Profit Drivers for Suckler and Dairy Calf to Beef Systems

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Introduction

The value of beef and cattle output in 2013 for Ireland was €2.1 billion, representing 30% of total agricultural output, and was the largest single agricultural sector. However, profitability at farm level is extremely low with the majority of beef farmers making a net loss when farm support payments are excluded from income. Due to the considerably lower comparative cost of grazed grass as a feedstuff, increasing the proportion of grazed grass in the annual feed budget is critical to improve the profitability beef cattle production systems in Ireland. This must be done in the context of maximising the value of carcass beef produced per animal on the farm. In this paper we outline the key drivers influencing profitability and quantify the financial returns from suckler and dairy calf to beef production systems.

Key principles

The three key areas underpinning profitability beef cattle production systems are presented in Figure 1 and can be summarised as maximising financial returns by enabling the potential of beef cattle to be met within grass-based systems.

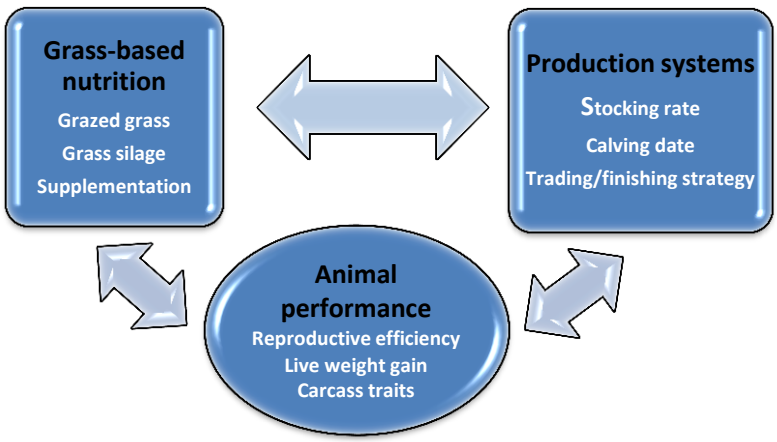

Figure 1: Key principles underpinning profitable suckler and dairy beef production systems

Grass-based nutrition

Irish grassland has the potential to produce high yields of highly digestible herbage due to favourable climate and soil types. Thus, Irish livestock farmers have a competitive advantage when compared to pigs, poultry and cattle feedlot systems, which require high quantities of concentrate feeding. Irish beef production systems must exploit this opportunity to grow and utilise grass efficiently. Grassland management revolves around a flexible rotational grazing system, with the objective being to achieve high animal performance from high digestibility leafy grass over a long grazing season. Grass conservation is very important due to the obvious necessity of producing silage for the indoor winter period and because a high proportion of total annual feed costs is for grass silage production. Additionally, silage harvesting is an integral part of grassland

management on beef farms. In Grange, the objective is to produce high digestibility first-harvest grass silage for progeny (75% dry matter digestibility (DMD)) and moderate digestibility (higher yields) silage for cows (67% DMD). The annual feed budget (dry matter (DM) basis) for the Grange calf-to-weanling system comprises *ca.* 70% grazed grass, 25% grass silage and 5% concentrates and for the calf-to-beef system, *ca*. 60% grazed grass, 30% grass silage and 10% concentrates. Obviously, these proportions are largely constrained by the prevailing environment and, thus, will differ accordingly. Nevertheless, it is estimated that currently, on average, grazed grass constitutes 51% of the total feed budget on Irish suckler beef farms and total herbage utilised is less than 5 t DM/ha. Recent analysis (Teagasc, 2013) suggested that, based on the prevailing level of technology uptake on beef farms, the proportion of grazed grass in the annual feed budget could increase modestly and herbage utilised increased substantially (when stocking rate increases are also taken into consideration) by 2020.

Notwithstanding the focus on maximising grazed grass in the total feed budget, concentrate supplementation is necessary to make up the deficit in nutrient supply from forage and when grass or grass silage supply declines. In integrated suckler and dairy calf-to-beef systems, supplementation of calves (1 kg/day) occurs pre- and post-weaning; supplementation levels are typically higher (2-3 kg/d) in calf-to-weanling systems. Weanlings are generally supplemented with 1-2kg concentrate daily during the first winter to grow at ~0.6 kg live weight per day and avail of compensatory growth during the subsequent grazing season. Finishing cattle receive higher levels of supplementation daily – heifers 3-4 kg, steers 4-5 kg and bulls 5 kg to *ad libitum* concentrates. Concentrate supplementation of cows (1-2 kg daily) is confined to first-calvers, from calving until turnout to pasture.

