

# Dairy calf-to-beef production systems

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## Summary

- With the abolition of milk quotas in 2015, it is expected that there will be a greater number of dairy calves available for beef production.
- Dairy calf-to-beef production systems are sensitive to the price of calves, concentrates and finished beef.
- Pasture-based early-maturing dairy crossbred beef production systems can produce carcasses that have adequate weight and fat cover at slaughter. With their greater carcass production, late-maturing dairy-beef systems can deliver a high output per hectare.
- Utilising high quantities of pasture and achieving high output of animal product per hectare are fundamental to the profitability of the systems.

## Introduction

With the forecasted expansion of Irish dairy cow numbers following the abolition of milk quotas in 2015, there will likely be a greater number of dairy-bred calves available for beef production. Since Ireland's competitive advantage in milk production is based on efficient utilisation of pasture, milk production will continue to be focused on seasonal spring-calving production systems. In 2012, approximately two-thirds of dairy cows were mated to dairy sires, 22% were bred to early-maturing breeds and the remainder were bred to late-maturing continental types and other breeds. Given the low value for male dairy breed calves this spring, the plentiful supply of replacement heifers on dairy farms and the adoption of sexed semen on some dairy farms, it is possible that there may be an increase in the proportion of dairy-beef crossbred calves. Nevertheless, there will be a plentiful supply of male dairy breed calves (mainly Holstein-Friesian) coming from the dairy herd. With current market trends, issues surrounding age at slaughter and target carcass weight, finding the most profitable beef production systems for these male dairy calves is a challenge for the industry. Irrespective of the production system, it is imperative that a market outlet, and the approximate sale price, is established from the outset.

A wide range of beef systems are possible for dairy calves reflecting differences in breed, gender and finishing age. A production system must be decided on before calves are purchased. This will ensure that the optimum stocking rate that utilises grazed grass, facilities and labour efficiently for that production system is selected. Care must also be taken when purchasing calves as overpriced calves can greatly reduce the profitability of the system.

## Outline of male dairy calf-to-beef production systems

- **15 month bull system:** in this system early-born 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 with excellent 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 scores 2=/2+. This system meets UK market requirements 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 is 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 on concentrates *ad-libitum* over a 100 day period. Target carcass weight for this system is 320 kg.
- **21 month steer system:** for spring-born calves, indoor winter finishing can generally only be avoided by slaughtering cattle at a lighter carcass weight at the end of the second grazing season. Management is similar to the bull systems described previously, however calves are castrated towards the end of the first grazing season and are “stored” through the first winter on good quality grass silage and concentrates before turn-out for a second grazing season. Calves must have good life time performance and have an early birth date for this system. All breed types can be considered if their carcasses are commercially acceptable. Target carcass weight is 280 kg.
- **24 month steer system:** this is a commonly practiced system for Holstein-Friesian steers and targets are based on research carried out at Teagasc, Grange. Finishing occurs during the second winter and cattle are offered good quality grass silage and 5 to 6 kg concentrates. The target carcass weight is 320 kg.

## Results from dairy calf-to-beef systems in Johnstown Castle

Calves in the 15 month bull production system typically gained 0.80 kg/d during the first season at pasture. At housing, calves were built up to *ad-libitum* concentrates 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/head. Average daily gain during the finishing period was 1.35 kg. Bulls finished in this production system achieved a carcass weight of 265 kg, which was lower than the target carcass weight. Carcass conformation were ‘O=’ and ‘2=’, respectively.

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 100 days. They were then housed in June and finished on *ad-libitum* concentrates for 100 days. Concentrate input during the finishing period for bulls in this system was 1.2 tonnes/head and carcass weight was 320 kg. Conformation score was ‘O=’ with a fat class at slaughter of ‘2+’.

Steers in the 24 month system were slaughtered in spring with a concentrate input of 1 tonne/head. Carcass weight was 320 kg, with conformation score and fat class of O- and 3=, respectively. The earlier finished 21 month steers were slaughtered in November following a period of concentrate supplementation at pasture at the end of the second grazing season. Both steer systems utilise more grazed grass per head than bull production systems which reduces the costs of production. While the stocking rate potential is reduced when compared with a bull system the steer production systems are less vulnerable to an increase in concentrate price.

Table 1 shows the economics of the production systems described above. Assuming a calf price of €100, a base beef price (R3 steer) of €4.05 and a finishing concentrate price of €255, the 19 month bull production system was the most profitable on a gross margin per hectare basis, mainly due to the higher output per hectare and heavy carcass weight. Actual price payable depends on carcass grading, seasonality and eligibility for quality assurance bonus. However, it is important to note that with price discounts on bulls relative to steers, steer production systems become more profitable. The 15 month bull 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. This system was the least profitable on a per head basis. Gross margin per head for the steer production system ranged from €447 to €460. However, net margin per head was 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 1** — Performance targets and gross margins of male dairy calf to beef systems.

