



IRISH CATTLE BREEDING FEDERATION

Developments in Beef Genomics.



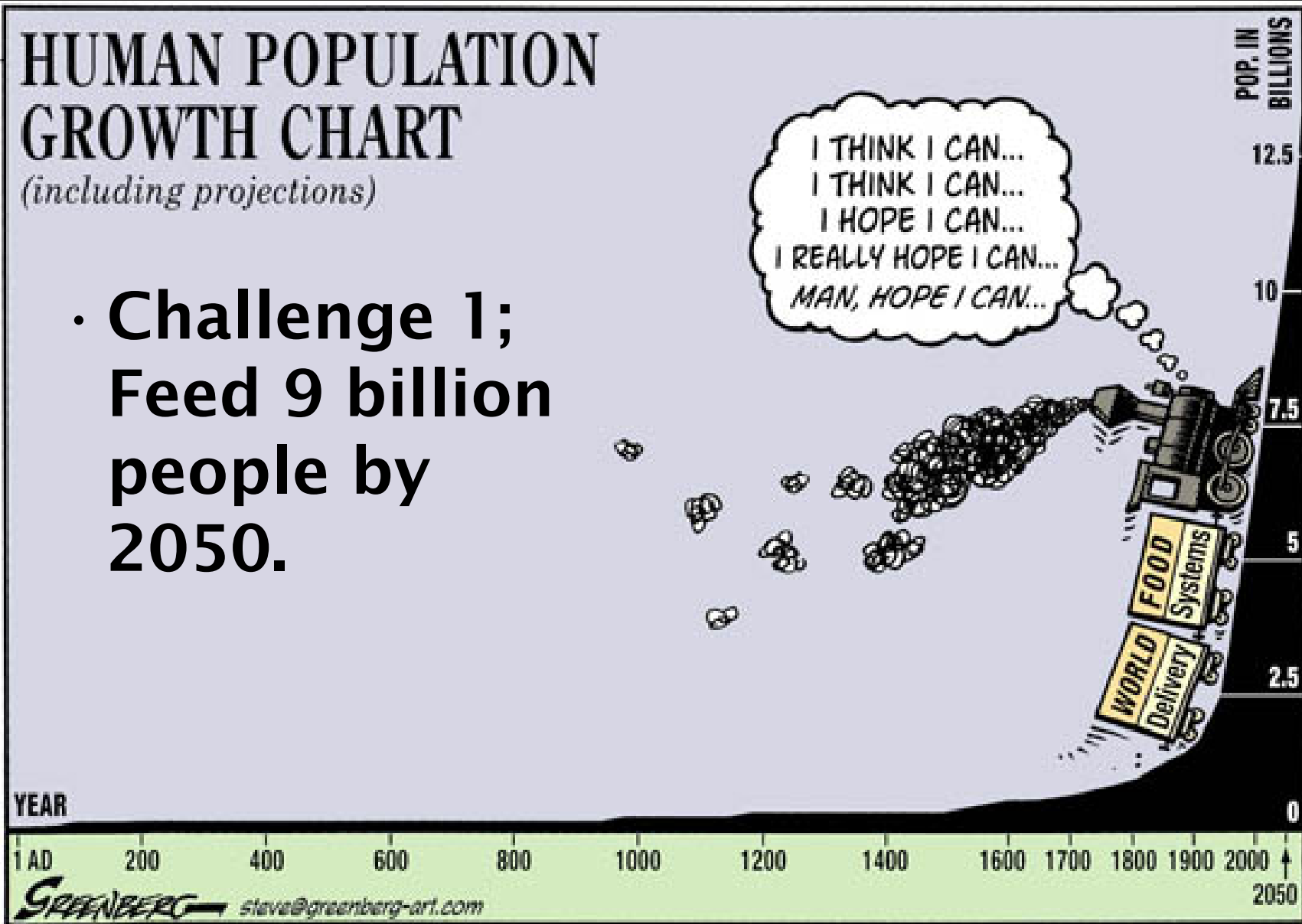
Challenges & Opportunities.

