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IRISH CATTLE BREEDING FEDERATION

ICBF Beef Industry Meeting.

9 December 2015

Department of Agriculture, Food and the Marine

An Roinn Talmhaíochta, Bia agus Mara

Agenda.

- 10.00 Tea & coffee.
- 10.15 Genomics in beef cattle – Donagh/Ross.
- 11.15 On-farm validation of the replacement index – Noirin
- 11.45 Use of foreign EBV's – Ross & Thierry.
- 12.00 Docility evaluations – Ross.
- 12.30 Dairy Beef Index – Noirin
- 1.00 Lunch
- 2.00 DNA for Active AI Sires – Pat.
- 2.15 BDGP update – Andrew
- 2.30 Major genes/genetic disease – Matt
- 3.00 Performance recording in the pedigree beef herd – Pat
- 3.15 AOB
- 3.30 Herdbook update.

Multi-breed beef genomic evaluations

Donagh Berry[1], Ross Evans[2], and John McCarthy[2]

[1]Teagasc, Moorepark,
[2]Irish Cattle Breeding Federation,

ICBF Industry Meeting, Portlaois, Dec 2015

Stages of research

- Currently >200,000 genotypes
  - 4000 → 36,000 → 65,000 → 105,000

1. Data quality control
2. Development and testing of efficient algorithms
   - Speed (28 days → 4 days)
   - Amenable to scale up
3. Reliability
4. Test proofs

Dairy retrospective analysis (n=244)

Trait	Genomic	Parental average
Milk yld (kg)	0.75	0.67
Fat yld (kg)	0.68	0.48
Fat %	0.81	0.73
Prot yld (kg)	0.68	0.53
Prot %	0.75	0.64
Calv. Int (d)	0.77	0.65
Survival (%)	0.64	0.49

11% to 42% improvement

Avg: 23%

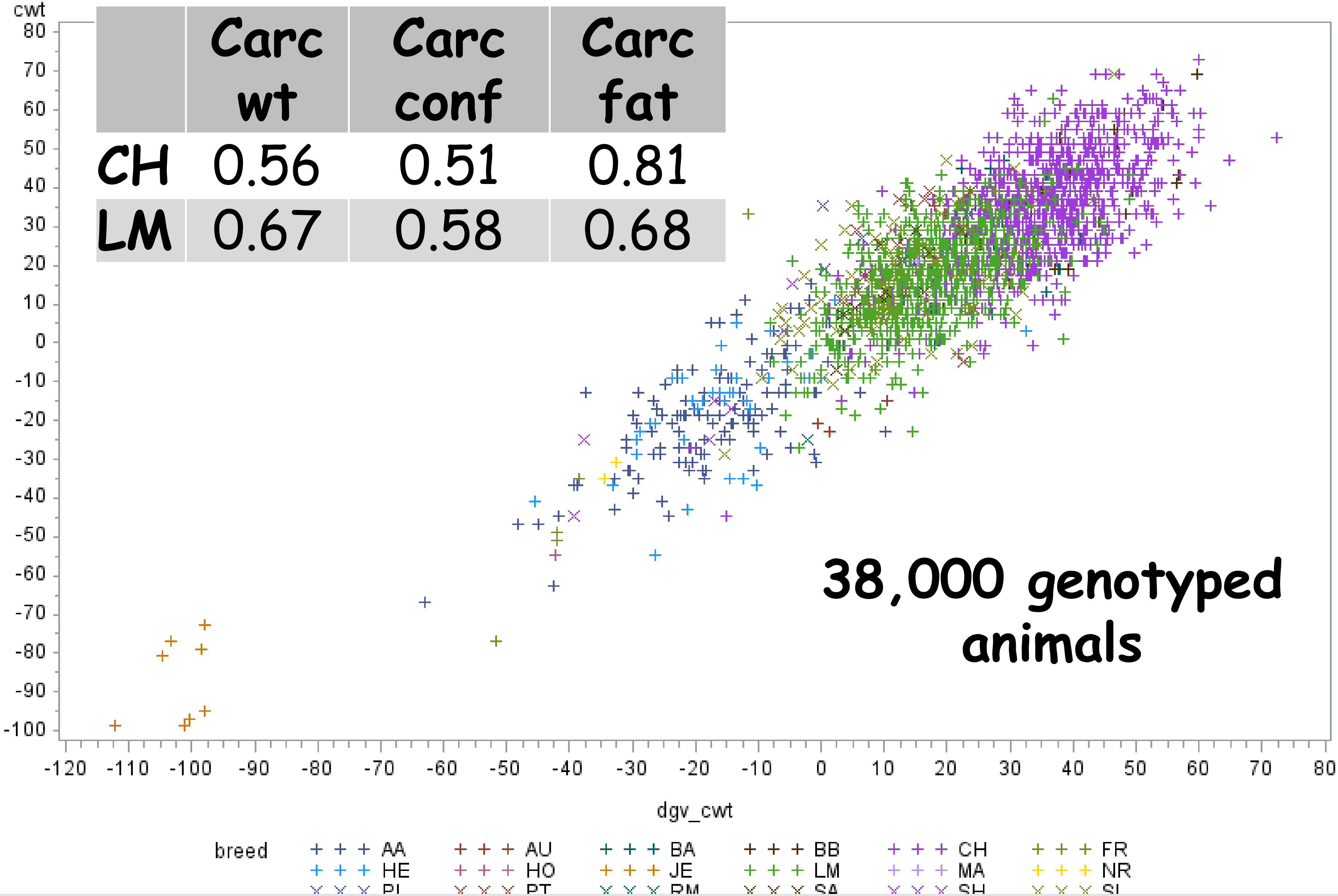
Testing procedures

1. Can it predict genetic merit as young animals?
    - Pretend today is 2008 and compare predictions of “young bulls” to current proven proofs
2. Impact on proofs of high reliability bulls
    - should be little
3. Impact on reliability – good increases

Can we predict the future?

Can we predict the future?

	Carc wt	Carc conf	Carc fat
CH	0.56	0.51	0.81
LM	0.67	0.58	0.68

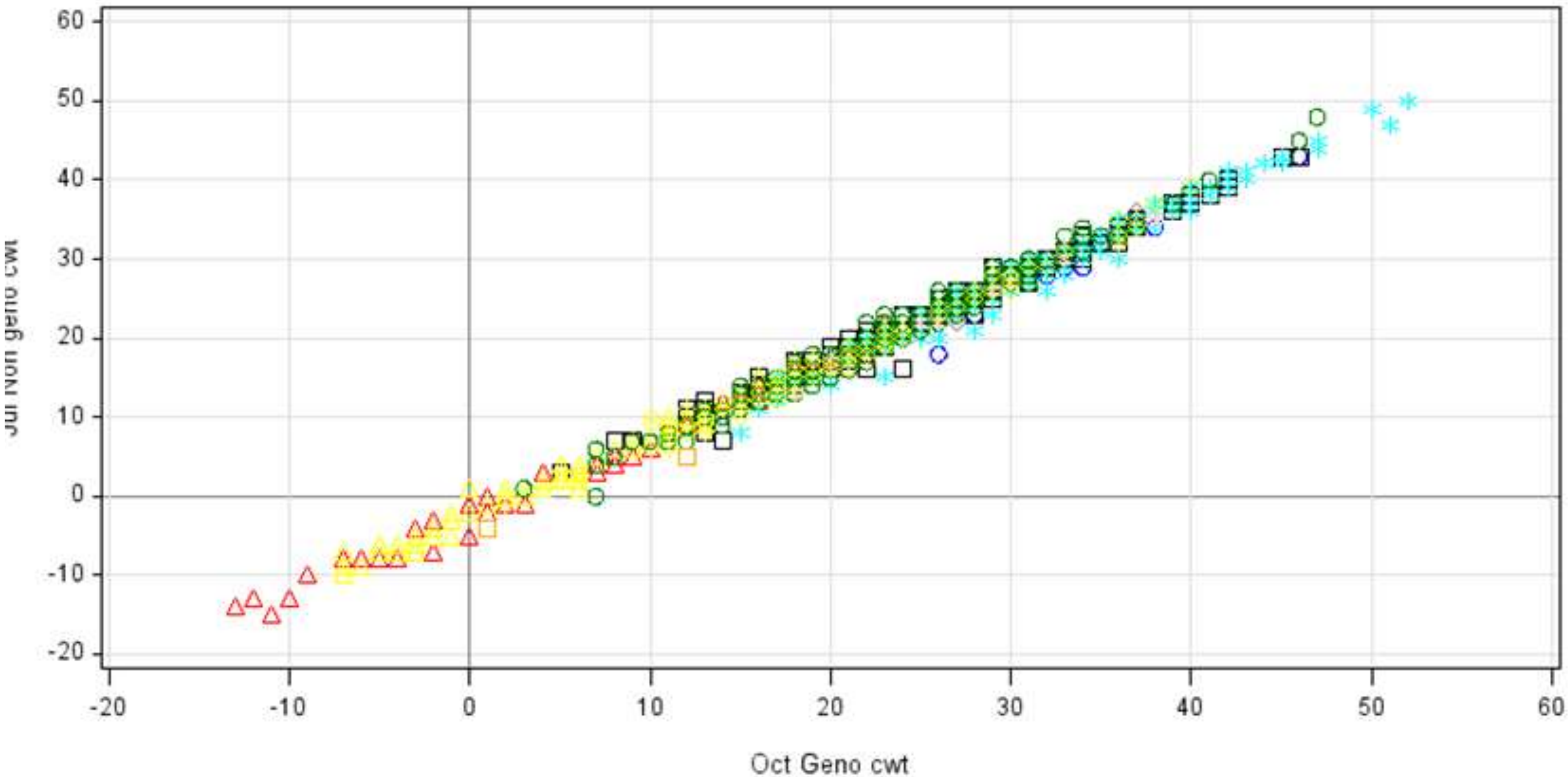


Summary

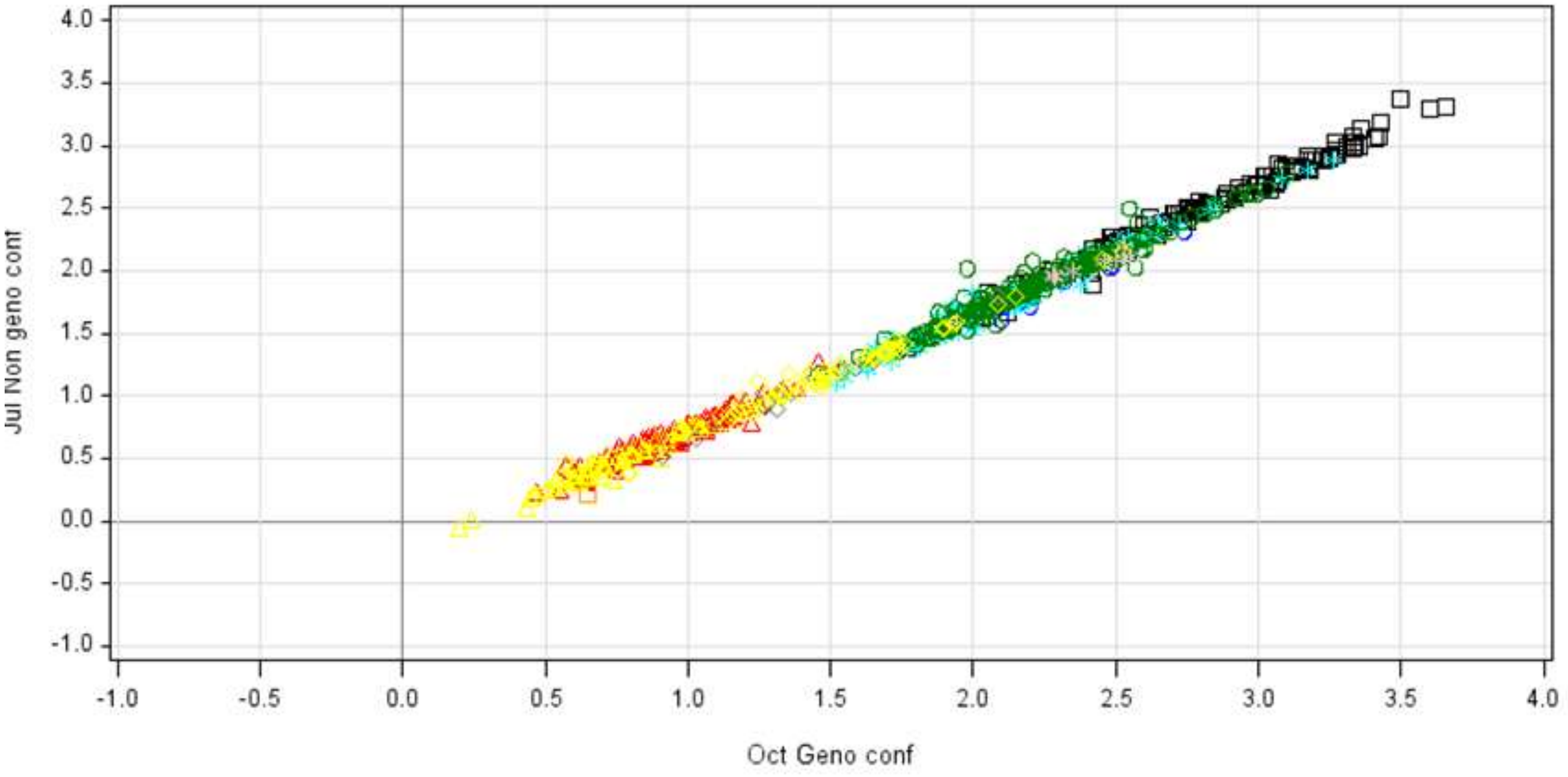
- Good predictive ability
  - In-line with expectations (experience from dairy)
  - Not perfect (same in dairy)
- Similar mean and variability in proofs
- Difficult to validate properly
  - Recent animals are genotyped
  - Ours is probably better than most!
- To-do
  - Re-do analysis with >100,000 genotypes

Impact on proven bulls

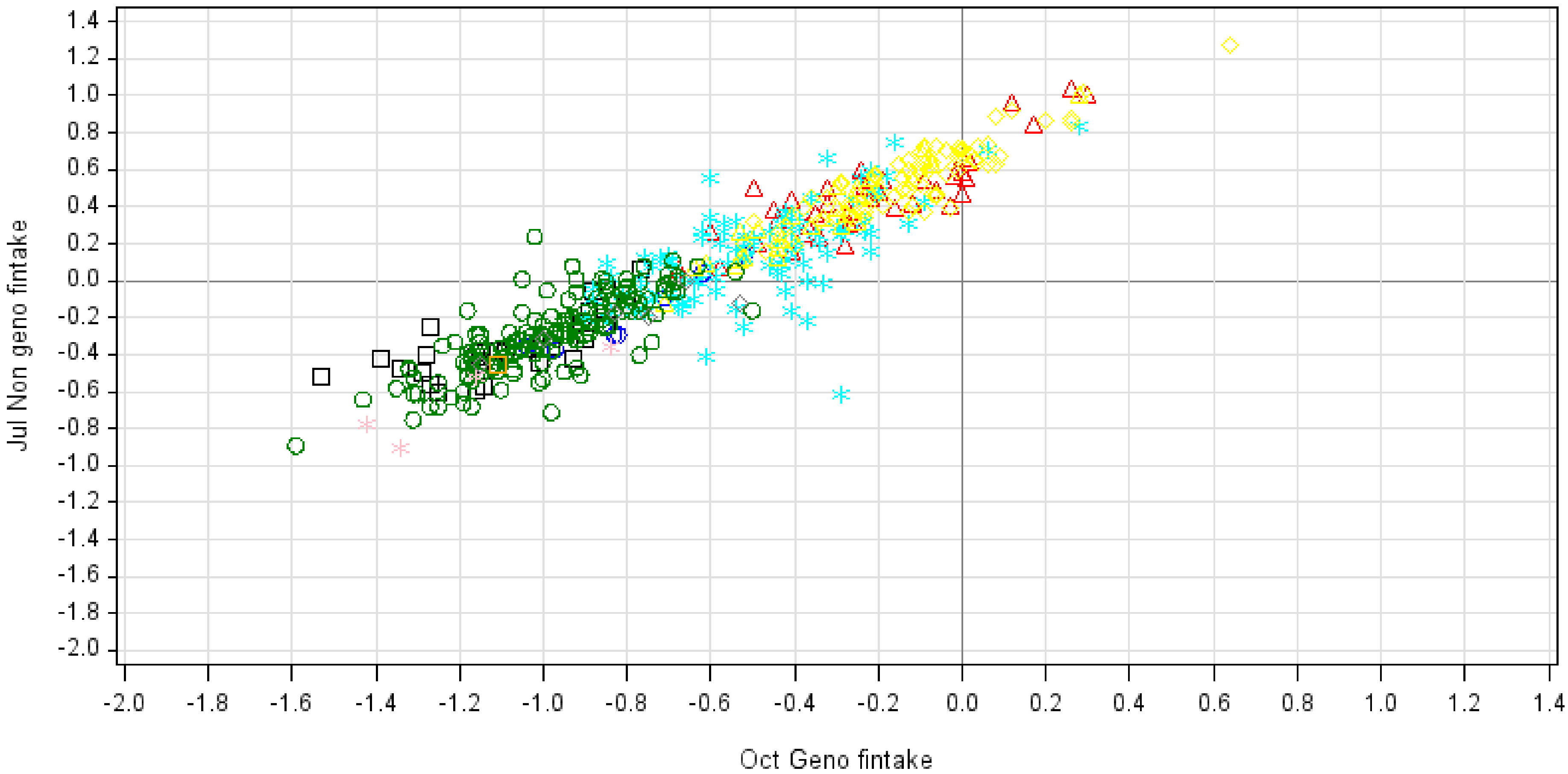
Carcass weight



Carcass conformation

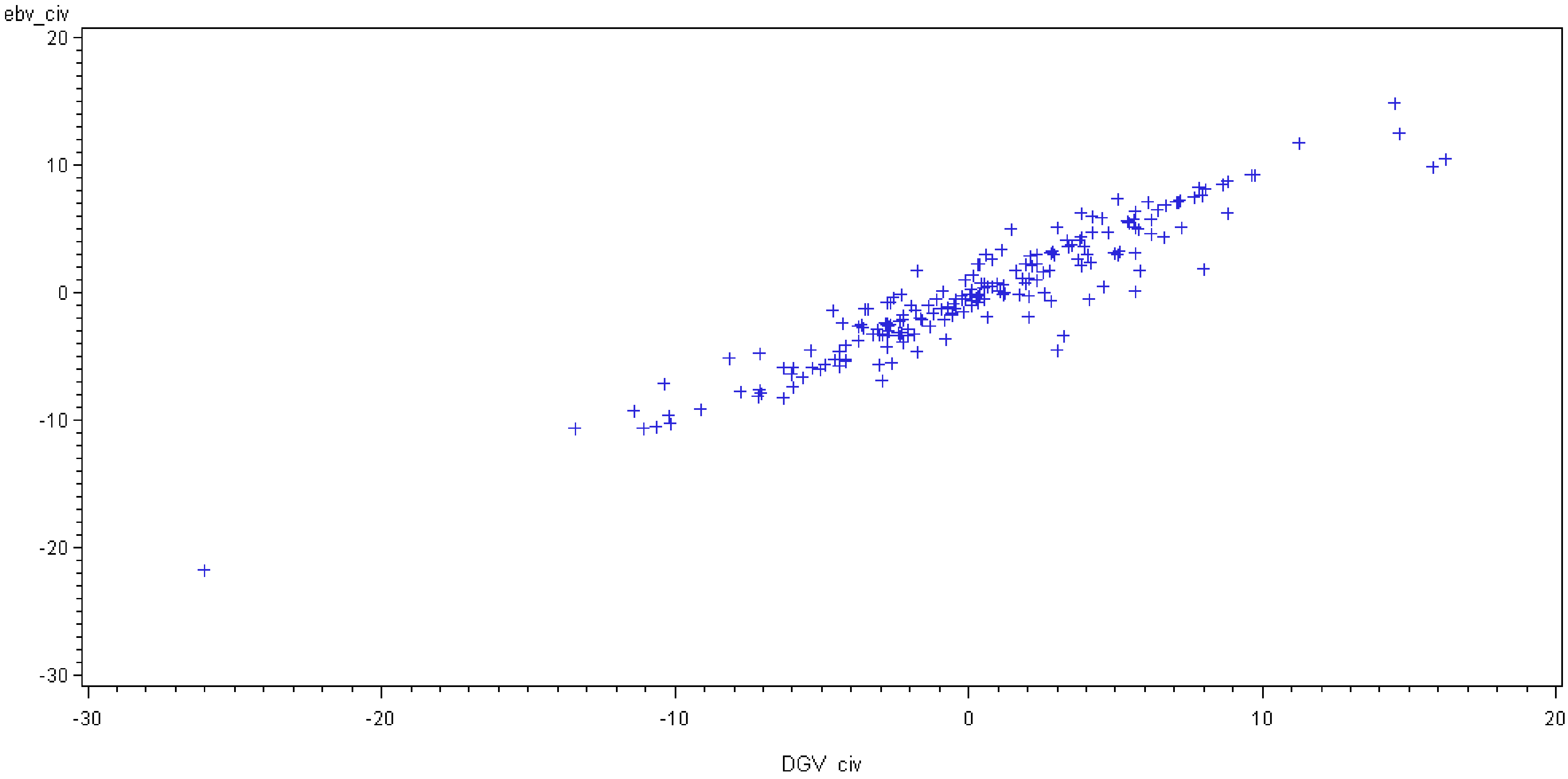


Feed intake

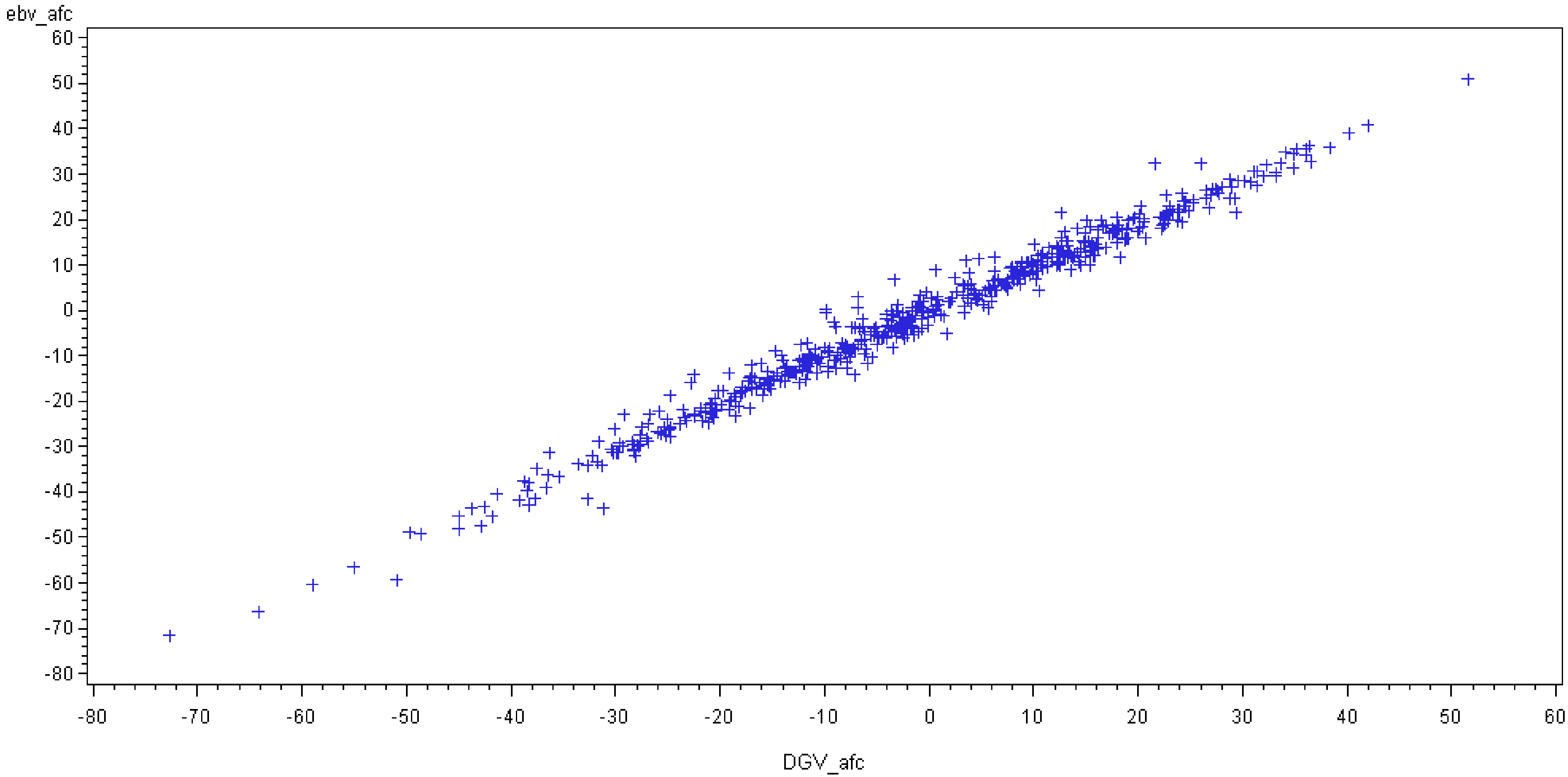


Jul Non geno fintake
Oct Geno fintake
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
-2.0
-2.0
-1.8
-1.6
-1.4
-1.2
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4

