



IRISH CATTLE BREEDING FEDERATION

Dairy Breeding Consultation Meeting

Thursday 5th November 2009

Moorepark



Agenda

1. Research Reports:
 - a. Fertility evaluations – Donagh Berry
 - b. Health evaluations – Donagh Berry
 - c. Calving Evaluations – Francis Kearney
 - d. Location data (CMMS) – Ross Evans
 - e. Beef evaluations – Ross Evans
 - f. Genomics – Francis Kearney
 - g. EBI – Laurence Shalloo
 - h. Test-day models, culling index, Interbull test runs, across breed linears – Andrew Cromie
 - i. Cross breeding – Frank Buckley
2. Roll-out & implementation
 - a. Meeting 9th Dec – changes for January 2010
 - b. Implications – Active Bull List
 - c. Official proof release – Monday 1st Feb
3. Gene Ireland
 - a. Review
 - b. Plans for 2010
 - c. Research – Sinead McParland
4. AOB

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Female fertility

***Donagh Berry¹, Francis Kearney²,
Ross Evans² & Andrew Cromie²***

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Current state of the art

- Calving interval (parity 1 to 3)
- Survival (parity 1 to 3 - *adjusted for milk yield*)
- Lifespan
- Milk yield (parity 1 to 3 – *predictor*)
- Type traits
 - ANG, BCS, UD, FA

Research questions

- **Potential of insemination data to define new goal traits (replace CIV) or act as predictors**
- **Extend to 5 lactations**
- **Increase the accuracy of identifying high yielding & fertile bull dams**
- **Re-estimate genetic parameters**

Data

- **Years 2002 to 2009**
- **2,208,503 AI records on Holstein-Friesian COWS**
- **221,860 natural mating records**
- **379,336 pregnancy diagnoses**
- **1,612,724 Holstein-Friesian cows**
- **14,757 dairy herds**

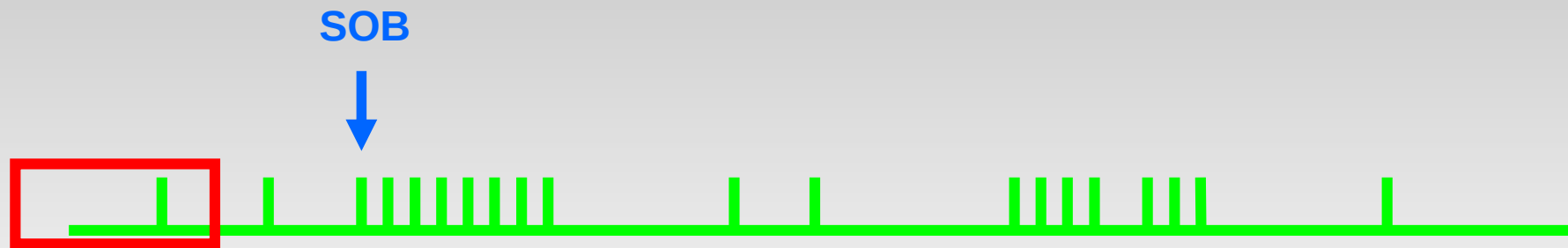
Interbull Traits

- Trait I – heifer conception trait (NR56)
- Trait II – return to cyclicity (CFS)
- Trait III – pregnancy trait (NR56)
- Trait IV – conception as an interval trait (NS)
- Trait V – calving to conception or CIV

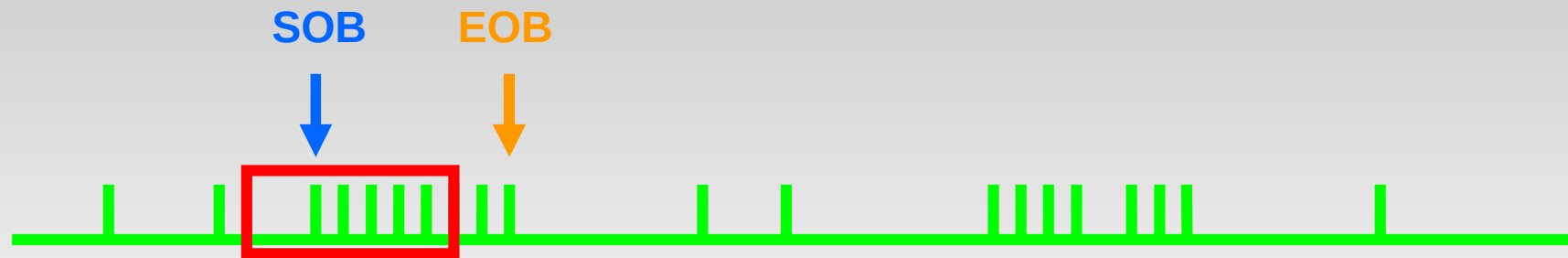
Traits

- **Interval traits**
 - Age at first service (AFS), age at first calving (AFC), Calving to 1st service (CFS), calving interval (CIV), calving to conception
- **Binary traits**
 - Pregnancy rate 1st service (PRFS), 56-day non-return (NR56), 21-day submission rate (SR21), pregnant in the first 6 weeks of the breed season (PR42), calving in the first 42 days of the calving season (CALV42)
- **Count traits**
 - Number of services (NS)

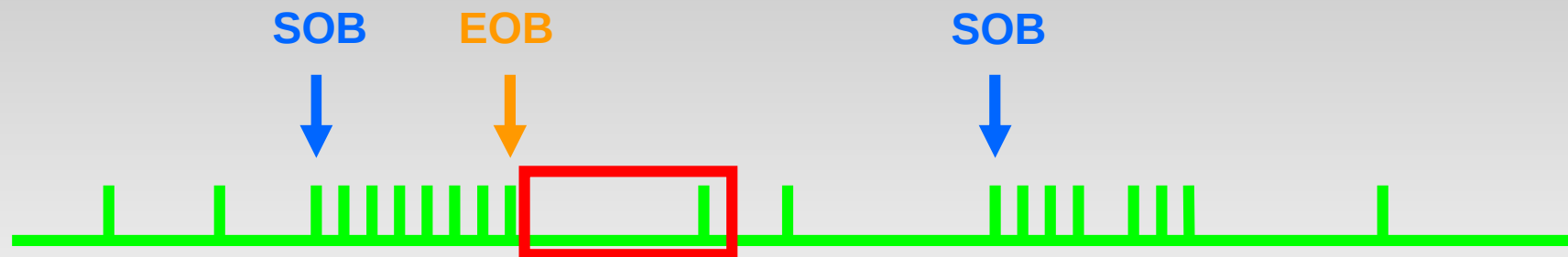
Defining the breeding season



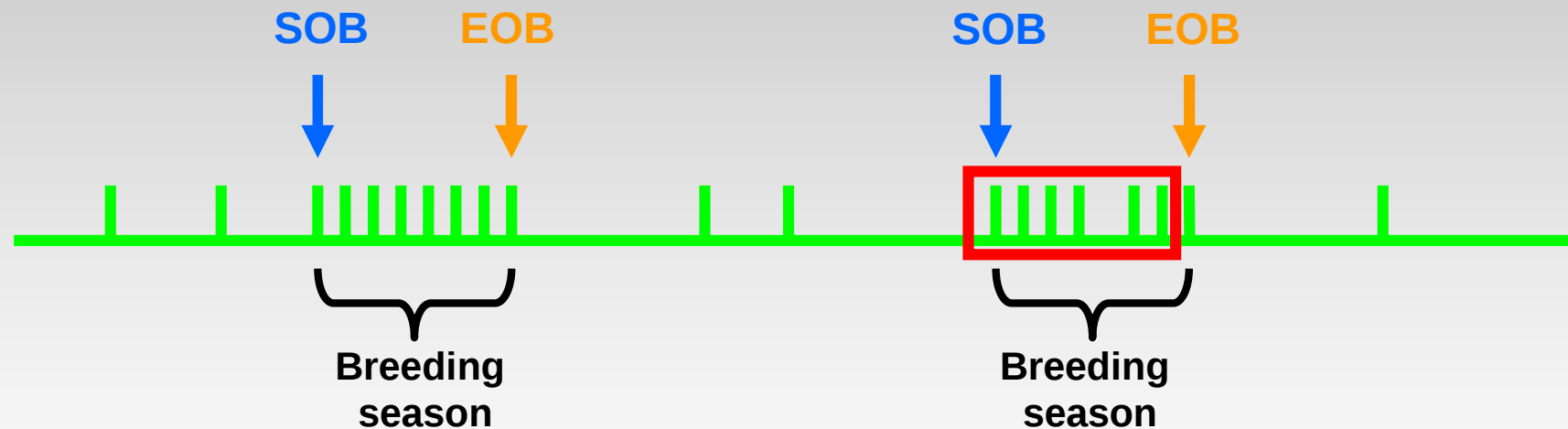
Defining the breeding season



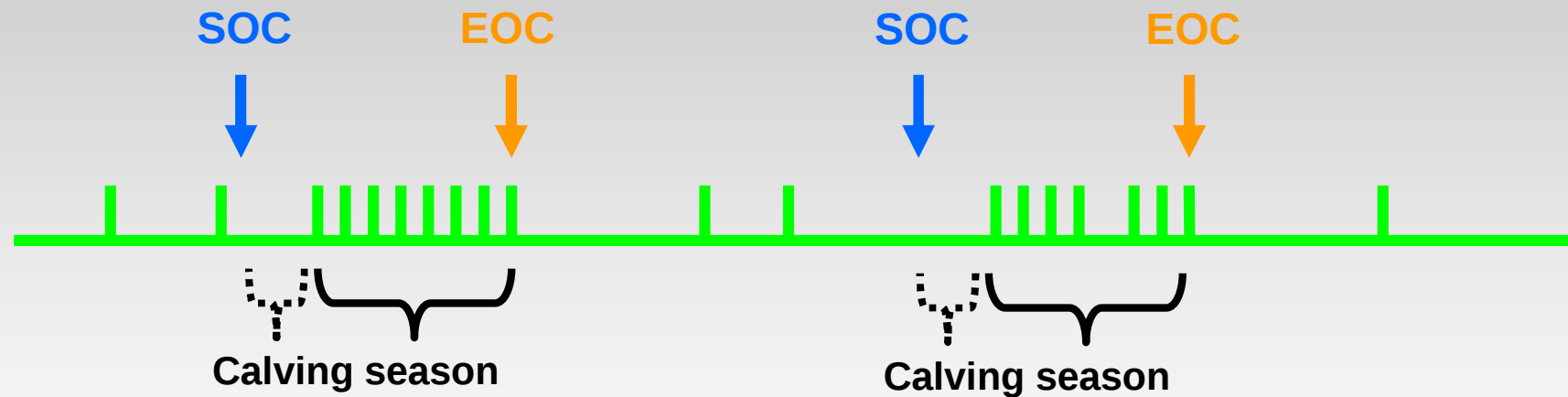
Defining the breeding season



Defining the breeding season



Defining the calving season



Analysis – within parity

- **Fixed effects**
 - Contemporary group
 - Holstein breed proportion
 - Heterosis and recombination
 - Age at calving
 - PRFS and NR56
 - Whether or not a double insemination
 - Service sire
 - Year of service by month of service

Current estimates v new estimates genetic variation and heritability

Trait	Parity	Current		New	
		SDg	h^2	SDg	h^2
Survival	1		0.027		0.030
	2		0.021		0.014
	3		0.016		0.010
	4				0.051
	5				0.036
Calving interval	1		0.048		0.051
	2		0.031		0.036
	3		0.034		0.032
	4				0.021
	5				0.022

Current estimates v new estimates genetic variation and heritability

Trait	Parity	Current		New	
		SDg	h^2	SDg	h^2
Survival	1	0.059	0.027	0.061	0.030
	2	0.054	0.021	0.039	0.014
	3	0.048	0.016	0.023	0.010
	4			0.046	0.051
	5			0.016	0.036
Calving interval	1	9.62	0.048	10.2	0.051
	2	7.79	0.031	8.2	0.036
	3	7.93	0.034	7.7	0.032
	4			9.8	0.021
	5			10.1	0.022

Current estimates v new estimates genetic correlations

		Parity			Survival		Calving interval	
		1	2	3	1	2		
Survival	2	0.71 (0.72)						
	3	0.71 (0.72)	0.89 (0.86)					
Calving interval	1	-0.20 (-0.53)	0.03 (-0.52)	0.00 (-0.13)				
	2	-0.24 (-0.60)	-0.12 (-0.55)	-0.09 (-0.62)	0.93 (0.69)			
	3	0.02 (-0.50)	0.06 (-0.51)	0.13 (-0.82)	0.85 (0.59)	0.90 (0.61)		

