

Single step GBLUP for purebred beef

Genomic breeding values for
weight/growth and carcass traits

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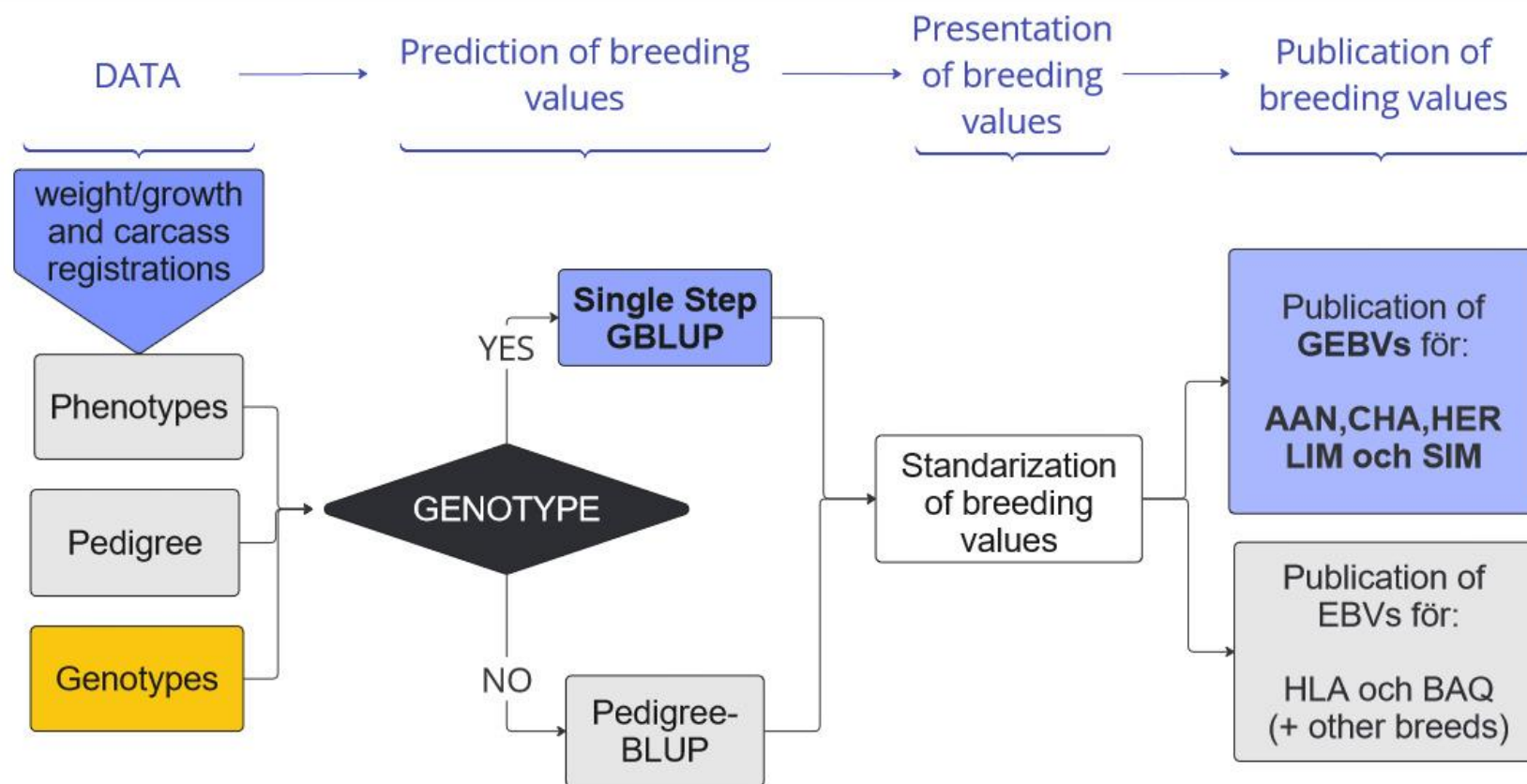
Point of departure