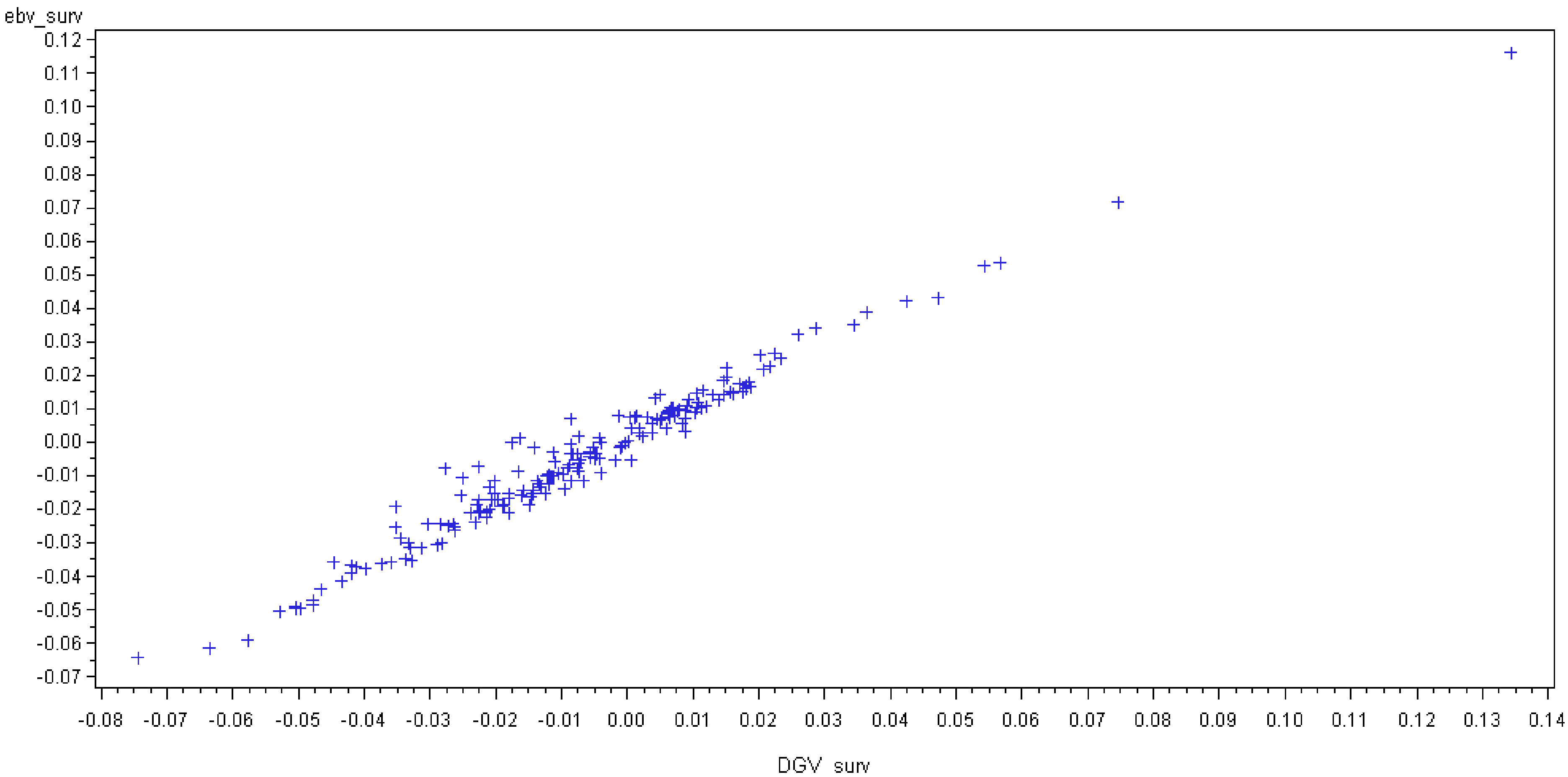
Calving interval



Age at first calving



Survival



ebv_surv
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
-0.07
-0.08 -0.07 -0.06 -0.05 -0.04 -0.03 -0.02 -0.01 0.00 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.10 0.11 0.12 0.13 0.14
DGV_surv

Summary

- Minimal impact on proven bulls
  - Because they're proven!!
  - DNA already expressed in progeny

- Some "proven" bulls did move
  - Information coming from correlated traits
  - "Curve benders" deviate from the average expectation
    - Fatter, lighter carcasses have better fertility

Impact on reliability

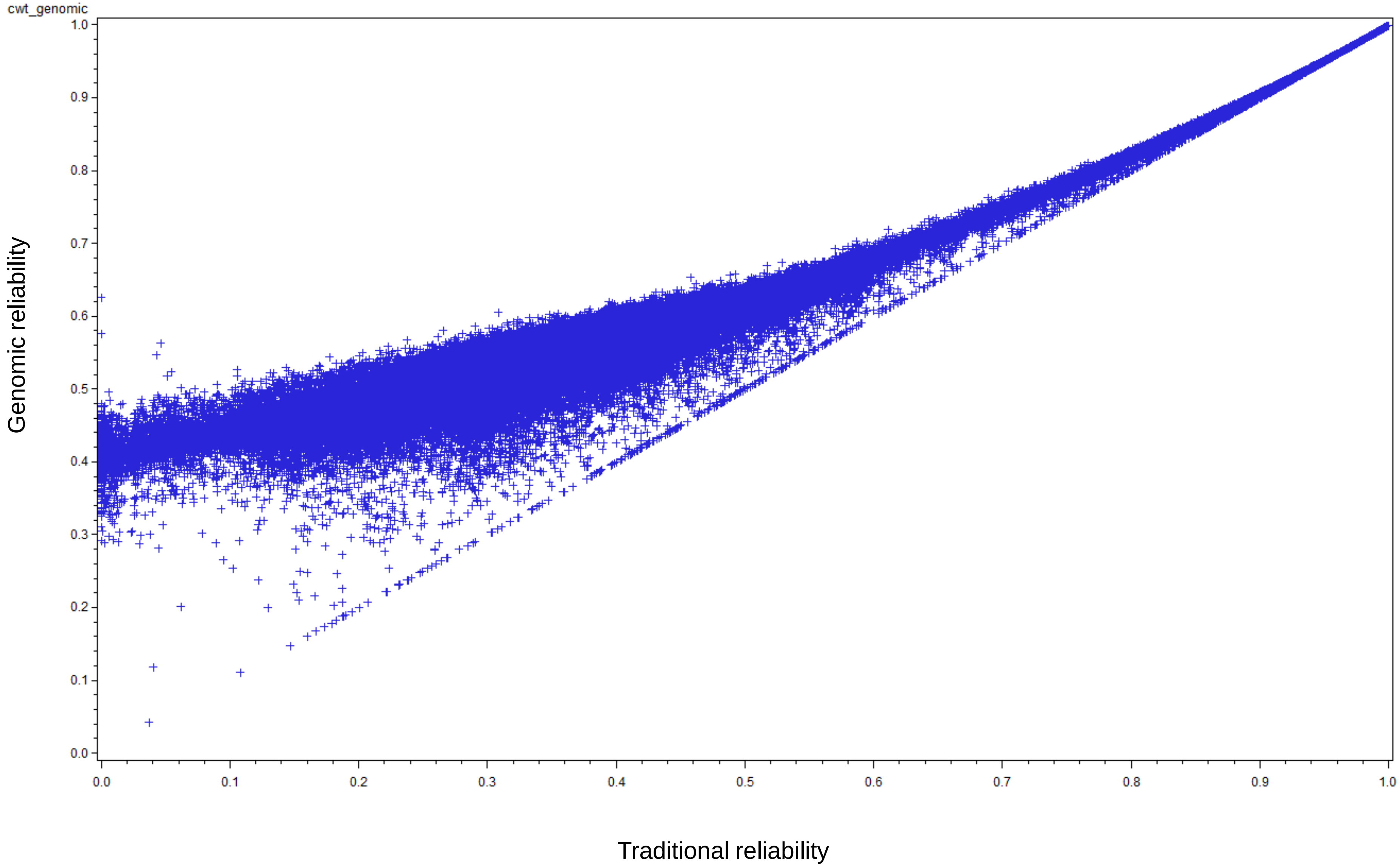
Trait average

Trait	h^2
Calving diff - dir	0.10
Calving diff – mat	0.04
Calf mortality - dir	0.02
Gestation length	0.40
Farm docility	0.35
Linear docility	0.35
Cow docility	0.35
Milk Score	0.34
Maternal wean wt	0.25

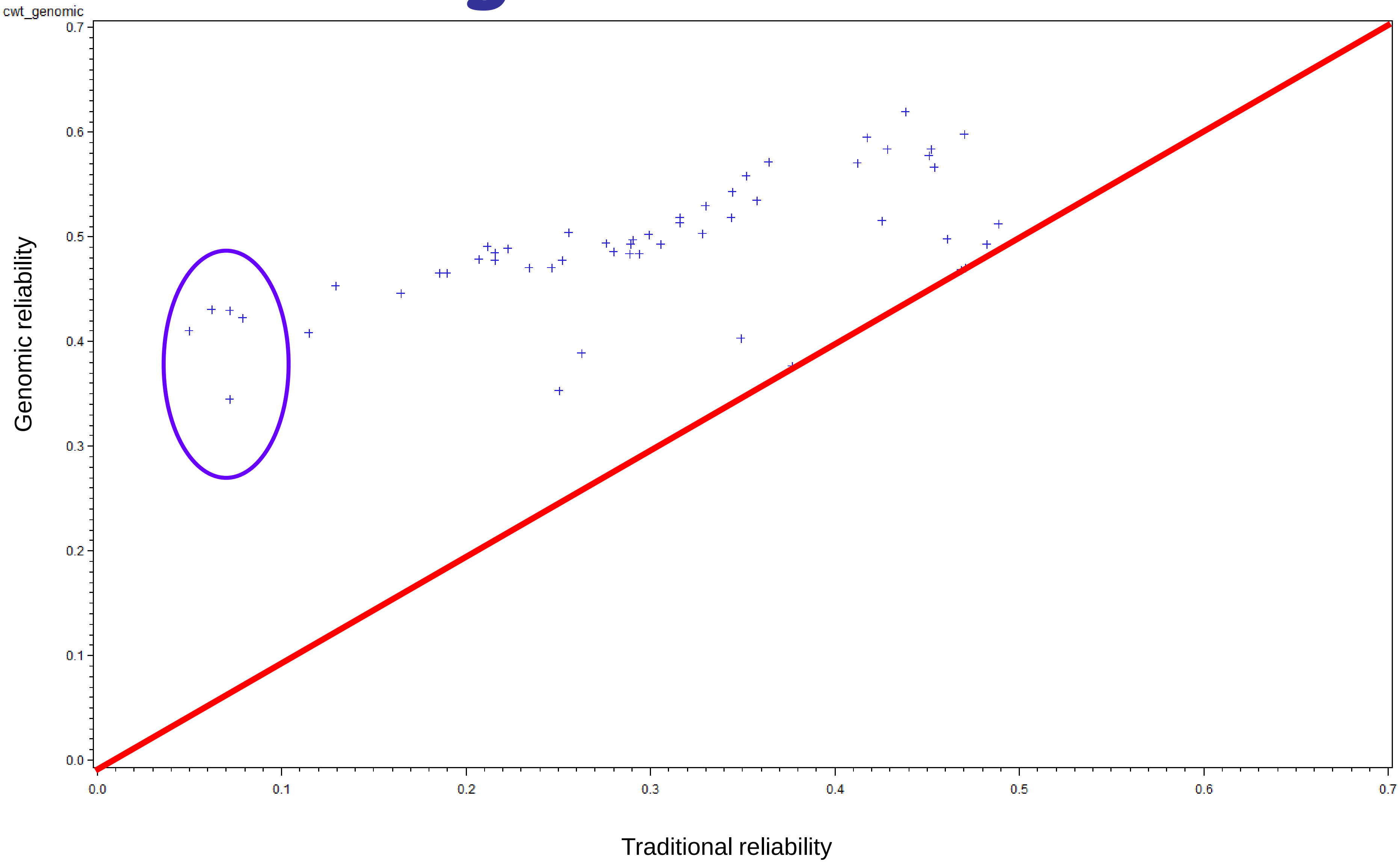
Trait average

Trait	h²	Reliability		Progeny equiv.	Weight genomics
		Trad.	Genomic		
Age at first calving	0.31	0.21	0.46	6.3	0.54
Calving interval	0.02	0.16	0.44	95.7	0.63
Survival	0.02	0.14	0.43	139.5	0.68
Carcass weight	0.40	0.25	0.48	4.6	0.47
Carcass fat	0.35	0.22	0.46	5.4	0.52
Carcass conform	0.32	0.21	0.46	6.1	0.55
Feed intake	0.43	0.12	0.42	4.2	0.70

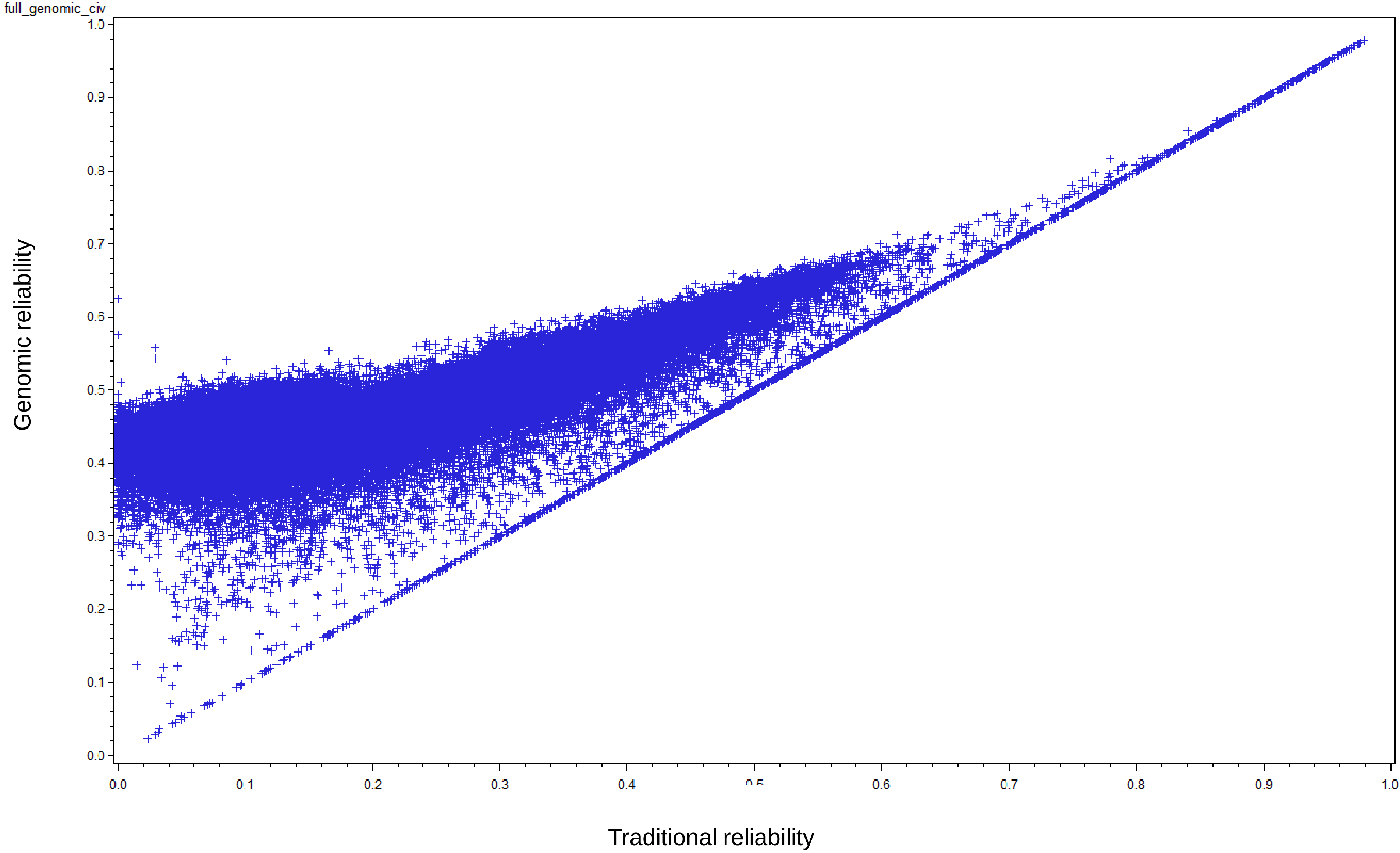
Carcass weight - reliability



Carcass weight – French registered bulls



Fertility- reliability



Summary

- Good lift in reliability
- Impact greater for lower heritability traits
- Nice lift in reliability of foreign bulls
- No impact on proven bulls
  - Because they're proven

Overall Conclusions

- Research on-going
  - Will continue for decades….
  - Evaluation very sensitive to data and statistical models (simple is best)
- Results look very good (and expected)

- To-do
  - Complete test-run (as if live)
  - Up-scaling to 1 million animals

Operational to do list

- Completion of genomic ebvs for all traits: maternal wean wt and calving still in pipeline
- Handling of foreign ebvs will need changing to reduce complexity of models and improve speed
- Quantification of movement in cows/young sires
- Full operational run from ICBF database including
  - Extraction of genotypes
  - imputation
  - Running of genomic evaluations
  - Loading to database and parental averaging
  - Computation of profit indexes and stars
  - Will need non-genomic evaluations concurrently in database to decipher cause of index change
  - Identification in database status of genotype i.e. in database vs in evaluation

Acknowledgements

- Research Stimulus Fund (multiGS)
- Science Foundation Ireland (PrecisionBreeding)

On farm validation of the replacement index

Nóirín McHugh

Andrew Cromie, Ross Evans & Thierry Pabiou

ICBF Industry Meeting, December 2015

Teagasc
Agriculture and Food Development Authority

The Irish Agriculture and Food Development Authority

Does the Replacement Index work?

Suckler Cow Report

IE

Print Date: 09/07/15

Does it reflect on the ground performance??

What about Replacement Index?

- 34 commercial herds-spring calving herds
- Participating in ICBF-Teagasc weight recording initiative

  (Derrypatrick & Maternal herd)
- Compare current cows replacement index to:

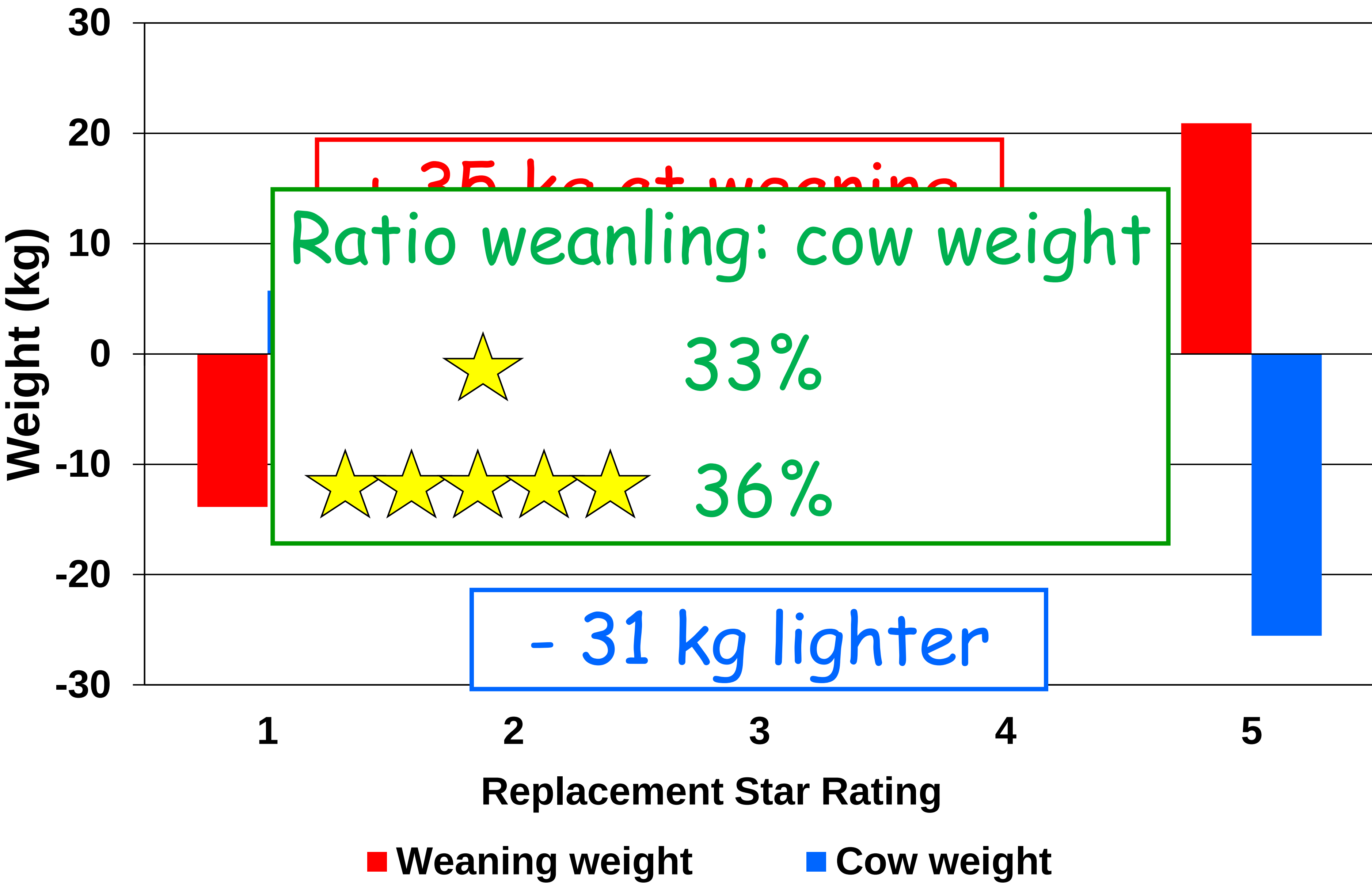
  1. Cow performance
  2. Calf performance

Cow Traits

5 Star Cow ★★★★★ V's 1 Star Cow ★

1. Calved for the first time 83 d earlier
2. Tighter calving interval → -7 d
3. 8% more likely to survive to next calving
4. More calves over their lifetime

Replacement index - Weight



Calf Traits

5 Star Cow V's 1 Star Cow

★★★★★ ★

1. Less calf mortality → -5%
2. Lower calving difficulty
3. Higher ADG →140g/d
4. Superior carcass traits

Calf Traits

Star rating	Age at slaughter	Carcass weight	Carcass conformation
★	629	341	9.07 (R+)
★★	625	344	9.09
★★★	630	350	9.16
★★★★	632	352	9.09
★★★★★	626	355	9.05 (R+)

What's it worth?

