Potential for Beef Breeding
Some thoughts from Irish Cattle Breeding Federation Society Limited (ICBF).

Andrew Cromie & Brian Wickham

19th April 2010

Background.

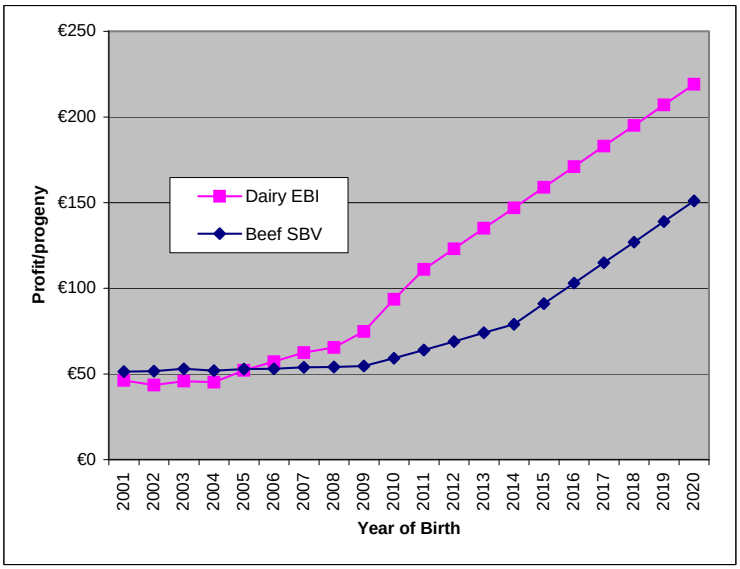
Recent trends from the ICBF database have indicated a 6% drop in the number of Suckler Beef Births in 2009, down from 994,261 in 2008, to 932,218 in 2009, a drop of some 6.2% (ICBF Update, 18 Dec 09). However, more recent analysis, would suggest a reduction in this rate of decline, with total suckler beef births for the year to date being 326,547, compared to 336,386 for the same period last year, a drop of some 2.9% in overall terms (ICBF Update, 17 Apr 10). Addressing this rate of decline and ensuring a profitable suckler beef industry is one of the key objectives of ICBF.

Genetic Trends.

The mission statement of ICBF is focused on genetic gain (in profit terms) for Irish dairy and beef farmers and its related industries. Recent genetic trends from ICBF have indicated major improvements in the profitability of our National dairy herd, with the average EBI having increased from €45 for females born in 2005, to €94 for females born in 2010, an increase of some €49. In cumulative terms these improvements are expected to deliver some €345 million to dairy farmers over the next 10-15 years (profit predictions having been independently verified by Teagasc using herd EBI and Teagasc profit monitor data (*Ramsbottom et al., 2009).*

Figure 1. Genetic Trend for our National Dairy and Beef Herds in Dairy Economic Breeding Index (EBI) and Suckler Beef Value (SBV) from 2000 to 2020.*

Year of	Dairy		Beef	
Birth	Dairy EBI	Cum Gain*	Beef SBV	Cum Gain*
2001	€46		€51	
2002	€44	-€5.4	€52	€0.6
2003	€46	-€0.9	€53	€3.4
2004	€45	-€2.2	€52	€1.2
2005	€52	€11.5	€53	€3.2
2006	€57	€21.9	€53	€3.4
2007	€62	€32.4	€54	€5.2
2008	€65	€38.3	€54	€5.4
2009	€75	€57.1	€55	€6.7
2010	€94	€94.5	€59	€15.7
2011	€111	€129.4	€64	€25.3
2012	€123	€153.4	€69	€35.3
2013	€135	€177.4	€74	€45.3
2014	€147	€201.4	€79	€55.3
2015	€159	€225.4	€91	€79.3
2016	€171	€249.4	€103	€103.3
2017	€183	€273.4	€115	€127.3
2018	€195	€297.4	€127	€151.3
2019	€207	€321.4	€139	€175.3
2020	€219	€345.4	€151	€199.3



**Cumulative gain is calculated as difference in gain from current year compared to previous year, summed over all years. Note cumulative gain figure is doubled, as EBI and SBV reflect only genes passed on to the progeny, with the other half coming from the mate at conception.*

The reasons for these increases in dairy EBI are linked to three industry initiatives over the past 10 years, including; (i) the introduction of the EBI in 2001, with widespread user acceptance/uptake by 2004, (ii) the establishment of the G€N€ IR€LAND dairy breeding program in 2005, which increased the scale and EBI of our progeny testing program from 25 average EBI bulls/year to 70 high EBI bulls/year, and (iii) the introduction of genomics in 2009. From a scenario of zero profit from breeding (prior to 2005 profit gains in milk production were being cancelled out by losses due to infertility), this is a remarkable turn-around and reflects the real long-term value of investment in cattle breeding.