1. Upgrade the current pedigree BLUP PbB evaluation to include genotype data (on all current Nordic breeds and traits)
2. Development of the weight/growth and carcass evaluation first, followed by the calving evaluation.
3. **Implementation of genomic breeding values for weight/growth and carcass traits for the November 2024 evaluation – five largest populations**

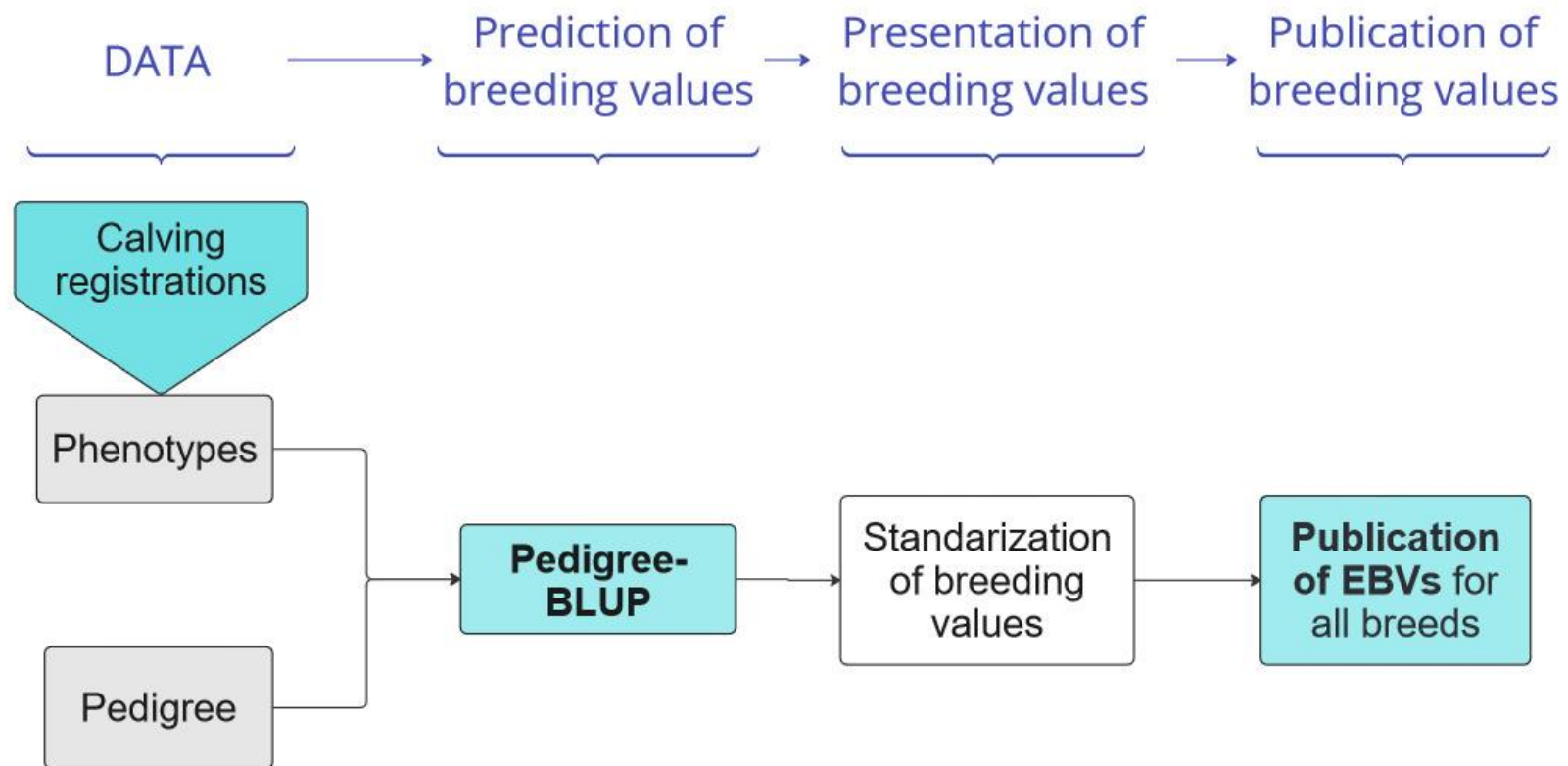
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NAV PbB evaluation for weight/growth and carcass traits (upgraded to ssGBLUP)



