



IRISH CATTLE BREEDING FEDERATION

ICBF Dairy & Beef Industry Meeting.

1st August 2013.

Dairy Only. 9.30-10.30 AM

- Economic Values in EBI - Laurence Shalloo. 9.50 – 10.10.
- Improvements in dairy genetic evaluations - Andrew Cromie. 9.30 – 9.50.
- Next Generation Dairy Herd - Sinead McParland. 10.10 – 10.30.
-

Dairy & Beef. 10.45-1.00 PM

- Calving evaluations - Ross Evan. 10.45 – 11.30.
- Sexed semen update - Ian Hutchinson. 11.30 – 11.45.
- Genetics of Health & Disease - Donagh Berry. 11.45 – 12.00.
- New projects ((i) health & disease, (ii) genomics, (iii) male fertility & (iv) meat eating quality) - Andrew Cromie. 12.00 – 12.15.
- Development of IDB19k chip - Mike Mullen & Matt McClure 12.15-12.30.
- Genomics for parentage verification - Karl O'Connell. 12.30 – 1 PM.

Beef Only. 2.00-4.00 PM

- Validation of indexes – Norin McHugh. 2.00 – 2.30.
- Interbeef & international genetic evaluations – Thierry Pabiou. 2.30 – 3.00.
- GEN€ IRELAND Update, including Tully progeny test. – Stephen Conroy.

EBI Economic value update

Economic Value updates - Review

- 2007
 - Move to land limiting situation
 - All additional feed bought into the system @ €176/tonneDM
 - Ratio of protein to fat going from 2:1 to 2.7:1
 - Update on replacement heifer costs
- 2009
 - Maintenance sub index
 - Beef Sub index
 - Milk Price
 - Costs

Background

- Last economic value update – 2009
- What has happened since
 - Milk price 2009 -23cpl
 - Milk price 2010 – 28cpl
 - Milk price 2011 – 34cpl
 - Milk price 2012 – 28cpl
 - Milk Price 2013 - ~36cpl
- Cost change
- Long term price projections????

Industry Developments since 2009

- A+B-C – Over 95% of all milk being paid for using this system
- Seasonal milk payment
 - Dairygold
 - Glanbia
 - Carbery
 - Future???
- Processing capacity

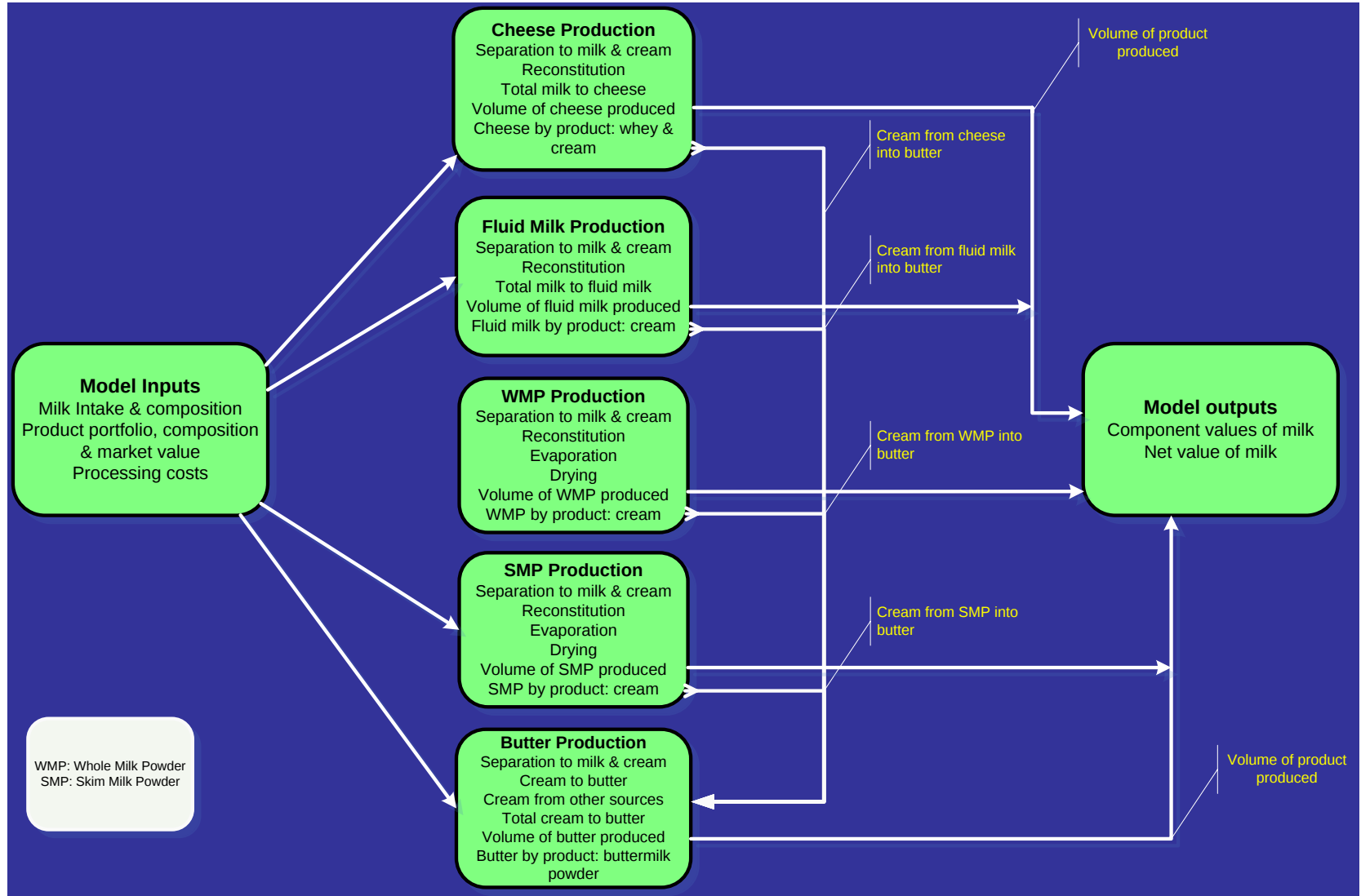
Model Developments since 2009

Milk Processing Sector Model (MPSM)

Processing sector model

- The processing sector model is a simulation model
- It is built with both an annual and a monthly time step model and can incorporate seasonal effects into the analysis
- The model is developed in Microsoft Excel and is solved using Visual Basic
- It is a mass balance model, accounting for all inputs and outputs

Processing sector model schematic



Proposal

- Update all costs in the model
- Use the MPSM to develop the component values of milk
- Integrate the seasonal outputs from the MPSM
- Any other suggestions?

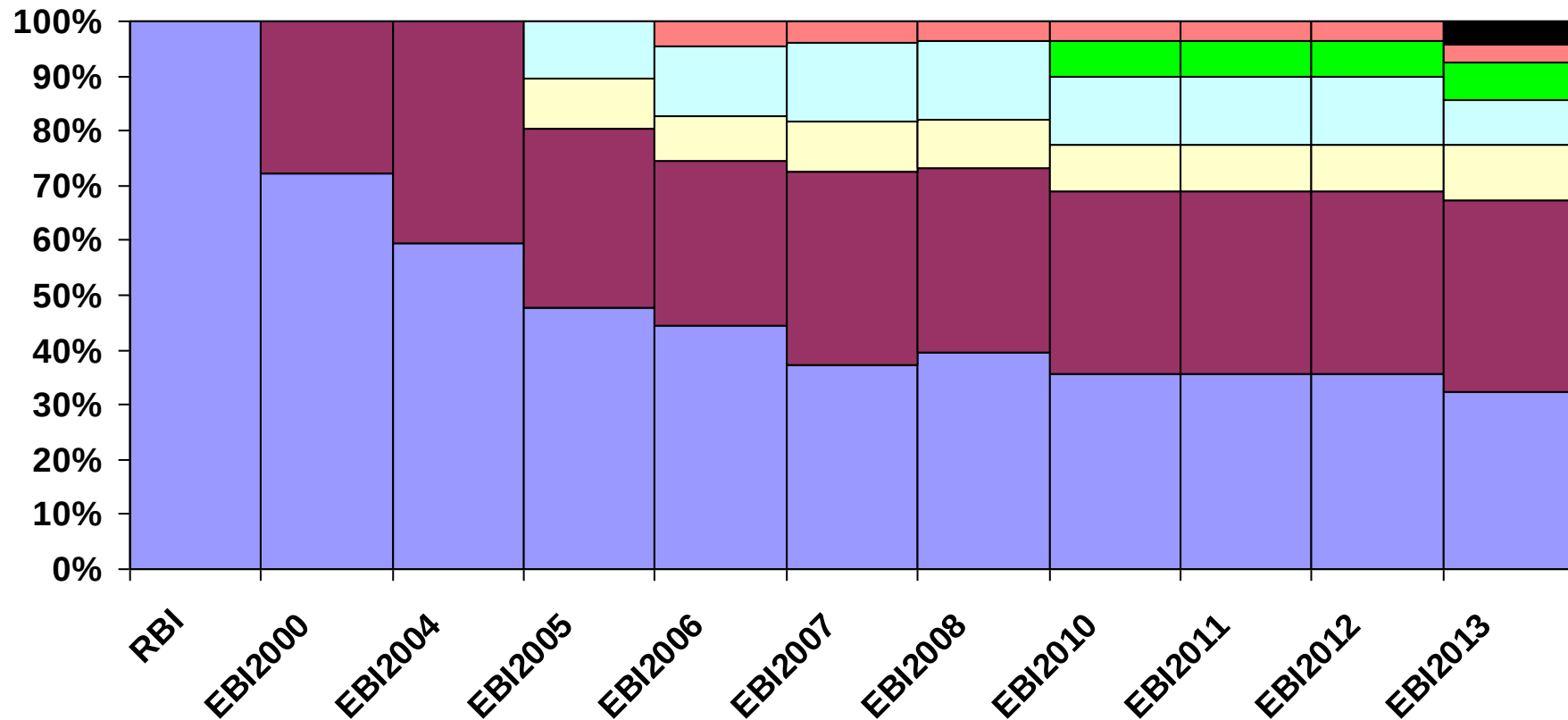


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Improvements to Dairy Genetic Evaluations.

Andrew Cromie

The EBI



 Milk

 Fertility

 Calving

 Beef

 Maintenance

 Health

 Management

Priority work.

- Test-day models.
- Mastitis & lameness evaluations.
- Review of genetic base.

Test Day model – Current.

- Moving from current 305d model to test day model for Milk/Fat/Prot
- Method of choice in most national evaluations
- Additional benefits - extra data (e.g. persistency, herd effects)
- Better account of effects on specific herd tests
- Passed Interbull test run Jan 2013 (HOL)

TDM - Latest work.

- Testing improvements to model
 - inclusion of later lactation (above parity 5)
 - inclusion of milk tests after 305 dim
- Estimation of parameters for HV (Heterogeneous Variance) correction
- Examination of relevant Persistency measure – important to not have persistency highly correlated with milk
- Interbull test run Sep 2013 – improved model (HOL + other breeds)

TDM - Where next?

- Test proofs in Autumn (Oct/Nov)
- Test proofs for persistency (Oct/Nov)
- Decision on how to combine parities 1/2/3+ into single trait for publication
- Expectation (what other countries have seen) 305d proofs compared to test day proofs
 - Proven Bull correlations ~ 0.99 , Young bulls correlations ~ 0.95 & Cows ~ 0.85 ,
- There will be changes in cow rankings, but much less in bull rankings



DEP Health Notification Form

DEP 4



1234567100166

Herd owner: JOHN SMITH

Herd no: IE1234567

Print date: 15-Sep-2011

Listed below are cows currently in your herd or
cows which calved since 01-Jan-2011

Every animal listed below
should be given a milking
temperament score

Circle mastitis or lameness
events only where they have occurred

Cow Jumbo	Tag Number	Last Calving Date	Lact. No.	Milking Temperament Score VG = Very Good G = Good A = Average P = Poor VP = Very Poor (circle relevant)	Mastitis 1 = 1 case 2 = 2+ cases (circle relevant)	Lameness 1 = 1 case 2 = 2+ cases (circle relevant)
2-1	IE123456790182	17/02/2011	9	VG G A P VP	1 2	1 2
6-1	IE123456750162	10/04/2011	8	VG G A P VP	1 2	1 2
9-1	IE123456770180	10/05/2010	7	VG G A P VP	1 2	1 2
255	IE123456770255	16/01/2011	7	VG G A P VP	1 2	1 2
256	IE123456780256	22/04/2011	7	VG G A P VP	1 2	1 2
259	IE123456720259	10/02/2011	6	VG G A P VP	1 2	1 2
265	IE123456790265	20/03/2011	6	VG G A P VP	1 2	1 2
275	IE123456720275	12/05/2011	7	VG G A P VP	1 2	1 2

Mastitis & Lameness.

h2/rg	milk	scs	mast	lame
milk	48%			
scs	-0.18	20%		
mast	0.22	0.71	2%	
lame	0.15	0.19	0.68	4%

- Based on data from DEP.
- High correlation between MA & LM.

Mastitis & Lameness (ii)

- Future approach
 - MA (event) + MA (DEP data) + predictors (milk yield, SCS - average, peak....), linear type.....
 - Heritability = ?, rg =
- Same approach for LM.
- Combine into single evaluation.
- Other health & disease traits.
 - Update from Donagh Berry.

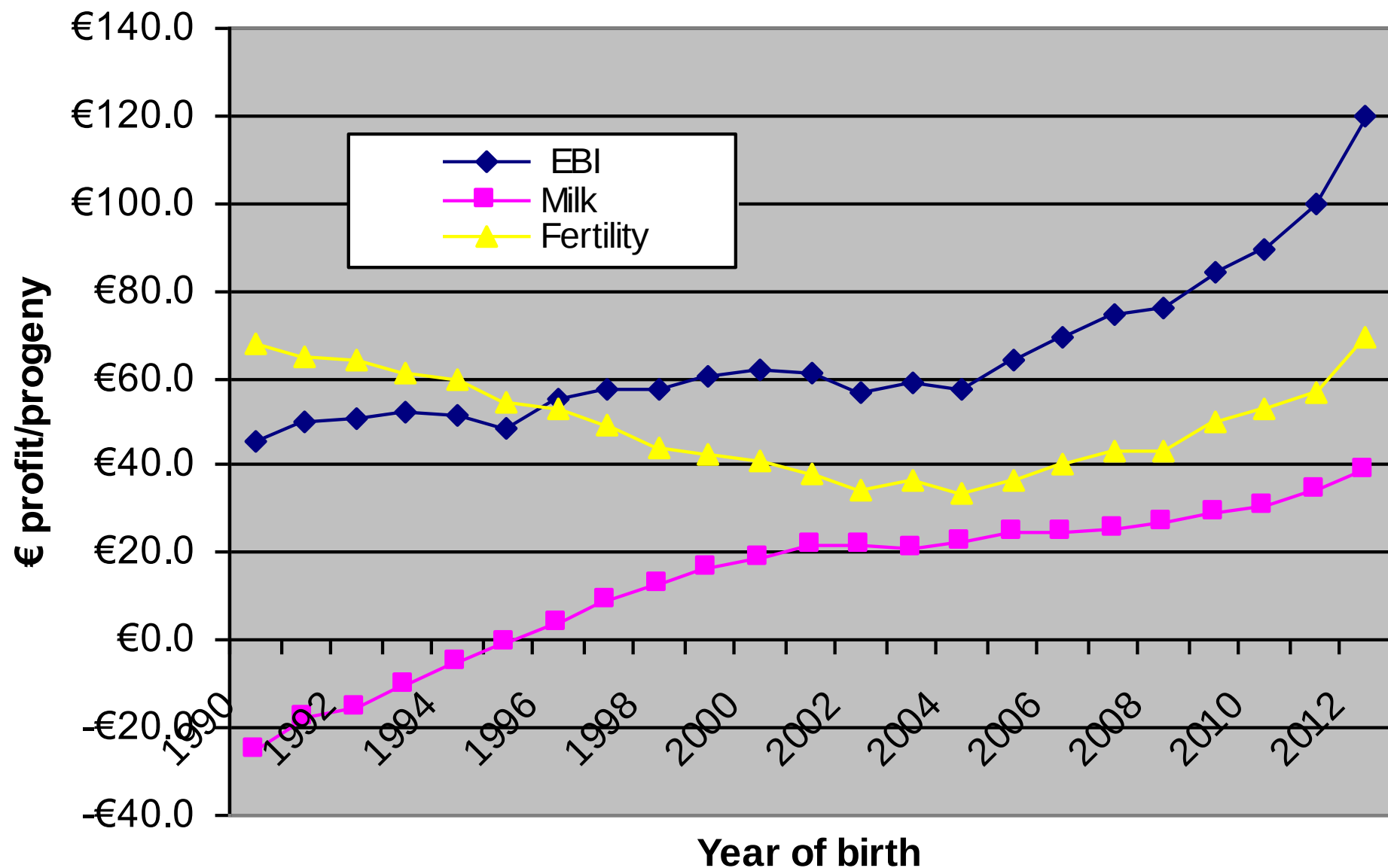
Where next?

- Estimate genetic parameters.
- Review economic values.
- Generate test proofs.
- Major initiative to promote event driven on-farm recording of health & disease events.
 - Next version of DEP.

Genetic Base – Current.

- Milk base. Cows born in 1995 and milking in 2000 (heifer equivalent).
 - 5,192 milk, 196 fat & 171 protein.
- Fertility base. Progeny from sires born between 1988 – 1992.
 - 402 CI days & 83% Survival.
- New milk evaluations. Opportunity to review and up date genetic base.
 - Account for genetic gain.

Genetic Trends in EBI, Milk & Fertility Sub-Index



Genetic Base – Future.

- Key requirements;
 - Stable – large reference point.
 - Same group of base animals for milk and fertility.
 - More reflective of current population.
- Expect average EBI to drop.
 - Drop larger for fertility sub-index.
- Update at next industry meeting.

Next Generation Herd

Update
July 2013

Next Generation Herd - Objective

Genetically elite and diverse research herd

1. Breeding cows compatible to Irish grass based production system
2. To facilitate the monitoring of difficult to measure traits
 - Cow health, greenhouse gas emissions, intake
 - Deleterious consequences of genetic selection?
3. To enhance the development of the EBI
 - Identify new traits

Genetic Potential

	Elite (n=90)	Average (n=45)
EBI	234	116
Milk SI	57	38
Fert SI	138	59
Calving SI	35	28
Beef SI	-12	-9
Maint SI	13	4
Health SI	0	0
Manage SI	2	0

Experimental Groups

- Heifers across 3 experimental groups
 - Low grass allowance, High Concentrate & control

Feeding Treatments	Control	LGA	HC
Target Post-Grazing Residual (cm)	4.5	3.5	4.5
Annual Concentrates (kg)	300	300	1200

Milk production to date . . .

	National Avg			Elite		
Up to 23/06/2013	CON (15)	LGA (15)	HC (15)	CON (30)	LGA (30)	HC (30)
Milk yield	2755	2525	2817	2657	2609	2722
Fat (%)	3.91	4.04	3.96	4.16	4.36	4.13
Protein (%)	3.34	3.27	3.29	3.42	3.41	3.45
Milk solids	184	200	204	201	203	206
Cumulative MS yield	196 (kg/cow)			203 (kg/cow)		

Fertility to date . . .

	Average	Elite
24 d submission rate (%)	82	89
Conception to first service (%)	48	65
54 d in-calf rate (%)	62	79

Linear Classification Scores

Health Events

- No effect of group on lameness
- Mastitis events

	Average	Elite
Animals with mastitis	17%	18%
>1 mastitis event	6%	4%

Conclusion

- To date . . .
- Higher genetic potential animals (+€118 EBI)
 - Higher milk solids
 - Better fertility
 - Poorer conformation
 - Similar health events



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Calving evaluations



Background

- Current calving evaluation is across breed utilising data from dairy and beef herds
- A single direct calving difficulty pta is produced
- Is there evidence to suggest that there needs to be separate dairy herd and suckler herd calving difficulty ptas?

Profile by breed

Type of herd	Number of calvings	Breed	% of calvings which are heifers	% with score of 1 (unassisted)	% with score of 2 (some assistance)	% with score of 3 (considerable difficulty)	% with score of 4 (vet)
dairy herd	377952	AA	45.4%	79.2%	16.8%	2.7%	1.3%
beef herd	289302	AA	31.1%	89.4%	8.3%	1.4%	0.8%
dairy herd	108261	BB	4.1%	66.9%	25.6%	5.5%	2.0%
beef herd	230234	BB	8.7%	72.7%	19.6%	4.4%	3.3%
dairy herd	119605	CH	9.0%	74.2%	20.6%	3.8%	1.3%
beef herd	1535470	CH	9.1%	79.3%	16.3%	3.0%	1.4%
dairy herd	208533	HE	18.3%	74.5%	21.0%	3.2%	1.3%
beef herd	128187	HE	20.3%	85.7%	11.7%	1.6%	1.0%
dairy herd	214815	LM	18.9%	77.0%	18.6%	3.1%	1.2%
beef herd	1327061	LM	21.7%	83.7%	13.0%	2.3%	1.1%
dairy herd	54542	SI	9.8%	71.6%	23.1%	3.8%	1.5%
beef herd	233966	SI	16.0%	82.9%	13.6%	2.2%	1.3%

Initial research

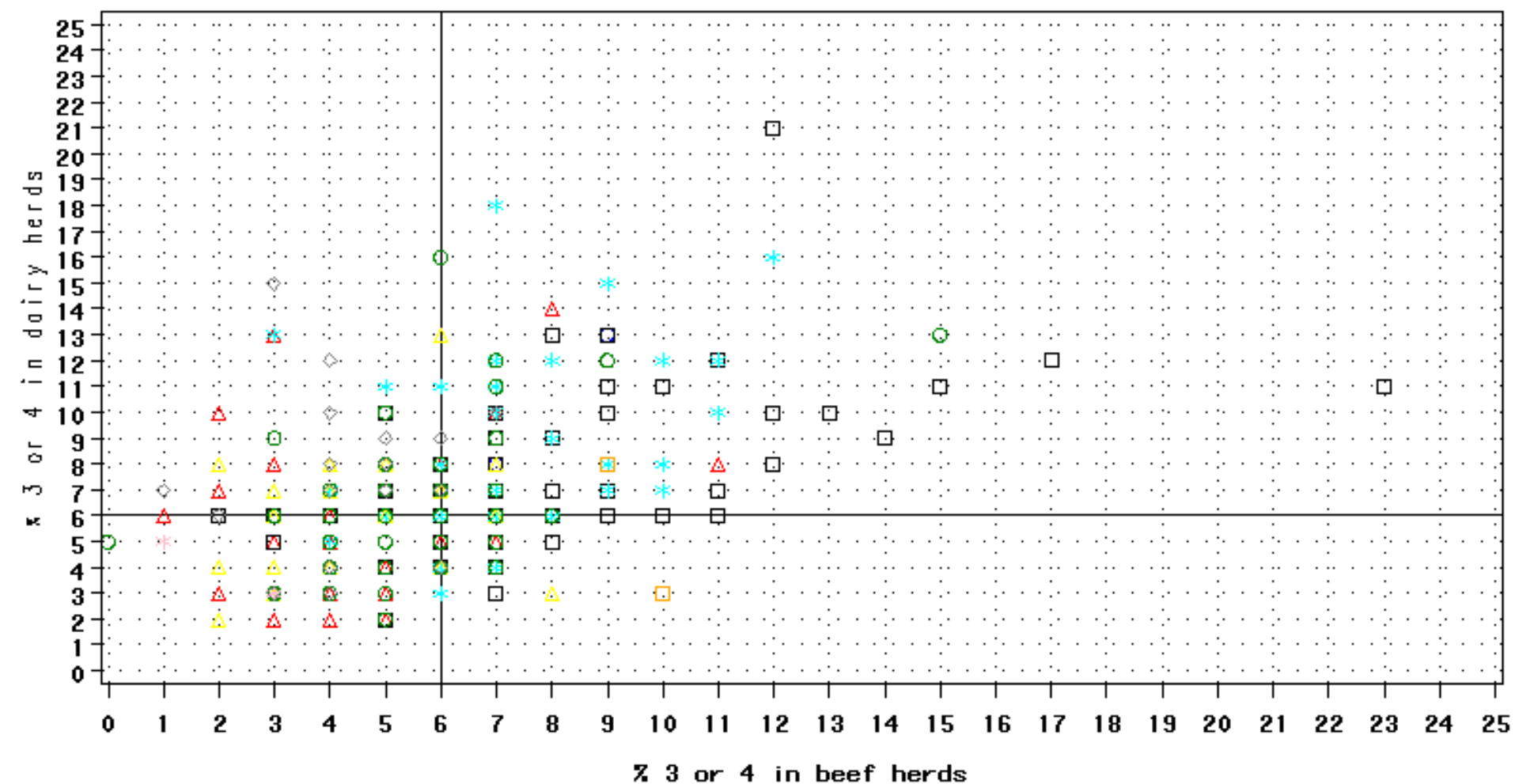
- Run separate dairy herd only and beef herd only evaluations
- Dairy herd evaluation: 4,029,063 of which 29% is by beef sires
- Beef herd evaluation: 3,988,296
- Both evaluations included predictor traits (weights, carcass) and foreign ebvs