What's it worth??

★★★★★ vs ★

1. Younger at first calving

2. Shorter calving interval

3. Lon

4. More

€172 per lactation

5. Heavier carcass weight

6. Less calving difficulty

7. Less calf mortality

Teagasc Grange Maternal Herd

Robert Prendiville, Simone McCabe and Noirin McHugh,
Teagasc, Grange, Dunsany, Co. Meath

Teagasc

Agriculture and Food Development Authority

The Irish Agriculture and Food Development Authority

Validation of Index

Two breeding strategies:

1. cows sourced from the suckler herd
2. beef cross cows sourced from the dairy herd

Two diverse genotypes:

A. high genetic merit animals
B. low genetic merit animals

Cow differences

Bulls high reliability bulls (>70%; AA and LM) selected based on their maternal index

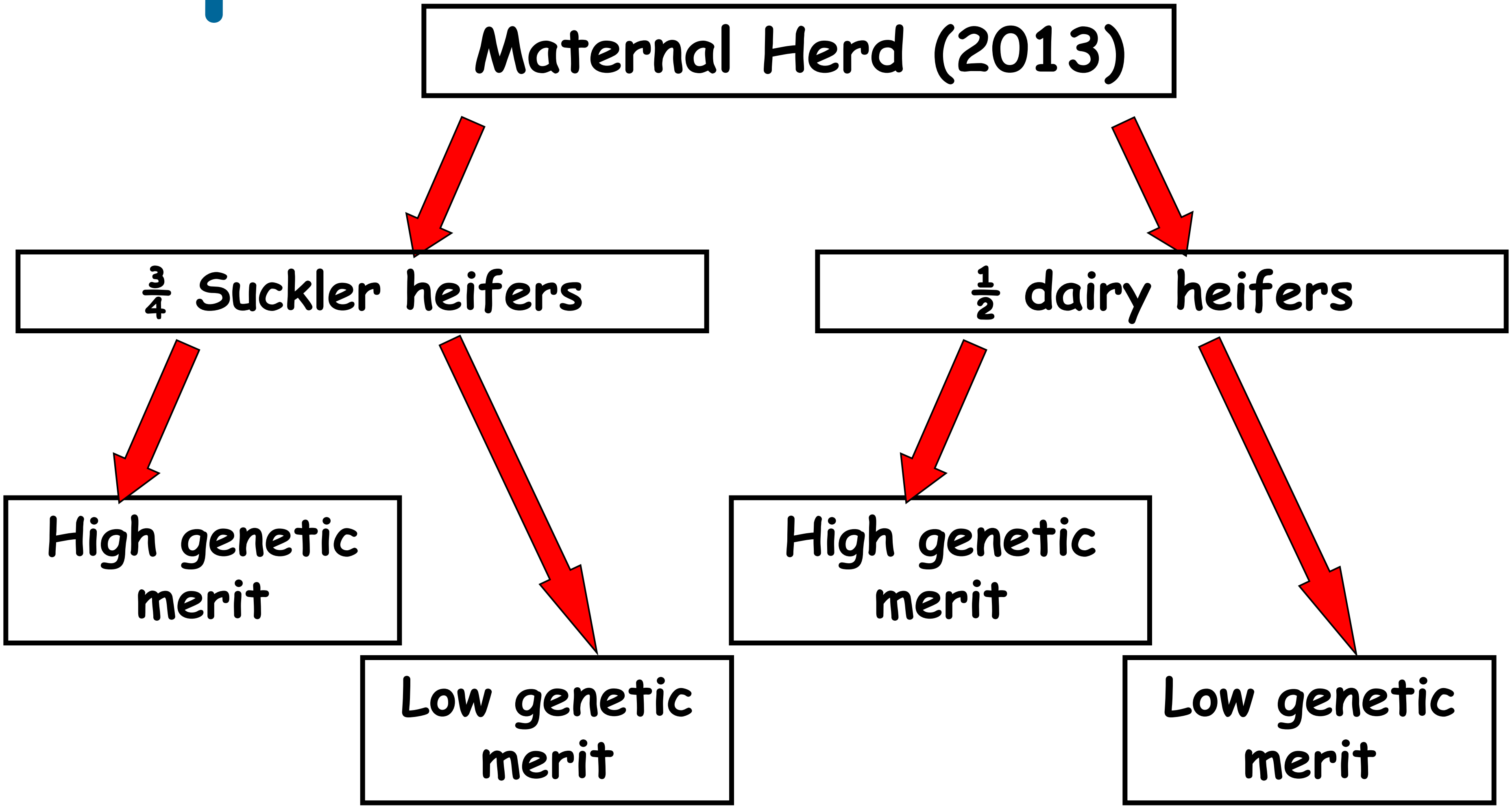
	High	Low
Maternal cow traits (€)	84	17
Maternal progeny traits (€)	35	33
Replacement index (€)	119	50

- High genetic merit (€119; 5 star)
- Low genetic merit (€50; 2 star)

PTA Cow Differences

	Genetic Merit		
	High	Low	Difference H Vs L
Mat cow traits	84	17	67
Mat progeny traits	35	33	2
Calving diff score	3.37	5.05	1.68 units easier
Cow weight (kg)	14	25	11 kg lighter
Gestation length (d)	0.53	1.76	1.23 shorter
Age at 1st calving (d)	-16.2	-7.2	9 younger
Mat. Weaning wgt (kg)	12.1	5.3	6.8 heavier
Direct carcass weight (kg)	7.0	10.8	3.8 kg lighter

Experimental Overview



Performance 2014/2015

	Genetic Merit		
	High	Low	P-value
Mean calving date	20/3	26/3	0.7296
Age at 1st calving (d)	756	758	0.7481
Calf birth weight (kg)	42	43	0.4188
Calving score (1-4)	1.39	2.05	0.7696
Calf mortality (%)	16	19	0.3904
Pregnancy rate (%)	89	86	0.7220
Milk yield (kg)	7.8	6.7	<0.001
Weaning weight (kg)	286	279	0.5258

Differences

	PTA High v Low	Actual
Mat cow traits	67	-
Mat progeny traits	2	-
Calving diff score	-1.68	-1.32
Cow weight (kg)	-11	-16
Gestation length (d)	-1.23	-3
Age at 1st calving (d)	-9	-2
Mat. Weaning wgt (kg)	6.8	8.1

Economic differences

	Economic value	Actual
Calving Diff	-€4.65	€3.07

To add:

Carcass information

Feed intake

[illegible]	[illegible]	[illegible]
CIV	-€2.30	-€13.80
Survival	€4.02	€12.06
Total		**€31.80**

Conclusions

- Genetic evaluations → important tool for selecting ideal cow
- Cows replacement index was associated with superior performance of cow and calf
- Genetic evaluations key to sustainable genetic gain & profitability of industry

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Using Foreign EBVs

NDP
National Development Plan
Transforming Ireland

Foreign EBVs

Limousine
Angus
Belgian-Blue

Pedigree cattle Services

Charolais
Limousine
Blonde d'Aq.
Salers
Parthenaise
Aubrac

French EBVs

- From IBOVAL
- N = 46,589 animals

Indexation des bovins allaitants en ferme

	IFnais rel.	AVel rel.	CRsev rel.	ALait rel.	DMsev rel.	DSsev rel.	ICRCjbf rel.	CONFjbf rel.
Females	27%	13%	42%	36%	52%	51%	26%	29%
Males	66%	32%	70%	56%	74%	73%	45%	48%

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Limousine UK EBVs

- From Basco
- N = 4,954 animals

	Dcal rel.	Mcal rel.	W200 rel.	Milk rel.	Musc rel.
Females	32%	25%	39%	25%	32%
Males	46%	32%	52%	31%	45%

Angus UK EBVs

- From Pedigree Cattle Services (Perth)
- N = 5,149 animals

	Dcal rel.	Mcal rel.	W200 rel.	Milk rel.	US musc rel.	Rib Eye rel.
Females	18%	17%	44%	32%	24%	45%
Males	28%	26%	57%	42%	36%	56%

Belgian Blue UK EBVs

- From Pedigree Cattle Services (Perth)
- N = 1,477 animals

	Dcal rel.	Macl rel.	W200 rel.	Milk rel.	US musc rel.	Rib Eye rel.
Females	20%	15%	43%	27%	22%	15%
Males	24%	17%	46%	33%	24%	16%

Key for using foreign EBVs

- Identify common bulls
  - With high rel.

- Use a representative sample of foreign information
  - Too small sample => bias

- Routine update of foreign EBVs

Facilitators

- Clean IDs = walk in the park
  - FRA animals
- 1 direct contact abroad
  - FRA, UK LIM (InterBeef ID), UK AAN BBL
- Electronic updates of EBVs
  - mistakes made after manual update

Pitfall

- Mis-Matching IDs

ICBF	AAN UK
IYMT108IR	IYM.T1.08(IR)
UK182920500136	UK182920 500136
121700921220	1217009212(NZ)20
645412	645412(CA)13

  - No common pattern within/across breeds
  - Angus : 1,477 animals in Xref file with UK Angus in last update
    - … probably done manually by the Pedigree Cattle Services

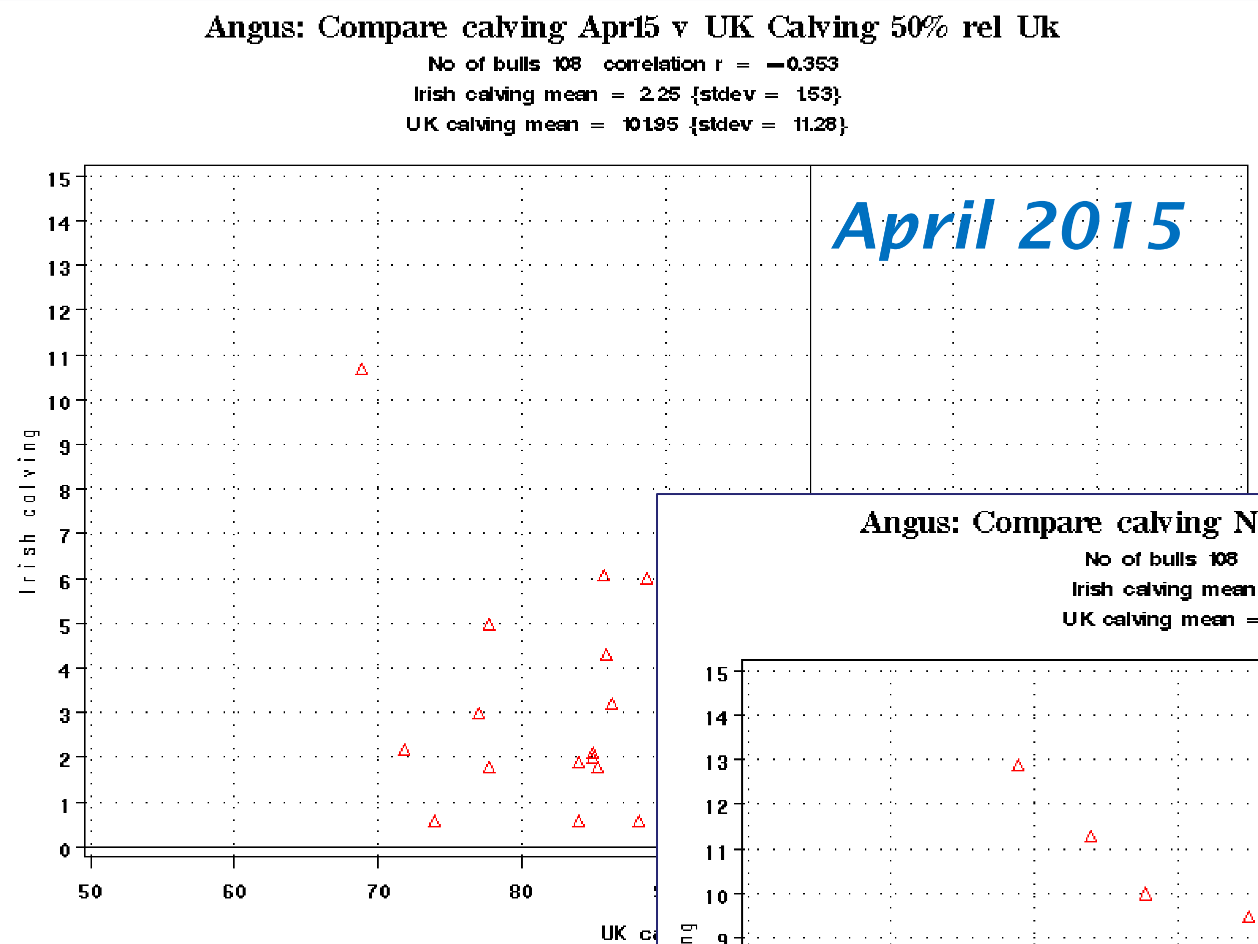
Solution

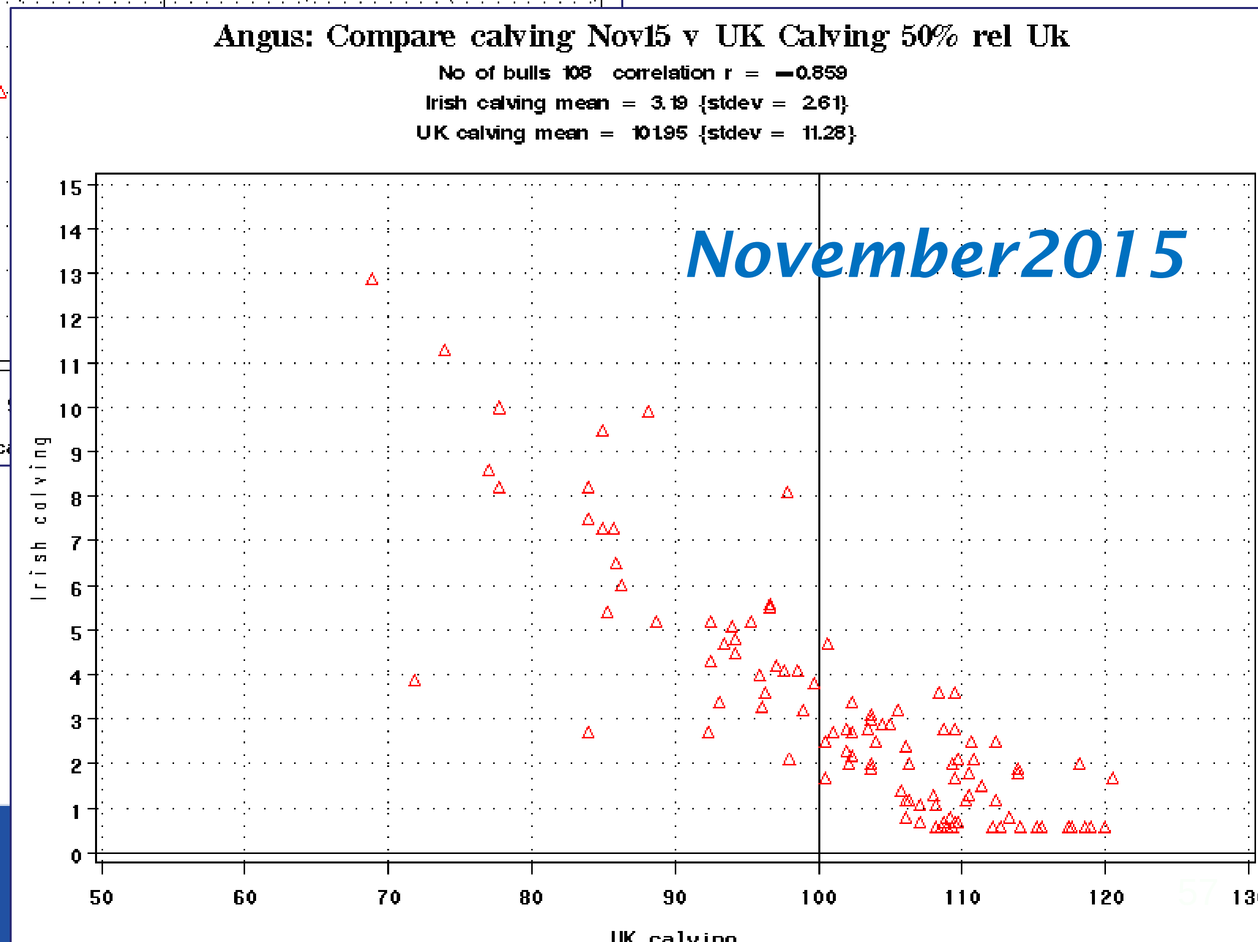
- Tidying IDs
  - Creating and storing Xref files

More breeds!

- Stabiliser UK
  - Discussion started in Aug 2015 between Stabiliser society, Signet, SRUC, and ICBF
  - Recent email agreement from UK Stabiliser society via Signet to sent all UK stabiliser bulls to ICBF
  - With UK/Herd-book tags
  - With sire and dam
- French A.I. company Evolution
  - Catalogue bulls will be sent to ICBF

IRL EBV & GBR EBV





Summary

- Using foreign EBVs require a data exchange process to be put in place for newcomers
- Solid progress made with Angus + Belgian Blue UK
  - By matching IDs
- Common ID between countries would be ideal
  - Breed || Country of origin || Sex || tag
- Building Xref files within breed

IRISH CATTLE BREEDING FEDERATION

Docility evaluations

National Development Plan
Transforming Ireland

Introduction

- Currently evaluate weanling docility on a 5 point scale VP, P, A, G, VG.
- EBV presented on same scale that it is evaluated on
- Included in the Terminal and Replacement index

Star Rating (within Angus breed)	Economic Indexes	Euro value	Index reliability	Star Rating (across all beef breeds)
★★☆☆☆	Replacement (per daughter lactation) Maternal Cow Traits Maternal Progeny Traits	€73 €34 €39	30% (Low) 29% 33%	★★★☆☆
★★★★★	Terminal (per progeny)	€82	33% (Low)	★★☆☆☆
☆☆☆☆☆	Dairy Beef	€	% (N/A)	☆☆☆☆☆

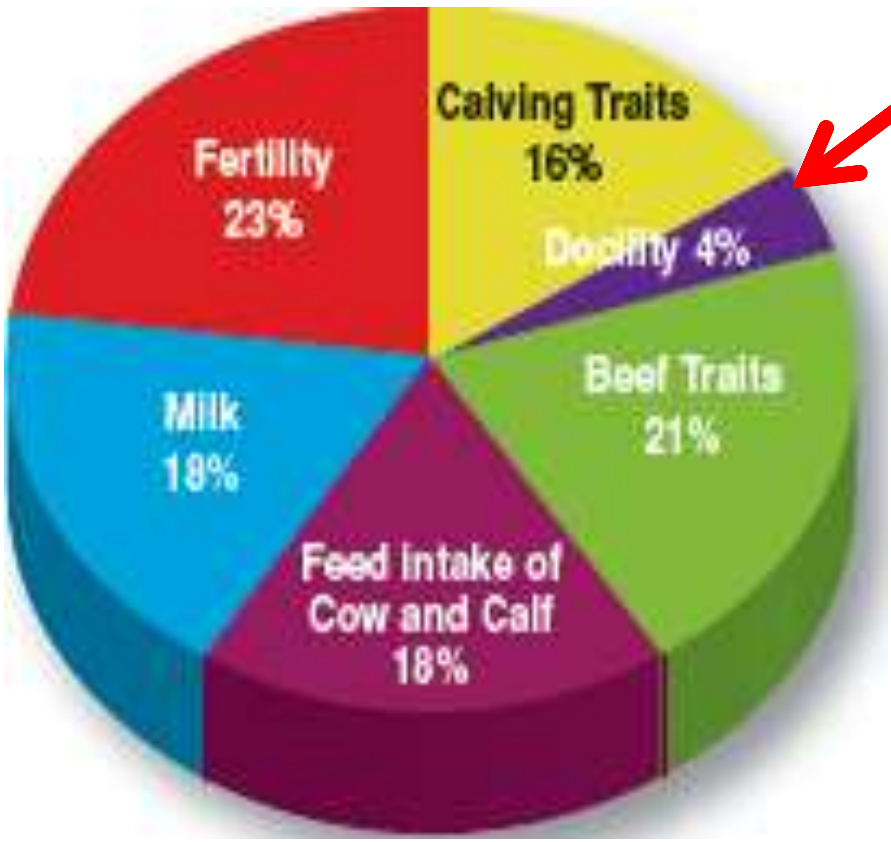
Star Rating (within Angus breed)	Key profit traits	Index value	Trait reliability	Star Rating (across all beef breeds)
	Expected progeny performance			
	Calving difficulty (% 3 & 4) Breed ave: 2.35%, All breeds ave: 4.49%	3.20%	37% (Low)	
★★★☆☆	Docility (1-5 scale) Breed ave: 0.01, All breeds ave: 0.00	-0.01 scale	44% (Average)	★★★☆☆
★★★★★	Carcass weight (kg) Breed ave: 5.63kg, All breeds ave: 13.98kg	15kg	36% (Low)	★★★☆☆
★★★★☆	Carcass conformation (1-15 scale) Breed ave: 0.68, All breeds ave: 1.23	.72 scale	32% (Low)	★★☆☆☆

