



IRISH CATTLE BREEDING FEDERATION

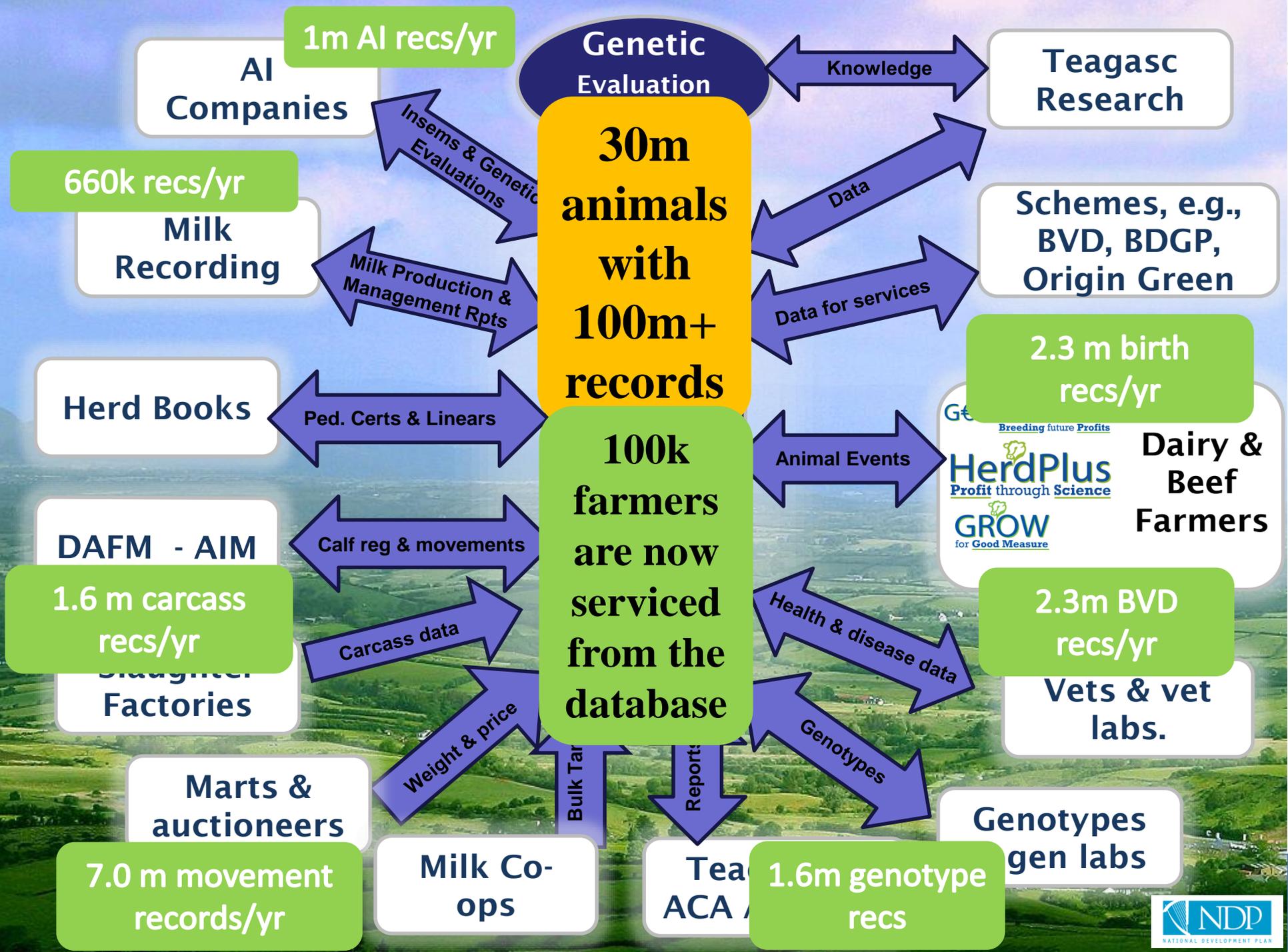
Genetic Indexes in Beef Cattle



Clodagh Ryan

Irish Cattle Breeding Federation.

