



From pasture to plate – data collection along the entire food chain

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Brown Bagger, Nov 2020

Grand challenges



Irish beef production

- 7.2 million bovines
- **970,000 suckler cows** with an average herd size of less than 20 cows; 26,100 single suckling herds with greater than suckler 10 cows
- Systems include
 - suckling,
 - store to store,
 - store to beef, and
 - calf to beef



**84,599
FARMS**



Dairy
15,639



Cattle Rearing
19,952



Cattle Other
27,025



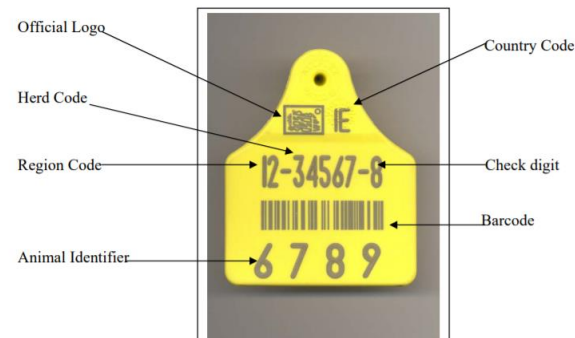
Sheep
12,758



Tillage
7,387

Ireland/EU rules of engagement

- **A single unique life-long identification**
- **Compulsory to record**
 - Dam ID
 - Gender
 - All births
 - All deaths
 - All inter-location movements
- **Carcass information**
- **Incentives to record other data**
 - Dystocia, calf quality, docility, milk score ...



An Bliain Teiciméireachta agus Bliain
Department of Agriculture and Food, Ireland.

Tag No. INNER FACE

Passport/Cattle Identity Card IE 8888888 7 0123

Date of Birth: 16 MAY 2000
Breed: HE Sex: M A L E
Date of Issue of Card: 28/09/2000

ID. Code of Dam: IEMNSG0070M

Name & Address of Owner/Keeper of Head of Stock/Owner of Breeding Rights:
JOE FARMER
GLENROE FARM
CO WICKLOW

Special Beef Premium Eligibility/Status (for Official use):
Z8888888

FIRST AGE PREMIUM		BULL PREMIUM FROM		ONE FULL DIVIDEND UNIT FROM		SECOND AGE PREMIUM	
FROM	16/12/2000	16/12/2000	17/05/2002	FROM	16/01/2002	TO	16/01/2002
TO	15/01/2002	NO UPPER AGE LIMIT					

Certificate of Tuberculosis Testing
I certify that this animal passed the test indicated below and that no animal failed the test.

DATE OF TEST: _____
Herd No. _____
Signature of Veterinary Surgeon _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

Certificate of Brucellosis Testing
I certify that this animal passed the test indicated below and that no animal failed the test.

Date of Test: _____
Herd No. _____
Signature of Certifier _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

This is an official document. It is the property of the Minister for Agriculture and Food. Any alteration/interference/damage renders it invalid. Document must be replaced by the owner/keeper and completed as BULL CARD FOR OWNERS/KEEPERS, TRANSACTIONS AND MOVEMENTS following arrival of animal at each holding (see reverse of card). Document must be surrendered (a) on request to an Authorized Person (b) to the veterinary surgeon at the commencement of any culling scheme (c) to the DAFS office. Some fields may be left blank. Details of the various features are given in the accompanying leaflet.

