

Genomic Selection in Ireland

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The Irish Agriculture and Food Development Authority

"Genomic selection" v marker assisted selection

- **Marker assisted selection**
 - Only uses a small number of genetic markers
 - Usually commercially driven (Black box)
 - Generally does not consistently work across populations/breeds/families
- **Genomic selection**
 - (Hundreds of) thousands of markers
 - Usually driven by national genetic evaluation bodies (with commercial investment)
 - Does work - experience from dairy

Ireland - ground rules!

- Research
 - Teagasc - national research body
- Implementation
 - Irish Cattle Breeding Federation (ICBF)
- Access (based on dairy experience)
 - **AVAILABLE TO ALL!!!**
 - Irish and international breeding organisations (AI stations, breeders, farmers etc.)

Funding

- Teagasc

- ICBF

- Competitive funding

- Breeding biological material

- AI stations

Personnel time

€0.4 million cash
- genotypes

Before we go any further

- Genomics of any sort is USELESS without the basics
 - Live and accurate phenotypic database across a range of important traits
 - Pertinent breeding objective
 - A world-class breeding program able to compete internationally

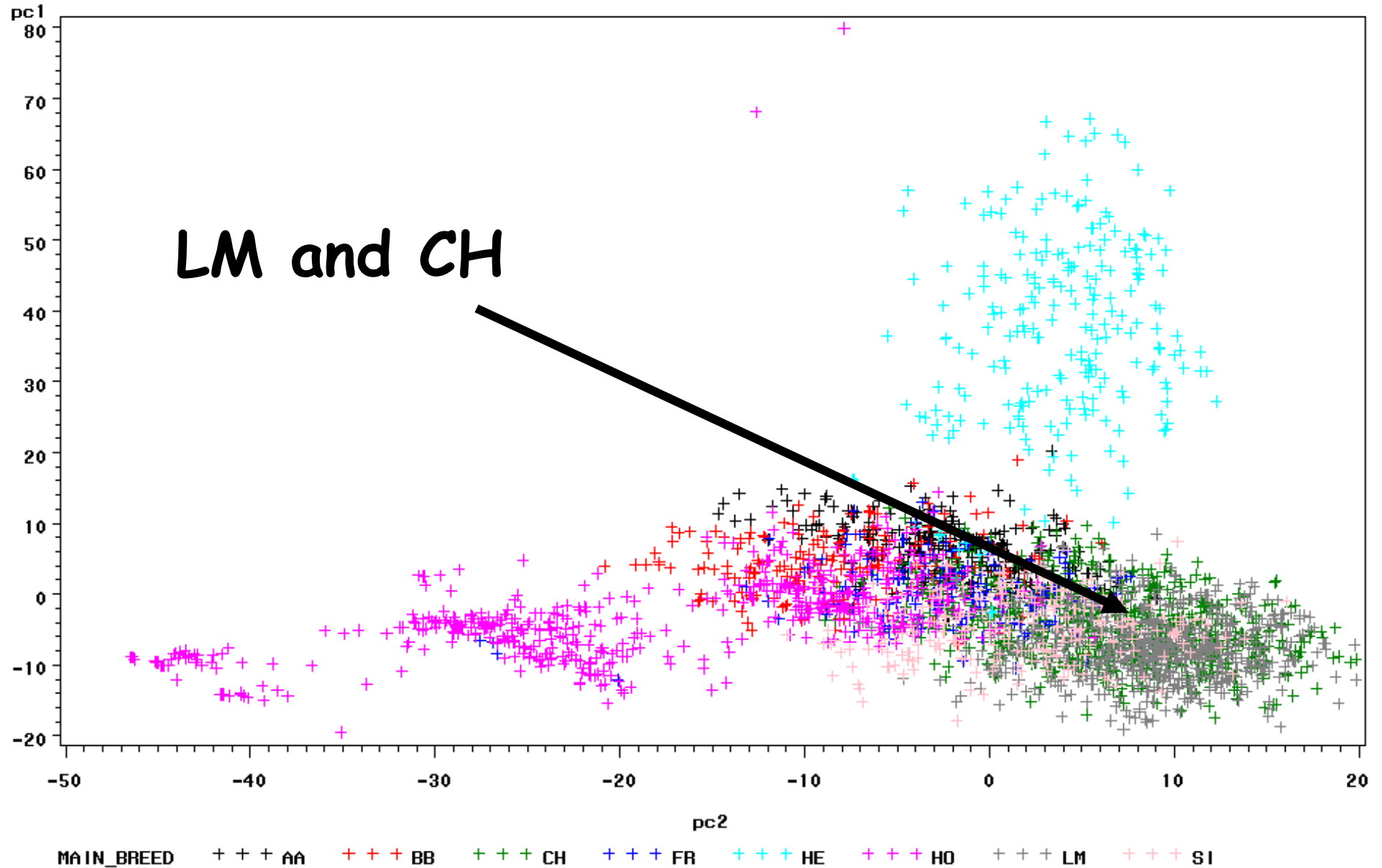
Genotyping - IRL

- **Illumina High Density genotypes**
 - Simulations suggest works best across breeds
 - Illumina (in my opinion) appeared more committed to bovine
 - Affymetrix???
- **Laboratories**
 - Weatherbys Ireland (jflynn@weatherbys.ie)
 - Neogen Ltd (formerly Geneseek)
(JWalker@neogen.com)

Current status - IRL

Breed	Total	Carcass wt	Direct calv. Diff.	Fertility
LM	730	672	709	167
CH	710	674	684	140
BB	196	157	190	45
HE	234	201	222	58
HF	721	701	707	145
SI	264	239	248	81
AA	269	235	256	48
TOTAL	3124	2879	3016	684