Looking at genetic trends in Suckler Beef Value (Figure 1) indicates similar profit potential for beef cattle. For example, the SBV was first introduced in 2006, with only limited uptake. However, that would appear to have changed this year (SBV of commercial females has increased from €55 for females born in 2009 to €64 for females born in 2010). Assuming that this increase is maintained into the future, then, coupled with ongoing developments in our beef breeding programs (ICBF is currently in discussion with the industry regarding developments in beef G€N€ IR€LAND program and genomic evaluations), then a target of €200 million from beef breeding is achievable by 2020.

Changes in Individual Traits.

Assuming our goal is to maximise SBV gain (along the lines outlined in Figure 1), the next most relevant question is what level of gain (or loss) can we expect in the individual traits that are important to our beef industry. Answers to this question are given in Table 1, and are based on progeny performance from 1807 AI sires (some 756k records in total).

Table 1. Comparison of progeny performance for AI Sires, for SBV and key profit traits.

Traits	1 Star	2 Star	3 Star	4 Star	5 Star	Difference.	Description*
€uro-Star Indexes							
Suckler Beef Value	€30.9	€65.1	€77.4	€87.4	€115.1	**€84.2**	€168 more profit/progeny.
Predicted performnace - Genetics							
Calving Difficulty %	6.5	6.7	6.2	6.3	6.2	**-0.3**	Less difficult calvings (-0.6%)
Gestation Length Days	1.6	1.6	1.8	1.8	1.6	**0.0**	No change in gestation length
Mortality %	0.6	0.6	0.6	0.6	0.6	**-0.1**	Less calf mortality (-0.2%)
Weaning Weight Kg	-0.6	5.4	7.3	8.8	12.9	**13.5**	Greater weanling weight for age (+27.0 kg)
Calf Quality (cents/kg)	12.4	13.3	13.5	14.0	15.1	**2.7**	Greater weanling value for age (+5.4cents/kg)
Carcass weight Kg	8.4	13.8	16.4	18.1	22.6	**14.2**	Greater carcass weight for age (+28.4 kg)
Carcass conformation (1-15)	1.2	1.3	1.4	1.4	1.5	**0.3**	Greater carcass conformation (+0.6 points)
Carcass Fat (1-5)	-0.1	-0.2	-0.2	-0.2	-0.4	**-0.3**	Less carcass fat (-0.6 points)
Age at 1st Calving Days	2.7	-2.5	-1.3	-2.0	-5.7	**-8.4**	Younger age at first calving (-16.8 days)
Calving Difficulty % - Maternal	7.6	7.4	7.4	7.2	7.2	**-0.4**	Less difficult calvings on cows (-0.8 days)
Weaning Weight Kg - Maternal	1.4	2.9	2.7	3.1	3.6	**2.2**	Greater milk in daughters (+4.4 kg)
Calving Interval Days	-1.5	-1.6	-1.7	-1.8	-2.0	**-0.5**	Reduced calving interval (-1 day)
Cow Survival (% 1-2 lactation)	-0.1	0.0	0.1	0.1	0.3	**0.4**	Greater cow survival (+0.8% from 1st to 2nd parity)
Cull Cow Weight Kg	9.9	14.4	16.4	18.0	21.5	**11.6**	Greater cull cow weight for age (+23.2 kg)
Actual performance - Phenotypes.							
Calving Difficulty %	8.9	7.5	6.2	6.1	5.9	**-3.1**	Less difficult calvings (-6.2%)
Gestation Length Days	286.5	287.4	287.1	287.7	287.5	**1.0**	Greater gestation length (+2 days)
Mortality %	2.0	1.8	2.7	1.7	2.1	**0.1**	Increase in calf mortality (+0.2%)
Weaning Weight Kg	285.3	303.2	311.1	313.0	323.1	**37.8**	Greater weanling weight for age (+75.6 kg)
- Age at weanling days	233.1	233.6	231.9	230.4	233.0	**-0.1**	- Similar age at sale
Calf Quality (cents/kg)	175.6	174.9	176.8	176.6	181.3	**5.7**	Greater weanling value for age (+11.4 cents/kg)
Carcass weight Kg	338.1	352.4	354.5	363.6	371.6	**33.5**	Greater carcass weight for age (+67.0 kg)
- Age at slaughter	762.1	740.0	739.0	737.1	716.0	**-46.1**	- Slaughtered 92 days younger.
Carcass conformation (1-15)	7.3	7.9	8.1	8.2	8.5	**1.2**	Greater carcass conformation (+2.4 points)
Carcass Fat (1-5)	2.8	3.0	2.9	2.9	2.9	**0.1**	Increase in carcass fat score (+0.2)
Age at 1st Calving Days	907.1	909.0	919.2	918.0	920.4	**13.3**	Increase in age at first calving (+26.6 days)
Calving Difficulty % - Maternal	8.8	6.9	7.8	6.5	8.0	**-0.8**	Less difficult calvings on cows (-1.6%)
Weaning Weight Kg - Maternal	297.5	310.0	317.1	313.8	313.4	**15.9**	Greater milk in daughters (+31.8 kg)
Calving Interval Days	394.5	398.3	403.2	395.1	397.5	**3.0**	Greater calving interval (+6.0 days)
Cow Survival (% 1-2 lactation)	76.2	74.2	74.4	74.9	74.0	**-2.2**	Decrease in cow survival (-4.4%)
Cull Cow Weight Kg	258.3	265.4	280.3	274.8	285.0	**26.7**	Greater cull cow weight for age (+53.4 kg)

