



IRISH CATTLE BREEDING FEDERATION

Genetic Improvement in Cattle.



Dr Andrew Cromie, Technical Director ICBF & Chairman of Interbeef.



Genetic Improvement in Cattle; Key requirements.

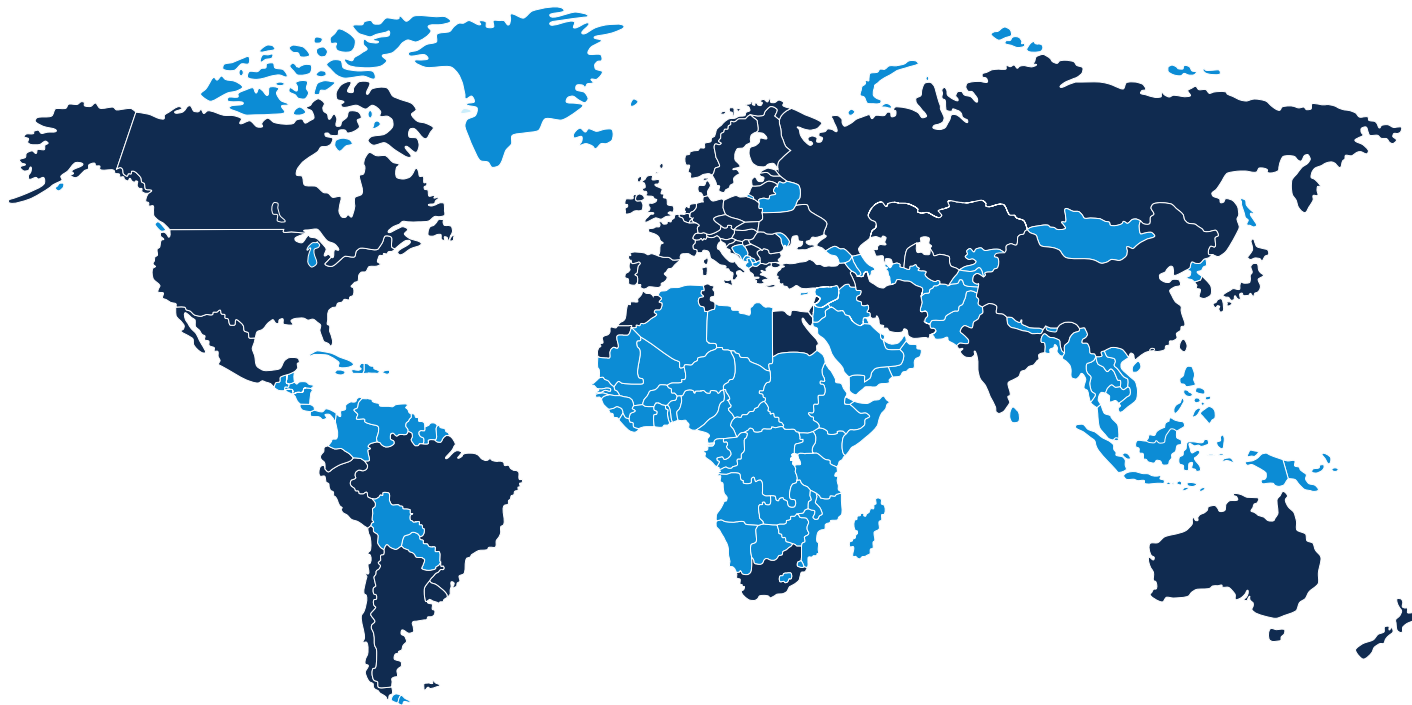
- Close collaboration.
 - Many parts to supply chain, especially in cattle.
 - Examples; ICAR (Interbeef) & ICBF.
- Some basic principles (using ICBF as an example).
 - Accurate identification, performance data, genetic evaluations & breeding Programs.
- Summary & discussion.

ICAR fact sheet

- ICAR: The International Committee for Animal Recording
- Non-Governmental Organization (INGO)
- Formed on March 9th, 1951, in Rome
- ICAR is composed of 117 Members from 59 countries; 30 Associate Members, 87 Full Members.
- The ICAR activities are managed by 4 Sub-Committees and 12 Working Groups. Interbeef is one of these working groups.
- ICAR has gone on to be “The” international guideline reference for animal identification, recording systems, data analysis and genetic evaluation.