- We need to feed more people.
- **But** in a Climate Efficient Way.
- The beef cow is highly inefficient in terms of kg CO₂ output per kg protein.
- **But** she is a key part of rural infrastructure/eco-system in many countries.
- ***Can we breed a more climate efficient cow?***
- ***What is the potential role of genomics?***

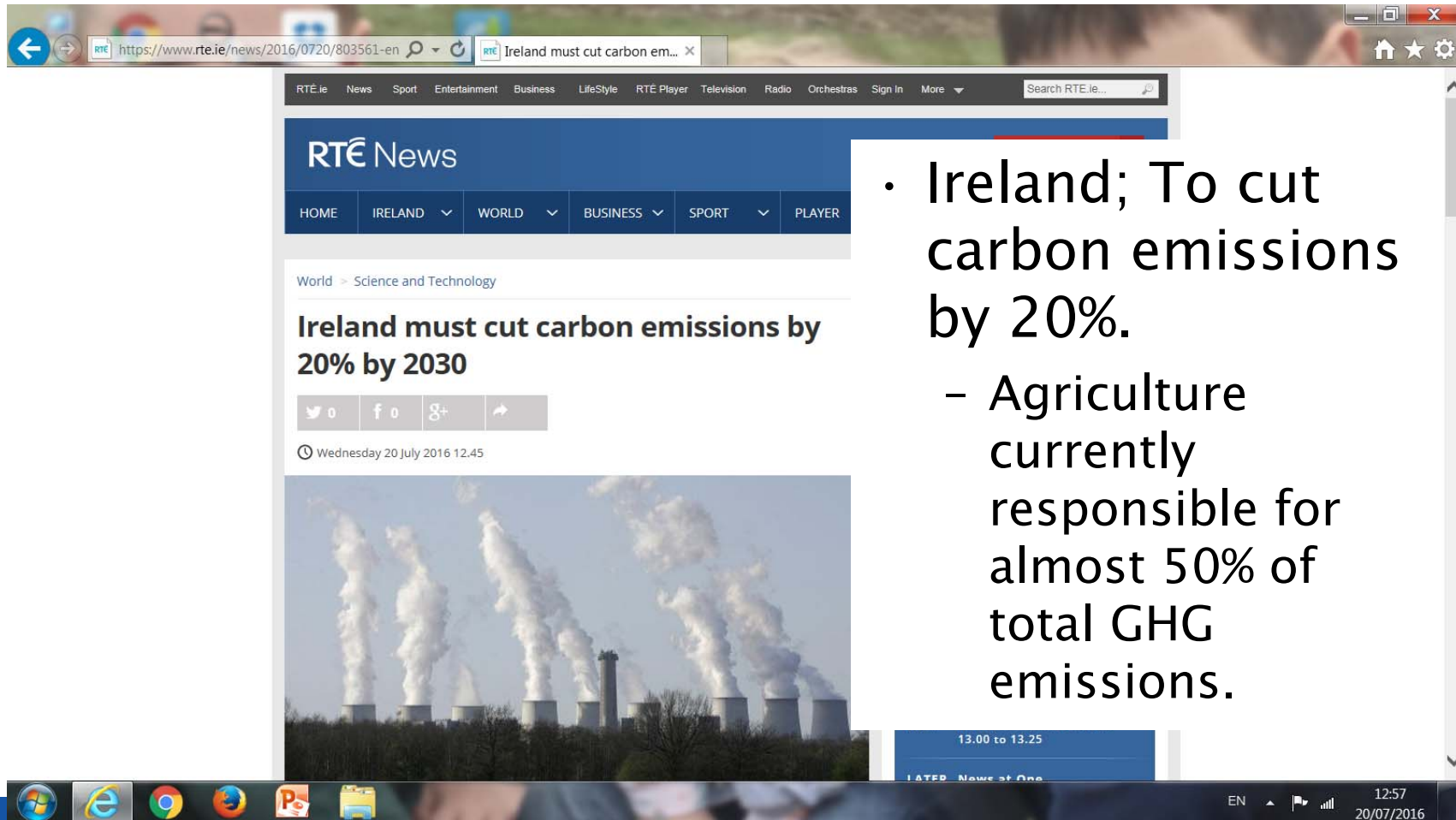
HUMAN POPULATION GROWTH CHART

(including projections)

- Challenge 1;
Feed 9 billion
people by
2050.



Protect Climate & Environment.



The screenshot shows a web browser window displaying an RTE News article. The article title is "Ireland must cut carbon emissions by 20% by 2030". Below the title, there are social media sharing icons for Twitter, Facebook, and Google+. The article is dated "Wednesday 20 July 2016 12:45". The main image shows several industrial smokestacks emitting thick white plumes of smoke against a clear sky. The browser's address bar shows the URL "https://www.rte.ie/news/2016/0720/803561-en". The RTE News website navigation menu is visible at the top of the article, including links for HOME, IRELAND, WORLD, BUSINESS, SPORT, and PLAYER. The browser's taskbar at the bottom shows various application icons, including Internet Explorer, Google Chrome, and Microsoft Word.