AI sires > 70% rel, min 50 recs both: dairy difficulty v beef difficulty

Count 278 correlation $r = 0.5$

Dairy eval mean = 7 {stdev = 3.1}

Beef eval mean = 6 {stdev = 2.8}



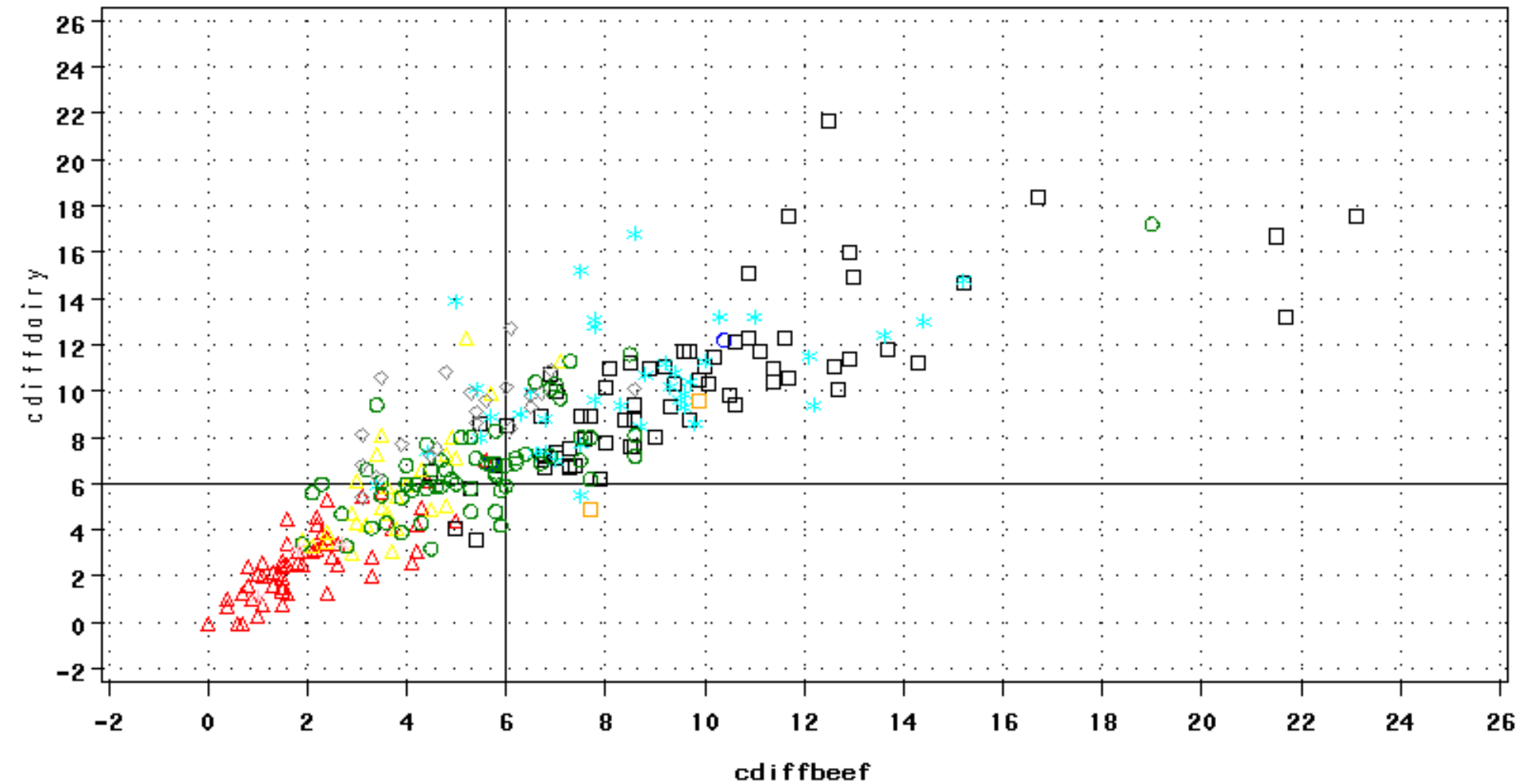
△ △ △ AA	○ ○ ○ BA	□ □ □ BB	* * * CH	△ △ △ HE
○ ○ ○ LM	□ □ □ PT	* * * SA	◇ ◇ ◇ SI	

AI sires > 70% rel, min 50 recs both: pta dairy v pta beef

Count 278 correlation $r = 0.84$

Dairy eval mean = 7 {stdev = 3.8}

Beef eval mean = 6 {stdev = 3.8}



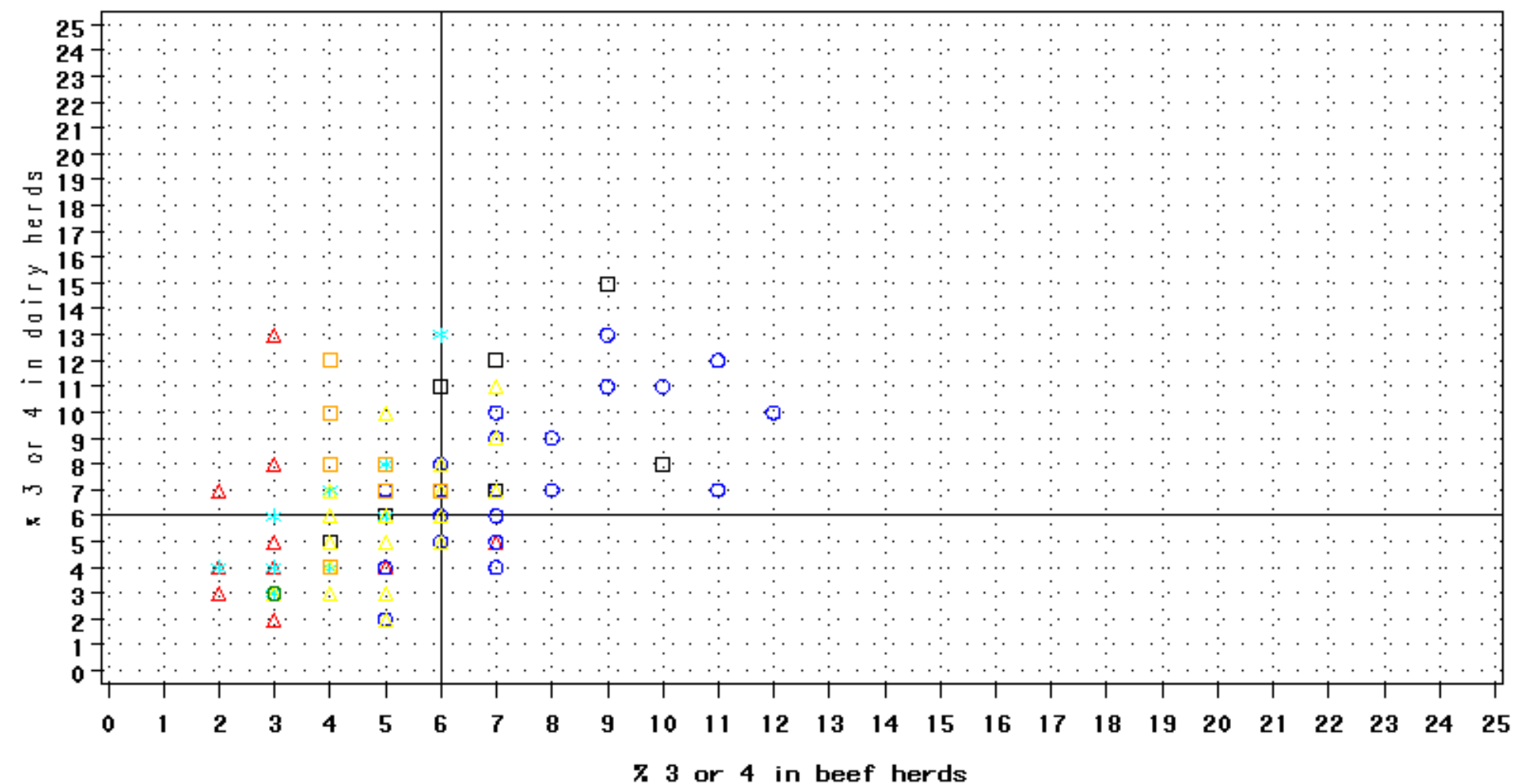
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○ ○ ○ LM	□ □ □ PT	* * * SA	◇ ◇ ◇ SI	

AI sires > 90% rel, min 100 recs both: dairy difficulty v beef difficulty

Count 118 correlation $r = 0.6$

Dairy eval mean = 6 {stdev = 2.7}

Beef eval mean = 5 {stdev = 2.1}



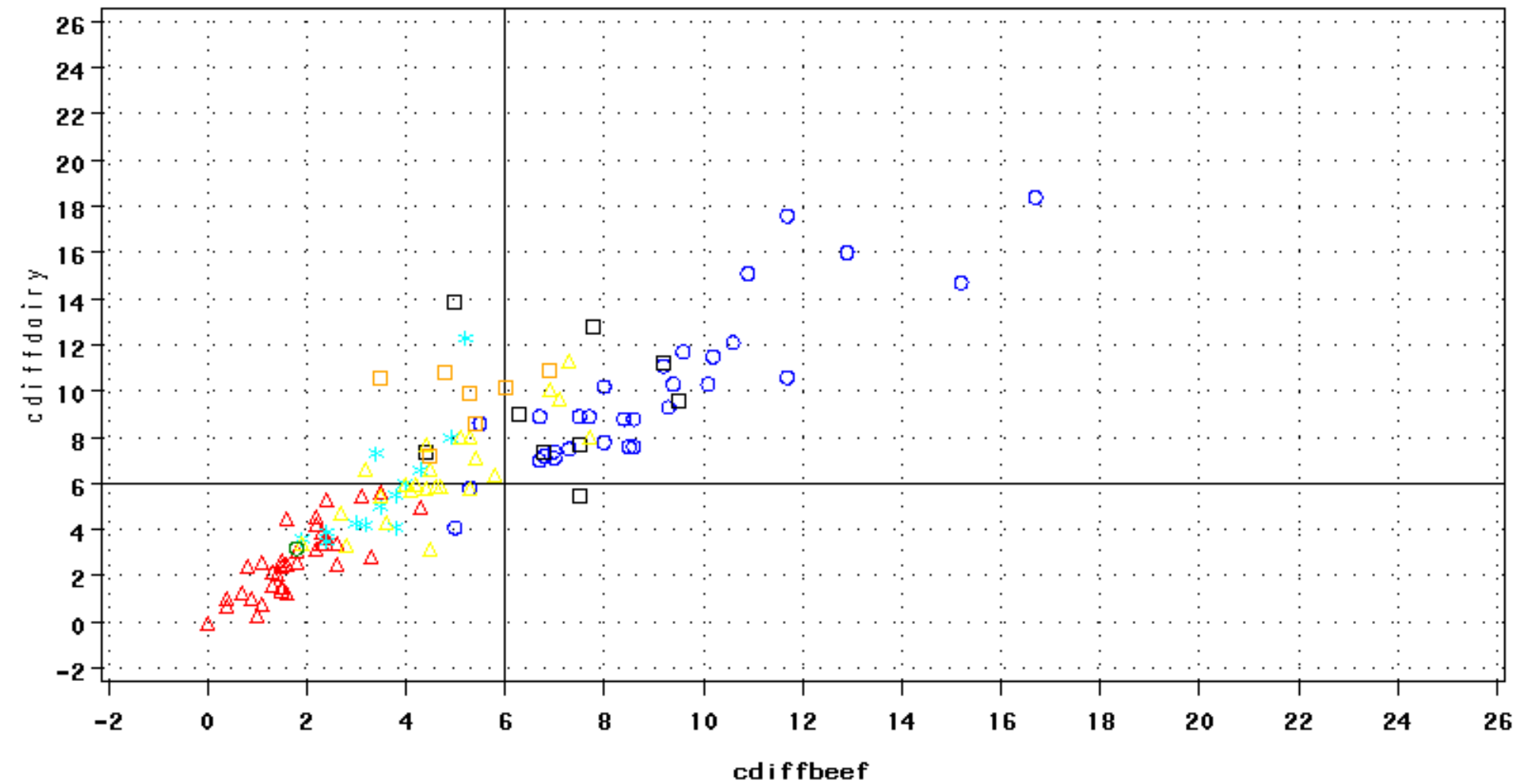
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○ ○ ○ SA □ □ □ SI

AI sires > 90% rel, min 100 recs both: pta dairy v pta beef

Count 118 correlation $r = 0.89$

Dairy eval mean = 7 {stdev = 3.8}

Beef eval mean = 5 {stdev = 3.3}



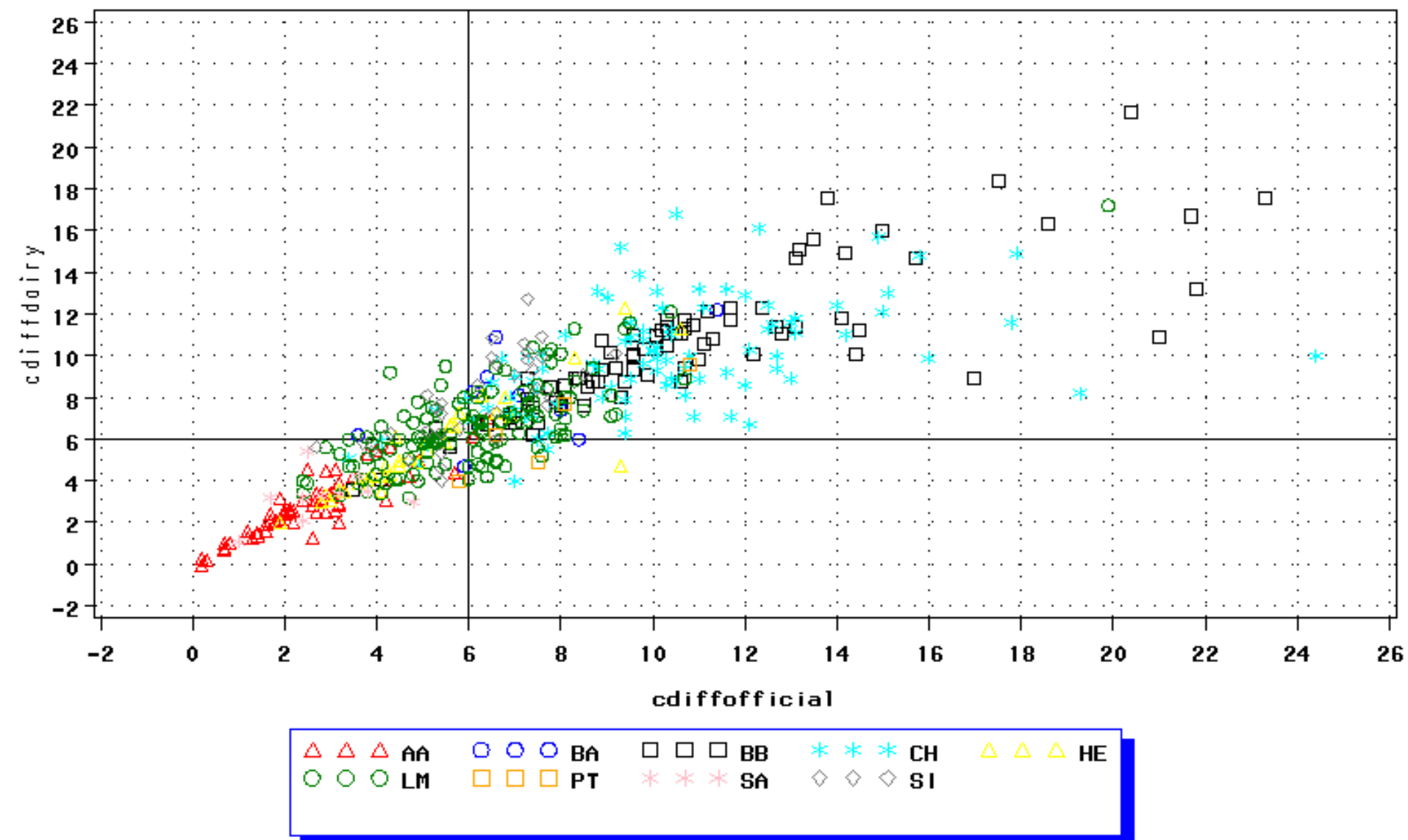
△ △ △ AA	○ ○ ○ BB	□ □ □ CH	* * * HE	△ △ △ LM
○ ○ ○ SA	□ □ □ SI			

AI sires > 90% rel official v dairy only no rel restriction

Count 463 correlation $r = 0.86$

Dairy eval mean = 7 {stdev = 3.5}

Official eval mean = 7 {stdev = 4}

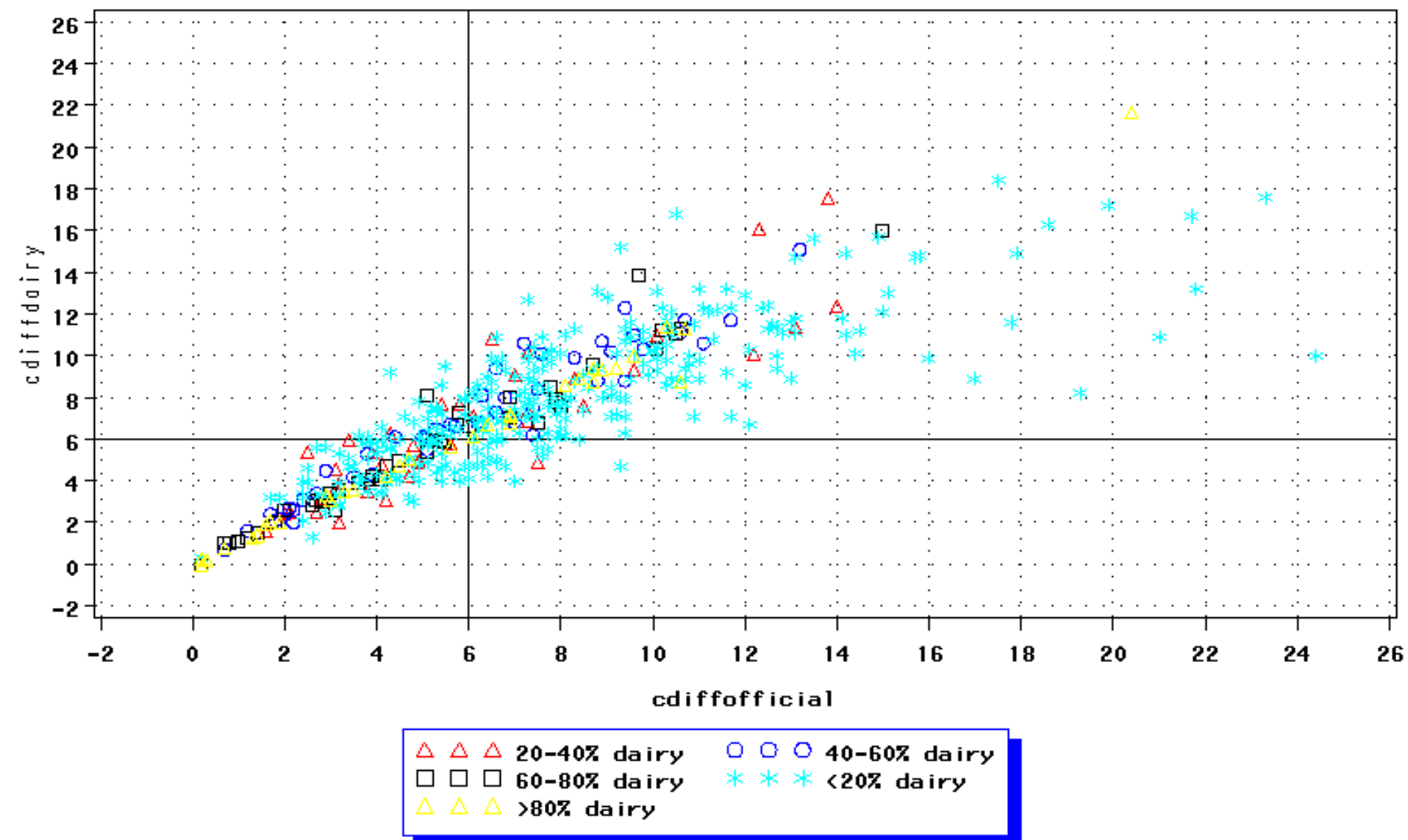


AI sires > 90% rel official & dairy only no rel restriction

Count 463 correlation $r = 0.86$

Dairy eval mean = 7 {stdev = 3.5}

Official eval mean = 7 {stdev = 4}

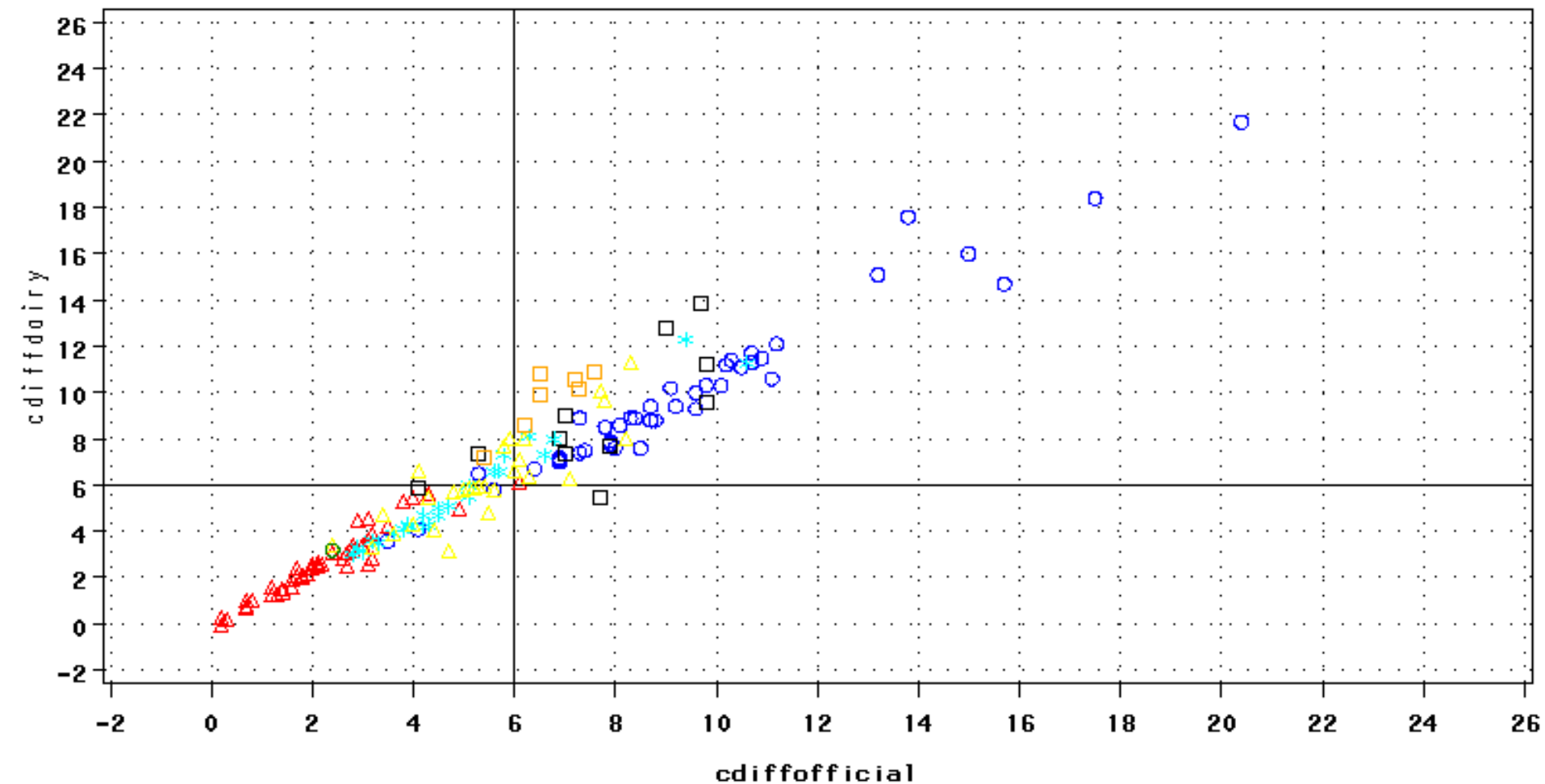


AI sires > 90% rel official v dairy only 90 rel

Count 162 correlation $r = 0.97$

Dairy eval mean = 6 {stdev = 3.9}

Official eval mean = 6 {stdev = 3.5}



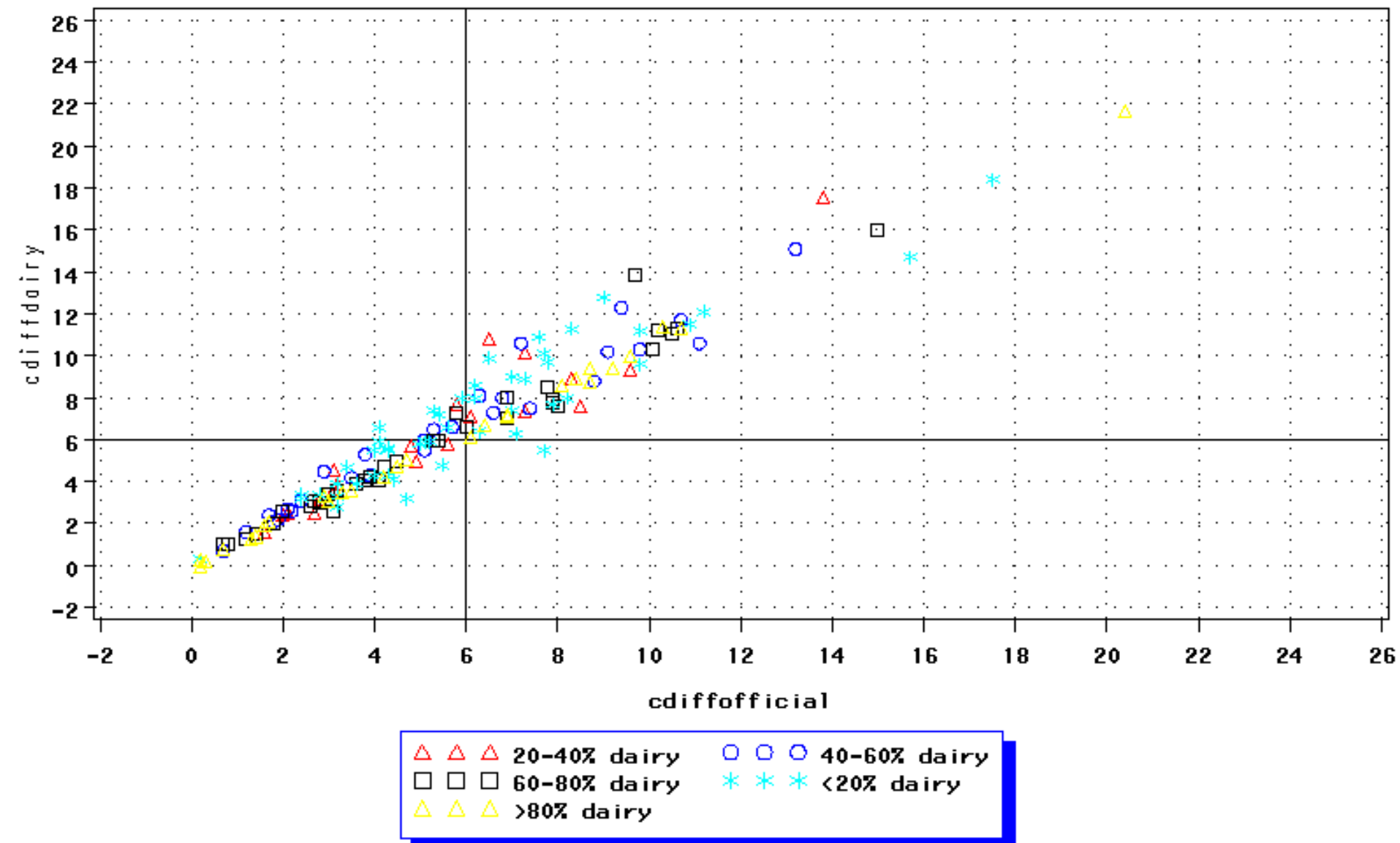
△ △ △ AA	○ ○ ○ BB	□ □ □ CH	* * * HE	△ △ △ LM
○ ○ ○ SA	□ □ □ SI			