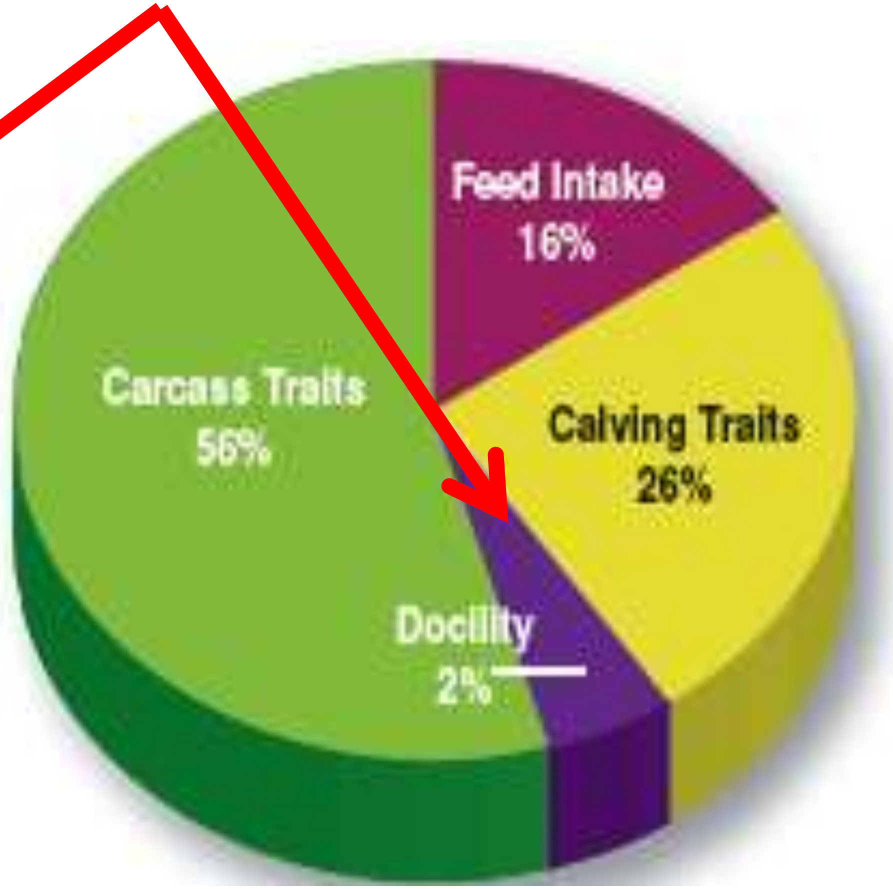
Breed	Index/trait	sd	1pc	20pc	40pc	50 pc	60pc	80pc	99pc
			1 star	2 star	3 star	3 star	4 star	5 star	5 star
All Breeds	Docility (1-5 scale)	0.1	-0.25	-0.08	-0.02	0	0.03	0.08	0.23

Economics

- Economic value based on
  - Labour
  - Risk of serious injury
- Included in the Terminal and Replacement index
  - Direct economic impact of weanling docility
  - Predicted impact of cow docility

Relative weighting in indexes





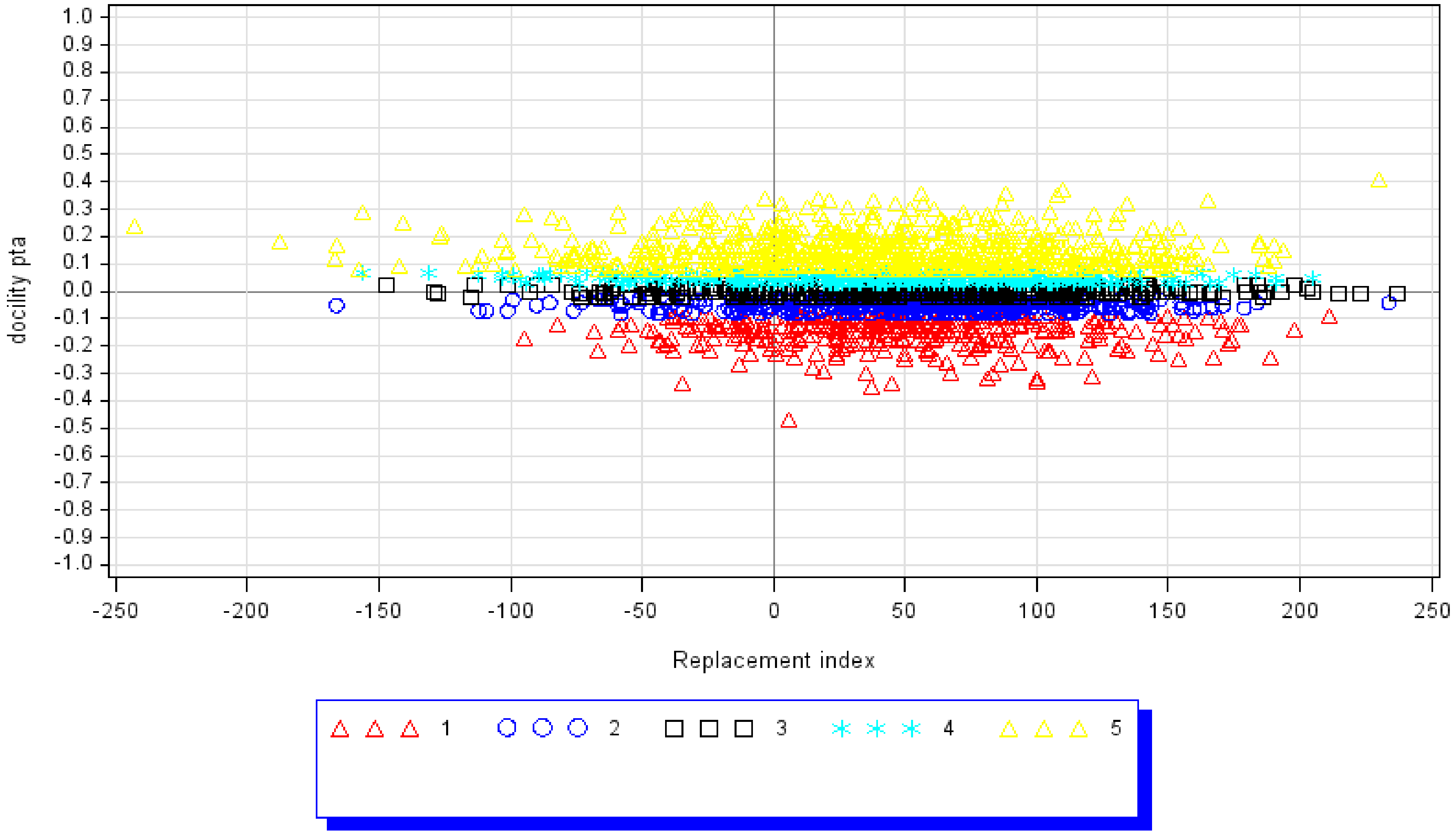
Replacement **Terminal**

Current docility and Replacement index: AI sires > All rel

No of bulls 2237 correlation r = −0.072

Doc mean = 0.02 {stdev = 0.11}

Repl mean = 46.53 {stdev = 62.31}



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Options for increasing emphasis

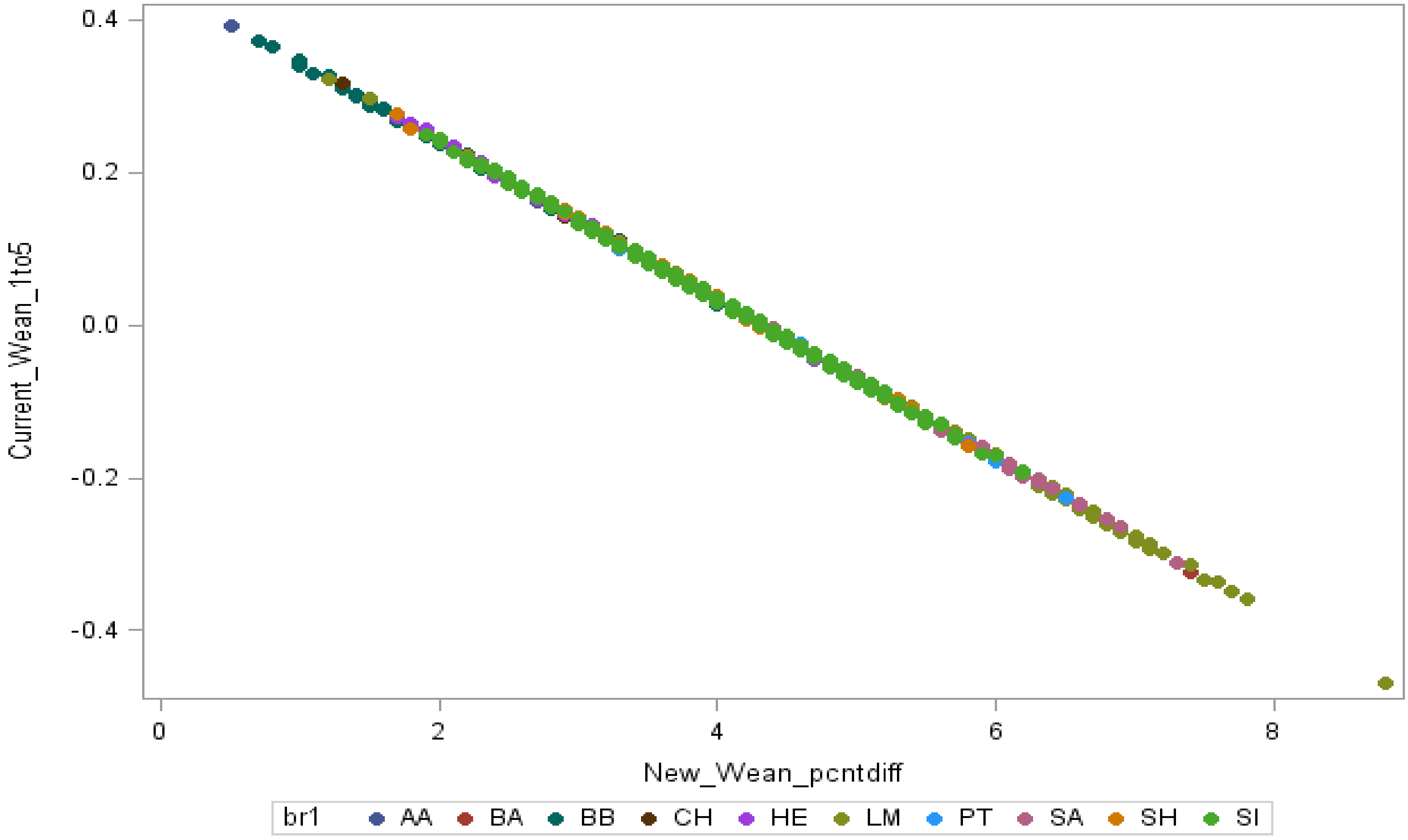
1. Express a non-linear relationship between docility ebvs and risk of a problem animal
   - At high EBV, the risk escalates
2. Incorporate a new trait: cow docility
3. Penalty for low reliability in breeds with large variation in docility
4. Revise the Economic Value

Option 1

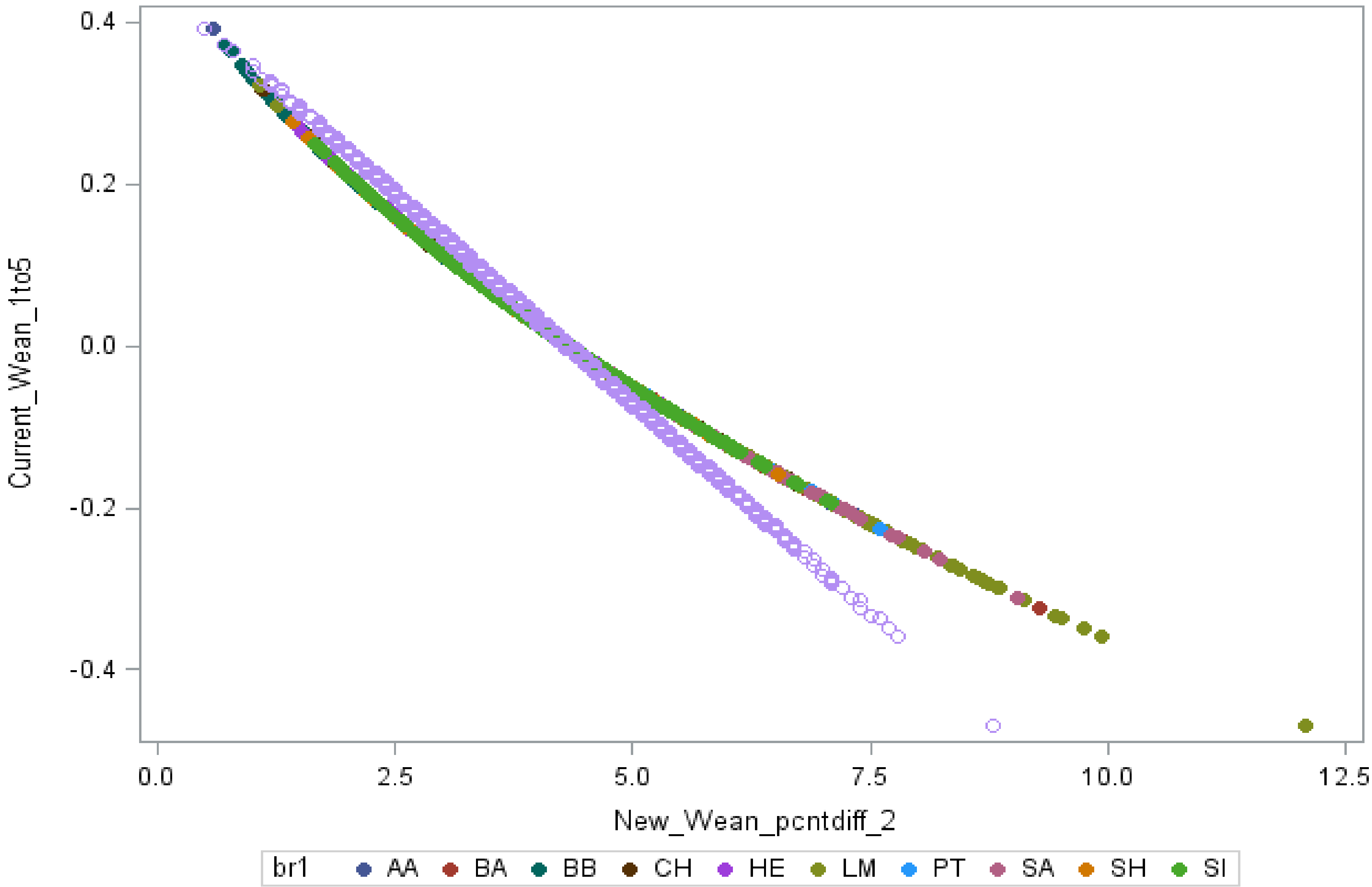
Express a non-linear relationship between docility ebvs and risk of a problem animal

- At high EBV, the risk escalates

Transforming 1 to 5 scale into % difficult scale



Transforming 1 to 5 scale into non-linear % difficult scale



Option 2

Incorporate a new trait: cow docility

Cow Docility

DEPENDENT VARIABLES:

TR-NAME		N-OBS	MEAN	SD	MIN	MAX
1	farmsc	1,218,257	2.3	0.77	1	5
2	linsc	178,457	7.47	1.14	1	10
3	cowsc	1,461,163	3.96	0.82	1	5

Number of Observations for Each Trait Combination

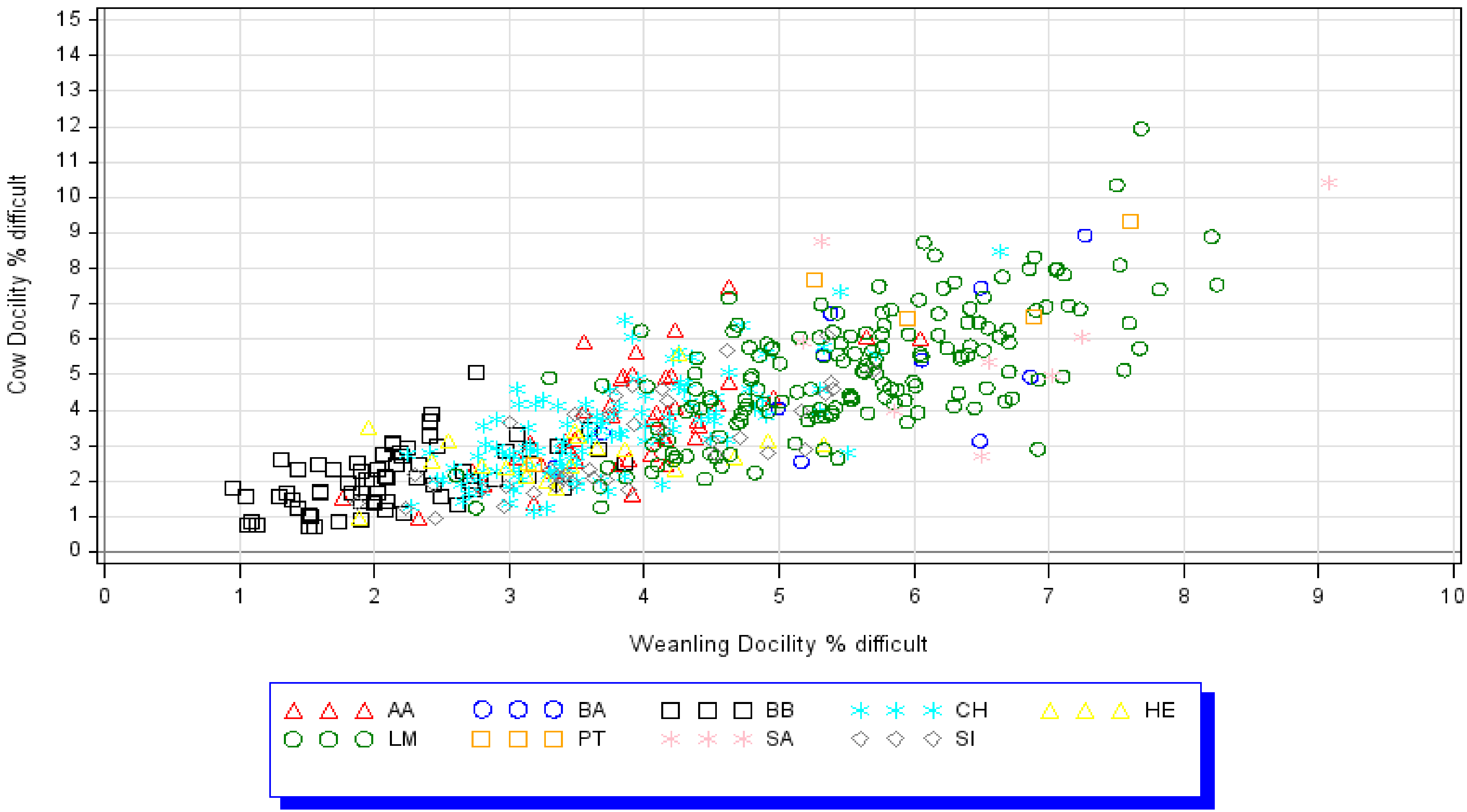
	1	2	3
1	1,218,257		
2	25,498	178,457	
3	79,258	22,550	1,461,163

