IRISH CATTLE BREEDING FEDERATION

Implementation and uptake of Genomic Selection in Irish Holstein-Friesian Dairy Cattle

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NDP National Development Plan Transforming Ireland

Teagasc Agriculture and Food Development Authority

Estimation/Validation

- Genomic evaluations introduced in Ireland in Feb 2009 using GBLUP
- Training population of ~ 1000 bulls
- Large increase in genotypes through bi-lateral sharing with other countries
- Included MACE proofs in training population for 2010

ICBF.com

Estimation/Validation

Correlations

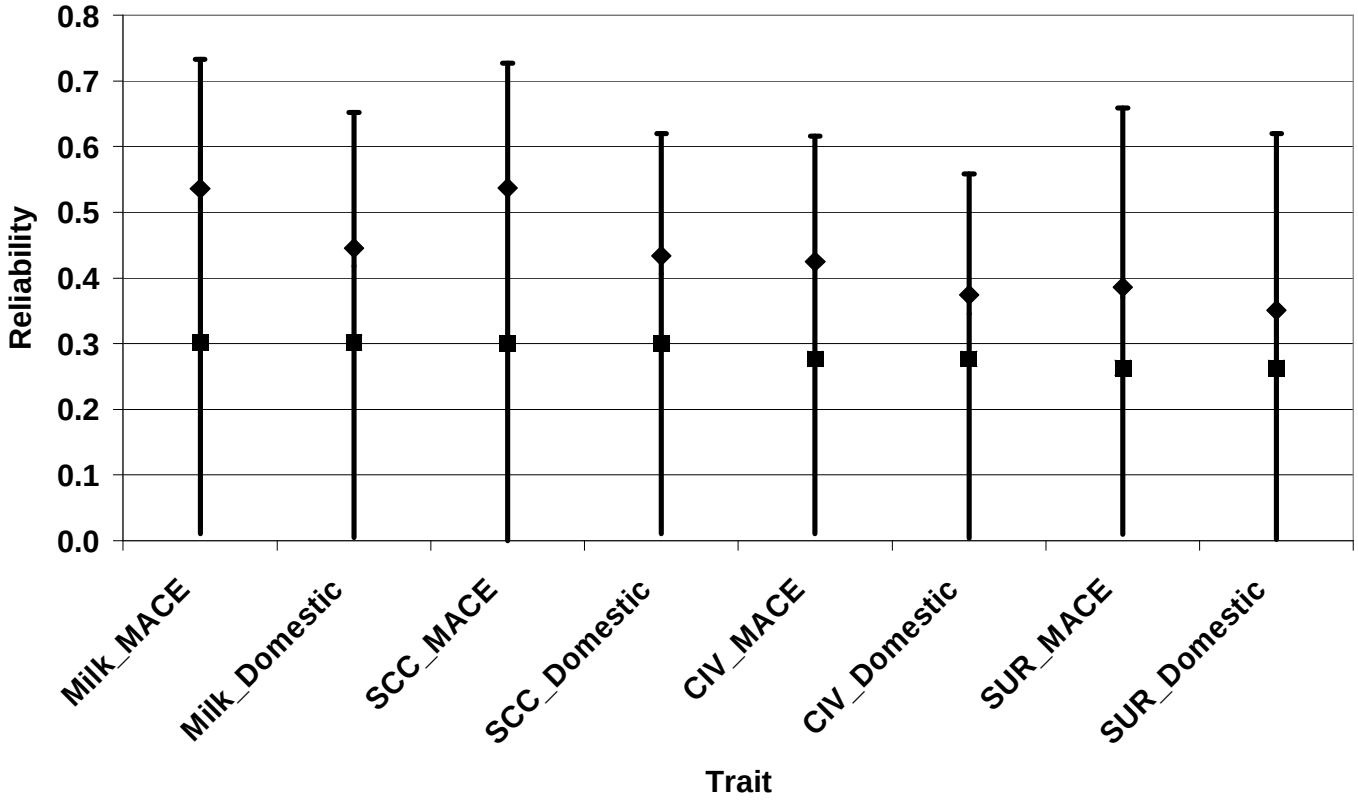
	Domestic			MACE		
	N	DGV	GEBV	N	DGV	GEBV
Milk (kg)	883	0.66	0.69	3204	0.77	0.77
Fat (kg)	883	0.65	0.65	3204	0.73	0.72
Protein (kg)	883	0.67	0.69	3204	0.77	0.77
SCC (SCC units)	883	0.41	0.47	3204	0.6	0.63
Calving Interval (days)	542	0.66	0.69	1447	0.73	0.73
Survival (%)	542	0.55	0.58	1108	0.58	0.59