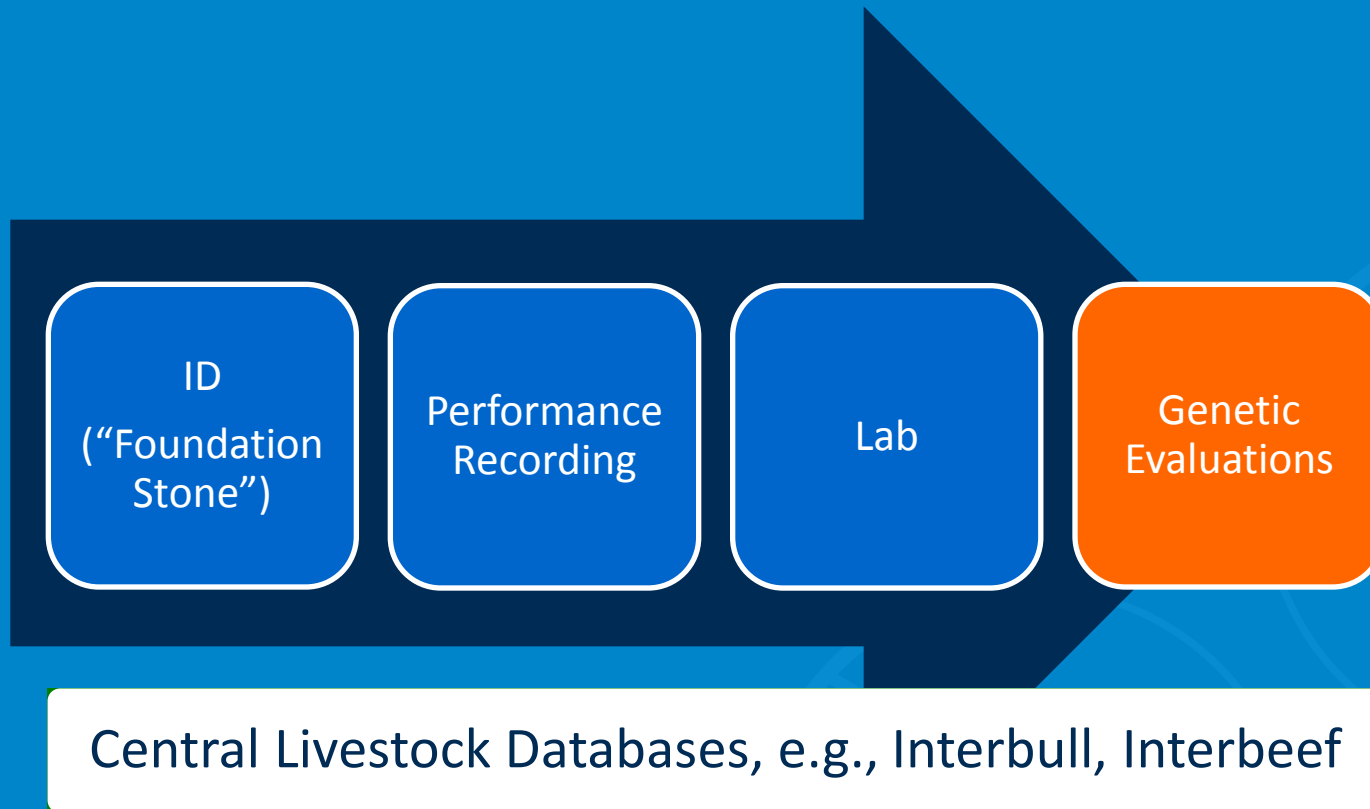
ICAR's members

ICAR has 117 members (87 Full members + 30 Associate members) in 59 countries

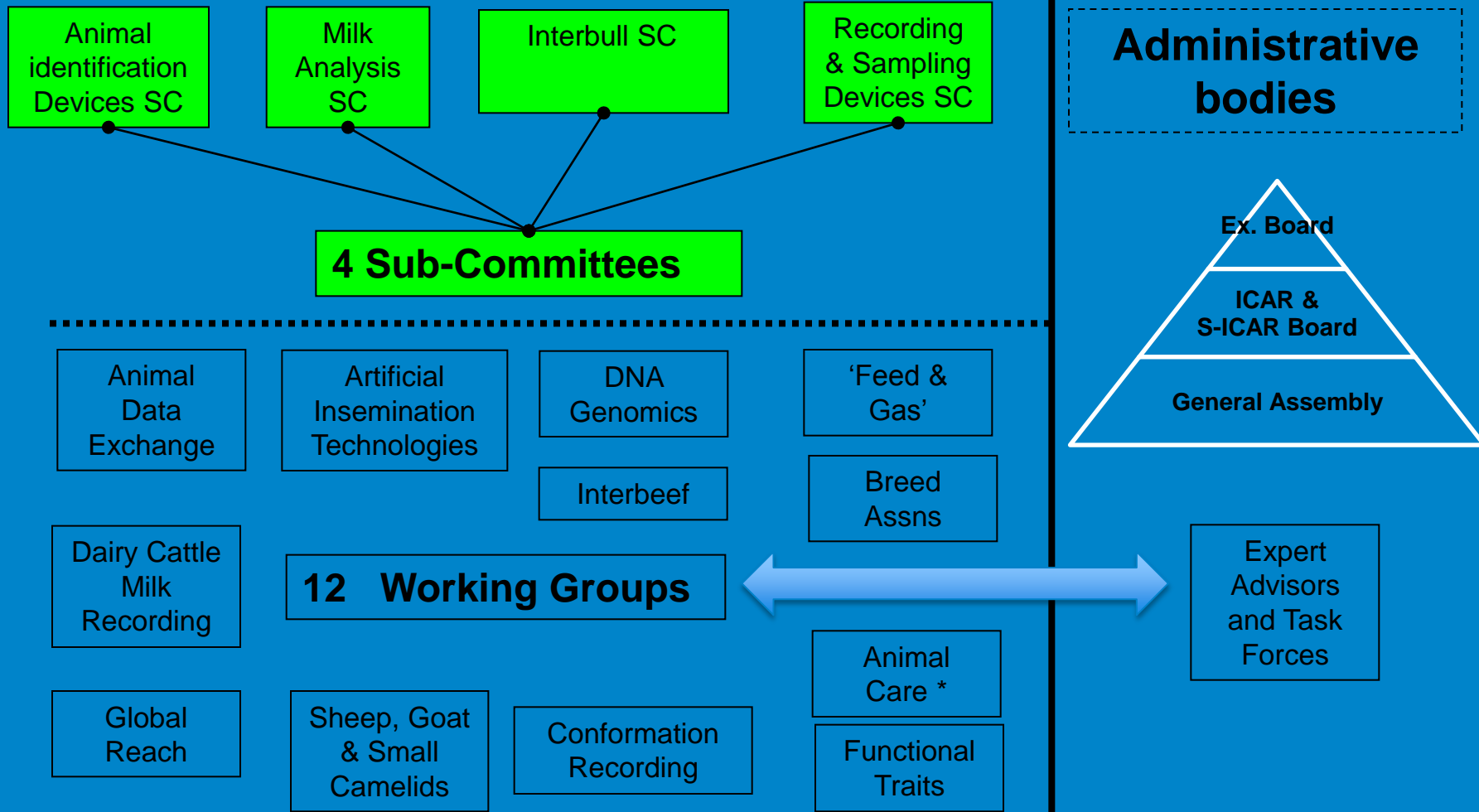


Countries (in dark blue) with at least one organisation as ICAR Member

ICAR's Building Blocks



ICAR Current Technical Organisation



ICAR's core products and services

- Guidelines
- Evaluation Services
- Certification Services
- Seminars and workshops