	Bulls		Steers	
	15 months	19 months	21 months	24 months
Age at slaughter				
Body weight (kg)				
Turnout	90	90	90	90
1st winter	240	240	240	240
Turnout (2nd season)	–	330	320	320
Live weight at start of finish	–	450	490	510
Live weight at slaughter	520	610	550	620
Beef price (€/kg)	4.12	3.66 (3.36 <sup>2</sup> )	3.81	3.87
Carcass weight (kg)	256	320	264	320
Net income <sup>1</sup> (€/hd)	974	1,092 (996)	927	1159
Variable costs (€)	739	691	480	700
Gross margin				
Per head (€)	235	401 (305)	447	460
Per hectare <sup>3</sup> (€)	–	1,403 (1,068)	1,341	1,150
Net margin				
Per head (€)	67	220 (124)	258	201
Per hectare (€)	–	770 (434)	774	503

Note: <sup>1</sup>Net income = sales – calf purchase price, <sup>2</sup>Beef price of €3.36 representing a reduction of 30 c/kg and <sup>3</sup>stocking rate of 200 kg organic N.

### What are the appropriate systems for dairy-beef crossbred calves?

For beef producers early-maturing dairy beef crossbred animals have the potential to achieve a commercially acceptable level of carcass fatness at a young age and are, therefore, suitable for systems of production that aim to finish at the end of the second grazing season producing saleable carcasses at a relatively low slaughter weight. Previous research carried out in Grange evaluated the merits of late maturing dairy beef crossbred animals. Robust, breed-specific, blueprints were developed. Carcass conformation for late-maturing heifer production systems were predominately 'O=/' O+' with carcass fat classes of 3-/=. Conformation scores for late maturing steer production systems were 70% R and 30% O with fat scores of '3'.

### Outline of dairy beef crossbred calf-to-beef production systems

- **19 month early-maturing heifer:** animals are at pasture for the first grazing season and are stored during the first winter on grass silage *ad-libitum* with limited concentrate supplementation. Heifers are slaughtered off pasture at the end of the second grazing season. Live weight at slaughter was 460 kg with a carcass weight of 235 kg.
- **21 month early-maturing steer:** animals are at pasture for the first grazing season and stored during the first winter on grass silage *ad-libitum* with limited amounts of concentrates. They are turned out to pasture for the second grazing season and slaughtered in November before the second housing. The target carcass weight in this system is 280 kg.
- **21 month late-maturing heifer:** is managed similarly to the 19 month early maturing heifer system. Heifers remain at pasture for an additional two months and are slaughtered in November at the end of the second grazing season. Live weight at slaughter is 520 kg with a target carcass weight of 270 kg.
- **24 month late-maturing steer:** this system is identical to the steer system described above for dairy steers. Finishing occurs during the second winter and cattle are offered good quality grass silage and 5 to 6 kg concentrates/head. The target carcass weight is 350 kg.

**Table 2** — Performance targets and gross margins of beef crossbred dairy calf-to-beef systems.

	EM heifer <sup>1</sup>	EM steer	LM heifer	LM steer
Age at slaughter (months)	19	21	21	24
Body weight (kg)				
Turnout	90	90	90	90
1st winter	230	240	240	240
Turnout (2nd season)	300	320	320	330
Live weight at 2nd housing	–	–	–	520
Live weight at slaughter	460	530	520	640
Calf price (€)	200	240	280	310
Beef price (€/kg)	3.98	3.81	3.84	3.92
Carcass weight (kg)	235	280	270	350
Net income <sup>2</sup> (€/hd)	716	796	763	1046
Variable costs (€)	431	437	437	661
Gross margin				
Per head (€)	285 (344) <sup>3</sup>	359 (429)	326	385
Per hectare <sup>4</sup> (€)	998 (1,204)	1,077 (1287)	978	963
Net margin				
Per head (€)	140 (199)	257 (327)	223	126
Per hectare (€)	490 (697)	771 (981)	669	315

Note: <sup>1</sup>EM = early maturing and LM = late maturing, <sup>2</sup>Net income = sales – calf purchase price, <sup>3</sup>Gross and net margins from early maturing systems including producer group bonus and <sup>4</sup>stocking rate of 200 kg organic N.

## Results from dairy beef crossbred production systems

Heifers in the 19 month production system were 462 kg at live weight at slaughter yielding a carcass of 234 kg. Carcass conformation for heifers in both production systems were predominately 'O=' with carcass fat classes of 3-/. Steers slaughtered in the 21 month production system had a live weight and carcass weight of 533 kg and 277 kg, respectively. Carcass conformation for steers in both production systems were predominately 'O=/ O+' with carcass fat classes of 3-/.

Table 2 shows the economics of the dairy beef crossbred production systems. Assuming the calf prices outlined in Table 2, a base beef price of €4.05 plus quality assurance bonus and a finishing concentrate price of €255, the steer production systems are more profitable than heifer systems on a per head basis. Aside from the 24 month late-maturing steer system, which was greater due to the indoor finishing period, variable costs were similar across the production systems. Gross margin per head was greater for steers compared to heifers. However, on a per hectare basis small differences were apparent between the systems. The early-maturing producer group bonuses greatly increased the profitability of the systems.

## Conclusion

Various finishing systems can be employed on dairy calf-to-beef enterprises depending on the breed type, gender and production system. The success of the systems is based on achieving a high proportion of total life time gain from grazed grass. Profitability is vulnerable to increases in calf purchase price and concentrate input costs, as well as the selling price (incl. bonuses) of beef.