Weanling vs Cow on new scale: AI sires > 90% rel wean

No of bulls 472 correlation r = 0.797

Cow mean = 3.87 {stdev = 1.89}

Weanling mean = 4.23 {stdev = 1.55}

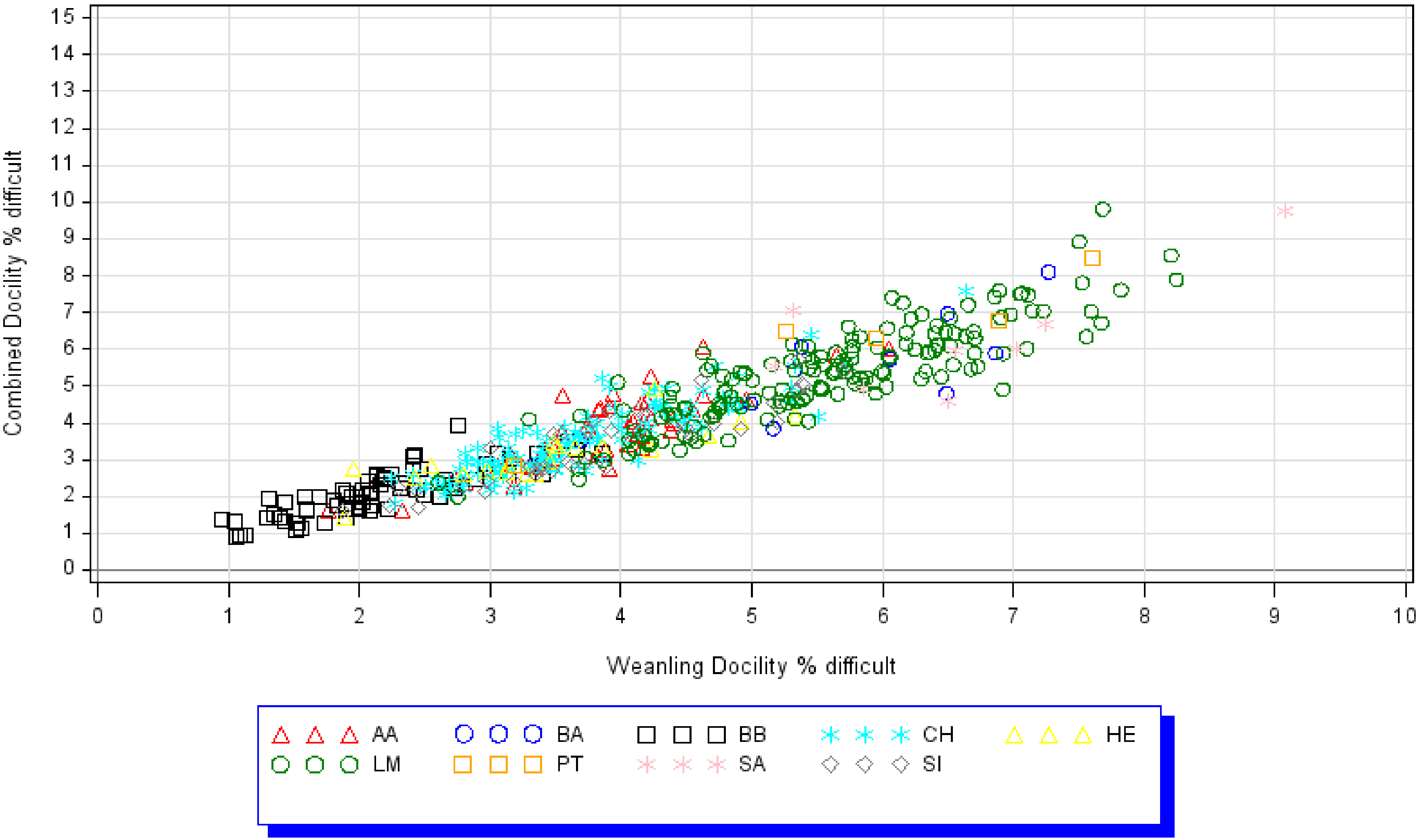


Weanling v Combined docility: AI sires > 90% rel wean

No of bulls 472 correlation r = 0.937

Combined mean = 4.05 {stdev = 1.63}

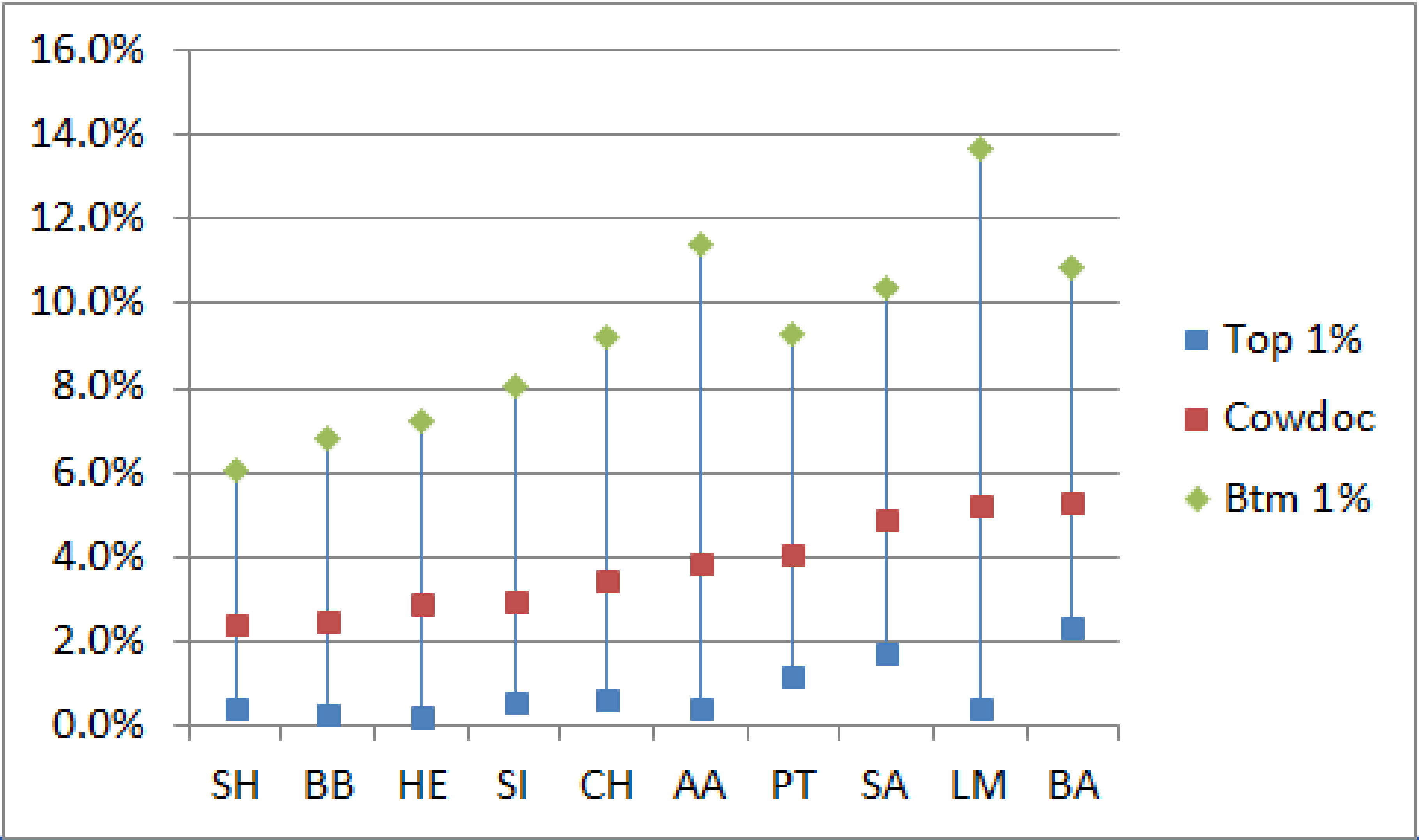
Weanling mean = 4.23 {stdev = 1.55}



Option 3

Penalty for low reliability animals dependent on the variation with the breed for docility

Cow docility variation by breed



Summary of penalty by breed

br1	numrecs	Cowdoc	std	penalty for bulls < 40% rel	penalty for bulls 40% to 70 % rel	Cowdoc with penalty
SH	189	2.4%	0.93%	0.13%	0.07%	2.8%
BB	424	2.5%	1.00%	0.17%	0.10%	2.7%
HE	417	2.9%	1.09%	0.16%	0.09%	3.2%
SI	364	2.9%	1.25%	0.12%	0.07%	3.2%
CH	677	3.4%	1.27%	0.08%	0.05%	3.6%
AA	404	3.8%	1.34%	0.11%	0.06%	4.0%
PT	55	4.1%	1.84%	0.15%	0.09%	4.3%
SA	72	4.9%	1.69%	0.16%	0.09%	5.0%
LM	520	5.2%	1.96%	0.13%	0.07%	5.3%
BA	119	5.3%	1.77%	0.17%	0.10%	5.6%

Option 4

Revise the Economic Value

Economic Value: current

- In order to convert the calculated average cost per injury or death to a cost per change in docility score, it is assumed:
  - That there is a decrease in risk of “problem” animals by 15% for a 1 unit increase in average docility score for a group of animals
  - 1 problem animal increases labour requirements by 5 hours per year per problem suckler cow
  - 1 problem animal increases labour requirements by 3 hours per year per weaned calf on average over the lifetime of a slaughter animal or replacement heifer until first calving
  - 1 problem animal increases the likelihood of injury or death by 0.01 (1%) for suckler cows.
  - 1 problem animal increases the likelihood of injury or death by 0.005 (0.5%) for weanlings
  - Labour costs per hour are €17.80 per hour.

Economic Value: current

- **Suckler cow**
- (Risk of "problem" animals x number of additional hours labour x cost per hour) + (Risk of "problem" animals x likelihood of injury or death x cost of injury of death) = EV of a 1 unit increase in docility
- (0.15 x 5*€17.80) + (0.15 x 0.01*€13889) = EV of a 1 unit increase in docility
- €13.35 + €20.83 = **€34.20**
-
- **Weaned calf to replacement or slaughter**
- (Risk of "problem" animals x number of additional hours labour x cost per hour) + (Risk of "problem" animals x likelihood of injury or death x cost of injury of death) = EV of a 1 unit increase in docility
- (0.15 x 3*€17.8) + (0.15 x 0.005*€13889) = EV of a 1 unit increase in docility
- €78.00 + €10.42 = **€18.43**

Economic Value: New

- In order to convert the calculated average cost per injury or death to a cost per change in docility score, it is assumed:
  - That one problem animal (POOR OR VERY POOR) increases labour requirements by 5 hours per year per problem suckler cow
  - That one problem animal increases labour requirements by 3 hours per year per weaned calf on average over the lifetime of a slaughter animal or replacement heifer until first calving
  - That 1% more POOR OR VERY POOR (current 5%) increases the numbers of serious injuries by 167 and deaths by .67 for suckler cows.
  - That 1% more POOR OR VERY POOR (current 5%) increases the numbers of serious injuries by 110 and deaths by .42 for weanlings
  - Labour costs per hour are €17.80 per hour.

Economic Value: New

- **Suckler cow**
- (Risk of "problem" animals x number of additional hours labour x cost per hour) + (Risk of "problem" animals x likelihood of injury or death x cost of injury of death) = EV of a1% more POOR OR VERY POOR increase in docility
- (0.01 x 5*€17.80) + cost of extra injury + cost of extra deaths = EV
- €0.89 + €1.13 + €1.52 = **€3.55**
-
- **Weaned calf to replacement or slaughter**
- (Risk of "problem" animals x number of additional hours labour x cost per hour) + (Risk of "problem" animals x likelihood of injury or death x cost of injury of death) = EV of a 1 unit increase in docility
- (0.15 x 3*€17.8) + cost of extra injury + cost of extra deaths = EV
- €0.53 + €0.78 + €1.17 = **€2.49**

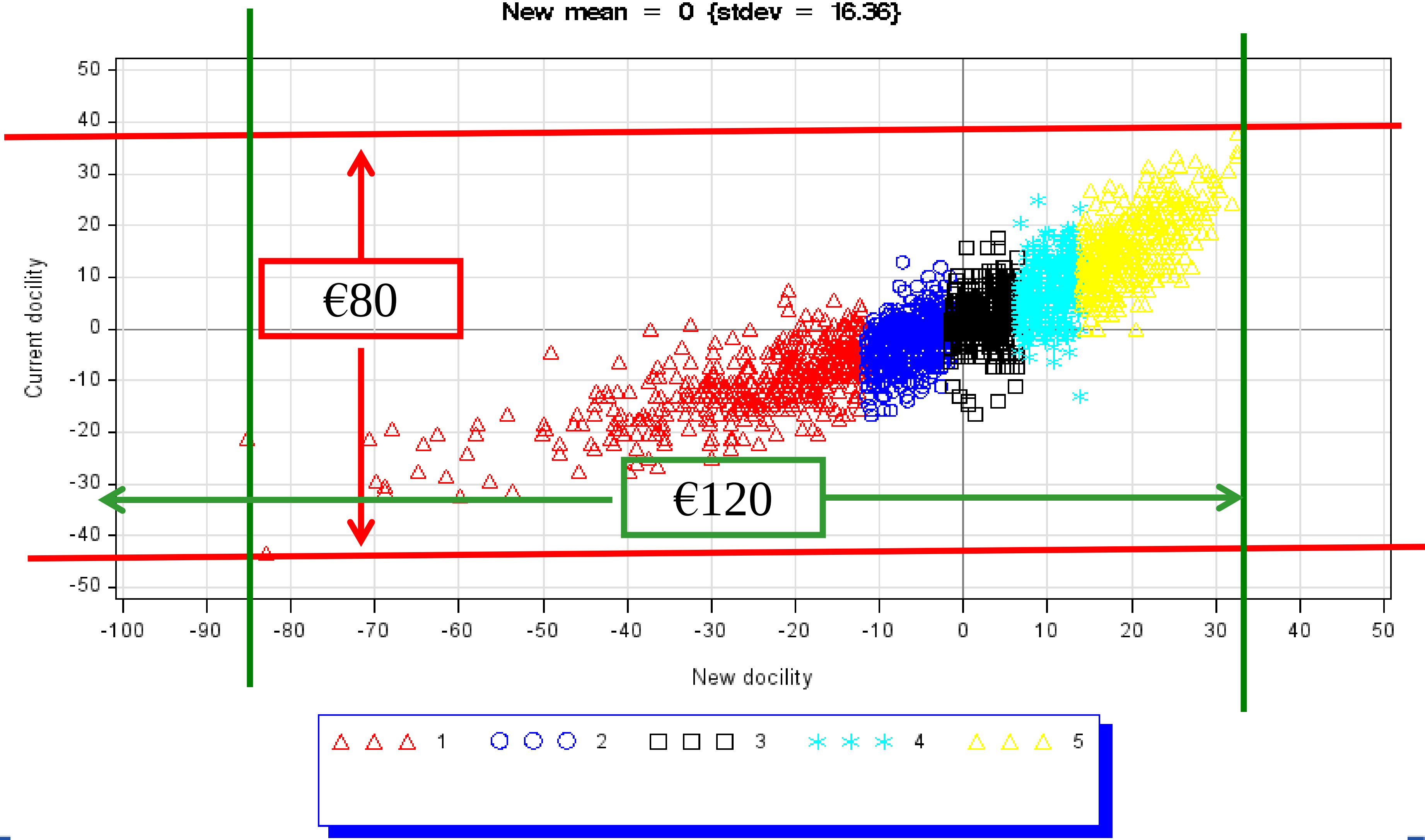
Impact of 4 options

Current v New Euro contribution: AI sires all rel current

No of bulls 2238 correlation r = 0.874

Current mean = 2.25 {stdev = 10.48}

New mean = 0 {stdev = 16.36}

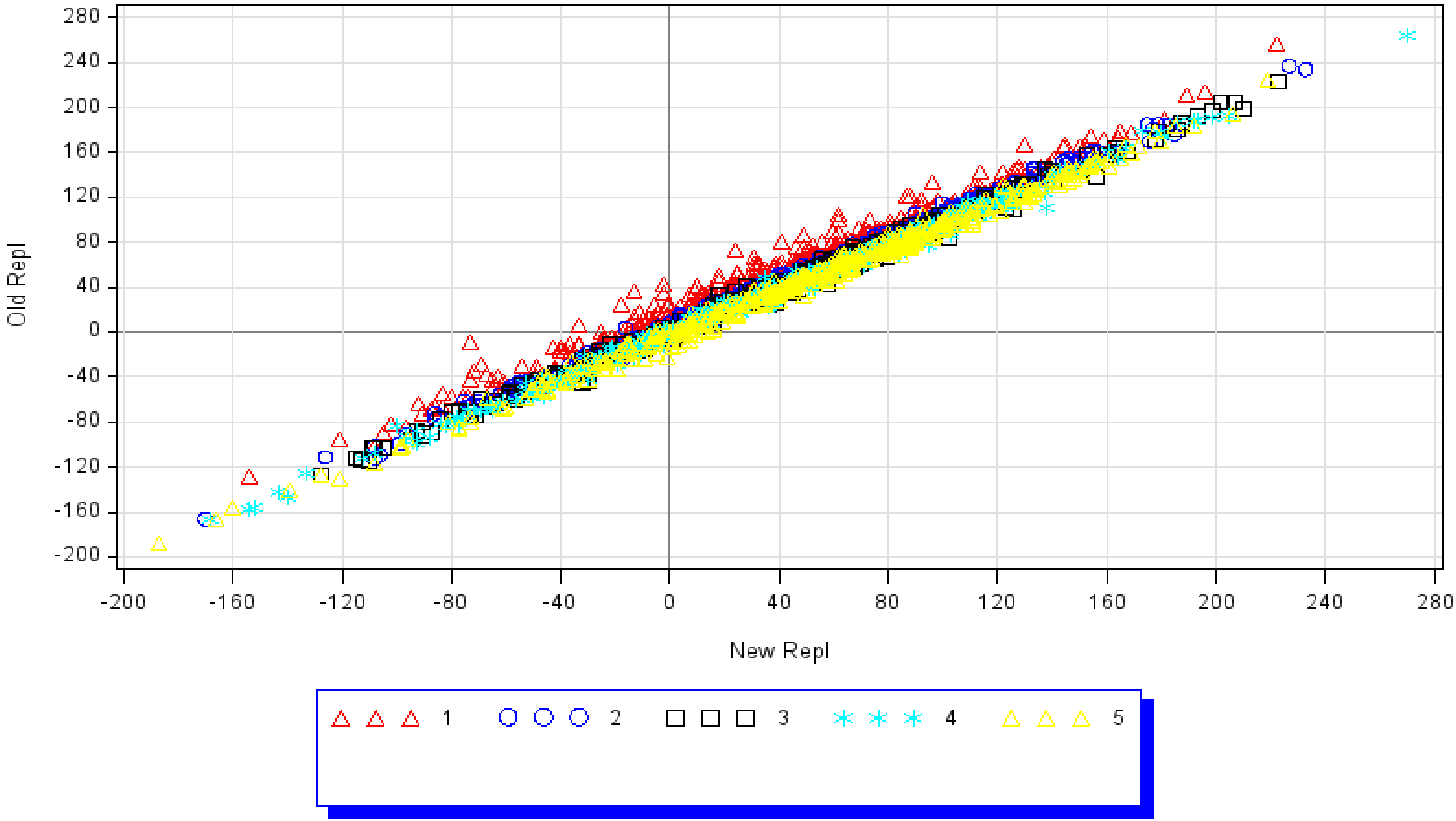


Current v New Replacement Index: AI sires all rel doc

No of bulls 2238 correlation r = 0.99

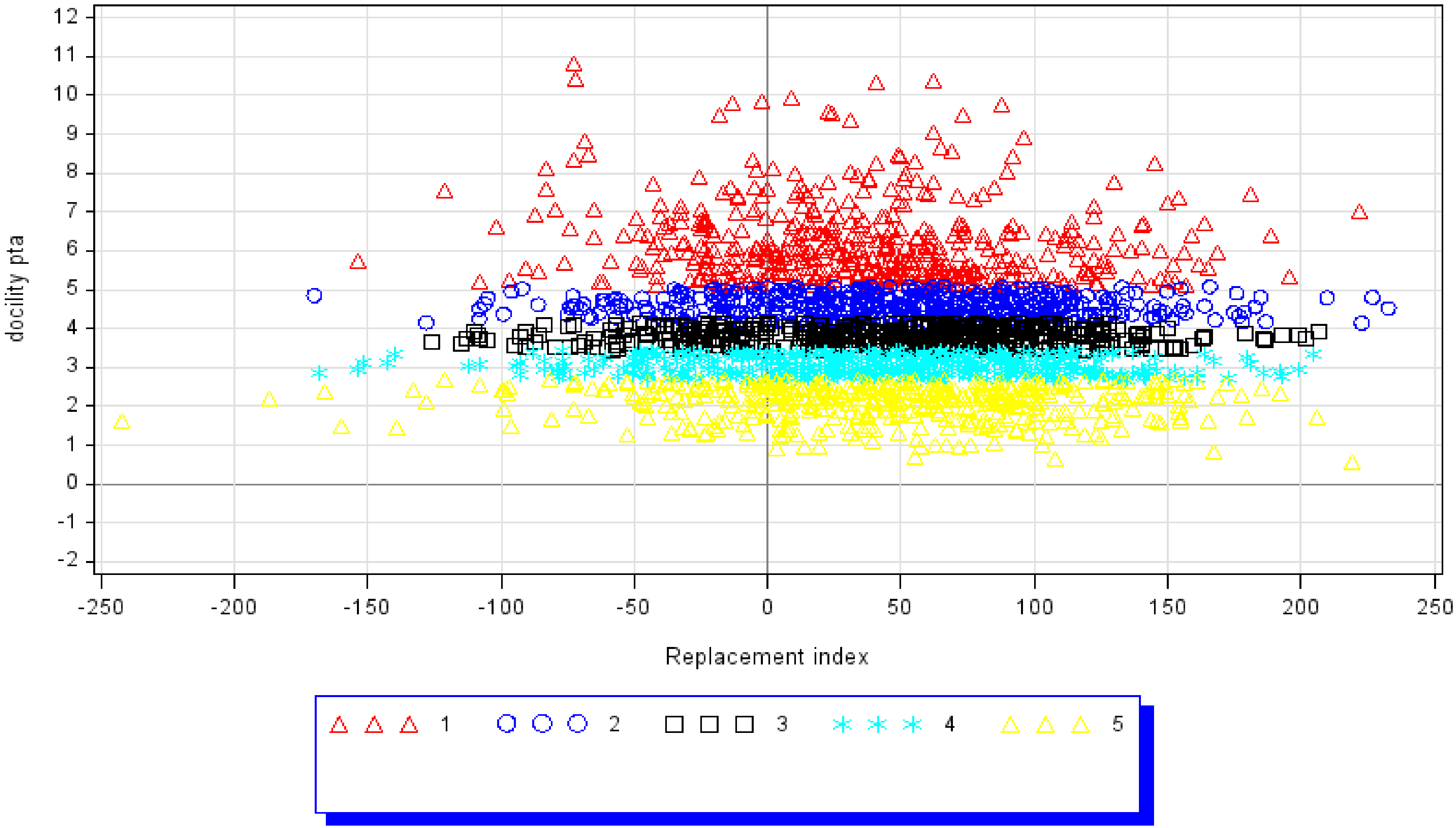
Current Repl mean = 45.79 {stdev = 61.85}

New Repl mean = 43.53 {stdev = 62.78}



New docility and Replacement index: AI sires ALL rel

No of bulls 2238 correlation r = −0.056
doc mean = 3.99 {stdev = 1.53}
Repl mean = 43.53 {stdev = 62.78}



Summary

- Research work done
- Test evaluations available for distribution to industry
- Decision at next industry meeting on implementation

Dairy Beef Index

Update

Objective:
Develop a breeding index for dairy farmers → select beef bulls

Traits influencing decision

1. Calving difficulty
2. Calf mortality
3. Gestation length
4. Calf price

Gestation length

Accounts for:

- Loss in milk sales
- Change in the feed budget

Economic value -€3.00

Calves Sold

- Economic value implicitly assumed within the EBV of calf price
- Mortality rate for each bull is included in the economic value

Economic value **€1.00* Mortality adjustment**

Calving Difficulty

Issues

1. Calculation of PTAs
   - Include all data or only dairy data
2. Calculation of economic value
   - Linear versus non-linear value

Calving Difficulty – calculation of PTAs

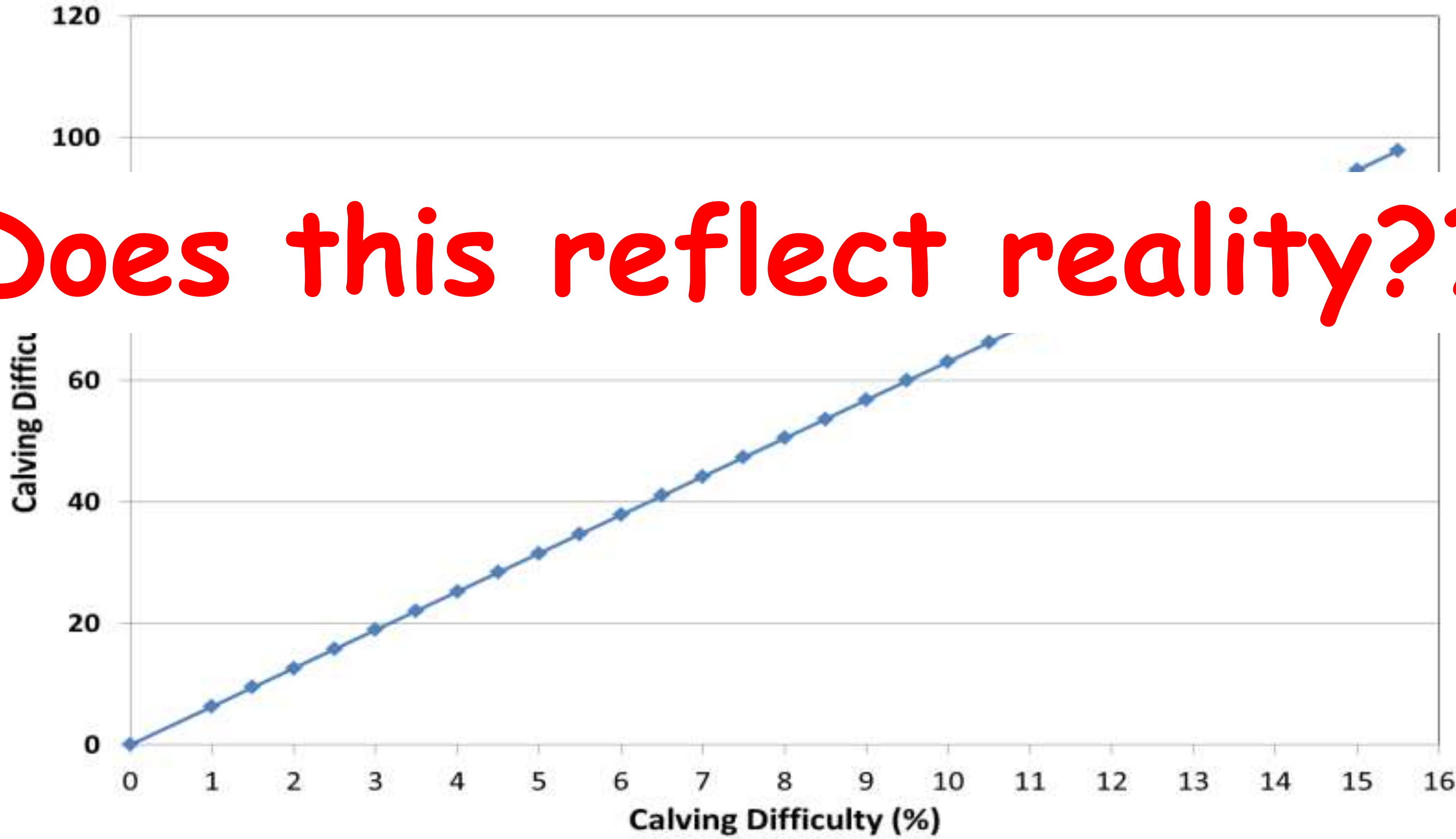
- Issue discussed by research group (ICBF, Teagasc, Abacus Bio)
- All scenarios tested

