fully compensated for later, and resulted in a loss of 22kg carcase weight.

In a subsequent experiment, the effect of a period at pasture with differing levels of concentrate was investigated. These results are summarised below:

Start weight kg	114	114	114

[15] O'Riordan EG & Keane MG (2010) Bull Beef Production from Holstein/Friesian Male Calves www.thecattlesite.com Accessed 21/09/11

Treatment Start – day 140	Ad-lib concentrate (barley/soya) indoor	Pasture + ad-lib concentrate	Pasture + 2kg concentrate days 1-112, adapting to ad lib days 113-140
Day 141-266	Ad-lib concentrate indoor		
Concentrate intake (kg DM)			
Day 1-140	711	640	384
Day 141-266	872	919	914
Total: Day 1-266	1583	1559	1298
Live weight gain (kg/day)			
Day 1-140	1.26	1.34	1.07
Day 141-266	1.24	1.30	1.24
Total: Day 1-266	1.25	1.32	1.15
Final live weight (kg)	447	464	419
Carcase weight (kg)	237	244	216
KO %	53.1	52.5	51.6

The restricted concentrate group (2kg / day during the initial grazed period) consumed overall 285kg less concentrate than the indoor ad lib group. They had slower growth rates when at grass, but growth rate in the finishing period was the same. The restricted concentrate group therefore achieved lower live weights and carcases were 21kg lighter than the ad lib indoor group. The group offered ad lib concentrates at pasture achieved similar carcase weights to the indoor group, and had similar overall concentrate intake.

These experiments suggest that a period at grass prior to indoor finishing has no detrimental effects on bull performance, provided concentrates are offered ad-lib. Although no savings on concentrates are made without reducing carcase weight, this presents the opportunity to make cost savings by reducing the length of time bulls are housed saving labour, manure handling and bedding costs.

Other evidence suggests that the performance of bulls in such systems is sensitive to weather conditions while bulls are at grass. The above research does not report what the prevailing weather conditions were at the time the trials were conducted.

SECTION 6. DAIRY STEERS

6.1 Advantages and disadvantages of castration

Options for castration:

- Rubber rings can only be applied in the first week of life
- A burdizzo can be used up to 2 months of age
- After 2 months of age castration can only be done by a veterinary surgeon, using anaesthetic[16]

There are a number of benefits from keeping male calves entire if the facilities are available to manage them appropriately. Bulls produce leaner carcasses with a high yield of edible meat in a shorter time, compared to steers[17]. Bulls are also able to convert feed to lean meat more efficiently, enabling them to achieve higher growth rates than steers[18]. A Holstein bull calf should weigh approximately 100-125kg at 12 weeks, having achieved a daily live weight gain of 0.65-0.75kg up to this point[19].

Keeping bulls entire can provide quicker returns, since they are typically finished at 12-14 months of age, thereby throughput of a beef system will also increase. This relatively young age can also help ensure good eating quality and tenderness. Disadvantages of rearing bulls include:

- Higher housing costs to manage bull behaviour – including adequate barriers to contain stock in neighbouring pens
- Potential behavioural problems caused by sex hormones, including aggression, mounting behaviour, and problems associated with segregating bulls from heifers and cows
- Housing, handling and movement systems on farm must allow for safe working around bulls so that tasks can be carried out efficiently and safely

[16] DEFRA. 2011. Cattle (England): Code of Recommendations for the Welfare of Livestock (PB7949). Section 2 – Calf rearing.

[17] Bailey, C.M., Bohman, V.R., Probert, C.L. 1966. Growth Rate, Feed Utilization and Body Composition of Young Bulls and Steers. *Journal of Animal Science* **25:** 132-137

[18] Mackenzie, G. 2011. Maximise early growth and reduce costs. Farmers Weekly.

[19] Harper, A. Webster, S. 2008. Rearing options for Holstein bull calves to 12 weeks. DairyCo and Eblex.

Steers are usually finished more slowly, typically over 18 to 24 months, although they can be finished intensively. Trial work has compared the performance of bulls, steers and heifers. The following table[20] compares the performance of steers, bulls and heifers fed the same diet – in this case an intensive by-product based system containing 12.4 MJ ME / kg DM and 13.5% crude protein, fed ad-lib. Note that these were Continental-cross cattle, however, similar comparisons would apply for pure dairy bred bulls and steers, although the absolute values would be different. Heifer data is included here for completeness and comparison only.