AI sires > 90% rel official & dairy only 90 rel

Count 162 correlation $r = 0.97$

Dairy eval mean = 6 {stdev = 3.9}

Official eval mean = 6 {stdev = 3.5}

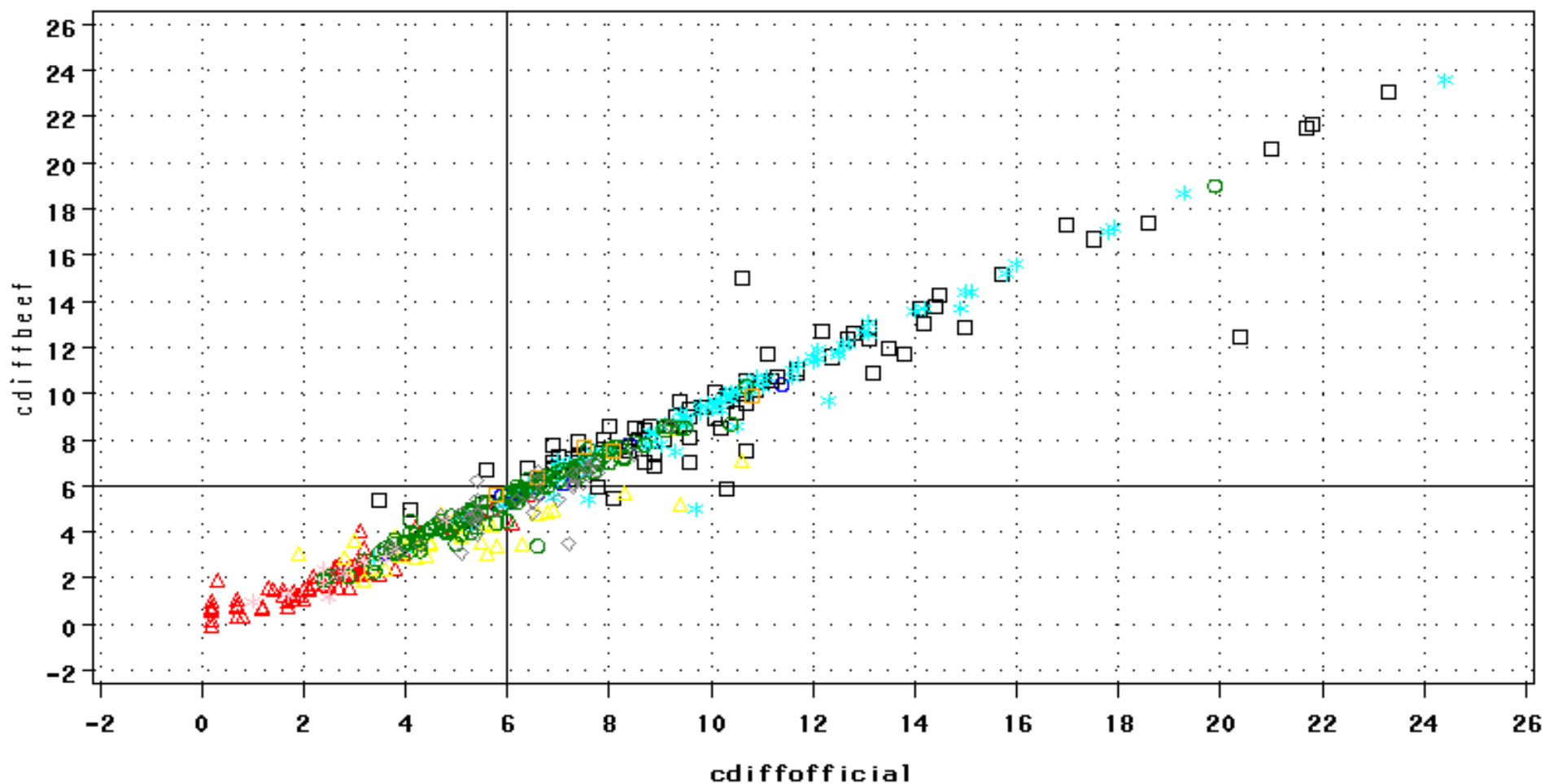


AI sires > 90% rel official v beef only no rel restriction

Count 463 correlation $r = 0.98$

Beef eval mean = 7 {stdev = 3.9}

Official eval mean = 7 {stdev = 4}



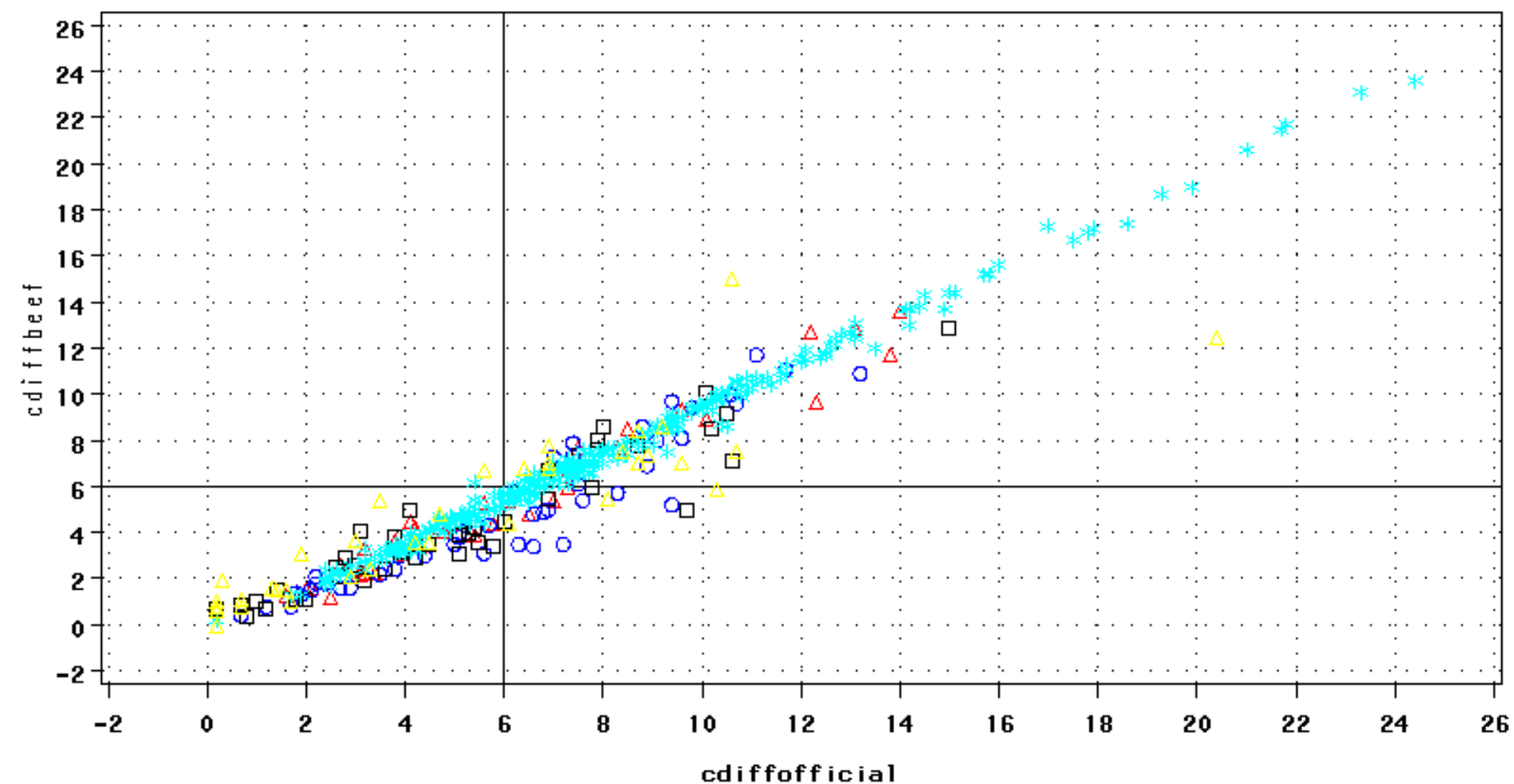
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✱ ✱ ✱ SA
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AI sires > 90% rel official v beef only no rel restriction

Count 463 correlation $r = 0.98$

Beef eval mean = 7 {stdev = 3.9}

Official eval mean = 7 {stdev = 4}



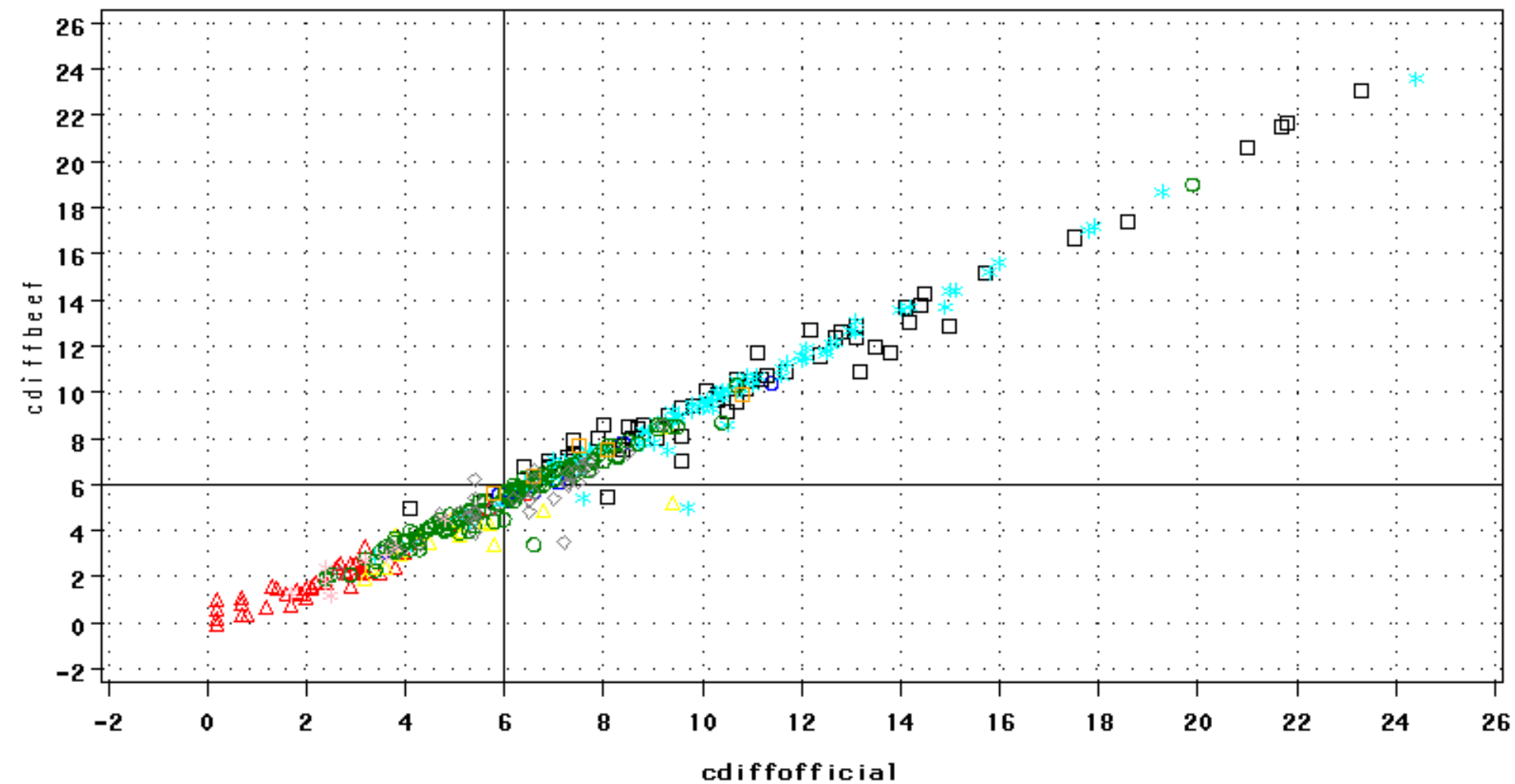
△ △ △ 20-40% dairy	○ ○ ○ 40-60% dairy
□ □ □ 60-80% dairy	* * * <20% dairy
△ △ △ >80% dairy	

AI sires > 90% rel official v beef herd only 90 rel

Count 391 correlation $r = 0.99$

Beef eval mean = 7 {stdev = 3.9}

Official eval mean = 7 {stdev = 3.9}



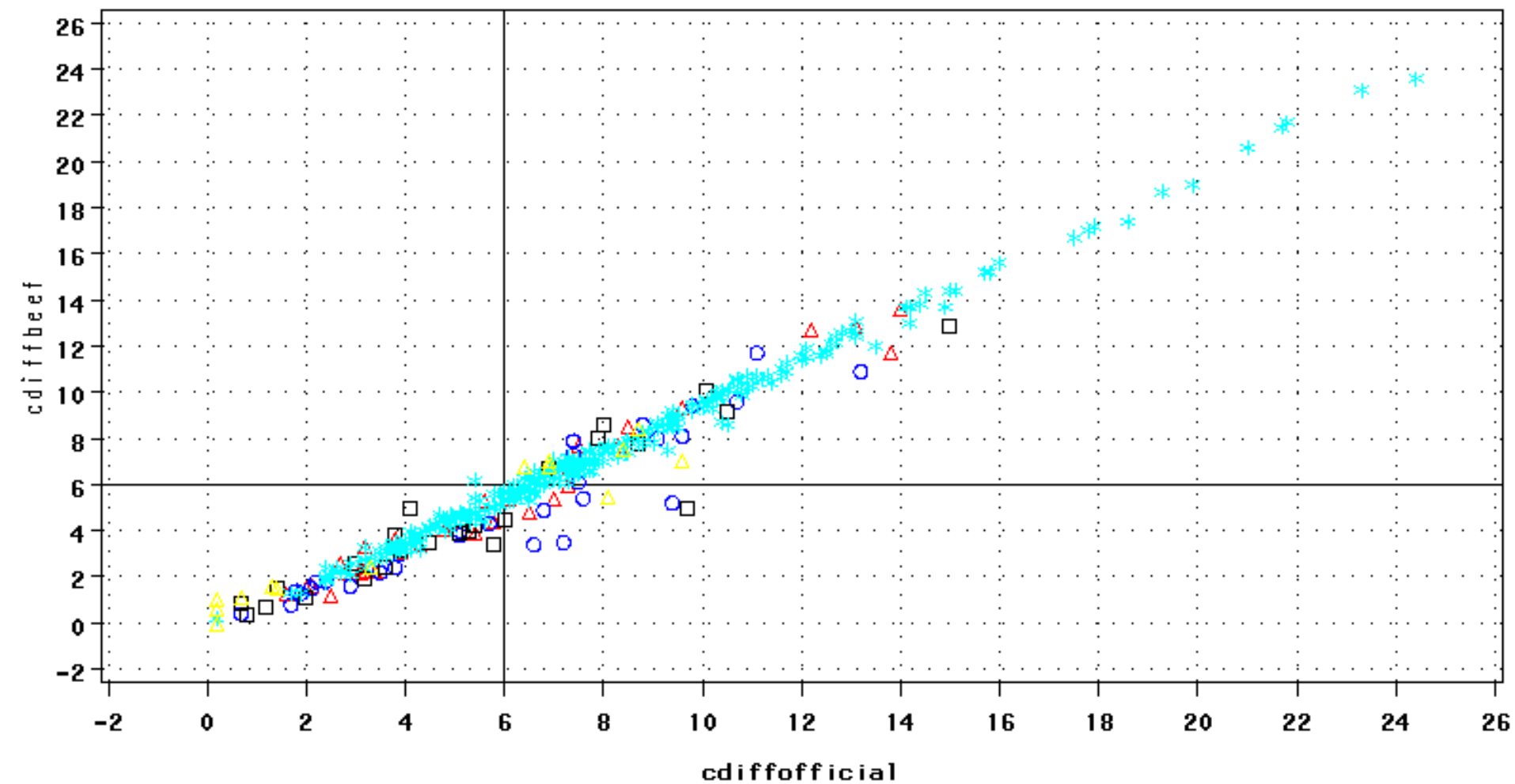
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○ ○ ○ LM	□ □ □ PT	* * * SA	◇ ◇ ◇ SI	

AI sires > 90% rel official v beef herd only 90 rel

Count 391 correlation $r = 0.99$

Beef eval mean = 7 {stdev = 3.9}

Official eval mean = 7 {stdev = 3.9}



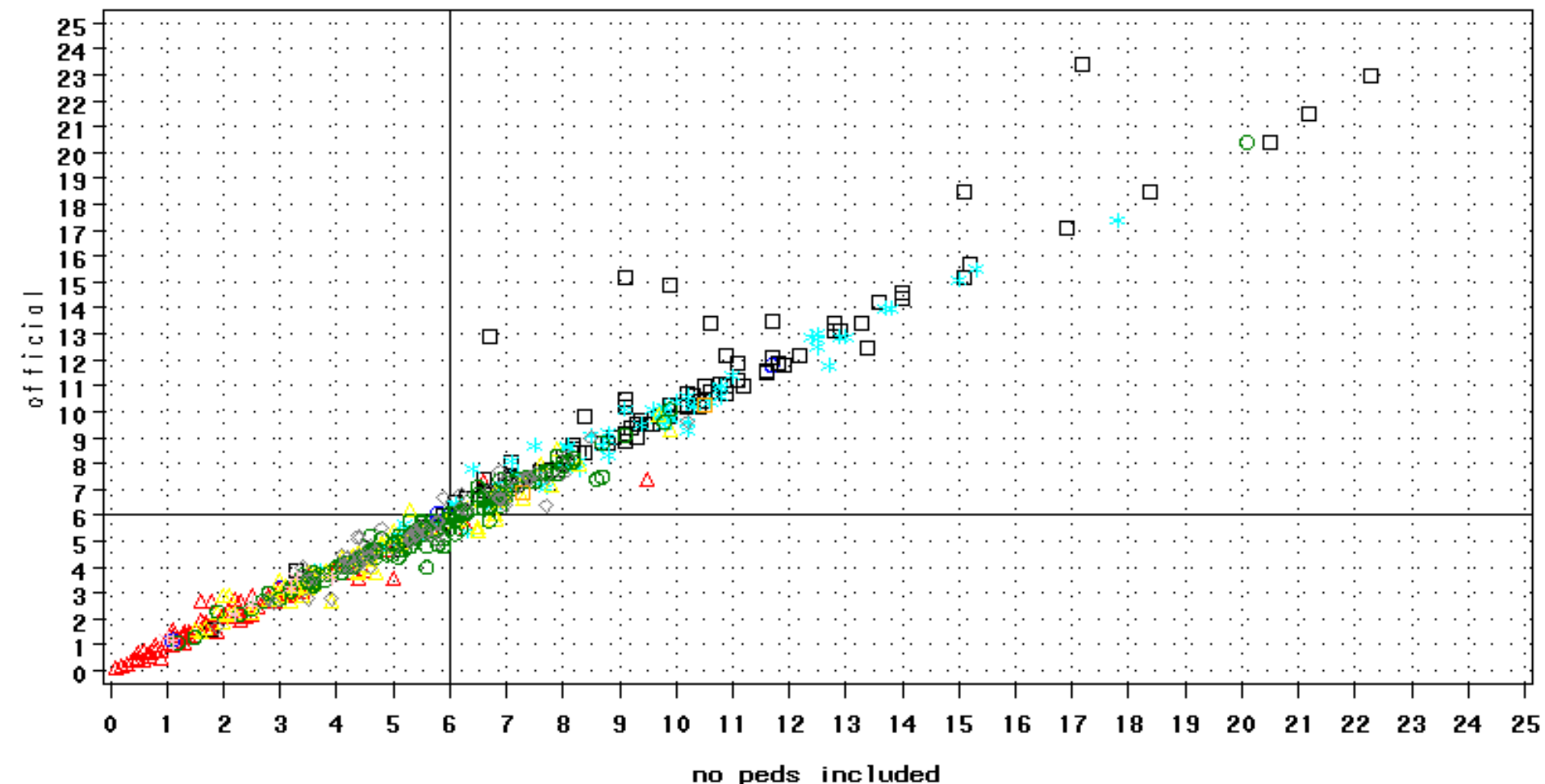
△ △ △ 20-40% dairy	○ ○ ○ 40-60% dairy
□ □ □ 60-80% dairy	* * * <20% dairy
△ △ △ >80% dairy	

