Animal & Grassland Research and Innovation Centre

Grange

Teagasc National Beef Conference

Profitable Beef from the Dairy Herd

9th October, 2013

Newpark Hotel, Kilkenny

teagasc

Agriculture and Food Development Authority

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Dairy Calf-to-Beef – Setting the Scene

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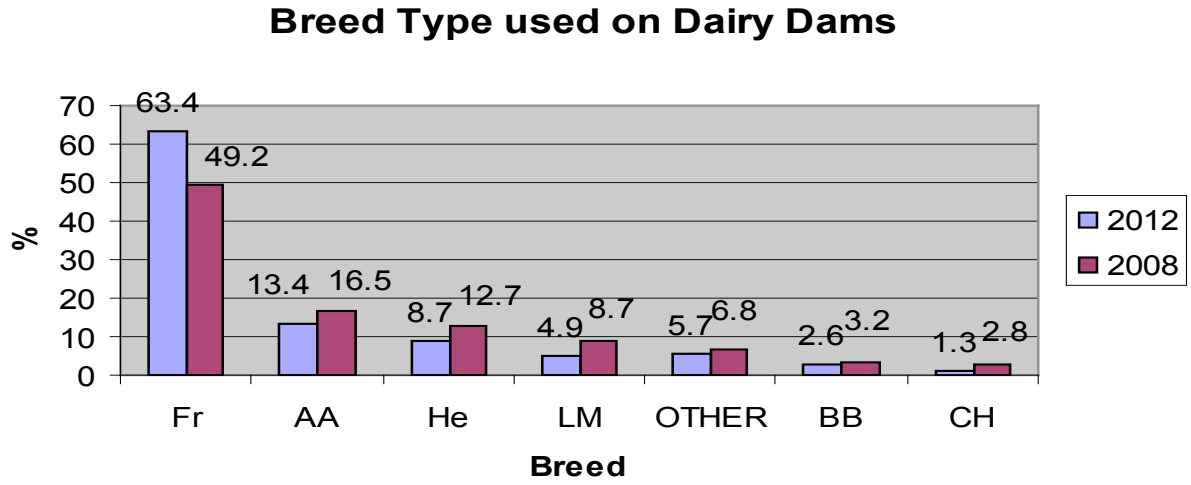
Summary

- There is renewed interest in the whole area of dairy beef production by many of the stakeholders across the industry.
- As dairy cow numbers increase there will be more surplus male dairy calves and beef cross dairy calves available for beef production.
- Dairy beef can be produced at a lower economic and environmental cost than suckler beef as the overhead cost of the cow is borne by the dairy industry.
- When operated at high levels of animal performance from grass at high stocking rates, dairy beef systems can be quite profitable.

Current position – dairy cow numbers to increase

In the Food Harvest 2020 document the target is that we would increase dairy output volume by fifty percent. This will come about by a combination of increased yield / cow (15%) and increasing cow numbers by approximately 30 per cent. This would have the effect of increasing the current dairy herd from 1.1 m cows to 1.43 m cows by 2020.

As things stand we have seen an increase in the number of dairy cows from 1.03m in 2008 to 1.086m in 2012 and this growth of 5.1 per cent is predicted to continue. The graph below shows the break down of sire breed used on dairy dams in 2008 and 2012.



The figures clearly show the shift towards using Friesian sires on dairy cows from 49.2 per cent in 2008 to just over 63 per cent in 2012 allowing the current expansion. Even when dairy cow numbers level out, the use of 45 per cent Friesian sires on dairy cows would be needed to maintain cow numbers.

With the predicted expansion in dairy cow numbers we are looking at somewhere in the region of an extra 240,000 calves becoming available for either export or retaining to finish within the country. The breed mix of these calves will ultimately change as numbers begin to stabilise. The other important point is that dairy beef will be needed to underpin our beef industry if suckler cow numbers continue to decline.

Suckler cow numbers have shown a decrease in the last few years. This trend seems to be continuing as calf birth registrations is back seven per cent in the suckler herd and overall cow

slaughterings are up by 14 per cent year-to-date (Burke 2013). This decline is likely to continue over the medium term in the absence of some direct support for the suckling sector. The 2012 NFS reports that, on cattle rearing farms direct payments comprises 120 per cent of income. On these farms in 2012 Single Farm Payment and REPS payments declined by 2 and 20 per cent, respectively putting extra pressure on the enterprise which is increasingly viewing the suckler cow as a high overhead cost.

Opportunities for dairy beef

Dairy beef has the advantage of being a by-product of the dairy industry and so compared to a suckled calf who has to carry the full cost of its parents carry very little overheads. Dairy calves for the same reason have a much lower carbon footprint as the dairy enterprise covers its parents environmental impact.

UK market potential

The UK which is our largest market has a structural deficit in beef and based on the 2013 figures this is likely to increase. Currently the British market is only about 77 per cent self sufficient in beef and they have a projected import demand of some 405,000 t this year up from 382,000 t in 2012.

Both suckler and dairy cows have been declining in the UK. In the last five years alone dairy cows have decreased from 1.95 m in 2007 to 1.81 m in 2012. Similarly suckler cow numbers have dropped from 1.698 m to 1.675 m over the same period. Their suckler herds will face the same pressures as our own and they will do well to limit the decline as they are less likely to receive any alternative form of support.

Processors/retailers

The presence of a number of our large beef processor in the UK should give us the potential to capitalise on the growing demand within the UK market. We have already witnessed that some of the major retail chains in the UK have relaxed their 'buy british' policy and are importing Irish beef.

It is also evident as processors and retailers work closely together that they are acutely aware of the market situation. Blade Farming in the UK is an example whereby dairy farmers agree to use semen from selected beef bulls. The dairy farmer then provides a healthy calf to rearers, who after three months, batch and move calves on to finishing units. It works on a contracted price system and a blueprint for calf management is laid out. Tesco's and Waitrose have also been involved in similar type schemes for dairy beef.

These examples are evidence of more integrated supply chains in beef. The retailers will undoubtedly take on more risk in the production of beef but producers will face stricter production protocols and will be more restricted in their selling habits.

Processors with an eye firmly on cattle supplies have also come on board with research to examine the various production systems available to dairy beef and their economic potential. These systems will be examined in more detail during the course of the day.

One of the down sides to dairy beef has been the Holstein influence which has downgraded the quality of the carcase in terms of meat yield and share of high value cuts. Work in Grange (Drennan 2007) has shown that a one unit change in conformation grade (ie an O+ 3+ to R+3+) would increase meat yield by 4.2 per cent.

New technologies

The attractiveness of Dairy beef can be further enhanced if we can progress and role out some of the new technologies that exist.

The recent trial by Teagasc and ICBF in the spring looking at the effectiveness of sexed semen is very promising. If exploited this would allow the expansion of the dairy herd but with a much lower use of Friesian sires on dairy dams. In theory at least we could see Friesian sire usage drop from the current 63 per cent to nearer 35 per cent in a sexed semen scenario. This would allow dairy farmers to select more beef sire for the remainder of the herd increasing calf value and leaving a more desirable beef animal for finishers.

The likelihood is that we would see a return to higher usage of traditional breeds such as Hereford and Aberdeen Angus which can be exploited on a forage based system and that fit nicely into a retail market where breed specific demand is growing.

Another area that could deliver a positive outcome for dairy beef would be the use of genomics and improved breeding indices. There is a very real need for the industry to be able to deliver short gestation, easy calving beef sires irrespective of breed that can be used on the dairy herd. The finisher will also require information on growth rate and carcase finish traits that will allow economic finishing of these animals at lower carcase weights. Genomics and the ICBF dairy beef index will have a central role in realising these goals.

Economics of the dairy beef system

As you will see later in the day there is a detailed breakdown of the economics of the various systems. In general whether it is a Holstein Friesian bull or steer or the use of early maturing breeds for dairy beef the potential gross margin from the system done well is between €1100-€1400 / hectare. It appears that is the more extensive forage based systems that offers the best returns.

This compares well to the current performance of the suckler herd where the top 10 per cent of producers in 2012 profit monitor achieved a gross margin of €1089 / hectare. The top one third of suckler producers had a gross margin of €809 / hectare.

Challenges

There are clearly a number of positives for the development of the dairy calf-to-beef system in the country and it is in the interest of all parties that it is developed.

There are, however, a number of challenges that will have to be overcome if the system is to reach its potential.

- Can retailers, processors and producers work together successfully to create an integrated supply chain. This would help stabilise returns from the enterprise to the producer while at the same time delivering a consistent high quality product to the retailer and processor.
- This integrated supply chain may also hold the solution to the potential seasonality problem that would exist within the country where potentially 90 per cent of these calves would be born in spring.
- As today will demonstrate there is a good volume of research existing around the various dairy beef systems. Clear blueprints for production targets, input levels, calf rearing guidelines and animal health protocols need to be communicated to farmers. Farmers changing to this type of system will need to be afforded the opportunity to develop a whole new skill set to

efficiently operate this type of system.

- If demand for this type of animal increases, will we be able to have some level of control over calf price? On the figures that will be discussed during the conference a €50 / head increase in calf price would decrease gross margin by €150-€190 / ha. Equally if we see a surge in the numbers of the traditional breeds going through the system will this erode some of the current bonuses that exist for these breeds today. There will be a need to retain this level of bonus which equates to between €200-300 / ha.
- Finally, I think it is hugely important that we develop a situation where our dairy beef system exists with a sustainable suckler beef system. Both systems will be needed to maintain our reputation as highly quality, forage based beef producing country.

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"Rearing Healthy Bought in Calves" What Works on My Farm!

Michael Murphy[1] and Michael Daly[2]

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Farming background

The farm of 91 ha including nine ha leased/rented was previously in dairying but was always rearing calves to steer beef. The farm infrastructure still includes paddocks, internal roadways, etc. The land type is medium to heavy soils with a very undulating landscape and is located in a disadvantaged area.