NAV PbB evaluation for calving traits (same as for June 2024)



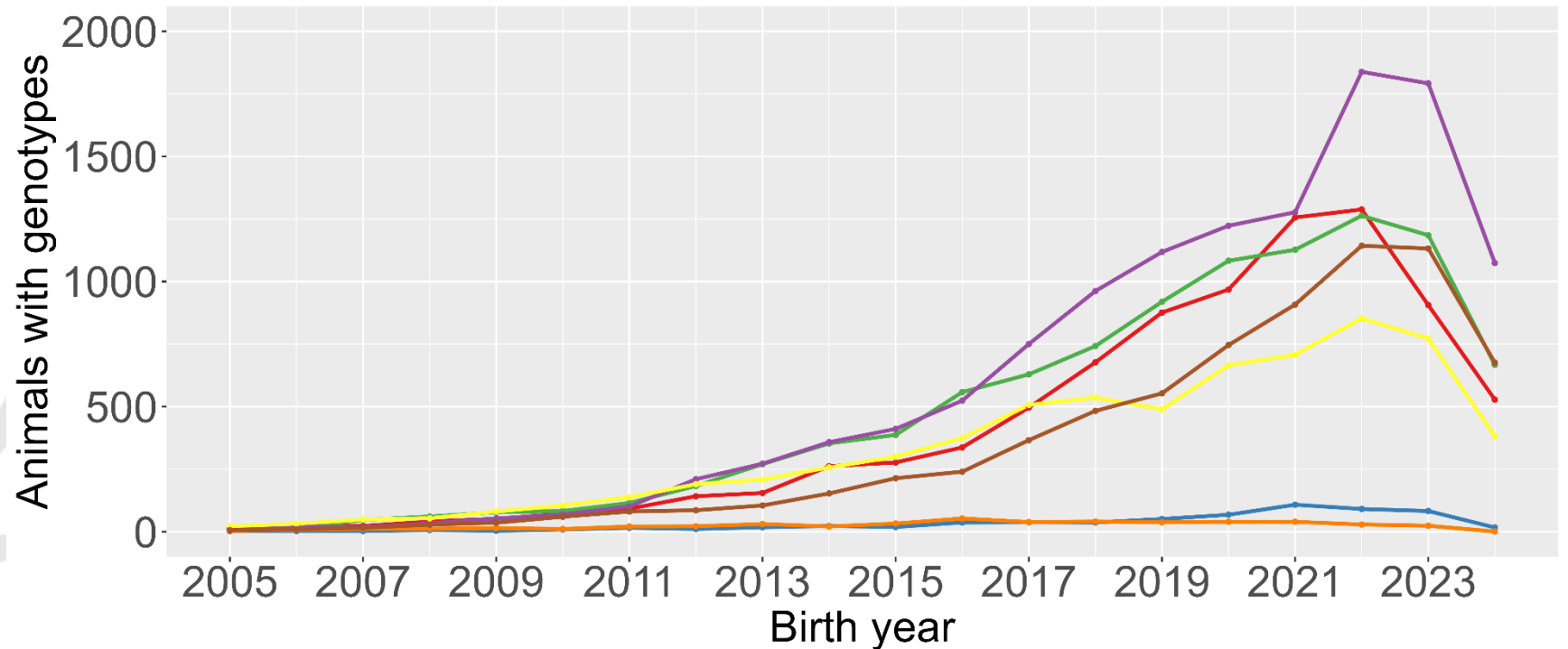
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Breeds and traits with genomic information

Breed	Weight/growth and carcass_traits	Calving traits	Growth, carcass_quality and production_index	Dam index	Calving index
AAN	GEBV	.	GEBV	GEBV+EBV	.
CHA	GEBV	.	GEBV	GEBV+EBV	.
HER	GEBV	.	GEBV	GEBV+EBV	.
LIM	GEBV	.	GEBV	GEBV+EBV	.
SIM	GEBV	.	GEBV	GEBV+EBV	.
BAQ	.	.	.	.	.
HLA	.	.	.	.	.
Other	.	.	.	.	.