AI sires > 60% rel, min 10 recs official: official v noped

Count 609 correlation $r = 0.99$

Official eval mean = 6 {stdev = 3.7}

No ped eval mean = 6 {stdev = 3.5}

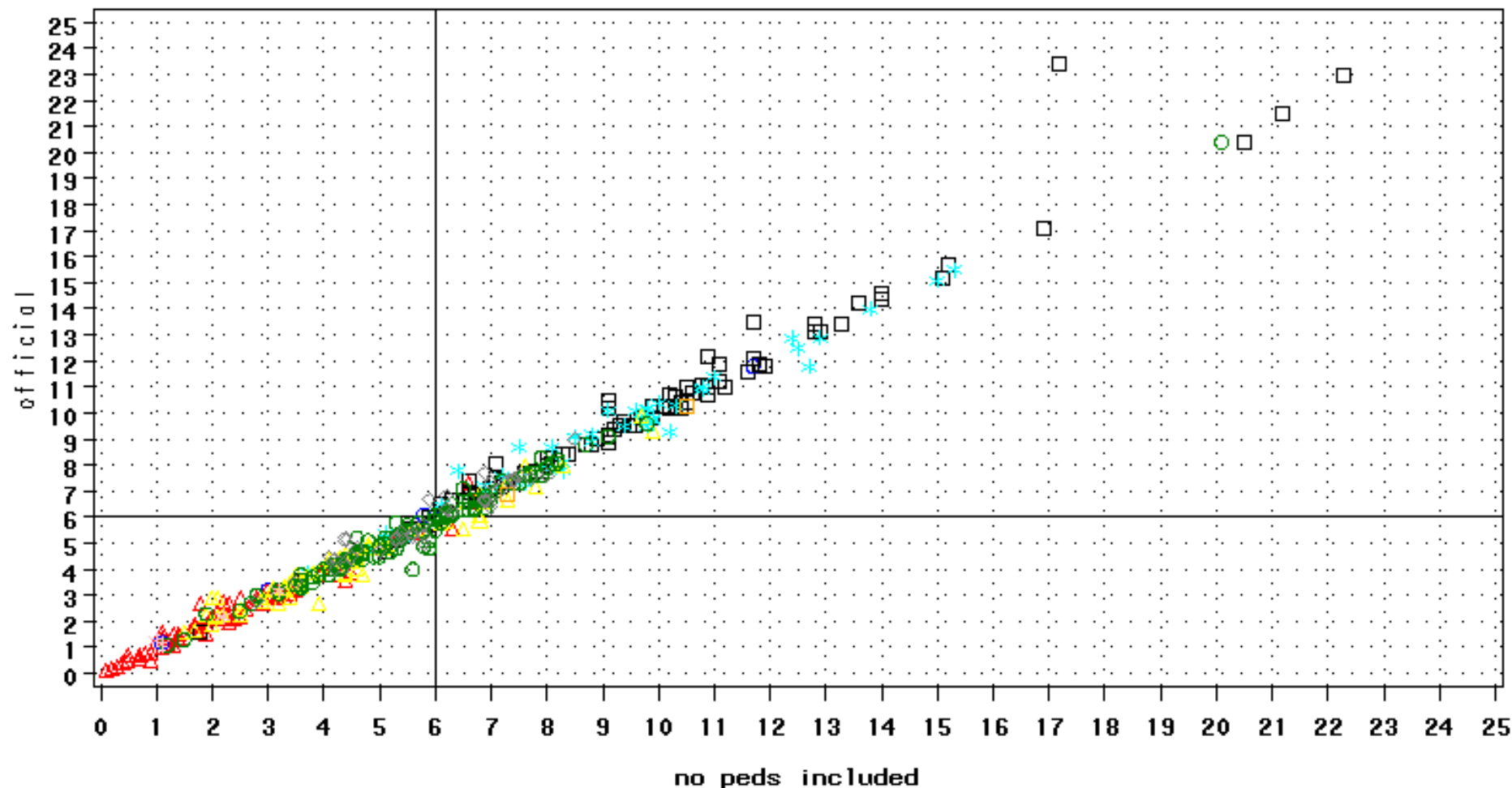


AI sires > 70% rel, min 10 recs official: official v noped

Count 464 correlation $r = 0.99$

Official eval mean = 6 {stdev = 3.7}

No ped eval mean = 6 {stdev = 3.6}



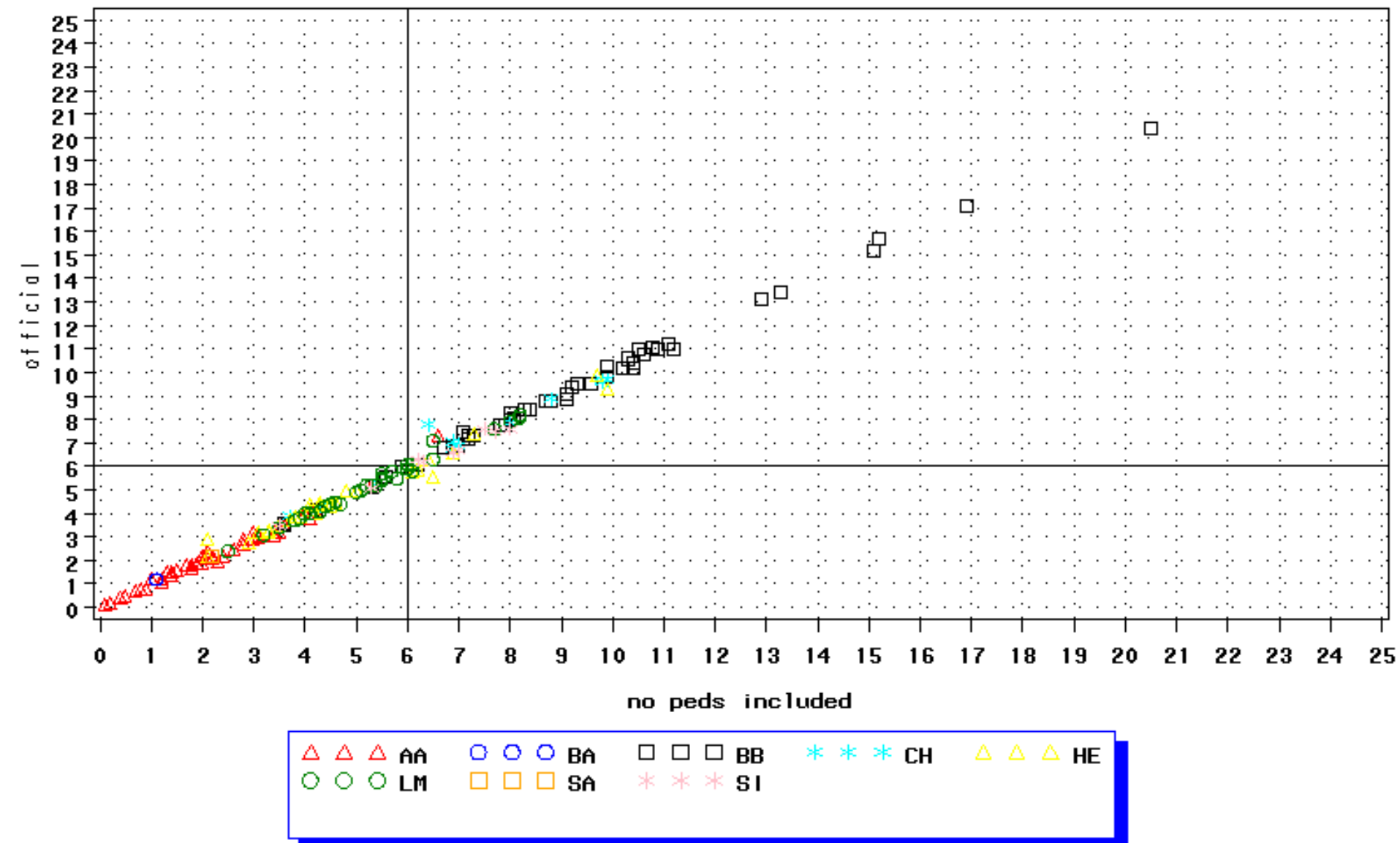
△ △ △ AA	○ ○ ○ BA	□ □ □ BB	* * * CH	△ △ △ HE
○ ○ ○ LM	□ □ □ PT	* * * SA	◇ ◇ ◇ SI	

AI sires > 90% rel, min 50 recs official: official v noped

Count 186 correlation $r = 0.998$

Official eval mean = 5 {stdev = 3.5}

No ped eval mean = 5 {stdev = 3.5}



Conclusion

- Some evidence to suggest that bulls may rank differently in dairy versus beef herds
- Compared to the current ptas, new ptas based on dairy only data will move more than beef only ptas
- However, a multi-trait with both traits included will reduce the movement

Next phase

- Genetic parameter estimation to assess the genetic correlation between dairy herd and beef herd data
- Evaluation with both traits correlated
- Appetite for two ptas? Publication of both ptas?



IRISH CATTLE BREEDING FEDERATION

Beef fertility evaluations



Background

- Current beef fertility evaluation is based on 3 traits
 - Age 1st calving, Calving interval, Survival
- Pedigree and commercial cows are compared together when in the same herds
- Cows have their CIVs post flushing censored

Issues raised

- Pedigree cows are often treated differently to commercial cows
 - Left to mature longer before 1st calving
 - Calving timed for shows, not as vital as in commercial herd
- Very little recording of flushing events is penalising cows with long calving intervals due to flushing

New evaluation

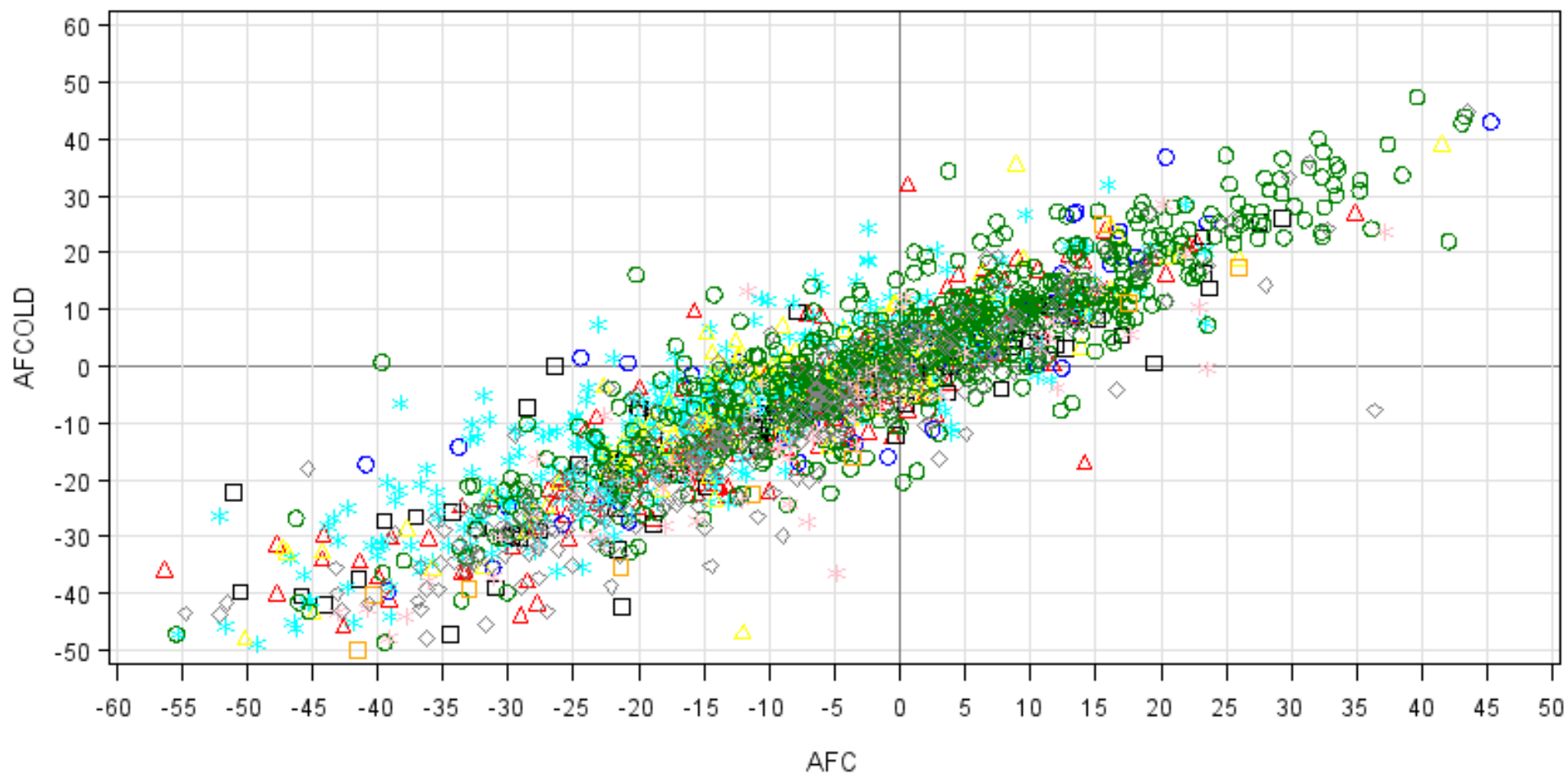
- Separate contemporary groups for pedigree versus commercial
 - Already implemented in beef, linear, docility
- Identify all donor cows who ever had ET calves and omit ALL their fertility performance from the evaluation

AI sires > 70% rel previously AFC

No of bulls 1907 correlation $r = 0.97$

Oldeval mean = -5 {stdev = 17.6}

Neweval mean = -7 {stdev = 17.9}

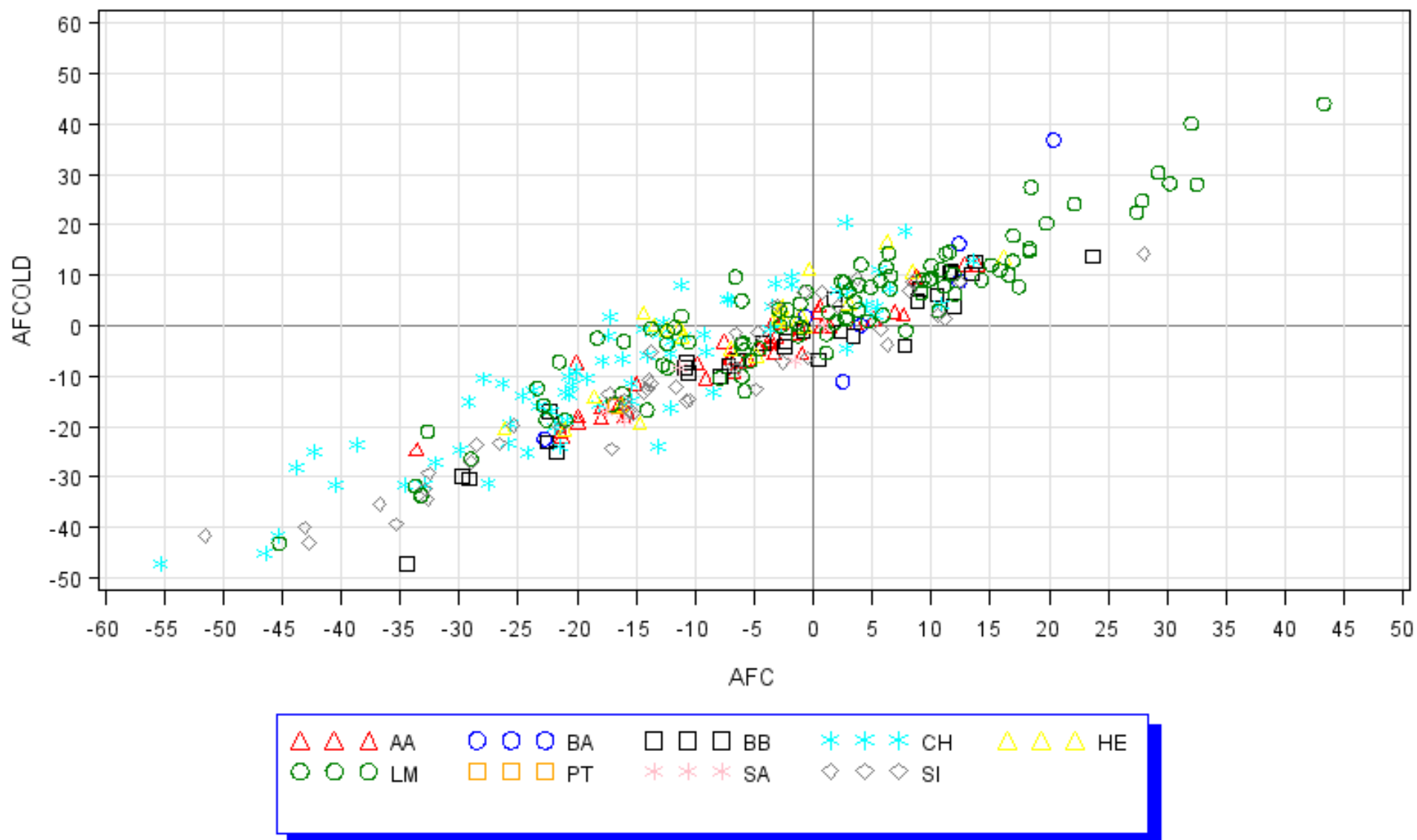


AI sires > 90% rel previously AFC

No of bulls 325 correlation $r = 0.97$

Oldeval mean = -5 {stdev = 15.6}

Neweval mean = -7 {stdev = 16.7}

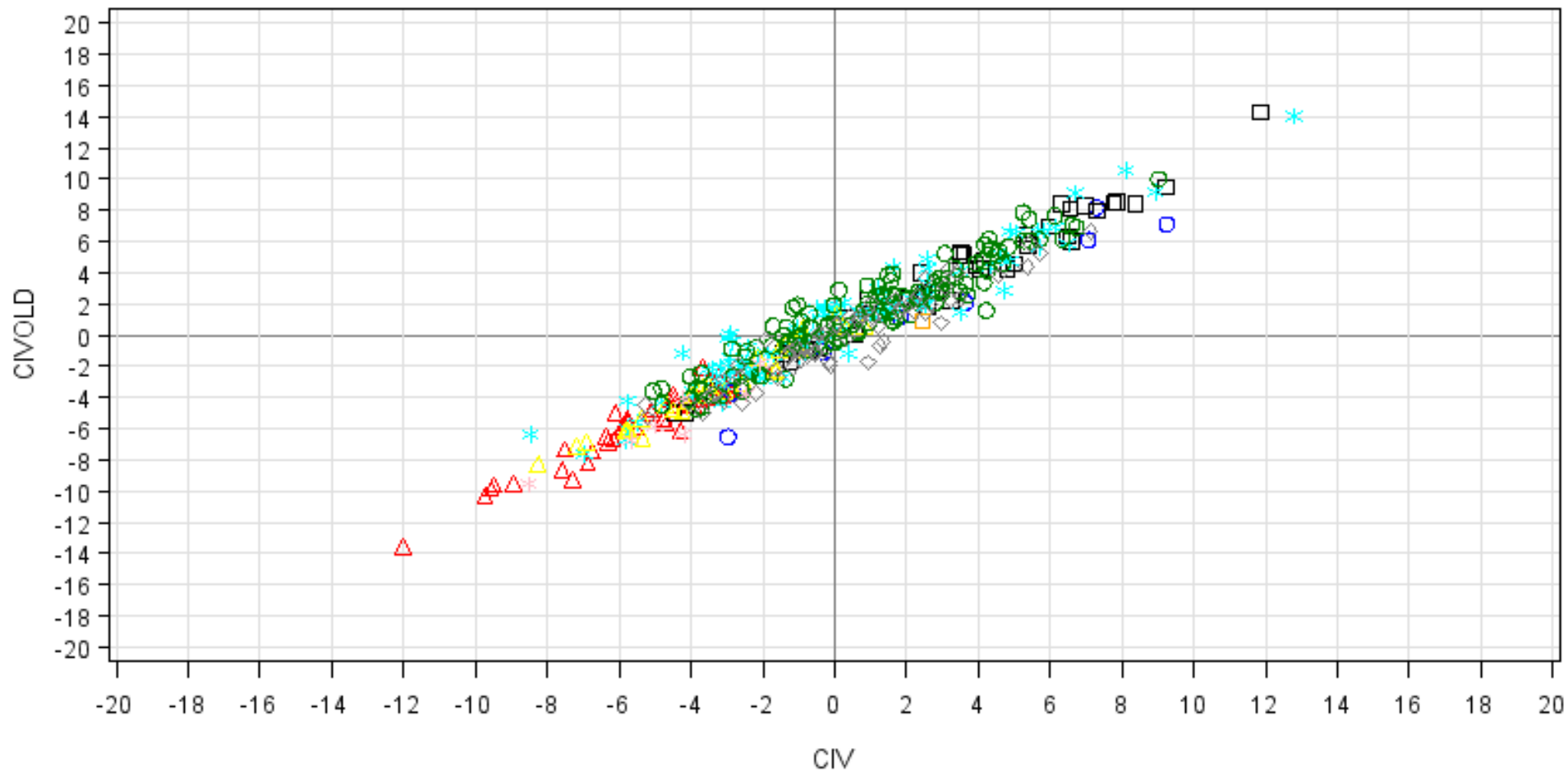


AI sires > 70% rel previously CIV

No of bulls 404 correlation $r = 0.97$

Oldeval mean = 0.1 {stdev = 4.2}

Neweval mean = -0.1 {stdev = 3.9}

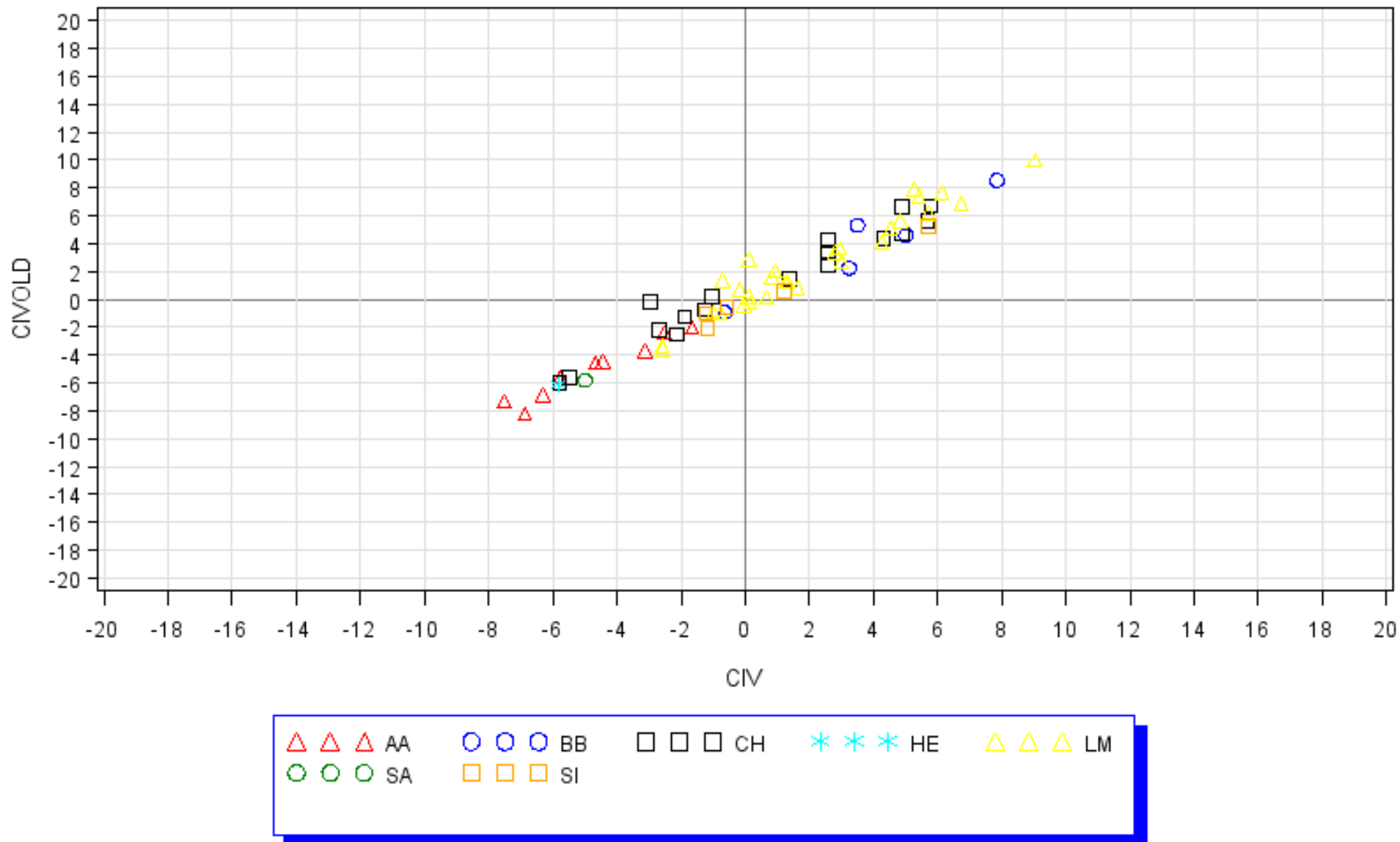


AI sires > 90% rel previously CIV

No of bulls 66 correlation $r = 0.97$

Oldeval mean = 0.9 {stdev = 4.4}

Neweval mean = 0.6 {stdev = 4}

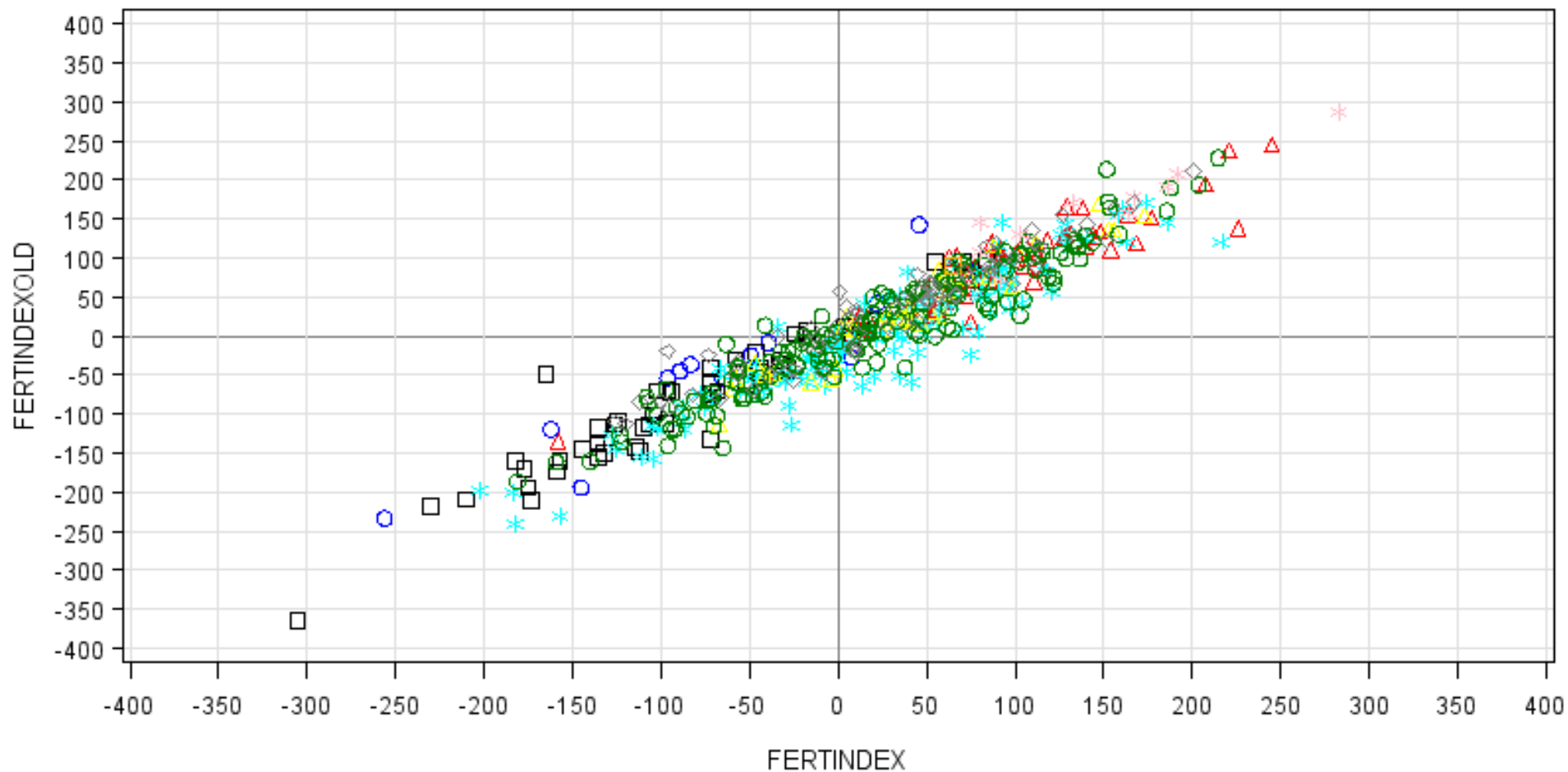


AI sires > 70% rel previously FERTILITY INDEX

No of bulls 522 correlation $r = 0.95$

Oldeval mean = 14 {stdev = 91}

Neweval mean = 21 {stdev = 89}



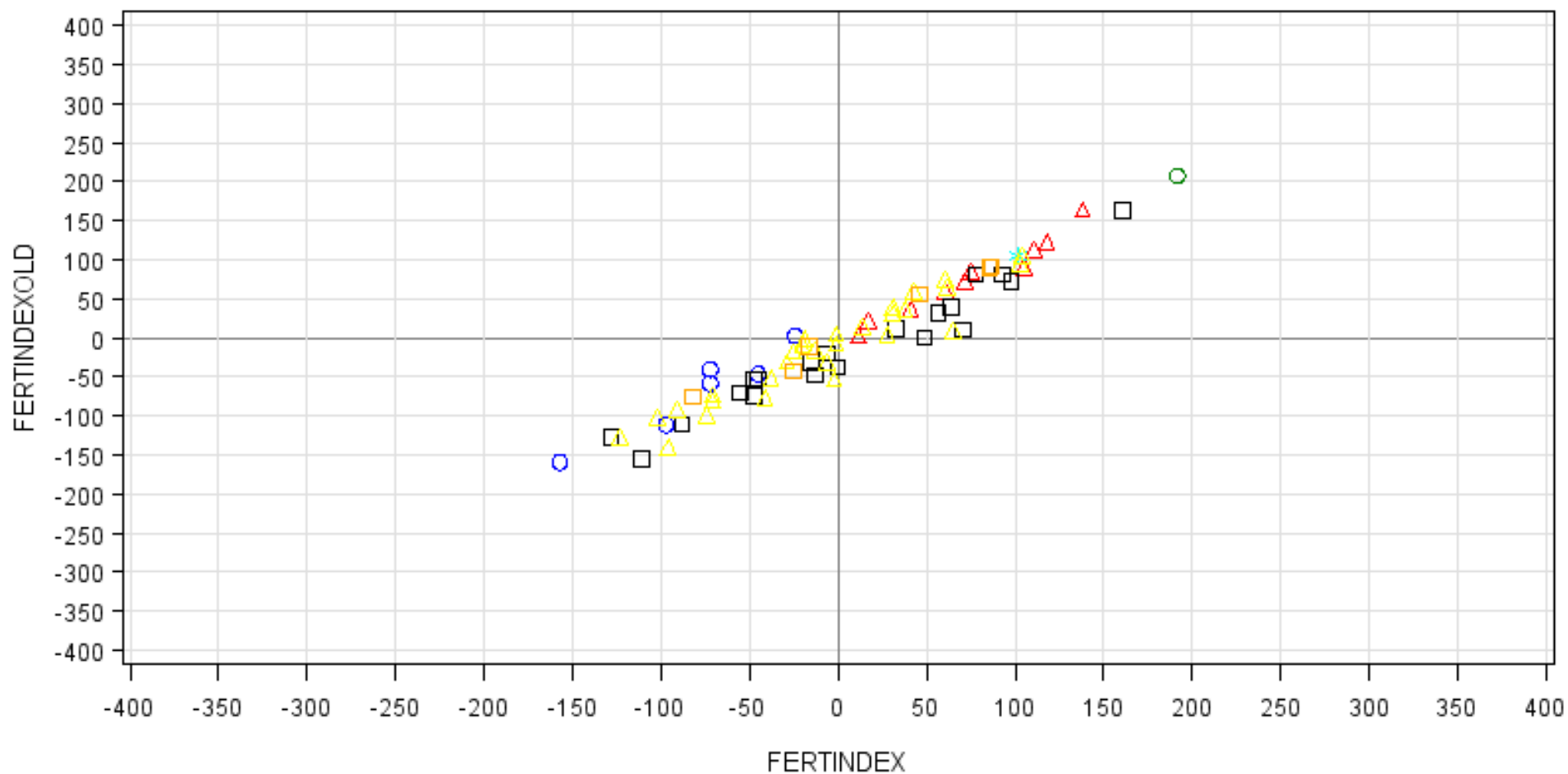
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○ ○ ○ LM	□ □ □ PT	* * * SA	◇ ◇ ◇ SI	