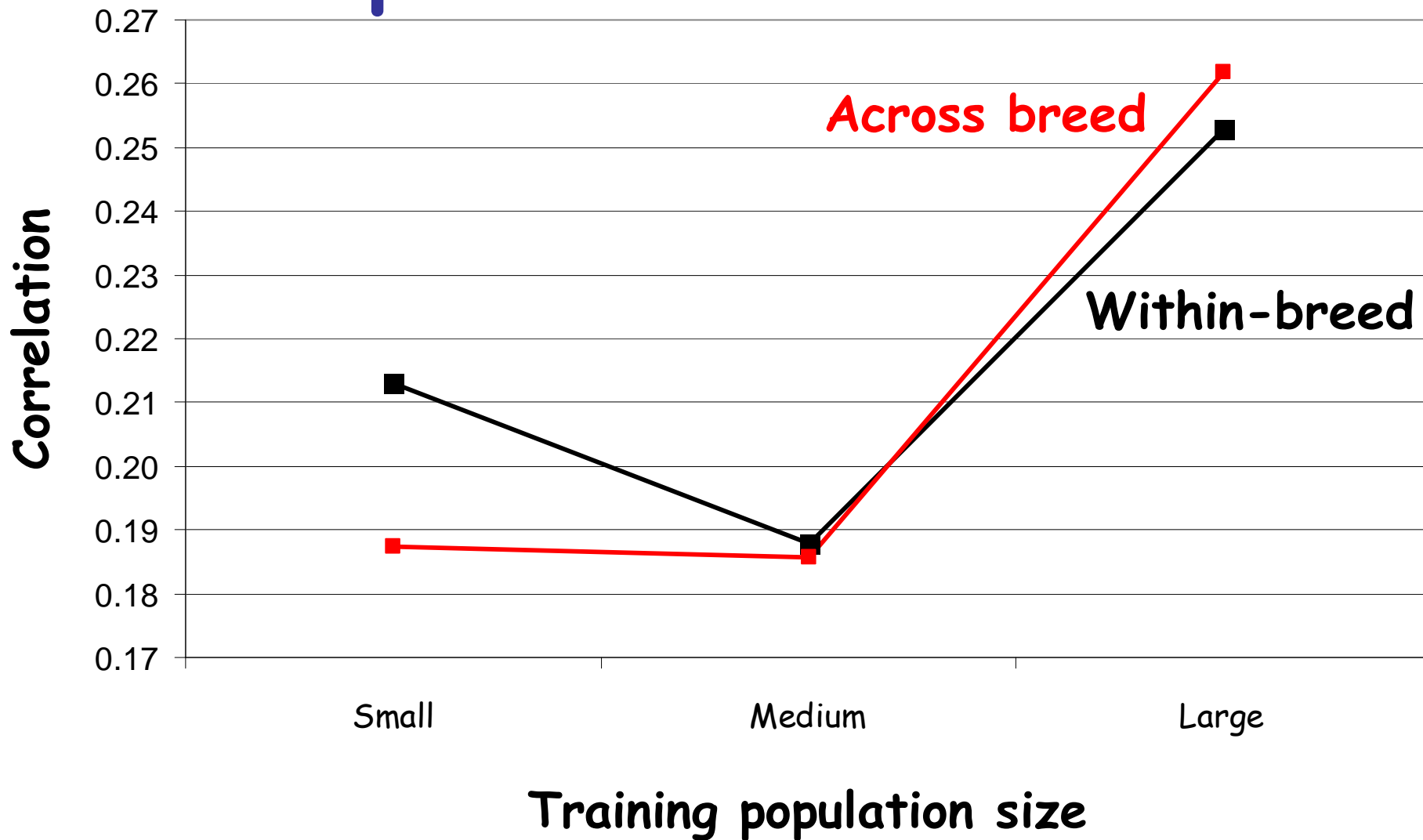
Population stratification - BTA1



Genomic predictions - Carc. Wt



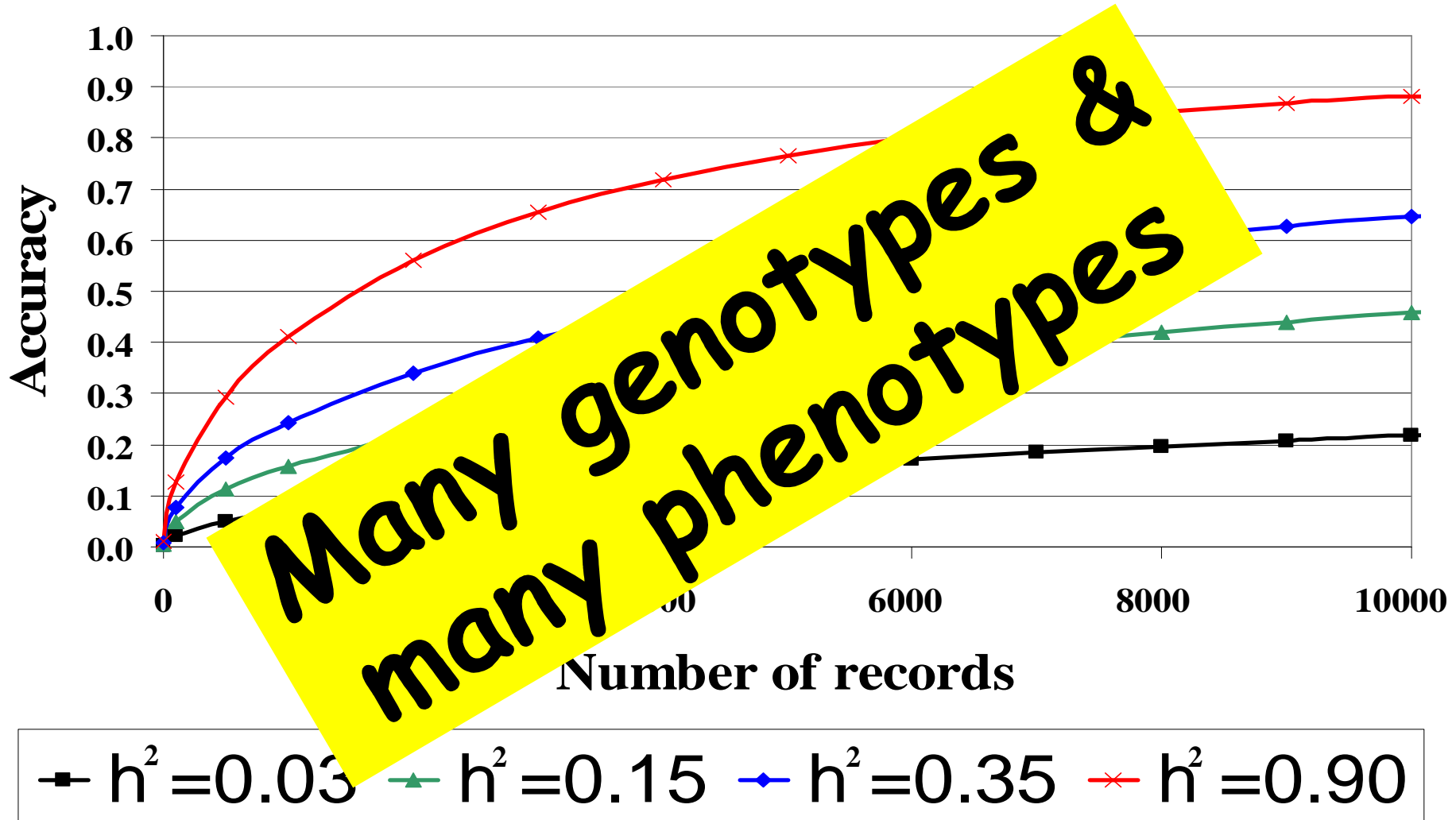
Genomic predictions - Carc. Conf



Genomic predictions - Carc. Fat



Size matters!!!



International file - genotypes

INTERBEEF_ID	Name	DOB	Alises	Ireland	UK	France
LIMFRAM000800523063	PACHA 08	19991111	FR1932049539	Genotyped	Priority	Priority
LIMFRAM000897010132	NELSON	19971207	FR1986001532	Have DNA - not genotyped	Priority	Priority
LIMFRAM001202088259	TEHIX	20020117	FR1986011105	Have DNA - not genotyped	Priority	Genotyped
LIMFRAM001203095058	THE TIS	20020930	FR1986011107	Priority	Genotyped	Priority
LIMFRAM001204085223	ULM	20030917	FR1991000344	Priority	Genotyped	Priority
LIMFRAM001207086026	BENZENE	20060917	FR1993002022	Have DNA - not genotyped	Genotyped	Priority
LIMFRAM001294114730	JOYAU	19940325	FR1995013233	Have DNA - not genotyped	Genotyped	Priority
LIMFRAM001295161096	LITRON	19951202	FR1997010234	Genotyped	Genotyped	Priority
LIMFRAM001295166705	LACET	19950119	FR1997012807	Genotyped	Priority	Priority
LIMFRAM001296163972	MOUSTIC	19960412	FR1997018717	Have DNA - not genotyped	Genotyped	Priority
LIMFRAM001298169575	ODEON	19980102	FR2246741810	Have DNA - not genotyped	Priority	Priority
LIMFRAM001298181846	NEOPHIN	19971115	FR2289014048	Priority	Priority	Genotyped

...I already have it made!!