New estimates in brackets

Current estimates v new estimates genetic correlations

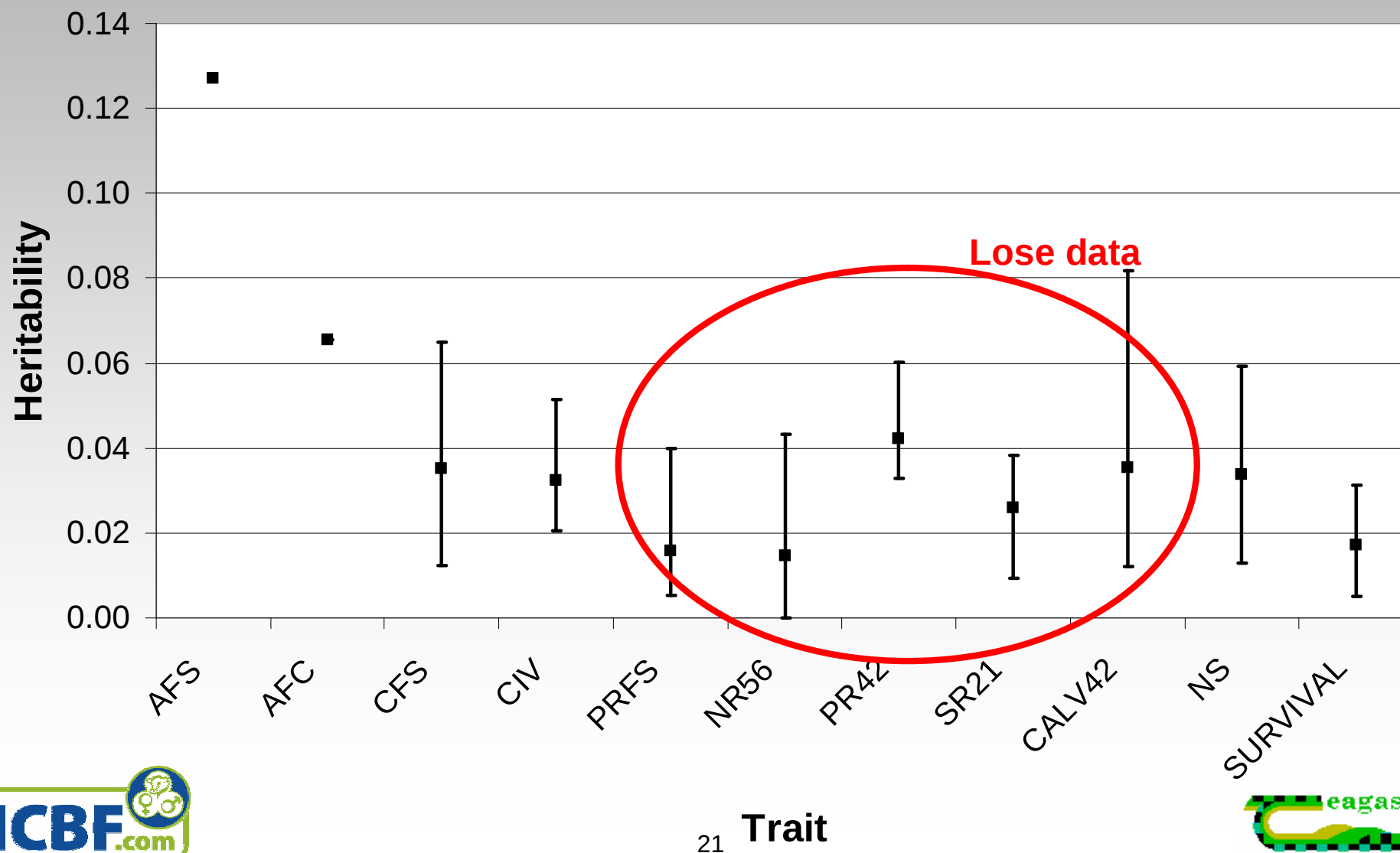
Milk parity	Survival			Calving interval		
	1	2	3	1	2	3
1	0.25 (-0.17)	0.55 (-0.40)	0.43 (-0.29)	0.51 (0.33)	0.50 (0.65)	0.64 (0.37)
2	0.13 (0.09)	0.48 (-0.29)	0.39 (-0.16)	0.51 (0.02)	0.49 (0.52)	0.62 (0.45)
3	0.32 (0.01)	0.42 (-0.25)	0.47 (-0.16)	0.44 (0.23)	0.47 (0.31)	0.67 (0.42)

New estimates in brackets

Survival and milk yield genetic correlation

Years	Parity 1	Parity 2
1998 to 2000	-0.05	-0.03
2006 to 2008	-0.14	-0.33

Heritability - variation



Genetic correlations CFS & CIV

- CFS is genetically correlated with CIV
 - Good predictor

		Calving to first service		
		1	2	3
Calving interval	1	0.77	0.05	0.65
	2	0.04	0.76	0.23
	3	0.52	0.31	0.54
	4	0.50	0.23	0.40
	5	0.84	-0.05	0.23

Genetic correlations CIV & Calv42

- CIV is genetically selecting for more animals calving in the first 42 days of the calving season

		Calving interval				
		1	2	3	4	5
Calv42	1	-0.43	-0.49	-0.29	-0.04	-0.05
	2	-0.48	-0.43	-0.30	-0.56	-0.18
	3	-0.42	-0.28	-0.71	-0.51	-0.66
	4	-0.47	-0.10	-0.43	-0.50	-0.88
	5	-0.20	-0.12	-0.43	-0.48	-0.56

Recommendations

- **Extend fertility evaluation to five lactations (Beef & Dairy)**
- **Include CFS as an early and biological predictor trait**
- **New evaluations**
 - **CFS (1-3), CIV (1-5), survival (1-5), AFC, milk (1-5), lifespan**

Blending PTAs to reflect reality

- Should PTAs reflect their expression under ideal circumstances

Survival to next lactation	Survival	Weighting
	1.00	0.26
0.90	0.90	0.24
0.86	0.77	0.20
0.77	0.60	0.16
0.85	0.51	0.13

Changes to proofs

- **CMMS update (anonymous knowledge of herd of entry)**
- **Revised editing (ETs, CIV to 800 days)**
- **Revised genetic parameters**
- **Additional parities**

Conclusions

- **More relevant genetic parameters**
- **More genetic variation and greater heritability**
- **Better biological predictors**
 - **Should help in cow fertility evaluations**
 - **GENE IRELAND® elite bull dams**
- **Better fertility evaluation**

Male fertility

***Donagh Berry¹, Francis Kearney²,
Ross Evans² & Andrew Cromie²***

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Why interested?

- Useful to monitor sire fertility and technician efficiency during the season
- Useful to undertake retrospective analysis of
 - Sires
 - Technicians
 - Years (different semen processing)
- Useful to answer possible farmer queries

Current state of the art

- **Raw non-return rates**
- **Disadvantages**
 - **Selective mating of some sires (technicians) to inherently low fertility cows**
 - **Selective mating of semen to different parity cows and stage of lactation**
 - **No account of number of inseminations (repeatability)**
 - **Need to be routine**

Objective

To develop a system to rapidly and routinely estimate simultaneously sire and technician “fertility” accounting for noise and annual variation

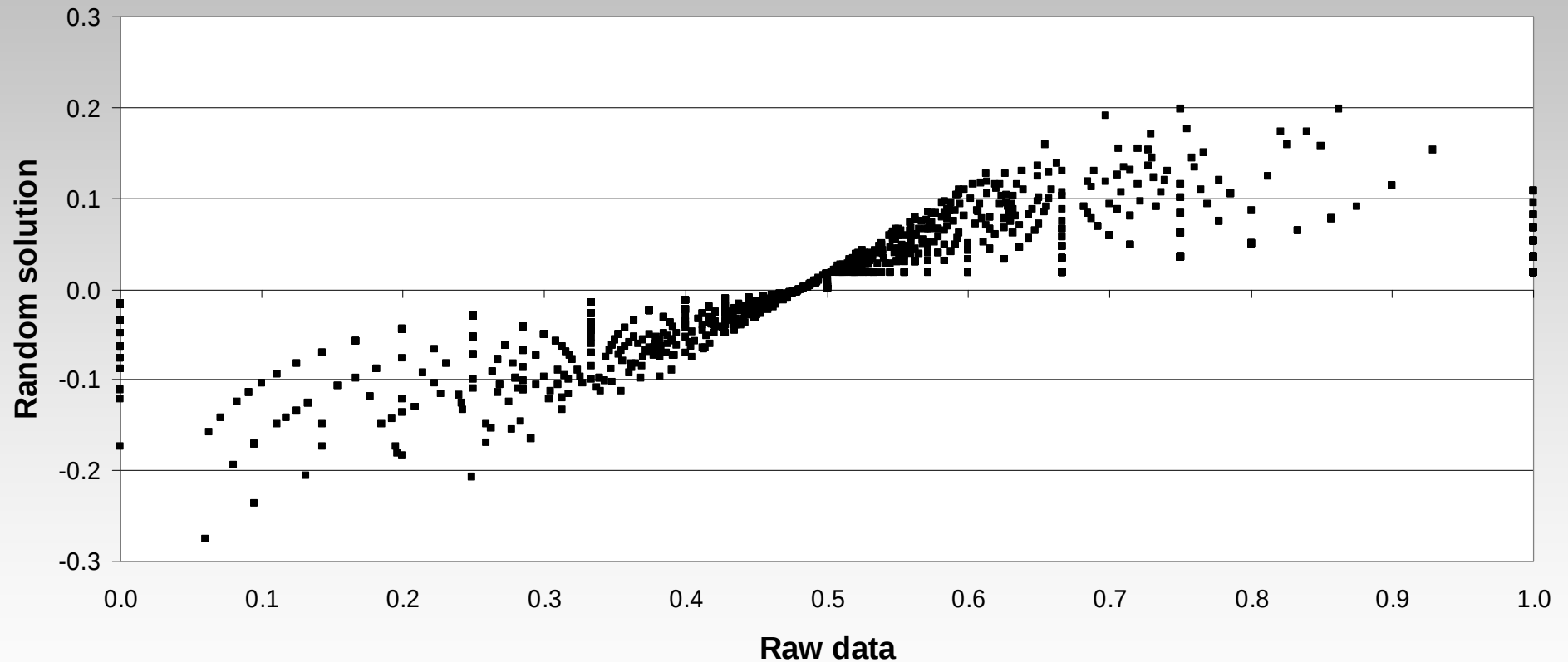
Data

- **3,023,469 insemination records on dairy and beef cows**
- **432,139 pregnancy diagnoses**
- **Ensure accuracy**

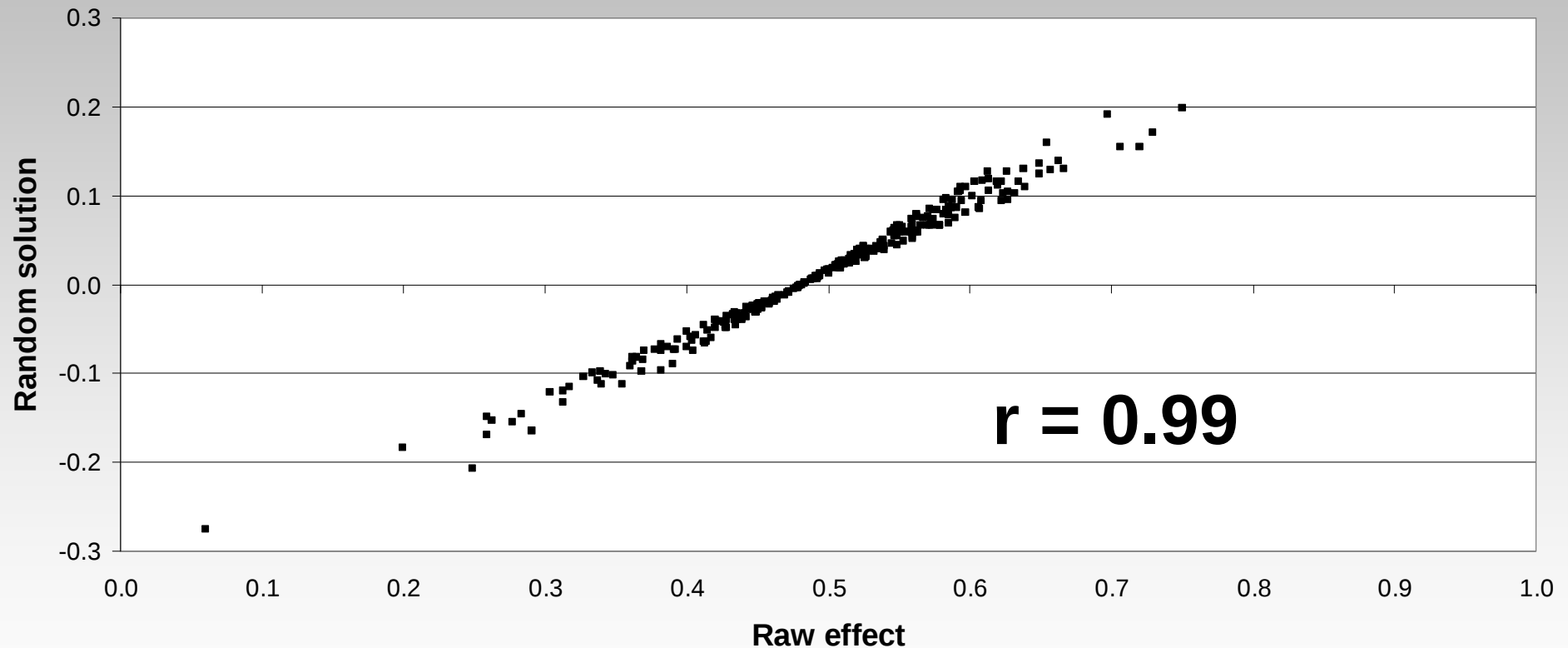
Trait definition

- **Double inseminations excluded**
- **Not pregnant**
 - If followed by another service or a negative pregnancy diagnosis (PD), or by a gestation of >300 days if a beef bull or 295 if a Holstein-Friesian bull
- **Pregnant**
 - If no other service and served within 30 days of the end of the herd AI season, no negative PD and calves within 275 and 300 days (beef bull) or 275 to 295 days (HF bull)
- **Missing**
 - No other service, PD or next calving and served within 25 days of the end of the herd AI breeding season