- Established in 2000 as a co-op of 30 cattle breeding organisations
 - Farm orgs, AI comps, milk recording co-ops, herdbooks (shareholders) + DAFM
- Operating budget
 - 50% industry good (govt & tag) & 50% service income (industry service fees & ICBF herdplus)
- Based in West Cork, staff of 70 => servicing 100k farmers



€uro-Star Indexes

€uro-star Index

Replacement Graphics

Terminal Graphics

Linear Type

Pedigree

Evaluation History

Index Comparison

Star Rating (within Angus breed)	Economic Indexes	€uro value	Index reliability	Star Rating (across all beef breeds)
★★★★★	Replacement (per daughter lactation)	€148	61% (High)	★★★★★
★★★★★	Terminal	€99	72% (High)	★★★☆☆

- Profit Index, e.g., €80 more per calving
 - Multi-breed evaluations
- Star system; 5 star versus 1 star
 - Across all breeds. Also within breed
- Entire Population evaluation

Construction of Profit Indexes

- Collaboration with Teagasc (National research and advisory body)
- Bioeconomic model used
 - Based on a commercial production system
 - Reviewed on an annual basis

Farm system overview

	<u>2012</u>	<u>2015</u>
Mean annual R3 steer price (€/kg)	3.78	4.00
Labour – general (€/hr)	15.29	9.33
Labour – stockmanship (€/hr)	15.29	15.29
Concentrate (€/t)	255	300
CAN (€/t)	306	260
GDP deflator	18%	21%
Mean calving date	March 3	March 12
Farm stocking rate (organic N/ha)	210	200
Farm area (ha)	40	40
Cows calving	65.7	62.2
Weaning weight (kg)	317	318
Carcass weight (kg)	372	374
Mature cow weight (kg)	611	611
Gross margin per cow calving (€)*	492	638
Gross margin per ha (€)*	809	993

*Excluding land and labour

Terminal Index

- How *profitable* an animal's progeny will be for
 - liveweight
 - carcass traits
 - being finished for slaughter
- Calving traits & Docility
 - Unavoidable



Terminal Index

+ €8 Polledness
+ €25 Meat Quality

Feed Intake
16%

Calving Traits
25%

Docility
2%

Carcass Traits
57%

How do we compare?