Tag No. IE888888870123

From pasture to plate



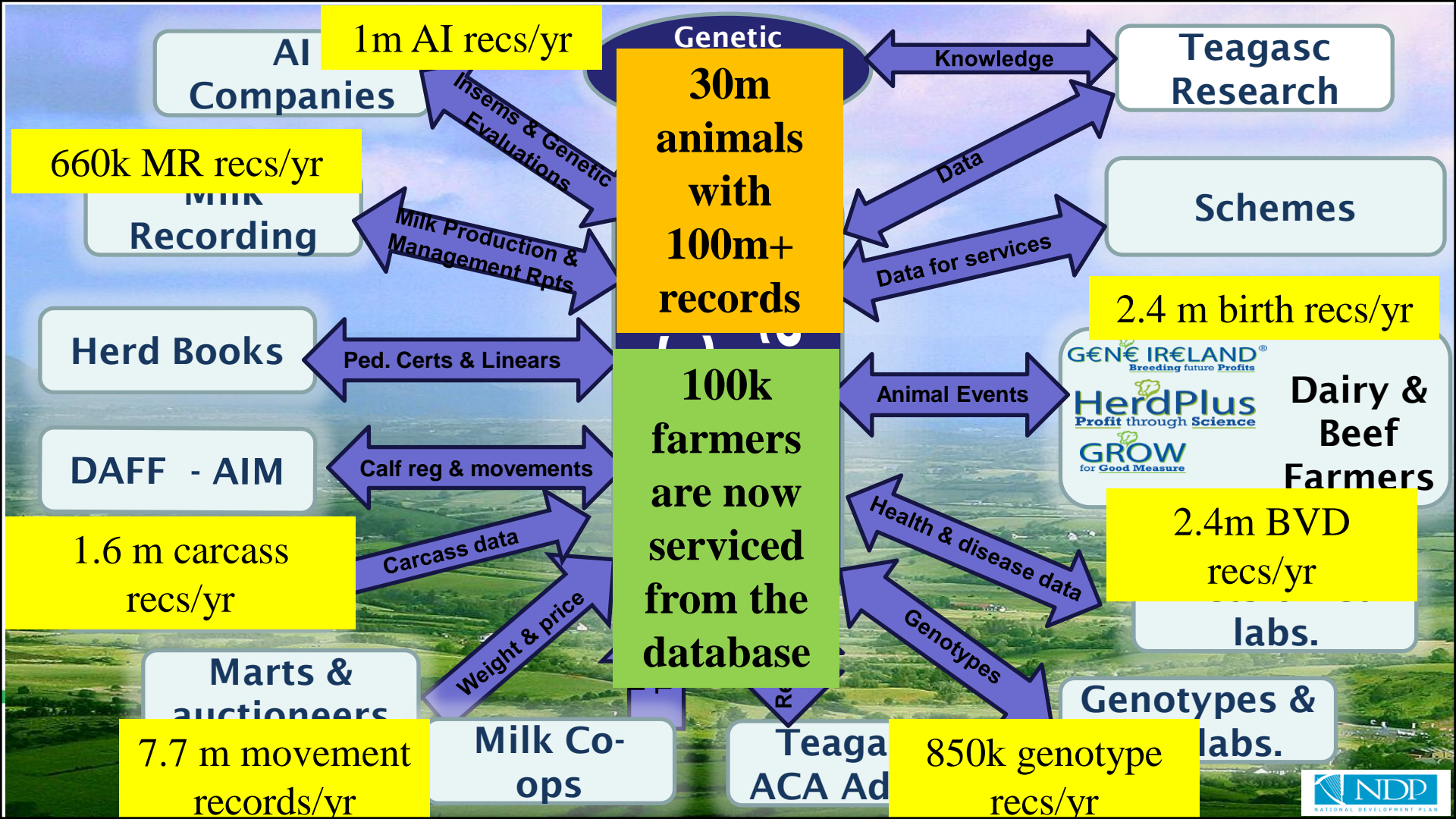


Irish Cattle Breeding Federation

- Co-operative established in 2000
- 80 staff servicing 100,000 farmers

Organisation	Share %	Members
Farm organisations	46	6
AI services	18	3
Milk recording	18	3
HerdBooks	18	3
Dept Agric	0	1

- **Objective – ensure the next generation of animals are better than the previous**
- Independent genetic evaluations for farmers & industry
- Close relationships with key stakeholders (e.g., DAFM, Teagasc, Universities)
- Data sharing for a common good
 - ICBF do not own animals



AI Companies

1m AI recs/yr

Genetic
30m animals with 100m+ records

100k farmers are now serviced from the database

Teagasc Research

660k MR recs/yr

Milk Recording

Schemes

Herd Books

2.4 m birth recs/yr

DAFF - AIM

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

1.6 m carcass recs/yr

2.4m BVD recs/yr
labs.