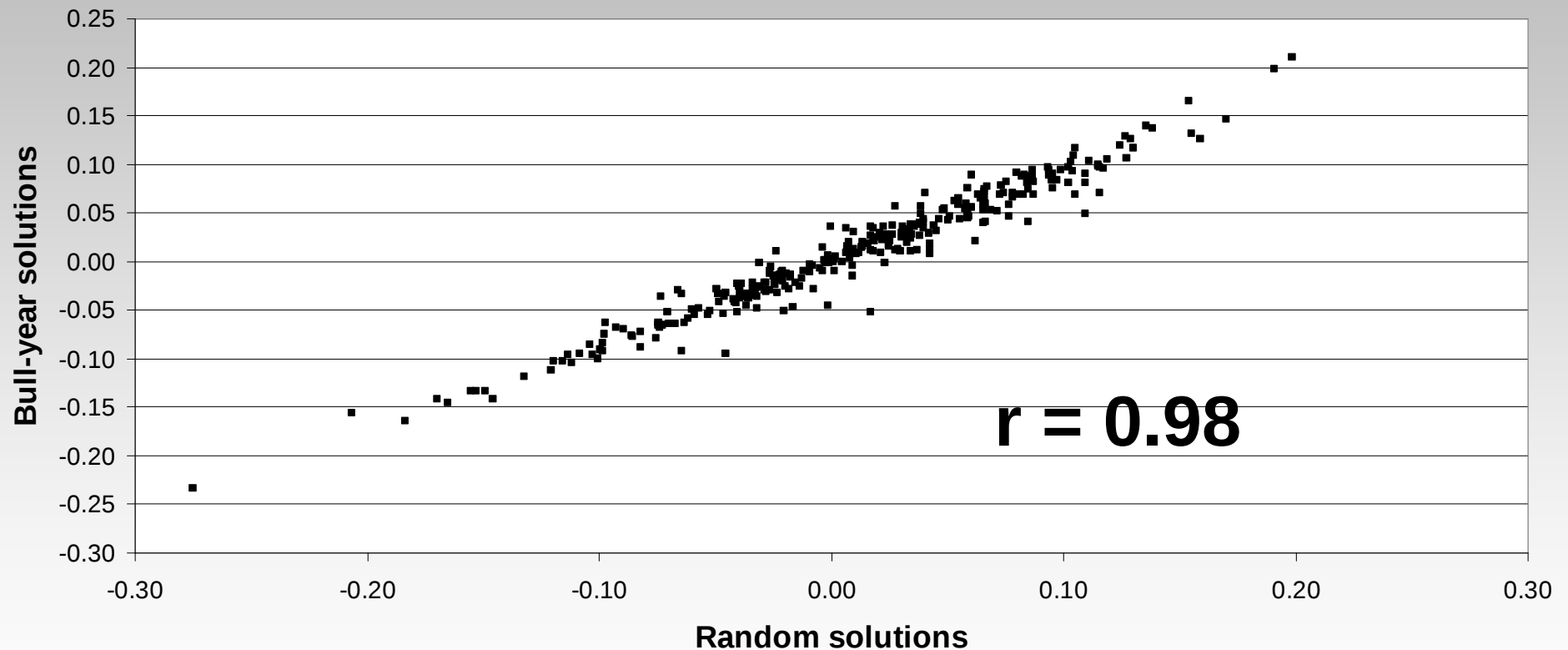
Raw (fixed) versus random



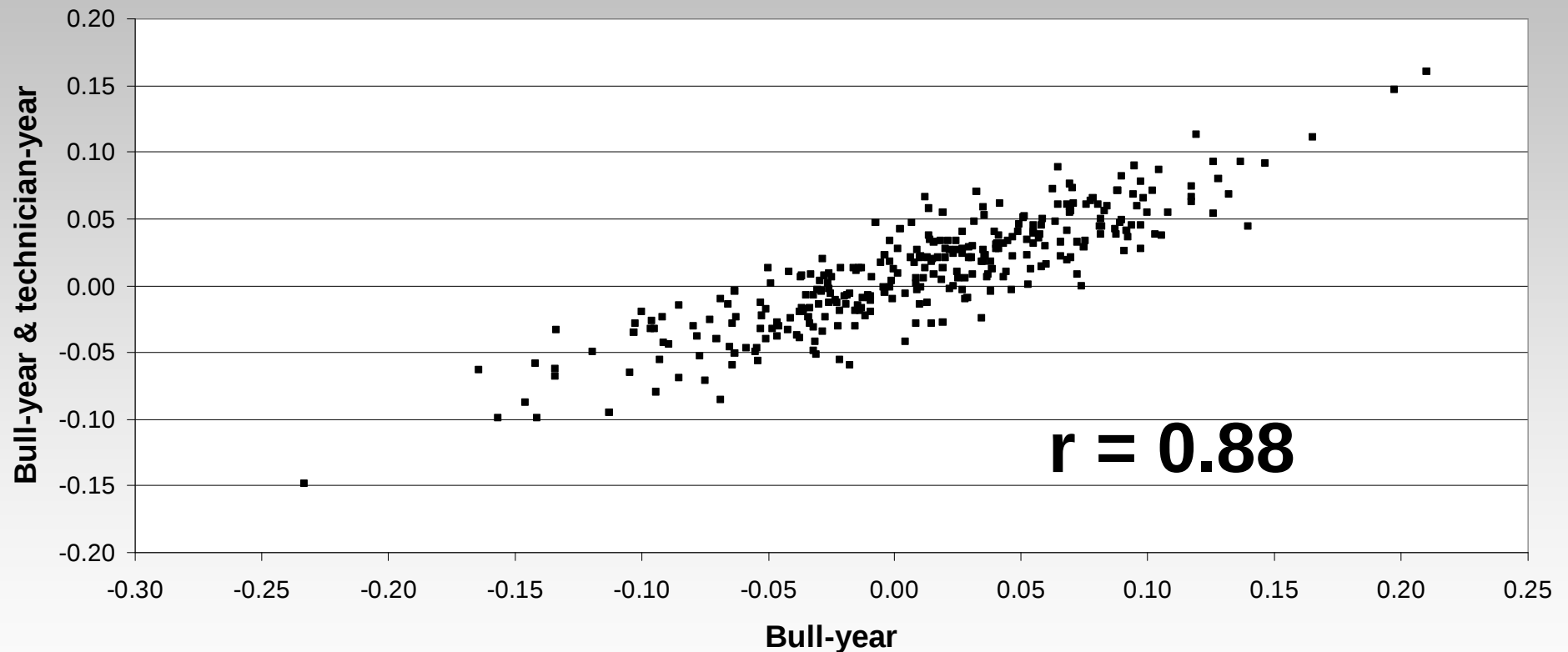
Raw (fixed) versus random >50 inseminations