Animal Performance	**Bulls**	**Steers**	**Heifers**
Start wt (kg)	130	148	135
Slaughter wt (kg)	583	534	488
Days to slaughter	316	283	280
DLWG (kg)	1.44	1.36	1.26
Carcass wt (kg)	317	283	261
Killing out %	54.3	53.0	52.5
Carcass grade	R/-U 4L	O+/R 4L	O+/R 4L/4H
Feed use (t/head)	3.05	2.85	2.52
FCR (kg feed/kg LWG)	6.73	7.04	6.95
FCR (kg DM/kg LWG)	5.43	5.69	5.61

The bulls recorded the highest slaughter and carcase weights, daily live weight gain, and superior carcase conformation grades. The bulls also achieved the best feed conversion rate over the finishing period. In this study, growth rate of bulls was 6% faster than steers.

In this trial, the cattle were fed an intensive finishing diet based on co-products. However its energy and protein content is highly comparable to a cereal-based concentrate. The financial implications of castration are present below for a range of feed costs, based on the finishing performance shown above:

	Feed cost / kg LW gain	
Feed cost	**Bulls**	**Steers**
£100 / tonne	0.67	0.70
£120 / tonne	0.81	0.84
£140 / tonne	0.94	0.99
£160 / tonne	1.08	1.13
£180 / tonne	1.21	1.27
£200 / tonne	1.35	1.41

[20] Marsh, S.P. 2000. Animal Science Research Centre – Beef unit Trial Results – 1997 (a) Comparison of the performance of bulls, steers and heifers. HAUC

6.2 Dairy steer production systems

Steer production has become less popular since the removal of coupled beef premiums, but can still bring in extra revenue to the business. Having lower testosterone levels steers grow slower than bulls, but are also more suited to a forage based system.

Steers are usually finished over 18-24 months, with at least one season at pasture. Alternative systems for spring and autumn born calves are described below.

The longer cattle can be kept outside the less costs are accrued for bedding and feeding etc. Some producers have set up systems which allow cattle to be kept out for extended grazing seasons or even outwintered and fed supplementary feed or even total mixed rations to maintain growth rates. Such systems depend on having the right type of soil type and climate or having a roofed area which opens on to a grazing area.

6.2.1 18 month system for autumn born calves[21]

Age	End of period LW (kg)	DLWG (kg/d)	Details
Up to 6-7 months	220kg	0.9	Aim for moderate but consistent growth throughout this period
6-7 months – 14 months	450kg	1.0	Turnout onto high quality pasture, monitor pasture quality, growth and availability to ensure consistent growth of 1.0kg / day is maintained
14 months – 18-20 months	600kg	1.2	Finish steers over winter from high quality grass silage and rolled barley (or equivalent ration)

- Calves will be reared indoors over winter, to reach 220kg at turnout in April at 6-7 months old
- This represents relatively modest daily live weight gains of approximately 0.9kg/day during this initial period, with more rapid growth following turnout onto high quality spring pasture – at a lower cost.
- This can be achieved by feeding 3.5kg/day of 18% CP concentrate with high quality grass silage (>11 MJ ME/kg, >12% CP, 25-30% DM)

[21] Weatherup N, Dawson L, McHenry P (not dated) Finishing dairy-origin beef Blueprint. Northern Ireland Red Meat Industry Taskforce

- The steers then graze a high quality pasture throughout the summer. A rotational or strip grazing system is recommended to ensure efficient grazing and pasture recovery. Pasture cover of 3,000kg DM/ha should be grazed to 1,600kg DM/ha in spring and 1,800kg DM/ha in the autumn. Pasture should be well grazed to encourage leafy re-growth and avoid low value stemmy swards. This is best achieved by moving animals between small paddocks regularly (rotational grazing). Later in the season aftermath grazing following the second silage cut may be used for grazing depending on herbage quality and growth.
- Target daily live weight gain should be 1.0kg/day from pasture
- The steers then enter their second housed period, where they will be finished over winter. At 14 months old, they should weigh 450kg. Daily live weight gain of 1.0kg should be maintained.
- During the finishing period they are fed high quality grass silage and concentrate at 2.5-3.5kg /day. Rolled barley with vitamin / mineral supplementation is sufficient, since high protein rations have been shown to provide no additional growth performance but increase carcase fatness.
- Steers are finished at 18-20 months old at 600kg, giving a target carcase weight of 300kg and killing out at as close to 50% as possible. Grade O-3 is achievable.
- If a steer has not reached a live weight of 450kg by 16 months old (around January 1st), they are unlikely to reach an acceptable finish by 18-20 months. In this case they should enter a further store period, i.e. withdrawing concentrate, to be turned out in the spring and finished at grass at 24 months.