Proposal

1. For calculation of dairy beef index use dairy cow and heifer PTAs
2. Combined value published
3. All 4 PTAs (beef cow & heifer, dairy cow & heifer) available on ICBF website

Currently….. Calculation of economic value

- Current calving evaluations assumes linear impact of calving difficulty
- Every 1% increase has **same** negative impact

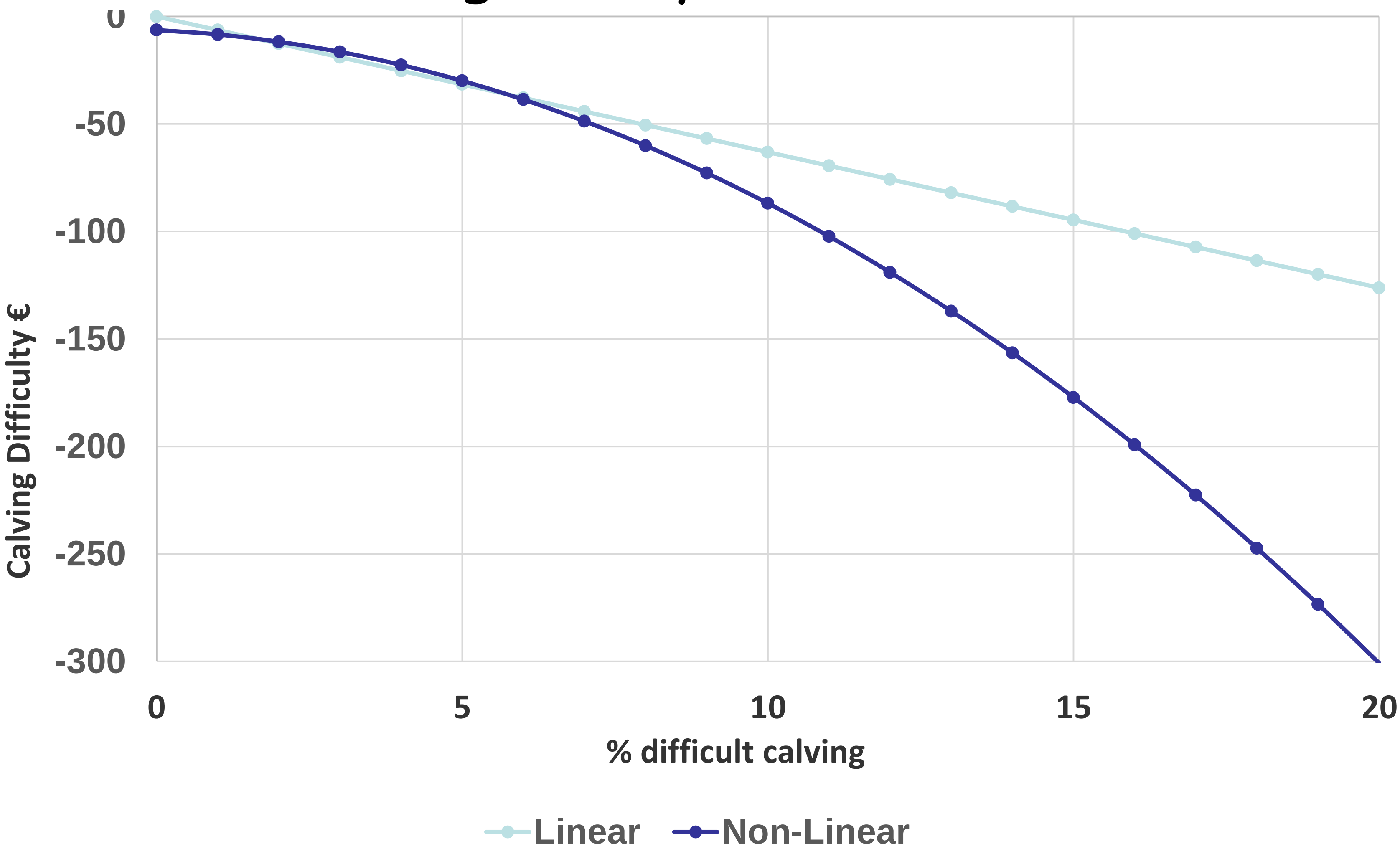


Does this reflect reality??

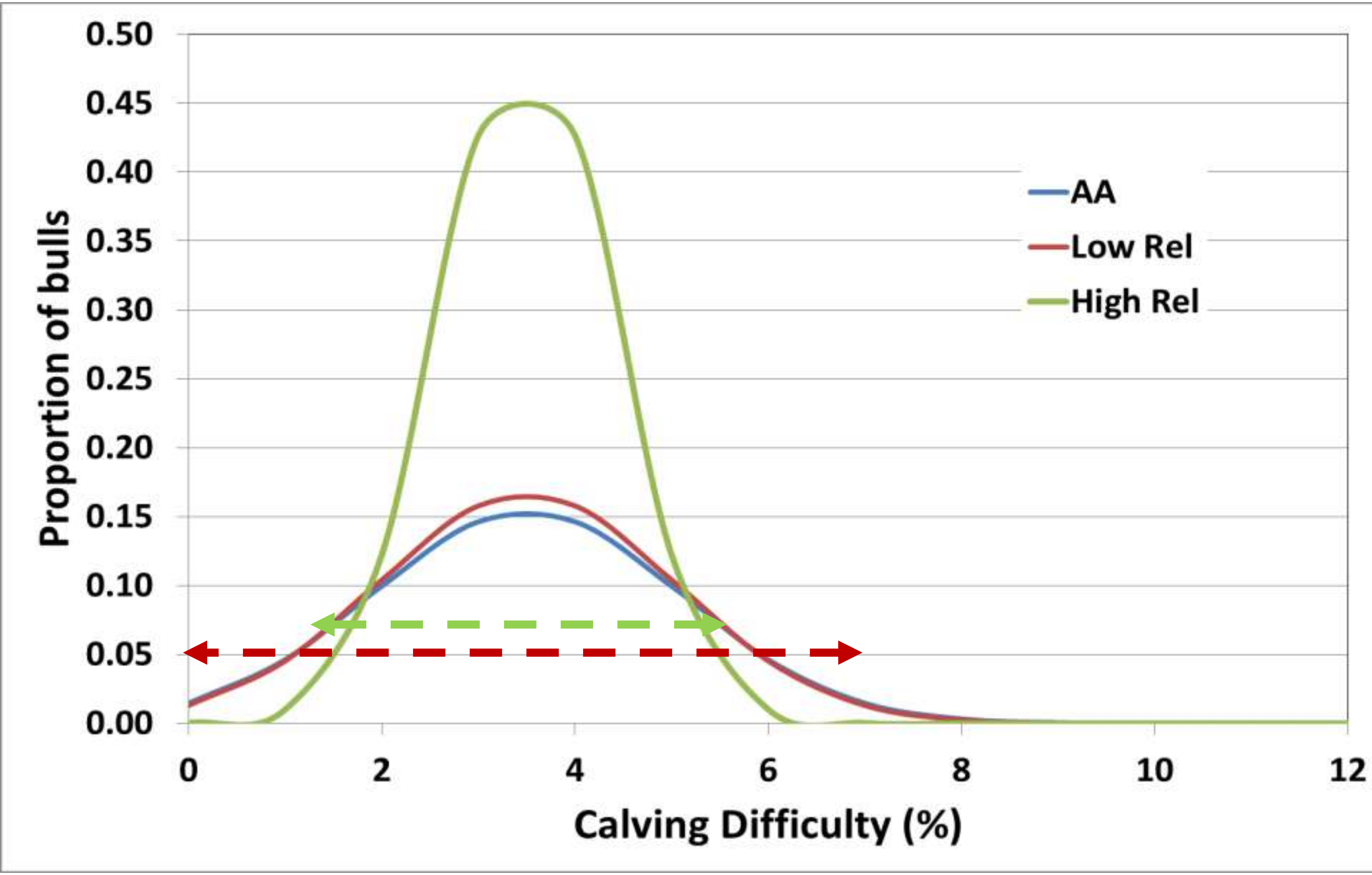
Proposal… non-linear calving function

Designed non linear calving function

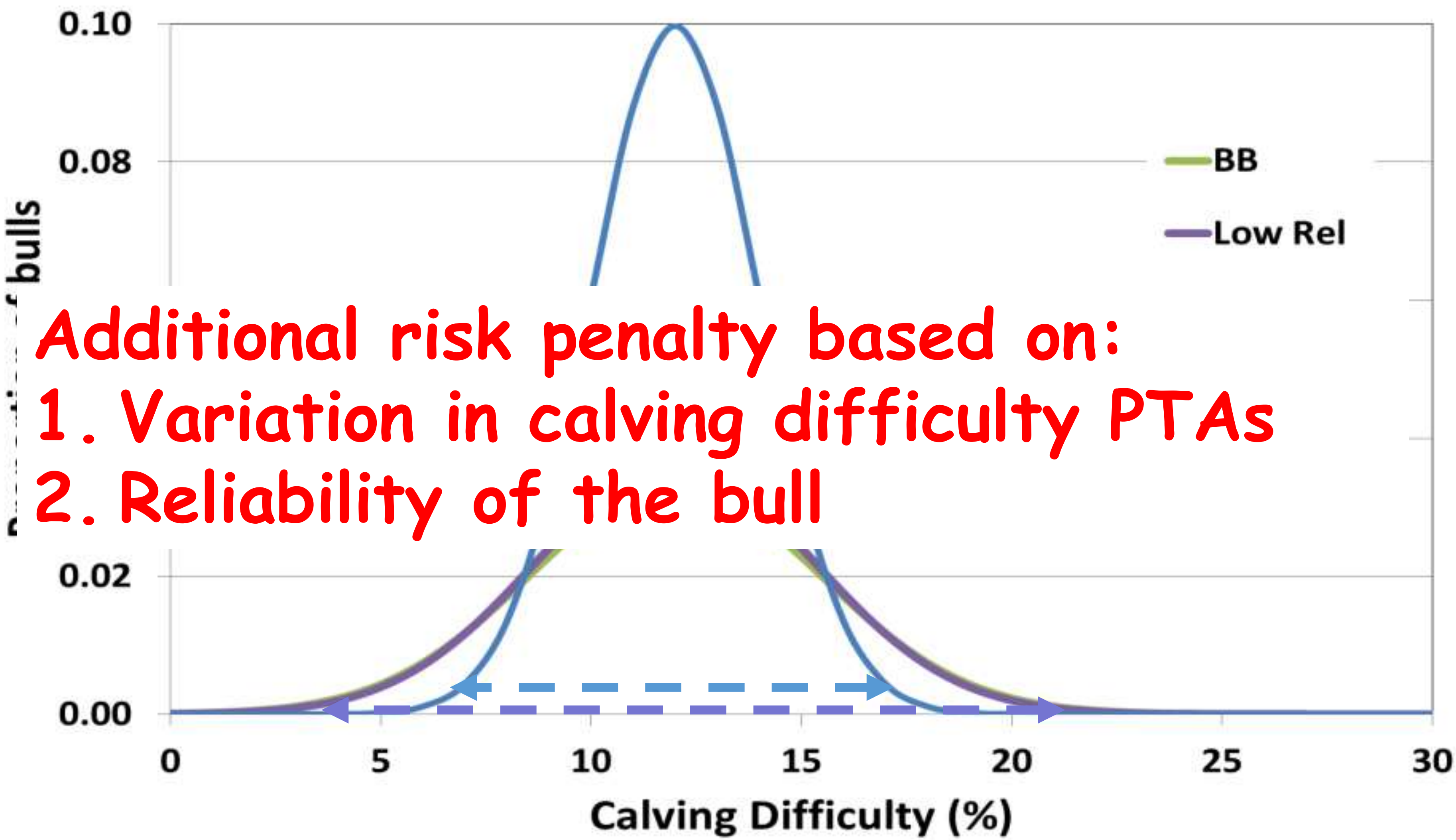
Based on calving survey conducted 2014



Variation in calving difficulty PTAs



Variation in calving difficulty PTAs



Additional risk penalty based on:

1. Variation in calving difficulty PTAs
2. Reliability of the bull

Results to date…

Breed	DBI	Calf_Diff	CalfValue	Gestation
AA	3	2.7	31	-0.7
BB	-151	12.4	121	0.6
HE	12	4.9	54	1.1
LM	16	5.9	73	3.7
SI	-2	6.3	87	2.2

Test proofs available in Spring 2016

- Large variation within breeds

ICBF.com

IRISH CATTLE BREEDING FEDERATION

DNA for Active AI Sires.



NDP
National Development Plan
Transforming Ireland

DNA from Active AI Sires

- ‘Genomics’ has increased the need to have DNA from an AI Sire sent to ICBF for genotyping.
- **2 dead unused** straws of semen are preferred.
- In August every year, ICBF requests 2 dead unused straws from every bull that was coded in the previous 12 months.
- Hopefully a quieter time of year for AI Labs.
- @ 70% of bulls requested are returned.

DNA from Active AI Sires

- BDGP has increased the need to now receive & genotype these straws more quickly.
- 19th Nov'15 - **13** AI Companies & Herdbooks were emailed to return 2 dead straws from **72** bulls.
- To-date: **5** Org's have returned **14** bulls.
- Incorporating these Straw Requests into the routine AI Coding screen would be a better approach.
- List of bulls that straws requested from – always available – continually updated.

DNA from Active AI Sires

- Very good progress has been made however in terms of returning straws in general.
- Particularly from old & influential bulls.
- Tremendous thanks due to Breed Societies, AI Companies & Breeders in tracking down Bulls:
- 533 AI bulls on a master ‘wanted’ list.
- 78 ‘Priority 1’ bulls – **63** returned to-date (81%)
- 455 ‘Priority 2’ - **92** returned to-date (20%)

ICBF.com

DNA from Active AI Sires

- **TXG – Texan Gie**

UNF – Udel F18 Knightflyer

- **BHP – Bowerhouse Topper**

TIN – Turin

DNA from Active AI Sires

- **OXY – Onyx**

SYP – Sympa

- **ALO – Annaly Leo**

RTB – Rosten Barney

DNA from Active AI Sires

- In Summary:
- We need to make the supply of straws of semen for genotyping ‘routine’.
- Move away from the current ‘on request’ model.
- Action on ICBF to alter current AI Code system.
- In meantime:
- **PLEASE SEND BACK REQUESTED BULLS ASAP!**

- *Thanks again for all the cooperation on this issue to-date!*

IRISH CATTLE BREEDING FEDERATION

Update: Genetic Disease and Major Genes

Matthew McClure

National Development Plan

Transforming Ireland

No 'Genomic Perfect' Animal

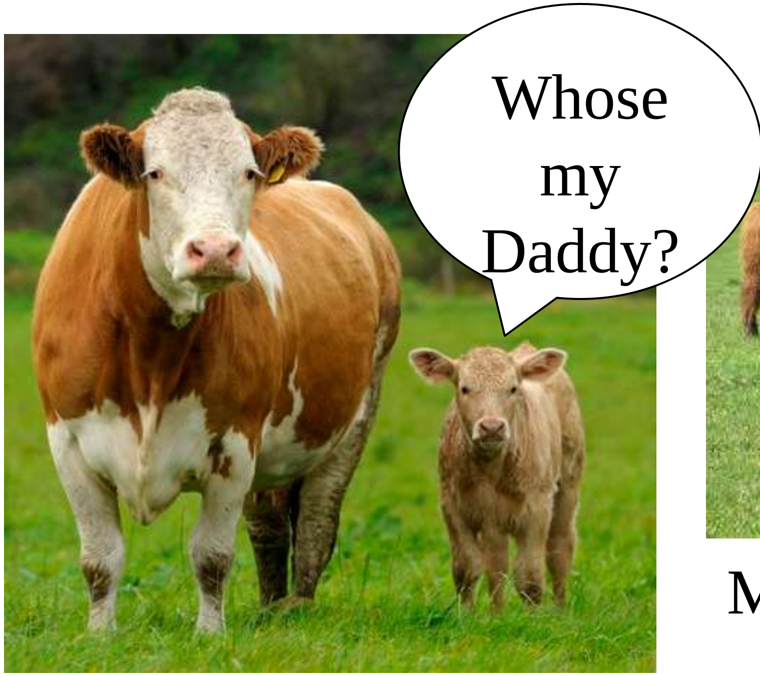
Pawnee Farm Arlinda Chief, 1962

- HH1 carrier
- >16,000 daughters
- >World-wide Economic Value vs Disease Cost
  - $25 billion value from increased milk yield
  - $0.4 billion cost from HH1 abortions

Every animal is a carrier for a small number of lethal diseases, along with other unwanted diseases/traits.

Most are unknown diseases

What Does ICBF do With a Genotype?



Male? Or Female?

Who's IE123xxxxx

Identify High Genomic Animals

★ VS ★ ★ ★ ★ ★

Genetic Disease Status???

Genetic Disease Testing

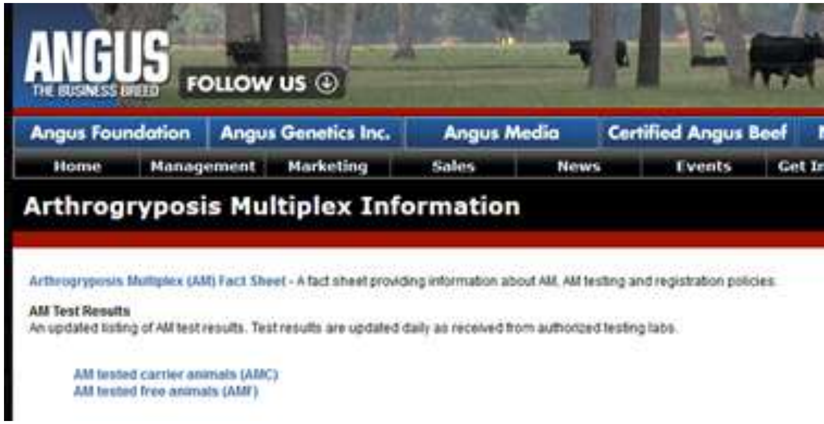
- Many countries only routinely test
  - AI
  - Pedigree animals

- Ireland tests every IDB genotyped animal
  - AI
  - Pedigree
  - Commercial

Disease Status Reporting World-Wide

American Angus Association

http://www.angus.org/pub/AM/AMInfo.aspx



Select Sires (AI)

http://www.selectsires.com/resources/images/Haplotypes_0414.pdf

7HO9222	Shot	HH5C
7HO9281	Bigshot	HH3C
7HO10375	Mr Mudd	HH3C
7HO10406	Dashawn	HH2C
7HO10429	Montney	HH3C
7HO10585	Helix	HH5C
7HO10702	Excel	HH4C
7HO10723	Spur	HH3C
7HO10884	Avery	HH3C
7HO11279	Moonboy	HH3C
7HO11283	Mayfield	HH3C
7HO11402	Tavir	HH3C
7HO11424	Offie	HH2C
7HO11488	Branson	HH5C
7JE1038	Valentino	JH1C
7JE1151	Galvanize	JH1C
7JE1163	Irwin	JH1C
7AY109	Dixon	AH1C
7BS871	Advisor	BH1C

US Holstein Association

http://www.holsteinusa.com/pdf/haplotype/hapbulcarriers.pdf

Stud Code	Name	Registration	HH1	HH2	HH3	HH4	HH5	HCD
29HO09061	208 D G DANO-ET	USA 17395753	C					
	2ND-LOOK ALEXANDER 9990	840003004418274						1
29HO16289	2ND-LOOK FREDDIE PRIDE-ET	840003004418282					C	
7HO09546	2ND-LOOK MALLOY	USA 60882194						1
14HO06571	2ND-LOOK MILLENNIUM-ET	840003004418265		C				
	2ND-LOOK OBSERVER 11014-ET	840003008562090					C	
204HO00219	528 NEW-WORLD EMPIRE-ET	USA 17190309	C		C			

ICBF.com

Ireland Disease Testing

IDB chip >150 Disease/Trait Probes

-65 validated, ~30 in pipeline

CHIP CONTENTS FOR DISEASES & TRAITS

Lethal recessives

1. CVM*-Complex Vertebral malformation
2. DUMPS
3. Brachyspina*
4. BLAD

Congenital disorders

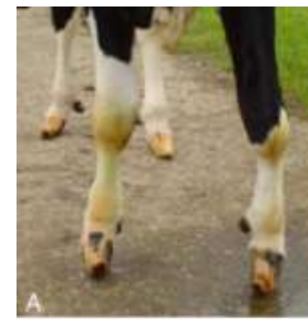
1. Arthrogryposis (Curly Calf)*
2. Fawn Calf Syndrome or Contractural Arachnodactyly*
3. Hypotrichosis PMel17
4. Hypotrichosis in Belted Galloway, HEPHL1 SNP
5. Hypotrichosis KRT71*
6. Spiderleg- MOCS1 gene- Simmental
7. Spiderleg- SOUX gene- Brown Swiss
8. Polledness
9. Mule Foot
10. Tibial Hemimelia (TH)*
11. Black/Red Coat Color/Red Factor
12. Red Recessive coat colour (Different to red factor)
13. Silver Color Dilutor
14. Dun Color
15. RNF11 (affects growth and stature)
16. Osteopetrosis (Marble Bone Disease)
17. Pink Eye (Infectious Bovine Keratoconjunctivitis)
18. Protoporphyria Ferrochelatase Gene (Photosensitization)
19. SMA- Spinal muscular atrophy
20. Beta Lactoglobulin
21. Beta Mannosidosis
22. Alpha Mannosidosis
23. Citrullinemia
24. CMDI: Congenital muscular dystonia I
25. CMDII: Congenital muscular dystonia II
26. Crooked Tail Syndrome*
27. Factor XI
28. Heterochromia Irides (White Eye)
29. SDM- Spinal dysmyelination-SPAST Gene
30. Idiopathic Epilepsy*
31. Pulmonary Hypoplasia*
32. Weaver
33. Neuropathic hydrocephalus* (water head syndrome)

Major genes

1. DGAT1
2. MSTN (GDF8) Double Muscling*
3. A1/A2 beta casein + *
4. Fertility Haplotypes (HH1, HH2, HH3, JH1)
5. Kappa Casein I
6. Kappa Casein II
7. ABCG2
8. GH2141 and GH2291 (Marbling,growth rate)*
9. IGF1-AF017143
10. STAT1*
11. STAT3*
12. STAT5*
13. Calpain (Tenderness) loci

* Royalty fees may apply

Brachyspina
Agerholm et al., 2006



Mulefoot
Duchesne et al., 2006

Double Muscle-Myostatin
ICBF.com

Ireland Disease Rates

1) 170,992 IDB genotyped animals since 2013

- Dairy and Beef animals
  - >42,000 herds
- Most of the active AI sires

2) 38 validated mutations that cause 33 diseases

3) Carrier rates of lethal or unwanted diseases?