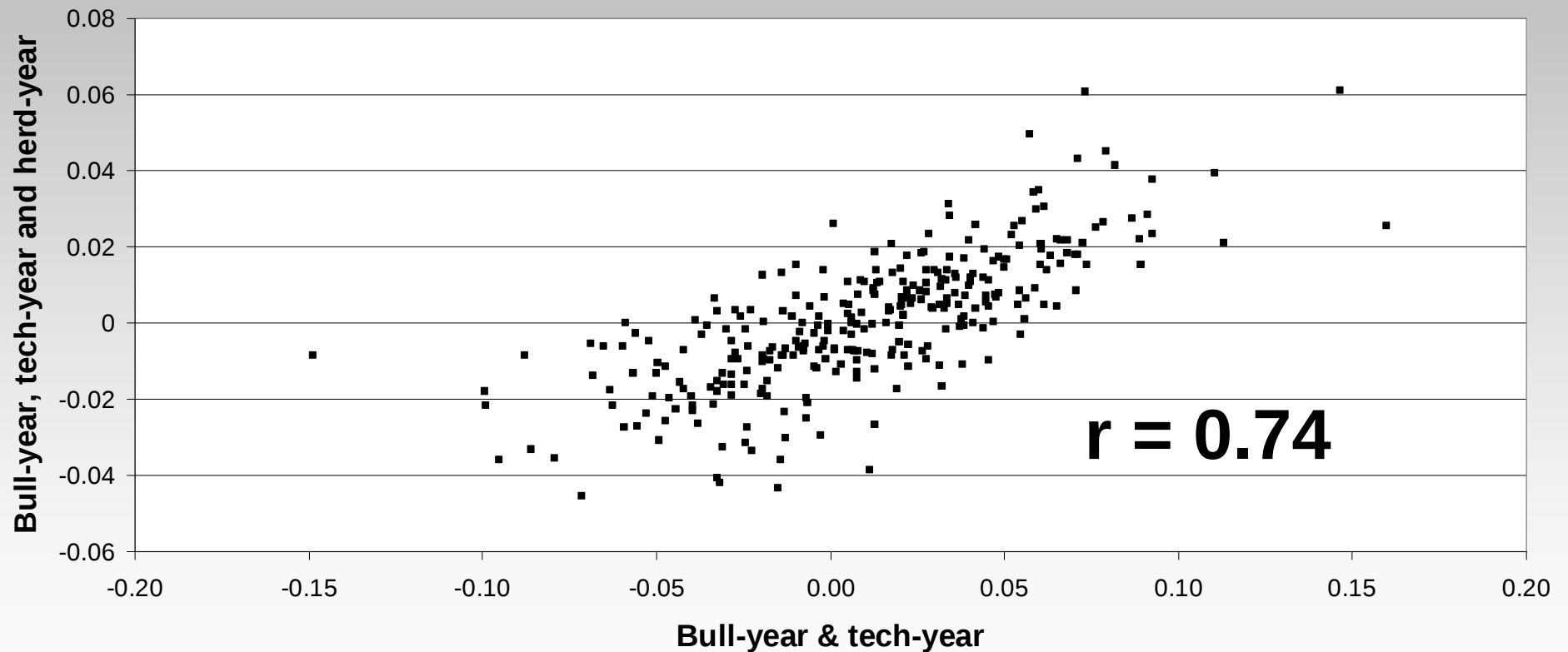
Annual bull effects accounted for



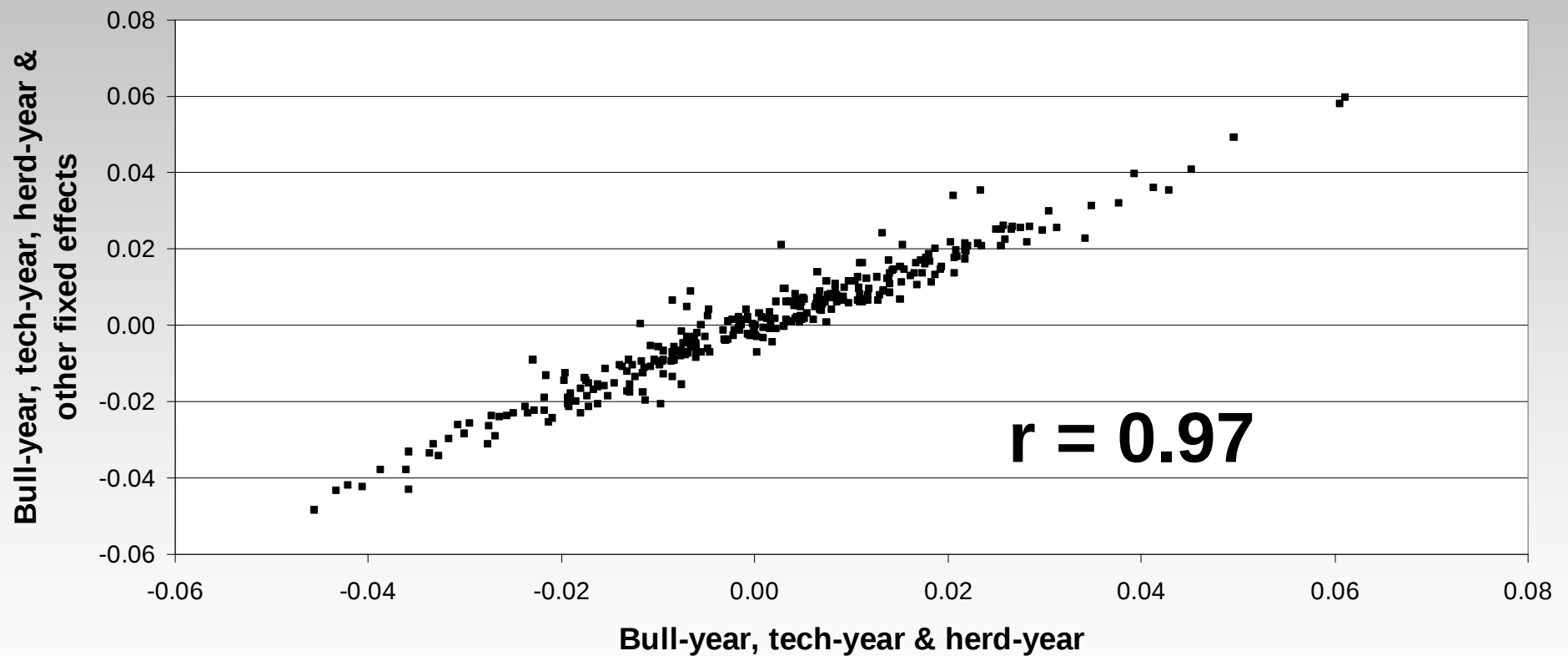
Technician-year accounted for



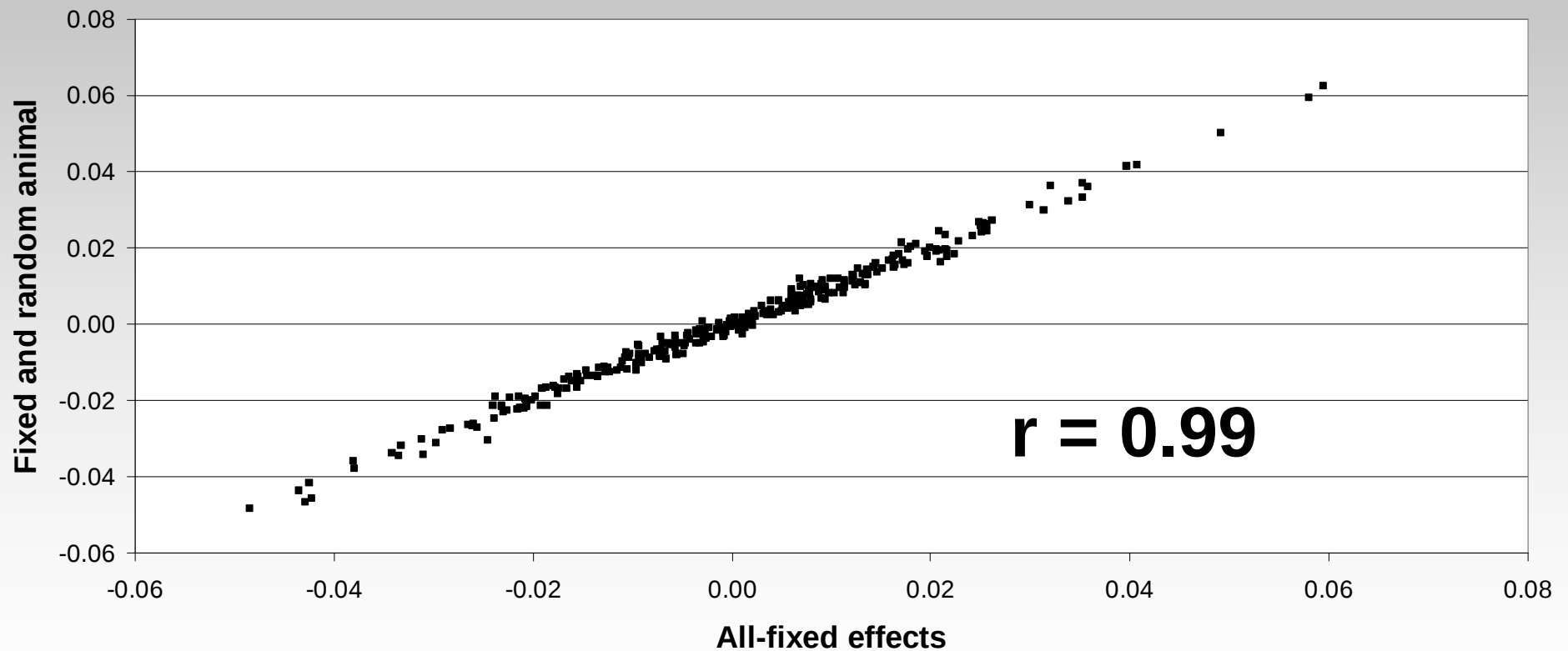
Herd-year accounted for



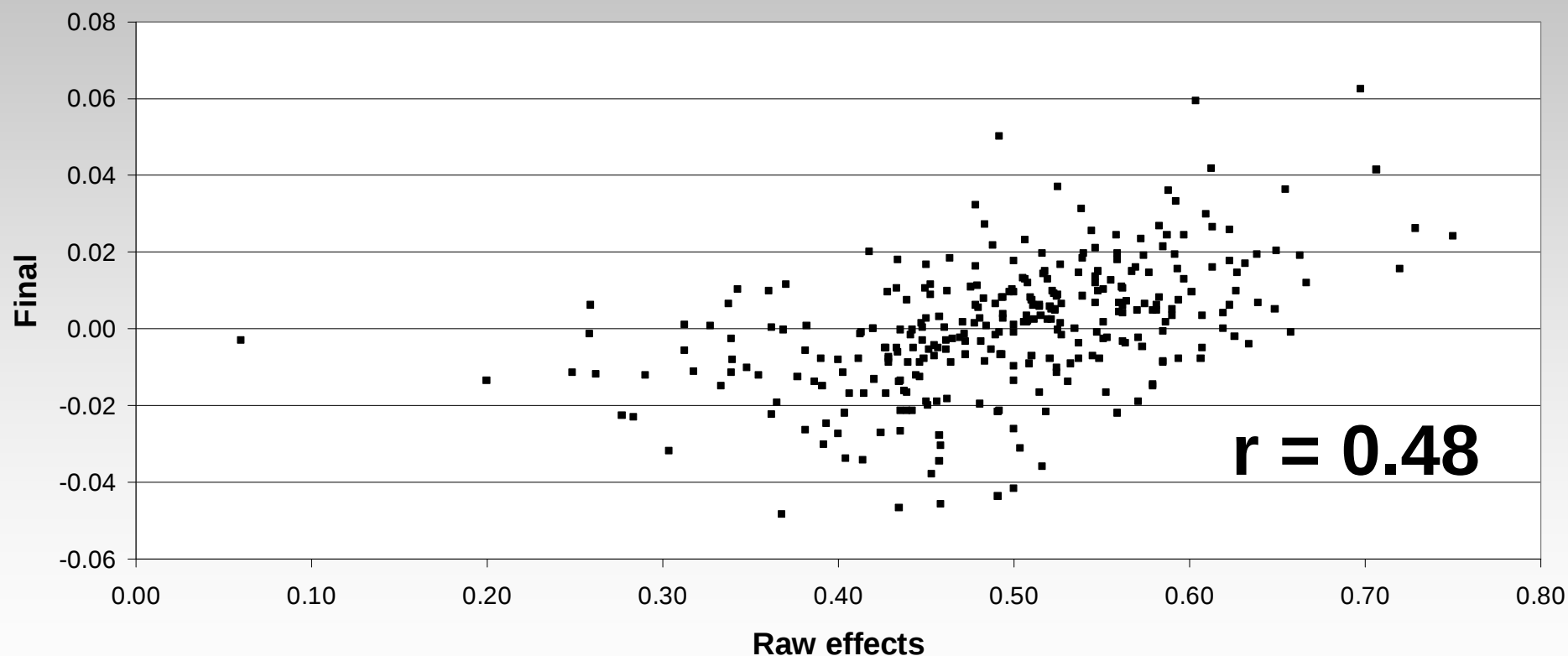
Fixed effects accounted for



Animals genetic and repeatable effects accounted for



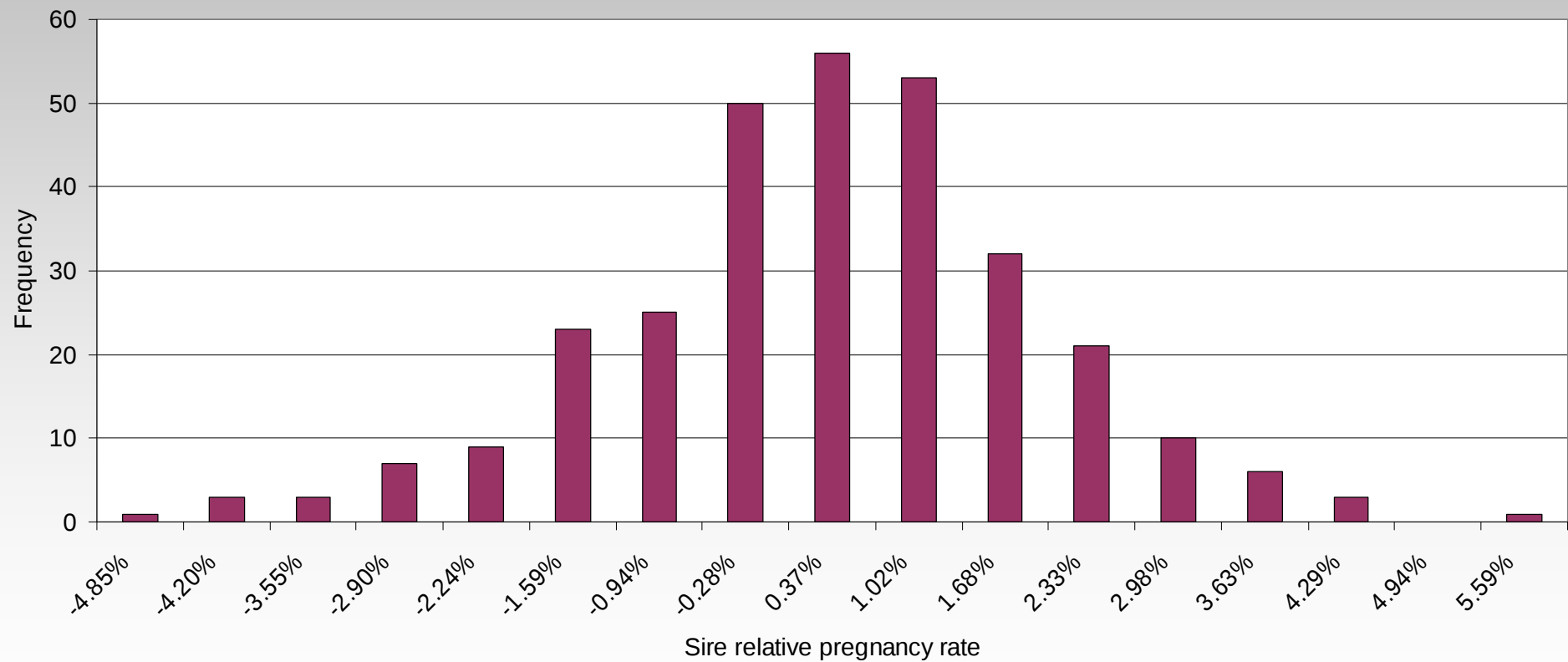
Raw versus final model



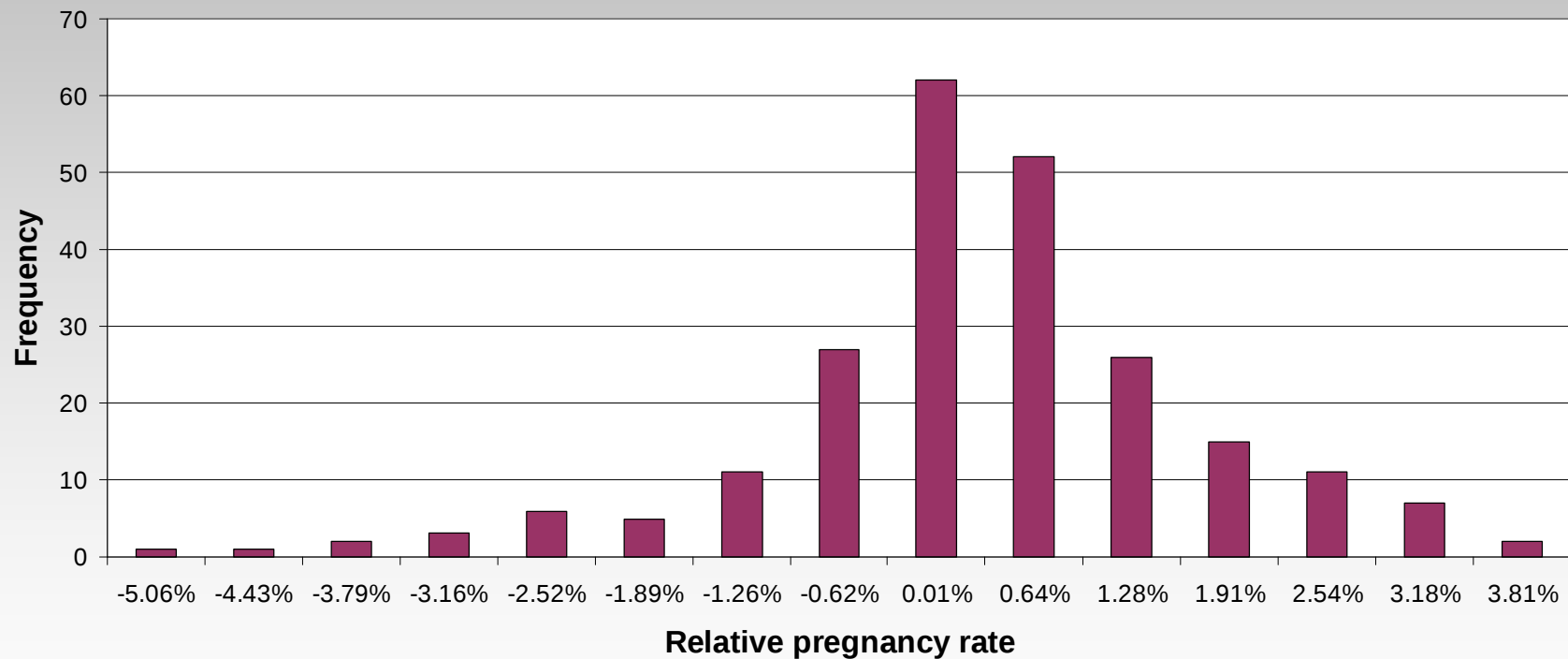
 $r = 0.18$ for technicians >100 insems



Sire relative PRFS



Technician relative PRFS



Conclusions

- Opportunity to develop a system to provide valuable information
- Information is key
- Correlation “best” model with raw à 0.48
 - Improvement
- Additional research
 - Fresh versus frozen semen
 - Inbreeding of mating
 - Genomics of male fertility (Teagasc, UCD)

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Genetics of mastitis and lameness

***Donagh Berry¹, Sean Coughlan²,
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Current knowledge

- **Cost of lameness & mastitis in Ireland**
 - On average X and Y respective
- **Incidence of lameness & mastitis in Ireland**
 - ???
- **Heritability of lameness & mastitis in Ireland**
 - ???
 - Probably ~0.05 based on international data
- **Retained afterbirths, milk fever, ketosis**
 - ????
 - Animal Health Ireland