Animal performance

To ensure high levels of profitability from beef production systems, animal productivity, or output per livestock unit, must be high. High output per LU is determined by weight for age and carcass quality of the progeny and, in the case of suckler systems, reproductive performance of the cow herd.

- *Weight for age and carcass quality*

Drennan and McGee (2009) identified three important factors influencing growth rate and carcass quality of beef progeny: 1) use of late-maturing continental breeds, 2) availing of hybrid vigour and, 3) milk production of the dam in the case of suckler beef systems. Drennan and McGee (2009) concluded that suckler dams should have at least 50% and preferably 75% of a late-maturing continental breed to produce progeny suitable for higher-priced markets as a result of improved conformation and leaner carcasses. Murphy et al. (2008a,b) found that progeny from crossbred cows with Friesian or Simmental ancestry had higher carcass weight for age than ¾ or purebred beef breed suckler cows (Table 1). These differences in carcass growth reflected differences in calf pre-weaning gain due to milk yield of the dam. However, progeny from cows with Friesian ancestry had poorer conformation and were fatter than those from purebred beef breed cows.

Table 1. Impact of suckler cow breeding on weight for age and carcass conformation and fat score of progeny (Source: Murphy et al., 2008a,b)

	Beef-Friesian	3/4 beef	3/4 beef (Sim)[1]	Purebred beef
Pre-weaning gain (kg/d)	1.12	1.00	1.07	0.92
Post-weaning gain to slaughter (kg/d)	0.96	0.95	0.98	0.96
Kill out proportion (g/kg)	554	562	558	571
Carcass weight for age (kg/d)	0.61	0.58	0.61	0.59
Carcass conformation score[2]	3.23	3.23	3.36	3.55
Carcass fat score[3]	2.9	2.8	2.8	2.5

[1]3/4 beef breed suckler cows including 50% Simmental breeding. [2]Scale 1 to 5 (best). [3]Scale 1 to 5 (fattest)

- *Reproductive performance*

Data from the Irish Cattle Breeding Federation (ICBF) suggests that average calving rate (i.e. number of live calves produced per cow on the farm) for Irish suckler beef farms is 0.83. In other words, for every 100 cows, only 83 weanlings are produced. This low level of reproductive performance is an obvious contributor to low levels of profitability on Irish suckler beef farms as the cost of carrying each suckler cow is only offset by 0.83 weanlings.

The calving rate is largely a function of two variables; calving interval and pregnancy rate. Analysis of data from spring-calving suckler cows at Grange between 1987 and 1999 showed that a calving interval of 367 days and a pregnancy rate of 94% were achieved (Drennan and Berry, 2006). The results show that under appropriate levels of management, good reproductive performance can be attained in a spring-calving suckler herd.

To obtain these levels of live weight and reproductive performance, the breeding policy should exploit breed differences and hybrid vigour or heterosis (advantage to crossbreds over the average of the parent breeds). Good reproductive performance (i.e. producing close to one healthy calf per cow exposed for breeding) is critical, and ideally cows need to first calve at 2 years old. Research shows that the advantage expected from using a cross-bred suckler cow as opposed to a purebred in terms of kg of calf weaned per cow put to the bull is about 13%. In addition, using a sire from a third breed increases the weight of calf weaned per cow exposed for breeding by approximately a further 8 %. Animals of high genetic merit should be used and sires selected on the basis of the new beef breeding indexes: Replacement Index where replacement heifers (homebred or purchased) are selected for breeding and Terminal Index where progeny are produced for slaughter. High lifetime live weight gain of progeny i.e. attaining high weight for age during pre-weaning (combining cow milk yield and the animal's own genetic capacity for growth) and post-weaning (genetic merit, feeding management and exploiting compensatory growth) coupled with good carcass traits is essential.