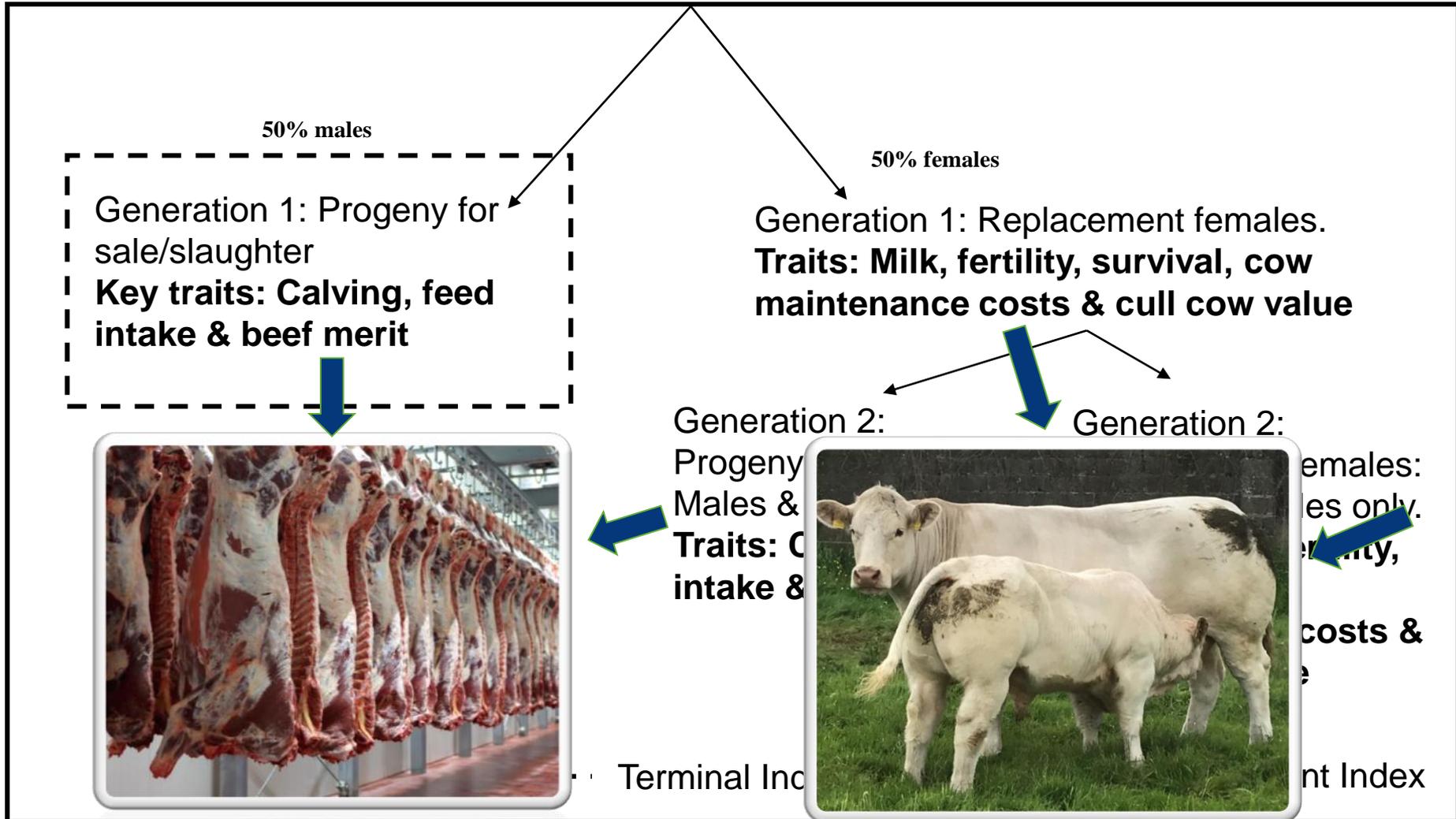
Trait Name	Ireland Terminal Index	France IABjbf	America Terminal Sire Index	Germany RZF	South Africa Terminal Index	Australia Northern Terminal
Carcass Weight/Beef Yield	y	y	y (hot)		y	y
Conformation	y	y				y
Carcass Fat	y		y			y
Rib Eye Area			y			y
Marbling			y			
Age at slaughter		y				
Weaning weight			y		y	y
Yearling Weight			y			
Muscle dev				y		
Birthweight			y		y	y
Calving	y					y
Mortality	y					
Gestation	y					
Feed Intake	y				y	
Docility	y					

Replacement Index

- How suitable female progeny will be for:
 - Calving ability
 - Milk
 - Fertility
 - Low maintenance
 - Producing progeny for Beef



Replacement Index



Replacement Index

Cow Traits
(71%)

Calf Traits
(29%)

+ €6 Polledness



How do we compare?

Trait Name	Ireland	France	Germany	South Africa	Australia
	Replacement Index	IVMAT	RZL	Cow Index	Domestic
Birthweight		y		y	y
Calving	y	y			y
Maternal Calving	y	y			y
Maternal Birthweight				y	
Weaning Weight		y		y	y
Maternal WWT	y	y		y	y
Muscle dev/Eye Muscle		y			y
Skeletal Dev		y			
Calving Interval	y		y	y	y
Mortality	y		y		
Survival	y		y	y	
Gestation					
AFC	y			y	
Cow Liveweight	y			y	y
Cull Cow Weight	y				
Docility	y				
Feed Intake	y				
Carcass Weight/Beef Yield	y			y	y
Conformation	y				
Carcass Fat	y				y

€uro-Star Indexes

<i>Across Breed</i>	<i>€urostar Rankings</i>	
★★★★★	5 Stars	<i>Index Value is in top 20% of all animals</i>
★★★★	4 Stars	<i>Index Value is in top 40% of all animals</i>
★★★	3 Stars	<i>Average Index Value</i>
★★	2 Stars	<i>Index Value is in bottom 40% of all animals</i>
★	1 Star	<i>Index Value is in bottom 20% of all animals</i>

- Within Breed stars are for ranking purebred animals from the same breed
- Across Breed stars show where the animal's index ranks against animals across all other breeds

For example, a bull may be 5 stars for a trait Within Breed, but 1 star Across Breeds, if the bull's breed has a lower Breed Average than the All Breeds Average for that trait.