Marts & auctioneers

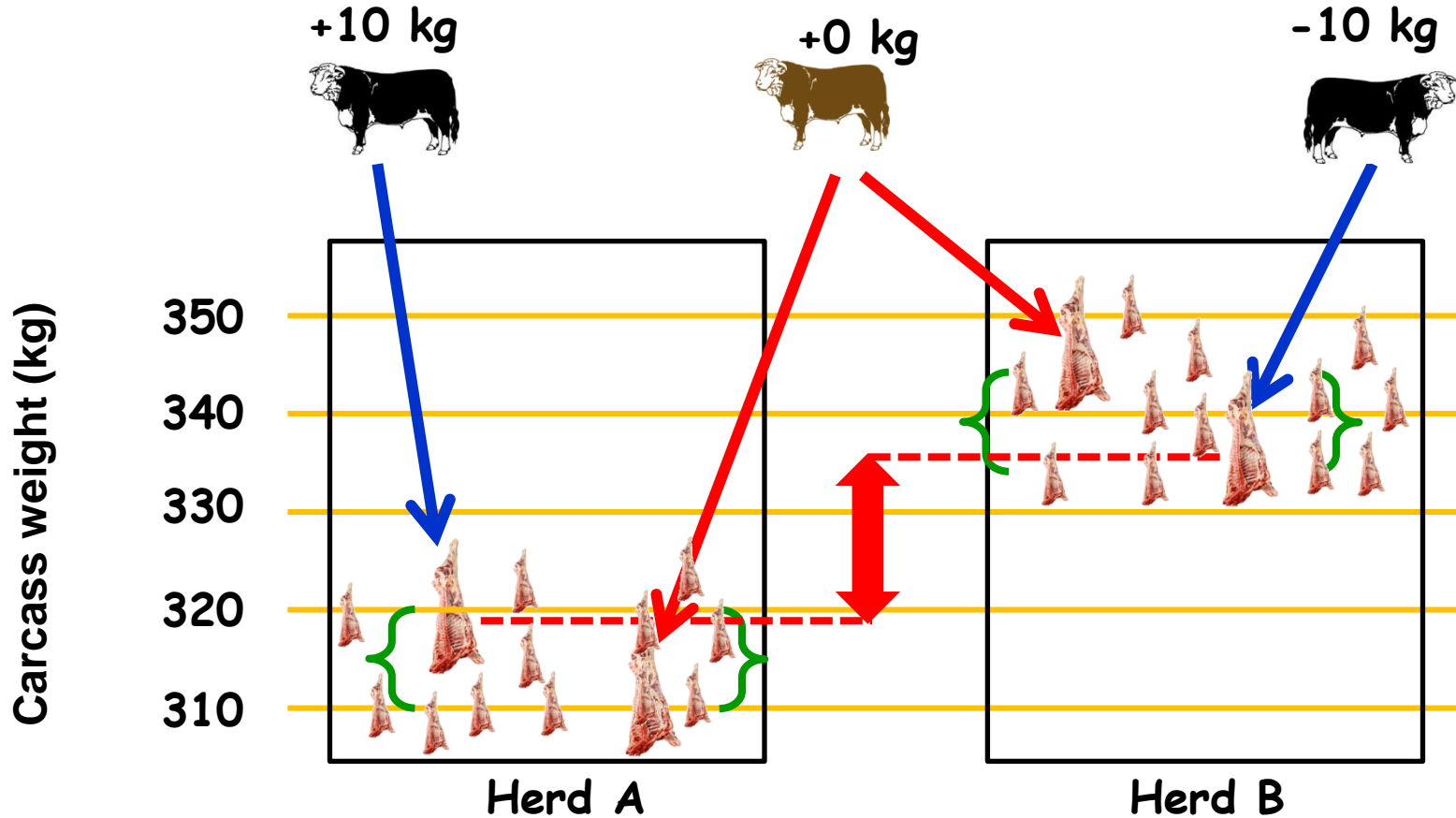
7.7 m movement records/yr

Milk Co-ops

Teaga ACA Ad

850k genotype recs/yr

Genotypes & labs.



Carcass weight (kg)