for



ANIMAL
IDENTIFICATION



ANIMAL
RECORDING



ANIMAL
EVALUATION



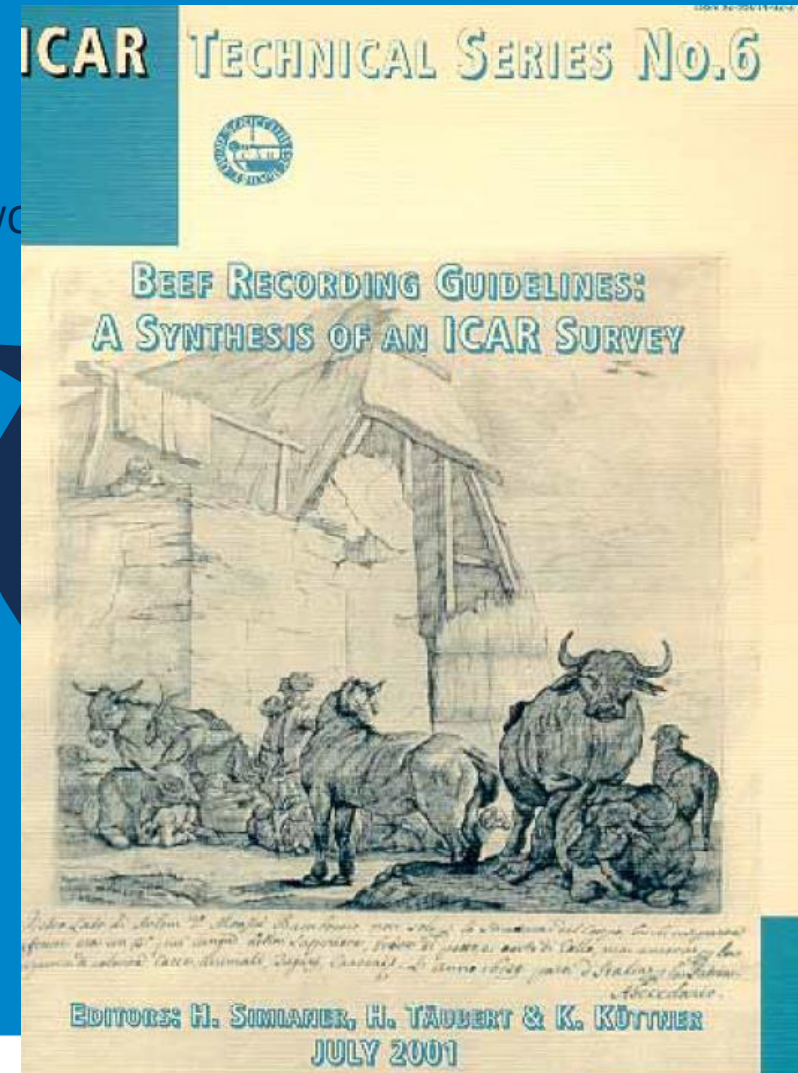
ANIMAL DATA
MANAGEMENT



THE GLOBAL STANDARD
FOR LIVESTOCK DATA

ICAR Guidelines and Standards

- Results of the work of the ICAR Sub-Committees and Working Groups are the “ICAR RECORDING GUIDELINES”
- Guidelines are a “live process” of amendments/updating, according to new technologies, tools and developments
- Every year new text of RG is proposed to GA for approval
- This meeting is timely as beef guidelines have not been updated (formally) since 2001. Focus of activity has been on genetic evaluations.