6.2.2 18 month system for spring born calves – cross check with Gantt chart

Age	End of period LW (kg)	DLWG (kg/d)	Details
6 months	220kg	1.0	Calves will be reared and weaned indoors. Most calves are likely to remain indoors during their first summer, as they will be too young to turn out onto high quality spring pasture. Calves born very early in the year may have the opportunity for a grazing season, providing pasture quality is sufficient to maintain target growth rate of 1kg / day
6 – 12 months	400kg	1.0	Over the winter, the aim is to continue with consistent growth
12 months – 18	580kg	1.0	Turn out onto high quality spring

months			pasture and aim to finish whilst at grass, but additional supplementation may be required.

- Calves will be reared and weaned as usual, to reach a minimum weight of 100kg at 12 weeks of age
- Depending on the birth date of the calf, producers will need to make a decision whether to turn the calf out during its first summer or not. Late spring and summer born calves are unlikely to be old enough to make good use of grass in their first summer but may benefit from access to a paddock. Calves born early in the year could have a period at pasture.
    - Assess pasture quality and growth. The success of any system is reliant on achieving consistent growth rates. If good quality pasture is available, it may be possible to turn out calves born in January or February in April or May onto high quality spring grass. Ensure the overall quality of the diet does not decline as pasture quality falls later in the summer – supplementation may be necessary to prevent a check in growth rate.
    - It is not worth turning calves out late into the grazing season when quality has declined – this could result in a check in growth at turnout, followed by a second check due to change in diet when they are brought in.
- Over the following winter, aim to maintain consistent live weight gain, through until spring turnout. This is achieved at the least cost by ensuring there is plenty of high quality home grown forage available for ad lib feeding. This should be supplemented appropriately to ensure nutritional requirements are met to meet target growth.
- Depending on pasture quality and steer condition, they may be finished from grass over the summer with or without supplementation. Aim to finish before July when finished beef prices traditionally begin to decline until September, but monitor the market and steer condition to judge the best time for slaughter – delaying slaughter could result in a poorer carcase grade (and higher costs of keeping the animal for longer) which could diminish any return from improved prices. Slaughter at 550-600kg to achieve a carcase weight of up to 300kg.

6.2.3 24 month system for spring born calves[22]

Spring born steers will usually have a second grazing season before slaughter at 24 months. They will typically reach up to 620 kg live weight.

Age	End of period LW (kg)	DLWG (kg/d)	Details
Up to 7 months (calf rearing and first grazing)	250kg	1.0	Calves will be initially reared and weaned indoors. In this system they are fed 80kg of concentrate to weaning, and then turned out to grass. They will graze 660 kg (DM) of grass and consume a further 60kg of concentrate. This will bring them to 250kg when they are housed for their first winter.
7-12 months (first winter)	320kg	0.5	Over the winter, the steers will be fed 110kg of concentrate and 500kg (DM) of grass silage. They should weigh 320kg at Spring turn out. In the first year the steers will have averaged 0.5-0.6kg daily live weight gain.
12 months - 18-20 months (second grazing season)	500kg	1.0	Steers are turned out in the spring at 320kg where they will graze the full season consuming around 1790kg (DM) of grass, without supplementation. They will weigh around 500kg when brought in for their second winter and the finishing period. Grass will need to be of high quality if this is to be achieved without supplementation.
18-20 months - 24 months (Finishing)	620kg slaughter weight	1.0	During the second winter, steers are finished, consuming 750kg of concentrate and 960kg (DM) of grass silage. Growth rates of up to 1kg will be achieved at this time.