** Note. Differences must be multiplied by a factor of 2, as these only reflect differences between sires. Similar differences exist between 1 star and 5 star cows.*

This analysis clearly indicates the value of moving our Suckler beef herd from, on average, 1 or 2 star animals (the current genetic level of our National beef herd) to 5 star animals. For example, data from Figure 1 would indicate a SBV difference of €84 per progeny, between progeny of 1 star and 5 AI sires, with the majority of this improvement coming from; (i) better weaning weight for age (+13.5 kg), (iii) better carcass weight for age (+14.2 kg), and (iii) better maternal traits, especially maternal milk and fertility. The fact that these traits have the highest response is not surprising, as these are the traits with the highest weighting in the SBV. It is also important to note that the improvements outlined in Table 1, only reflect sire progeny differences. To get a full picture of the potential benefits of breeding, we must multiply each of the changes by a factor of 2, reflecting the improvements from both the sire (i.e., AI sire or stock bull sire) and the dam. Thus the difference in overall profit terms between the 1 and 5 star animals from Table 1, would be €168/progeny.

Looking more closely at actual performance (Table 1) indicates even larger difference than predicted based on genetic index alone. For example, whilst the ICBF indexes would indicate a difference of 14.2 kg in terms of weight for age at slaughter between progeny of 1 and 5 star AI sires, actual progeny performance indicates a difference of 33.5 kg at an even younger age (-46 days). These additional gains reflect the benefits of improved technical performance in other areas, such as

feeding and animal husbandry, which are both strongly linked to improvements in genetic index (as farmers become technically better at breeding they also improve in other areas of farm and business management).

Implications for 2020 Vision document.

Results presented in this document indicate the huge potential of beef breeding over the next 10 years. Genetic predictions would indicate that each of the following is achievable;

- ***Sucker Beef Value.*** An increase in SBV from current level of €50 (for cows in the National herd) to €150 (for cows to be born in 2020). Expressing this in terms of progeny value, indicates an increase in profit of €200/animal for animals born in 2020 (based on €100 gain on both the sire and dam side). Extrapolating data from Table 1 (where difference in SBV was €84 between 1 star and 5 star AI sires) suggests that this increase in profit will come from a combination of;
    - ***Increased Weaning weight.*** An extra 27.0 kg weaning weight, at the same age.
    - ***Increased Carcass weight.*** An extra 28.4 kg carcass weight, at the same age. Also, phenotypic performance indicates that these animals are being finished at younger ages (-46 days on average).
    - ***Increased weanling and carcass quality.*** An extra 5.4 cents/kg on weight at weaning and 0.6 points on carcass conformation score.
    - ***Increased cull cow weight.*** An extra 23.2 kg at slaughter.
    - ***Better maternal milk.*** An extra 4.4 kg milk at weanling.
    - ***Better fertility traits.*** An extra 16.8 days age at first calving, 1 day shorter calving interval and 0.8 % animals surviving between 1st and 2nd parity. However, unlike other traits outlined above, these improvements have not yet been borne out in terms of phenotypic performance, perhaps reflecting the lower level of data currently available for maternal traits in the ICBF database.

- ***Improved phenotypic performance.*** In addition to the genetic predictions outlined in Table 1, this analysis would also indicate major opportunities for improvement in other areas of technical performance. This is reflected in the larger than expected observed performances for each of the traits, indicating the strong association there is between increasing genetic merit and increasing technical performance in other areas.

- ***Development of G€N€ IR€LAND and Implementation of Genomics.*** As with the success of the dairy breeding program, the genetic predictions outlined above are based on the successful implementation of 3 major projects within the Irish beef industry; (i) Uptake and acceptance of SBV, (ii) the scaling up of our G€N€ IR€LAND beef program from the current 20 beef bulls with good SBV's (top 20%) to a target of 100 bulls with exceptional SBV's (top 2%), and (iii) the establishment of a research, development and implementation project, looking at genomics in beef cattle. The latter two initiatives are projects of major importance for the Irish beef industry and ones that we would urge the 2020 vision group to support, as we are confident that the implementation of these projects will successfully deliver increased output, at lower cost (i.e., profit) for our beef industry. A prize of €200 million is potentially available for beef farmers, with levels of gain similar to that which can be established from dairying. Given the strategic importance of our National Suckler herd, ICBF would urge the 2020 group, to consider these projects as it develops its strategy for our agri-industry.

…