Current and future farming system (2013+)

Calf-to-steer beef (Friesian)

- February –March born Friesian bull calves purchased at two weeks of age in 2013 will be reared for slaughter following a second season at grass by Dec 2014 at approximately 22 months.
- Previously the cattle system was finishing Friesian bull calves at 16 months.

Calf-to-beef (heifers)

- 120 April – May born Hereford / Angus heifer calves purchased at two weeks of age in 2013 , to be finished at 18-22 months in late 2014 / early 2015.

Calf rearing system

There are two automatic calf feeders on this farm which can rear 70 calves/feeder. Accordingly the heifer calves are only purchased once the Friesian bull calves are weaned.

The calf rearing system on this farm has four equally important periods:

Phase 1 : Quarantine Shed.

Phase 2 : Specific Calf rearing shed with access to adjacent paddock.

Phase 3 : Slatted shed post weaning with access to grass.

Phase 4 : 100 per cent at grass.

Quarantine shed

A converted pig farrowing shed is used initially to batch calves into groups of five/pen. Training to drink from bucket teats is supervised upon arrival onto farm.

Day 1 : Half rate milk replacer + electrolyte is fed.

Day 2 : Feeding as per day one

: Vaccination programme (IBR, RSV, PI3)

: Calves are computer tagged for automatic calf feeder

Calves are then moved to the main calf rearing shed.

Calf rearing shed

This is a 65 day diet programme of milk replacer, meal ad-lib and straw only roughage. Our farm has two calf rearing sheds with an automatic computerised milk feeder in each shed. Each shed holds 70 calves and generally is filled within two weeks. Both sheds are straw bedded and at 21 days calves have access to an adjacent paddock beside each shed. Location of calf shed

is therefore crucial to allow for an outdoor acclimatisation. Calves are vaccinated for blackleg prior to paddock turnout. Preventative measures for coccidiosis is addressed throughout by medicating meal and oral dosing. Benefits on this farm in having adjacent paddocks, include reduction in health / disease pressure, reduction in straw bedding and very importantly training to an electric fence wire.

Slatted shed post weaning

Once weaned, each block of 70 calves is moved to two separate slatted sheds. Both sheds again have access to new adjoining paddocks. Calves are fed 2 kgs meal, straw roughage plus grass access. Calves at this stage are weighed and after 4-5 wks they are 100 per cent at grass. Calves during this period are treated for lice and again coccidiosis prevention is implemented.

Calves at grass period

No meal is offered post 2-3 wks on grass and five acre paddocks are strip grazed with each grazing group. Calves are dosed every 4-5 wks with alternate products and are periodically weighed to monitor growth rates.

Variable calf rearing costs to-date (end Sept. 2013)		
Item	**No.**	**Price**
Vaccines	4	€16
Milk Replacer	37kg @ €2.10	€78
Straw	0.6bales@€14	€8
Lectade		€0.50
Meal	170kg@ €370/t	€63
Dosing/Vecoxan		€9
Grass		€30
Purchase Price	/head	€150
	Total	**€355**

Summary

- Clearly defined husbandry strategy for each phase of calf rearing process.
- Vaccination programme to minimise mortality and lack of thrift.
- Maximum milk replacer intake (37+ kgs / calf).
- Allocation of good quality grass post weaning to ensure target weight gain
- No meal post weaning.

Rearing Healthy Beef Calves

Maggie Gould and Jessica Cooke

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Introduction

The first three months of a calf's life are critical. The growth rate achieved in this period will affect the lifetime performance of the animal. Optimising nutrition and minimising morbidity is essential to ensure the calf has the best possible chance of achieving its full genetic potential for growth and feed conversion efficiency.

Calf rearing systems need to recognise that early life events have long term effects on the performance of the calf and capitalise on them.

Set targets for your calf rearing enterprise

Buying or rearing calves, whether to sell on again or as part of your beef enterprise leaves tight margins. Objectives must be set for the enterprise and protocols should be designed to ensure the objectives are achieved.

The critical targets for rearing dairy beef calves up to 15 weeks of age are as follows:

Minimal mortality:

Target per cent per cent mortality with a maximum of five per cent.

Minimal morbidity:

If the calf suffers setbacks from poor health, feed intake and average daily gain will be affected. Low morbidity will also minimise treatment and medication costs per calf.

Optimal daily liveweight gain:

Calves should average 700 – 800 grams / day up to 15 weeks

Age (weeks)	Target live weight (kg)		
	AA/Hereford	Holstein	Continental
1 week (purchase)	45	48	50
6 weeks (weaning)	70	73	75
12 weeks	100	102	105
15 weeks	117	119	122

Source: Dawson (2006); Keane (2003)

Source of the calf

Most beef enterprises depend on the calf being purchased rather than the calf being born on the farm. If possible calves should be purchased where background information including disease status, colostrum supply, and feeding regime prior to purchase are available. This information will be beneficial to help ensure calves are of optimum health at the time of purchase. Calves should preferably be purchased from farms which have control programmes in place against economically important diseases such as calf scours, BVD, and IBR.

Purchased calves should be inspected thoroughly, and calves that are dull or listless, show signs of diarrhoea or have discharges from the eyes, nose or mouth should be rejected. Calves should be lively, have a shining coat, bright eyes and a clean moist nose. Consistent batches of calves purchased from the one source is the ideal as mixing calves from various sources

increases the risk of cross-infection.

Calves should not be moved from the farm of origin until at least seven days of age and preferably not until they are three to four weeks of age as this will reduce the high risk of scours and stress in the young calf aged less than three weeks.

Purchased calves should be isolated from resident calves for one week to allow them to be monitored for any disease problems and ensure they do not carry or spread infection to the remainder of the herd.

Calves being purchased which have not had the absolute minimum amount of good quality colostrum (three litres within two hours of birth from the first milking) are going to be potential disease risks on farm. Good quality colostrum not only helps to protect the young calf against disease but it also has a major effect on the development of the intestinal tract leading to improved intake, growth and long term performance.

A good relationship between the purchaser and provider will be beneficial, since knowledge of the source, disease status and colostrum status of purchased calves is vital.

Feeding the Calf

Due to cost, availability and ease of management, milk replacer will be the choice of the majority of calf rearers, focused on beef from the dairy herd. The quality and quantity of proteins in the powder is vital - it should have a minimum of 20 per cent protein and preferably 23 per cent to support good frame growth. Protein concentration below 20 per cent will reduce live weight gain and will impact on the compaction of weight gain. Protein quality can be an issue, particularly in the first month of life so it is important that the milk replacer used has sufficient (contains mainly) milk derived proteins during this period.

Fat levels should be 18 – 20 per cent with sufficient minerals and vitamins. Fat levels of 18 – 20 per cent will encourage early intake of concentrate ration.

Traditionally, economics drove the feeding rates with a target of 1.25 / 1.5 bags of calf milk replacer targeting 6 - 8 weeks old at weaning. Research now shows that achieving the targeted gain of 700/800 Grams and 120 kgs at 15 weeks is the key. The total amount of milk solids fed / day, as opposed to the milk volume is the key. To achieve 700/800 grams / day of growth, the calf will need to consume 650 to 700 grams of good quality milk powder / day. The amount to feed will however depend on the number of days on farm, calf entry weight, dry feed intake, and the target growth rate and exit weight.

Feeding systems

Provided calf health, husbandry and housing are correct calves can be successfully fed using a variety of systems, including cold ad libitum, warm ad libitum, bucket fed once or twice a day and computerised feeding systems.

The system used must be suitable for the labour and housing available, and irrespective of the feeding system, it is important to ensure that the energy and protein content supplied/calf/day is enough to support the target growth rate. Calves need to be fed twice a day with milk for at least the first four weeks of life to satisfy their nutritional needs. But by four weeks of age, the calf starts to eat increasing amounts of solid food, and will be able to start digesting it. If the

calf is consuming adequate dry feed at four weeks of age, the amount of milk offered can be reduced to encourage solid feed intake. Feeding twice a day for at least the first four weeks of life also allows the rearer to check drinking speed, volumes consumed and general demeanour of the calves.

With increasing numbers and batches of calves being put through systems, computerised calf feeding has gained in popularity. Computerised feeders cut down labour significantly and allow time for improved calf husbandry. The little and often feeding promotes calf health and encourages earlier intake of dry feed. Probably the biggest advantage of computerised calf feeding is the gradual weaning where setbacks to growth rates are avoided.

Irrespective of the system, consistency in milk temperature, concentration, volume and time of feeding is key.

Water, roughage and dry feed

In order to achieve a targeted 700 to 800 grams / day the calf must start eating a high quality calf starter as early as possible in life. This should be offered from the first week of age. A good quality calf starter should typically contain 12 M.J. energy, 18 – 20 per cent crude protein and at least 25 per cent Starch Sugar with enough fibre to avoid digestive upsets. Calf starter should be palatable and dust free, and refreshed daily to encourage early intake. For roughage supply up to weaning, clean fresh barley or oaten straw is preferred.

In addition to milk, clean fresh water must be available at all times from day three, to support rumen development. Water contained in the milk is not enough because milk bypasses the rumen in healthy calves. Water is also important to encourage dry feed intake - for each 1 kg of concentrate consumed the calf will drink 4 / 5 litres of water.

Calf diseases

As with all diseases, prevention is much more efficient than treatment. Ensure a good bio-security and farm health plan is in place which is monitored by your veterinary surgeon. As discussed above, bio-security issues such as knowing the disease status of the source herd, using and checking colostrum status, rejection of sick calves, buying a three week old animal, isolation of new animals on farm all improve the chances of minimising disease.

Well bedded and well ventilated housing with a good protocol around hygiene and calf husbandry will also help to minimise disease risk.

