Quality Meat Scotland

Red Meat Topic Sheet: 20 Years of Genetic Gain: Building a More Efficient Scottish Beef Herd

Key Traits for Economic and Environmental Growth

Background:

This 20-year snapshot highlights the genetic gains made across Scotland's cattle industry. Through QMS-funded evaluations, breeders have focused on key carcase, efficiency and maternal traits that drive both profitability and environmental sustainability. Informed breeding decisions, guided by Estimated Breeding Values (EBVs), have helped farmers produce suckler beef that is more productive, efficient and sustainable.

Key Findings

The table below summarises the main genetic trends over the past two decades. Each trait shows how consistent selection for performance and efficiency has delivered measurable gains, reinforcing the role of genetics as a powerful tool for a profitable and environmentally sustainable beef sector.

Trait	Trend (2003–2023)	Key Insight / Impact
Days to Slaughter	↓ From +9.11 to -7 days	Faster finishing times improve profitability and cut GHG emissions by up to 10%.
Carcase Weight	↑ From -4.3 to +1.97 kg	Genetic gains help achieve optimal retail carcase weights more efficiently.
Growth Rate	↑ From -0.01 to +0.007 kg/day	Improved daily gain reduces production time and costs, boosting sustainability.
EUROP Conformation	Fluctuated (–0.43 → +0.44)	Conformation classification improved market value overall, enhancing carcase quality.
EUROP Fat	↓ then ↑ (0.18 → -0.47 → 0.21)	Genetic trend moving toward ideal fat cover for market requirements.
Age at First Calving	↓ From +3.14 to -7.82 days	Earlier calving improves herd productivity and reduces lifetime emissions.
Calving Interval	Variable (–0.5 → –1.17 → –0.5)	Genetic improvement supports shorter intervals and greater reproductive efficiency.
Productive Life Span	↑ Steady increase post-2009	Longer productive life enhances sustainability and profitability.
Calf Survival	↑ Continuous improvement	Strong genetic gain reducing calf mortality across the herd.
EnviroBeef (Carbon Efficiency)	↓ Steady reduction in footprint	Genetic selection driving measurable environmental progress across Scottish herds.

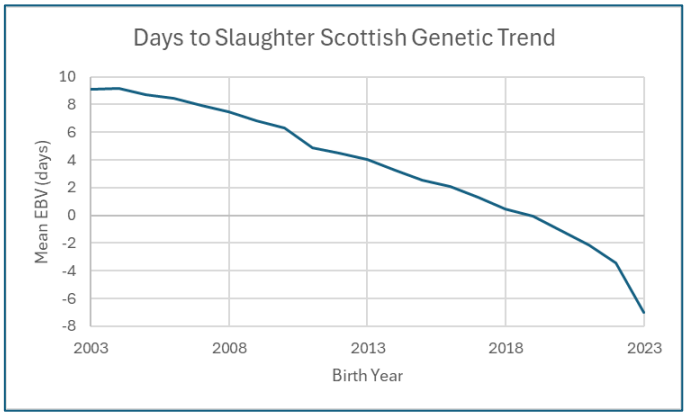
Days to Slaughter

What it is:
This trait measures the genetic potential for how quickly animals reach slaughter weight. Faster finishing reduces feed, housing and labour costs, and lowers total lifetime greenhouse gas (GHG) emissions.

Why it matters:
Reducing days to slaughter allows more animals to be processed efficiently, improving overall farm productivity. Achieving optimal slaughter weight at a younger age also reduces environmental impact, since animals require less feed over their lifetime. Selecting for true genetic potential ensures improvements are due to breeding, not just feeding or management changes.

Impact:
Modelling by Alltech E-CO2 suggests that reducing slaughter age from 24.8 to 20 months for heifers and from 23.1 to 18 months for steers can cut a farm's carbon footprint by around 10%.

Trend (2003–2023):
Mean EBV has decreased steadily from +9.11 days above the UK average in 2003 to –7 days below the UK average in 2023. This shows a clear genetic shift toward faster finishing, improving economic efficiency and reducing lifetime GHG emissions.



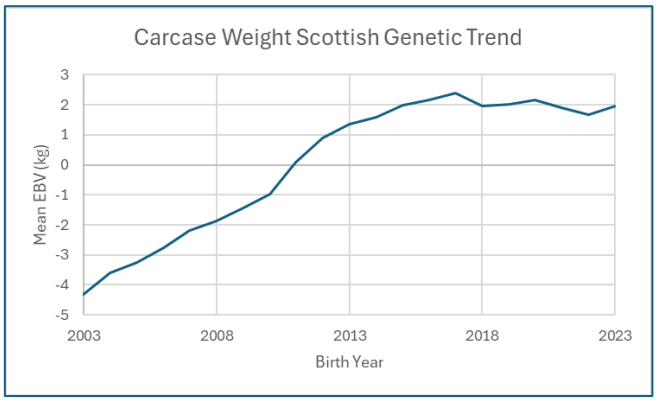
Carcase Weight

What it is:
The weight of the carcase after slaughter, important for meeting abattoir and retail standards (typically 270–400 kg deadweight, ~330 kg ideal).