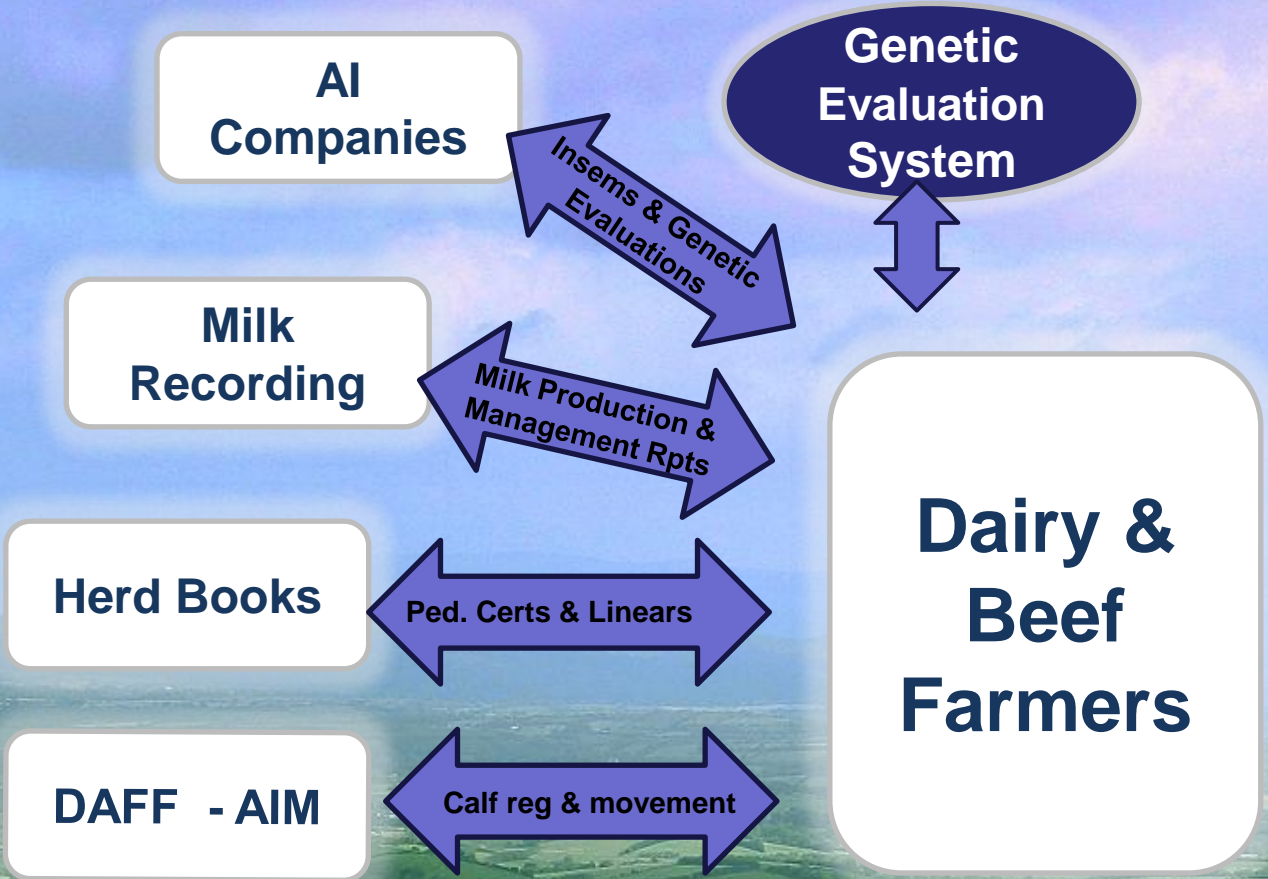


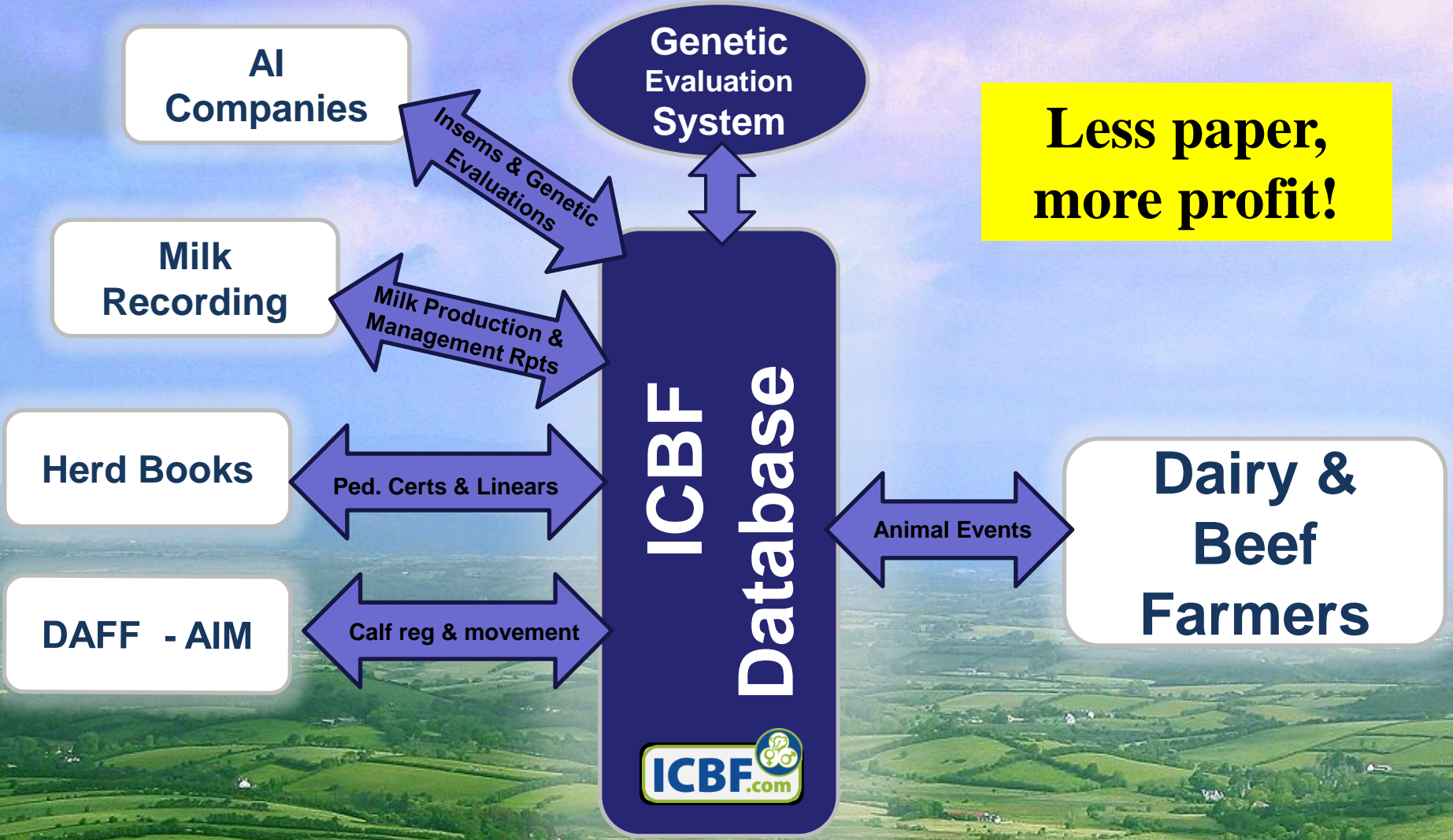
Irish Cattle Breeding Industry.

- Co-ordinated by ICBF.
 - ICBF => a “non-profit” co-operative of 30 cattle breeding organisations (AI, HB + MRO’s) + 2 Farm Organisations.
 - Established in 2000. Industry now responsible for cattle breeding decisions.
 - Central database in 2002. Now key cornerstone of Irish AgFood industry.
- Funded by industry & government (DAFM).
 - Turnover of €8m in 2015. 20% govt funding.

ICBF – Key Principles.

- Focused on farmer benefit.
 - Many stakeholders, but farmer is core.
- Strong principle of “Profit from science”.
 - Key relationship with Teagasc (govt research & extension).
- Independent genetic evaluations.
- Aim to be world-leading (research => implementation).
 - 2nd in world to launch dairy genomics, after US.
 - Beef Genomics => largest livestock genomics project globally.





1m AI recs/yr

AI Companies

Genetic

30m animals with 100m+ records.

Teagasc Research

Knowledge

700k MR recs/yr

Milk Recording

Insems & Genetic Evaluations

Schemes, e.g., BVD, BGDP, Origin Green

Data

Milk Production & Management Rpts

Data for services

2.3 m birth recs/yr

Herd Books

Ped. Certs & Linears

100k farmers are now serviced from the database.

Animal Events

GENE IRELAND®
Breeding future Profits
HerdPlus
Profit through Science
GROW
for Good Measure
Dairy & Beef Farmers

DAFF - AIM

Calf reg & movements

1.6 m carcass recs/yr
Factories

Carcass data

2.3m BVD recs/yr

Health & disease data

Vets & vet labs.

Weight & price

Bulk Tank

Reports

Genotypes

Genotypes & labs.