Weaning calves

The criteria for successfully weaning calves are:

- Consuming at least 1kg calf starter / day for three consecutive days
- Body weight of 80 to 85 kg
- Minimum age of 8 weeks
- Healthy and not stressed

Calves can be weaned either abruptly or step weaned (stepping down the amount of milk fed and the number of feeds / day). There is no major difference between step weaning and abrupt weaning, providing the calf's rumen is adequately developed and that they are eating at least one kg of calf ration / day. However, gradual weaning does reduce the stress at weaning and can avoid temporary setbacks in growth rate performance.

Monitoring growth rates

Weighing calves on at least two time points during the rearing period is an excellent way to check their health and performance, thus highlighting if any nutritional changes need to be made.

If possible weigh calves at birth, or at the time of entry onto the farm, and again at 6-10 weeks. Alternatively weigh calves at time points that coincide with existing management practices (such as dehorning) to minimise additional labour requirements.

Weigh scales offer the most accurate measure of calf weight and, if set up correctly in a race or crush, will be the easiest method to use. If weigh scales are not available, use a weigh band (girth tape) or height stick or height marks on the crush wall. Using the same measure and being consistent is key.

Summary

Successful calf rearing with minimum mortality, low disease levels and efficient use of labour and other inputs is critical for profitable dairy beef production. It is a costly enterprise and high standards need to be set and met. It is extremely important to set objectives for your calf rearing enterprise and to monitor these objectives with every batch of calves reared. Excellent husbandry together with the correct nutrition will help ensure calves achieve their full potential, resulting in an efficient and profitable enterprise.

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Early Maturing Dairy Beef Systems

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Summary

- Calves from early maturing (Angus and Hereford) sires account for 25 per cent of calves born from the national dairy herd.
- There is a significant premium available for beef produced from these early maturing sires when produced to a market specification.
- Blueprints for these production systems are focused on low input pasture based production with high levels of animal performance from grazed grass.
- Current research is examining various finishing strategies for heifers and steers from low input pasture based production systems ensuring continuous supply of beef throughout the year.
- Results presented indicate that the production systems under investigation are profitable and that life time gain from grazed grass is a critical component of this.

Introduction

Currently, approximately 60 per cent of dairy cows are bred to dairy sires with the remainder bred to beef sires. This represents an increase in the proportion of dairy sires and is largely attributed to the abolition of milk quotas in 2015. It is anticipated that dairy production systems will continue to be seasonal, where the majority of calves will be born in spring. The early maturing beef breeds, Aberdeen Angus and Hereford, are the more desired beef breeds used by dairy farmers due to their ease of calving and short gestation traits. Over 80 per cent of the Aberdeen Angus and Hereford calves from Holstein-Friesian cows are born between February and May (Figure 1).

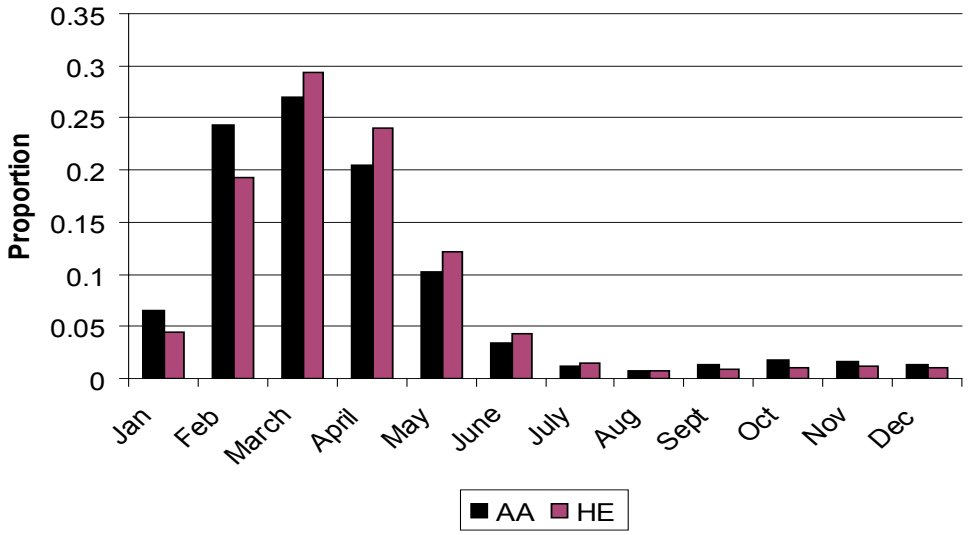

Figure 1: *Proportion of Aberdeen Angus and Hereford calves born / month to dairy cows*

Most of the early maturing beef breeds used on the dairy herd achieve a commercially acceptable level of carcass fatness at a young age and are therefore, suitable for systems of production which are grass based producing saleable carcasses at relatively low slaughter weight. Typically, early maturing dairy male calves are finished as steers while heifers are finished off pasture at the end of the second grazing season or retained for breeding in the suckler herd. These early

maturing dairy calf to beef systems are sustainable in that performance is optimised from grazed pasture.

Previously, Keane et al. (2009) described the performance of early maturing crossbred animals from the dairy herd (both heifers and steers) based on research carried out at Teagasc, Grange. These systems focused on low input pasture based production. Currently, approximately 20 per cent of early maturing heifers are slaughtered from 18 to 21 months of age while 42 per cent are greater than two years of age at the time of slaughter. Similarly, 26 per cent of early maturing male cattle are slaughtered at 22 to 25 months of age while 36 per cent are greater than 30 months at slaughter. Such systems greatly reduce the stocking rate potential of the farm and increase the costs of production.

A number of products (*Hereford Prime* and *Certified Angus*) are currently on the market which capitalise on the perceived eating quality traits of animals from these breeds within pre-defined carcass weight, age and fatness specifications. Since early 2011 Teagasc have developed a joint research programme with ABP Food Group, Certified Irish Angus, Irish Hereford Prime, the Irish Angus Cattle Society Ltd. and the Irish Hereford Breed Society to optimise the production of these systems by developing technologies for each of the key stakeholders involved, including the beef bull breeder, the dairy farmer, the beef farmer and the meat processor.

Current research at Johnstown Castle

In spring 2011, the early maturing dairy calf to beef study was established at the Johnstown Castle research farm. The aim of the research was to provide greater insight into the potential of these breeds from low input pasture based production systems. The study at the Johnstown Castle research farm is relatively small scale but will be repeated over multiple years, providing a clearer insight into the merits of alternative early maturing dairy crossbred production systems.

Detailed animal performance results from Johnstown Castle have been presented via a number of forums in recent times: Teagasc Open Day, update in the Irish Grassland Association newsletter, etc. The findings from the first year of the study suggest a very favourable response to early maturing dairy calf to beef production systems. Projected animal performance and profitability of the production systems were presented at the Teagasc open day. However, results from the first cycle of calves have now been complete. Hence, the objective of this paper is to describe the production systems that are being evaluated and outline preliminary economic analysis, to provide an indication of the profitability of these early maturing dairy calf to beef production systems.

Current study and preliminary economic analysis

A total of 128 early maturing dairy cross calves were assembled for the study. Sixty-four February born calves were purchased in early March, 32 males (16 Angus and 16 Hereford) and 32 females (16 Angus and 16 Hereford). An additional 64 April born calves, identical in breakdown to that purchased in March, were purchased in late April/early May. Varying production systems were generated by adjusting the age at slaughter for February and April born heifers and steers (Figure 2).

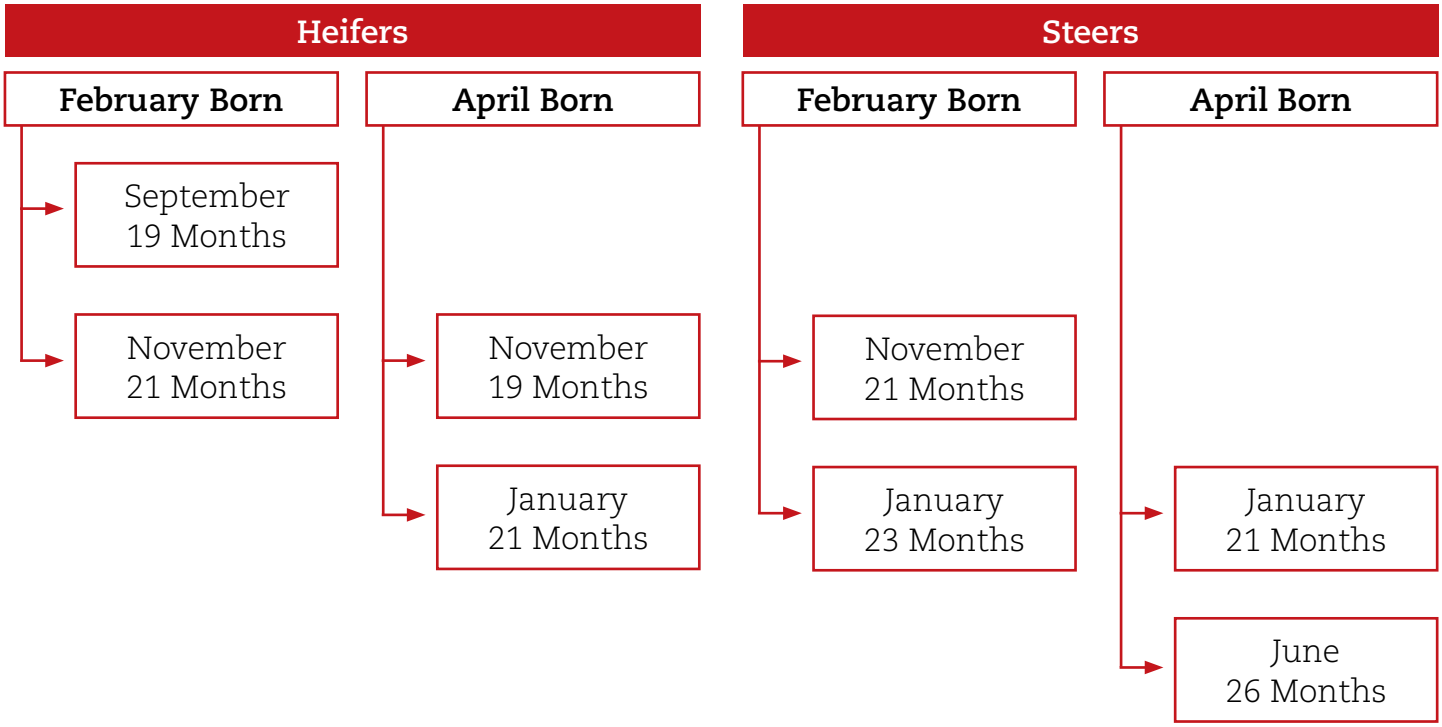

Figure 2: *Production systems for early maturing heifers and steers*

The objectives of the experiment were to establish systems of production that are profitable to producers and marketable for processors while ensuring continuous supply of high value product to the marketplace. Low input pasture based systems are the focal point for all production systems investigated. Performance results from the calves purchased in the first year of the three year study are presented. Calves were supplemented at pasture during the first grazing season receiving 1 kg / head daily. During the first winter good quality grass silage was offered in addition to a further 1.5 kg / head daily.