Health in the EBI

- **Economic weight on mastitis placed on SCC with an assumed genetic correlation of 0.70**
- **Economic weight on lameness placed on locomotion with an assumed genetic correlation of -0.40**
- **Not optimal!**

Lameness and Mastitis data

- 61,205 “positive” mastitis records >2003
- 18,106 “positive” lameness records >2003
- Only first record within 10 day window
- CMMS data à movements in an out
 - We know what cows were on the farm when the event occurred (34 million)
- Compressed to a per lactation basis

Linear type trait data

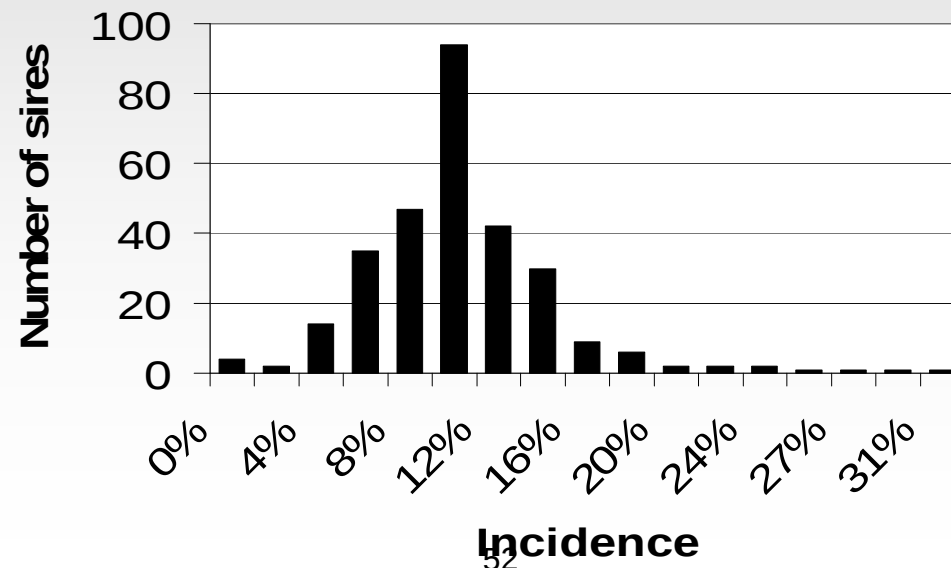
- **First lactation animals scored in contemporary groups of ≥ 4 animals**
 - 44,189 records
- **Feet traits**
 - FA, RLS, LOCO
- **Udder traits**
 - UD, US, FUA, RUH, TL, TEMP, EASE

Statistical model

- **Mastitis and lameness**
 - Herd-year-season of calving
 - Number of herd events
 - Parity
 - Holstein proportion
- **Type traits**
 - Herd-visit contemporary group
 - Stage of lactation
 - Calving month

Genetic results - lameness

- Incidence – 10%
- Heritability – 0.04
 - *Compares well with international estimates (maybe a little on the low side)*
- Repeatability -0.07
- Genetic standard deviation – 0.05



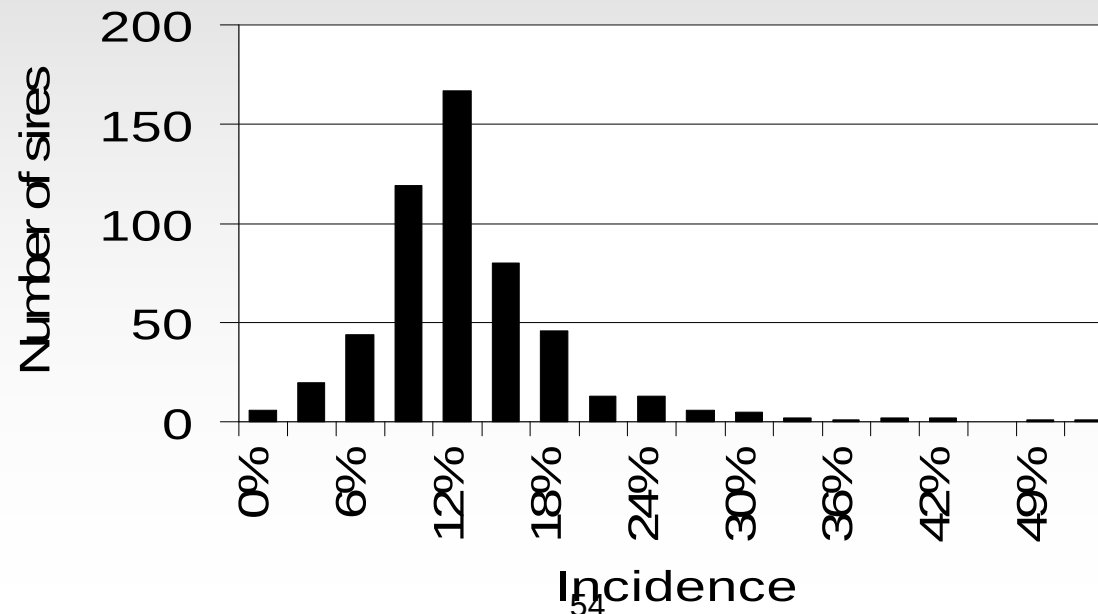
Genetic results - lameness

- Correlation with type traits

Scale		R_g	R_p
RLS	Straight → sickled	-0.05 (0.11)	0.01 (0.03)
FA	Low → steep	0.05 (0.12)	-0.05 (0.03)
LOCO	Lame → even gait	-0.35 (0.11)	-0.02 (0.03)

Genetic results - mastitis

- Incidence – 10%
- Heritability – 0.05
 - Compares well with international estimates
(maybe a little on the high side)
- Repeatability -0.10
- Genetic standard deviation – 0.07



Genetic results – mastitis and SCC

- Correlations with SCC

Parity	Rg	Rp
1	0.60 (0.06)	0.18 (0.01)
2	0.52 (0.07)	0.05 (0.01)
3	0.34 (0.08)	0.08 (0.02)
4	0.17 (0.07)	0.01 (0.02)
5	0.13 (0.09)	0.01 (0.03)

Genetic results – mastitis and type

- Correlations with type

Trait	Scale	Rg	Rp
FUA	Loose → tight	-0.17 (0.07)	-0.03 (0.01)
RUH	Very low → very high	-0.15 (0.06)	-0.02 (0.01)
UD	Below hocks → above hocks	-0.06 (0.07)	-0.05 (0.01)
US	Broken → Strong	-0.21 (0.08)	-0.06 (0.01)
TL	Short → Long	0.20 (0.06)	0.02 (0.01)
EASE	Slow → Fast	0.02 (0.12)	-0.00 (0.01)
TEMP	Nervous → Quiet	-0.22 (0.12)	-0.02 (0.01)

Economics - lameness

- **Cost - €53.83**
- **Incidence - 15%**
- **Relative emphasis**
 - **Increase from 0.3% to 0.7%**

Economics - mastitis

- **Cost - €71.84**
- **Incidence - 25%**
- **Relative emphasis**
 - **Increase from 0.8% to 1.3%**
 - **On top of 2.9% on SCC (tiered milk price)**
 - **Total -> increase from 3.7% to 4.2%**

Recommendations

- **Develop new health genetic evaluation**
- **Repeatability model for lameness and mastitis (all lactations)**
- **Correlated traits**
 - SCC (parity 1 to 3)
 - Udder type traits (FUA, US, TL)
 - Locomotion
 - Milk yield?
 - Beef cattle
- **Major national initiative to record health**

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Calving Performance Evaluations

Francis Kearney

Calving Performance

- Currently based on parameters that were estimated a number of years ago
- Large increase in data in the last number of years
- Estimates of heritability based on records across all lactations
- Is heifer calving/gestation a different trait?

Current Model

- Evaluate calving difficulty, maternal calving difficulty, gestation, mortality
- No correlation between traits except a negative 0.7 correlation between direct and maternal calving difficulty
- Historical calving data used as a correlated trait for each trait

Data Edits

- Only HO and FR cows
- Each animal should have a record known for calving ease, gestation length and stillbirth
- HYS should have at least 5 animals present as 1st parity cows.
- HYS should have at least 5 animals present as higher parity cows.
- Sire should have at least 5 offspring as 1st parity cows.
- Sire should have at least 5 offspring of different dams as higher parity cows.
- Mgs should have at least 5 offspring as 1st parity cows.
- Mgs should have at least 5 offspring of different dams as higher parity cows.
- Historical data was left out.
- Number of records=121,500

Heritabilities

Current Estimates

	heritability
Calving Diff	0.25
Gestation	0.40
Mortality	0.01

New Estimates

	heritability
<u>Calving Diff</u>	
1 st	0.13
Later	0.07
<u>Gestation</u>	
1 st	0.45
Later	0.40
Mortality	No estimate

New estimates in line with those in the literature

Correlations

	CD	MCD	Gestation
1st – Later	0.72	0.29	0.93

Correlation between two traits less than 0.8 indicate traits are not controlled by the same genes

Correlations

Correlation between direct and maternal – current estimates indicate that daughters of bulls that are easy calving have difficulty calving themselves

	Current	New
CD-MCD	-0.7	
CD-MCD -1st		-0.48
CD-MCD -later		-0.24

Implications

- Lower heritabilities for calving diff will result in lower reliabilities especially for new test bulls
- Biologically a model with 1st and later parities evaluated separately should be used for CD, MCD
- Weighting between 1st parity and later parities must be calculated
- Direct calving will have less of an impact on maternal calving due to a lower correlation

Implementation

- Drop historical data in addition to model changes
- Test runs to evaluate changes in proofs
- Develop weightings
- Present proofs to the industry for feedback
- Implement for Spring 2010??

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CMMS Changes

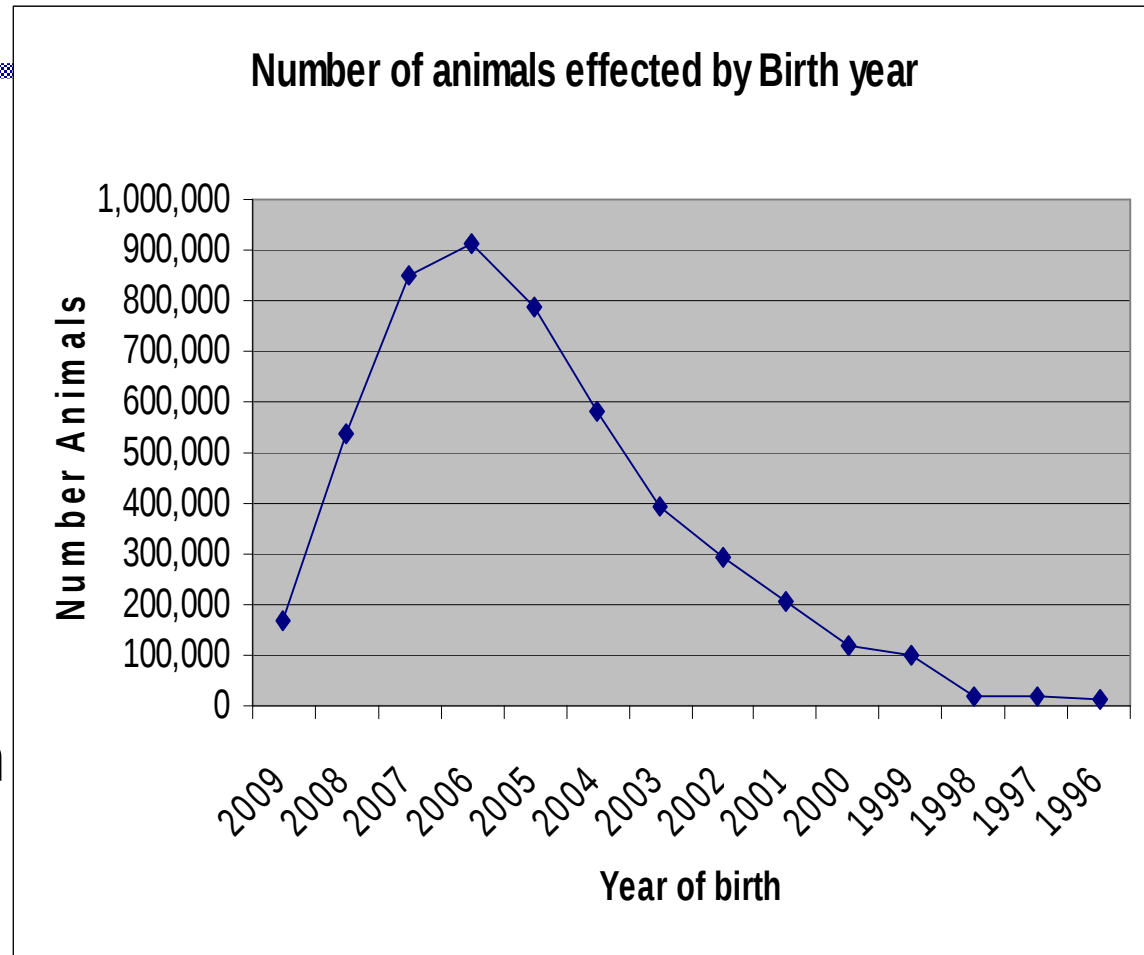
- When animals move to/from herds, that data is received by ICBF from dept
- When animals move to/from non-ICBF herds, a generic herd (referred to as IEIRELAND) was used to hold all these movements
- Data on animals not used past point of exit from Animal Events herd (censored in case of fertility)

–	Cow 1	Cow 2
Lact 1	IE3013333	IE3013333
Lact 2	IE3013333	IEIRELAND now S111111
Lact 3	IE1211111	IEIRELAND now S222222

- ICBF have no visibility on what the actual herd is, the “herd id” used is completely anonymous.