Marts & auctioneers

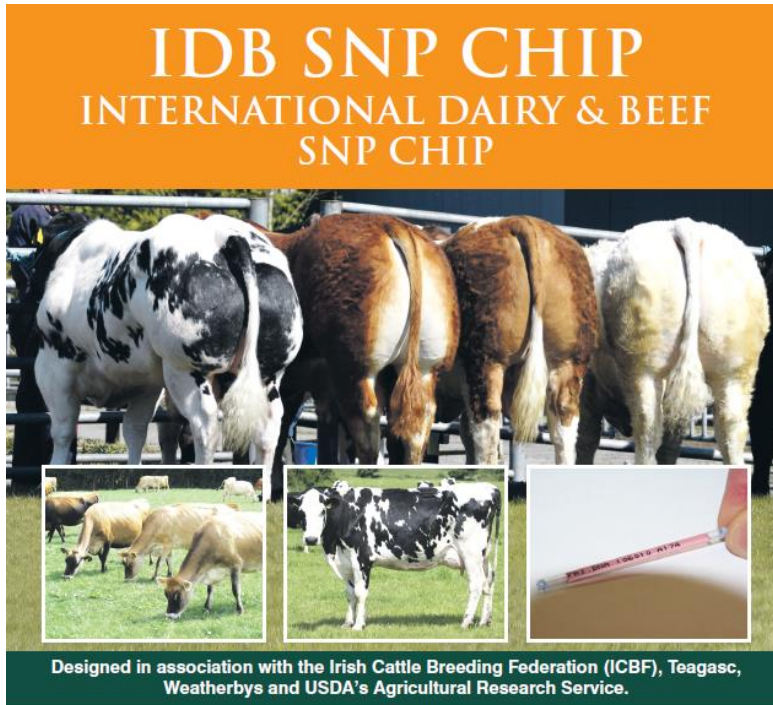
7.0 m movement records/yr

Milk Co-ops

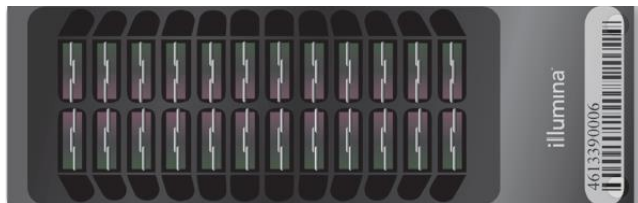
Teagasc ACA Ad

500k genotype recs/yr

IDB Chip – The database in 54k SNP's!



- The International Dairy & Beef Chip.
- Developed in Ireland, with Illumina. Currently on v3.
- 54k SNP's.
 - 40k core, 6k for better imputation, 7k for “regions of interest” & 1k for major genes/defects.
- 160 Major genes/defect.
 - Database will drive this.
- DNA based calf reg.



Genetics Works; Example EBI

Genetic Trends in EBI (1996 - 2015).