The economic analysis undertaken is based on the biological (animal performance) data generated at the Johnstown Castle research farm. Variable costs including milk replacer, fertilizer, contractor charges, medical and veterinarian, silage and reseeding, fixed costs (machinery maintenance and running costs, farm maintenance, car, telephone, electricity and insurance) and sales values were based on actual system inputs and outputs where possible and evaluated on current prices (Table 1).

Table 1. Assumptions of the model	
Milk replacer (€/t)	2200
Calf ration (€/t)	350
Finishing ration (€/t)	300
Silage (€/t)	27
Straw (€/t)	80
Vet callout fee (€/callout)	70
Vet meds per calf (€/calf)	15
Beef price (c/kg for R3)	450

Live weight and carcass performance levels are presented in Table 2. Sensitivity analysis was also carried out on the key variables (calf price, concentrate price and beef price) to assess the impact of fluctuations in profitability.

Results from heifer production systems

Each finishing system contained 16 animals. Of the 32 February born heifers, the first 16 animals (8 Angus and 8 Herefords) were slaughtered in September at 19 months of age. The remaining February born heifers were slaughtered in November at 21 months of age thus providing data for a further two months finishing. Both heifers in 19 and 21 month production systems were slaughtered off pasture. Animals received 2.5 kg of concentrates / day for 60 days pre-slaughter. The physical performance of the Aberdeen Angus and the Hereford production systems were similar and so, for the purposes of presentation, are integrated from hereon. Heifers in the 19 month production system were 454 kg at slaughter yielding a carcass of 228 kg. Live weight and carcass weight for heifers in the 21 month production system were 471 kg and 238 kg, respectively. Carcass conformation for heifers in both production systems were predominately 'O=' with carcass fat classes of 3=.

The April born heifers also had two ages at slaughter. The first group were slaughtered in November at 19 months following supplementation of 2.5 kg concentrates for the final 60 days at pasture. The remaining animals were housed and finished on silage *ad-libitum* with 5 kg of concentrates / day. These animals were slaughtered in January at 21 months of age. April born heifers in the 19 month production system had a live weight at slaughter of 465 kg yielding a carcass weight of 234 kg. The heifers in the 21 month production system had a live weight and carcass weight of 501 kg and 249 kg, respectively. Carcass conformation for heifers in both production systems were predominately 'O=' with carcass fat classes of 3=/+.

Table 2. Performance results from the production systems.

Month of birth	Heifers				Steers			
	February		April		February		April	
Average daily gain (kg/d)								
First season at pasture	0.82		0.79		0.92		0.78	
First winter	0.76		0.71		0.75		0.67	
Second season at pasture	0.78		0.74		0.82		0.78	
Indoor finishing	-		1.01		0.98		1.11	
Second winter	-		-		-		0.43	
Third season	-		-		-		1.28	
Month of slaughter	Sept	Nov	Nov	Jan	Nov	Jan	Jan	June
Age at slaughter (mo)	19	21	19	21	21	23	21	26
Live weight	454	471	465	501	533	581	545	606
Carcass weight	228	238	234	249	277	293	270	315
Conformation score	O=	O=	O+	O+	O=	O+	O=	O+
Fat class	3-	3=	3-	3+	3-	3=	3=	3+

Economic outcomes

The economics of the production systems based on profitability / head are presented in Table 3. For the February born heifers finished at 19 months of age total variable costs were €417 / head and thus, gross margin was €331 / head. By delaying the slaughter date by two months, beef price reduced slightly (since November prices are historically lower than September prices) and carcass output per head increased by 10 kg. Taken together, these differences increased gross margin / head slightly (€13). Net margin / head followed from the gross margin results with the 21 month system returning a slightly higher margin than the 19 month system.

Table 3. Economics of the production systems under investigation (€/hd unless stated)

	Heifers				Steers			
Month of birth	**February**		**April**		**February**		**April**	
Slaughter age (mo)	19	21	19	21	21	23	21	26
Beef price (c/kg)[1]	424	416	421	446	411	441	437	460
Revenue								
Livestock sales	965	991	986	1112	1141	1296	1178	1449
Less purchases	217	217	217	217	273	273	273	273
Net income	748	774	769	895	867	1023	905	1176
Concentrates	170	170	141	186	172	263	237	160
Milk replacer	57	57	57	57	57	57	57	57
Hay	4	4	4	4	4	4	4	4
Grazed grass	67	84	71	75	90	79	66	97
Grass silage	40	35	21	64	42	105	92	151
Vet & med	40	40	40	40	40	40	40	45
Other	38	38	35	41	43	51	48	50
Total variable costs	417	430	370	467	448	599	545	564
Gross margin (€/hd)	331	344	399	428	419	424	360	613
Gross margin (€/hd; incl. QAS and bonus payments)	415	450	502	520	542	528	460	745
Net margin (€/hd)[2]	169	182	237	161	257	157	93	346
Net margin (€/hd; incl. QAS and bonus payments)	253	288	340	253	380	261	193	478
Number of animal units[3] per ha at different stocking intensities								
200 organic N	3.5	3.0	3.5	3.0	3.0	2.5	3.0	2.2
225 organic N	3.9	3.4	3.9	3.4	3.4	3.0	3.4	2.5
Sensitivity analysis on a per head basis								
Concentrate price (+/- €10/t fresh)	4.80	4.60	4.00	5.30	4.90	7.50	8.10	4.70
Beef price (+/- 10c/kg)	22.80	23.80	23.40	24.90	27.70	29.40	27.00	31.50

[1]Actual price received depends on date of sale (i.e. seasonality effects) and carcass grading assuming a base price of €4.50/kg carcass; [2]Fixed costs include depreciation and interest on buildings/facilities and overheads. [3]An animal unit represents a calf through to slaughter.

The total variable costs associated with production for the April born heifers slaughtered at 19 months of age (in November) were €370. This resulted in a gross margin of €399. By leaving the animals at pasture until the end of the grazing season and finishing the cattle indoors

at 21 months of age over a 90 day period, beef price was greater and the concentrate input requirements increased by 150 kg / head (€45 / head). Although gross margin / head was greater (by €29), the greater housing requirements of the 21 month system (slaughtered in January) increased capital costs for this system relative to the earlier finished 19 month system. Thus, net margin per head was greater for the 19 month system.

Results from steer production systems

Consistent with the heifer production systems, the steers were either February or April born and had two ages at slaughter. The first group of February born steers were slaughtered off pasture with 2.5 kg of concentrate supplementation in November at 21 months of age. The remainder of the February born steers were housed and finished indoors on silage ***ad-libitum*** with 5 kg of concentrate supplementation per day. These animals were slaughtered in January. Live weight and carcass weight of 533 kg and 277 kg, respectively, were achieved for steers in the 21 month production system. February born steers finished at 23 months of age were housed after the second season at pasture and finished indoors on silage ***ad-libitum*** and 5 kg of concentrate supplementation. Live weight at slaughter was 581 kg and a carcass weight of 293 kg was achieved. Carcass conformation for steers in both production systems were predominately 'O=/ O+' with carcass fat classes of 3-/=.

Late born steers also had two slaughter dates. The first group were housed in November after the second season at pasture and finished at 21 months of age on silage ***ad-libitum*** plus 5 kg of concentrates. These animals were slaughtered in January and were 545 kg live weight at slaughter. Carcass weight for these steers was 270 kg. The final group were housed and stored over the second winter on a silage only diet. These animals were turned out to pasture for a third season and were slaughtered in June at 26 months of age. Live weight at slaughter was 606 kg and a carcass weight of 315 kg was achieved. Carcass conformation for steers in both production systems were predominately 'O=/ O+' with carcass fat classes of 3=/+.

Economic findings

The economics of the production systems based on profitability per head are presented in Table 3. Total variable costs for the February born steer slaughtered at 21 months of age were €448 resulting in a gross margin of €419 / head. By retaining the animals for a further two months, finishing indoors on grass silage and concentrates, sales and concentrate costs / head increased (by €155 and €91, respectively). Livestock sales typically benefit from a beef price rise at this time of the year. Gross margin / head was similar for both systems, however, capital costs were greater for the 23 month system (requiring an indoor finishing period) and therefore, there was a net margin advantage of €100 / head in favour of the 21 month system.

Similarly, there were substantial differences in the economics of the April born steer systems, however, in this case the advantage was in favour of the systems finishing at the older age with beef price rise again favouring the later finish system. Both systems required a second indoor winter feeding period with the steers slaughtered in January finished indoors on silage ***ad-libitum*** and 5 kg of concentrates and the steers destined for grass based finishing stored on silage only. Steers slaughtered at 26 months of age achieved heavier carcass weights with lower concentrate requirements. Indeed, approximately 75 per cent of the slaughter weight was achieved from grazed grass as opposed to 55 per cent for the 21 month system. Consequently, gross margin / head was significantly greater for the 26 month system relative to that achieved in the indoor system. Fixed costs were similar and thus, net margin also followed this same trend with the 26 month system having a net margin / head more than three times that of the 21 month system.