Production Systems

Economic analysis of suckler and dairy calf-to-beef production system comparisons at Grange has shown that where individual animal performance remains high, stocking rate is the main driver of farm profitability. Consequently, operating at a relatively high

stocking rate is important. However, stocking rates on beef farms in Ireland are very low as indicated by the Teagasc National Farm Survey (NFS; Hennessy et al., 2013), with a mean value of 1.06 LU/ha for cattle rearing farms and 1.25 LU/ha for non-breeding farms in 2012. Correspondingly, output value and gross farm margin were also very low at €651/ha and €287/ha, respectively for cattle rearing farms and €830/ha and €368/ha, respectively for non-breeding farms.

For suckler beef systems, turnout date of cows and progeny is a critical element influencing composition of the annual feed budget (Table 2). Where grass is available and where grazing conditions are appropriate, earlier turnout increases the proportion of grazed grass in the total farm feed budget and hence, improves profitability. Previously, analysis indicated that advancing turnout date by one day increased net margin by €1.54 per cow due to differences in feed and slurry handling costs. Although this analysis was based on prices prevailing in 2009, the principles still apply and indeed the magnitude of the effect at current prices are likely to be greater. Earlier turnout has also been shown to result in improved animal performance (Kyne et al., 2001; Gould et al., 2010; O'Riordan et al., 2011), although in these studies this advantage is largely diminished by the end of the grazing season due to the effects of compensatory growth.

Table 2. Impact of turnout date of suckler cows on the total farm feed budget and financial performance

	Turnout date of suckler cows		
	Start of grazing season (Feb 23)	*Plus 3 weeks*	*Plus 6 weeks*
Annual feed budget (% of total DM fed)			
Grazed grass	65	62	58
Grass silage	27	30	33
Concentrates	8	8	9
Financial results (€/ha)			
Gross output	1,671	1,672	1,674
Variable costs	927	960	1,015
Gross margin	743	712	660
Fixed costs	432	433	435
Net margin	311	279	225

(Source: Teagasc, Grange)

Suckler beef production in Ireland is predominantly based on spring-calving cows with 80% of calvings between January and June. However, there continues to be an interest in autumn-calving systems. A key motivation for autumn-calving in many cases is to provide weanlings for the premium priced, live export market. This market requires E and U grade weanlings and in this respect, autumn-calving systems facilitate greater use of AI as cows are indoors during the breeding season, thus providing for increased sire selectivity and higher quality (muscularity and weight for age) progeny. Autumn-born weanlings are also available for sale earlier in the season and can therefore, avoid the peak weanling supply period in late autumn. Where sale is delayed until this peak supply period, sale live weight is greater and hence, weanling/yearling value is also

greater. Where a split-calving pattern is operated, i.e. calving a proportion of the cow-herd in spring and the remainder in autumn, a further advantage is that labour requirements are not concentrated into a single period. However, autumn-calving systems have higher costs relative to spring-calving systems. Firstly, feed costs are typically greater because the cow is lactating during the winter indoor feeding period and requires higher quality silage and/or concentrate supplementation. Secondly, housing/facility costs are greater as additional creep areas for calves are required. Previous analsyis at Teagasc, Grange (Figure 2; Crosson and McGee, 2011) showed: 1) Spring-calving systems were more profitable. 2) The profitability of autumn-calving systems increased at a greater rate as weanling price increases. In essence, the additional weanling price is captured to a greater degree by the additional liveweight output from autumn-calving systems. 3) A weanling price of €167/100 kg and €204/100 kg was required to breakeven in spring- and autumn-calving systems, respectively.