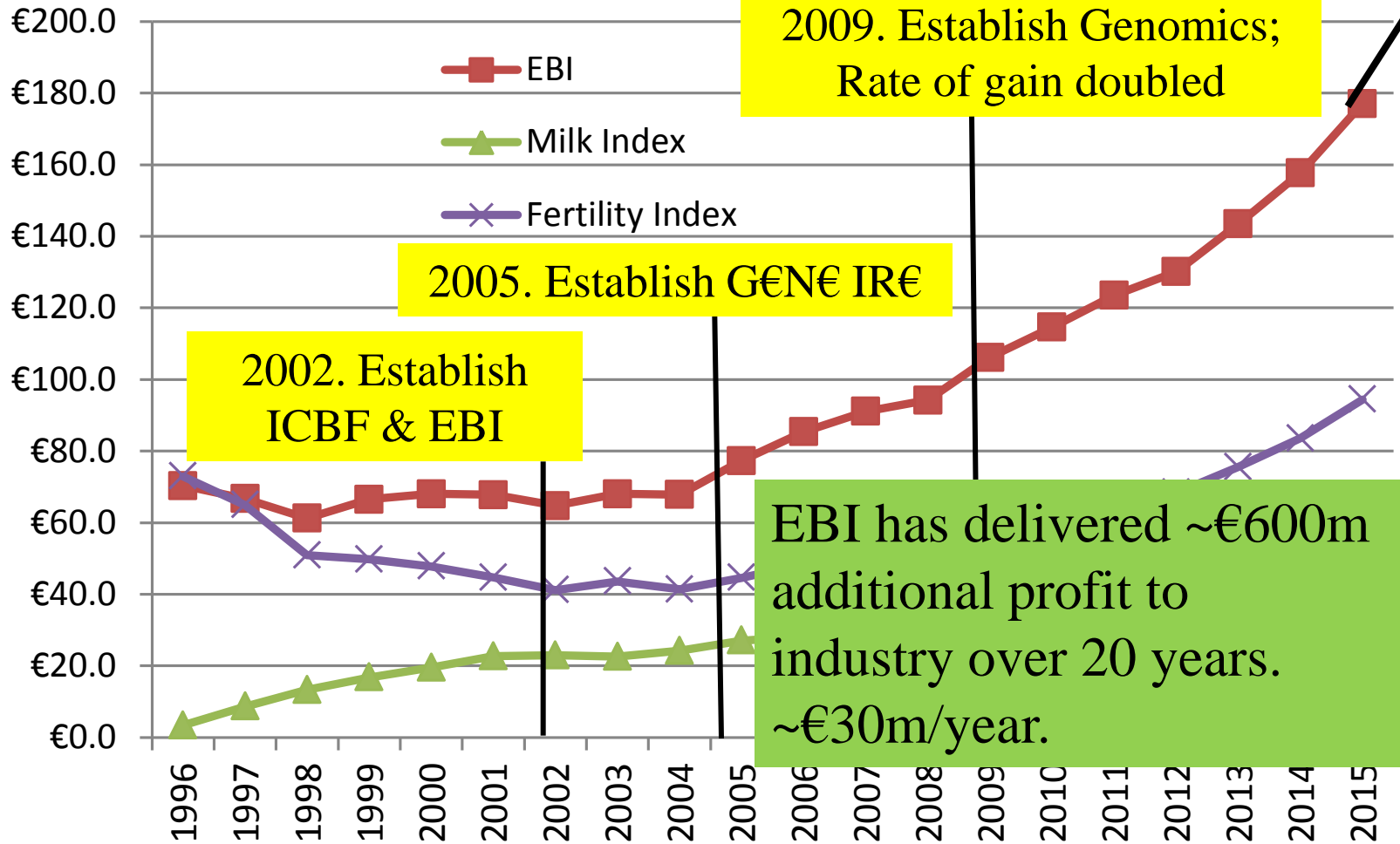
2016. Next Gen Herd

2009. Establish Genomics;
Rate of gain doubled

2005. Establish G€N€ IR€

2002. Establish
ICBF & EBI

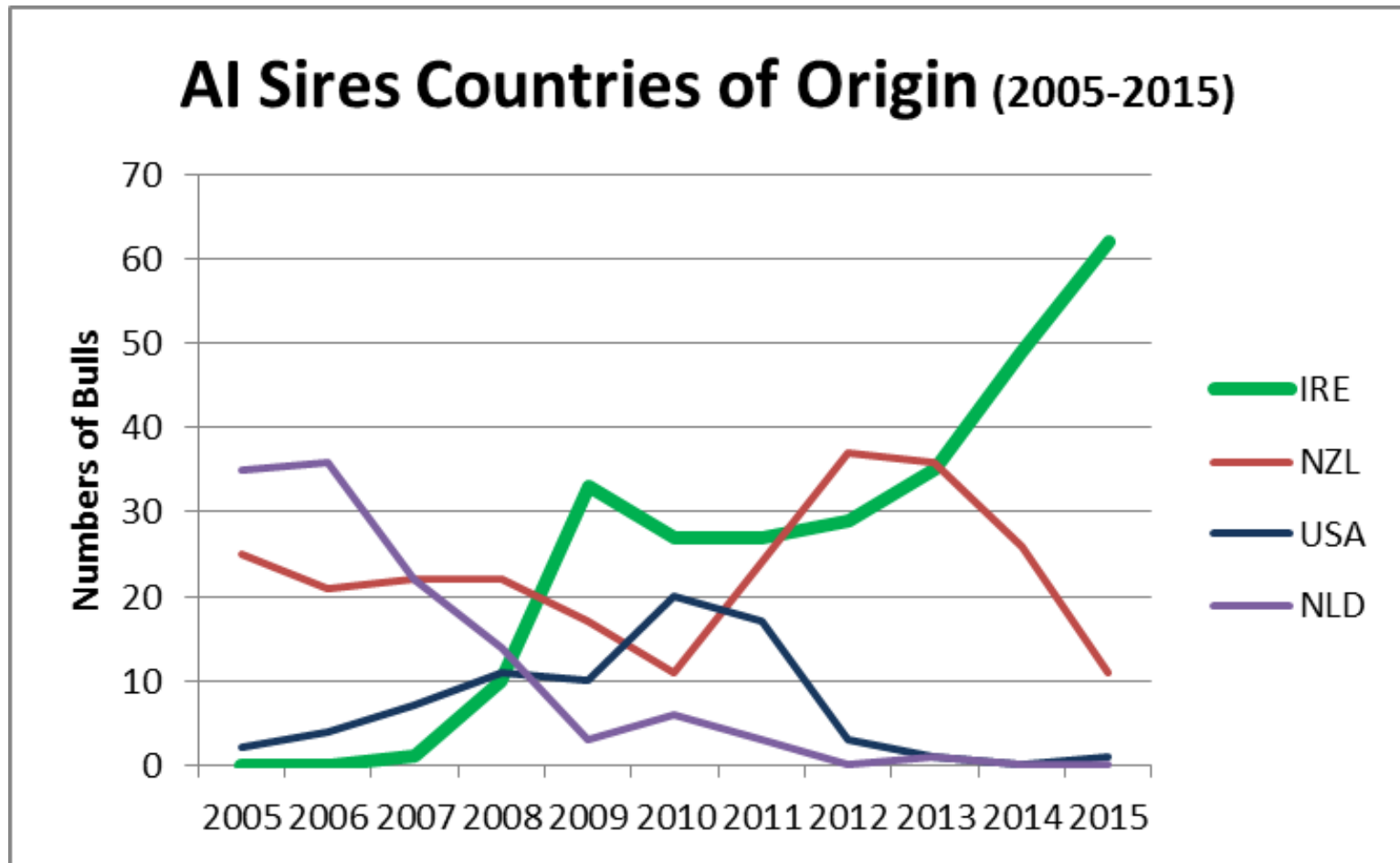
EBI has delivered ~€600m additional profit to industry over 20 years. ~€30m/year.