Why it matters:
Hitting target carcase weights efficiently maximises profit, reduces waste, and lowers feed and nutrient use. Genetic improvements help farmers reach these weights consistently without overfeeding.

Impact:
Optimising carcase weight reduces production costs and environmental footprint while maintaining meat quality.

Trend (2003–2023):
Average EBV increased from –4.3 kg below the UK average in 2003 to +1.97 kg above the UK average in 2023. This reflects consistent genetic gains toward achieving optimal carcase weights for market and abattoir standards.



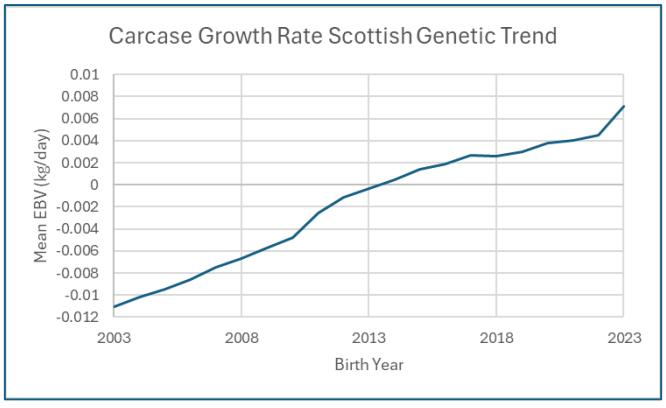
Growth Rate

What it is:
Measures daily weight gain in kg/day. Higher growth rate means animals reach slaughter weight faster.

Why it matters:
Faster-growing animals need less feed and time to reach market, reducing costs and environmental impact. It also allows for heavier or leaner carcases at the same age, improving efficiency and carcass quality.

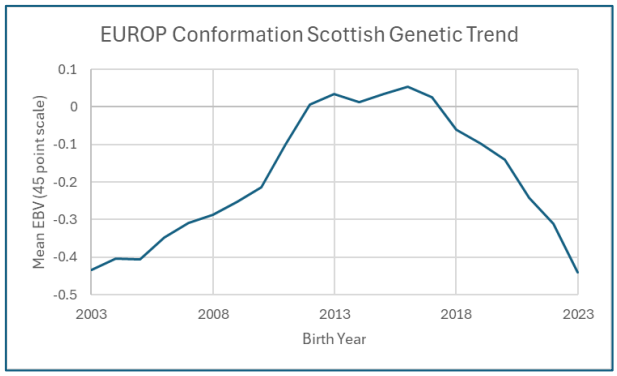
Impact:
Higher genetic potential for growth directly contributes to reduced age at slaughter and lower resource use.

Trend (2003–2023):
EBVs improved gradually from –0.01 kg/day in 2003 to +0.007 kg/day in 2023, indicating steady progress in genetic potential for daily weight gain. This supports faster finishing and more efficient production.



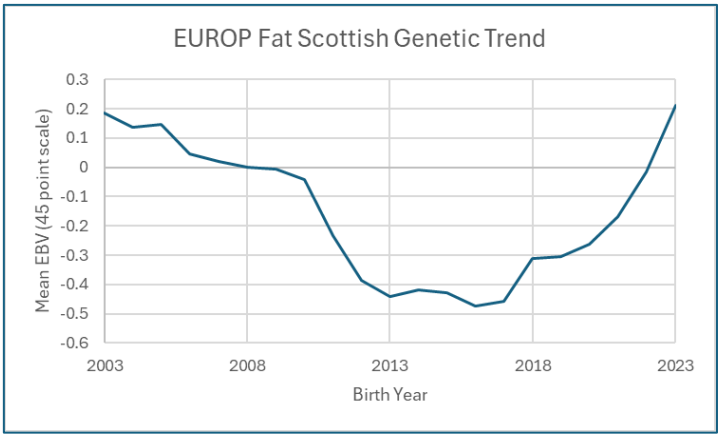
EUROP Conformation

What it is: Predicts carcase shape/quality at a given slaughter age using the EUROP (E – excellent, U – very good, R – good, O – poor and P – very poor) grid. Ideal Conformation grades are found in the middle of the EUROP grid.
Interpretation: Better conformation enhances market value and packing efficiency. While trends have fluctuated, overall genetic potential has improved, helping produce carcases that meet industry standards.
Trend (2003–2023):
EBVs rose from –0.43 in 2003 to a peak of 0.53 before settling at 0.44 in 2023. Overall, this shows modest improvement in carcass conformation, helping produce animals that meet market standards more consistently.