[22] O'Riordan EG & Keane MG (2010) Bull Beef Production from Holstein/Friesian Male Calves www.thecattlesite.com Accessed 21/09/11

Steers reared on this system will have a DLWG of around 0.8kg/day from birth to slaughter. Up until the end of the first winter (approximately 12 months) a relatively low growth rate of 0.5-0.6kg/day allows the opportunity to maximise subsequent growth from high quality pasture achieving a lower feed cost per live weight gain.

The majority of carcases will grade at O, with some at P, with fat scores of 3 and 4.

The system is dependent on achieving good growth rates from grass – this relates to high grass utilisation and excellent pasture quality. Each steer will consume 1000kg of concentrate, but 75% of this is during the finishing period.

The disadvantages of finishing steers on a 24 month system are that it ties up more working capital and reduces cattle throughput. Feeding cattle to achieve slow rates of growth during the winter on relatively expensive home conserved forage or other feeds will results in relatively high feed costs per kg daily liveweight gain even when daily feed costs are low. Simply improving forage quality would be able to improve growth rates and reduce costs and age at slaughter considerably.

6.2.4 Case study

JR Horton & Son, Easton Farm, Devizes, Wiltshire

Stephen Horton manages a dairy herd, beef and arable enterprises in the Wiltshire Downs. The farm includes a mixture of land quality – with the dairy herd utilising the best lowland pasture, and the higher downland managed under HLS and grazed by the beef cattle. Beef calves are retained from the dairy herd, and include Aberdeen Angus crosses as well as pure Holstein-Friesians. All the pure dairy-bred male calves are castrated and the business finishes up to 60 black and white steers per year.

The system is designed to be as simple as possible, minimising the use of buildings, labour and purchased feeds.

The dairy herd begins calving from September with the majority calved by March. Calves are fed on waste milk (colostrum) for the first 10 days. They are then reared using a 23% protein, 18% oil milk replacer for 6-7 weeks, when they are weaned. They are offered BOCM QRD (quicker rumen development) pellets for 2 months, when they switch to rearer pellets. Calves are turned out to grass for the remainder of the summer.

During the first winter, the steers are fed a diet of silage with home mixed rolled barley and a rapeseed meal and soya bean blend at a ratio of 2:1 (barley: protein blend). They are turned out in Spring (mid – late April), and graze until October depending on grass growth. During

this period, the animals develop frame, but will not usually finish from the medium quality downland pasture available to them at Easton Farm.

They are brought in for a second winter in October where they will finish indoors from grass silage and home mix barley and protein.

First and second cut silage is fed to the dairy herd. The beef enterprise is run on the less favoured grassland and so has a low fertiliser input. Silage made for the steers would often be third cut from the same swards as the dairy cows had for the previous two cuts. Usually this quite light cut is baled.

Mr Horton uses a field officer from Meadow Quality to assess the stock and assign the steers to an appropriate market based on the condition of the animals themselves, and prevailing market trends. The majority are sold direct to slaughterhouses, although some are put through live auctions.

The Holstein Friesian steers are typically sold at 24-27 months, and achieve carcase weights from 315-380kg at –O3, with the occasional P+3.

Gross margin

	Number	**Value £/unit**	**Total £**	**Per head £**
Stock sales (hd)	90	950	85,500	448
Transfers in (hd)	99	50	4,950	26
Total returns			**80,550**	**422**
Purchased concentrates (t)	11	360	3,960	21
Home grown concentrates (t)	50	100	5,000	26
Home grown straw (t)	95	11	1,080	6
Silage (acres)	565	55	31,075	163
Vet & Med			1,910	10
Office & Misc			3,820	20
Total costs			**46,845**	**245**
GROSS MARGIN				**176**
Average numbers (head)				191

Lessons:

- The steer enterprise is highly complementary to the rest of the farm business, taking calves from the dairy herd, and using poorer quality, low input grazing which is managed under an environmental scheme
- This enables the best quality grazing and silage to be used by the dairy herd
- Costs are minimised due to most of the feed being home grown
- The case study shows that slow cattle throughput can be offset when the enterprise is well managed in terms of cost control, and it adds to the efficiency of the whole farm business by allowing optimal application of the farm's resources to each of the various farm enterprises.