- Ireland; To cut carbon emissions by 20%.
 - Agriculture currently responsible for almost 50% of total GHG emissions.

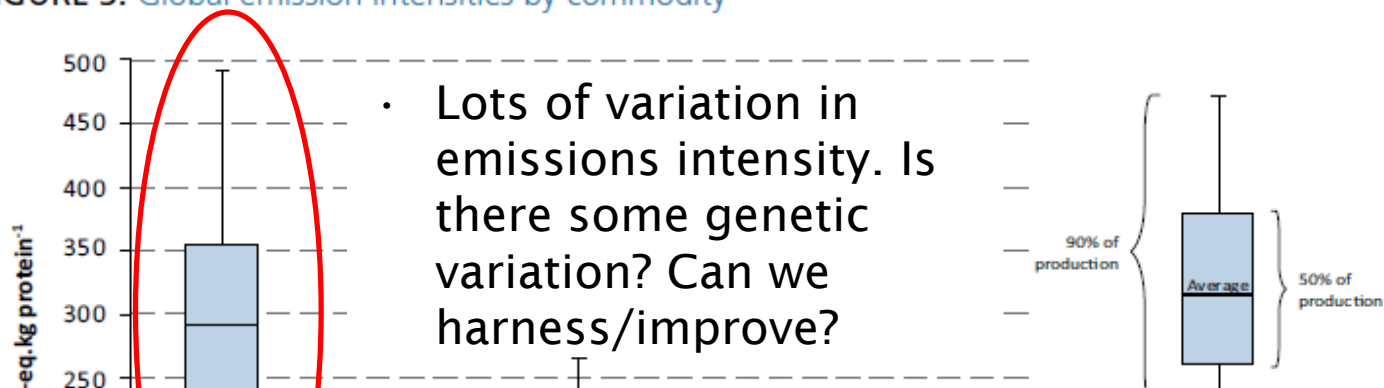
Beef cows & rural infra-structure.



- Suckler cows & beef cattle are a key part of Irelands rural infra-structure.
 - Small fragmented farms, marginal land etc.
- *“In the context of the food versus climate challenge, there is a requirement on countries such as Ireland to become even more efficient in their beef production”*. Searchinger 2016.

Breed a more efficient beef cow?