+10 kg



+0 kg



-10 kg



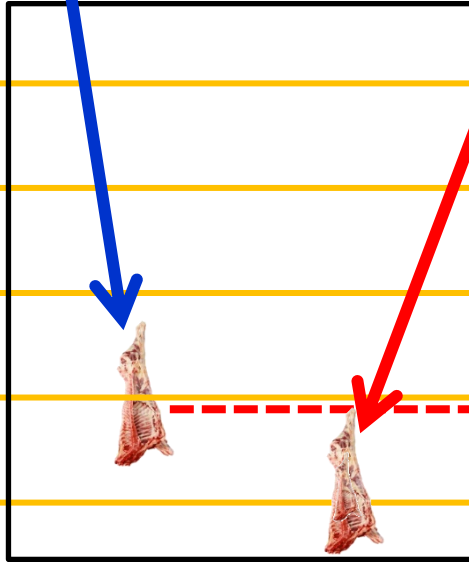
350

340

330

320

310



Herd A

0 kg



Herd B

+30 kg

BLUEs v BLUPs

$$P = G + E$$

$$P = BLUP + BLUE$$

Good growth = Poor genetics + excellent management

Good growth = Excellent genetics + poor management

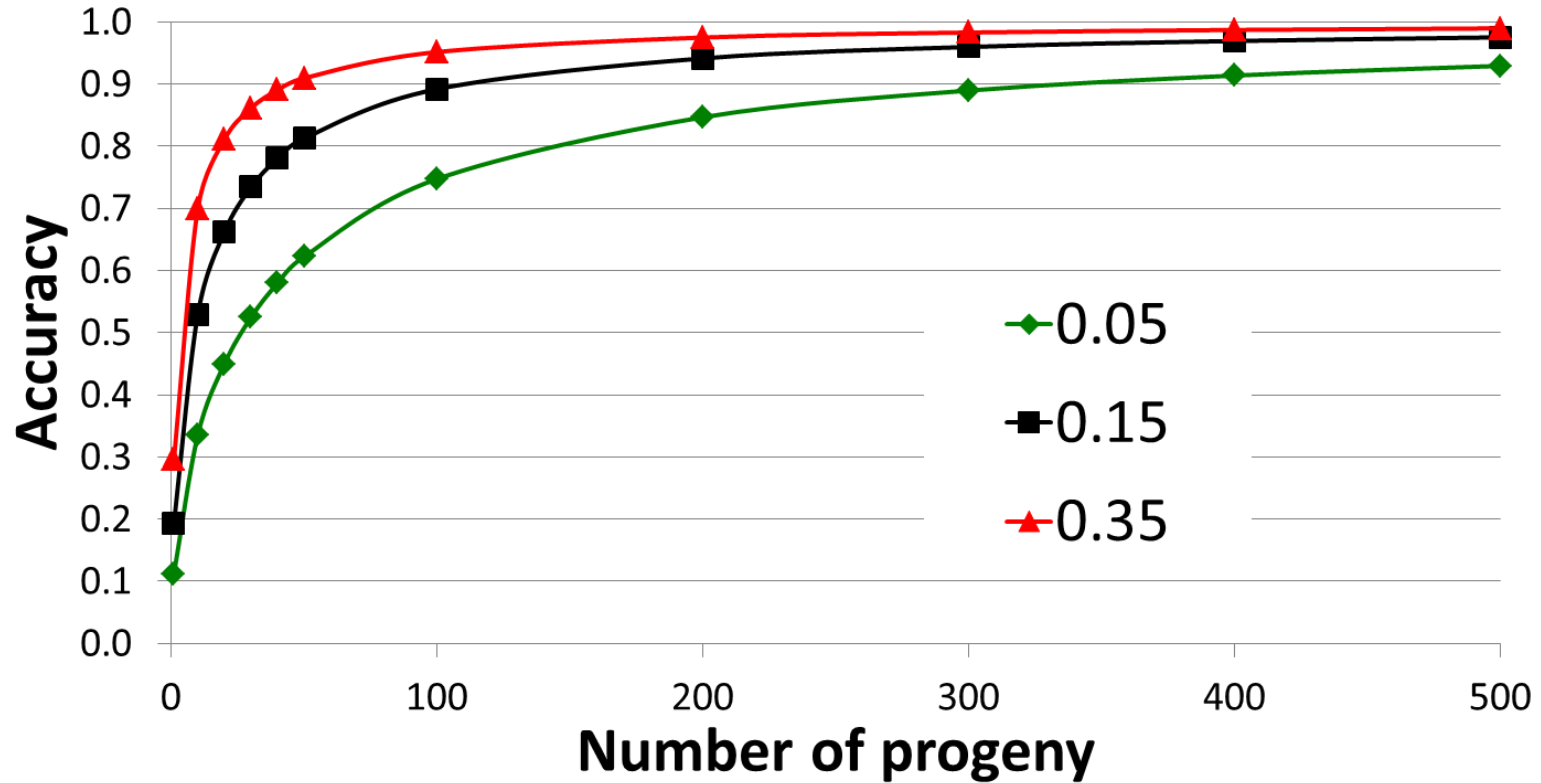
Same advice for both???