SECTION 7. CONCLUSION

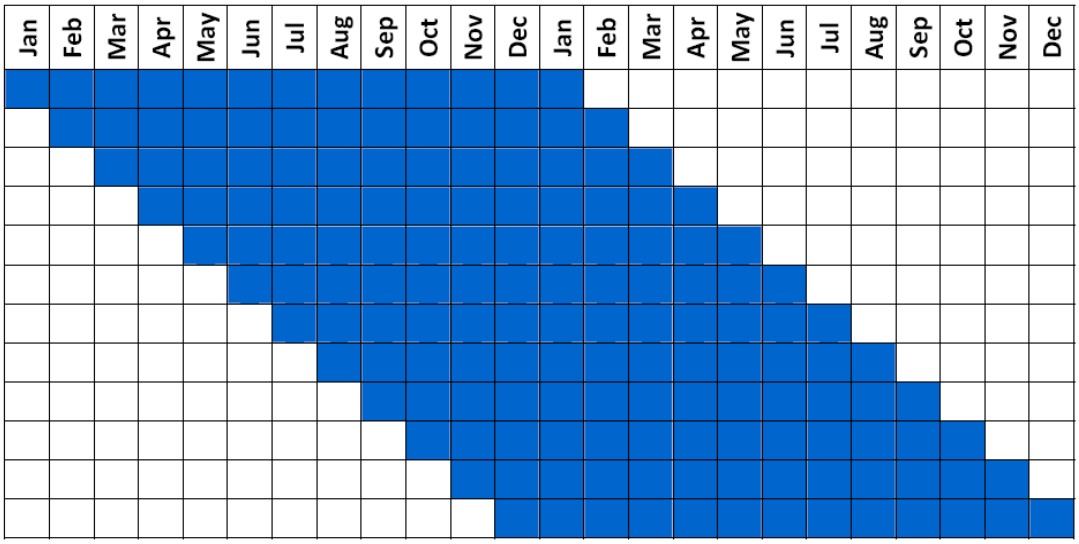
This report has outlined the main system options for pure dairy-bred male calves, including veal production, bull systems and steer systems. It has challenged the traditional systems of production by suggesting that alternative feeds other than cereals can be used in finishing rations for these beef cattle and that grazing can play an important part in systems to reduce feed costs where managed carefully to maintain forage quality and therefore animal performance. It also recognises the potential for high quality home grown conserved forage to control costs. Slaughter age is a key determinant of feed conversion efficiency and the carbon footprint of a production system hence in all systems attention to detail to improve performance has the potential improve revenues for the producer. The pure dairy-bred male calf does not have the same carcase conformation as a suckler bred animal but when produced to meet the market requirements for this type of animal they can offer economically sound opportunities for beef producers. As with any system the returns are very sensitive to calf or store prices, sale or deadweight prices and feed prices.

APPENDIX1: Summary of options for pure dairy bred bulls and steers

Some of the main systems for pure dairy-bred bulls and steers have been represented diagrammatically below with a Gantt chart showing the period from birth to slaughter to act as a guide only. These are intended to illustrate likely finishing dates based on the calf birth date. Where applicable, potential grazing periods are shown in pale green. These timings will not apply to all farms in all seasons. It is necessary to judge the quality of the pasture and the ground conditions, as well as the condition and weight of the cattle, to determine when turnout is possible and equally when housing will be required.