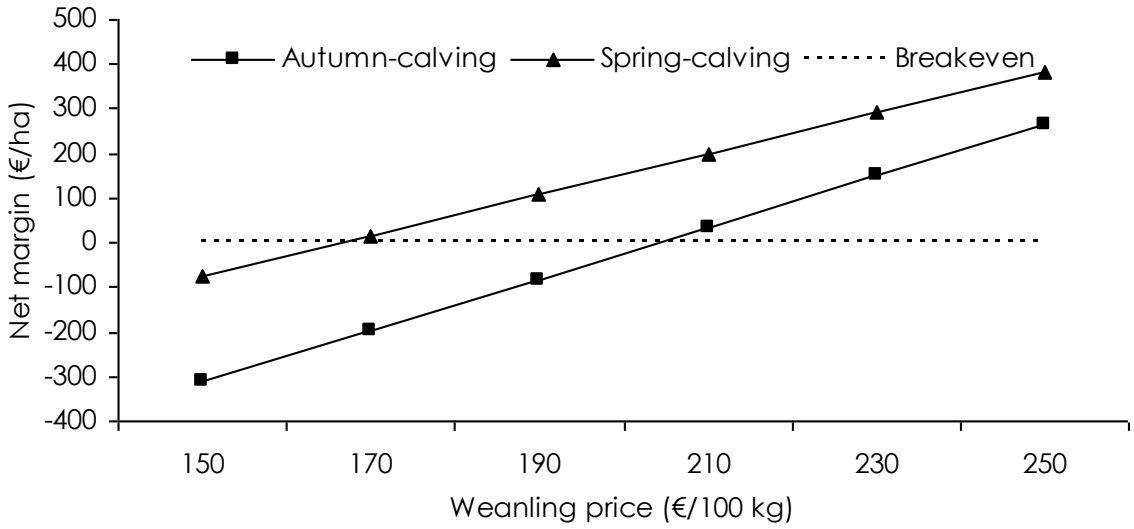

Figure 2. Impact of calving date on net farm margin for suckler calf-to-weanling production systems (Source: Crosson and McGee, 2011).

Economic comparison of suckler beef production systems

A weanling system and four integrated calf-to-beef suckler spring–calving production systems were compared (Table 3). In the weanling system, weanlings were sold at 9 months of age following a 90-day creep feeding (225 kg/calf) period. For all integrated calf-to-beef systems, heifers were finished indoors at 20 months of age. Two steer systems were compared: in the first system, steers were finished off pasture at 20 months of age after receiving 5 kg concentrates daily for the final 75 days of the grazing season. The second system involved finishing steers at 24 months of age following a second indoor winter. Two bull systems were compared: in the first system weaned bulls were housed and offered high digestibility grass silage and concentrates prior to slaughter at 15/16 months of age. In the second system, weaned bulls were stored for the first winter, turned out to grass for a 100 day grazing period and then housed for finishing on *ad libitum* concentrate at 18/19 months of age. For all systems, the farm area was 40 hectare and mean calving date was 12 March.

The number of cows calving per hectare was lower where progeny are retained on the farm for longer e.g. there are more cows calving in the weanling system than in the calf-to-beef systems. Feed budgets differed considerably across systems with the proportion of grazed grass being lower and proportion of concentrate being higher for calf-to-beef systems, especially bull/heifer systems, when compared to the weanling system, reflecting the concentrate feed requirements of the finishing phase. The calf-to-weanling system was least profitable for the base price scenario, the bull & heifer beef system was most profitable and the steer & heifer system was intermediate in terms of profitability. However, the market risks pertaining to bull beef systems must be borne in mind when evaluating these systems.

Table 3. Comparison of alternative suckler beef production systems[1].

Male age at sale (months; m)	**9m**	**20m steer**	**24m steer**	**16m bull**	**19m bull**
Heifer age at sale (months; m)	**9m**	**20m**	**20m**	**20m**	**20m**
Cows calving/ha	2.3	1.64	1.49	1.83	1.69
Grazed grass - % total feed	67	62	63	58	61
Concentrates fed (kg per cow)	307	525	407	790	710
Male carcass weight (kg)	-	338	397	372	398
Carcass output[2] (kg/ha)	86	567	556	660	630
Variable costs (€/ha)	1,061	1,036	1,048	1,340	1,195
Total farm costs (€/ha)	2,160	2,022	2,018	2,391	2,177
Total farm costs (€/kg[3])	2.13	3.58	3.63	3.62	3.45
Gross margin[4] (€/ha)					
Base price[5]	803	936	911	977	1,030
High price[6]	*1,004*	1,219	1,189	*1,307*	*1,345*
Low price[7]	*603*	654	633	*647*	*714*
Net margin (€/ha)					
Base price[5]	180	293	255	308	401
High price[6]	*381*	575	531	*638*	*716*
Low price[7]	*-20*	10	-20	*-22*	*86*