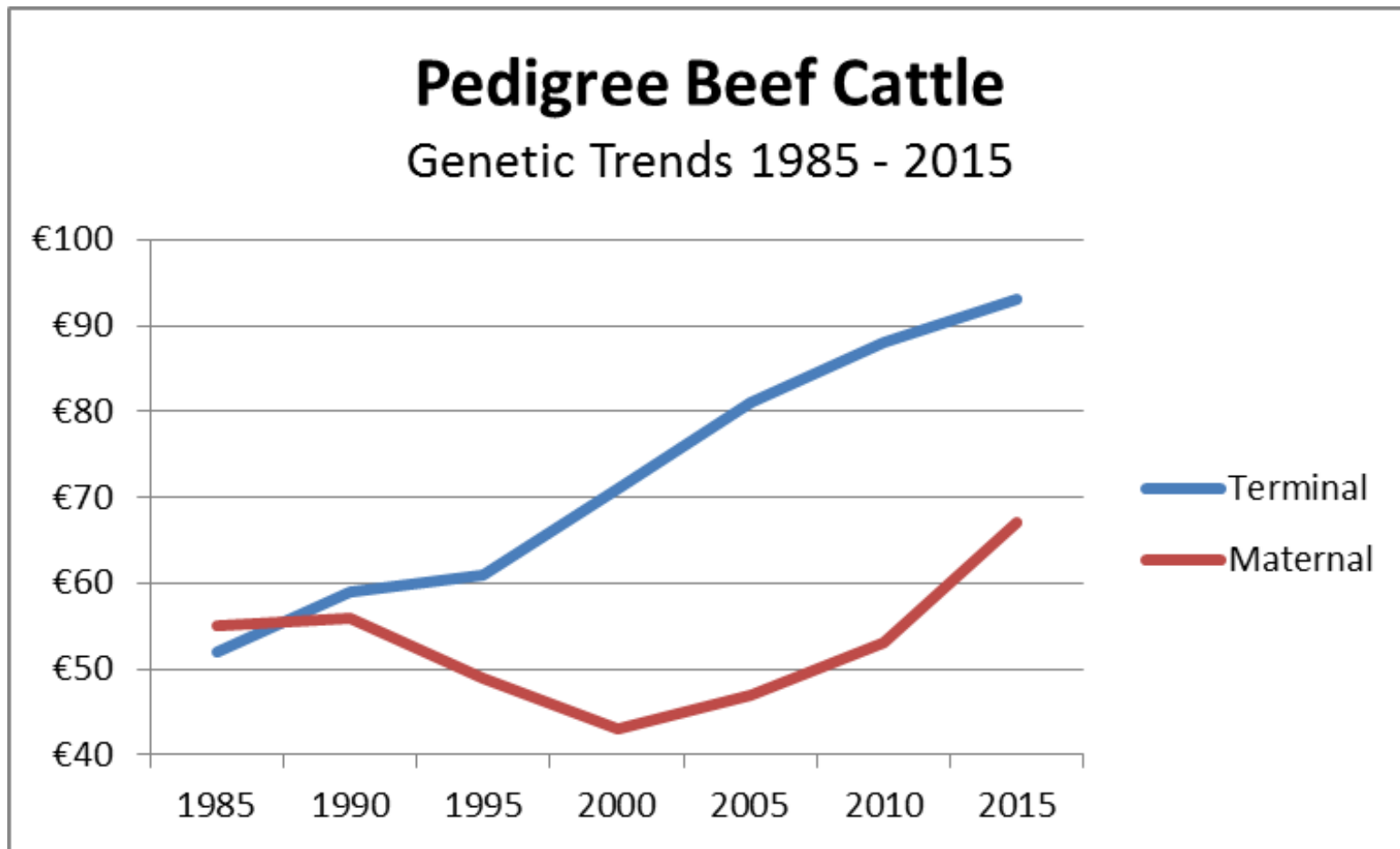
NextGen results - 2016

	National Average	Elite
Days in milk	150	153
Milk solids to date (kg)	277	293
Fat %	4.12	4.41
Protein %	3.41	3.57
Live-weight	534	514
BCS	2.81	2.95
Submission 3 weeks (%)	91	96
6 wk in-calf rate (%)	51	77
9 wk in-calf rate (%)	69	91

GENE IRELAND Breeding Program – Est 2005.



Genetic Trends in Pedigree beef Herd.



€uro-Star Replacement Index.

Trait	Goal	Relative wt
Calving ease	More	10%
Feed efficiency	More	10%
Carcase	More	10%
Maturity	More	10%
Female fertility	More	20%
Docility	More	4%

Emphasis:

Cow traits 71%

Calf traits 29%



5 Star Cows Leaving More Profit



All Suckler Cows

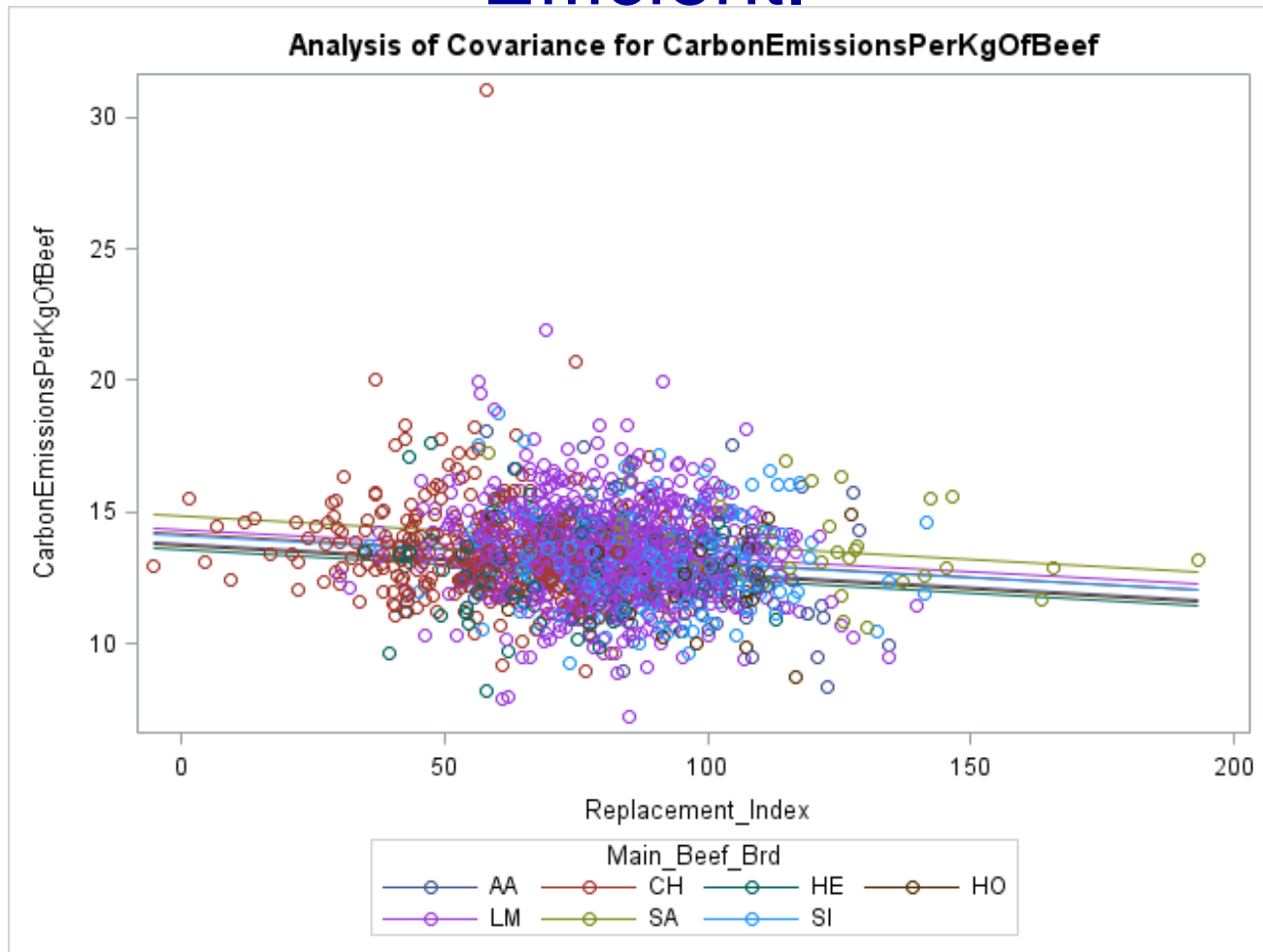


Cow Details				Milk Performance		Fertility Performance			Progeny Carcass Performance		
Star Rating	No. of Cows	Replacement Index	% Still Alive	Calf Weaning Weight (kg)	Cow Milk Score (1-5)	Age 1st Calving (months)	Calving Interval (days)	No. of Calvings	Carcass Weight (kg)	Carcass Value	Age at Slaughter (days)
★★★★★	33,493	€108	83%	336	4.08	30.2	403	2.69	358	€1,474	697
★★★★	24,317	€76	80%	324	3.87	30.9	407	2.56	356	€1,469	712
★★★	21,644	€60	79%	319	3.74	31.3	411	2.47	356	€1,470	715
★★	20,908	€43	76%	315	3.61	31.5	416	2.40	357	€1,475	721
★	23,911	€12	72%	309	3.36	32.1	423	2.25	357	€1,477	726
Difference 5 Star V's 1 Star		+€96	11%	27kg	0.72	-1.9 months	-20 days	0.44 calves	0kg	€-2	-29 days

Performance of all suckler females born in 2011 when ranked on replacement index



High Genetic Merit Herds are More Carbon Efficient.



*Breeds with at least 40 herds in data set

The Irish BDGP Scheme.

- Focused on breeding more profitable , sustainable and carbon efficient cows.
- Funded from EU Rural Development Program.
 - Co-funded by Irish government (DAFM).
- €300m total funding 6 years (2015-2020)
 - Farmers paid ~€90/cow/year to complete key actions re: the scheme.
 - ~500k animals genotyped to-date.
 - ~2.5m animals in total will be genotyped during period of scheme.

Expected reductions in emissions from genetics

- Total non ETS GHG emissions from Ireland estimated at 41,680 kT, with 18,657 kT from agriculture (EPA 2012 report)

	2020			2030		
	kT of CO2e	% reduction Agri	% reduction All	kT of CO2e	% reduction Agri	% reduction All
Suckler beef breeding strategy						
Current replacement index trend	-66.14	0.4%	0.2%	-529.1	2.8%	1.2%
Genomics with increased Gene Ireland AI	-261.56	1.4%	0.6%	-1,442.1	7.8%	3.3%
Genomics with best case Gene Ireland AI	-385.02	2.1%	0.9%	-2,270.2	12.2%	5.2%

New Traits of Interest; Carcass and meat eating quality

- Length of loin, for a fixed loin area (retail pack).
 - Work underway between ICBF, Teagasc and meat processing industry.
 - Current status; Based on VIA images (1.6m animals/year), 200k animals with actual cut data (from one processor) + ~500 data from a primal grading machine.
 - Next 18 months; 7.5k animals with complete data (cut and meat eating quality) => apply to all animals.
- Meat eating quality.
 - Large differences within and across breeds. Heritability for tenderness of 25%.

Genetics for Meat Eating Quality

- Can we breed to improve meat eating quality?
- Evidence from breed premium schemes, e.g., Angus & Hereford, would suggest yes.
- What about within each of our main beef breeds? Are there bulls that will breed progeny that are good to taste and those that are not so good to taste!
- Current focus of work within the GENE IRELAND performance test program at Tully.



Top AI bulls for Meat Eating Quality*

- Early results indicate significant genetic variation in meat eating quality.
- Initial “test” proofs generated based on sires with progeny evaluated at Tully*
- Early results are very promising => plan to have official proofs during 2017.

Table 1. Top AI sires for meat eating quality

Brd	Code	Name	Owner
AA	RWB	Rawburn Lord Rocket	Dovea AI
BA	KCE	Kilmoney Bruce	Dovea AI
BB	VMP	Viilablues Empire	Dovea AI
CH	FSZ	Fiston	NCBC
HE	GZS	Goulding Poll Superduty	NCBC
LM	EFZ	Elite Flag	NCBC
PT	CBQ	Cambridge	NCBC
SA	PZB	Bonaparte	NCBC
SH	CZB	Creega Dice	Dovea AI
SI	RWV	Raceview Van Halen	Dovea AI

Results from Consumer Tasting Session, Grange July 2016

Table 1. Consumer tasting session, Teagasc Grange Beef Open Day, 5 July 2016*

Panel	High EBV Steak			Low EBV Steak			Diff EBV	Consumer Score	
	Brd	Tag	EBV	Brd	Tag	EBV		High	Low
1	BB	IE331469770176	3.3	BB	IE111104920402	-0.3	3.6	5	2
2	CH	IE281166191119	3.6	CH	IE281170330957	-3.2	6.8	6	1
3	CH	IE341454730305	2.8	CH	IE281170360943	-3.6	6.3	5	2
4	LM	IE331469720188	2.9	LM	IE371072440485	-4.0	6.9	7	0
5	LM	IE331469750190	2.5	LM	IE111104960414	-2.9	5.4	4	3
6	LM	IE281158740537	2.2	LM	IE281170320956	-5.6	7.8	6	1
7	SA	IE331469760183	1.7	SA	IE331469760191	-1.6	3.3	7	0
8	SI	IE331518830647	-0.2	SI	IE331518890644	-6.7	6.5	6	1
9	AA	IE341454770291	2.3	AA	IE301049020234	-2.4	4.7	7	0
10	BB	IE151826250311	2.6	BB	IE301159890412	0.0	2.5	3	4
11	CH	IE151052580966	3.0	CH	IE281158730536	-3.0	6.0	5	3
12	CH	IE361198261193	2.2	CH	IE221068630680	-0.1	2.2	3	4
13	LM	IE341454770300	2.4	LM	IE281170310947	-1.0	3.4	5	3
14	LM	IE151826220317	2.2	LM	IE301049090240	-0.1	2.3	6	2
Tot			2.4			-2.5	4.8	75	26

* Based on young bulls slaughtered (<16 mts) on 11 Jan and 18 Jan 2016

Summary.

- Genetic improvement in Ireland is now generating €30m/year for Irish dairy farmers with similar potential for beef. Additional GHG benefits.
- But, effective genetic improvement in livestock requires close collaboration at national and international level.
 - ICAR and ICBF are relevant examples.
- We must collaborate if we are to meet the “food versus climate” challenge in the future.
- We are very keen to engage with more partners in generating further improvements for farmers & industry, e.g., UNECE.

A balanced cow in Ireland!