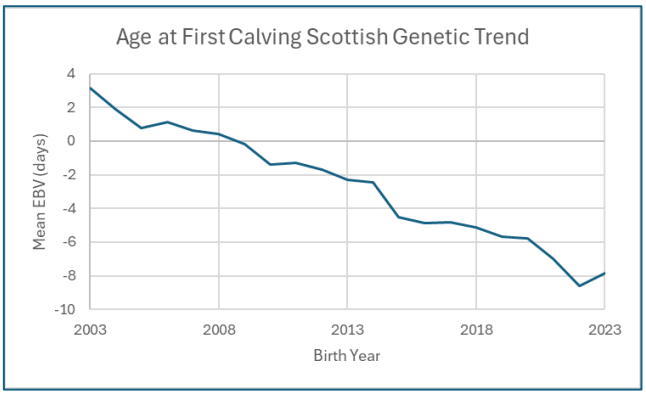
EUROP Fat

What it is: Predicts fat cover at slaughter. Leaner or optimal fat improves meat quality and reduces waste.
Interpretation: Selecting for ideal fat cover balances carcass quality and production efficiency. Trends show Scottish herds initially became leaner, then fat levels increased slightly to align with market preference.
Trend (2003–2023):
The EBV trend initially decreased from 0.18 in 2003 to –0.47 around 2017, indicating leaner carcasses, and has since risen to 0.21 in 2023. This shows selection for optimal fat cover, balancing production efficiency with market requirements.



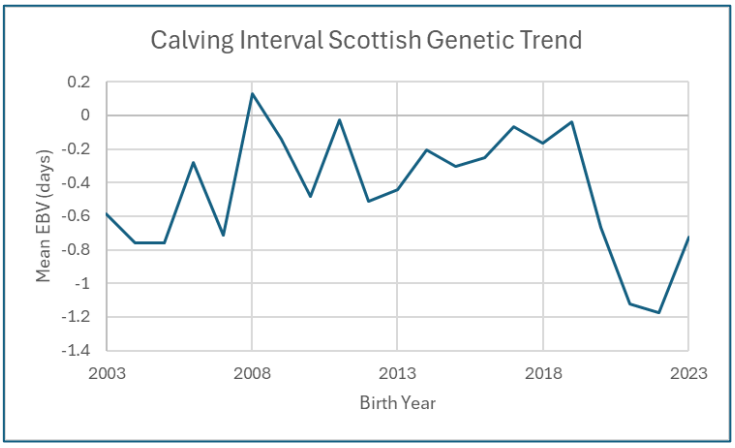
Age at First Calving

What it is: Age when heifers produce their first calf. Earlier calving improves herd productivity.
Interpretation: Reducing age at first calving increases lifetime productivity, lowers total GHG emissions per calf, and enhances economic efficiency. Genetic gains ensure this is achievable without compromising animal health.
Trend (2003–2023):
EBVs reduced from +3.14 days above the mean in 2003 to –7.82 days below the mean in 2023, demonstrating a clear genetic trend toward earlier calving. Earlier calving improves productivity and reduces overall lifetime emissions.



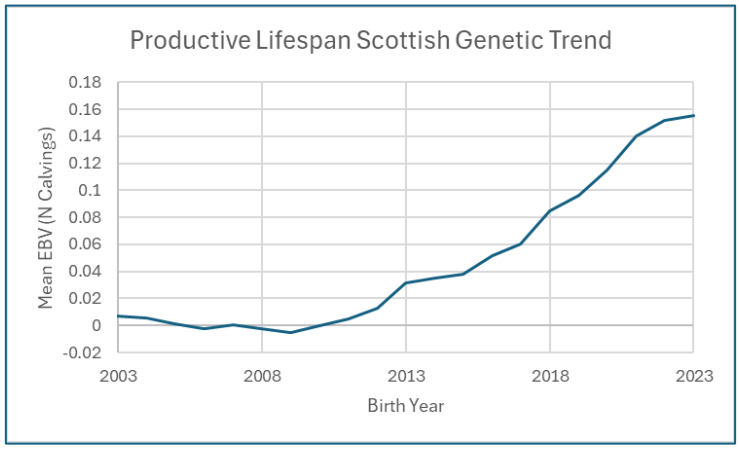
Calving Interval

What it is: Time between successive calves. Shorter intervals increase herd productivity.
Interpretation: Optimising calving intervals boosts the number of calves a cow can produce over her lifetime, improving profitability and reducing per-calf environmental impact.
Trend (2003–2023):
EBVs fluctuated modestly from –0.5 in 2003, dropping to –1.17 in 2019, and returning to –0.5 by 2023. Despite small variations, the overall trend shows improvement in reproductive efficiency.