Producer group bonus payments

The bonus payments from the producer groups make a significant contribution to the economics of the production systems. The bonus payments for the early maturing heifers are €60 / head approximately. Similarly, the production systems for the steers increase significantly. There is a large differential in bonus payment for the steers due to the seasonality of the bonus structure for the Angus. The bonus payments range from €68 to €95 / head. The impact of the bonus scheme as paid for the animals slaughtered in the Johnstown Castle project are presented in Table 3.

Herbage production

A key element of profitable dairy calf to beef systems is the efficient utilisation of grazed grass. Each system has a different requirement for herbage per head ranging from 2.3 t DM for the 19 month heifer systems to 4.3 t DM for the 26 month steer system. At a stocking rate of 200 kg organic N / hectare and assuming excellent levels of grass utilisation, the farm would need to grow 10.1 t DM/ha and 11.6 t DM / ha for each system, respectively. At 225 kg organic N / hectare this rises to 11.3 and 13.0 t DM/ha, respectively. Thus, the capacity of the farm to grow grass will largely dictate the stock carrying potential of the farm.

Conclusion

The finishing systems are presented from the first cycle of calves from the research study being carried out at Johnstown Castle, the aim of which is to establish sustainable systems of production for early maturing heifers and steers that are profitable to producers and result in a high value product that is continuously available to the marketplace. Current results indicate that optimum animal performance was achieved across all production systems, yielding adequate carcass weights, conformation scores and fat classes across all systems. The economic appraisal suggests that there were substantial differences in gross between the systems. In particular, achieving a high proportion of total life time gain from grazed grass is critical.

Acknowledgements

Financial support from ABP Food Group, Irish Hereford Prime, Certified Irish Angus, the Irish Hereford Breed Society and Irish Angus Cattle Society is gratefully appreciated. The authors also wish to acknowledge the diligent work carried out by the Johnstown Castle staff.

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Angus Beef from a Friesian Dairy Herd: a Farmers' Experience

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Introduction

Alongside my wife Geraldine and our four children, we farm just over 100 ha in south Kilkenny, of which 84 ha is owned and a further 16 ha leased. The land is split in three divisions. The soil type is a podzolic and acid brown earth. The farm is situated 600 feet above sea level in rolling hill countryside; there is 44 ha on the grazing platform for the dairy cows. Approximately 80 ha of our farm would be dry with the remaining 20 ha is a little heavy in parts.

We milk 90 Friesian dairy cows which are all spring caving to supply Glanbia. We breed all our own replacements from AI bulls and use an Angus stock bull after we have enough replacements bred. All drystock are brought to slaughter and are usually slaughtered by ABP. We also grow 10 ha of spring barley which we use to feed the stock.

One of the main focuses on the farm over the past five years has been to drive up output and reduce costs through increasing stocking rate, improved grassland management, compact calving and financial control. By working closely with my local discussion group and Teagasc we have managed to make great strides to achieving our goals. It was with the adoption of better grassland management practices along with a reseeding programme that has improved our output based on the extra grass that the farm is growing since we started and our improved management skills.

Why angus?

Calving Ease

Calving 120 plus dairy cows into a herd every year ease of calving is paramount for us. Getting the cows to calve and move into the milking parlour as soon as possible is our number one priority. In spring, with a lot of cows calving over a short time, the angus bull suits our system as they require little or no assistance.

Short gestation period

We use AI Friesian for the first seven weeks of the breeding season followed by six weeks of Angus bull. The later calving cows are bred to Angus which have a shorter gestation period in order to maintain our compact calving. The lighter Friesian heifers also receive as Angus bull to aid easier calving and improve their ability to go back in calf earlier the following year.

Active Calves

We find Angus calves from our dairy herd as strong healthy which need little attention and fit our system very well. They are quickly on there feet and suckle their mothers readily, with young heifers makes for easier management.

No dehorning

Polled Angus calves require no dehorning which is one less job for the spring on our busy dairy farm.

Docility

We find the stock to be quite and easy to manage, there is no different to them and our Friesian cattle.

Angus Friesian cross

The Friesian cow and Angus bull make an excellent cross with the Friesian cow giving the size

and the Angus giving the beef characteristics.

Earlier finishing

We finish our Angus heifers at 22 month and the bullocks at 26 months. The lighter carcass of about 350 kg is what is required by the meat processors. This is very achievable with the Angus stock.

Angus premium

An addition benefit is the extra price premium of up 20 cent per kilo which is available through the Angus scheme.

Management

Calves are fed twice a day using teat feeders for the first six weeks and once a day for the next four weeks, and all calves are weaned by 10 week. Calves receive five litres whole milk a day, reduced to three litres on once a day. Calves get access to hay and meal at all times. They are turned out to grass at a month old with a runback to a loose shed.

Calves are vaccinated for IBR and RSP at three weeks old. Cows and calves receive a selenium injection. We adopt a leader follower system for the calves ahead of the yearlings. The weanlings are treated with ivermictin for summer worms and we also treat them with a multi Vitamin for B12 imbalance.

Weanlings are housed from early November with a white drench and a fluckicide a few weeks later and are treated for lice as required with a pour-on. Weanlings are fed silage and home mix of our own barley, beet pulp and soya at a ratio of 45 : 40 : 15 split plus minerals and are cut out meals four weeks before turnout.

Financial analysis

The financial analysis is based on our 2011 & 2012 dairy profit monitor.		
Year	**2011**	**2012**
Livestock Units	62.5	65.6
Land Ha	27.7	28
Stocking Rate	2.25	2.27
Gross Output	**€1982**	**€2130**
Variable Costs		
Purchased Concentrates	€224	€252
Home Grown Concentrates	€144	€138
Fertilizer	€316	€305
Lime	€17	€15
Veterinary	€109	€110
Contractor	€152	€155
Seed & Spray	€10	€8
Sundry Var. Cost	€103	€106
Total Var. Costs	**€1075**	**€1049**
Gross Margin	**€907**	**€1081**

Note: *Dairy Profit monitor take account of the feed from the Beef enterprise but Fertilizer and all other variable costs are broken down on a livestock unit basic. This weights negatively on the beef system as there are more variable costs associated with the dairy enterprise. All the beef enterprises figures above include both Friesians & Angus*

Yearlings are turned out in early March and are grazed in a paddock system of six divisions due to water constraints and they get fresh grass twice a week. Year-and-half cattle get a worm treatment at housing alongside a flukicide. They get silage only up to 100 days from finish then they get transferred to a meal and straw diet only. The meal is own Barley 4 kg, Beet pulp 4 kgs, Maize meal 2kgs and soya 0.5 kgs. with straw and minerals. Angus cattle are finished in this diet from early spring on.

Plans for the future

With the future abolition of milk quota we see an expansion in dairy cow numbers. The intention is to sell Friesian bull calves. The replacement heifers and Angus heifer and angus bull calves will be reared on the out-farm. With the further development of sexed semen we see breeding our replacements from our best dairy stock and selecting male Angus semen for the remainder. The Angus stock bull will remain for ease of management and to tidy up the herd at the end of the breeding season.

Beef Production from Male Holstein-Friesian Cattle from the Dairy Herd

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Summary

- Since May 2010 research has been carried out at Johnstown Caste exploring various finishing strategies for spring born male dairy calves evaluating production systems for bulls and steers.
- Bull systems with animals slaughtered at 15 or 19 months and steer system with animals slaughtered at 21 or 24 months were compared.
- At current grain prices the steer systems had higher profit / head and / hectare than the bull systems and the 21 month steer was more profitable than the 24 month steer.
- The bull system is extremely sensitive to grain prices and becomes a more viable option at low grain prices.
- Meat quality analysis showed no difference in eating quality between dairy bulls slaughtered at 15, 19 and 22 months of age and meat from Jersey × Holstein-Friesian bulls was more juicy and tender than Holstein-Friesian bulls.

Introduction

In recent years there has been a notable shift from steer beef to bull beef production for dairy calf to beef systems. Indeed, the number of bulls (including suckler bulls and excluding cull cattle) slaughtered, in Ireland, as a percentage of total slaughtering increased from 3 to 20 per cent from 2000 to 2012 (Bord Bia, 2013). This change can largely be attributed to greater live weight, carcass weight and feed conversion efficiency of bulls compared to steers. To capture the higher performance potential of bull systems, however, concentrate feeds are normally fed at a higher rate than steer systems. In general, although numerous systems of production are employed by dairy beef farmers, the overall profitability of the systems is heavily reliant on beef and concentrate prices. This is of particular concern when concentrate prices are high. Taking this into consideration, it is important for dairy calf to beef farmers to explore options for finishing male dairy calves and to prepare financial budgets to evaluate the implications of alternative finishing options.

Current research

Previous research in Teagasc, Grange explored various systems of production for male dairy calves. Pre-decoupling steer production systems were more profitable than bull systems. This was largely due to the greater premium earning capacity of steers. Since May 2010, dairy calf to beef research has been carried out at Johnstown Caste exploring various finishing strategies for spring born male dairy calves. This research is highly applicable and industry driven, including beef farmers and meat factories. The project is evaluating the production systems for bulls and steers and exploring avenues of reducing the concentrate input during the finishing period. Since the project was established in 2010, considerable fluctuations in concentrate price and beef price have occurred. This undoubtedly has significant implications for the profitability of the systems, particularly for bull beef production systems.

Which production system?