Number of genotypes by August 2024



AAN BAQ CHA HER HLA LIM SIM



Number of genotyped animals by breed and country by August 2024

Breed	DNK	FIN	SWE	Other	Total Aug24	Total Jan24
AAN	1608	4504	2241	154	8507	7551
CHA	408	3912	5289	188	9797	8693
HER	1518	4807	5723	86	12134	10300
LIM	2538	2474	1584	162	6758	5756
SIM	1546	3029	2386	102	7063	5881

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Number of genotyped animals by breed and country by August 2024

Breed	DNK	FIN	SWE	Other	Total Aug24	Total Jan24
BAQ	320	90	189	72	671	601
HLA	402	7	75	29	513	444

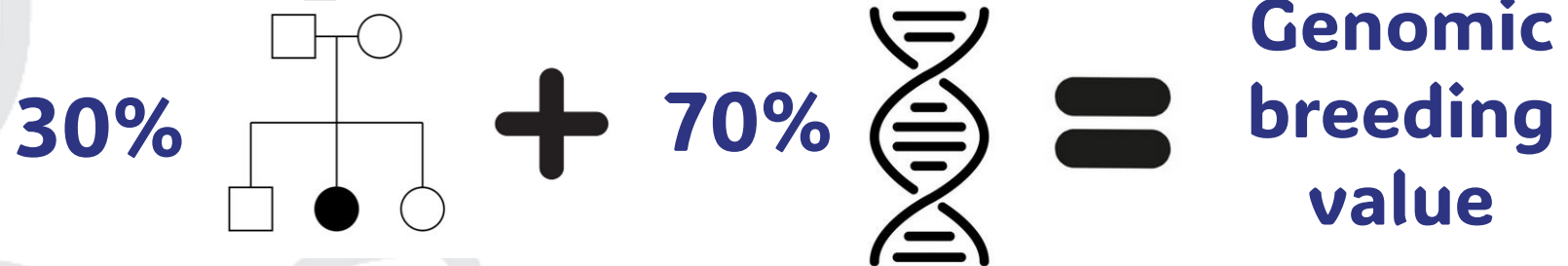
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Single step genomic prediction

A blending of genomic information and pedigree information



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Validation of the pedigree BLUP model

Data	...2017	2018	2019	2020	2021	2022	2023	Model	Breeding values
Registrations animal 1	BW	WG		PWG		SDG		Pedigree BLUP Full	EBVs
Registrations animal 2						BW	WG		
Pedigrees									
Registrations animal 1	BW	WG		PWG		.		Pedigree BLUP reduced	EBVs
Registrations animal 2						.	.		
Pedigrees									

Validation of the single step GBLUP model

Data	...2017	2018	2019	2020	2021	2022	2023	Model	Breeding values	
Registrations animal 1	BW	WG		PWG		SDG		GEBVs full	GEBVs	
Registrations animal 2						BW	WG			
Pedigrees										
Genotypes										
Registrations animal 1	BW	WG		PWG		.		GEBVs Reduced	GEBVs	
Registrations animal 2						.	.			
Pedigrees										
Genotypes										

Reliability of pedigree BLUP

New table

Pedigree BLUP - full	Pedigree BLUP- reduced	Comparison of breeding values
EBVs full	EBVs reduced	Medium agreement ~ medium reliability 

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Reliability of pedigree BLUP vs. ssGBLUP