AI sires > 90% rel previously **FERTILITY INDEX**

No of bulls 73 correlation $r = 0.97$

Oldeval mean = 1 {stdev = 79.6}

Neweval mean = 8 {stdev = 74.9}



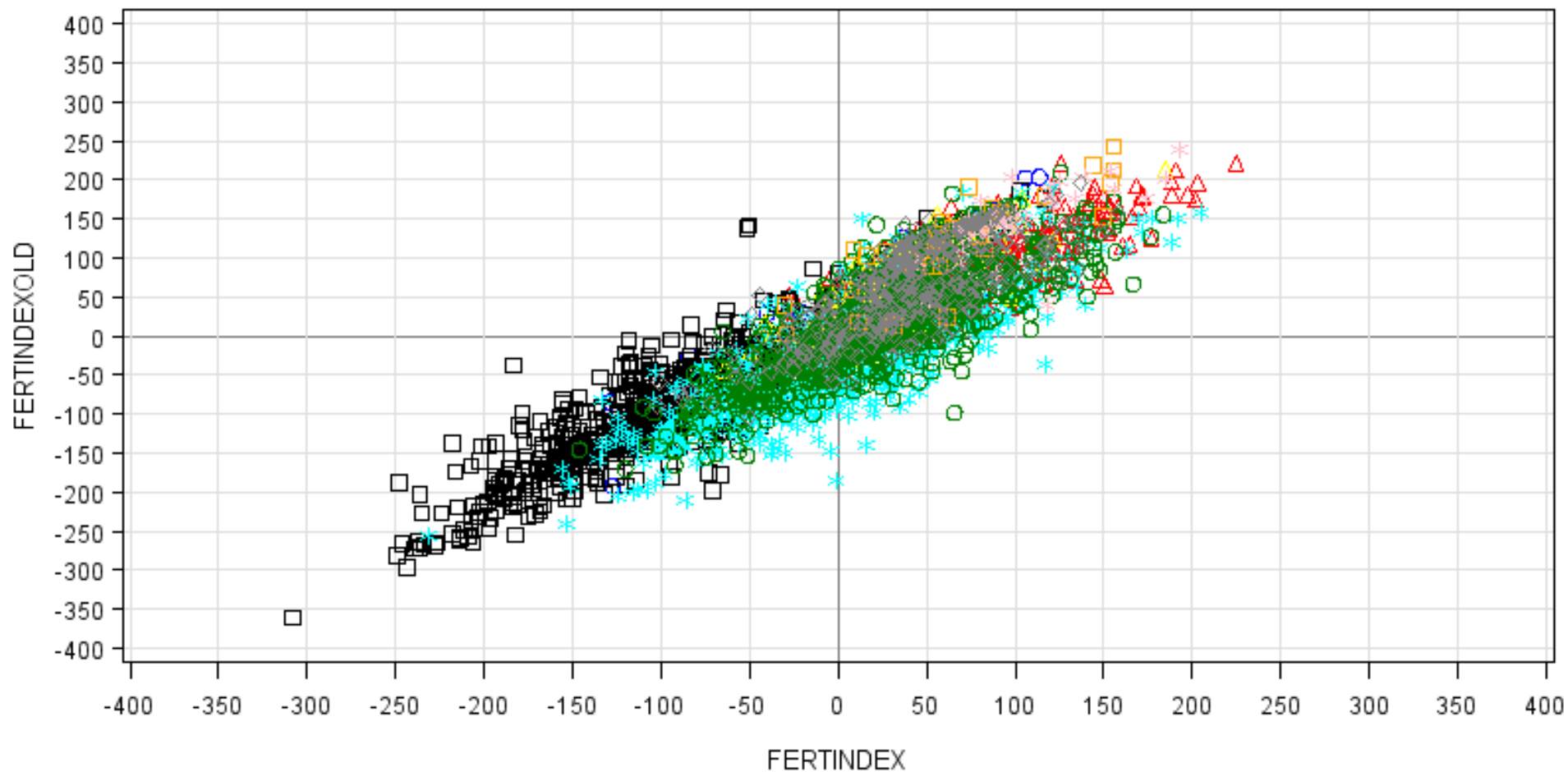
△ △ △ AA	○ ○ ○ BB	□ □ □ CH	* * * HE	△ △ △ LM
○ ○ ○ SA	□ □ □ SI			

ET DONOR DAMS FERTILITY INDEX NEW V OLD

No of bulls 14393 correlation $r = 0.89$

Oldeval mean = -13 {stdev = 94.9 }

Neweval mean = -5 {stdev = 83.7 }



Conclusion

- Age 1st calving affected by hys change more than calving interval
- ET donor cows will have their own information omitted from evaluation
 - May see drop in reliability



Sexed Semen Field Research Trial – Update

1st August 2013



Why the interest?

- €100m/yr additional value to agri-food industry.
 - Dairy farmer with 100 cows.
 - Now; 30 HF females, 30 HF males & 40 beef.
 - Future; 30 HF females, 3 HF males & 67 beef.
 - Similar benefits for beef farmers.
 - Opportunity to grow dairy herd more quickly.
- Sexed semen technology around for ~10 years.
 - **But**....15 unit decrease in pregnancy rate (50% -> 35%).
 - Not acceptable for compact seasonal systems.
- Recent results from NZ (fresh sexed semen) = 5 unit decrease.

Sexed Semen Research Partners



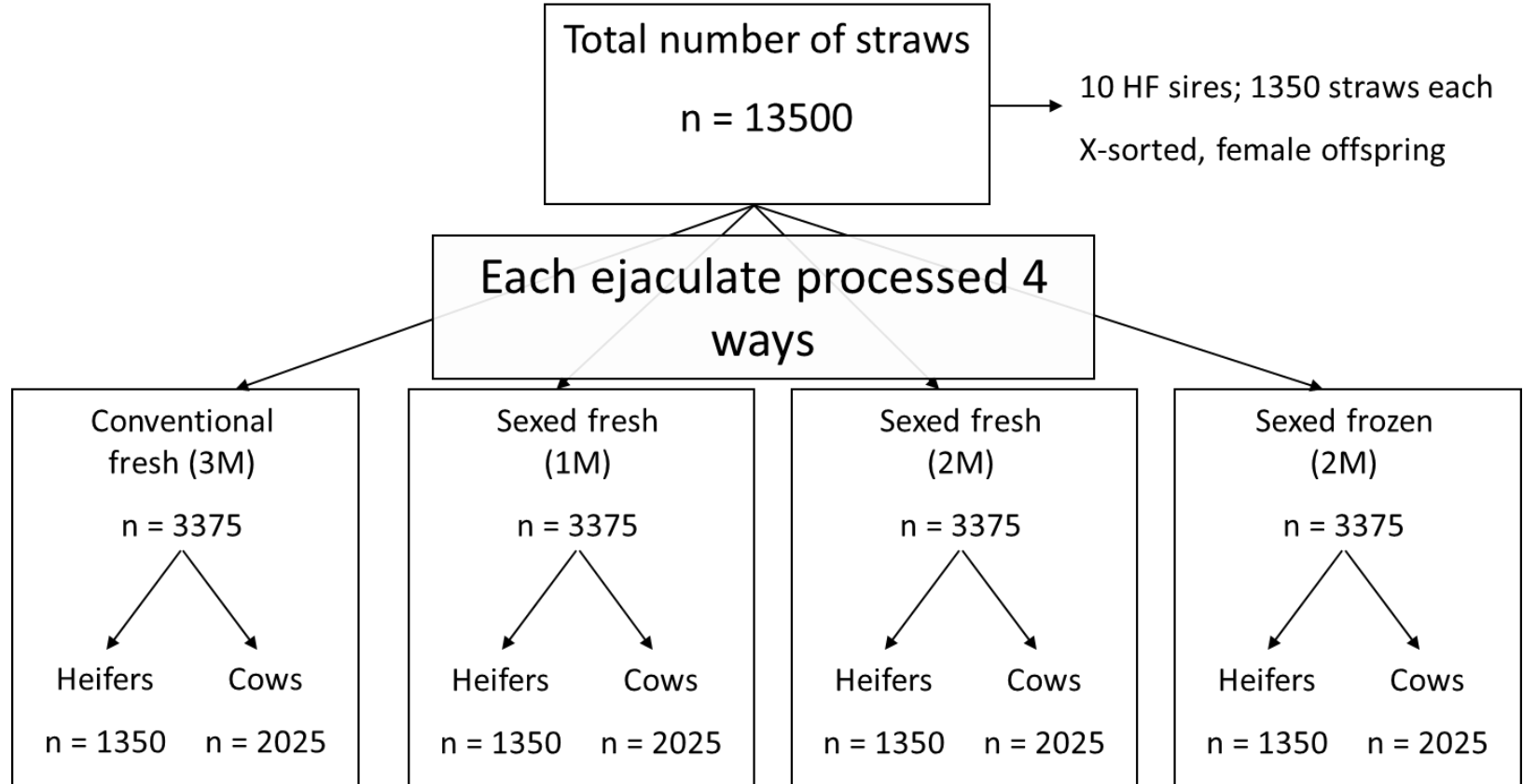
Objectives

- Establish the potential of sexed semen for Irish dairy & beef industries.
- Three field research trials;
 - Sexed female Holstein Friesian semen.
 - Sexed male Angus semen.
 - Sexed male & females beef semen.
- “Largest ever” field research trial on sexed semen.
 - Animals, breeds, treatments.....

Sexed Semen Research Partners



Holstein Friesian - Study Design



Actual	1614	2536	1572	2177	1434	2288	1490	1924
% Target	120%	125%	116%	108%	106%	113%	110%	95%

Sexed Semen Research Partners



Results (ii); Treatment Comparisons

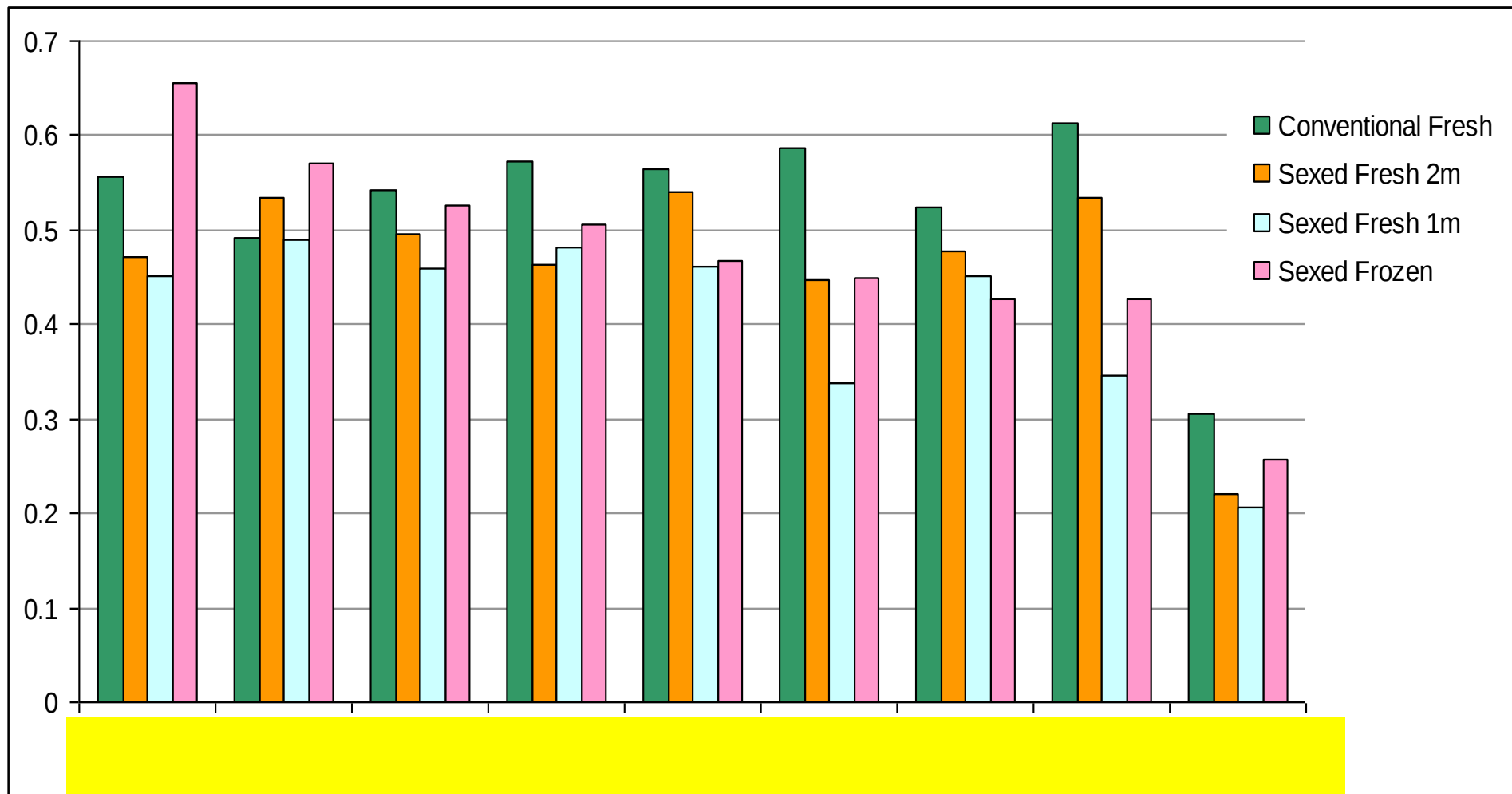
Treatment	Records	Not in-calf	In calf	% in calf
Cows	2386	1298	1088	45.6%
- Conventional fresh	681	335	346	50.8%
- Sexed fresh 2m	603	328	275	45.6%
- Sexed fresh 1m	573	347	226	39.4%
- Sexed frozen	529	288	241	45.6%
Heifers	1914	964	950	49.6%
- Conventional fresh	518	227	291	56.2%
- Sexed fresh 2m	441	228	213	48.3%
- Sexed fresh 1m	454	258	196	43.2%
- Sexed frozen	501	251	250	49.9%

- **Note: Large variation in herd performance.**

Sexed Semen Research Partners



Results (iii); Sire * Treatment Comparisons.



Sexed Semen Research Partners



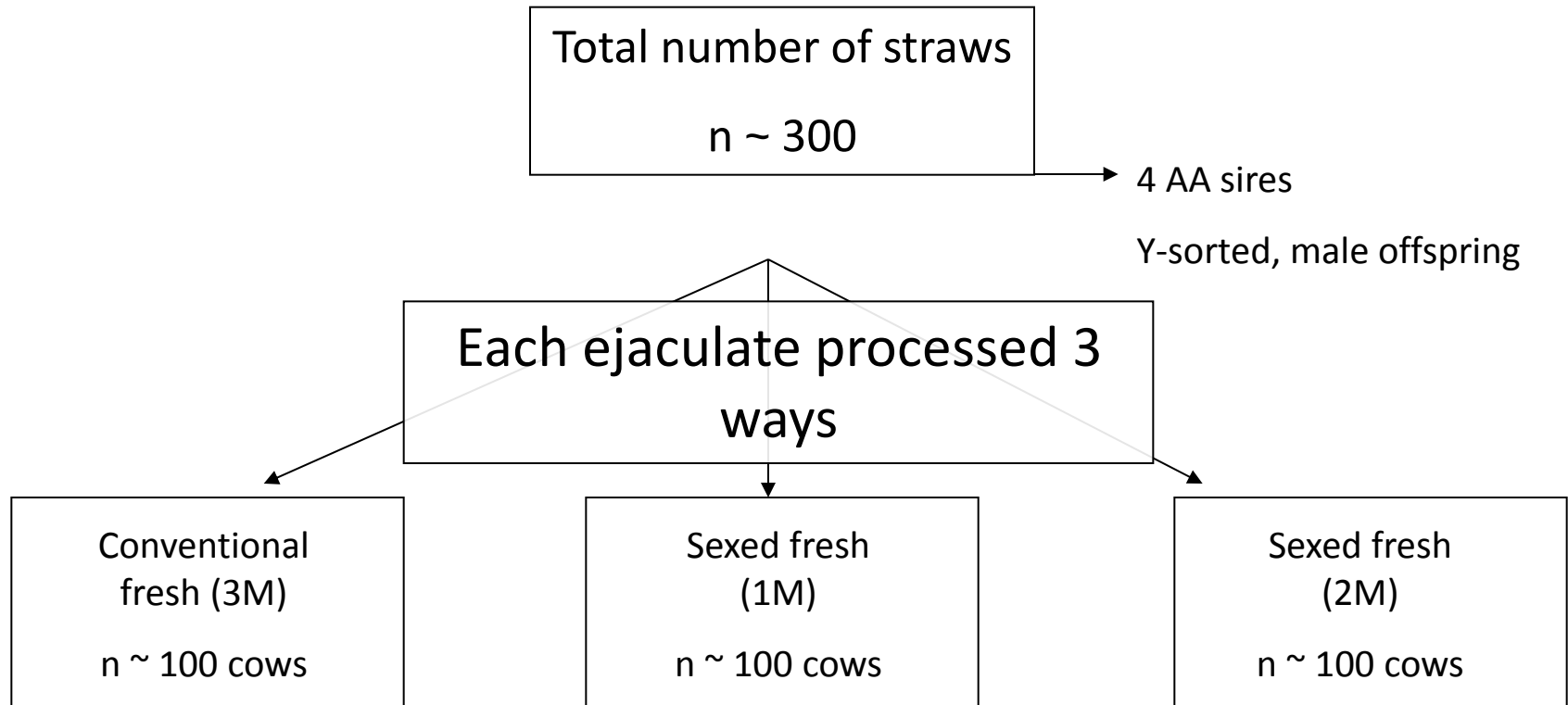
HF Project - Where next?

- Large sire differences. Project initiated to develop prediction equations re: male fertility.
 - Multi-factorial; (i) lab data (pre & post processing), (ii) flow cytometry, (iii) IVF, (iv) ICBF (% females & male fertility) (v) any additional data and (v) pregnancy rates from field trial.
 - Target completion for this project of August.
- “Full” project results (including sire predictions) in early Sept.

Sexed Semen Research Partners



Dairy Phase II – AA study design.



- Below initial target (600), reflecting weather/fodder issues and also logistical aspects of getting semen onto farms (mainly cost).
- Still sufficient to demonstrate gender differences.

Sexed Semen Research Partners



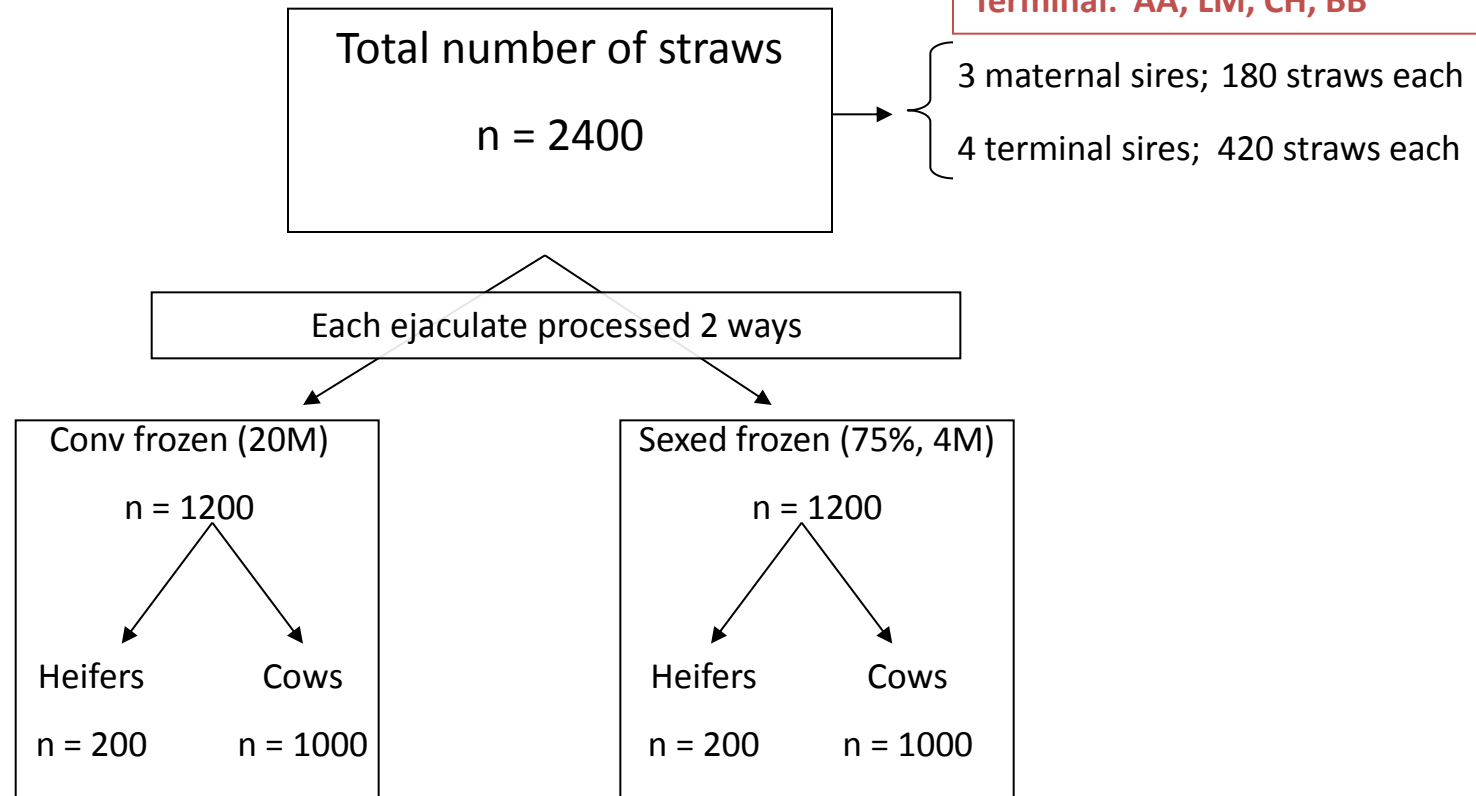
Suckler Beef Trial

Maternal straws X-sorted (75%)

Terminal straws Y-sorted (75%)

Maternal: LM, SI, HE

Terminal: AA, LM, CH, BB



Sexed Semen Research Partners

Suckler Trial

- 7 bulls with semen collected; 3 maternal bulls & 4 terminal bulls.
- Synchronisation program included.
- Currently signing up herds for the project. 30 herds signed up & further ~130 herds with sign-up material.
- A small number of herds have started already, main focus is Autumn.