A wide range of beef systems are possible for calves reflecting differences in breed, gender and finishing age. When deciding on a production system it is essential that the decision is made when the calf is in the early life stage. If concentrate price is low then bull production

systems have the potential to be highly profitable systems. However, if concentrate price is high some bull production systems can become loss-making. For the purpose of this paper, four of the production systems (Table 1) under evaluation at Johnstown Castle are described; two bull and two steer production systems. The first bull system is exploring the opportunity to have a second season at grass and thus bulls are slaughtered at 19 months of age. However, market requirements dictate that bulls be slaughtered at less than 16 months of age. The steer systems involve differing slaughter ages; 21 months or 24 months of age. The objective of this paper is to describe the production systems and present economic analysis to outline the profitability of each system. Sensitivity analysis will also be presented to highlight the opportunities/ threats of fluctuations in beef price, concentrate price and calf price on the systems. A further objective of this paper is to discuss the results that have been collected and analysed from some of the meat quality research to date.

Table 1: Target performance for dairy calf to bull and steer production systems

	Bulls		Steers	
Age at slaughter	15 month	19 month	21 month	24 month
Live weight (kg)				
May	90	90	90	90
November	270	230	230	230
Turnout (March)	-	300	300	300
May/June	520	420	-	-
September	-	600	490	-
November	-	-	550	490
Slaughter weight	520	600	550	620
Carcass weight	275	320	280	320
Average daily gain (kg/d)				
First season at pasture	0.80	0.80	0.80	0.80
First winter	1.30	0.70	0.70	0.70
Second season at pasture	-	1.20	0.90	0.90
Indoor finishing	-	1.80	-	0.90

Production systems

- **15 month bull system:** in this system calves are turned out to pasture following weaning in April/May for the first grazing season and supplemented with concentrates. Animals are housed in late October/early November, remain indoors, and are finished on *ad-libitum* concentrates with a limited proportion of roughage or good quality silage and concentrates. Bulls are slaughtered in May/June. A target carcass weight of 275 kg is required for bulls in this system with conformation scores of O=/O+ and fat class 2=/2+. This system meets UK market demands, in that young bulls are slaughtered at less than 16 months of age.
- **19 month bull system:** Management and performance for the first season at pasture was identical to that described for the 15 month system however, calves are "stored" over the first winter on good quality grass silage and concentrates daily. In general, animals are turned out to pasture for 100 days in early March, housed in June and finished over a 100 day period. Target carcass weight for this system is 320 kg.
- **21 month steer system:** It is more common to finish steers at 24 months of age at the end of the second winter (described below) however, indoor finishing is the most expensive phase of two-year-old spring systems, and therefore, systems that do not require an expensive winter finishing phase are of interest. For spring-born calves, winter finishing can only be avoided by slaughtering cattle at a lighter carcass weight at the end of the second grazing season at

19 to 21 months of age. Target carcass weight is 280 kg at 21 months of age. In order to finish at the end of the second grazing season, calves must have good life time performance and have an early birth date (early to mid February). While the results presented here are specific to 21 month Holstein-Friesian steers, all breed types can be considered if their carcasses are commercially acceptable.

- **24 month steer system:** This is a commonly practised system for Holstein-Friesian steers finishing cattle at 24 months of age and targets are based on research carried out at Teagasc, Grange Management is similar to the bull systems described previously, however calves are castrated towards the end of the first grazing season and are "stored" over the first winter on good quality grass silage and concentrates daily before turn out for a full second grazing season. Finishing occurs during the second winter and cattle are offered good quality grass silage and 5 to 6 kg concentrates. Target slaughter and carcass weight is 620 kg and 320 kg, respectively. If they are of extreme dairy type, a proportion of the carcasses will fall into conformation class 'P'. Less extreme dairy animals will predominantly fall into class 'O'. About 50 per cent of carcasses fall into fat class 3 and 50 per cent into fat class four.

Results from Johnstown Castle

In 2010, the dairy bull trial commenced in Johnstown Castle. To date research has included varying levels of concentrate supplementation during the first season at pasture, bull and steer systems of production and subsequent meat quality analysis which was carried out the Ashtown research centre.

Concentrate supplementation as calves

Three years of high and low concentrate input systems were investigated. Calves were allocated a low allowance (0 or 1 kg / d) or a high allowance (2 kg / d) of concentrates. Typically, calves on a high allowance of concentrates gained an additional 0.15 kg / d. Therefore, results from this study would question feeding high allowances of concentrates to calves, particularly those intended to be in a 19 month bull and steer production systems. The additional carcass weight gained did not offset the cost of supplementing with concentrates during the first season at pasture. However, calves intended for a 15 month bull production system may need to be on a higher plane of nutrition as a greater weight for age is required to reach the target specification.

Both 15 and 19 month bull production systems have been managed as described above. In addition, alternative finishing strategies have also been investigated. Bulls in the 15 month system were finished off grass silage and 5 kg of concentrates while the 19 month bulls were finished off pasture and 5 kg of concentrate supplementation for 100 days pre-slaughter rather than finishing indoors.

Results from bull systems

Typically, calves in the 15 month production system gained 0.80 kg/d during the first season at pasture. At housing calves assigned to the 15 month production system were built up onto concentrates ad-libitum over a three week period. They remained indoors on concentrates ***ad-libitum*** and were slaughtered in May/June. Total concentrate input during the finishing period was 1.8 tonnes. Average daily gain during the finishing period was 1.35 kg / d. Bulls finished in this production system achieved a carcass weight of 256 kg. Those on the high allowance (allocated 2 kg / d) during the first season at pasture had a carcass weight of 263 kg while calves allocated the low allowance during the first season had a carcass weight of 251 kg. Carcass conformation were 'O= and '2=', respectively.

Alternative finishing strategies were also explored for the 15 month bulls. Bulls were finished indoors on grass silage ***ad-libitum*** (72 DMD) with 5 kg of concentrate supplementation. Average daily gain during the finishing period was 1.16 kg/d and a carcass weight of 236 kg was achieved.

While the concentrate input was reduced average daily gain and carcass weight was also lower. In addition, conformation score (O-) and fat class (2-) were lower than bulls finished on concentrates *ad-libitum*. Irrespective of finishing strategy the 15 month bull production system has a low requirement for grazed grass. Therefore, it cannot operate as a stand alone system. Another production system/ enterprise would have to be operated on a farm. This system is highly dependent on concentrates imported onto the farm.

Bulls in the 19 month bull production system were pasture grazed as calves, stored through the first winter and returned to pasture in early March for a 100 day period. They were then housed in June and finished on concentrates *ad-libitum* for 100 days. Concentrate input during the finishing period for bulls in this system was 1.2 tonnes and carcass weight was 320 kg. Conformation score was 'O=' with a fat class at slaughter of '2+'.

Alternative finishing strategies whereby the proportion of concentrates were reduced during the finishing period were also investigated. For the last two years bulls were either housed indoors and finished on concentrates *ad-libitum* or supplemented with 5 kg of concentrates at pasture for 100 days (June to September). Bulls finished off pasture with concentrates had an average daily gain during the finishing period of 1.48 kg/day. Carcass weights were 21 kg lighter than those finished indoors on concentrates ad-libitum. However, conformation score (O-) and fat class (2-) were also lower. The 19 month bull production system is capable of having a high output per hectare. When concentrate price is reduced this system has the potential of being highly profitable. However, it is essential to have a market for these animals since demand is limited for bulls finished at greater than 16 months of age.

Inputs and performances with the steer systems are very predictable and repeatable. Steers in the 24 month system are slaughtered in spring with a concentrate input of one tonne. Carcass weight at slaughter was 320 kg with conformation score and fat class of O- and 3=, respectively. The earlier finish steer is slaughtered in November off pasture at the end of the second grazing season and this facilitates a greater output / hectare. Both steer systems utilise more grazed grass than bull production systems and consequently reduces the costs of production. While the stocking rate potential is reduced when compared with a bull production system this system is less vulnerable to an increase in concentrate price. In addition, steer beef production is not susceptible to the perception of lower meat eating quality.

Economics of the systems

Tables 2 and 3 shows the economics of the 15 month and 19 month bull systems and the 21 month and 24 month steer systems. The figures are based on a calf purchase price of €150 / head, a base beef price of €4.50 / kg and a concentrate price of €300 / t. Mortality of five per cent was included. The 19 month bull system was more profitable than the 15 month system largely owing to differences in concentrate costs. Both systems had similar fixed costs and therefore, similar relative profitability was evident in net margin terms. The 15 month bull system was not considered on a per hectare basis since the feed demand in this system is largely based on purchased concentrates with a very low requirement for grazed or conserved grass. In other words, the 15 month system has a very modest land requirement although it is important to bear in mind the organic nitrogen and slurry contribution of these cattle with regard to the stocking rate and slurry capacity limitations of the Nitrates Directive. The steer systems were more profitable than the bull systems. Gross margin per head was approximately €400 / head for both systems with gross margin / hectare greater for the 21 relative to the 24 month system due to the greater number of animals carried per hectare. However, net margin / head and / hectare is much greater for the 21 month steer system. This is due to the large difference in capital costs for these systems; the 21 month system has no requirement for second winter housing in contrast to the 24 month steer system.

Table 2. Assumptions used in the analysis	
Calf price (€/head)	150
Milk replacer (€/t)	2200
Calf ration (€/t)	350
Finishing ration (€/t)	300
Silage (€/t)	27
Vet callout fee (€/callout)	70
Beef price (c/kg for R3)	450

Table 3: Economics of dairy beef production systems using male Holstein Friesian calves (€/head unless stated)				
	Bulls		Steers	
Slaughter age (months)	**16**	**19**	**21**	**24**
Beef price (c/kg)[1]	449	413	412	434
Revenue				
Livestock sales	1149	1321	1047	1388
Less purchases	157	158	157	158
Net income	991	1163	890	1230
Concentrates	621	548	183	382
Milk replacer	68	68	68	68
Hay	4	5	4	4
Straw	15	0	0	0
Grazed grass	18	41	89	89
Grass silage	0	73	49	157
Vet & med	36	37	38	40
Other	68	56	35	54
Total variable costs	829	828	467	795
Gross margin (€/hd)	162	334	423	434
Net margin (€/hd)[2]	0	172	261	168
Number of animal units[3] / ha at different stocking intensities				
200 organic N	-	3.5	3.0	2.5
225 organic N	-	3.9	3.4	2.8
Sensitivity (impact on margin / head)				
Concentrates (+/- 10 €/t fresh)	17.90	15.70	5.20	10.90
Beef price (+/- 10 c/kg):	25.60	32.00	25.40	32.00

[1]Actual price received depends on date of sale (i.e. seasonality effects) and carcass grading assuming a base price of €4.50/kg carcass. [2]Fixed costs include depreciation and interest on buildings/facilities and overheads. [3]An animal unit represents a calf through to slaughter.