Ancillary data

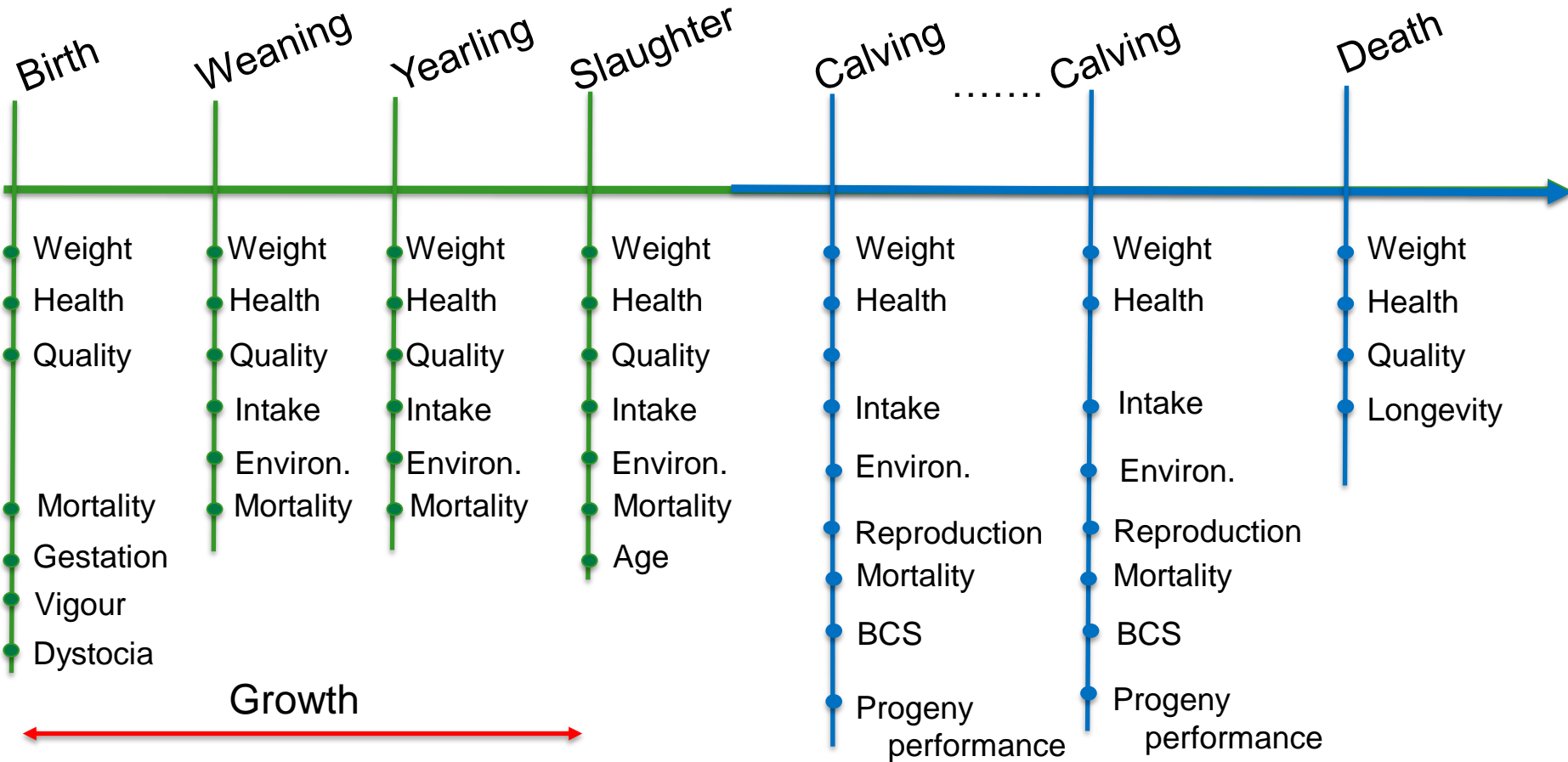
- Gender
- Age
- Parental information
-

- Contemporary group
 - If fed differently

Quantity of data - breeding



Data across life



Birth

Trait	h ²	N
Weight	0.20	18
Health	0.05	75
Quality	0.15	25
Mortality	0.03	130
Dystocia	0.20	18
Vigour	0.20	18
Gestation length	0.45	8

Direct & maternal effects

Economic values

Objective versus subjective

Genomics – just more data

Weight v Dystocia

New traits??