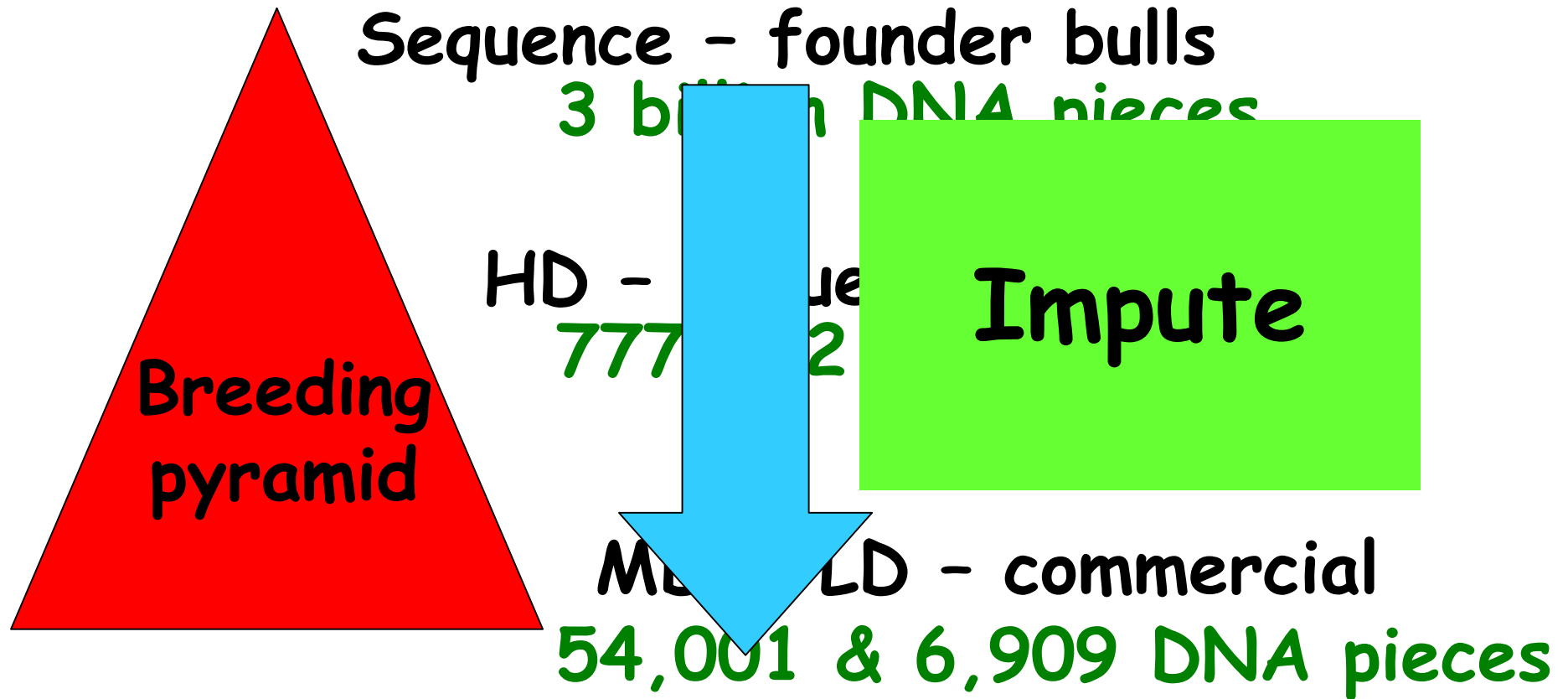
International file - phenotypes

- **INTERBEEF**
- Genomic selection in Irish dairying is successful from using information from INTERBULL
 - Exploit phenotypes directly in a multi-country (/multi-trait) international genomic evaluation
 - Intergenomics
 - Exploit international EBVs

Ireland's priorities

- Genotypes + phenotypes!!
- Genomic evaluations - multi-breed or within-breed
- Imputation
 - Need to increase training population size - industry involvement
 - "Genomic selection" = parentage testing

The future



Greater accuracy & across breed evaluations

Conclusions

- We all need international collaboration
 - Possible exception is France
 - Still will be better (& less expensive) if engaged internationally
 - Remember collaboration is probably more useful for the exporting country
- International collaboration has been successful in dairy so why not in Limousin
 - Other beef breeds might beat you to it!