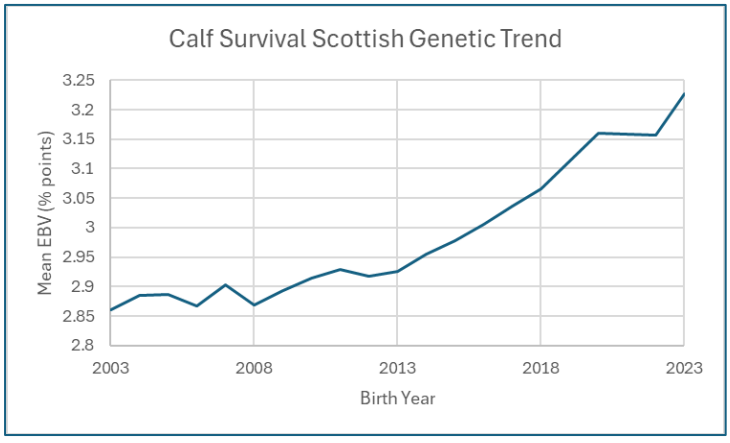
Productive Life Span

What it is: Expected number of calvings over an animal's lifetime. Longer productive life reduces replacement costs.
Interpretation: Longer-lived cows contribute more calves and reduce the need for replacements, improving both economic and environmental efficiency.
Trend (2003–2023):
EBVs were slightly negative or flat until 2009, after which they increased steadily. This indicates that genetic potential for longer productive life has improved over time, supporting herd longevity and profitability.



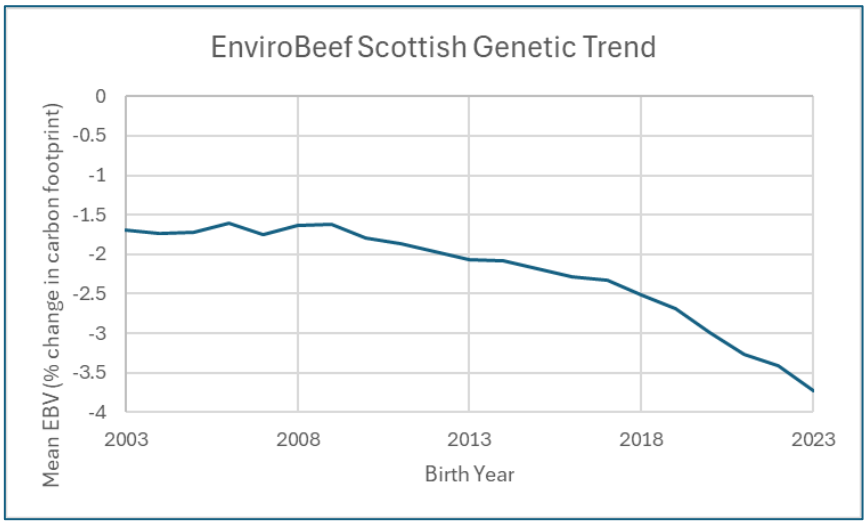
Calf Survival

What it is: Likelihood of calves surviving to adulthood.
Interpretation: Selecting for survival reduces mortality, improves efficiency, and ensures more calves reach market or breeding age. This also reduces wasted resources and associated emissions.
Trend (2003–2023):
EBVs show a steady upward trend, reaching an unprecedented high in 2023. This reflects consistent gains in genetic potential for calf survival, reducing mortality and improving herd productivity.



EnviroBeef (Carbon Efficiency)

What it is: Measures the genetic potential to reduce carbon footprint via efficiency.
Interpretation: Improving efficiency reduces feed requirements and lifetime emissions per animal, creating economic and environmental benefits. Progress in this trait shows Scottish farmers are breeding herds with lower environmental impact without compromising profitability.
Trend (2003–2023):
EBVs began relatively flat but have declined steadily toward 2023, showing a measurable reduction in carbon footprint. This indicates that genetic selection is driving both environmental and economic benefits in Scottish suckler herds.



Conclusion

Over the past 20 years, Scottish cattle breeders have made significant genetic gains across key traits that drive both economic and environmental performance. Improvements in growth, carcase quality, reproductive efficiency, and environmental efficiency show that informed breeding decisions using EBVs can deliver measurable benefits. These gains not only increase profitability and herd productivity but also reduce the environmental footprint of suckler beef production. Continuing to use genetic selection as a tool will help the Scottish beef sector remain competitive, sustainable, and resilient into the future.