E.g. NEX – Nelson - (December 2017 Evaluation)

Star Rating (within Charolais breed)	Key profit traits	Index value	Trait reliability	Star Rating (across all beef breeds)
★★★★★	Daughter milk (kg) Breed ave: -4.61kg, All breeds ave: 2.09kg	-2.30kg	97% (V High)	★☆☆☆☆

Genetic Variation in Charolais AI Sires

	Minimum	Mean	Maximum
Terminal Index	€53	€108	€175
Replacement Index	-€147	€16	€180
Carcass Weight	8.5kg	30.13kg	48.3kg
Carcass Conformation	1.14	1.87	2.95
Carcass Fat	-0.9	-0.31	0.47
Cull Cow Weight	21.3kg	55.70kg	84.2kg
Cow Live Weight	16.9kg	70.0kg	124.7kg
Feed Intake	-0.75kg	-0.02kg	0.84kg
Maternal Weaning Weight	-15.6kg	-3.9kg	12kg
Cow Survival	-5.95%	-0.89%	3.12%
Calving Interval	-8.1days	0.08days	10.66days
Age at First Calving	-51.3days	-16.57days	18.5days
Calving Difficulty	2.3%	8.19%	20.2%
Gestation	-1.6days	2.82days	5.67days
Mortality	-1.13%	0.30%	2.94%
Maternal Calving Difficulty	2.21%	5.35%	13.93%
Docility	-0.24	0.04	0.34

Foreign EBV Inclusion

- Foreign EBVs included from several countries (UK, France mainly)
 - enhancing reliability of outcross sires
- Foreign EBV Calving **30,529**
- Foreign EBV Weaning Weight **54,572**
- Foreign EBV Linear **45,000**
- Foreign EBV Carcass **32,255**
- Foreign EBV Milk **53,689**

Interbeef



- 9 countries bringing together phenotypes & pedigree into a unique genetic evaluation for beef cattle
- 5 breeds
 - Including Charolais
- Publish: Weaning Weight & Calving Ease
- Next step: Integrate Interbeef EBVs as part of the domestic genetic evaluation

Major Contributors to Irish Charolais

<i>Name</i>	<i>AI Code</i>	<i>% Pedigree Progeny</i>	<i>Total Progeny</i>	<i>Marginal Contribution</i>	<i>Relationship to Population</i>
DOONALLY NEW	CF52	26%	43453	6.29%	7.26%
PIRATE	PTE	15%	44966	4.26%	5.89%
INDURAIN	IDU	82%	7863	3.62%	4.91%
DOMINO	OMD	91%	647	3.31%	4.23%
MAJOR	MJR	92%	1391	2.65%	4.10%
EXCELLENT	EXT	94%	3658	2.55%	2.87%
ERUDIT	ERU	97%	669	2.50%	3.12%
MEILLARD RJ	MIR	94%	1548	1.89%	4.71%
SHAMROCK AMBASSADEUR	CF12	97%	1589	1.83%	1.86%
FISTON	FSZ	6%	43833	1.82%	1.76%

Data Recording in Ireland

- Majority of data coming from commercial herds/progeny
- Incentivised through Governmental schemes
 - SCWS, BDP, BDGP, BEEP
- Farmer records - milk, docility, quality scores, culling reasons
- Weights - on farm, marts, abattoirs
- Animal Movement data - DAFM