Summary of options for bulls

13 month housed - intensive

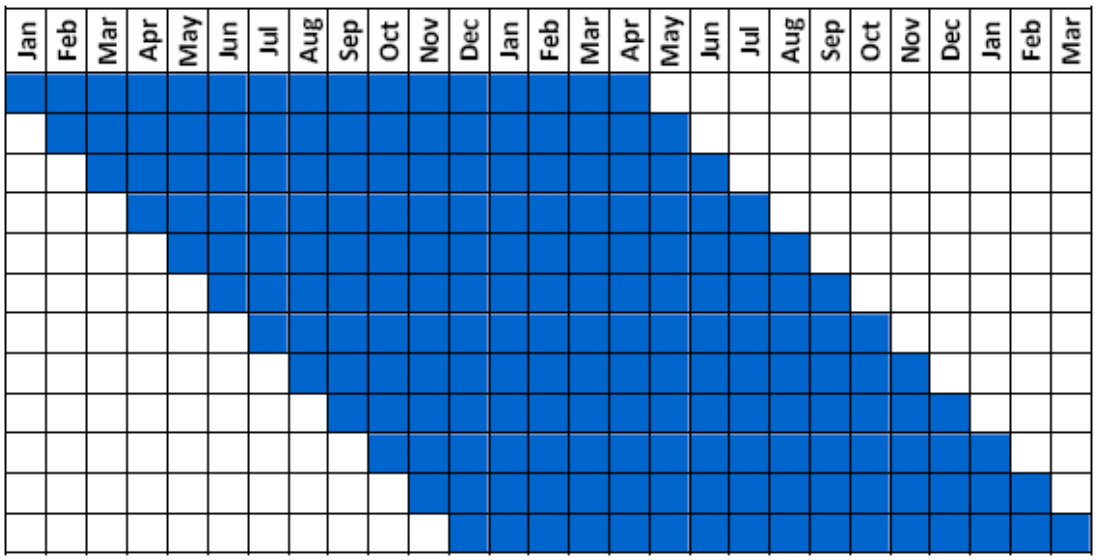


Advantages	Disadvantages
High cattle throughput	Ration may be relatively high cost per tonne – cereal or cereal-alternative (co-product) based
Being housed, the system and animal performance is more easily controlled and monitored	Bulls can present a safety risk if adequate housing and handling facilities and policies are not in place
Faster growth rates and earlier finishing time may reduce feed cost per kg gain	There is little room for slippage in growth targets caused by disease challenge, variable feed quality or other stressors. High standard of management is required to achieve consistent, high rates of growth

Success factors

- Feed costs should be carefully reviewed to identify the least cost ration (per kg live weight gain) which will deliver required growth rates
- The system design and set up, and work force skills must be in place to manage bulls safely and effectively
- Performance should be monitored regularly through recording bull weights and condition
- A strict veterinary and stockmanship regime is essential

16 month bulls – housed, silage fed

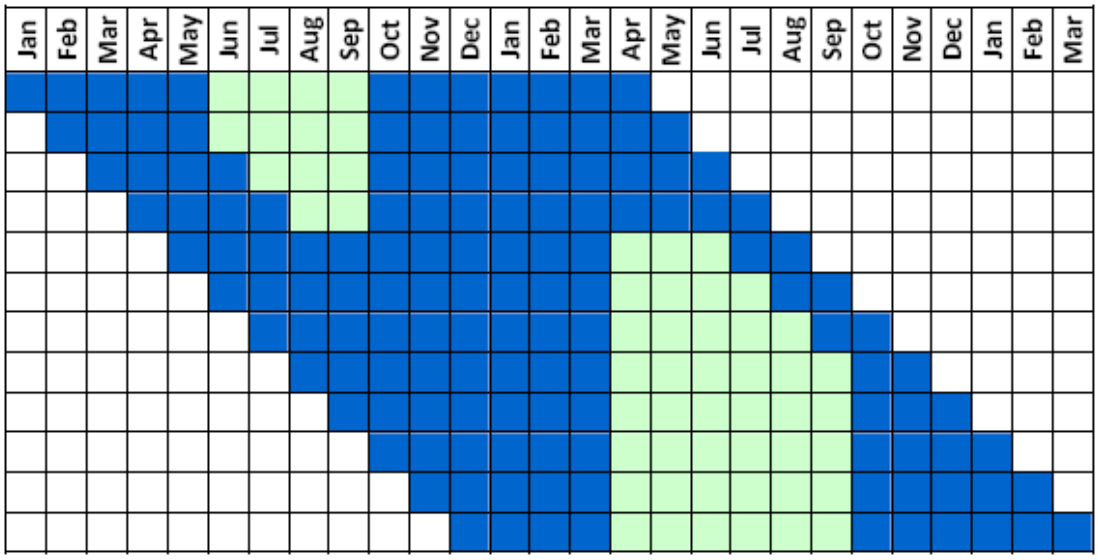


Advantages	Disadvantages
Opportunity to potentially save costs through home grown conserved forage	Reliant on producing consistently high quality forage
Still achieves relatively high cattle throughput	Risks associated with bull behaviour increase with age – increasing likelihood of bull injuries
	Bulls must achieve adequate finish at 16 months to meet most buyers' specifications