Details

- **5,101,346 animals affected**
- **7,178,848 movements modified**
- **Implemented in July 2009**



Effect on evaluations?

- No effect of calving evaluation
- Negligible effect on Milk evaluation
- More data available for fertility evaluation on some existing cows
- Extra information already implemented on beef (fattening contemporary groups improved)
- Some individual sires will change with extra information
- Will be incorporated with new fertility proofs

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Revision of the beef component in the EBI

- **Mart Calf price: Initial research done by Noirin McHugh**
 - Calf price is heritable (0.32)
 - Routinely collected (50,000 calves currently qualify for an evaluation)
 - Currently estimating genetic parameters with 16 traits in beef eval
 - Incorporate into beef evaluation as new trait

Revision of the beef component in the EBI

- **Cow liveweight**
 - Measured from cow sales in marts
- **Heritability**
 - Price 0.07
 - Weight 0.26
- **Incorporate cow live weight as new trait and use as an indicator of maintenance requirements**

Revision of the beef component in the EBI

- **Work is well advanced on calf price**
 - Should have pds for next industry meeting
- **Cow liveweight pd to follow**
- **Then in a position to examine the beef component of the EBI with possible breakdown into Efficiency and actual beef/cull merit of cow (currently cull cow carcass weight EV included both)**

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IRISH CATTLE BREEDING FEDERATION

Genomic Selection Update

- Research
- Provision of an operational service



Further genomic research

- **Speed up SNP editing (looking forward to 660,000 SNPs and 3,000,000,000 SNPs)**
- **SNP calling**
 - Issue of calling difference across labs and time
- **More genotype swapping**
 - UK, Poland, LIC, Switzerland, eurogenomics??
- **INTERBULL MACE evaluations**
- **Cows in the genomic evaluation**
- **Across breed genomic evaluation**
- **SNP identification (Illumina chip)**
- **New methods of genomic evaluation**

Uptake of GS bulls

- 349,000 inseminations from Spring 2009 breeding season collect via AI technician handheld
- Do-it-yourself (DIY) insemination not available (DIY ~33% of total insems)
- Looked at 3 categories of bulls DP-IRL, DP-INT, and GS

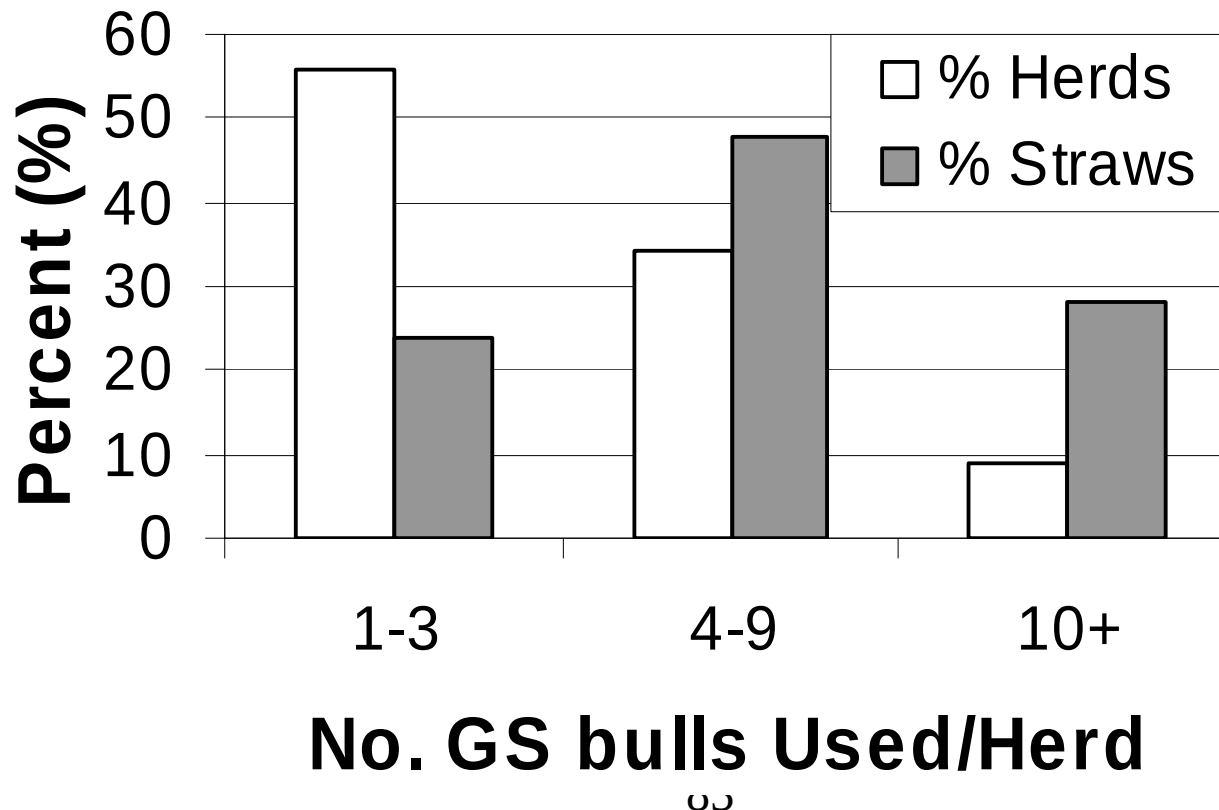
Uptake of GS bulls

Proof	No. Bulls	Straws/bull	% Use	Bulls/Herd
DP-IRL	754	175	37	2.7
DP-	478	204	29	3
INT GS	90	1310	34	4

- GS bull accounted for 34% of all inseminations
- Mean number of bulls/herd was 4 in line with recommendations

Uptake of GS bulls

- Closer look at how GS bulls were used within herd



GEBVs vs. EBVs

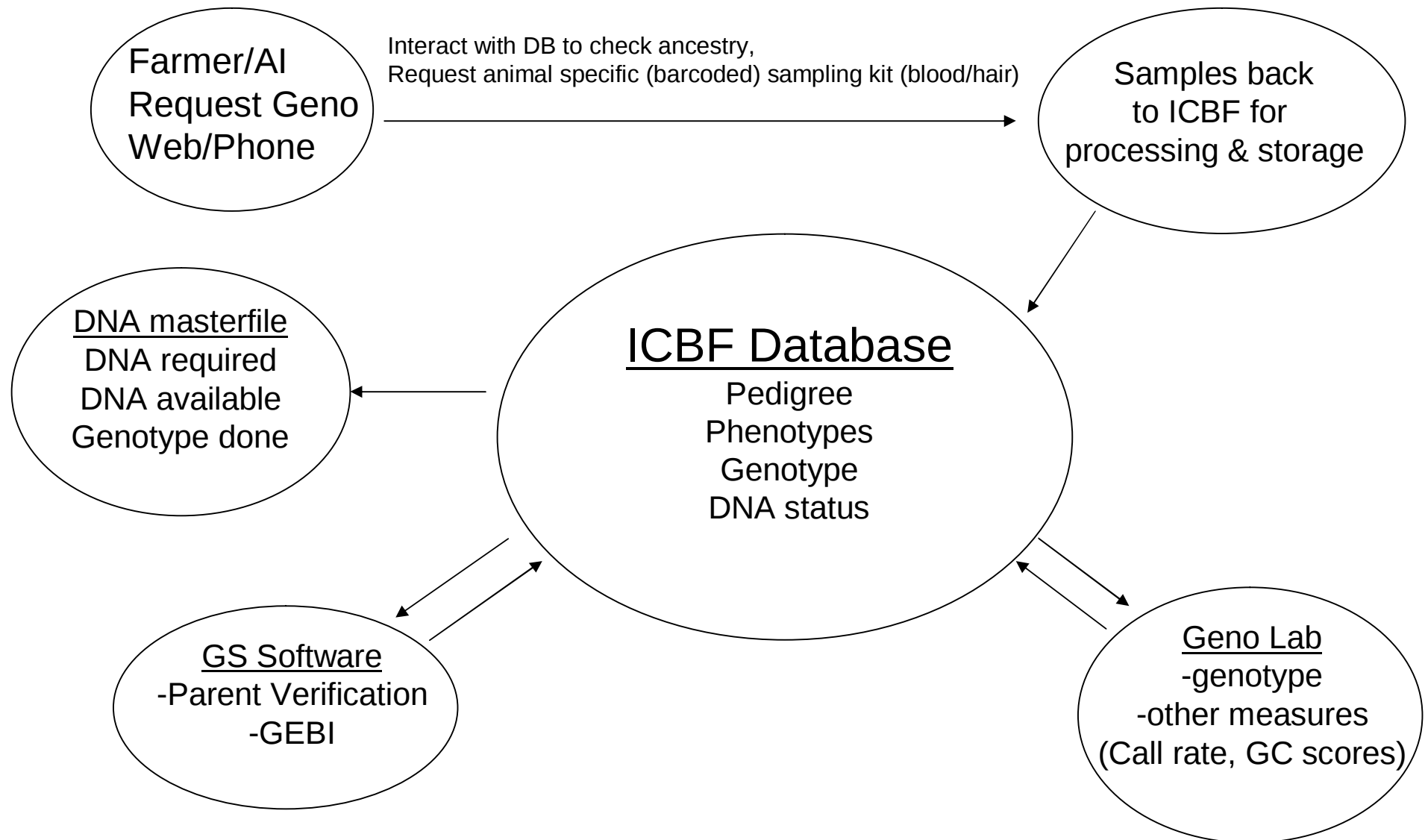
- Test bulls from 2006 marketed as GS bulls in Spring 2009
- Just received their first proofs based on daughter performance
- 35 bulls with $\geq 70\%$ reliability for production

GEBVs vs. EBVs

	Correlation			Diff in mean		
	GEB V	DGV	PA	GEB V	DGV	PA
Milk (kg)	0.64	0.65	0.63	65	50	77
Fat(kg)	0.51	0.57	0.40	2	2	3
Prot(kg)	0.59	0.65	0.53	2	1.5	2.2

Currently, DGV appear to be best predictor, followed by GEBV and finally PA

Operational Genomic Service



Current Status

- GeneSeek, USA selected as lab of choice after competitive tendering process (8 labs across EU/NA submitted tenders)
- Development of website to handle process is underway
- Lab to handle samples in place
- Improvements to software to ensure timely return of proofs is on-going

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EBI Update

Laurence Shalloo

¹Teagasc, Moorepark

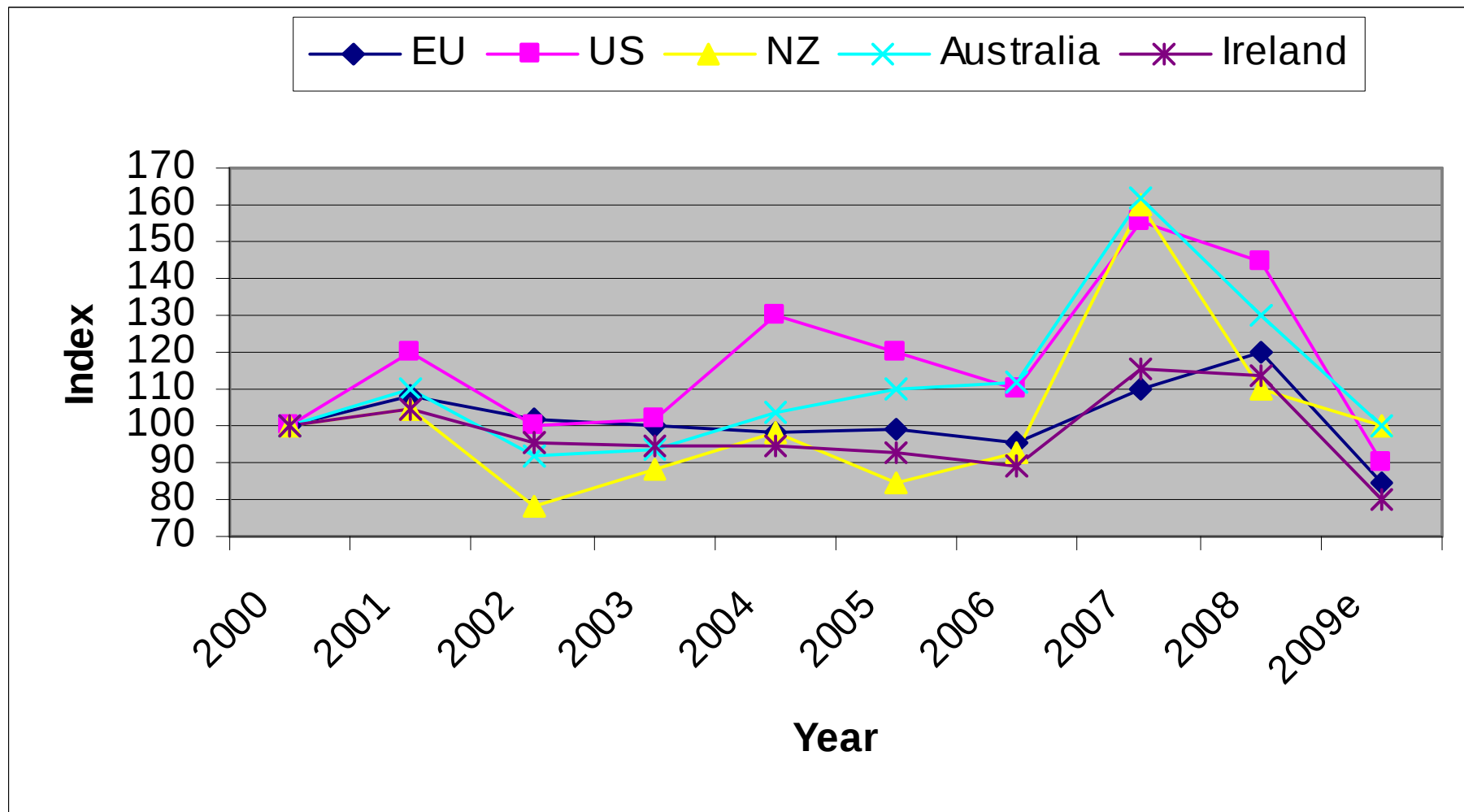
Laurence.Shalloo@Teagasc.ie

Overview

n Update costs and prices

n Live weight-beef

Milk price



Variability – key future component

- n Historic dairy standards no longer apply;
 - q CAP reform
 - q Consumer
 - q Climate change
 - q World economic situation
 - q Projected food requirements
 - q Peak oil