Data Recording in Ireland

Trait	Heritability	All	Charolais	
			Pedigree	Crossbred
Calving Difficulty	9%	15,883,233	118,264	2,829,074
Gestation	35%	5,187,521	53,859	121,345
Calf Mortality	4%	21,236,335	222,569	3,105,619
Docility	35%	1,910,346	5,794	705,653
Feed Intake	44%	6,286	883	378
Carcass Weight	38%	8,650,632	37,249	2,111,920
Carcass Conf	33%	8,650,092	37,245	2,111,851
Carcass Fat	30%	8,648,010	37,221	2,111,315
AFC	31%	2,647,616	45,084	491,242
Mat Calv Diff	4%	15,883,233	165,830	1,593,305
Mat WWT	25%	1,096,925	27,577	470,208
Milk score	20%	3,185,149	50,875	613,236
Calving Interval	2%	5,719,484	210,765	998,575
Cow Survival	2%	6,786,371	289,415	1,163,929
Cow Liveweight	32%	1,313,365	19,221	70,097
Cull Cow Carcass	29%	2,205,840	34,626	115,508

Genotyping

- Majority of data coming from commercial herds/progeny
- BDGP – Beef Data & Genomics Program
- 60% of reference females genotyped annually
- Five year scheme
 - Ending in 2020/2021

1.6 million genotypes are now included in genetic evaluations



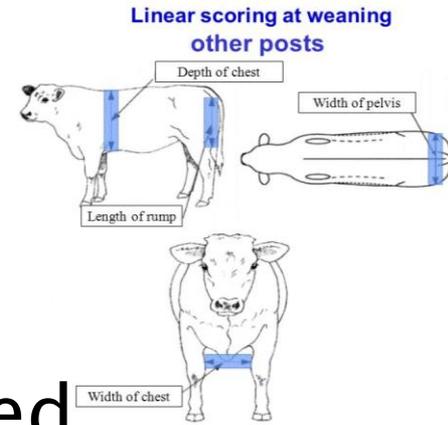
Whole Herd Performance Recording

- Pedigree Herds
- Voluntary basis
- Independent assessment
- Annual visit
- Validates herd data
- Higher Reliability indexes
- Increased Buyer Confidence
 - Stamp in sales catalogue



Whole Herd Performance Recording

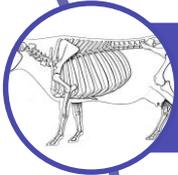
- What is recorded?
 - 1-149 days – weighed
 - 150-700 days – weighed & scored
 - Calved females – weighed & scored
 - Cows scored for various udder traits, milkability, docility, c-section evidence, various skeletal & functionality traits



Traits Recorded



Functionality: Fore Leg Front View, Hind Legs Rear & Side View, Level of Back, Locomotion



Skeletal: Height at Withers, Length of Back, Pelvic Length & Width, Width at Pins, Width at Hips, Depth & Width of Chest



Muscle: Width at Withers, Width behind Withers, Loin Development, Hind Quarter Development, Thigh Width, Inner Thigh Development



Breed Quality: Canon Bone Thickness, Type of Head, Plates, Depth of Rump, Scrotal Circumference, Docility