[1]Assumptions: Grass utilised, 10 t DM/ha. CAN, €320/t. Urea, €360/t. Concentrate feed ration, €260/t. Maiden heifer cost, €1,000/hd. Opportunity costs for owned land and family labour are not included. [2]Includes cull cow output. [3]Costs per kg live weight for the weanling systems, costs per kg carcass weight for the systems taking progeny through to beef. Includes replacement heifer costs. [4]Gross margin = sales – replacement heifer costs – variable costs. [5]Base price; €2.40/kg live weight for the weanling systems, €4.00/kg carcass for the finishing systems. [6]High price; €2.65/kg live weight for the weanling systems, €4.50/kg carcass for the finishing systems. [7]Low price; €2.15/kg live weight for the weanling systems, €3.50/kg carcass for the finishing systems.

Economic comparison of dairy calf to beef production systems

A wide range of production systems are possible for beef crossbred calves originating from the dairy herd 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 provided a market outlet is available for these animals. However, if concentrate price is high some bull production systems can

become loss-making. For the purpose of this paper, four production systems are described; two bull and two steer production systems. The steer systems involve differing slaughter ages; 21 months or 24 months of age. In the 21 month system, 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 second grazing season. 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). The 24 month system is the most commonly practiced system for Holstein-Friesian steers and targets are based on research carried out at Teagasc, Grange. Management is similar to the 21 month steer system. Finishing occurs during the second winter and cattle are offered good quality grass silage and 5 to 6 kg concentrates. Market requirements dictate that bulls be slaughtered at less than 16 months of age and this is the first system evaluated. 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. There is also a market for older bulls (normally less than 20 months of age) and therefore, the second bull system quantifies the benefit of a second season at grass and thus bulls are slaughtered at 19 months of age. 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.

Table 4 shows the financial performance of the calf to steer and bull beef production systems. The figures are based on a calf purchase price of €100/head, a base beef price of €3.75/kg and a concentrate price of €260/t. At a fixed stocking rate (in this case 200 kg organic N per ha) the number of animal units carried per hectare varied depending on age at slaughter and was therefore highest for the bull beef system finishing at 16 months of age and lowest for the steer beef system finishing at 24 months of age. Concentrate feed requirement was also highest for the 16 month bull system. Live weight and carcass weight output were highest for the bull beef systems. Costs were also highest for the bull beef systems largely reflecting concentrate inputs in these systems. Across all systems there was an 86 c/kg differential between the most efficient (21 month steer) and most expensive (16 month bull) system. The steer systems were more profitable than the 16 month bull systems, however the 19 month bull system was most profitable across all systems. At the base price of €3.75, gross margin per head was approximately €140 for the 16 month bull system and €400 per head for remaining three systems. The 15 month system has a very modest land requirement and therefore, these systems are normally run in conjunction with a second system to make optimal use of grazed grass. Despite the limited land requirement, 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.

Table 4. Comparison of alternative dairy calf to beef production systems[1].

Male age at sale (months; m)	**21m Steer**	**24m Steer**	**16m Bull**	**19m Bull**
Animal units/ha	3.0	2.5	4.7	3.5
Grazed grass - % total feed	69%	51%	18%	37%
Concentrates fed (kg per animal unit)	586	1,093	2,011	1,633
Male carcass weight (kg)	262	320	256	320
Carcass output (kg/ha)	785	790	1,189	1,118
Variable costs (€/ha)	1,444	1,637	3,294	2,420
Total farm costs (€/ha)	2,309	2,524	4,540	3,401
Total farm costs (€/kg)	2.94	3.19	3.82	3.04
Gross margin[3] (€/ha)				
Base price[4]	1185	1066	640	1,404
High price[5]	*1,578*	*1,461*	*1,199*	*1,963*
Low price[6]	*793*	*671*	*81*	*845*
Net margin (€/ha)				
Base price[4]	620	426	-140	772
High price[5]	*1012*	*821*	*418*	*1331*
Low price[6]	*227*	*31*	*-699*	*213*

[1]Assumptions: Stocking rate, 200 kg organic N/ha. CAN, €320/t. Urea, €360/t. Concentrate feed ration, €260/t. Opportunity costs for owned land and family labour are not included. [3]Gross margin = sales – replacement heifer costs – variable costs. [4]Base price; €3.75/kg carcass. [5]High price; €4.25/kg carcass. [6]Low price; €3.25/kg carcass.