Update costs and price

- n Last update carried out in 2007
 - q Milk price was set at 30c/l
 - q FAPRI projections are 27c/l
 - q Analysis carried out at 27c/l with sensitivity analysis
 - q All costs and prices
 - n Energy costs
 - n Fertiliser costs – 2008
 - n Feed costs
- n Analysis available for next meeting

Cow live weight

- n 2007 changes
- n Revenue à more carcase and higher price
 - q No change
- n Feed costs based on land limitng
 - q Costs à growth & maintenance
 - q Feed costs increased to €176/tDM
 - q Feed costs €0.163/UFL
- n Old economic weight = +€0.04
- n New economic weight = -€0.513

Cow live weight

- n Analysis carried out outside the Moorepark Dairy Systems Model currently
- n Calculations completed using net energy system
- n Costs;
 - q Energy for growth
 - q Energy for maintenance
- n Revenue
 - q Carcase sales

Analysis Feed efficiency Sub - Index

- n Bring inside the model
- n Develop new sub index – Feed efficiency
 - q Economic value live weight
 - n 1kg change in live weight
 - n Farm output maximized
 - n Optimize cow numbers for change therefore no change in the herbage on the farm that will be utilised
 - n Changing live weight will result in changes to milk sales
 - n Energy to grow animal will be included here
- n Carcass value captured in beef sub index

Summary

- q Results will be presented in December meeting

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IRISH CATTLE BREEDING FEDERATION

General Research Update

Francis Kearney on behalf of Andrew Cromie

Test day Model

- 4 year project entitled '***Multi-breed Genomic Evaluations of Dairy Cattle in Ireland using Test-day models***' has been initiated between Ireland, Finland (MTT) and the Netherlands (Wageningen/Lelystad)
- John McCarthy, ICBF just started a PhD project
- The main outcomes are
 - new test-day model proofs for milk production traits for all breeds
 - better accounting of heterosis and recombination and other factors
 - integration of genomic information in an optimal way.

Culling Index

- Useful for deciding which animals to cull
- Some animals may be doing better or worse than their EBI due to factors such as age, heterosis, low milk in last lactation, empty etc
- Research on how best to fit heterosis and recombination
- Various models will be tested with new fertility data
- Collaborative effort between ICBF, Teagasc, Abacusbio

Interbull Test Runs

- Submit data to Interbull test runs in 2010 (April & September)
 - New fertility model
 - Calving performance
 - Other breeds subject to data availability

Linear Type

- Limited impact in EBI
 - Correlations to traits linked to profitability at best moderate, many close to zero
- Is current overall type relevant to seasonal calving, grass based herds
- Perceived unfairness when classifying Irish daughters with GB daughters resulting in poorer type for IRL bulls
- Across breed linear type
- Propose to sit down with interested stakeholders to discuss the direction of the linear evaluations

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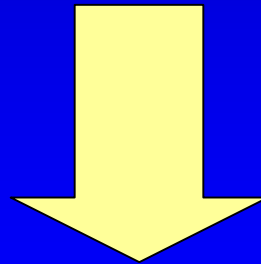
CROSSBREEDING – is it more profitable?

Frank Buckley and Laurence Shalloo



Background

- Ballydague study
- Norwegian Red – on-farm study
- Economic implications???



Teagasc/ICBF



Economic Modelling

- Biological data – Ballydague
 - Extrapolated for NR & NRX
- Moorepark Dairy Systems Model
 - 40 ha growing 13t grass DM
 - Milk price 27 c/l
 - P:F ratio 2.6:1
 - Fertilizer 250 kg N/ha
 - Concentrates – 316 kg DM
- Sensitivity Analysis
 - Milk price, F:P ratio and replacement cost

Biological & Economic Assumptions

Biological Assumptions

- Milk Production

- Holstein-Friesian: 5297 kg @ F% 4.12 & P% 3.49
- Jersey: 4232 kg @ F% 5.32 & P% 4.03
- Jersey×Holstein-Friesian: 4977 kg @ F% 4.77 & P% 3.88
- Norwegian Red: 5032 kg @ F% 4.05 & P% 3.49
- Norwegian Red×Holstein-Friesian: 5297 kg @ F% 4.05 & P% 3.49

- Replacement rate

- Holstein-Friesian & Jersey: 29.8%
- Jersey×Holstein-Friesian, Norwegian Red & Norwegian Red×Holstein-Friesian: 21.7%

€ Assumptions

- Cull cow value

- Holstein-Friesian: 244 kg @ €1.50 = €366
- Jersey: 149 kg @ €1.00 = €149
- Jersey×Holstein-Friesian: 214 kg @ €1.25 = €268
- Norwegian Red: 231 kg @ €1.50 = €347
- Norwegian Red×Holstein-Friesian: 244 kg @ €1.50 = €366

- Male calf value

- Holstein-Friesian, Norwegian Red & Norwegian Red×Holstein-Friesian: €80
- Jersey: €0
- Jersey×Holstein-Friesian: €30

Profit Implications

	HF	J	JX	NR	NRX
Annual milk yield (kg)	529,939	482,356	493,665	514,848	528,106
Milk Sales (kg)	518,353	469,169	482,118	502,939	516,500
Milk protein (kg)	18,085	18,959	18,732	17,586	18,059
Milk fat (kg)	21,334	25,003	23,033	20,375	20,924
Milk protein (%)	3.49	4.03	3.88	3.49	3.49
Milk Fat (%)	4.12	5.32	4.77	4.05	4.05
No. of cows	100	113	99	102	100
Land area (Ha)	40	40	40	40	40
Stocking rate (LU/Ha)	2.34	2.66	2.38	2.45	2.39
Milk price (c/l)	30.64	38.16	35.44	30.51	30.51
Labour cost (€)	28,455	32,386	28,931	29,840	29,081
Concentrate costs (€)	6,206	7,063	6,344	6,544	6,377
Livestock sales (€)	30,941	23,197	23,200	28,379	28,049
Replacement costs (€)	45,636	51,940	33,175	34,218	33,348
Feed costs (€/kg)	6.4	7.1	6.9	6.6	6.4
Milk returns (€)	154,207	173,824	165,894	149,006	153,009
Profit/kg milk solids (€)	0.68	0.56	1.03	0.74	0.88
Profit/Ha (€)	674	615	1,075	702	857
Profit Farm (€)	26,966	24,592	42,989	28,062	34,283

Sensitivity Analysis

- At 20c/l all groups unprofitable!
 - -€19,261 for J to +€641 for JX
- At 33c/l difference between HF and J / JX increases due to higher MS
- Increasing F:P ratio reduces advantage of JX
- Reducing the cost of replacements reduces differential between HF and high fertility groups

Summary of findings

- Improved economic performance with crossbreds compared to HF cows at Ballydague
- Substantial advantage with Jersey crossbreds
- Difference in profit larger than that explained by differences in EBI

EBI – SUBINDICES - Sires

	HF	J	JX
EBI	105	97	132
MILK	58	48	75
FERTILITY	36	81	80
CALVING	20	11	14
BEEF	-7	-40	-35
HEALTH	-2	-3	-2

Conclusions

- Crossbreeding has a role!
- Need to identify high EBI sires for crossbreeding
- ICBF/Teagasc need to provide profit predictions which incorporate heterosis

IMPLICATIONS

QUESTIONS?

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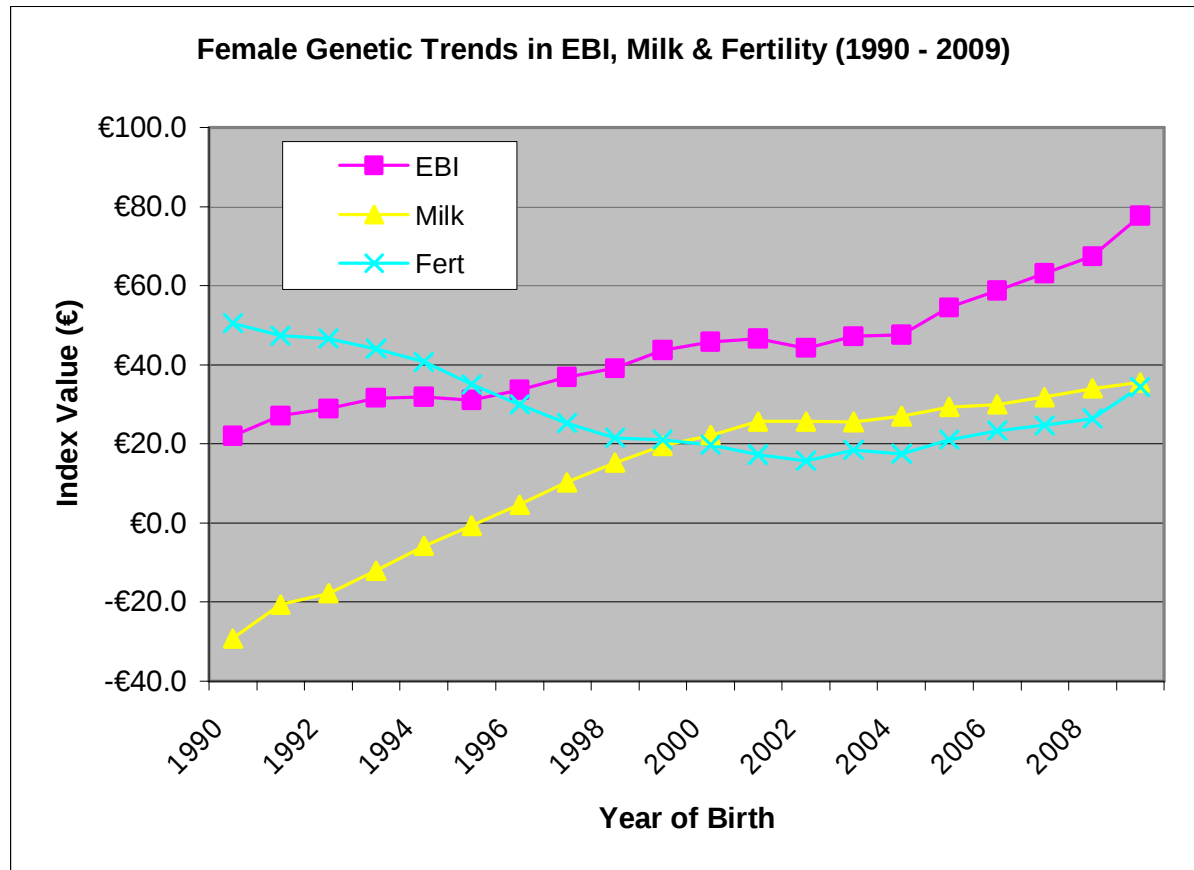
IRISH CATTLE BREEDING FEDERATION

***GENE IRELAND® Update.
Andrew Cromie & Brian Wickham
5th November 2009.***



Review - National EBI Trends – Genetic Gain & Births

Year	Births	EBI	Milk	Fert	Inc
1990	58,115	€22.0	-€29.1	€50.5	
1991	65,405	€27.1	-€20.6	€47.4	€10.3
1992	67,593	€28.9	-€17.7	€46.7	€3.5
1993	77,436	€31.6	-€12.1	€44.0	€5.4
1994	87,257	€31.9	-€5.8	€40.7	€0.6
1995	93,903	€31.1	-€0.6	€35.0	-€1.7
1996	117,056	€33.7	€4.6	€29.9	€5.4
1997	121,631	€37.0	€10.3	€25.2	€6.4
1998	111,811	€39.1	€15.2	€21.6	€4.3
1999	109,016	€43.8	€19.5	€21.0	€9.3
2000	112,405	€45.9	€22.2	€19.8	€4.2
2001	119,090	€46.6	€25.7	€17.3	€1.5
2002	138,220	€44.3	€25.7	€15.7	-€4.7
2003	148,405	€47.2	€25.5	€18.5	€5.9
2004	152,171	€47.6	€27.0	€17.6	€0.9
2005	150,660	€54.5	€29.3	€21.1	€13.7
2006	151,788	€58.7	€30.0	€23.4	€8.5
2007	167,123	€63.1	€31.8	€24.8	€8.8
2008	182,430	€67.4	€34.1	€26.4	€8.6
2009*	170,549	€77.6	€35.6	€34.5	€20.4



EBI gain of €20 achieved in 2009. From a low EBI base. Can we maintain?

GEN€ IR€LAND® – Bulls, Efficiency & EBI Gain

Year	No. Bulls	EBI	Milk	Fertility	Recorded Insems	Total progeny
2005	32	€97	€58	€32	1217	302
2006	53	€111	€48	€56	1287	241
2007	53	€138	€71	€52	1068	270
2008	76	€141	€61	€67	856	224
2009	55	€155	€63	€76	643	N/A

- *Optimal = 100 bulls, 100 daughters & €23 gain.*
- Target efficiency achieved. 100 dtrs/bull.
- Increases in EBI of bulls? €12 vs €23/year (€35 with use of GS).
- Number of bulls? 54 bulls vs 100 bulls?