The impact of changes in concentrate and beef price on the profitability of these four systems was also evaluated. Results showed that the 15 month bull system was most sensitive to concentrate prices with a €10 / t increase/decrease in concentrate price reducing/increasing gross margin by €18 / hd. The 19 month bull system was most sensitive to beef price with a 10 c/kg increase/decrease in beef price increasing/reducing gross margin by €32 / hd. The 21 month steer system was least sensitive to concentrate and beef prices.

Meat quality

Cube roll samples were taken from dairy bulls slaughtered at 15, 19 and 22 months of age (Table 4). A suite of meat quality measurements were carried out to establish if differences exist between bulls slaughtered at different ages. These included tenderness, toughness, juiciness, the initial experience (toughness, crunchiness and juiciness) and the residual feel (greasy, swallow and mouthfeel). Results from this study showed no difference in any of the eating quality measurements between dairy bulls slaughtered at 15, 19 and 22 months of age. Interestingly, results from this study did show that the meat samples taken from Jersey × Holstein-Friesian bulls were more juicy and tender than Holstein-Friesian bulls. The results presented here are from the first year of the study carried out at Johnstown Castle. Further research is being carried out to see if these results hold true.

Table 4: Eating quality of bulls slaughtered at 15, 19 and 22 months of age

	Production system			Breed	
Age at Slaughter (mo)	15	19	22	HF	JEX
Texture (1 tough -8 tender)	4.84	4.87	5.21	4.77	5.17
Juiciness (1 dry -8 juicy)	5.11	5.14	5.19	4.98	5.32
Beef (1-8)[1]	4.53	4.60	4.49	4.56	4.52
Flavour liking (1-8)	5.30	5.33	5.19	5.31	5.23
Overall liking (1-8)	5.00	4.97	5.05	4.97	5.04

[1]*Eating quality was determined using a trained sensory panel on a scale of 1 to 8 (1 dislike to 8 like).*

References

Bord Bia. (2013b). Cattle throughput graphs 2000-2012.

Acknowledgement

This research was gratefully funded by Dawn Meats Ltd.

Our Experience of Friesian Calf-to-Beef Systems

Andy and Tom English

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Background

Our farm was traditionally operated as a calf to steer beef system with an out-farm devoted to growing barley and fodder beet for use in finishing the cattle. Traditionally, 120-130 calves were purchased as a mixture of spring born and autumn born calves. I was invited to participate in the Teagasc/Dawn Meats programme at the end of 2010. In drawing up the plan for the farm the aim was to increase output by including the production of bulls. A key part of the plan was to minimise investment in extra buildings if possible and to use the existing buildings more efficiently. I have been involved in a grass budgeting group and a BTAP finisher discussion group with my local Teagasc advisor Michael Fitzgerald. We participate in the Teagasc/Dawn programme group meeting and are also involved in grass measurement using the Teagasc Pasture Base Ireland programme.

Since 2010

- Built a calf rearing house that can rear 100 calves.
- Increased number of calves bought to 220 / annum.
- Started finishing bulls (80%) as well as steers (20%).
- Increased number of paddocks on the farm to increase grass utilisation
- Grass measurement and budgeting

Targeting a high output of beef liveweight / hectare – 1700 kg / ha 2013.

Current system

120 Spring born Friesian bull calves

- 2/3 Slaughtered at 18 months as bulls
  306 kg carcass 2013 (320 kg 2012 – August/September slaughter)
- **1/3** as steers at 24 months
  340 kg carcass (February/March slaughter)

100 Autumn born Friesian bull calves

- Slaughtered at 18 months as bulls
  320 kg carcass (March-April).

The system that has evolved suits the farm for the following reasons:

- Workload distributed throughout the year – calf rearing. Calves purchased in local mart or from exporter/agent.
- Sheds used throughout the year – spring born bulls finished indoors in July to September period with autumn born bulls and steers finished in the winter period.
- Cash flow is good.
- Stock numbers on the farm match grass growth. Spring born bulls housed in early July as grass growth starts to decline. Steers use the grass in the latter part of the year in conjunction with autumn yearling bulls and weanling calves.
- Output on the farm has increased from 1200 kg liveweight/ha in 2010 to 1700 kg in 2013.
- Profitability has increased – gross margin 2013 estimated at €1500 / ha+ (similar to 2012).

Grassland management:

- Paddock system – 1 - 2 days/paddock
- Grazing at correct height 1300-1500 kg DM/ha (9 – 10 cm)
- Re-seeding
- Measurement of grass – surplus removed as baled silage (75-80% DMD)
- Paddocks closed mid-October onwards and turnout mid-February
- 1st Cut Silage 2012 – 73 per cent DMD, 2nd Cut Silage 71 per cent DMD

Finishing diet:

- Winter finishing – fodder beet 20 kg/head/day, barley and balancer ration.
- Summer finishing – 2012 high quality baled silage (1/3 diet) plusconcentrate. 2013 – no baled silage due to need to build up supplies. Ad lib meal diet. Shorter finishing period in 2013.
- Fodder beet (8 ha) included in forage area devoted to rearing cattle. If this was treated as a separate enterprise it would add about 200 kg / ha to the output.

Key messages:

- High output & high gross margin – based on good grassland management. 3.5 units / ha.
- Good use of existing sheds.
- Finishing period – costs minimised due to fodder beet (winter finishing) and use of high quality baled silage when available (summer indoor finishing).
- Meet market specification – O=2= target. Carcass weight 300kg+.
- Good cash-flow throughout the year

Financial messages:

- Gross margin €1500-1600/ha. Potential to increase – calf price likely to remain low, beef price €4.20-4.30 / kg in spring and €3.70-3.80 / kg in summer/autumn, meal price reduction of €50 / t could add €200 / ha gross margin. Extra costs incurred in spring 2013.
- Costs approximately €700 to rear a calf from purchase to slaughter. Calf price 2013 was approximately €150.
- Cost of producing 1 kg liveweight is 100-125 c (variable costs) – top 1/3 profit monitors 122c/kg.
- Fixed costs well contained due to efficient use of sheds etc – about 30 c / kg (top 1/3 profit monitors 60 c / kg). Low usage of contractors.

The future:

- Aim to increase output to four units / ha – 1900 to 2000 kg / ha.
- Continued emphasis on grassland production especially early turn-out and maintaining grass quality throughout the grazing season.

Lessons learned from the Dairy Calf-to-Beef Programme

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Summary

- Early spring (Jan or Feb) born calves hit the performance target more readily and are thus more suited to the intensive 16 month-bull beef system.
- Target a turnout weight of 95-100 kg at 12 weeks. All else being equal, animals below this weight for age will have a reduced carcass output at the end of the production system.
- A minimum of 150 kg liveweight gain is necessary during the grazing period. Through adapting and implementing good grassland management standards this target can and has been achieved by animals on a diet of grass only with minimum concentrate supplementation. This approach significantly reduced the cost of production associated with this period.
- Average housing weight (standardized to 35 wks. of age) on the D2B programme was 268 kg. A minimum liveweight of 240 kg at 35 weeks is necessary for bulls to be considered for the 16-month system.
- Slaughter weight for the programme averaged 283 kg. Carcass conformation was predominantly 'O' (83%) and 'R' (13%) with a fat class of 2=/+ (85%).
- The annual feed budget for the 2011/2012 production cycle was 57 per cent supplementary concentrate, 26 per cent grazed grass and 17 per cent grass silage. Total lifetime input of 1.66 t concentrate, 0.735 t dry matter (DM) of grazed grass and a silage requirement of 0.51 kg DM.
- Total production cost (including purchase price, feed cost, mortality, veterinary, medicine and marketing costs) for the 16 month-bull beef system was €885 / hd. Total output across the farms was €1132 / hd. Average margin per head of €248, ranging from €86 - €330 between participants.
- Profitability of dairy bull beef systems is extremely sensitive to changes in calf purchase price, concentrate price and beef price.

Introduction

The Dairy Calf-to-Beef (D2B) programme is a joint initiative between ABP, Kepak Group, the Irish Farmers Journal through their AgriProfit Programme, McKey Food Service and OSI. The programme was launched in 2011 with the aim to utilize the latest technologies and up to date advice to maximize performance at farm level and investigate the most efficient and economic approach to bring dairy-bred bulls through to beef, that meet required market specifications. A total of 16 participants were selected all differing in geographical locations and existing farm enterprises and farm size. The dairy calf-to-beef enterprise represented the sole production system on some farms while for others the target was to complement a calf to beef production system with existing farm enterprises to boost overall farm output.

The focus in the programme is on producing dairy-bred bulls slaughtered at less than 16 months of age and achieving a carcass weight of 270 kg or greater, fat cover of 2=/2+ or greater and conformation grade of O= or better. As this is the target production criteria for the programme, the data used in this paper and discussions concerning such only relate to bulls meeting the required specifications. Also, as the 2012/2013 production data is still undergoing statistical analysis, production data from the 2011/2012 production cycle will form the basis of evaluations. This paper will examine the animal and financial performance achieved on a number of the pilot farms and key factors that impact on the performance of the dairy bull system.

Data analysis

Approximately 60 per cent of the bulls that initially started the scheme achieved the required programme requirements. The farm records and animal performance data were compiled on each of the pilot farms by the programme advisor along with the farmer. This data was then standardized to key stages in the production system (namely calf rearing, grazing and finishing) thereby enabling us to make a comparison between various parameters for each of the participants in the scheme and benchmark their performance to the proposed targets for the 16 month bull system. Production performance and lessons learned from each stage is discussed below.