Cow Traits: Milkability, Teat Placement, Teat Size, Udder Suspension

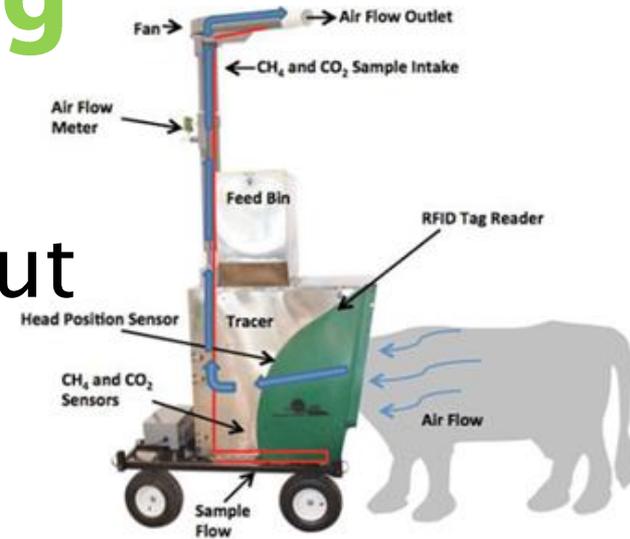
Cow Trait Heritabilities

Based on scores of Calves		Based on scores of Cows	
Linear Score Trait	h^2	WHPR Trait	h^2
Locomotion	0.1	Locomotion	0.16
Forelegs Front View	0.11	Forelegs Front View	0.13
Hindlegs Side View	0.1	Hindlegs Side View	0.19
Hindlegs Rear View	0.08	Hindlegs Rear View	0.05
Docility	0.21	Docility	0.03
Pelvis width	0.2	Pelvis width	0.2
Pelvis length	0.28	Pelvis length	0.27
Width at Pins	0.05	Width at Pins	0.23
Bone thickness	0.28	Teat placement	0.15
Width of muzzle	0.35	Teat size	0.13
Scrotal circumference	0.16	Udder suspension	0.16
		Milkability	0.17

Where to next?

GHG recording

- At forefront internationally
- Breed for reduced GHG output
- Tully facilities are **key**
- GreenBreed - develop, validate & deploy the necessary tools & strategies to achieve greater genetic gain in environmental & economic efficiency



Where to next?

Split Dairy & Beef Calving

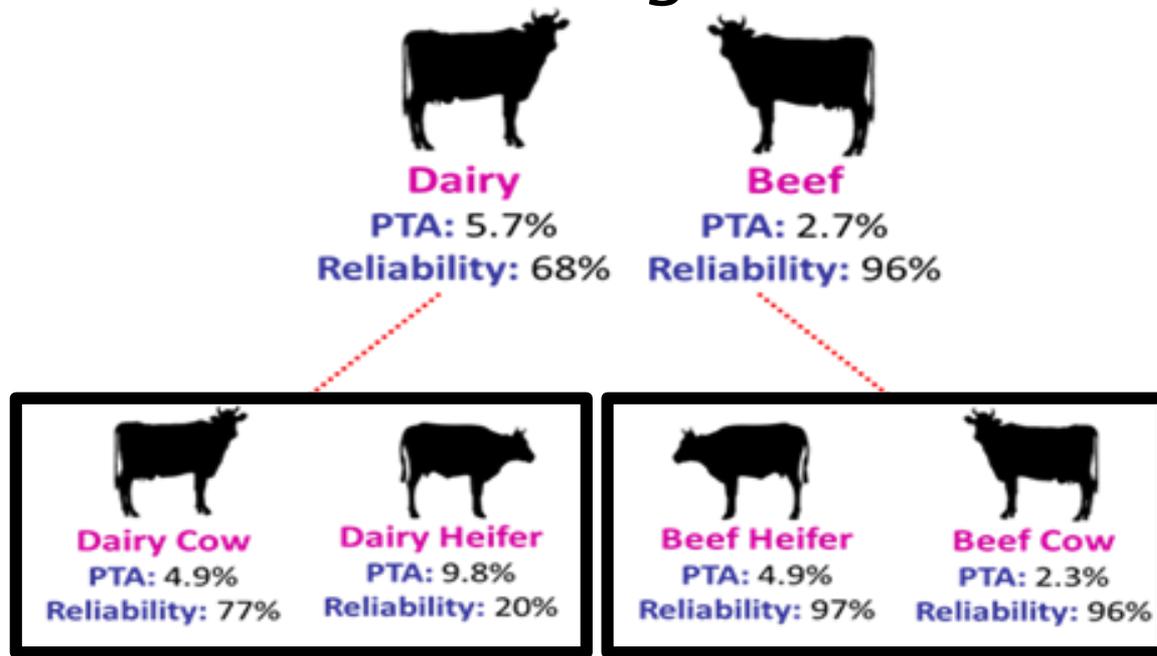
- Dairy cow calving ease records only have a correlation of 35% to beef cow calving ease records

	Dairy heifer cd%	Dairy cow cd%	Beef heifer cd%
Dairy cow cd%	83%		
Beef heifer cd%	64%	61%	
Beef cow cd%	38%	35%	88%

Where to next?

Split Dairy & Beef Calving

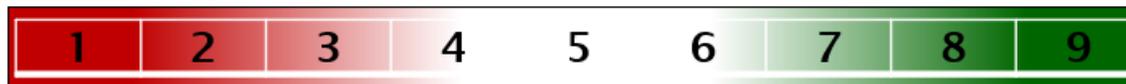
- Opportunity to display up to 4 calving PTAs for sires now
- Birth Size & Birth Weight PTAs also



Where to next?