FIGURE 3. Global emission intensities by commodity

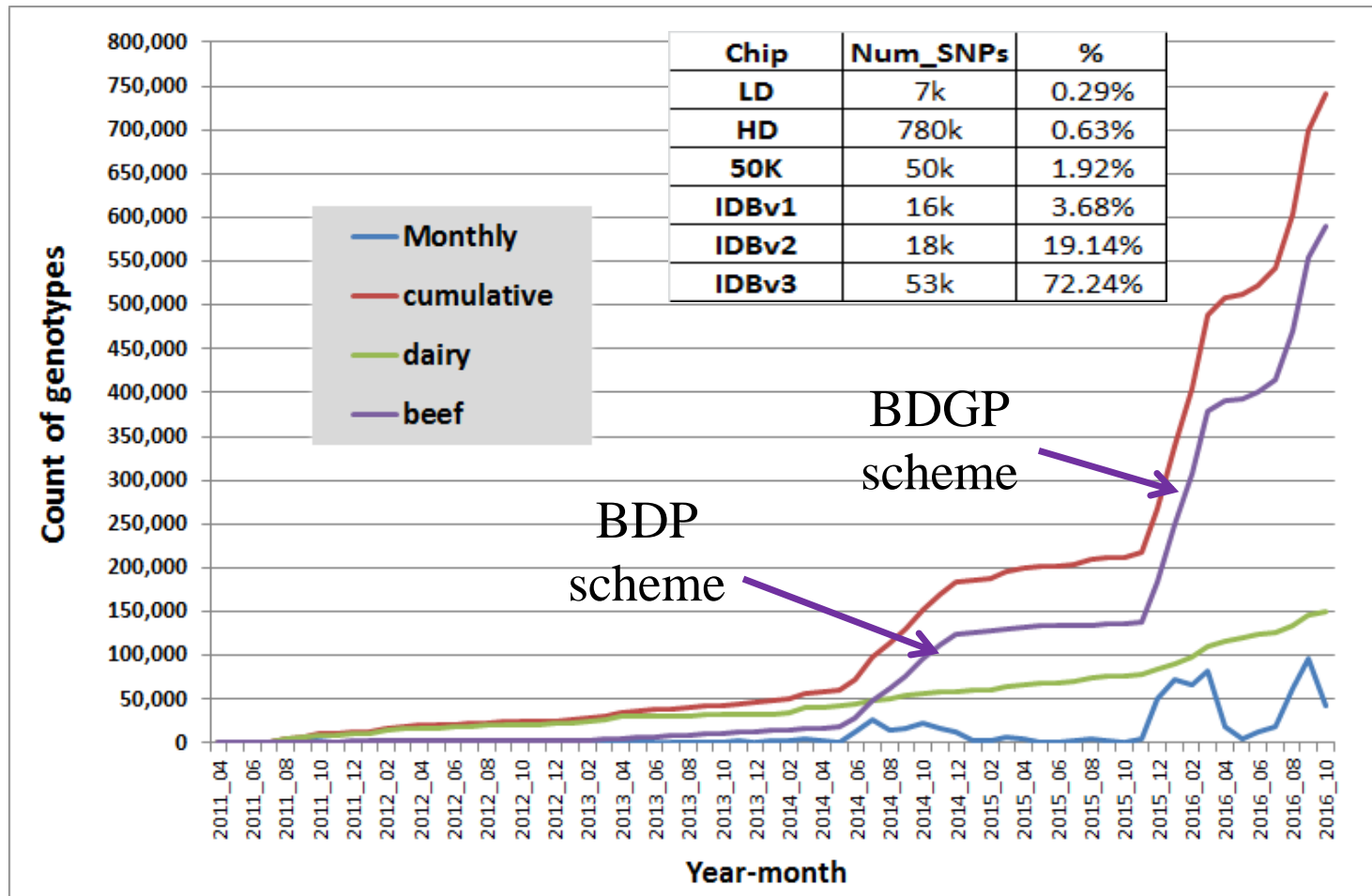


De Haas et al. JAM 2016. Methane emission h2 of 0.35 “it is possible to decrease the methane production of a cow by selecting more-efficient cows, and the genetic variation suggests that reductions in the order of 11 to 26% in 10 yr are theoretically possible, and could be even higher in a genomic selection program”

The Irish Beef Data and Genomics Program

- Focused on breeding more profitable, sustainable and carbon efficient cows.
- Funded from EU Rural Development Program.
 - Under article 28 (Climate + Environment).
 - Co-funded by Irish government (DAFM).
- €300m total funding 6 years (2015-2020)
 - Farmers paid ~€90/cow/year to complete actions
 - Genotyping, individual animal data, feed, grazing, slurry
- ~2.5m animals will be genotyped during period of scheme.