Weaning & Yearling

Trait	h^2	N
Weight	0.30	12
Health	0.05	75
Quality	0.30	12
Intake	0.30	12
Environment	0.20	18
Mortality	0.03	130

Direct & maternal effects

Economic values

Objective versus subjective

Spin-off traits

Efficiency

Growth rate

Intake?

Weaning & Yearling – subjective measures

Animal (2012), 6:9, pp 1389-1397 © The Animal Consortium 2012
doi:10.1017/S17571731112000705



Genetic relationships between carcass cut weights predicted from video image analysis and other performance traits in cattle

T. Pabiou^{1,2†}, W. F. Fikse², P. R. Amer³, A. R. Cromie¹, A. Näsholm² and D. P. Berrv⁴

Table 3 Genetic correlations (standard errors in brackets) between carcass cut weights (kg – at constant carcass weight) and carcass value (€ – at constant live weight), auction prices for calves (€), weanlings (€ – at constant live weight) and post-weanlings (€ – at constant live weight), live weight (kg) and weaning quality (score 1 to 5)

Trait	Total meat weight	Total fat weight	Total bone weight	Lower value cuts weight	Medium value cuts weight	High value cuts weight	Very high value cuts weight
Carcass value	0.45 (0.03)	-0.38 (0.05)	-0.72 (0.03)	0.38 (0.05)	0.35 (0.04)	0.52 (0.03)	0.69 (0.03)
Calves auction price	0.26 (0.07)	-0.23 (0.09)	-0.35 (0.07)	0.45 (0.08)	0.38 (0.07)	0.34 (0.07)	0.38 (0.07)
Weanling auction price	0.49 (0.11)	-0.39 (0.16)	-0.45 (0.13)	0.41 (0.14)	0.66 (0.10)	0.37 (0.11)	0.55 (0.12)
Post-weanling auction price	0.68 (0.08)	-0.67 (0.12)	-0.32 (0.13)	0.61 (0.11)	0.50 (0.11)	0.65 (0.08)	0.67 (0.10)
Live weight at weaning							
Direct	-0.13 (0.10)	-0.10 (0.14)	0.10 (0.12)	-0.03 (0.12)	-0.34 (0.11)	-0.07 (0.10)	0.01 (0.12)
Maternal	-0.01 (0.11)	-0.13 (0.15)	0.10 (0.13)	-0.16 (0.13)	0.07 (0.12)	-0.01 (0.11)	-0.01 (0.13)
Live weight at post-weaning	0.08 (0.08)	-0.12 (0.12)	0.09 (0.09)	-0.07 (0.10)	0.14 (0.08)	0.04 (0.08)	-0.02 (0.10)
Weaning quality	0.39 (0.08)	-0.31 (0.12)	-0.30 (0.10)	0.33 (0.10)	0.12 (0.09)	0.28 (0.08)	0.49 (0.09)

Farmer scored
 $h^2=0.32$

Professionally scored
 $h^2=0.24-0.26$

Table 4 Genetic correlations (standard errors in brackets) between carcass cut weights (kg – at constant carcass weight) and linear traits recorded at weaning and post-weaning age (scores 1 to 10/15)

Maturity group	Trait	Total meat weight	Total fat weight	Total bone weight	Lower value cuts weight	Medium value cuts weight	High value cuts weight	Very high value cuts weight
Weaning	Height at withers	-0.25 (0.11)	0.08 (0.17)	0.68 (0.10)	0.09 (0.14)	-0.58 (0.11)	-0.09 (0.12)	-0.06 (0.14)
	Length of back	-0.22 (0.12)	0.23 (0.17)	0.51 (0.13)	-0.12 (0.15)	-0.51 (0.12)	-0.09 (0.13)	-0.10 (0.15)
	Length of pelvis	-0.26 (0.15)	0.02 (0.21)	0.44 (0.17)	-0.28 (0.18)	-0.56 (0.14)	-0.20 (0.15)	-0.20 (0.18)
	Width at withers	0.32 (0.14)	-0.34 (0.20)	-0.28 (0.17)	0.44 (0.16)	-0.38 (0.15)	0.25 (0.15)	0.63 (0.14)
	Width behind withers	0.13 (0.13)	-0.17 (0.19)	-0.37 (0.16)	0.18 (0.16)	-0.33 (0.14)	0.10 (0.13)	0.43 (0.15)
	Loin development	0.29 (0.15)	-0.11 (0.21)	-0.46 (0.17)	0.26 (0.17)	-0.47 (0.15)	0.09 (0.15)	0.50 (0.15)
	Hindquarter development	0.42 (0.10)	-0.28 (0.16)	-0.41 (0.12)	0.32 (0.13)	-0.06 (0.12)	0.38 (0.11)	0.46 (0.12)