Meat Eating Quality

- Increase the genetic merit of the national herd for meat eating quality & red meat yield
- Meat Technology Ireland
 - Collect data on 7000 animals over 30 months
- Meat Eating Quality index to be published



“Extremely Tough”
“Not at all Juicy”
“Off-note”

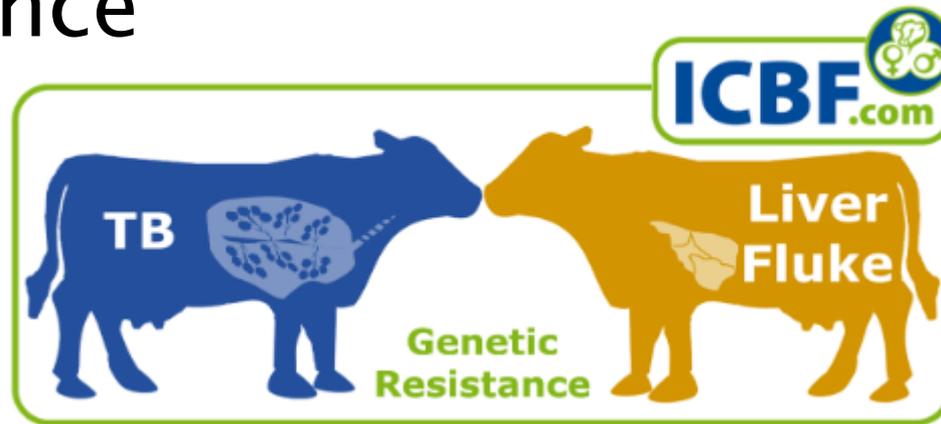


“Extremely Tender”
“Extremely Juicy”
“Extremely flavoursome”

Where to next?

TB & Liver Fluke Resistance

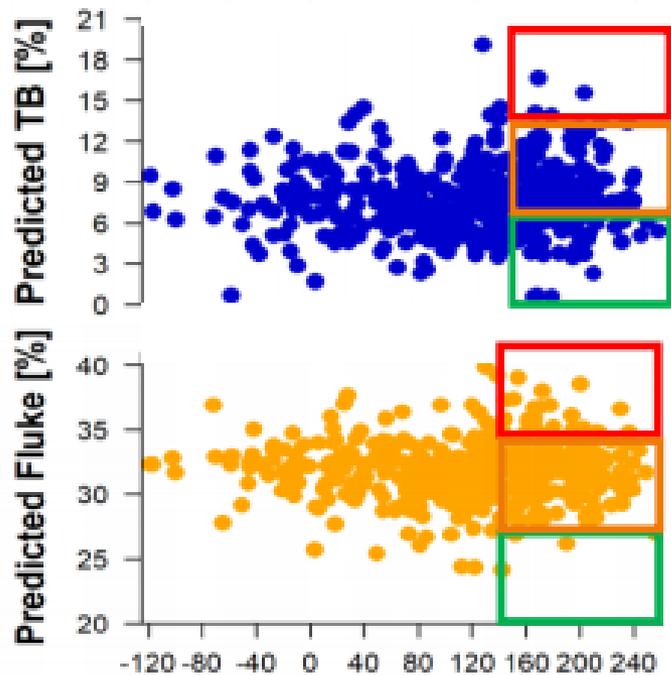
- Help farmers to maintain healthier cattle
- 12% heritability for TB resistance
- 1% heritability for liver fluke resistance



Where to next?

TB & Liver Fluke Resistance

- Not currently included in Eurostar index
- Optimum use of breeding values



Traffic light system for using TB and liver fluke resistance breeding values



⇒ Highest overall index bulls with highest predicted prevalence of infection

⇒ Highest overall index bulls with average predicted prevalence of infection

⇒ Highest overall index bulls with lowest predicted prevalence of infection



Our Farmer & Government Representation



Our AI & Milk Recording Organisations



Our Herdbooks



Acknowledging Our Members