Success factors

- Producers should employ best practice in silage making from crop establishment through to harvest and storage. It is important to understand the true cost of home grown forage.
- Regular analysis of silage (especially grass silage) should be carried out to monitor quality throughout the feeding period – maize has far more consistent quality in a well managed clamp, but grass silage quality will vary between cuts, and potentially between different fields. Home grown forages should aim to be around 11 MJ ME/kg DM and fed in a ration supplemented to provide the additional energy and protein requirements of the animal.
- First and subsequent cuts of grass silage should be segregated to allow more control of silage quality
- Cattle must be supplemented appropriately according to the silage analysis to allow a balanced ration to optimise growth
- Bull weights and condition should be regularly monitored
- Pens and handling facilities must be robust enough to cope with older bulls

14-16 month bulls – with a grazing season



The date of birth of the calves will determine if they are suitable to be grazed. It is suggested that bulls aged between 4 and 8 months are most suitable. Bulls younger than 4 months are unlikely to be able to utilise grazing pastures very efficiently. Furthermore, there are various problems with having groups of older (8+ months) bulls outside on grazing pastures. Not least that they can become aggressive but also any change of diet is likely to cause a growth check, with the degree of check being proportional to the degree of the ration change. For

example, a change from a forage to an intensive cereal based ration ideally requires a period of acclimation for the rumen bugs to adapt to the new feeds. Also these older bulls will require large amounts of supplementary feed to achieve target finishing growth rates.

Advantages	Disadvantages
Cost savings can potentially be made by feeding well managed high quality pasture – reducing feed costs as well as costs associated with housing	Bulls will not achieve required finish from low quality or poorly managed pasture. In most cases supplementation is needed during grazing
Good growth rates can be achieved from well managed, high quality pasture	Bull behaviour means fences and field boundaries must be robust
	Bulls can cause a risk where there are nearby public access routes
	The system is dependent on the weather for pasture quality and availability, as well as bull performance at grass – flexibility is required to adapt in poor conditions

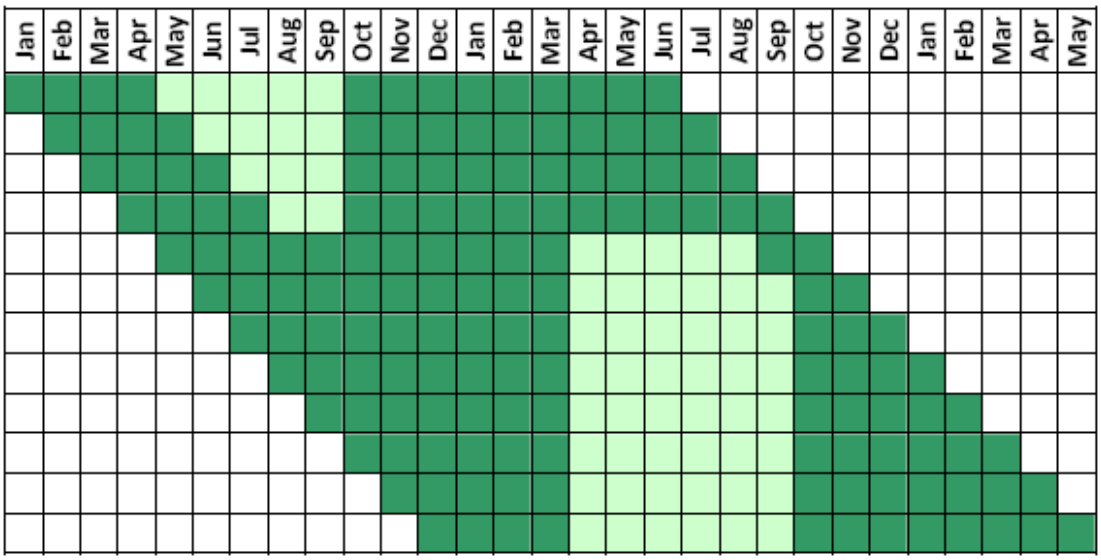
Success factors

- Fields should be carefully selected for their suitability for grazing bulls, taking into consideration rights of way, condition of boundary fences and hedges, and neighbouring livestock, as well as exposure to wind and ground conditions
- Bulls should be turned out onto high quality early season pasture, managed using best practice grazing management principles
- Bulls should be well grown before turnout (minimum of 4 months suggested). Supplementation with concentrate should be provided as necessary