Genotyping history at ICBF



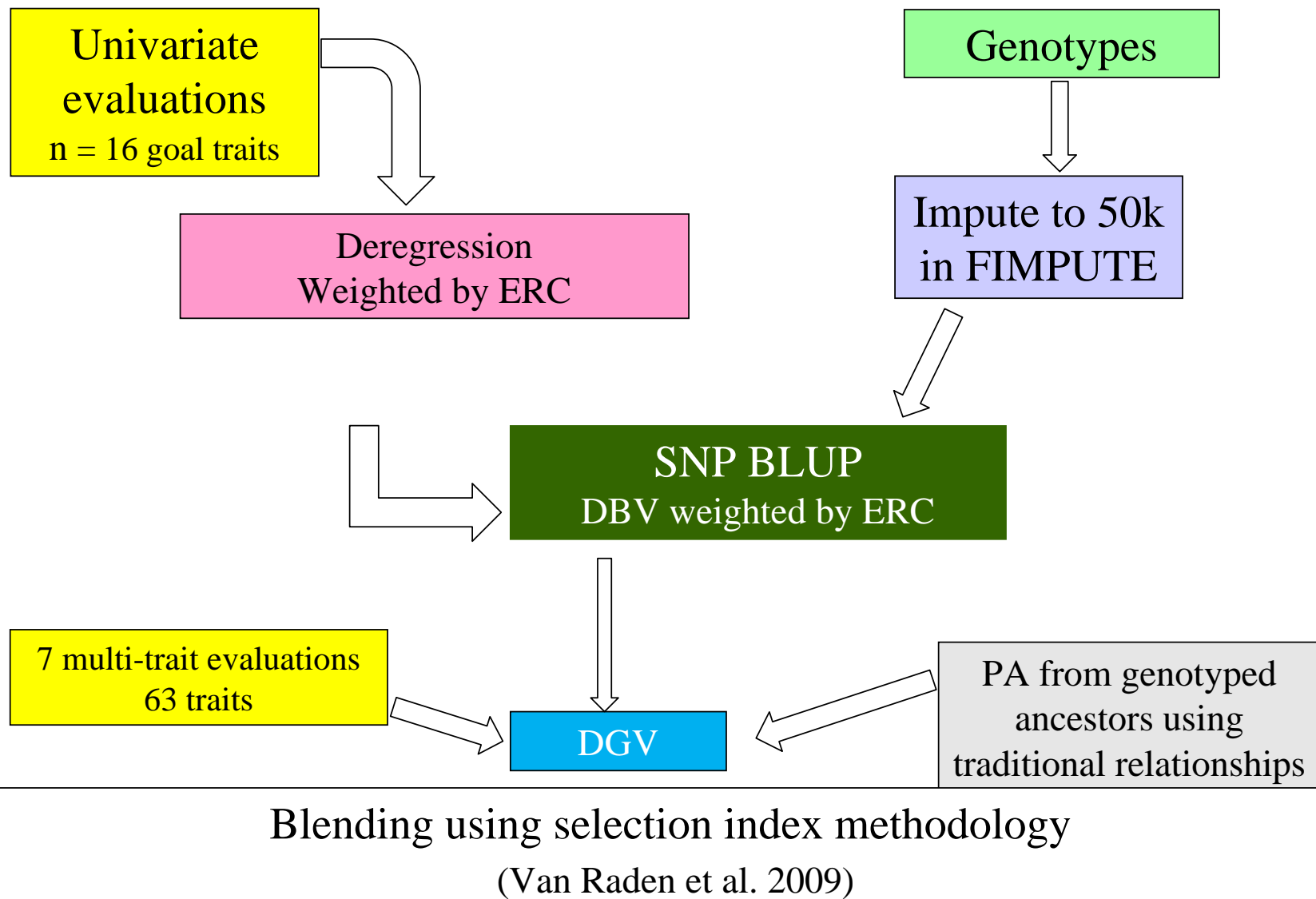
Characteristics of genotyped animals July'16

breed/breed cross	Count
Holstein_Friesian	55,258
Limousin	28,943
Charolais	26,777
Limousin_Holstein	25,212
Limousin_Charolais	23,346
Charolais_Limousin	21,569
Limousin_Simmental	19,408
Angus_Holstein	14,619
Limousin_Angus	14,246
Limousin_Hereford	14,235
Angus	13,908
Limousin_unknown	13,642
Holstein	11,627
Charolais_Simmental	11,617
Hereford_Holstein	10,715
Limousin_Belgian Blue	10,385

Category by sex	Count
AI sire	4,133
Males with progeny	45,064
Male with NO progeny	62,963
Female with progeny	303,358
Female with NO progeny	117,572

Sire error rate = 9.5%
5% in pedigree herds
130,000 sires predicted using
800k Parentage prediction &
discovery panel

2-Step Genomic Evaluation (Mix99)



Validation Carcass wt AI sires

- AI sires with first progeny born in 2012 had all their progeny phenotypes omitted

	Validation category	
	Holstein	Charolais
Current univariate Reliability	>95%	>85%
N	36	16
	Correlation with current deregressed univariate ebv	
EBV uni validation	0.750	0.590
GEBV validation	0.788	0.674
% of bulls whose sires were in SNP BLUP	100%	56%



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 new genomic test proofs

€uro-Star Replacement Index.

Trait	Goal	Relative wt
Calving ease	Less	16%
Feed efficiency	More	12%
Carcass weight	More	12%
Mature weight	More	12%
Female fertility	More	25%
Docility	More	4%