Estimation/Validation

Bias

	Domestic			MACE		
	N	DGV	GEBV	N	DGV	GEBV
Milk (kg)	883	36	46.3	3204	35.8	37.6
Fat (kg)	883	-0.88	-0.58	3204	-0.36	-0.25
Protein (kg)	883	0.4	0.62	3204	-0.14	0.3
SCC (SCC units)	883	0.02	0.02	3204	0.02	0.02
Calving Interval (days)	542	-1.13	-1.29	1447	-1.11	-1.17
Survival (%)	542	0.54	0.76	1108	0.6	0.71

Estimation/Validation



■ Parent Average ♦ GEBV

Implementation

- Bulls with GEBVs were eligible for Active Bull list where:
  - reliability for EBI ≥35%
  - reliability of calving proof based on progeny was ≥50%
- DAFF imposed limits on use of semen from these bulls
  - <35% Rel – 3,000 doses
  - 35-50% Rel – 5,000 doses
  - 50% Rel -10,000 doses
- Farmers advised to use a minimum of 4 bulls
- AI companies marketing fresh semen rotated bulls on a daily basis to ensure farmers received multiple bulls

Implementation

Active Bull List (Top 75 bulls with >2000 doses) is published in spring for main breeding season

	2007	2008	2009	2010
EBI €	118	124	150	196
Milk SI €	46	52	69	73
Fert SI €	60	60	64	96
Ave Rel %	74	76	58	55
No. GS bulls	0	0	39	27

Uptake of GS bulls

- Inseminations from 2009 & 2010 breeding season collected via AI technician handheld
- ~500k records for both years
- Looked at 3 categories of bulls
  - DP-IRL – proven with daughters milking in Ireland
  - DP-INT – proven with no daughters milking in Ireland
  - GS – selected on DNA and parent average

Uptake of GS bulls

	2009		
Proof	% Use	Bulls /hrd	EBI (Rel)
DP-IRL	37	2.7	120(86)
DP-INT	29	3	133(56)
GS	34	4	179(55)

Uptake of GS bulls

	2009			2010		
Proof	% Use	Bulls /hrd	EBI (Rel)	% Use	Bulls/ hrd	EBI (Rel)
DP-IRL	37	2.7	120(86)	25	3	146(76)
DP-INT	29	3	133(56)	34	3	155(47)
GS	34	4	179(55)	40	4	218(56)

- Number of straws of GS bulls has increased 6% since 2009
- Farmers still using an average of 4 GS bulls to spread their risk

Why such an uptake?

- High genetic merit for GS bulls
- Limited availability of highest index proven bulls
- Lower straw price for GS bulls compared to proven bulls. Discount for using teams
- AI companies marketed teams of bulls (high fertility, high protein, easy calving etc).

GEBVs vs. EBVs

- Test bulls from 2006 marketed as GS bulls in Spring 2009
- Received their first proofs based on daughter performance in Aug 2009
- 35 bulls with ≥ 70% reliability for production

GEBVs vs. EBVs

	Correlation			Diff in mean		
	GEBV	DGV	PA	GEBV	DGV	PA
Milk (kg)	0.64	0.65	0.63	65	50	77
Fat(kg)	0.51	0.57	0.40	2	2	3
Prot(kg)	0.59	0.65	0.53	2	1.5	2.2
SCC	0.69	0.69	0.63	0.02	0.01	0.02
Fat %	0.79	0.73	0.76	0.01	-0.01	-0.01
Prot %	0.70	0.70	0.70	0	0	0

Conclusions

- Addition of more bulls with MACE proofs increased the accuracy of predictions
- Up to 40% of inseminations in 2010 to GS bulls
  - Genetic merit, cost
- On average each herd used an average of 4 GS bulls
- Initial results are promising
- Future research using 3k, HD with beef, genotyping cows and high reliability herd bulls