Summary of options for steers

18 month steers

Finishing at grass will require supplementation. If planning to finish indoors then allow a minimum of a 60 days finishing phase. The grazing seasons shown are only indicative and maybe extended or shortened depending on individual farm circumstances and whether supplementary feed is provided to maintain growth rates.

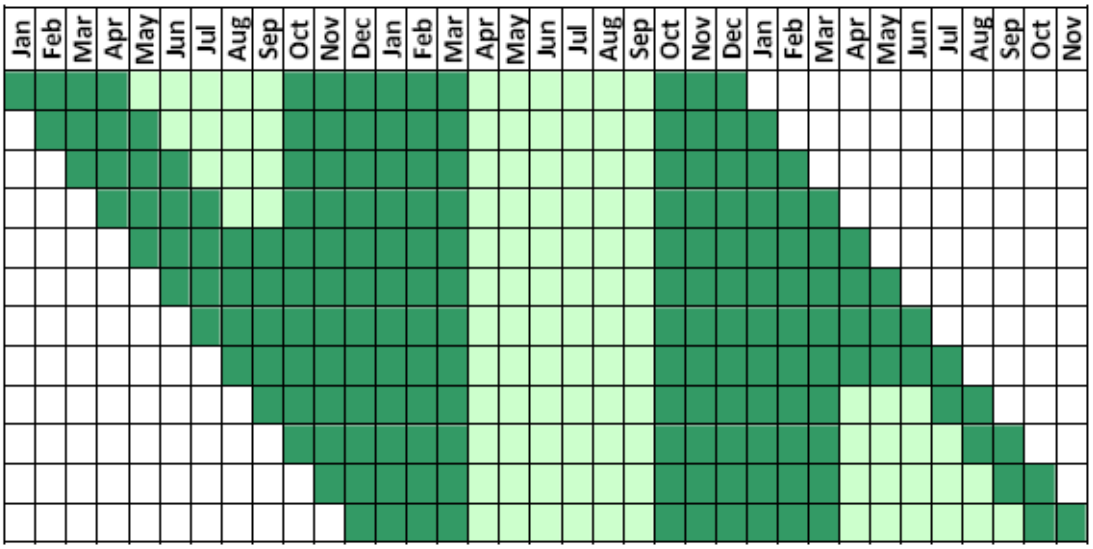


Advantages	Disadvantages
Steers are generally easier to manage from a behavioural perspective than bulls	Slower growth, therefore slower cattle throughput than bulls
High degree of flexibility in terms of feeds which could be used	Steers tend to achieve poorer carcase grading (due to conformation) than bulls
Opportunity to maximise low cost growth from pasture	

Success factors

- Potential feeding options can be appraised in terms of what can be grown on the farm – to maximise use of home grown forage and grazed grass. It is important to understand the real cost of home produced feeds
- Growth rates should be monitored and steers supplemented appropriately to optimise growth rates. It is important to monitor condition to avoid finishing steers over-fat.
- The 18 month system provides flexibility in terms of including a grazing season in the system but steers will probably need at least a 60 day finishing period after grazing to ensure they are slaughtered with the correct fat cover.

24 month steers



Advantages	Disadvantages
Favoured on some farms where it offers a way to utilise poorer quality land and/or home-grown forages	Much reduced cattle throughput
Can work well with environmental schemes	Two winters are required, increasing feed use and production costs
	Feed cost per kg gain can be expensive even where daily costs look cheap if growth rates are sub-optimal.

Success factors

- To keep costs to a minimum, it is important to maximise growth from home grown forages and grazed grass.

- It is important to minimise concentrate feeding as much as possible until finishing – allowing steers to grow frame initially, and then ideally finish from high quality pasture with supplementation as required to enable the correct fat cover at slaughter.
- Condition should be carefully monitored during finishing to slaughter at the optimum time