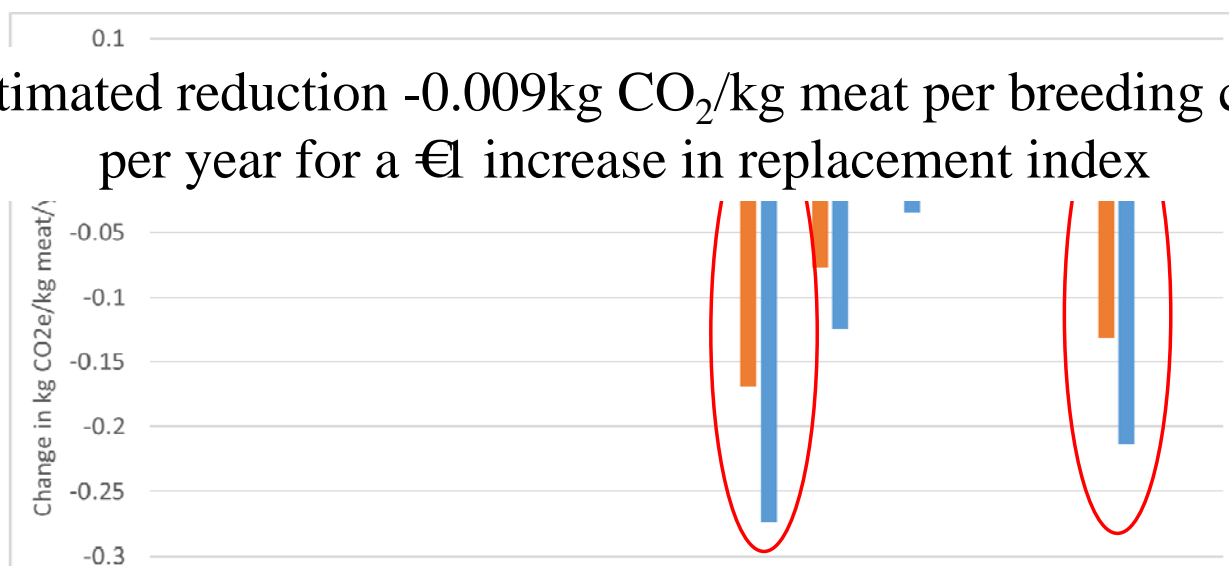
Emphasis:

Cow traits 71%

Calf traits 29%

Changes in Emissions from Selection on Replacement Index; Key Traits (systems model results)

Estimated reduction $-0.009\text{kg CO}_2/\text{kg meat}$ per breeding cow per year for a €1 increase in replacement index



Cheryl Quinton talk
Effects of Genetic Gains in the Irish beef maternal
replacement index on greenhouse gas emissions
ICAR 2016 Friday 11:30 am

Final Thoughts (Global Perspective).

- Technical challenges re: application of genomics are likely to be greater in beef than other species in the future.
 - Large datasets. High level of sharing of data (i.e., phenotypes, pedigree & genotypes) through orgs such as Interbeef & ABRI-Breedplan.
 - Complex models. Multiple breeds (including cross-breeds) & multiple traits and multiple country/environment models.
- ***Encourage you to participate in international evaluations of beef cattle***

Go raibh maith agat (Thanks for listening!)

Commercial Females

Report Date: 27-Aug-18 (Aug 2018 Feed Evaluation)
 Herd: 01770001-0140-0015
 Herd Owner: 20180-001-1

Replacement Index

All commercial females are listed here, by order of Replacement Index.
 A commercial female is a female not recorded as purchased in the ICBF database.

Jurbo	Tag	Date of Birth	ICB Ref No.	Breed (see code)	Dam	Sex	Index	Euro-Gen Across Breed
182	0141401000102	07-Dec-11	2	SRK	0141401000102	SDV	€143	*****
231	0141401000221	10-Jan-14	1	LMS	0141401000192	HCA	€131	*****
205	0141401000225	31-Jan-12	1	SRK	0141401000078	CPA	€117	*****
123	0141401000223	22-Mar-08	5	LMS	0141401000007	HCB	€116	*****
248	0141401000248	23-Mar-16	5	SRK	0141401000008	SLA	€115	*****
245	0141401000245	17-Jan-15	5	SRK	0141401000008	SLA	€114	*****
242	0141401000242	19-Jan-15	5	SRK	0141401000008	SLA	€113	*****
178	0141401000178	15-Aug-11	2	SRK	0141401000077	HCB	€110	*****
217	0141401000217	10-Jan-14	1	SRK	0141401000078	SDV	€107	*****
192	01414010002192	03-May-12	1	LMS	0141401000078	HCA	€106	*****
212	0141401000212	10-Sep-13	1	LMS	0141401000078	HCA	€106	*****
236	0141401000236	08-Oct-14	1	CPK	0141401000073	F12	€97	*****

This report is intended for use only for the purpose of recording a female's status. Missing data can be identified within a herd's ICBF data.