Calf rearing

Successful calf rearing should aspire to produce a healthy calf which is capable of optimum performance throughout its life from birth to slaughter. In order to achieve this aim the implementation of optimum calf rearing/husbandry practices along with minimal disease and morbidity during the calf stage is essential. Indeed, nutritional, health and environmental factors imposed during the calf rearing stage have been shown to affect subsequent performance throughout all stages of the bull system and as such will have a major impact on the ultimate profitability of the bull enterprise.

As part of the D2B programme animal performance targets were set for all stages of the production system. For the calf rearing period a target turnout weight and liveweight gain was set at 100 kg (at 12 weeks / turnout) and 0.7 kg / day, respectively. So put simply, over the rearing period calves should be gaining 55 kg of weight from birth until turnout (or weaning if calves reared outdoors). On the pilot farms for the 2011/2012 production cycle, animals that hit the 16 month bull specification at 12 weeks of age had on average a liveweight of 98 kg (SD±13) and this ranged from 84 to 106 kg between farms. Liveweight gain over the 12 week rearing period was just short of the target at 0.64 kg / day (SD±0.15) but there was variation between participants with some farms on average achieving 200-250 g / day extra gain. There was no major health issues identified on these farms and this extra gain is more likely attributed to dietary differences (greater consumption of milk replacer and concentrates) that better meet the animal nutritional requirements for growth and calf quality differences. For example total consumption of milk replacer averaged 23 kg across farms but ranged from 15 kg to 30 kg. Likewise calf concentrate input averaged 80 kg / calf and ranged from 50 kg to 105 kg, depending if the farmers offered the feed on a restricted versus an ad libitum basis. Animals offered the lower levels of these ranges were about 12-15 kg lighter at turnout (12 weeks) than the average bull on the scheme. This is a vital point to remember as there was no subsequent recovery of this liveweight loss throughout the rest of the production system. In fact, turnout weight is positively related to subsequent carcass weight and analysis from the group of bulls on this programme shows that having calves 80 kg to 90 kg versus 90 kg to 100 kg at turnout resulted in subsequent carcass weights of 272 kg compared to 285 kg, or a 13kg carcass weight loss difference. Overall, calf feed costs across the pilot farms average €74 resulting in a feed cost / day of 87 cent. Feed costs for 2012 born bulls did not differ significantly.

Grazing season

Increasing the proportion of grazed grass in the diet and achieving high levels of gain during the grazing period are fundamental to the viability of the 16 month-bull beef system. During the 2011/2012 grazing season bulls were at grass for 179 days (SD±17) and liveweight gain across the farms was 1.05 kg / day (ranging from 0.90-1.10 kg / day). This impressive performance resulted in bulls on average gaining 170kg of weight or 30 per cent of their lifetime weight gain from grass. However, it should be acknowledged there was significant variation in the level of grassland management across the pilot farms. Where good grassland management was practiced through employing techniques such as rotational grazing and leader follower grazing,

farmers readily achieved the target performance with little concentrate supplementation, apart from adaptation periods of three weeks post turnout and pre housing (40 kg; 1kg / head / day). Alternatively, where grassland management was not to the same standard or if calves were below target at turnout, additional supplementation was necessary in order to maintain satisfactory performance levels and achieve target housing weight. On these farms, bulls received up to 2kg of meal / head / day cumulating in 400 kg of concentrates over the entire grazing season. With concentrates costing €260-270/t, this increased production costs by €70-75 per head (at a concentrate cost of €280-€300/t, costs are increased by €112-€120 / head). In general, feed costs for the grazing period average €96 / head (SD±25) with feed cost / day averaging €0.52 and ranging from €0.35 to €0.69 depending on the degree of meal supplementation. Implementing a health programme, and in particular a worm treatment protocol, during the grazing season was also central to achieving high levels of animal performance.

Finishing period

To hit the market specification in terms of weight and classification, bulls on average need to gain about 280 kg in weight during the finishing stage (60 to 70% of their total lifetime weight gain). This weight gain is mainly achieved on a high cost / day diet. So in order to reduce/offset the cost of production, excellent feed conversion efficiency resulting in high carcass weight gain is essential. From looking at the data in the current analysis animal performance during this period is as expected one of the key drivers of margin / head in the system. Therefore, animal or management, or health factors that may reduce/impact performance during this period must be addressed.

From the data collected in the D2B programme, bulls were generally housed in mid October. They were acclimatized to their diet and commenced their finishing period that lasted on average 200 days. Weight at housing (standardized to 35 wks) is a key performance target in the 16 month-bull beef system. Average housing weight across the pilot farms was 268 kg (SD±29) and this ranged from 259 to 294 kg between farms. Furthermore, the analysis also revealed that to hit the 16 month specification, dairy bulls need to have a liveweight of greater than 240 kg at 35 weeks, as below this weight for age they do not have the growth potential required to meet the market specification of a carcass weight of 270kg or higher. During the finishing period the target daily gain is 1.15-1.20 kg / day. While these gains are high they were achieved in the programme. Average gain across the farms was 1.19 kg / day (ranging from 1.1-1.35 kg / day). Feed costs for the 2011/2012 finishing period averaged €458 / head resulting in a feed cost per day of €2.30 (ranging from €2.09-€2.45 / day). However, it is worth noting that a low feed cost / day does not automatically translate to the most economical finishing option. In fact, cost / kg carcass gain is a more important parameter to consider given that carcass gain is what the finisher is actually paid on. On average across the farms in the programme cost / kg carcass gain was €3.84 and this ranged from a low of €3.30 to a high of €4.30. If we compare the farms on either extreme on cost / kg carcass gain the data indicates that there was no difference between these farms in terms of housing weight, slaughter age or feed cost / day but a difference in growth rate equivalent to 200 g / day was observed (ie 1.05 kg / day versus 1.25 kg / day). This reduced animal performance over the finishing period resulting in a carcass weight difference between these farms of 41 kg, equal to €160 extra value / head (based on 2012 carcass prices). This further reinforces the importance of optimal performance throughout this stage of the bull beef enterprise

Output: slaughter traits

Bulls that hit the market specification had on average a slaughter age of 479 days (SD±20 day; 15.99 months) and were predominately early spring born calves (January or February). The mean birth date for the group was the 2nd February (SD±16 days). This data implies that early spring born calves hit their performance target more readily and are thus more suited to the intensive 16 month-bull beef system compared to their late spring born contemporaries. Carcass weight for the programme averaged 283 kg and ranged from 267 kg to 308 kg between participants. Carcass conformation in the bulls hitting the spec was predominantly 'O' (83%) and 'R' (13%) with a fat class of 2=/+ (85%).

Feed budget

The feed budget for the 16 month bull system was formulated based on detailed farm records from the participants in the programme, matched to the estimated intake potential of the animal. The annual feed budget for the 2011/2012 production cycle was 57 per cent supplementary concentrate, 26 per cent grazed grass and 17 per cent grass silage. Total lifetime concentrate input averaged 1.66 t. (SD 0.17) and ranged from a minimum input of 1.53 t to a maximum input of 1.95 t. The variation in concentrate consumption between farms can mainly be attributed to level of supplementation necessary during the grazing season. The remaining feed from the system came in the form of 735 kg dry matter (DM) of grazed grass and a silage requirement of 510 kg DM.

Financial performance for the Dairy Calf-to-Beef Programme

Input costs are as follows; calf purchase price €156 (ranging from €120-217), beef price €4.00 / kg and a concentrate price of €270 / t. (ranging for €265-€290 / t.). Mortality loss of five per cent was also included. Results show that total production cost (including purchase price, feed cost, mortality, veterinary, medicine and marketing costs) for the 16 month-bull beef system was €882 / hd and this ran between farms from a low of €779 / hd to a high €990 / hd. Total output across the farms was €1132 / hd. This left on average a margin / head of €250. However, it must be acknowledged that margins did vary from €86 to €330 between participants. This variation is principally due to the level of animal performance and production costs attained at farm level.

Important factors to consider before undertaking a dairy beef enterprise

Day-to-day experience from the participating farms highlights a number of important factors to consider before progressing down a 16-month bull finishing enterprise.

High level of working capital: a dairy beef production system is relatively easy to get into when you take into account calf purchase price. However, it must be stressed that a 16-month calf to beef production system requires very high levels of investment. With lifetime production costs ranging in the region from €800 to €1,000 / head, the capital required to bring 50 calves to slaughter can rise as high as €40,000 to €50,000. If not managed correctly, this can put immense pressure on cashflow.

Grass utilization: participants who undertook a 16-month spring-born bull finishing system as the sole enterprise on their farm found that the volume of grass utilized, as both grazed grass and grass silage, was very low. This is because calves have a low intake requirement for grass during the first grazing season while the winter finishing diet is based on ad-lib meal feeding. The net effect of this is high volumes of silage produced with no animals present to utilize it.

Specialised production system: There is no doubting that successfully achieving the targets of a 16-month bull production system requires very high levels of management. There is very little room for error. You need to look at your own system and see if it is the right fit for you. Factors like the quality of grassland on your farm, housing facilities for young calves or the cost at which you can purchase concentrates for example can have a huge impact on the feasibility of the system.

Type of calves selected: Analysis of the bulls that did not meet the specification showed the date of birth of the calf, calf quality and performance during the first grazing season having a very significant impact on the number of calves meeting the 16-month spec. Animals born in March/April found it nearly impossible to meet programme specifications irrespective of the level of concentrates fed. Calf quality is also critical. Poor quality calves at purchase (liveweight and conformation) failed in the majority of cases to compensate in later life for a poor start. Many of these calves failed to hit the conformation grade and fat cover even when slaughtered at older ages.

Notes

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NDP
National Development Plan 2007 - 2013

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Agriculture and Food Development Authority

Fermoy Print & Design 025-31355