Grange dairy calf-to-beef system evaluation

Nicky Byrne[1], Donall Fahy[1], Jamie O'Driscoll[1], Mark Kearney[1] and Noirin McHugh[2]

[1]*Teagasc, Animal & Grassland Research and Innovation Centre, Grange, Dunsany, Co. Meath;*
[2]*Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork*

Summary

- Dairy-beef progeny from beef sires with high-genetic merit for carcass traits have greater carcass, economic and environmental efficiency.
- Performance, profitability, greenhouse gas emissions, and human-edible protein efficiency improved with increasing carcass merit.
- Increased conformation and reduced feed costs were key profit drivers.

Introduction

Due to the expansion of the national dairy herd, the number of dairy-beef animals has increased in recent years, and now accounts for 63% of the cattle processed in Irish meat plants. Concurrently, there has been a decrease in carcass conformation score in the progeny from dairy dams bred using both beef and dairy sires. The selection criteria for beef sires used on the dairy herd (calving ease, gestation length and breed) places insufficient emphasis on genetic merit for carcass traits to counteract the poor and declining beef traits in Irish dairy cow genetics. Improved reproductive efficiency, greater usage of sexed semen and reduced heifer replacement rates have facilitated greater use of high genetic merit beef sires. These superior dairy-beef genetics, coupled with good management practices at farm level, can create more profitable grass-based dairy-beef systems with reduced slaughter age and environmental impact.

Grange dairy calf-to-beef study

The objective of the study was to compare the physical and financial performance of male progeny from three dairy-beef genetic groups, within an efficient grass-based production system. The sire genetic groups were Holstein-Friesian (HF) and two Angus (AAX) groups representing the main calf breeds born in the dairy herd. The HF group were the progeny of the top four sires on the Economic Breeding Index (EBI) active bull list in the previous breeding season. The two AAX groups were the progeny of AA sires that were ranked high (HIGH AAX; +8.1 kg carcass, 0.83 conformation) or low (LOW AAX; -3.7 kg carcass, 0.53 conformation) for carcass weight and conformation score, but both AAX groups had similar breeding values for calving ease and were used extensively across the national dairy herd. All progeny were from HF dams and sired by AI bulls.

In both spring 2018 and 2019, 120 male calves were purchased from 33 dairy farms throughout the country at approximately 21 days of age. The effect of early-life calf nutrition (indoors) on lifetime performance was evaluated, whereby half of the calves in each of the three 'genetic' groups received either four or eight litres of milk replacer/day from 30 days of age until weaning. Subsequently, each of the three genetic groups were grazed separately but were managed identically. An intensive grass-based system of production was implemented based on 48-hour grass allocations and grazing to a post-grazing sward height of 4 cm. When housed for the first winter and finishing period, steers were offered high dry matter digestibility (DMD 75%) grass silage ad-libitum and 1.5 kg and 5 kg concentrates/day, respectively. Steers were body condition scored (BCS) fortnightly during the finishing phase, and were drafted for slaughter at a BCS of 3.75 (scale 1-5), equating to a target carcass fat score of between 3= and 4-. All inputs and outputs were measured and used to model the economic and environmental efficiency of the genetic groups.

Results

There were no differences in lifetime growth or carcass performance for calves reared on four or eight litre of milk/day. Despite the four litre treatment consuming 25 kg more concentrate (fresh weight basis) than the eight litre treatment, there was a saving of €33 per head during the calf-rearing phase as a result of feeding 20 kg less milk replacer. The HIGH and LOW AAX steers had the same slaughter age and finishing period (63 days), which was one month shorter than HF steers (Table 1).

Table 1. *The effect of sire carcass merit on animal, system and environmental efficiency within a grass-based dairy-beef system*

	HF	HIGH AAX	LOW AAX
Animal			
Age at slaughter (days)	686 (22.8 months)	656 (21.8 months)	657 (21.8 months)
Carcass weight (kg)	300	305	300
Carcass conformation (1-15)	3.8 (O-)	5.3 (O=)	5.1 (O=)
Carcass fat (1-15)	8.4 (3=)	8.9 (3+)	9.2 (3+)
Lifetime concentrate use (kg)	695	552	545
System			
Stocking rate (LU/ha)	2.9	2.7	2.7
Carcass output/ha (kg)	960	976	960
Net margin (€/ha)*	462	728	607
Net margin (€/kg carcass)	0.48	0.75	0.63
Cost of production, (€/kg carcass)	3.07	3.04	3.11
Environmental			
GHG emissions (kg CO_2e/kg carcass)	14.2	12.9	13.2
Human edible protein ratio (kg/kg)	0.75	1.05	1.02

Base price of €3.70/kg on the QPS grid; €0.20/kg QA payment and €0.10/kg AA breed bonus. Calf and finishing concentrate price €420 and €300/t, respectively. Protected urea price €387/t. *Net margin excludes land & labour charge and assumes a calf purchase price of €60 and €180 per head for HF and AAX sired bull calves, respectively.

There were small differences in carcass weight and conformation score between the AAX groups (numerically in favour of HIGH AAX). The HF steers had a similar carcass weight but were leaner and had poorer conformation than the AAX groups, which resulted in a lower carcass value. The percentage of the lifetime diet dry matter consumed as forage (grazed and conserved grass) was 87% for both AAX groups and 85% for HF. Over their lifetime, the AAX groups consumed a total of 549 kg of concentrate (fresh weight) compared with 695 kg consumed by the HF steers.

HIGH AAX steers achieved the highest net margin (Table 1), due to better carcass weight, conformation and value/kg carcass; both AAX groups performed better than HF steers due to better carcass performance and a shorter finishing period. The HIGH AAX steers had the lowest 'carbon footprint', producing 9% less CO_2 eq per kg carcass than HF steers. Both AAX groups were net producers of human edible protein, whereas HF steers produced 25% less protein at slaughter than they consumed in their lifetime, meaning that for every 1 kg of human edible protein fed to cattle only 0.75 kg of human edible protein was produced in the form of meat.

Conclusions

In summary, all groups achieved similar carcass weight, but the AAX groups produced a carcass with better conformation and higher value. As AAX steers were slaughtered at a younger age, they had lower variable costs (fewer inputs) than HF. The use of high carcass merit beef genetics on the dairy herd will play an important role in improving the sustainability of both the dairy and the beef sectors. Large scope exists to improve the carcass characteristics of beef-cross calves derived from the dairy herd by choosing bulls ranked highly on the Dairy Beef Index for carcass traits (page 164).