National Herd Genetic Disease Surveillance:

Carrier Frequency in National (All) and Breed (Pure Bred) Herds											
	Beef	**Dairy**	Angus	Belgian Blue	Charlois	Hereford	Holstein	Jersey	Limousin	Shorthorn	Simmental
Count	**127,547**	**43,445**	**7,080**	**766**	**14,095**	**4,377**	**3,340**	**107**	**14,421**	**307**	**2,537**
AM_662	**0.002%**	**-**	-	-	-	-	-	-	-	-	-
BLAD	**0.133%**	**0.398%**	-	-	-	-	0.689%	-	0.007%	-	-
BM	**0.020%**	**-**	-	-	-	-	-	-	-	-	-
BD1	**0.002%**	**-**	-	-	-	-	-	-	-	-	-
BY	**0.194%**	**1.706%**	-	-	-	-	4.521%	-	0.007%	-	-
CMD1	**0.234%**	**0.005%**	-	3.264%	0.021%	-	-	-	0.028%	-	-
CMD2	**0.092%**	**0.002%**	-	1.175%	-	-	-	-	-	-	-
CT	**0.063%**	**0.083%**	-	-	-	-	-	-	-	-	-
CTS_AG	**0.575%**	**0.037%**	0.014%	7.180%	0.021%	-	0.030%	-	0.007%	-	-
CVM	**0.407%**	**2.283%**	-	-	0.014%	-	3.683%	-	0.007%	-	0.039%
DUMPS	**0.001%**	**0.002%**	-	-	-	-	-	-	-	-	-
HH1	**0.171%**	**1.625%**	-	-	-	-	2.365%	-	-	-	-
HH3	**0.070%**	**4.923%**	-	-	-	-	4.760%	-	-	-	-
HH4	**0.007%**	**0.251%**	-	-	-	-	1.377%	-	-	-	-
HY_KRT71	**0.432%**	**0.009%**	-	-	-	3.907%	-	-	-	-	-
JH1	**0.001%**	**0.085%**	-	-	-	-	-	7.477%	-	-	-
MF_NG1621KC	**0.009%**	**0.129%**	-	-	-	-	0.030%	-	-	-	-
MH2	**0.035%**	**0.076%**	-	-	-	-	-	-	-	-	0.039%
NH	**0.006%**	**-**	0.099%	-	-	-	-	-	-	-	-
OS	**0.007%**	**-**	0.113%	-	-	-	-	-	-	-	-
PCS	**0.006%**	**-**	-	-	-	-	-	-	-	-	-
PROTO	**0.845%**	**0.002%**	-	-	0.007%	-	-	-	4.230%	-	-
PMT_211	**0.005%**	**-**	-	-	-	-	-	-	-	-	-
PMT_284	**0.005%**	**0.002%**	-	-	-	-	-	-	-	-	-
RNF11	**0.306%**	**-**	-	17.232%	0.007%	-	-	-	-	-	-
SMA	**0.005%**	**0.021%**	-	-	-	-	-	-	-	-	-
TH_Improver	**0.197%**	**-**	-	-	-	-	-	-	-	7.818%	-

Stock Sires Genetic Disease Surveillance (Breed is the bull’s Major Breed Composition)

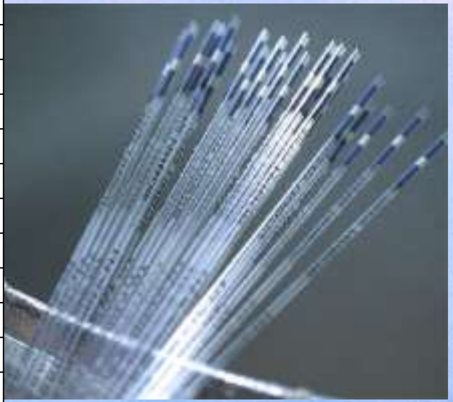
Stock Bull Genetic Disease Surveillance, DOB < 2013

Main_breed	Beef	Dairy	Angus	Belgian Blue	Charlois	Hereford	Holstein	Jersey	Limousin	Shorthorn	Simmental
# Stock Bull	22590	1213	1376	597	9485	670	993	17	8200	158	1182
AM_662	-	-	-	-	-	-	-	-	-	-	-
BLAD	0.02%	0.08%	-	-	-	-	0.20%	-	0.02%	-	-
BM	-	-	-	-	-	-	-	-	-	-	-
BD1	-	-	-	-	-	-	-	-	-	-	-
BY	0.18%	-	0.07%	-	0.01%	-	3.73%	-	-	-	-
CMD1	0.18%	-	-	4.86%	0.04%	-	-	-	0.09%	-	-
CMD2	0.07%	-	-	2.18%	-	-	0.10%	-	0.02%	-	-
CT	0.02%	-	-	0.17%	-	0.15%	0.20%	-	-	-	-
CTS_AG	0.34%	-	0.29%	10.05%	0.03%	-	0.10%	-	0.06%	-	0.08%
CVM	0.23%	-	0.07%	0.17%	0.04%	-	4.03%	-	0.04%	-	-
DUMPS	-	-	-	-	-	-	-	-	-	-	-
HH1	0.04%	-	-	-	-	-	0.70%	-	0.01%	-	-
HH3	0.10%	-	-	-	-	-	2.22%	-	-	-	-
HH4	0.01%	-	-	-	-	-	0.30%	-	-	-	-
HY_KRT71	0.15%	-	-	0.17%	0.03%	4.63%	-	-	-	-	-
JH1	-	-	-	-	-	-	-	-	-	-	-
MH2	0.01%	-	0.07%	-	-	-	-	-	-	-	-
NH	-	-	-	-	-	-	-	-	-	-	-
OS	0.00%	-	0.07%	-	-	-	-	-	-	-	-
PCS	0.01%	-	-	-	-	-	-	-	-	-	-
PROTO	1.83%	-	-	0.17%	0.01%	-	-	-	5.00%	-	0.08%
PMT_211	0.00%	-	-	-	-	-	-	-	-	-	-
PMT_284	0.00%	-	-	-	-	-	-	-	-	-	-
RNF11	0.41%	-	-	14.91%	0.01%	-	-	-	0.02%	-	-
SMA	0.01%	-	-	-	-	-	-	-	-	-	-
TH_IMPROVER	0.04%	-	0.07%	-	0.01%	-	-	-	-	3.80%	-

AI Sires Genetic Disease Surveillance:

Carrier Frequency in AI Sires by Breed

Breed	Beef	Dairy	Angus	Belgian Blue	Charlois	Hereford	Holstein	Jersey	Limousin	Shorthorn	Simmental
# AI Sires	349	89	30	29	85	25	81	3	64	19	42
AM_662	-	-	-	-	-	-	-	-	-	-	-
BLAD	-	-	-	-	-	-	-	-	-	-	-
BM	-	-	-	-	-	-	-	-	-	-	-
BD1	-	-	-	-	-	-	-	-	-	-	-
BY	0.57%	-	-	-	-	-	2.47%	-	-	-	-
CMD1	-	3.37%	-	10.34%	-	-	-	-	-	-	-
CMD2	-	-	-	-	-	-	-	-	-	-	-
CT	-	-	-	-	-	-	-	-	-	-	-
CTS_AG	0.86%	2.25%	-	17.24%	-	-	-	-	-	-	-
CVM	-	-	-	-	-	-	-	-	-	-	-
DUMPS	-	-	-	-	-	-	-	-	-	-	-
HH1	-	-	-	-	-	-	-	-	-	-	-
HH3	-	1.12%	-	-	-	-	1.23%	-	-	-	-
HH4	-	-	-	-	-	-	-	-	-	-	-
HY_KRT71	-	5.62%	-	-	-	16.00%	-	-	-	5.26%	-
JH1	0.57%	-	-	-	-	-	-	66.67%	-	-	-
MF_NG1621KC	-	-	-	-	-	-	-	-	-	-	-
MH2	-	-	-	-	-	-	-	-	-	-	-
NH	-	-	-	-	-	-	-	-	-	-	-
OS	-	-	-	-	-	-	-	-	-	-	-
PCS	-	1.12%	-	-	-	-	-	-	-	-	-
PROTO	-	2.25%	-	-	-	-	-	-	3.13%	-	-
PMT_211	-	-	-	-	-	-	-	-	-	-	-
PMT_284	-	-	-	-	-	-	-	-	-	-	-
RNF11	-	4.49%	-	13.79%	-	-	-	-	-	-	-
SMA	-	-	-	-	-	-	-	-	-	-	-
TH_IMPROVER	-	2.25%	-	-	-	-	-	-	-	10.53%	-



Interesting Notes

Many disease alleles are at a higher frequency

1) In commercial than the pedigree herd
2) In Stock than AI bulls

Some dairy unique diseases are in national beef herd due to crossbreds

Affect of Unidentified Carriers

Trait	#carrier AI sires	#carrier sires with genotyped offspring	#offspring genotyped	#carrier offspring
BY	2	1	14	7
CMD1	3	1	19	10
CTS_AG	5	3	27	13
HH3	1	1	38	21
HY_KRT71	4	3	63	27
Proto	2	2	74	40
RNF11	4	3	40	20
TH Improver	2	2	175	63

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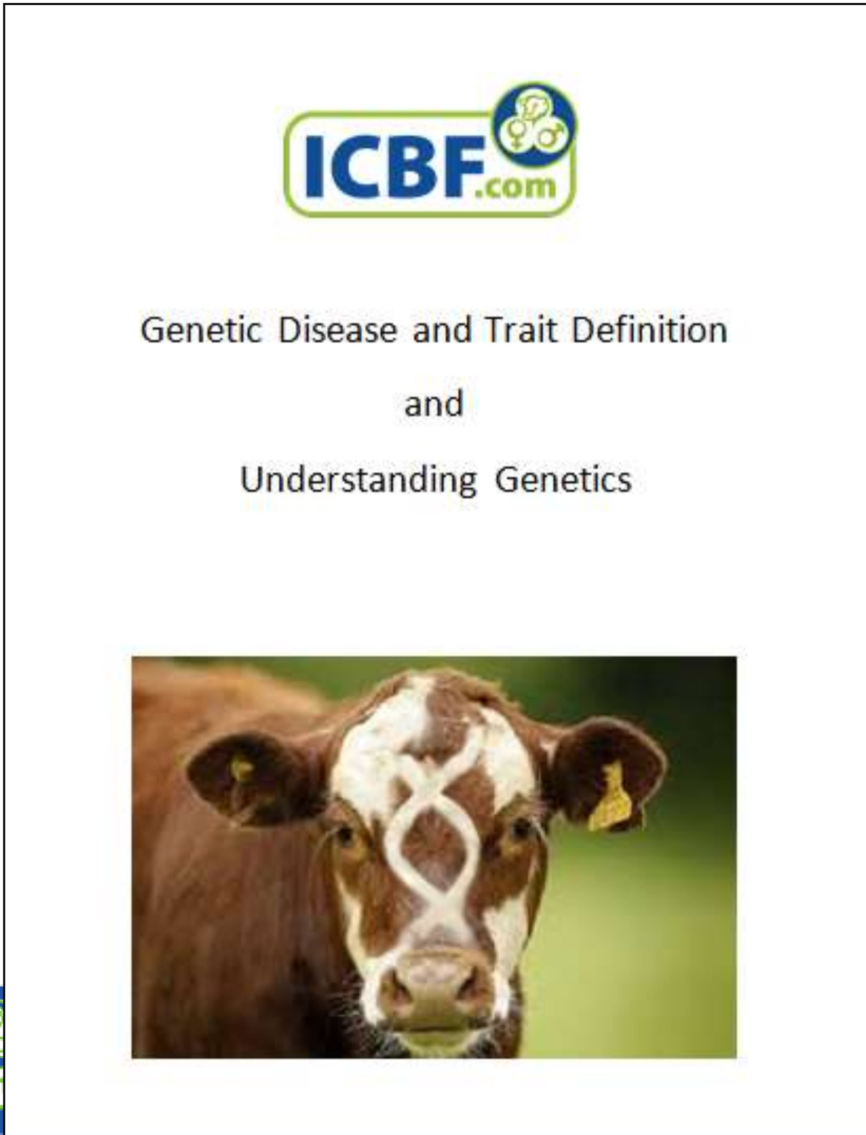
ICBF Current Plan

1) Information Booklet
2) Developing Disease Status Reports
3) Monitor Royalty Fee Traits
4) Track Disease Frequencies
5) Identify New Diseases



Disease/Trait Definition Booklets

Minimal Information

Alpha Mannosidosis

Abbreviations: AM 662, AM 967

Genetic Mode: Recessive

Royalty Fee: No

Trait Type: Lethal

Breeds found in: Angus (AM_961), Murray Grey (AM_961), Galloway (AM_662)

General: Affected calves are either aborted, born dead, die soon after birth, or die within the first year. Those born alive can show signs of ataxia, head tremor, aggression, and paralysis before death.

Common Ancestor: None identified

Available at
http://www.icbf.com/?page_id=2170

Extended Information

Alpha Mannosidosis

Abbreviations: AM 662, AM 967

Genetic Mode: Recessive

Royalty Fee: No

Trait Type: Lethal

Breeds found in: Angus (AM_961), Murray Grey (AM_961), Galloway (AM_662)

General: Affected calves are either aborted, born dead, die soon after birth, or die within the first year. Those born alive can show signs of ataxia, head tremor, aggression, and paralysis before death.

Common Ancestor:

Clinical: This lysosomal storage disease is caused by a build-up of mannose-rich compounds caused by deficiency of the alpha-mannosidase enzyme.

Gene: MAN2B1 (Mannosidase Alpha Class 2b Member 1)

Genetic: There are 2 mutations in MAN2B1 that cause this disease:

AM_662

Genetic: g.7:13956640G>A, c.662G>A, p.Arg221His

IDB probe: IDBv20700001524, IDBv20700001525, IDBv20700001526, IDBv20700001527, IDBv207000015248

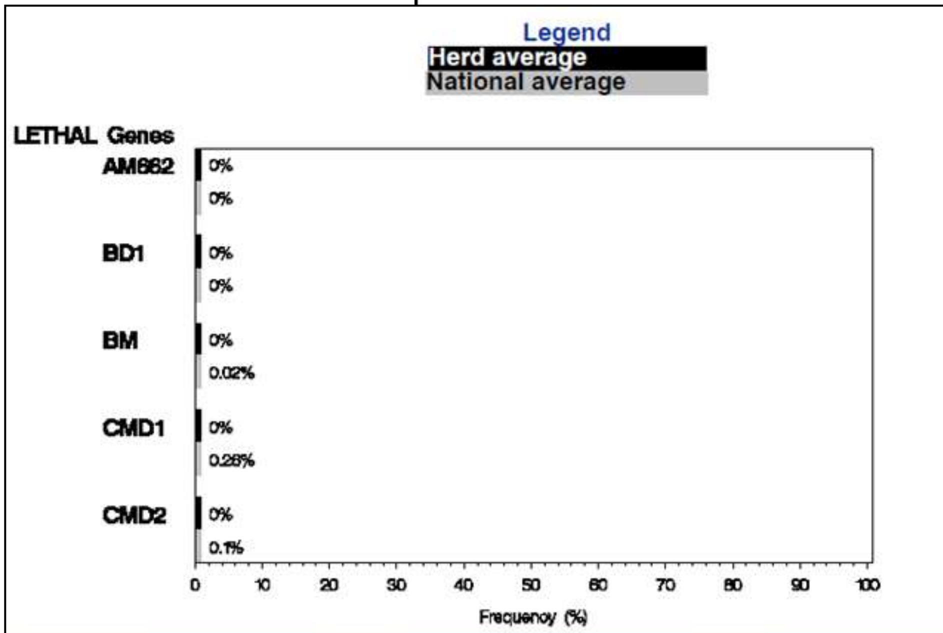
Flanking Sequence (AM_662):

CCGGTCCCTTATGCATCCTGCCCTCTCTTGTTCTCCCATCCCACTCGTCATCCCTCCCCATCTCCAGATGGGTTTTGA
CGGCTTCTTCTTTGGAC[G/A]CCTGGATTATCAAGACAAGAAGGTGCGGAAAAAGACGCTGCAGATGGAGCAGG
TGTGGCGGGCCAGCACCAGCCTGAAACCTCCCACTGCCGACC

AM_961

Genetic: g.7:13957949 , c.961T>C , p.Phe321Leu

ICBF: Genetic Disease/Trait Report Non-Royalty Traits



Oct

ajor Gene Repo

248
ajor genes: 139
ajor genes: 0

otype call rate of >9
rted

enes reported below

on the IDB chips ar
appendix A. All non Royalty Fee traits for each animal is listed in the farm report.
For traits that require a Royalty fee, please contact Weatherbys Ireland (045-875-521)

Table 1.1. Gene type: BENEFICIAL - Gene no 1: POLL_C

Type	Jumbo	Animal tag		Status
BEEF	1321	IE	321	Homozygote
BEEF	1476	IE	476	Carrier
BEEF	1477	IE	477	Carrier
BEEF	1520	IE	520	Carrier
BEEF	1522	IE	522	Carrier
BEEF	1523	IE	523	Carrier
BEEF	1538	IE	538	Carrier
BEEF	1540	IE	540	Homozygote
BEEF	1561	IE	561	Carrier
BEEF	1564	IE	564	Carrier
BEEF	1565	IE	565	Carrier
BEEF	1566	IE	566	Carrier
BEEF	1567	IE	567	Carrier

Summary for PEDIGREE BEEF animals

Jumbo	Animal tag	Lethal	Unwanted	Beneficial	Meat	Milk	Colour	No Test
LM581	IE: 31	.	.	POLL_C	CAPN1_316 CAPN1_4751 CAST_282 CAST_2959		.	
LM582	IE: 32	.	.	POLL_C	CAPN1_316 CAST_282 CAST_2870 CAST_2959		.	
LM584	IE: 34	.	.	POLL_C	CAPN1_316 CAPN1_4751 CAST_282 CAST_2959		.	
LM590	IE: 90	.	.	POLL_C	CAPN1_316 CAPN1_4751 CAST_282 CAST_2959		.	
LM593	IE: 93	.	.		CAPN1_316 CAPN1_4751 CAST_282 CAST_2959	DGAT1	.	
LM594	IE: 94	.	.	POLL_C	CAST_282 CAST_2959		.	

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Future Steps

- Reporting of carrier status
  1) On paid royalty fee traits
  2) Replacement stock for sale
  3) AI bulls—example bull search

- Work with industry to determine best standard for royalty fee traits

- Integration into ICBF sire advice

- Educate farmers on how to manage carrier animals

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Genetic Disease Commercial Farmer Reporting to ICBF

Genetic Disease Commercial Farmer Reporting to ICBF

Congenital defect recording

Congenital defect reporting questionnaire

Thank you for participating in this programme. We hope that through data collection such as this we will be able to identify animals that carry various congenital defects and eradicate the defects that reduce farmer profitability. After the 8 mandatory questions (denoted by a *) in the beginning and 3 at the end, feel free skip any questions that do not apply to the animal you're reporting. If you have any questions about this survey please e-mail Health@ICBF.com Thank you again for your participation!

*** 1. Are you the animal's owner?**

- ○ Yes
- ○ No

If no, what is your role with the calf (Veterinarian, farm worker, knackery, etc)?

*** 2. What is your herd number?**

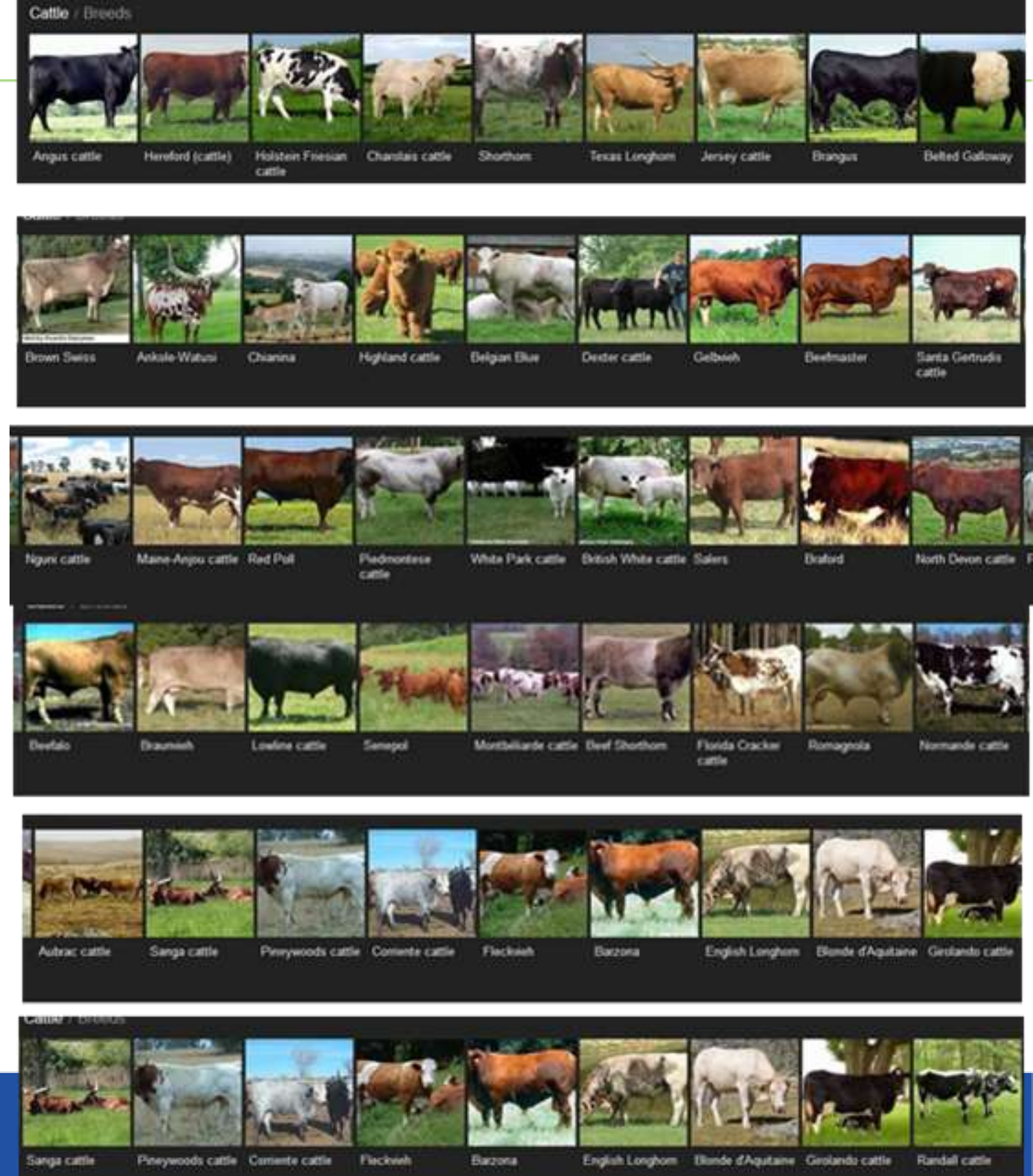
*** 3. What is the dam's tag number?**

Genetic Disease Discovery Collaborations

Farmer and Vet Reported Diseases

- Atresia Ani
- Atresia Jejuni
- Atresia Coli
- Progressive Ataxia
- Ventricular Septal Defect
- Schistosomus Reflexus
- Cleft Palate/Nostril
- Tail-lessness
- Photosensitisation

Thank You


Cattle / Breeds
Angus cattle
Hereford (cattle)
Holstein Friesian cattle
Charolais cattle
Shorthorn
Texas Longhorn
Jersey cattle
Brangus
Belted Galloway
Brown Swiss
Ankole-Watusi
Chianina
Highland cattle
Belgian Blue
Dexter cattle
Gelbvieh
Beefmaster
Santa Gertrudis cattle
Nguni cattle
Maine-Anjou cattle
Red Poll
Piedmontese cattle
White Park cattle
British White cattle
Salers
Braford
North Devon cattle
Beefalo
Braunvieh
Lowline cattle
Senepol
Montbéliarde cattle
Beef Shorthorn
Florida Cracker cattle
Romagnola
Normande cattle
Aubrac cattle
Sanga cattle
Pineywoods cattle
Corriente cattle
Fleckvieh
Barzona
English Longhorn
Blonde d'Aquitaine
Girolando cattle
Randall cattle

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IRISH CATTLE BREEDING FEDERATION

BDGP Update.