Slaughter

Trait	h^2	N
Weight	0.30	12
Health	0.05	75
Quality	0.30	12
Intake	0.30	12
Environment	0.20	18
Mortality	0.03	130
Age	0.13	28

Direct & maternal effects

Economic values

Objective versus subjective

Spin-off traits

KO

Total intake

Cow

Trait	H ²	N
Weight	0.30	12
Health	0.05	75
Quality	0.30	12
Intake	0.30	12
Environment	0.2	18
Mortality	0.03	130
Reproduction	0.03	130
Longevity	0.03	130
BCS	0.30	12

Objective versus subjective

- Milk score
 - 20% heritable
 - Genetic correlation of 0.70 with maternal weaning weight

Spin-off traits

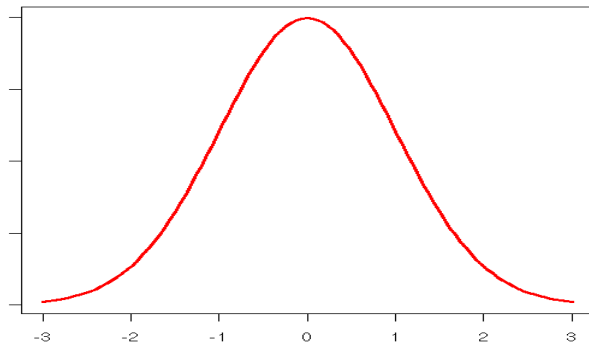
Lifetime kg yield

Lifetime intake

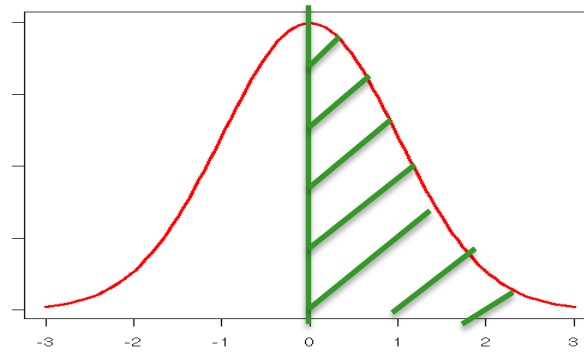
Lifetime footprint

Importance of data pre-selection

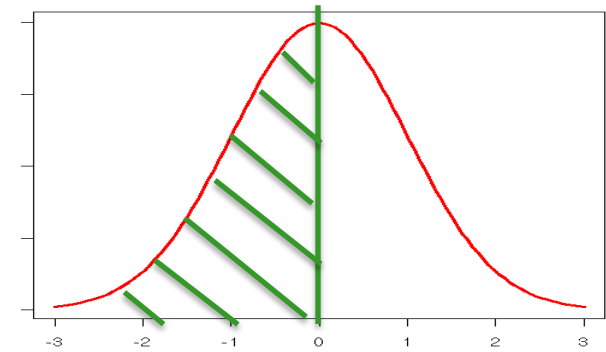
Which bulls/heifers do you slaughter versus keep?



EBV = 0



EBV = +0.8



EBV = -0.8

Genetic and nongenetic factors associated with the fate of maiden ewe lambs:
slaughtered without ever lambing versus retained for breeding¹

Noirin McHugh,^{*2}Thierry Pabiou,[†] Kevin McDermott,[†] Eamon Wall,[†] and Donagh P. Berry^{*}

Who owns the data?

- Rarely a sole own
- Ownership relates to property
 - Real property
 - *Own the land/animals from which the data was generated*
 - Personal property
 - *Owns the equipment (and possibly even developed the equipment) that created the data*
 - Intellectual property
 - *Generated the intellectual property from the resulting data*

Where to now?

- What's in it for **ME**?
- New traits
 - Health
 - Meat eating quality
 - Environment
 - Age at slaughter
- Citizen science??

Citizen/community/crowd science

- **Scientific research conducted, in whole or in part, by amateur/nonprofessional scientists**
- *Rate your steak?*