Sexed Semen Research Partners



Overall Summary.

- Initial results from HF project are very encouraging.
 - Performance of sexed frozen is of particular note.
- “Predicting male fertility” project initiated. A challenge – but with exciting possibilities.
- Now moving to suckler beef project.

Sexed Semen Research Partners



Acknowledgements.

All smiles as fresh sexed semen trial goes live



Richard Geary, Seamount, Currabinny, Carrigaline, Co Cork, shares a joke with Munster Cattle Breeding Group AI technician Tom Tobin while he inseminates one of Richard's cows as part of the new sexed semen trial which began this week. Over 300 herds, covering some 8,000 cow inseminations and 7,000 heifer inseminations, are involved in the project. Despite battling with weather and tight fodder supplies, the farming calendar continues, with the breeding season about to kick off.

Genetics of health & disease

Donagh Berry,
ICBF, Moorepark, Reprodac Ltd, AHI,
CEVERA

Teagasc, Moorepark

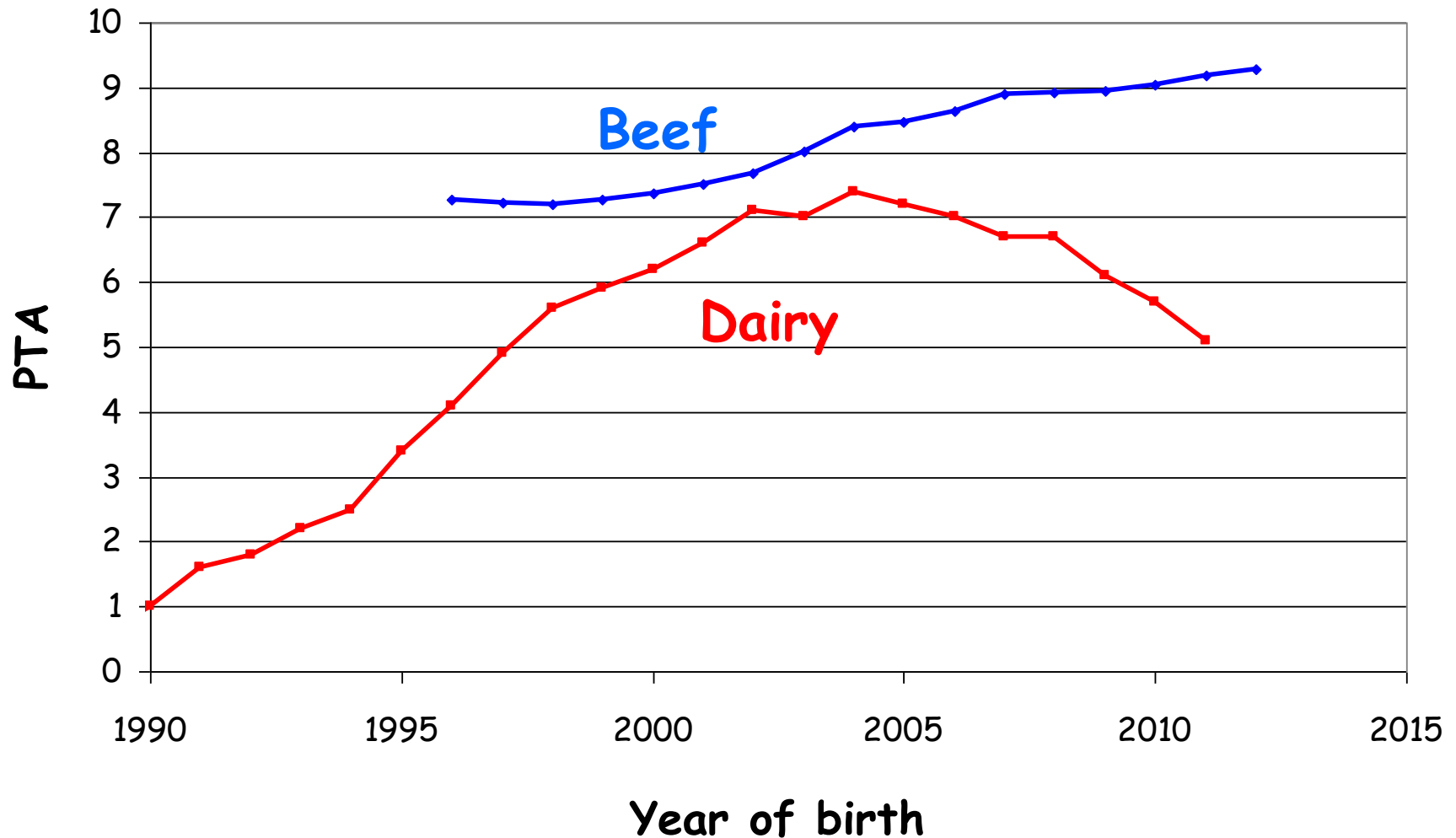
donagh.berry@teagasc.ie

ICBF Industry Meeting, Portlaois, August 2013

Motivation

- Animal health (and welfare) will be ever-increasingly important
 - Profitability
 - Consumer confidence
- Poorly (directly) accounted for in dairy & beef national breeding goals
 - Captured to some extent through other traits like survival and growth rate
- Data for genetic evaluations

Fear of the unknown...fertility



(Initial) Proposal

- Rather than (many) more EBVs, provide a combined “Robustness” index
- All EBVs available on website
- Major ones (e.g., mastitis, SCC, lameness) provided separately

Why genetics?

Genetic is cumulative and permanent

- Introgression of good genetics can be built on with each generation
- Introgression of bad genetics can be difficult to breed out

Part of an overall strategy to increase the animal health status

Health traits

Viral diseases

- Respiratory diseases (BVD, IBR...)

Udder health

- Somatic cell count, mastitis

Lameness

Other bacterial diseases

- Tuberculosis, paratuberculosis (Johnes)..

Metabolic diseases

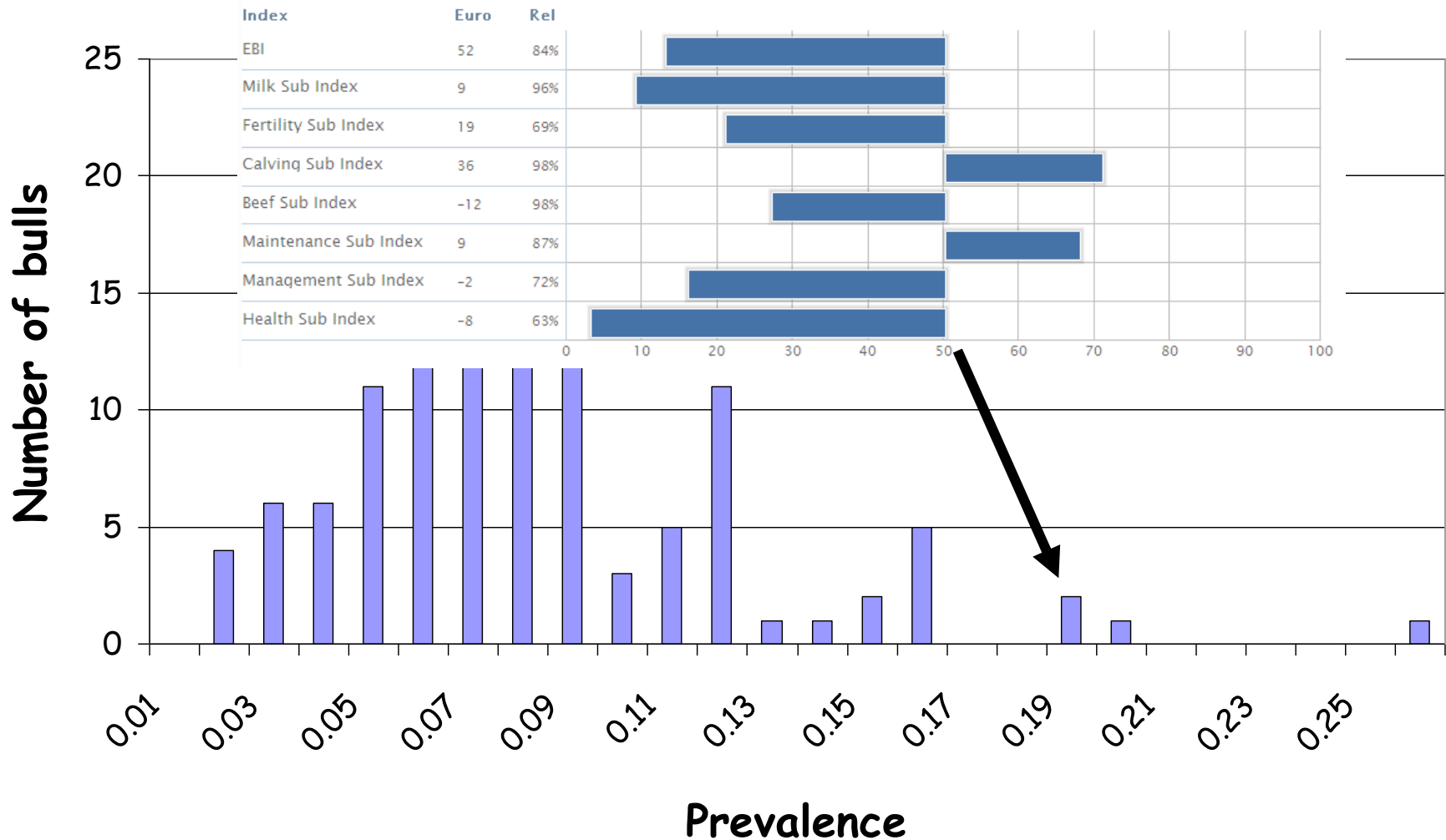
Fertility related ailments

Endo- & ecto-parasites

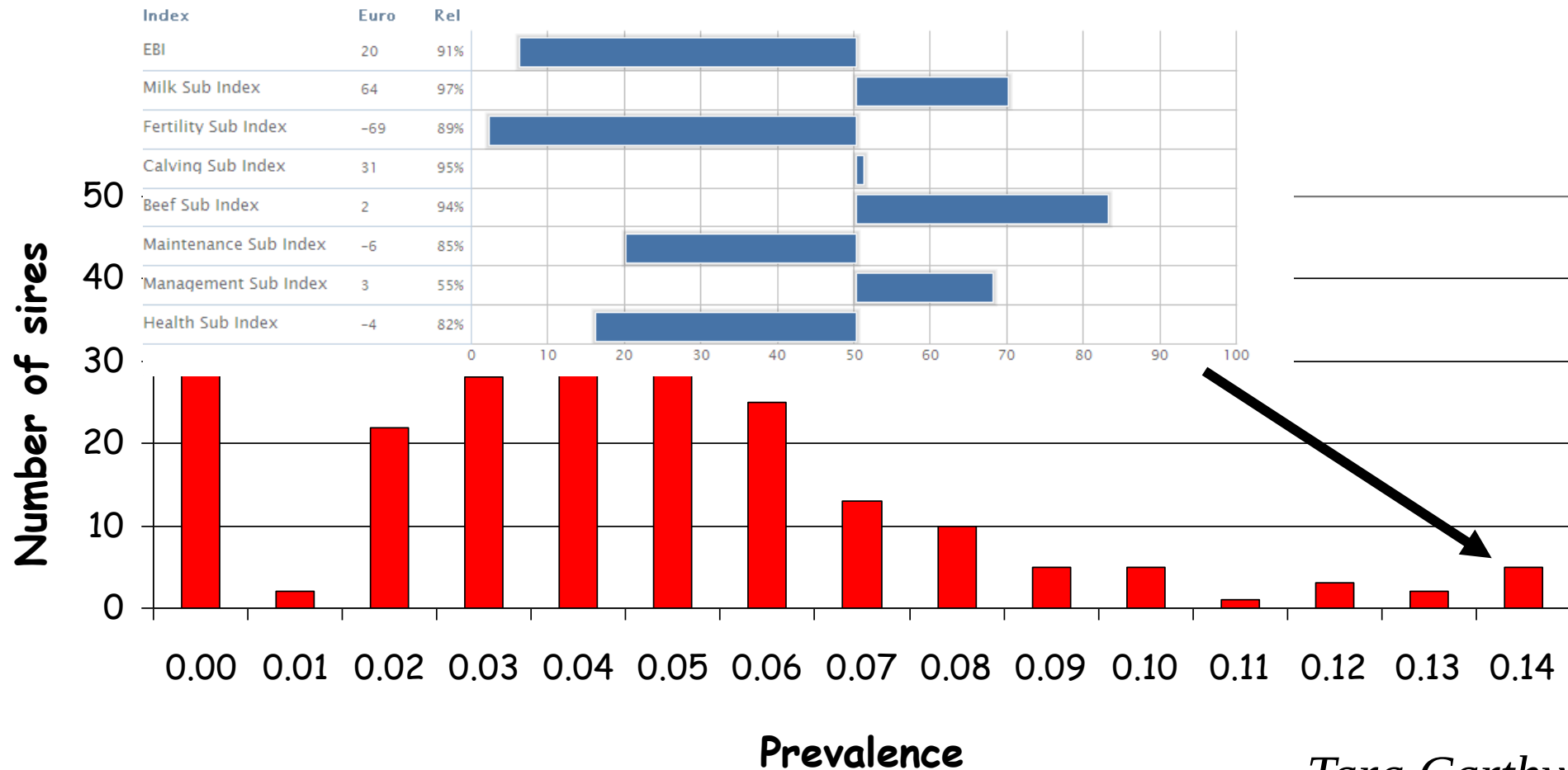
Heritability - Irish data

- BVD: 0.10
- IBR: 0.28
- TB: 0.18
- Johnes: 0.10
- Uterine health: 0.02 - 04
- Mastitis: 0.02; SCC: 0.13
- Lameness: 0.03
- Other: 0.01

BVD – sire prevalence

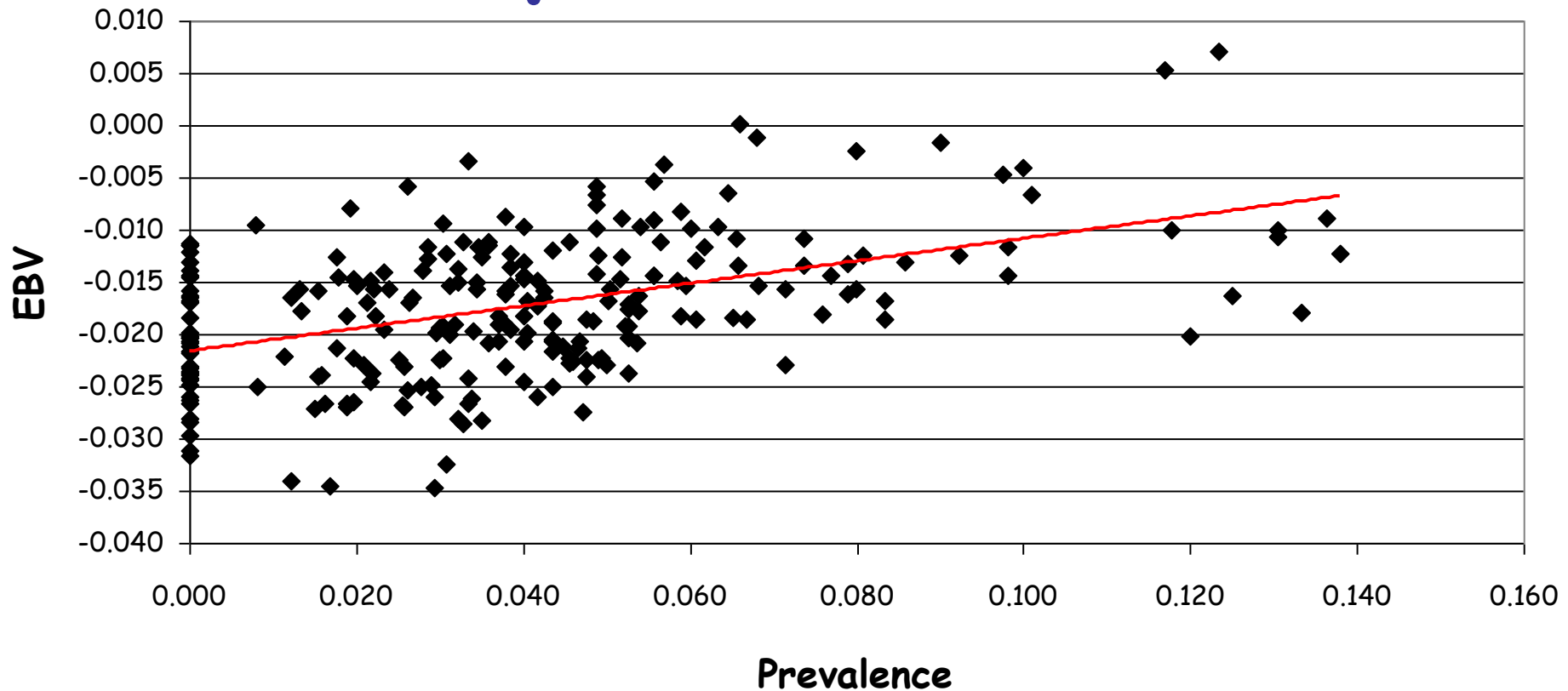


Cystic Ovaries - sire prevalence



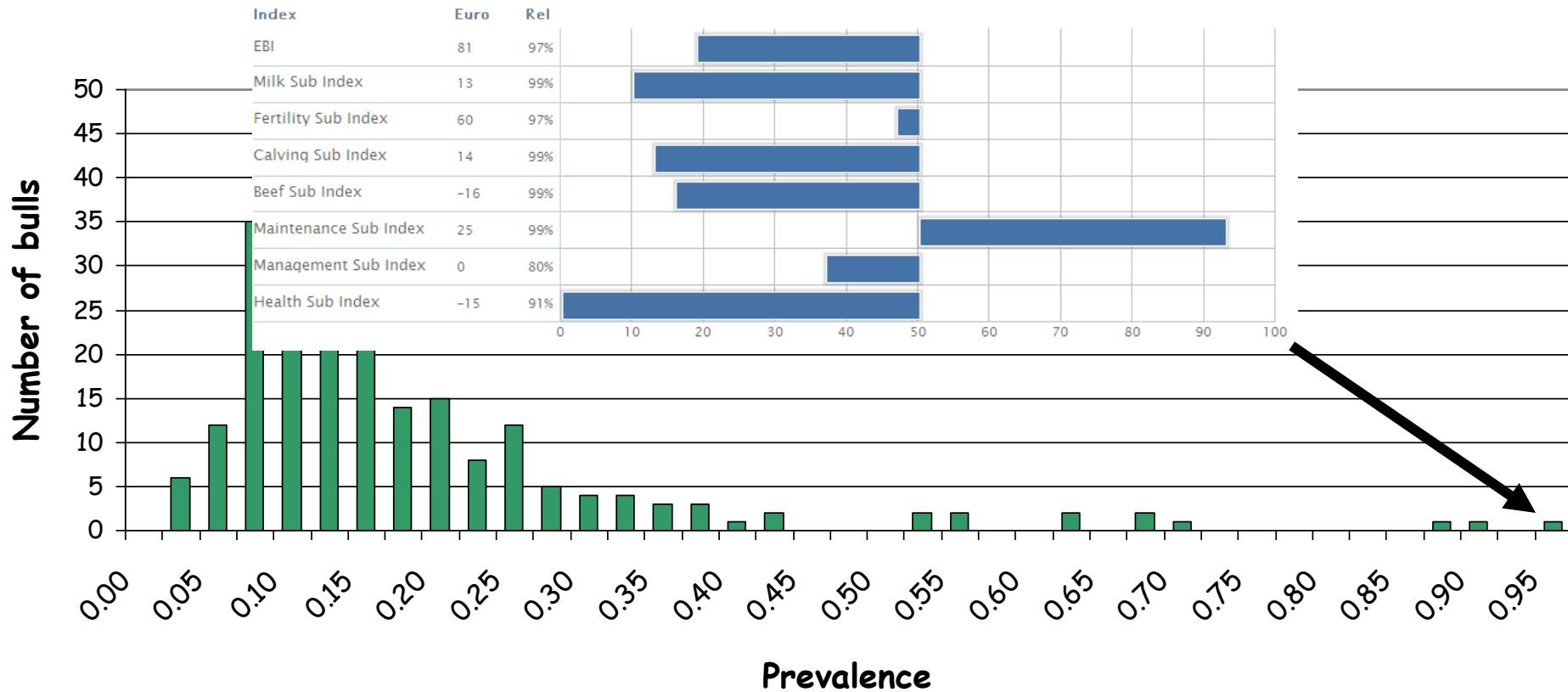
Tara Carthy

Cystic Ovaries - genetics versus prevalence



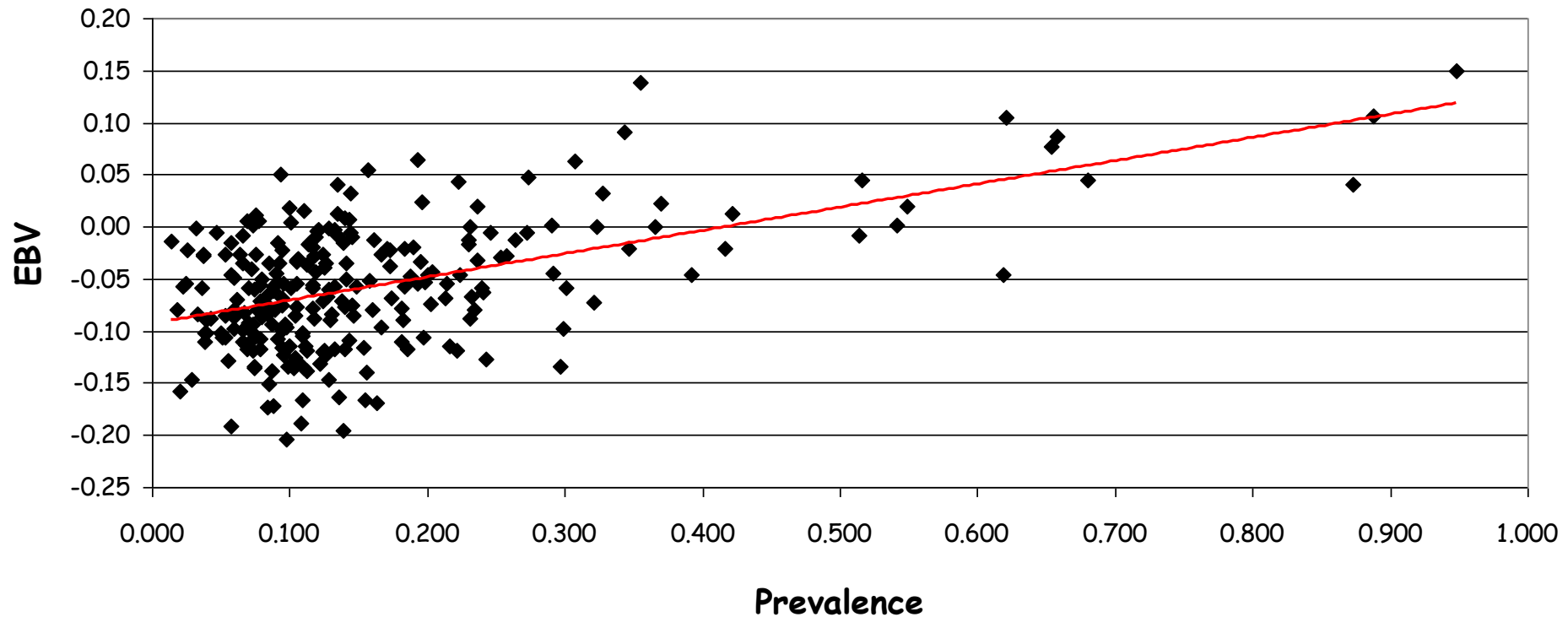
Tara Carthy

TB - sire prevalence



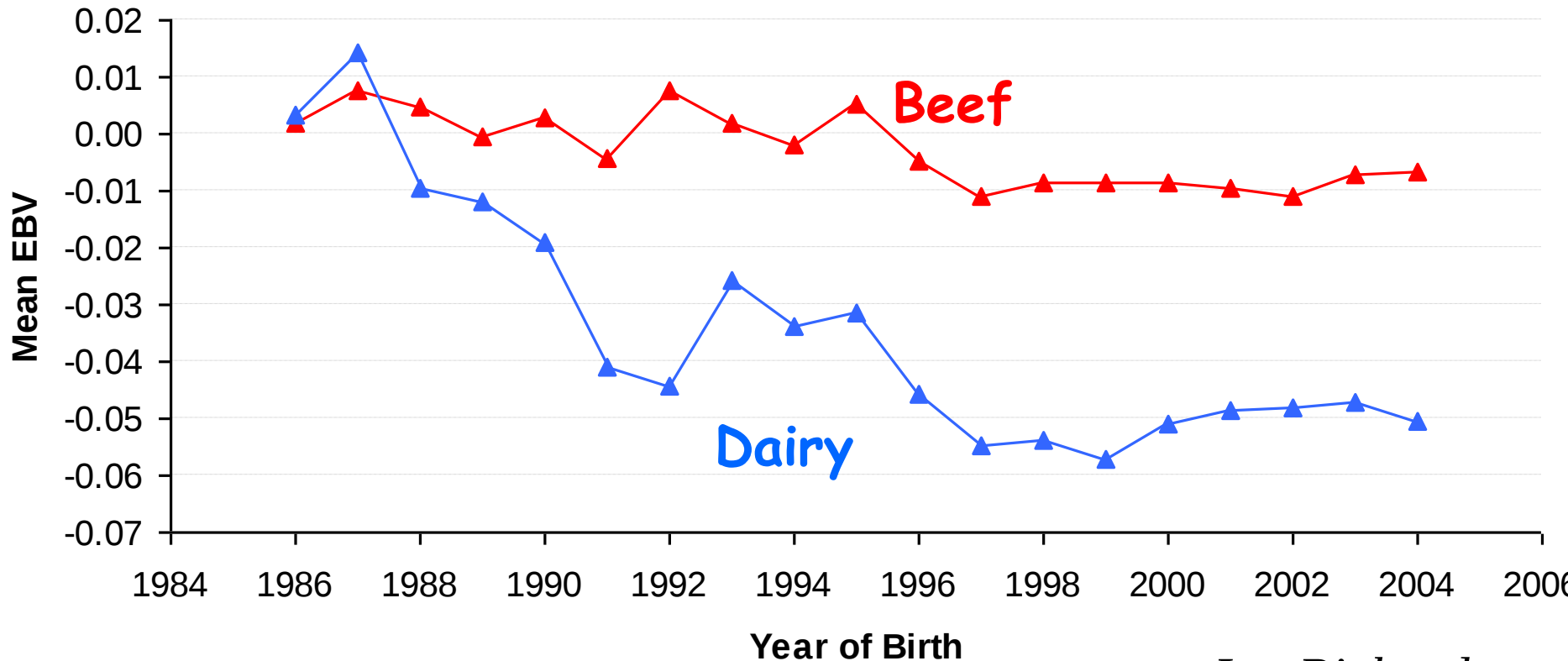
Ian Richardson

TB - genetics versus prevalence



Ian Richardson

TB - genetic trends



Ian Richardson

Next steps

- Collect more data on more diseases
 - Johnes
 - Abattoir data
- Develop robustness index
 - Health traits, BCS, fertility.....