Department of Agriculture, Food and the Marine

An Roinn Talmhaíochta, Bia agus Mara

Update.

- Tag & data returns.
  - 19k from 26k with data returned (90% tissues & 60% surveys). Payments starting ~15 Dec. Regular payments thereafter.
- Next BDGP reports, including €uro-Star evaluations and genotype data. Planning for Spring 2016.
  - Eligible/ineligible animals. Meeting with DAFM.
- BDGP Training.
  - Teagasc to undertake. Commencing Spring 2016.
- Genotype tags.
  - Planning for Spring 2016. Plan for dual tag from 2017.
- Pedigree/ancestry errors.
  - Process being developed with DAFM & herdbooks. Pats talk!

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IRISH CATTLE BREEDING FEDERATION

Pedigree Data Recording Analysis.

NDP
National Development Plan
Transforming Ireland

Backround

- The aim of this analysis was to get an understanding of the levels of data recording that is taking place in Irish beef pedigree herds.

- Beef pedigree bulls **born in 2013** are being used as the ‘dataset’ to see how much data has been recorded on them by **May 2015**.

Backround

- The main traits that are being looked at for this analysis are the following:
- Calving Difficulty
- Birth Weights
- Cow Service Dates
- Linear Scoring
- Weight Recording

Overview

Beef Pedigree Bulls - Data Recording analysis

(Bulls born in 2013 - data analysed May 2015)

Breed	Bulls born in 2013	Calving Survey						Birth weights	Cow Service Dates	Linear Scored	Weighed	Calving Survey & a Weight Recorded on them by May 2015		Dead by May 2015	
		None	Data	1	2	3	4					Numbers	%	Numbers	%
Angus	3082	599	2483	2294	166	14	9	168	446	363	515	450	15%	273	9%
Aubrac	121	12	109	97	10	1	1	15	25	26	40	36	30%	45	37%
Blonde	177	36	141	228	27	6	1	6	25	19	48	45	25%	39	22%
Blue	240	129	111	29	28	6	48	3	36	141	123	48	20%	20	8%
Charolais	4340	479	3861	2871	726	104	160	96	741	1409	1572	1355	31%	1125	26%
Hereford	1625	154	1471	1233	190	24	24	160	564	209	312	286	18%	154	9%
Limousin	4163	413	3750	3226	422	47	55	138	1025	1611	1797	1601	38%	931	22%
Piedmontese	86	9	77	60	13	1	3	7	1	6	9	9	10%	43	50%
Parthenaise	187	31	156	123	23	4	6	16	20	47	71	58	31%	41	22%
Saler	296	18	278	266	8	2	2	27	106	32	72	66	22%	85	29%
Shorthorn	283	31	252	210	33	7	2	21	42	20	48	44	16%	62	22%
Simmental	1052	128	924	731	151	13	29	75	234	381	444	393	37%	381	36%
Total	15652	2039	13613	11368	1797	229	340	732	3265	4264	5051	4391	28%	3199	20%
	%	13%		84%	13%	2%	3%	5%	21%	27%	32%				

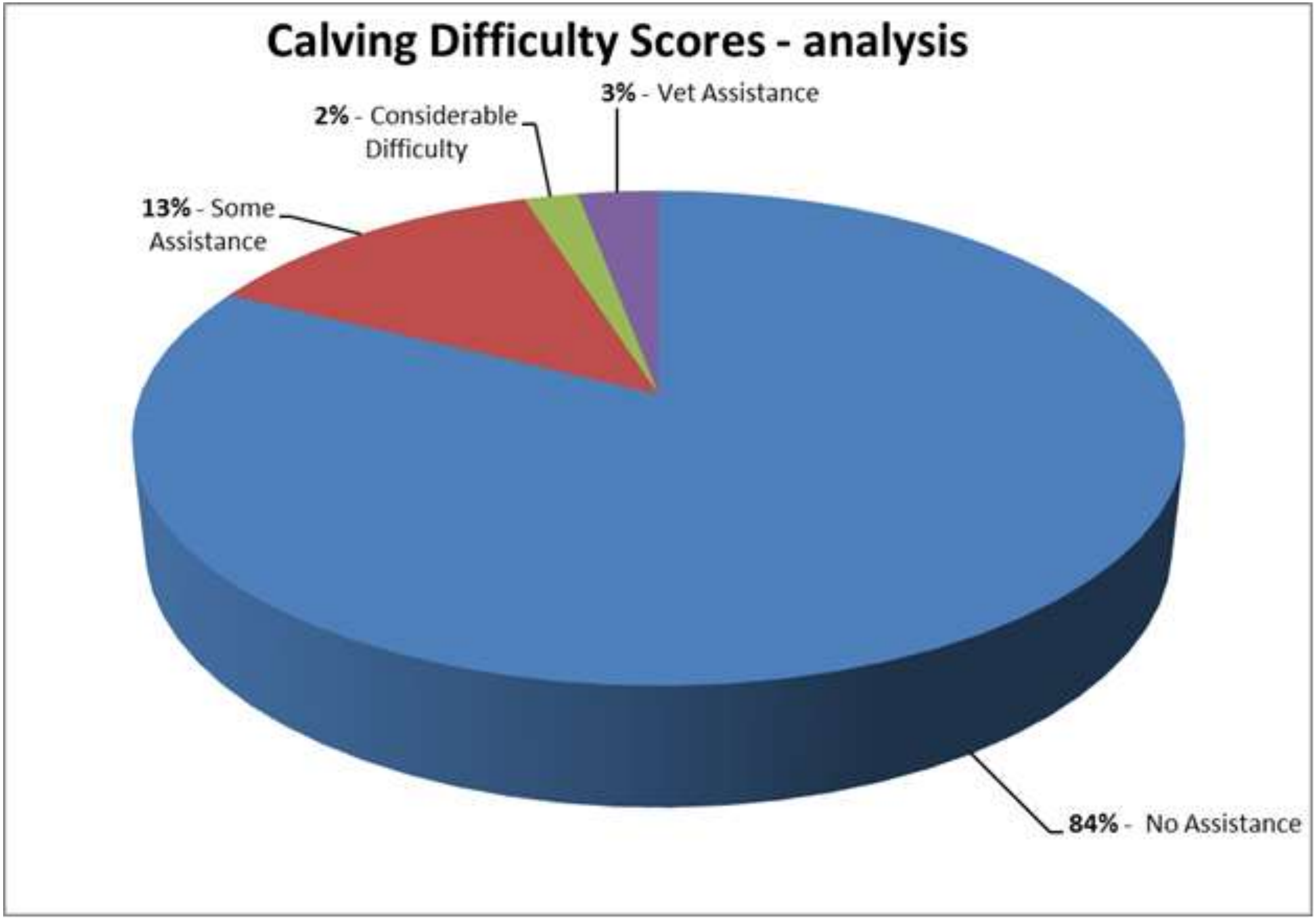
Overview

- **15,652** beef pedigree bulls were born across 12 beef breeds in Ireland in 2013.

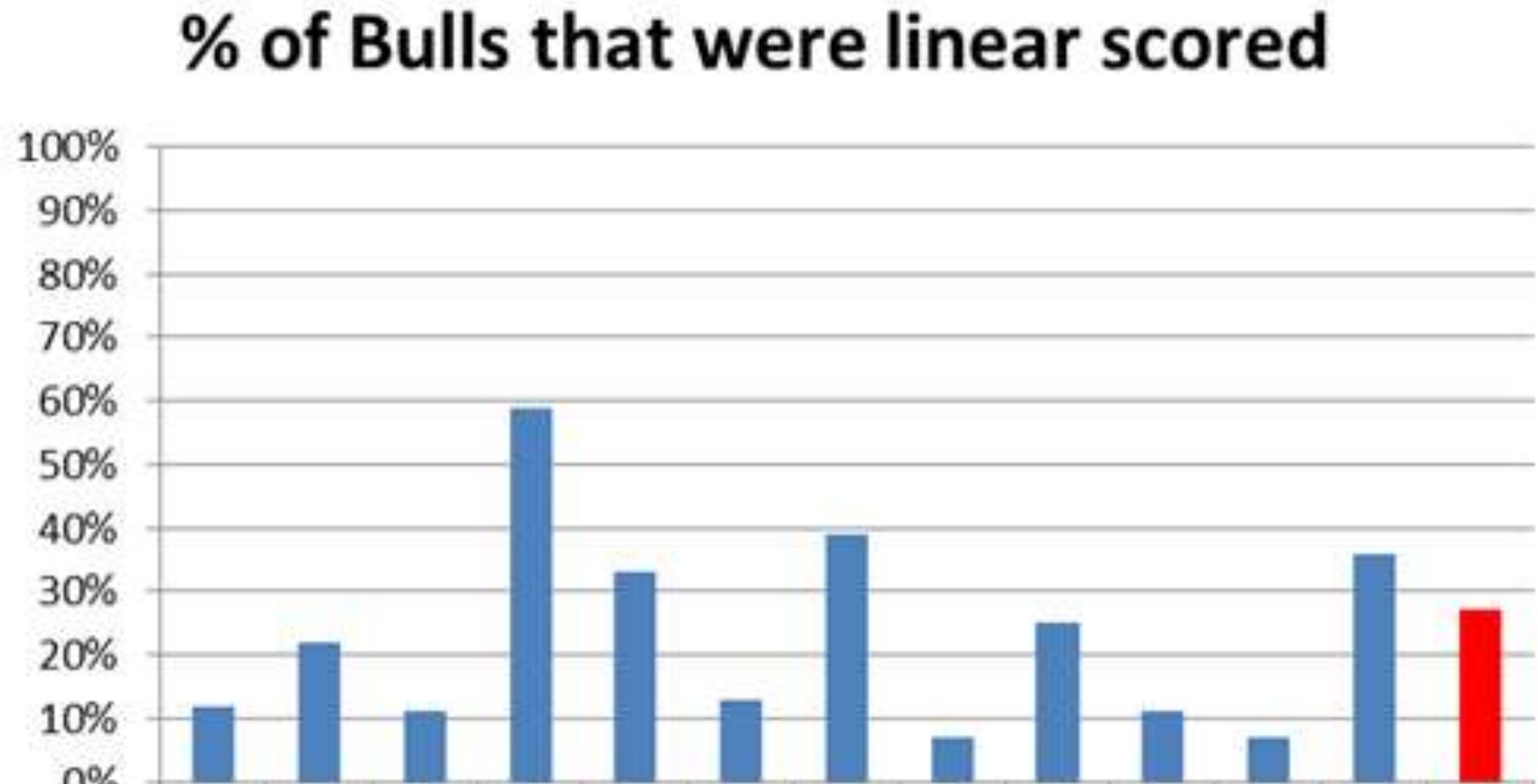
- On average, **28%** of them (**4391 bulls**), had a calving survey at birth and a liveweight recorded on them as a young bull, by May 2015. (Min:10%, Max:38%).

- On average, **20%** of them (**3199 bulls**), were dead by May 2015. (Min:8%, Max:50%)

Calving Survey

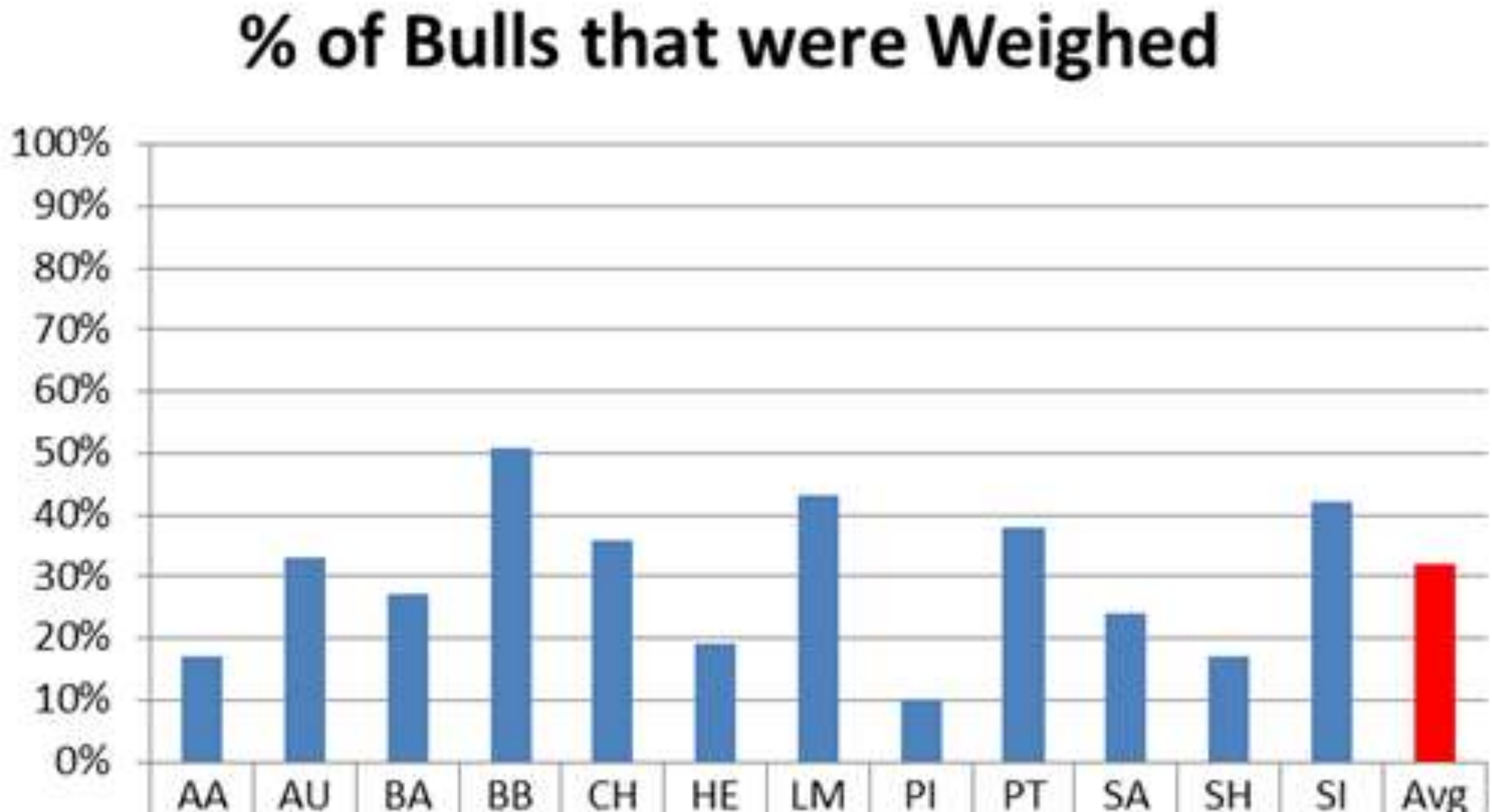


Linear Scored



	AA	AU	BA	BB	CH	HE	LM	PI	PT	SA	SH	SI	Avg
Series1	12%	22%	11%	59%	33%	13%	39%	7%	25%	11%	7%	36%	27%

Weighed

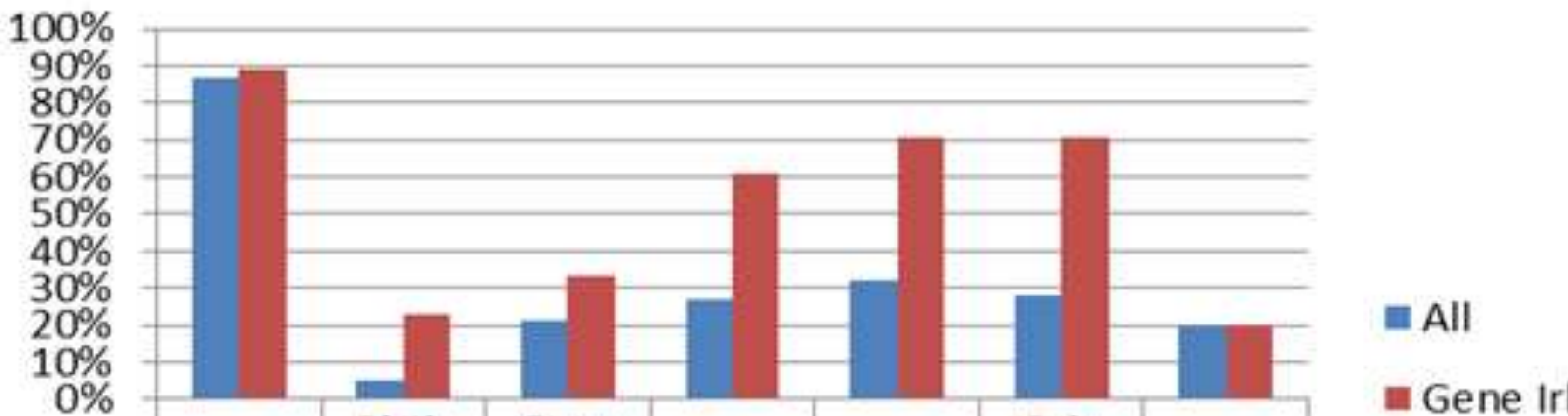


	AA	AU	BA	BB	CH	HE	LM	PI	PT	SA	SH	SI	Avg
Series1	17%	33%	27%	51%	36%	19%	43%	10%	38%	24%	17%	42%	32%

Gene Ireland

Data Recording Comparison -

All Ped Herds v Gene Ireland Herds



	Calving Survey	Birth weights	Dam Service Dates	Linear Scored	Weighed	Calv Surv & Weight	Dead
All	87%	5%	21%	27%	32%	28%	20%
Gene Irl	89%	23%	33%	61%	71%	71%	20%

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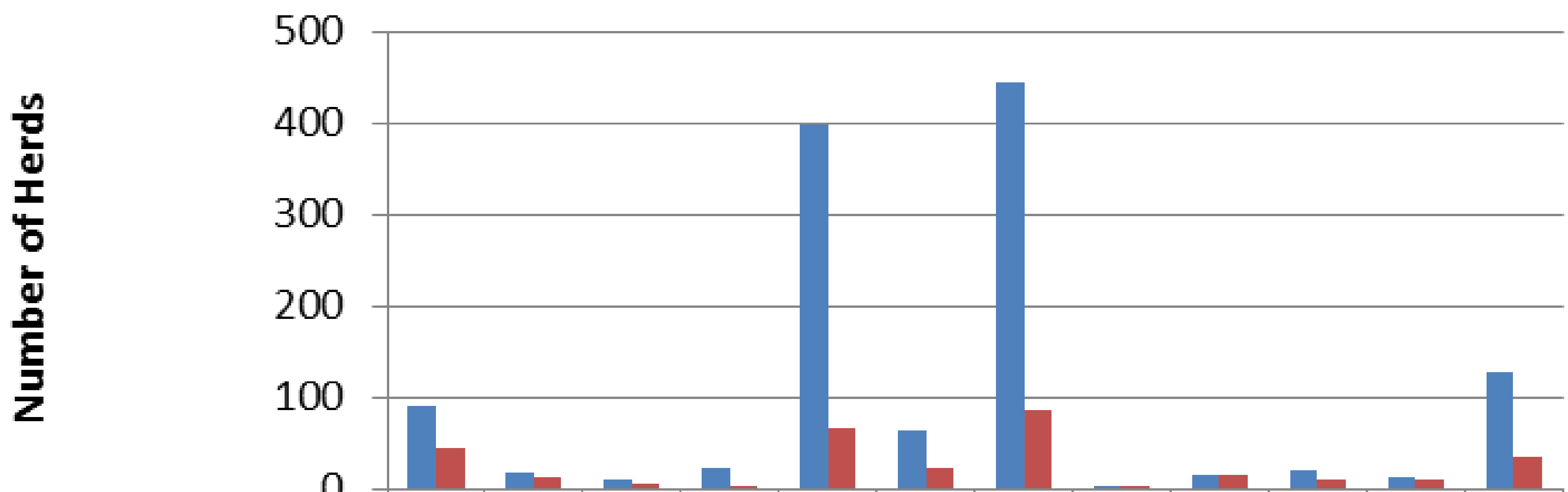
GI Herds v Other Ped Data Rec. Herds



	AA	AU	BA	BB	CH	HE	LM	PI	PT	SA	SH	SI
Calv Surv & Weigh	91	17	11	24	399	64	446	3	15	20	13	128
€250 GI	44	14	6	4	66	24	87	4	15	12	12	35

Summary

- Only 28% of young pedigree bulls have a calving survey & weight recorded on them.
- Data Recording in the 300 Pedigree Herds (€250/yr) is on average higher than in herds outside Gene Ireland.
- However, there is another 1000 herds that are outside Gene Ireland but which are recording a similar level of data.
- 'Entry Point' for Gene Ireland to be included in Gene Ireland review.