Diversity - ICBF Active Bull List Autumn 2009

Over half of bulls on Active Bull List are OJI sons.

How can we maintain genetic diversity?

Bull	Sire	EBI	Rel%	Range	Proof	Pr	Av	Supplier	
MANFRED JUSTICE	HCM	100	€287	93%	+/- €31	DP-IRL	€59	L	Eurogene/LIC
GREEN OJI FRANK	OJI	83	€252	52%	+/- €81	GS	€18	M	Eurogene/LIC
RYBANK OMAN	OJI	63	€242	43%	+/- €89	GS	€18	H	NCBC
HILL	OJI	100	€240	43%	+/- €89	GS	€18	H	NCBC
BOOK ASHLING JUS	OJI	65	€229	38%	+/- €93	GS	€18	H	NCBC
MAN CF CRICKET	OJI	100	€225	59%	+/- €75	DP-INT	€35	M	NCBC
ER O-MAN BOGART	OJI	100	€224	48%	+/- €85	DP-INT	€34	M	NCBC
	OJI	100	€221	50%	+/- €83	DP-INT	€28	M	Eurogene/LIC
TT-ACRES EIGHT-E	OJI	100	€221	52%	+/- €81	DP-INT	€24	H	NCBC
	RXO	100	€219	43%	+/- €89	DP-INT	€60	M	Dovea
	SRH	100	€215	77%	+/- €56	DP-INT	€48	L	Eurogene/LIC
YSON	OJI	100	€215	59%	+/- €75	DP-INT	€22	H	NCBC
	OJI	100	€211	52%	+/- €81	DP-INT	€22	H	Eurogene/LIC
S ELLROD ET	OJI	100	€211	50%	+/- €83	DP-INT	€24	H	ABS
	OJI	100	€210	50%	+/- €83	DP-INT	€21	H	Eurogene/LIC
	OJI	100	€209	47%	+/- €86	DP-INT	€22	H	Eurogene/LIC
LEE	OJI	100	€208	44%	+/- €88	GS	€18	H	NCBC
ALTA LADDIE	OJI	100	€206	51%	+/- €82	DP-INT	€14	H	ALTA
MOLA	OJI	100	€206	53%	+/- €81	DP-IRL	€20	H	Dovea
MANFRED ET	OJI	100	€205	69%	+/- €70	DP-IRL	€19	H	NCBC

Engagement – Bull Breeder Herds

- 269 HF bulls progeny tested since 2005 (~54 bulls/year).
- These have come from 137 bull breeder herds.

Herd ID	Breeder	Number Bulls
IEHOLLAND		21
IEGERMANY		8
IE1516234	Paddy O'Leary	7
IE1416542	John Kingston	6
IE1515492	Teagasc Moorepark	6
IE1411638	Robert Shannon	5
IE1511118	Denis Kiely	5
IE1515491	Kevin Hegarty	5
IEUK		5

- 1,200 farmers with cows in the top 2,000 cow listing.
- How can we increase the number of bull breeder herds?

Optimal Program – Current research work.

- Current optimal program – *Meuwissen 2008*.
 - 500 young bulls genotyped & 100 selected for progeny test (each with 100 daughters per bull).
- Issues being researched.
 - Genotyping females. Which animals? How many?
 - Genotyping males. How many?
 - Progeny testing males. How many?
 - Impact of removing progeny test (moving to “full-blown” Genomic Selection)?
 - Relatedness between training & selected population

GENE IRELAND[®] - Summary.

- Good progress, but we must;
 - Increase genetic gain (€12 - €35)
 - Increase number of bulls tested (54 – 100)
 - Increase level of genetic diversity (~20 sires)
 - Increase engagement with breeders (500 hrds)
 - Re-evaluate “optimal” program in light of GS.
 - *Maintain our “core” progeny test for ongoing research/development.*
 - *GS is not complete....much has still to be learnt!*

G€N€ IR€LAND®

– Where next? Plans for 2010

- G€N€ IR€LAND® has demonstrated ability to evolve;
 - Role of NDP funding.
 - Expansion to cater for multiple breeds & new AI participants.
 - Overall cost/bull – down from €15k to €1.5k.
- Must continue to evolve if genetic gain & industry profits are to be realised.

Proposed 2010 service.

- Procurement
- Genomics
- Progeny Test
- Breeder Support payments.
- Research – Training population & Elite Animals.
- *Systems are in place.....formalising, streamlining, improving.*

GENE IRELAND®

Procurement

- Already in place.
- List of top cows & top calves....
- Currently ad-hoc
- Formalised & stream-lined.
- High value service for breeding industry.
- Support & development costs currently being carried by ICBF.
- Need to move to cost recovery.
- Proposed annual license fee of ~€10k/year.

Genomics

- Already in place.
 - Genotypes – generating ~500 genomic EBI's for males and some females.
 - Bloods/semen – 1,000 samples from recent training population work
- Currently ad-hoc service.
- To be formalised & stream-lined.
- High value service to breeding industry.
- Support & development costs being carried by ICBF.
- Need to move to cost recovery.
- Proposed charges; Charged at ~€100 for genotype service & €250 for blood/semen service.
- Volume discounts.

Progeny Test Service.

- Already in place.
- Continue “as-is” for 2010.
 - 700 straws and semen charged at €5/straw.
- Progeny test fee of ~€1,560/bull.
 - Herd sign-ups.
 - Support material.
 - Semen dispatch.
 - Collection of all relevant data.
 - Generation of “independent & unbiased” EBI’s.
 - Note: Currently GEN€ IRELAND[®] carries no overhead, Animal Events or database costs.

Bull Breeder Support Service.

- Already in place (to some extent) - FBD funding.
- Currently ad-hoc service.
- To be formalised & stream-lined.
- Two levels of payments proposed:
 - GEN€ IRELAND Progeny Test – Pay €0.70 for 700 straws = €490.
 - GEN€ IRELAND GS Proof – Pay €0.25 for straws sold in year 2 (max of 20k straws) = €5k

Ongoing Research;

- Training population.

- How can we expand the training population to increase accuracy of genomic selection?
 - AI sires, stock bulls & high reliability females.
 - Lists sent to AI companies.
 - International collaboration.
 - Relatedness to selection candidates.

Ongoing Research; - Elite Animals

- How can we use ensure a supply of elite animals for GEN€ IRELAND®
 - Which animals (females/young bulls) to focus on?
 - Genetic level versus diversity?
 - Suggested matings (sires of sons).
 - Communication with herd-owners.
 - Procurement lists for AI organisations.

G€N€ IR€LAND Progeny Test – Spring 2010

Year	Count	EBI	EBI Rel	Milk	Fertility
2009	56	€171.0	0.43	€75.5	€81.8
2008	50	€154.8	0.47	€79.0	€58.0

- Target – to progeny test 100 bulls.
- Target EBI = €180-190? Selection of bulls?
Genetic Diversity?
- Early delivery of semen is key.

Feedback

- Please review and advise of your interest in participation in one or other of the GEN€ IR€LAND[®] services.
- Discussions with interested parties to continue.

Selecting cows from the national database for use as bull dams

Sinéad Mc Parland,
Kearney†, Evans†, Cromie† & Berry**

**Teagasc Moorepark Dairy Production Research Centre*

†Irish Cattle Breeding Federation

Objective

Design a mating scheme to generate
ELITE bull calves for entry to
GENE IRELAND every year

General idea

1. National database is screened to identify cows which have performed well
 - q Thresholds for performance
 - q Across all available lactations
2. Top 2000 cows (highest EBI) entered into computer programme
3. Bull mates identified for each dam

Selection of Bull Dams

n Production information

- q Milk solids > 350kg (300kg in P1)
- q Length > 100 days
- q Parity < 9
- q BV fat & protein > -5
- q Milk sub-index value (+ve)

n Fertility information

- q Age first calving (22 to 38 mo)
- q Calving interval (300 to 500 d)
- q Calved in the last 18 mo
- q Fertility sub-index value (+ve)

n In addition

- q EBI > €120
- q > 78% Holstein-Friesian
- q Feet and legs composite > 70
- q Mammary composite > 70

Selection of Bull Dams

- n Production information
 - q Milk solids > 350 kg (300 kg in 2L)
 - q Length > 100 days
 - q Parity < 9
 - q BV fat & protein < -5
 - q Milk sub-index value (+ve)
- n Fertility information
 - q Age first calving (22 to 38 mo)
 - q Calving interval (300 to 500 d)
 - q Calved in the last 18 mo
 - q Fertility sub-index value (+ve)
- n In addition
 - q EBI > €120
 - q > 78% Holstein-Friesian
 - q Feet and legs composite > 70
 - q Mammary composite > 70

Selection of Bull Dams

n Production information

- q Length (>100 days)
- q Parity < 9
- q BV fat < -5
- q BV protein < -5
- q Milk sub-index value (+ve)

n Fertility information

- q Age first calving (22 to 38 mo)
- q Calving interval (300 to 500 d)
- q Calved in the last 18 mo
- q Fertility sub-index value (+ve)

n In addition

- q EBI > €120
- q >78% Holstein-Friesian
- q Feet and legs composite >70
- q Mammary composite >70
- q GMI, UYC, NHS & OJI removed

Where we lose the records

- n 614,645 Alive Milk recorded HOxFR
- n 466,318 With known sire and dam
- n 367,976 With 2 complete generations known
- n 111,087 Following fertility edits
- n 78,629 Following production edits
- n 78,187 Following linear type edits
- n 6,563 EBI > €120
- n 4,441 Prominent sire lines removed

Top 2000 cows based on EBI

Variable	Mean	Minimum	Maximum
EBI (€)	143	131	194
Milk_SI (€)	68	1	152
Fertility_SI (€)	60	0	152
Milk (kg)	6,277	3,505	10,269
Solids (kg)	491	300	788
Fat (%)	4.24	2.66	6.65
Protein (%)	3.63	3.11	4.31
Calving interval	365	301	400

Highest contributing bulls

Bull	Dau	Bull	Dau	Bull	Dau
AAP	38	HFL	53	MAU	47
AHD	18	HRZ	21	MBH	41
BFU	36	HZO	71	MFX	34
BWH	55	KLA	26	QUR	19
BWZ	218	LBO	81	RUU	343
CPA	42	LLO	23	SSI	22
CWJ	86	LOO	52	TIH	29
EIX	26	LYE	21	WAU	26

1428 daughters

Additional edits???

- n Top 150 / 100 / 50 daughters & grand-daughters per bull
- n Allow prominent sire lines in moderation

Top 2000 cows across sire restrictions

	All	Top 150	Top 100	Top 50
EBI (€)	143	→ 142	→ 141	→ 139
Milk_SI (€)	68	68	67	66
Fertility_SI (€)	60	60	61	60
Milk (kg)	6277	6336	6363	6437
Solids (kg)	491	496	497	502
Fat (%)	4.24	4.22	4.22	4.20
Protein (%)	3.63	3.64	3.64	3.64
Calving interval	365	365	366	365
Sires represented	234	← 256	← 275	← 343

Top 10 sires across restrictions

Rank	No restriction		Top 150		Top 100		Top 50	
1	RUU	343	BWZ	150	BWZ	100	BWZ	50
2	BWZ	218	RUU	150	RUU	100	HFL	50
3	CWJ	86	CWJ	99	CWJ	92	RUU	50
4	LBO	81	LBO	88	HZO	90	LOO	49
5	HZO	71	HZO	81	LBO	90	CPA	48
6	BWH	55	HFL	65	HFL	70	HZO	48
7	HFL	53	BWH	60	LOO	65	LBO	48
8	LOO	52	LOO	60	BWH	64	CWJ	47
9	MAU	47	MAU	56	MAU	64	BFU	46
10	CPA	42	CPA	52	CPA	60	BWH	46
No. Daughters		1048			861		795	
					482			

Top 2000 cows across sire restrictions

	All		Top 150		Top 100		Top 50	
	Incl	Excl	Incl	Excl	Incl	Excl	Incl	Excl
EBI (€)	148	→ 143	147	→ 142	146	→ 141	141	→ 139
Milk_SI (€)	75	68	75	68	73	67	70	66
Fertility_SI (€)	57	60	58	60	59	61	59	60
Milk (kg)	6306	6277	6353	6336	6380	6363	6473	6437
Solids (kg)	497	491	500	496	502	497	507	502
Fat (%)	4.27	4.24	4.26	4.22	4.25	4.22	4.22	4.20
Protein (%)	3.65	3.63	3.66	3.64	3.66	3.64	3.65	3.64
Calving interval	364	365	365	365	366	366	366	365
Sires represented	202	← 234	226	← 256	249	← 275	335	← 343

What we do next

Computer generated matings

- n Elite bulls are identified by sire analysts
- n Determine how related the elite bulls and elite cows are to breeding females
 - q Living female Holstein-Friesians
 - q Incl. heifers and fetuses
- n Elite cows and elite bulls are entered into computer programme together
- n Makes phantom matings between all combinations of cow and bull

What we do next

Contract mating

- n Identify the best potential mating between bull and cow
 - q EBI of the phantom progeny
 - q Relatedness of phantom progeny to future breeding females
- n Cows are contract mated
- n Bull calves are entered into GEN€ IRLAND once mature

Inclusion of heifers

- n Include genotyped heifers next year
- n Treat differently to cows
 - q No phenotypes
 - q Reliability >50%
- n Must be better than the cows to get selected

Points for discussion

- n Current thresholds
 - q Too severe / too lax?
- n Limitation on sire contributions
- n Removal of sire lines
- n Use of genotype data
 - q Genotype bull calves when born
 - q Genotype top bull dams?