Acknowledgements

- Research Stimulus Fund (11/S/133)
- SFI 09/IN.1/B2642
- Data providers



IRISH CATTLE BREEDING FEDERATION

New projects.

Andrew Cromie

1. Health & Disease.

- Two major projects for 2014+
 - Linking existing databases re: health & disease traits.
 - Data collection systems on farms.
 - Event based recording (MA, LM, Scour....
 - Event based recording + treatments + animal remedies/quality assurance.
- Covering dairy & beef.
- Meetings with key stakeholders.

2. Genomics (i)

- Genomics for breeding program, traceability & quality assurance.
- Single sample, single system initiative for all key stakeholders.
 - ICBF, herdbooks, AI, meat processors, Borb Bia, DAFM, Teagasc.....
- Remove duplication -> maximise benefits for all.

2. Genomics (ii)

- Key elements of proposition;
 - Tissue sample.
 - Central repository.
 - Categories of animals (pedigree, commercial breeding, slaughter.....).
 - Use of latest SNP technology.
 - Use of ICBF infra-structure.
- 5-year program, with funding.
- Meetings underway.

3. Male fertility.

- Evidence of differences in male fertility for AI sires.
 - Sexed semen project.
- Arguably larger differences for natural service sires.
- Opportunity to establish a project to evaluate male fertility and establish “industry standards” for this trait.
 - Teagasc, CAVI vets, breeders.....
- *Please speak to me afterwards.*

4. Meat Eating Quality.

- Trait is heritable (10-15%).
 - Breed differences. Also within breed differences.
- Opportunity to establish based on animals slaughtered from Tully.
 - Trained meat tasting panels (Eolas).
 - Consumer panels (Ploughing?).
- Work underway. Updates at next meeting.

Development of a custom SNP chip for dairy and beef cattle

2013: an update

Rebecca Weld¹, Francis Kearney², Andrew Cronin³
and Donagh Berry⁵

¹Teagasc: Athenry; ³Grange; ⁵Moorepark

²ICBF, ⁴Weatherbys
michael.mullen@teagasc.ie

August 2013

Objectives

- Develop an inexpensive SNP chip for parentage verification and genomic selection in dairy and beef cattle
- Incorporate testing for known major genes / lethal recessives / congenital disorders
- Update annually

IDB content (V1-19K)

- Genomic selection - imputation to HD
~12,500 SNPs
 - Standard ~7,000 Illumina LD 'base' panel
 - Additional ~5,500 for imputation
- Parentage ~2,500 SNPs
 - ~200 SNPs per microsatellite (n=12)
 - 116 SNPs Heaton panel
- Lethal recessives (n=4)
- Congenital disorders (n=33)
- Major genes (n=16)
- Research component <2,000 SNPs

Status

8472 samples from March to 21st June 2013

Breed Number

AA 42

BA 2

BB 35

CH 964

FR 937

HE 242

Breed Number

HO 4417

LM 1130

PT 3

SA 6

SH 18

SI 186

Parentage verification

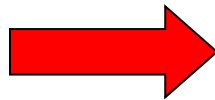
Sire
SNPs



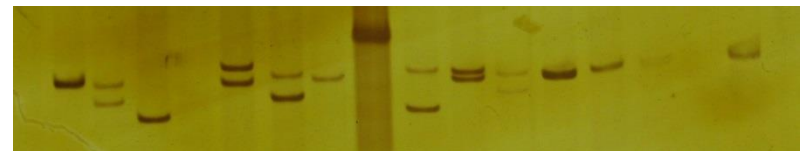
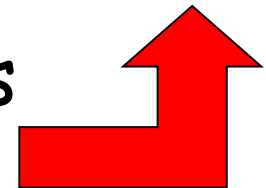
Parentage	Suggested sire
✓	n/a
X	BJY



Sire
Microsatellites



Predict microsats
from SNPs



Lethal recessives / Major genes

Holstein-Friesian

2% Brachyspina carriers

4% CVM carriers

Males & females

<<1% Citrullinaemia; Osteopetrosis; Mulefoot

DUMPs free -

21% A1/A1, 46% A1/A2, 33% A2/A2

45% DGAT1 carriers, 15% DGAT1 (K)

56% Kappa Casein

Lethal recessives / Major genes

CH/AA/BB/HE*/LM/SM

No Brachyspina - No CVM - No DUMPs

No fawn or curly calf

Myostatin - 19 variants

Mutation	Freq (%)					
	CH	AA	BB	HE	LM	SM
Q204X	27	-	-	-	7	-
FL94	27	2.5	6	-	98	50
nt821	<1	2.5	33	-	6	-

*2% Hairlessness carriers

Conclusions

- Custom chip - value for money
 - Flat price (extra costs for some tests)
- Eliminates need for standalone testing
 - Lethal recessives/congenital disorders
 - Major genes
 - Parentage
 - Genomic selection
- Carriers of lethals and major genes

IDB V2

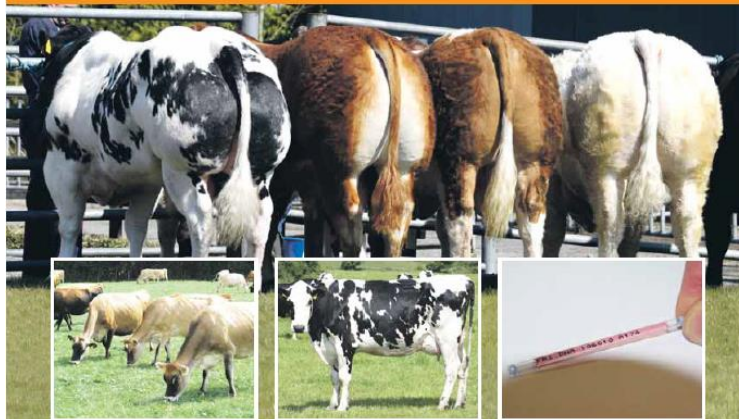
- Release January 2014
- Updated to include:
 - Additional ~50+ causative mutations
 - Breed assignment
 - Species identification

Acknowledgements

- **Chip design:**
 - Breed Societies and AI stations
 - Paul VanRaden, USDA
 - Jon Beever, Illinois university
- **Funding:**
 - Research Stimulus Fund (RSF-06-353; 11/S/112)
 - SFI (07/SRC/B1156)
 - Breed Societies and AI stations
 - ICBF & Teagasc

IDB flyer

IDB SNP CHIP INTERNATIONAL DAIRY & BEEF SNP CHIP



Designed in association with the Irish Cattle Breeding Federation (ICBF), Teagasc, Weatherbys and USDA's Agricultural Research Service.

This custom chip is the very latest design catering for both Beef and Dairy.

The chip consists of the Illumina LD (7K) base content plus a further 10,000 (10K) SNPs carefully selected to ensure very high imputation accuracy to HD & to convert to Microsatellite data for parentage verification. This extra panel of SNPs provides the very latest dual product for both Beef & Dairy breeds.

Both the core and additional ISAG recommended SNP parentage panels are present on the chip.

The IDB also contains a comprehensive selection of genetic markers to screen for genetic disorders & major genes.



For more details Contact: Weatherbys Ireland DNA Laboratory

+353(0)45875521
jflynn@weatherbys.ie



WEATHERBYS
Ireland

CHIP CONTENTS FOR DISEASES & TRAITS

Lethal recessives

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

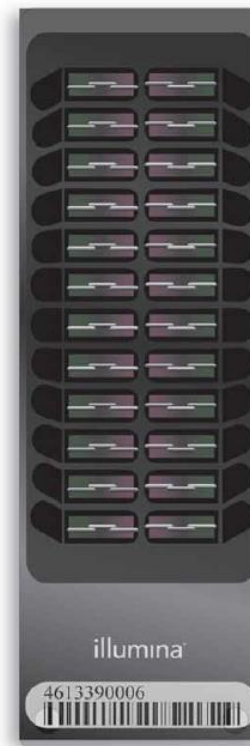
Congenital disorders

- 1 Arthrogyposis (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 Pollardness
- 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 Protoporphyrin 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 (H1, H2, H3, H4)
- 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





IRISH CATTLE BREEDING FEDERATION

Genomics for parentage verification



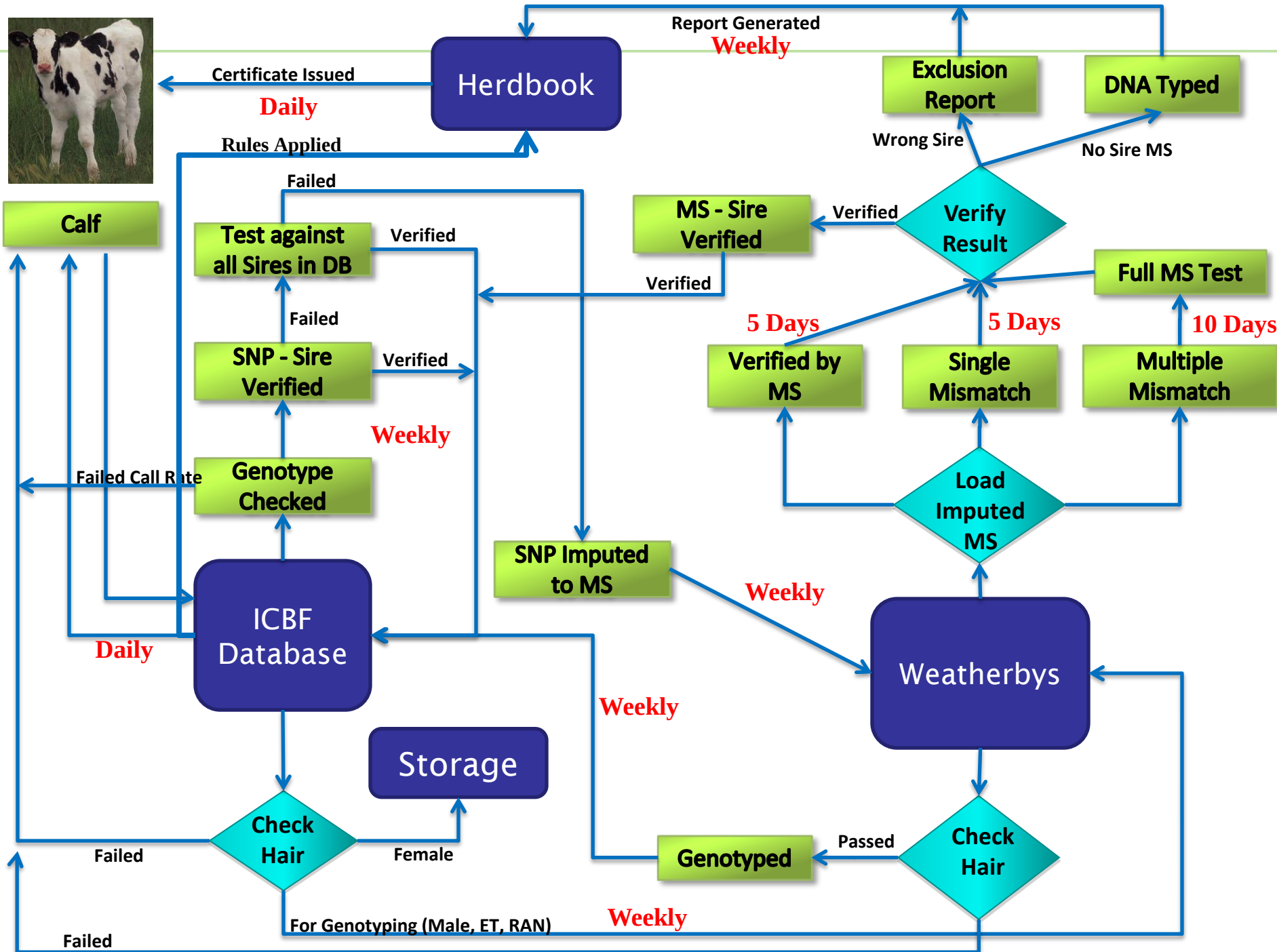
1st August 2013

Genotyping - Background

- Process in place since 2012 for HO/FR
- New process in 2013 for Pedigree Beef Male Calves
 - €10 Farmer – refunded if part of DAFM BDP scheme
 - €10 Society/Farmer
 - €10 Teagasc
 - €10 ICBF
- Using New technology – IDB19 & SNP Sire Verification
- Process has not gone as well as we expected
- Technical issues resulted in unforeseen delays
- Caused significant issues for the breed societies involved
- Considerable resources invested in past few weeks to rectify and we apologise sincerely for inconvenience caused.

Beef Herdbook Rules

- Males & Female (for some HB) animals born in 2013 are identified in the rules and given a GNO category
- Hair sample kits are issued to the breeder with the Herdbook specific letter.
- When the samples are received back in ICBF, the male samples are sent to Weatherbys for testing, the female samples are recorded and put into storage.
- The results from Weatherbys are received by ICBF and loaded into the database.
- The parentage is verified
- The animal then gets a PPT category and the HB rules continue.



Genotyping – Current status

- 26,000~ sample kits sent out (incl. males & females)
 - 13,000~ Beef Animals & 13,000~ Dairy Animals
- 17,000~ samples back
 - 7,300~ Beef Animals
- 13,600~ samples – all dispatched to Weatherbys
 - 4,200~ Beef Animals
- 13,200~ genotypes received
 - Beef
 - 45 % Sire Verified by SNP
 - 55% Sire Verified by Microsatellite
- 132 Beef animals with genotypes returned prior to Jul outstanding.

Sire Verification

- If animal fails SNP sire verification check – breed society notified.
- It will be checked against all other sires in the database – if an alternative is found breed society is notified and can make the change
- Where sire is not found, ICBF can provide the MS imputation for the animal but a DNA on the dam will be required to do a MS sire. Breed society, Weatherbys, breeder.
- Where the Sire of the Calf does not have a Genotype, the calf MS is imputed and sent to Weatherbys to confirm by MS verification.
- In dairy, we can identify 75% of incorrect sires from the genotype database – remainder by un genotyped stock bulls/ AI bulls not genotyped.

Additional Processing

- For ET calves typically a genotype does not exist for the dam. An imputed MS is generated and sent to Weatherbys for dam and sire verification by means of MS.
- For calves that don't have a sire genotyped the calf must get an imputed MS and then be verified by Weatherbys
- For animals that have poor quality hair samples, resampling must take place
- For animals that are genotyped with poor call rates, resampling must take place
- Hair cards are slowly returning – Text message reminders are actively being sent out.
- Letters due to go out detailing the delays and requesting hair cards to be returned.

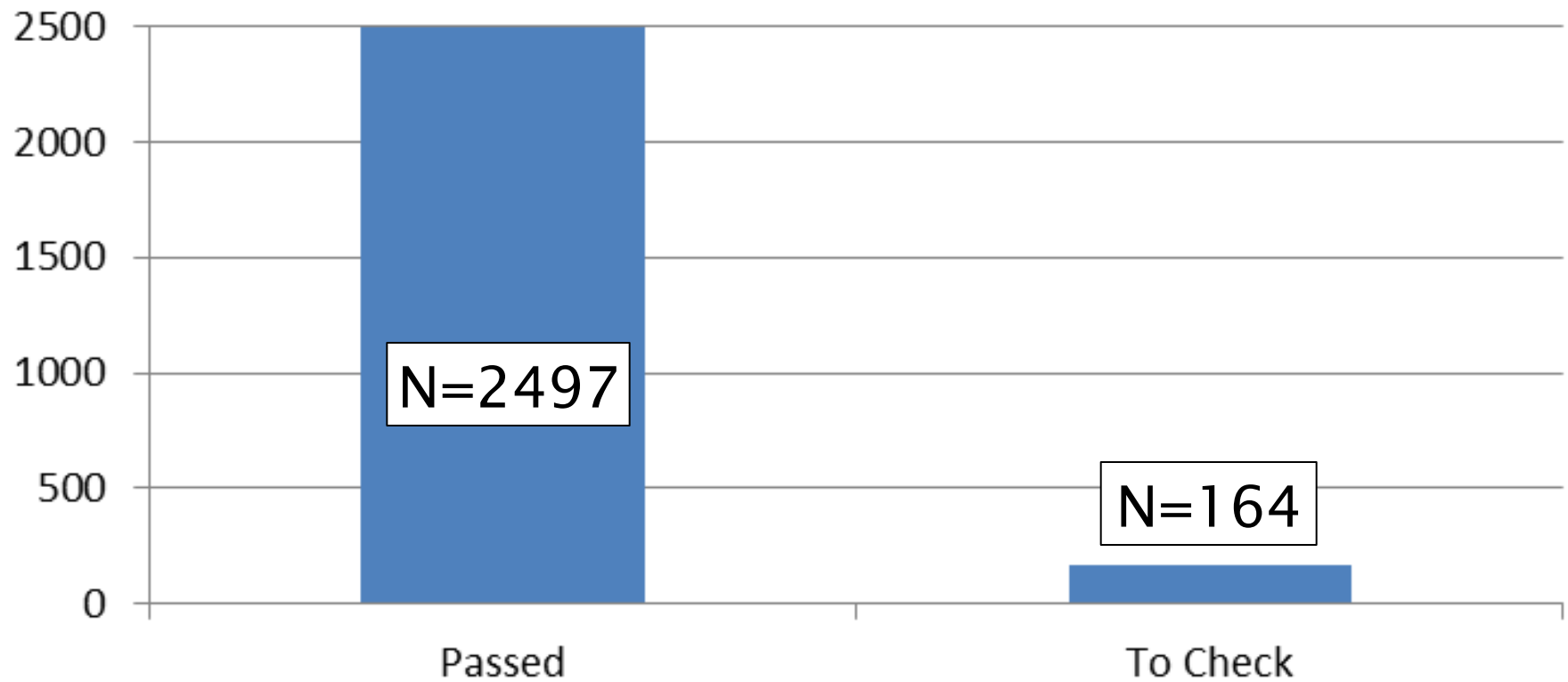
Herdbook Screens

Click Column Heading to sort by that attribute. Number of Batches Displayed :35

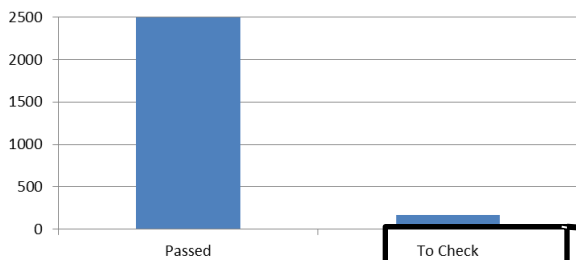
[Reset](#)

Date Requested	Herd	Owner	Animal Number	Sex	Breed	Sample	Org	Sent to Farm	ICBF Received	Sent to Lab	Chip	Genotype Received	DNA Processing	Sire Verified	Cert Print	Genotype Published
07-JUN-13			IE25	M	HE	HAIR	HE	07-JUN-13	18-JUN-13	19-JUN-13	19K	19-JUL-13	23-JUL-13	30-JUL-13	28-FEB-13	
04-JUN-13				F	LM	HAIR	LM	04-JUN-13			19K					
04-JUN-13				M	LM	HAIR	LM	04-JUN-13			19K					
04-JUN-13				F	LM	HAIR	LM	04-JUN-13			19K					
04-JUN-13				M	LM	HAIR	LM	04-JUN-13			19K					
07-JUN-13				F	HE	HAIR	HE	07-JUN-13	21-JUN-13		19K				11-JAN-13	
07-JUN-13				F	HE	HAIR	HE	07-JUN-13	18-JUN-13		19K				15-FEB-13	
07-JUN-13				M	HE	HAIR	HE	07-JUN-13	18-JUN-13	19-JUN-13	19K	12-JUL-13	15-JUL-13		18-FEB-13	
07-JUN-13				M	HE	HAIR	HE	07-JUN-13	11-JUL-13	17-JUL-13	19K				07-FEB-13	
07-JUN-13				M	HE	HAIR	HE	07-JUN-13	11-JUL-13	17-JUL-13	19K				07-FEB-13	
06-JUN-13				M	SI	HAIR	SI	06-JUN-13	25-JUN-13	26-JUN-13	19K	05-JUL-13	09-JUL-13	26-JUL-13	30-JUL-13	
07-JUN-13				M	HE	HAIR	HE	07-JUN-13	18-JUN-13	19-JUN-13	19K	19-JUL-13	23-JUL-13	30-JUL-13	28-FEB-13	
06-JUN-13				M	CH	HAIR	CH	06-JUN-13	24-JUN-13	26-JUN-13	19K	05-JUL-13	09-JUL-13	30-JUL-13		
06-JUN-13				M	CH	HAIR	CH	06-JUN-13	19-JUN-13	19-JUN-13	19K	28-JUN-13		04-JUL-13		
06-JUN-13				M	CH	HAIR	CH	06-JUN-13	09-JUL-13	10-JUL-13	19K	19-JUL-13		23-JUL-13	23-JUL-13	
06-JUN-13				M	CH	HAIR	CH	06-JUN-13	17-JUN-13	19-JUN-13	19K	28-JUN-13	04-JUL-13	16-JUL-13	16-JUL-13	

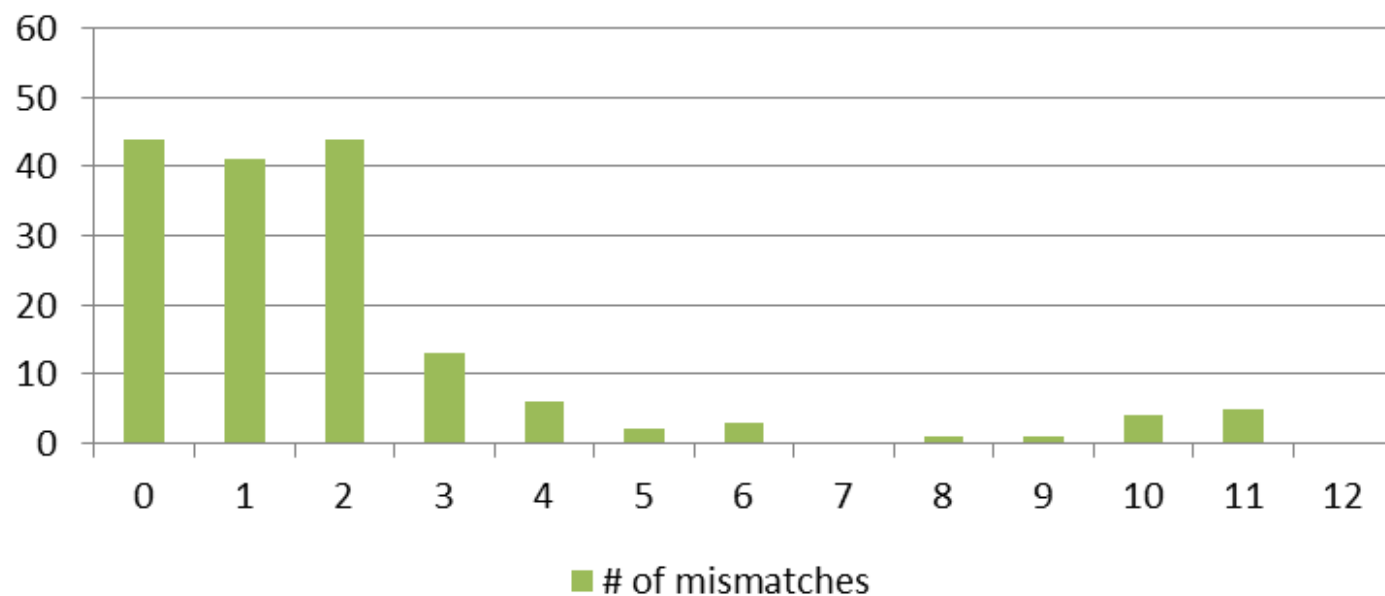
Initial success of Imputed Microsatellites



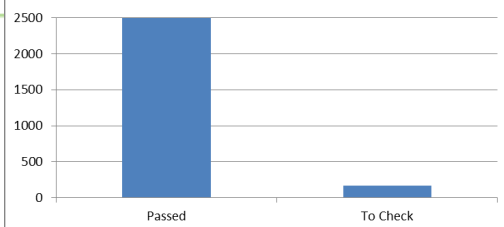
Initial success of Imputed Microsatellites



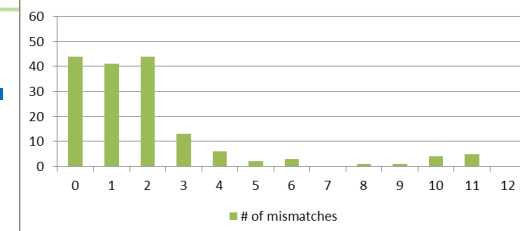
Difference between Imputed and Genotyped Microsatellites



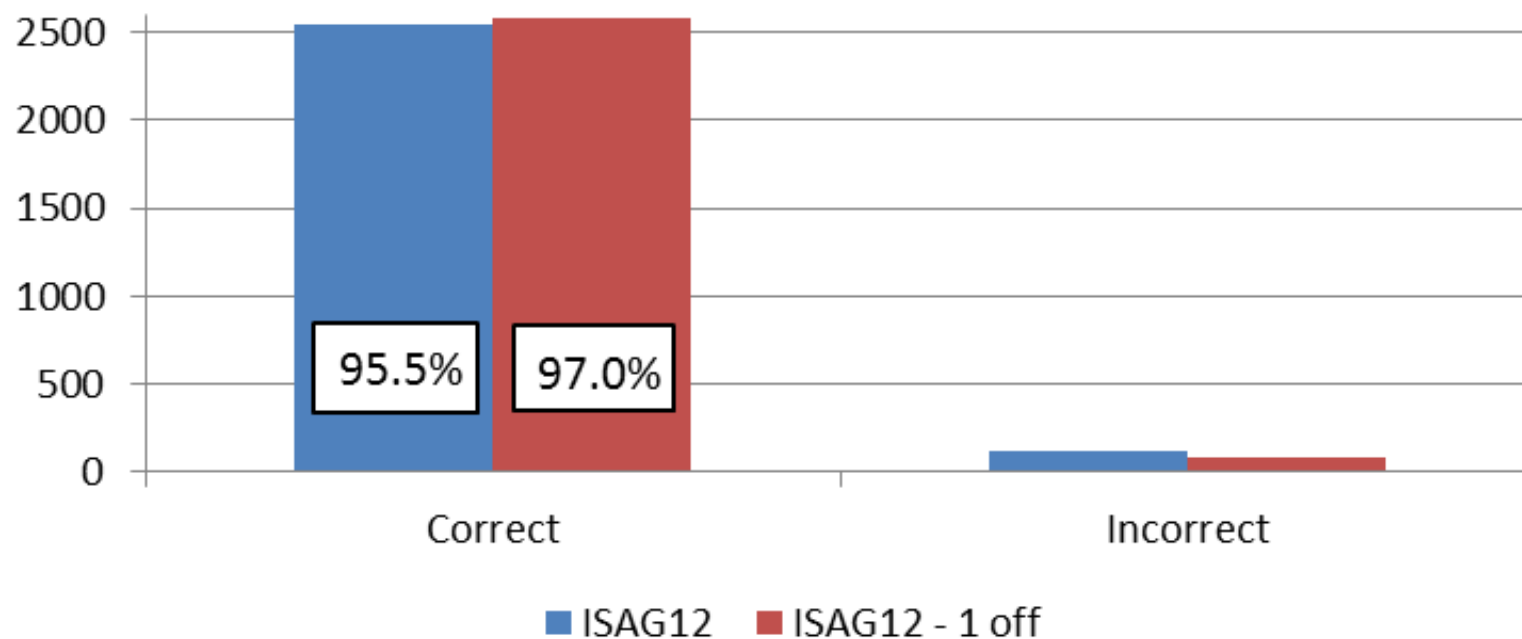
**Initial success of Imputed
Microsatellites**



**Difference between Imputed and
Genotyped Microsatellites**



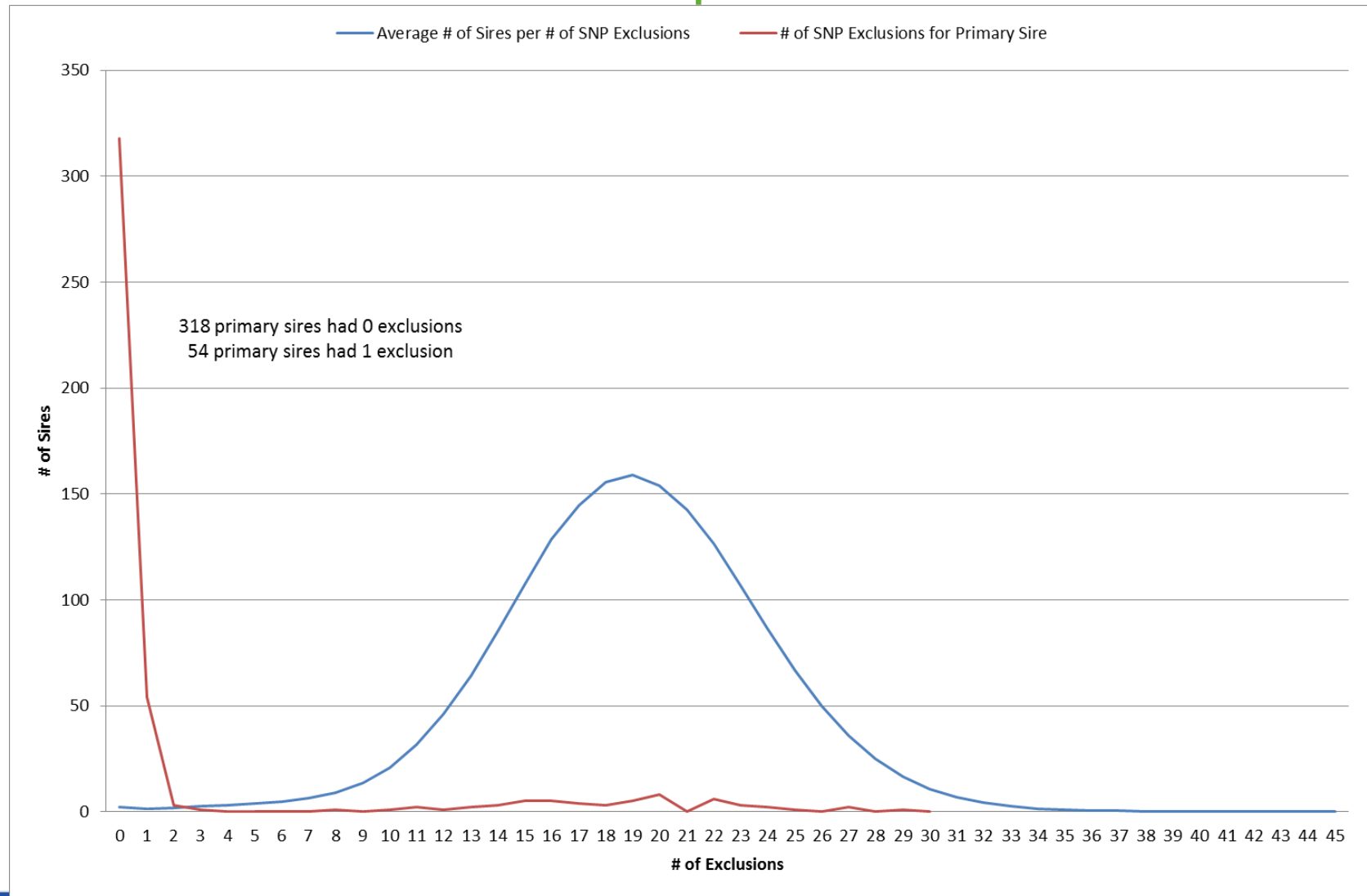
Overall Success of Imputed Microsatellites



ET Animals

- 2,661 animals have had microsatellite genotypes imputed
 - SNP parentage failed (small #)
 - Embryo transfer animal
 - No SNP genotype on sire (most of them)
- 97% accuracy with imputed microsatellites
 - Accuracy will increase for new runs
- Microsatellite imputation has saved Irish cattle farmers ~€50,000, as cost of MS genotyping is €20/animal.

Parental Verification of Nellore Cattle by Neogen using 14 SNP panel



Validation of the maternal indexes

N McHugh, A Cromie, R Evans & D Berry



Background

- Accurate genetic evaluations are key to sustainable genetic gain
- Must be reflective of on-farm performance
- Suckler cow key to overall efficiency and profitability
- Recent industry figures from the ICBF, on average:
 - 30 months of age at first calving
 - 384 days calving interval
 - Producing 0.85 calves per cow per year
- Assess to accurate genetic evaluations → selection of superior cows for breeding

Objective:

Do genetic evaluations work?

Previous studies... Terminal traits

- Genetic evaluations carcass traits → reflected in differences in animal performance
- High beef carcass sub-index → greater profitability of progeny
 - Carcasses of progeny of high BCI sires were 14 kg heavier
 - Difference in profitability at slaughter:
 - €42 based on BCI
 - €53 based on actual difference

What about maternal traits?

- Can be tested by comparing:

1. **Breeding values** for maternal traits
published by ICBF in April 2011

to

2. **Performance** of their subsequent
offspring

Analysis

Trait	No of Animals
Calving difficulty	25,967
Calf mortality	19,547
Age at first calving	7,981
Calving Interval	38,619
Cow Survival	5,582
Weaning weight	10,878
Maternal weaning weight	10,878

Maternal Traits

1 Star ★

V's

5 Star



Relative to 5 star animal:

- 40% higher probability of calving difficulty
- 7.4% higher probability of dead calf
- 3.2% lower probability of cow surviving to next parity

Maternal Traits

Expected result each unit increase in EBV increases trait by 1 unit

Trait	Each unit increase in EBV
Calving interval	↓ 0.58 days
Age at first calving	↓ 0.32 days
Weaning weight	↑ 1.75 kg
Mat weaning weight	↑ 0.84 kg

Maternal Traits

Expected result each unit increase in EBV increases trait by 1 unit

Trait	Each unit increase in EBV
Calving interval (Parity 2 or greater)	↓ 1 days
Age at first calving (Spring calving herds)	↓ 0.66 days

Future research

Maternal Herd (2013)

Total herd size 120

$\frac{3}{4}$ Suckler heifers (60)

$\frac{1}{2}$ dairy heifers (60)

**High genetic
merit (30)**

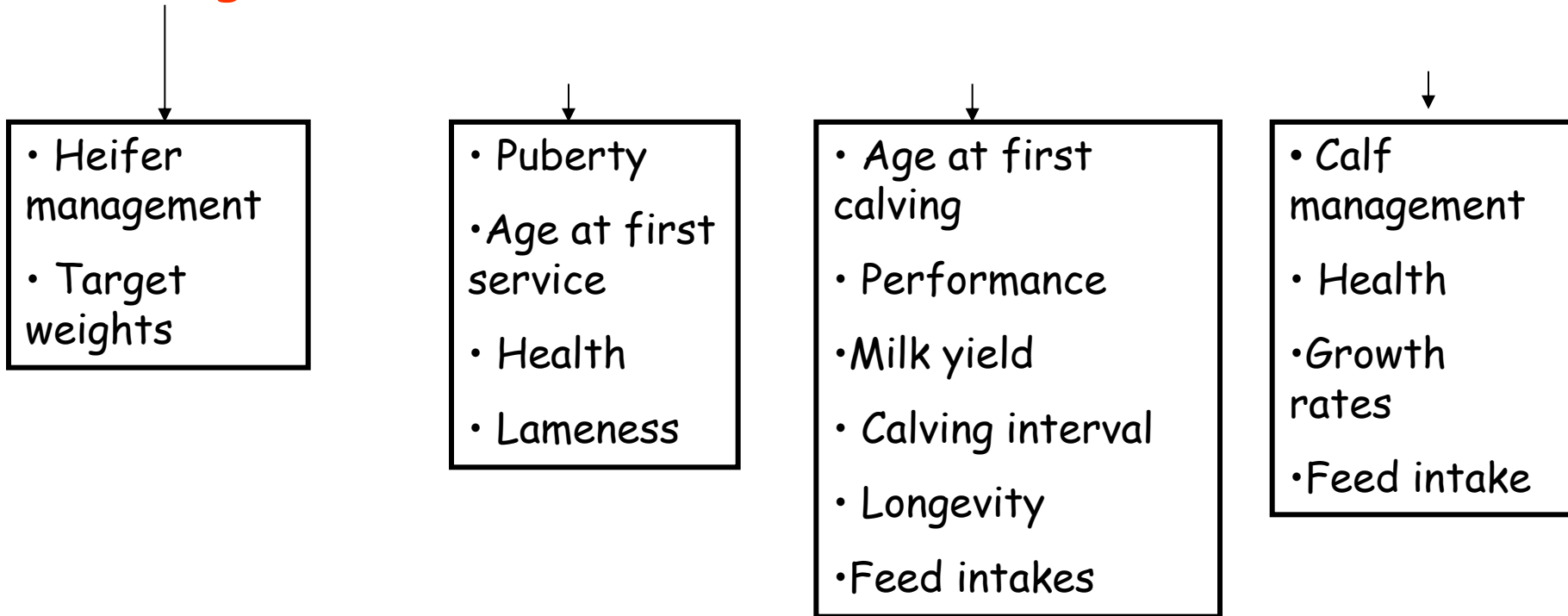
**Low genetic
merit (30)**

**High genetic
merit (30)**

**Low genetic
merit (30)**

Data recording

Weanlings



Conclusions

- Genetic evaluations key to **sustainable** genetic gain
- Genetic merit for maternal traits **was associated** with superior performance
- Importance of indexes for **improving profitability** in maternal traits
- New maternal suckler beef cow research herd **further investigate** maternal traits



IRISH CATTLE BREEDING FEDERATION

InterBeef & International data

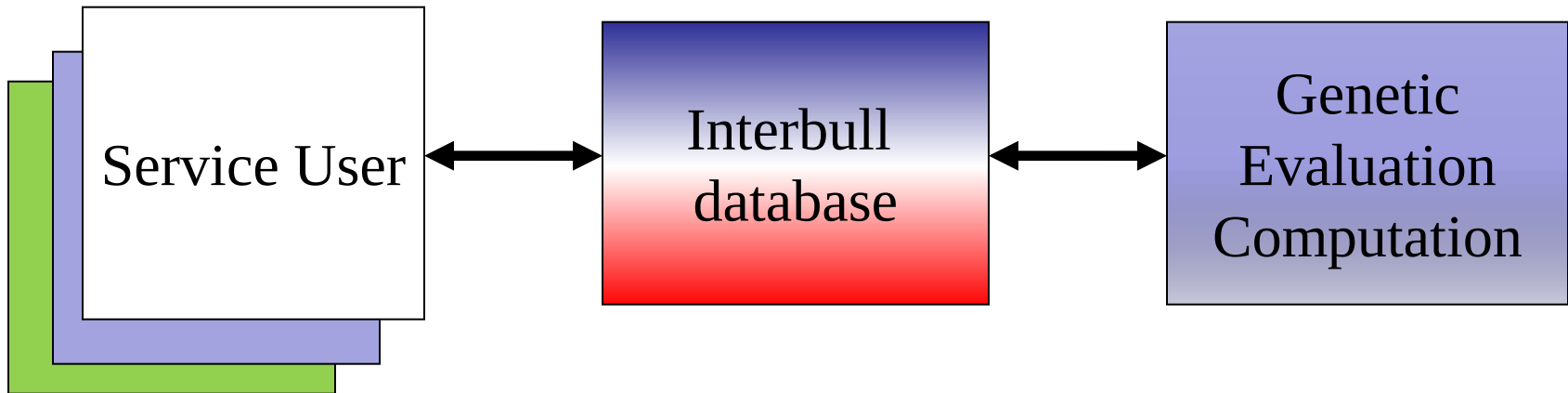


InterBeef Background

A working group of ICAR (chair. B. Wickham)
with objectives for beef breeds & traits:

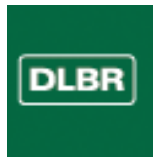
1. Provide forum for sharing knowledge on recording & genetic evaluations
2. Maintain guidelines & standards
3. Conduct international surveys
4. Develop international genetic evaluation services
5. Facilitate use of genomic selection

InterBeef Overview



- Service Agreement & Fees
- Rules for Participation - Roles & Responsibilities
- Operating Procedures
- Data Flows & Interfaces
- Quality Control & Query Support
- Methods & Models

InterBeef Service Users



- Anders Fogh



- Laurent Griffon



- Jan-Åke Eriksson



- Andrew Cromie
- Thierry Pabiou
- Ross Evans



- Clara Diaz



- Kaisar Siirko



CZECH BEEF BREEDERS ASSOCIATION

- Kamil Malat



- Raph MRode
- Kirsty Moore

Germany
Rep. South Africa
Letonia

InterBeef Research



- Eric Venot
- Florence Phocas
- Gilles Renand



- Andrew Cromie
- Thierry Pabiou
- Ross Evans



- Pavel Bucek



- Raph MRode
- Kirsty Moore

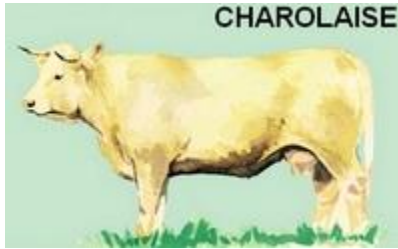


- João Dürr
- Valentina Palucci
- Mohammad Nifooroshan

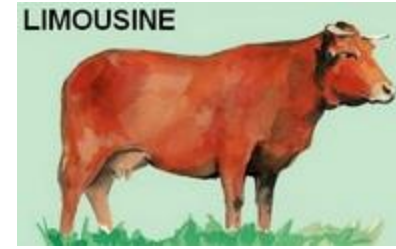
InterBeef Data

- Across country genetic evaluation
 - Using phenotypes
 - Accounting for GxE across countries
- Currently
 - 8 countries : FRA, IRL, GBR^{LIM}, SPA^{LIM}, SWE, FIN, DNK, CZE
 - 2 breeds : LIM & CHA
 - 1 routine trait : weaning weight
 - Research traits : calving/crossbred/carcass

InterBeef Weight Records



	COUNT	PERCENT
FRA	2,890,376	94.88
SWE	92,293	3.03
CZE	20,024	0.66
IRL	16,749	0.55
FIN	14,224	0.47
DNK	12,671	0.42



	COUNT	PERCENT
FRA	1,678,674	88.36
GBR	108,099	5.69
DNK	34,467	1.81
ESP	31,897	1.68
SWE	15,550	0.82
IRL	14,911	0.78
FIN	11,352	0.60
CZE	4,938	0.26

InterBeef Current Status

- Genetic parameters estimations for weight
 - IRL: in progress
- Definition of publication rules
 - InterBeef working group: near completion
- Expected routine evaluation for weights : Jan 2014
- Expected pilot run for calving: Jan 2014
- Inclusion of Xbred research
 - IRL : spring 2014

International Data

- Foreign breeding value = new trait
 - Breeding value = phenotype
 - Accuracy $\sim$ number of progeny
 - Genetic correlation to account for across country GxE
- No post-process
 - Breeding value account for Irish records AND genetic potential abroad

International Data Records

	Breed	Calving	Beef	Slaughter
F	Aubrac	4637	4790	
R	Blonde d'Aquitaine	1705	2008	2051
A	Charolais	11558	17863	13196
N	Limousin	9887	11156	10906
C	Parthenais	2670	2784	2750
E	Rouge des Pres	113	809	130
	Salers	5607	6058	6015
U	Angus	1844	1318	
K	Belgian Blue	748	534	
	Charolais	300	168	
	Hereford	279	216	
	Limousin	2408	1425	
	Simmental	768	582	
BEL	Belgian blue	201		

International Data Current Status

- Importance of foreign EBVs in Irish genetic evaluation
- 👍 V. good working relation with France and UK SAC – Foreign EBVs up to date.
- 👎 Breedplan EBVs – last update Aug. 2011

Conclusion

- InterBeef EBVs
 - Goal post
 - Access to a large amount of animals
 - Need establish (political/technical/financial) framework
- International data
 - Intermediate quick solution
 - Currently trying to establish working link with Australia re: Breedplan



IRISH CATTLE BREEDING FEDERATION

GENE IRELAND Maternal bull program



Objectives of GEN€ IRELAND MBBP

1. Identify the top maternal bulls across all the breeds and subsequent progeny testing to identify the best bulls
2. Reward herds that consistently provide high quality data for genetic evaluations – Herd Data Quality Index (HDQI)

GENE IRELAND MBBP



Herds signed up-to-date

- ❖ 185 herds
- ❖ Breakdown by breed of pedigree females in the program (n = 5457)

Breed	AA	AU	BB	SA	CH	HE	LM	PT	BA	SH	SI
Pedigree females	1036	119	71	375	921	413	1694	127	120	64	529

- ❖ Data collection visit
 - ❖ Weight, docility & functionality data
 - ❖ 85 herds visited to date
 - ❖ 3 scorers allocated to visit these herds
- ❖ ICBF herds visits
 - ❖ Overview of program, benefits & how to record information online etc.
 - ❖ 45 herds visited to date
 - ❖ Carried out by ICBF staff

Committee meetings

❖ Meetings held to date:

- LM, SI, CH, PT & SA – 2 meetings
- AA & BB – 1 meeting

❖ Upcoming meetings:

- CH, PT, SA & SI (3rd September)
 - Maldron Hotel, Portlaoise
- LM, AA, & BB (4th September)
 - Maldron Hotel, Portlaoise
- AU, SH & HE (29th August) – First meeting
 - Tully test center, Kildare

Committee meetings cont'd

- ❖ Focus is on:

- ❖ Identifying bulls for mating advice

- Must have adequate semen available
 - Autumn 2013

- ❖ Identifying bulls for progeny testing

- Each breed has different criteria i.e. calving difficulty etc
 - Available for Spring 2014 G€N€ IR€LAND program

- ❖ Promoting the program

- Weekly piece in IFJ



IRISH CATTLE BREEDING FEDERATION

GENE IRELAND progeny test at Tully



Tully progeny test

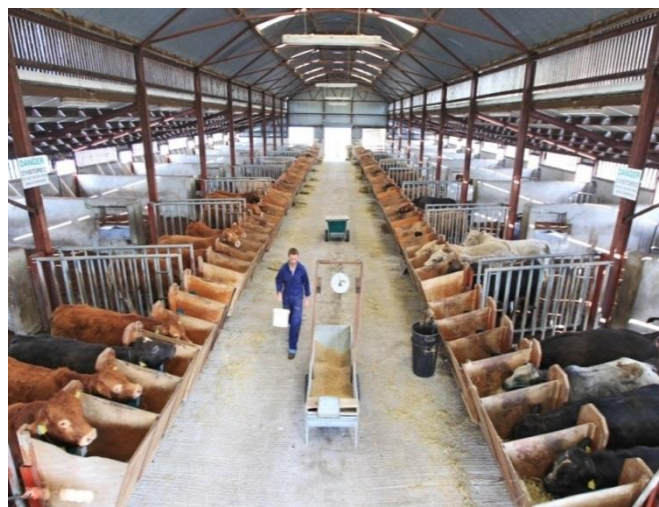
Progeny slaughtered to date

- ❖ 77 bulls (dob: 1st Aug – 30th Sept 2011)
 - Slaughtered: Dec 2012

- ❖ 58 bulls (dob: 1st Oct - 30th Nov 2011)
 - Slaughtered: March 2013

- ❖ 51 bulls (dob: 1st Dec 2011 - 31st Jan 2012)
 - Slaughtered: June 2013

- ❖ All data is available on the ICBF website (www.icbf.com) under the Tully section



Tully performance data

Performance for the 186 bulls slaughtered from Tully ranked on slaughter value

Group	Slaughter value (€)	Start Live-weight (kg)	Final Live-weight (kg)	Average Daily Gain (kg)	Dry Matter Intake	Feed Conversion Efficiency	Kill Out %	Carcass Weight (kg)	Age at slaughter (months)
5	€106	517	688	1.9	11.5	6	60.3	414.6	16.1
4	€87	481	659	1.98	11.4	5.9	59.8	393.8	16.5
3	€75	508	705	2.19	12.5	5.8	59.2	417.4	16.7
2	€61	500	689	2.1	12.3	5.9	58.6	403.3	16.8
1	€35	494	692	2.2	13.3	6.2	56.6	392.2	17
Average	€75	497	686	2.1	12.1	5.9	59.1	405.2	16.6

Tully progeny test cont'd

Progeny in the acclimatisation period

- ❖ 54 steers (dob: 1st Nov 2011 – 31st Dec 2011)
 - Due to start test: 1st August 2013
- ❖ 30 bulls (dob: 1st July 2012 – 31st August 2012)
 - Due to start test: 10th August 2013

Progeny on test

- ❖ 63 bulls (dob: 1st March 2012 – 30th April 2012)
 - Started test: 25th April 2013
 - Due to be slaughtered: 6th August 2013
- ❖ 46 bulls (dob: 1st May 2012 – 31st June 2012)
 - Started test: 2nd July 2013
 - Due to be slaughtered: Early October 2013

Data collected in Tully

- ❖ 90-day testing period
- ❖ Traits recorded:
 - Average daily gain (kg/day)
 - Feed conversion efficiency (DMI/ADG)
 - Linear scores
 - Scanned muscle and fat depth (mm)
 - Scrotal circumference (cm)
 - Kill-out rate
 - Health information

Factory data collected

- ❖ Carcass grades
- ❖ Carcass weight
- ❖ Primal yields
 - British specification
 - 21 different cuts
- ❖ NIRS spectra images at 4-6 points on the carcass
- ❖ PH measurements of the carcass/striploin

Meat eating quality

- ❖ Collect in conjunction with Teagasc Ashtown.
- ❖ ICBF purchase the striploin (RHS carcass)
- ❖ Traits recorded:
 - Colour of loin
 - Visual marbling of the loin
 - Composition analysis – Intramuscular fat %, protein % & moisture %
 - Cook loss and shear force measurements
 - Samples of the striploin are archived for sensory and tenderness analysis.
- ❖ Samples are being analysed at present
 - Sensory work due to commence shortly