New table

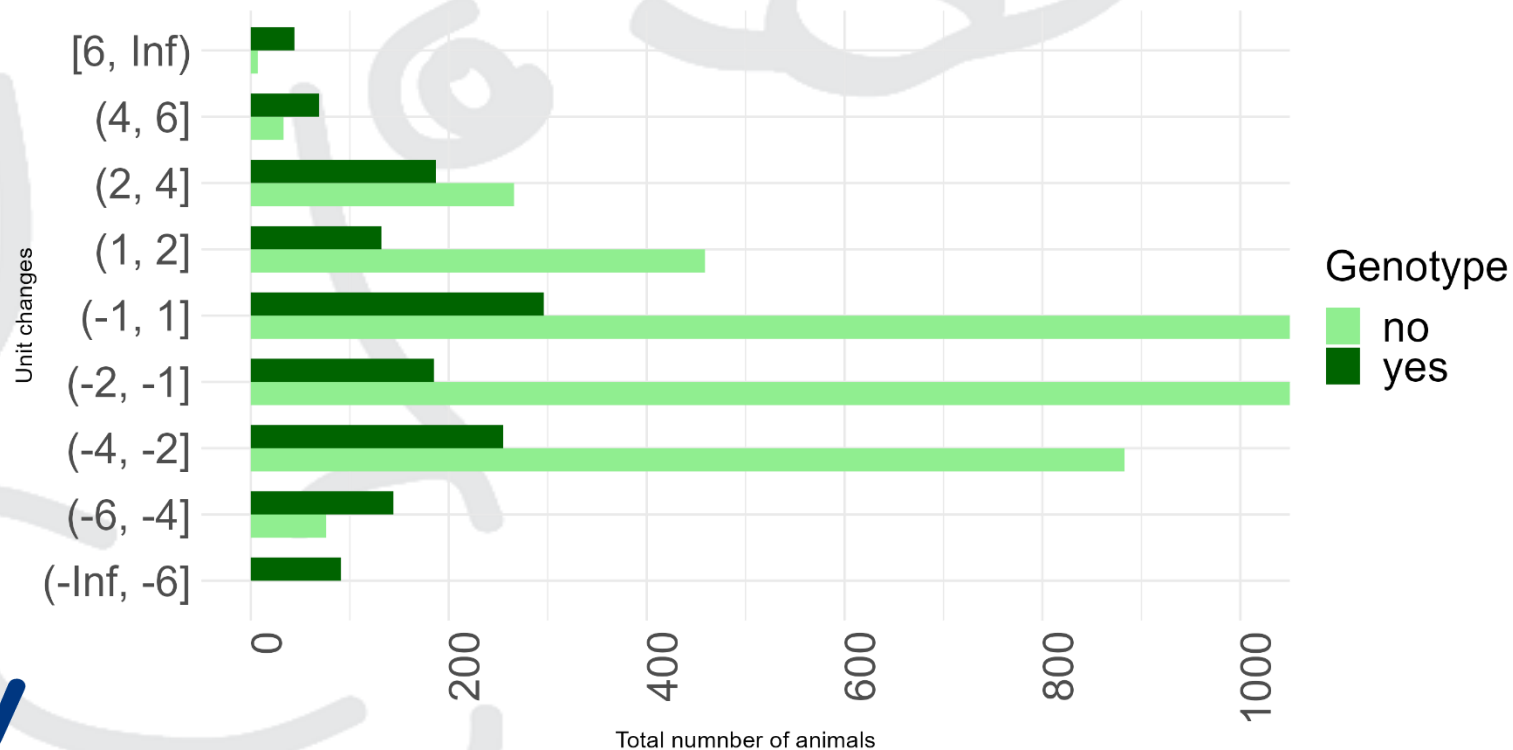
Pedigree BLUP - full	Pedigree BLUP - reduced	Comparison of breeding values
EBVs full	EBVs reduced	Medium agreement ~ medium reliability ★ ★

New table

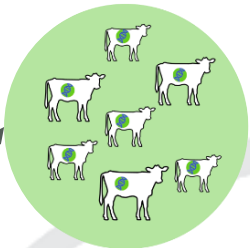
Single step GBLUP - full	Single step GBLUP - reduced	Comparison of breeding values
GEBVs full	GEBVs reduced	Medium - high agreement ~ medium - high reliability ★ ★ ★

Breeding value unit changes from pedigree BLUP to ssGBLUP for slaughter daily gain

HER males, slaughter daily gain, birth years 2019-2023



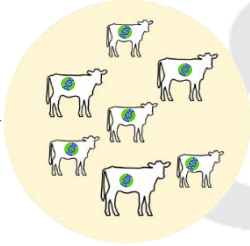
**Single step
GBLUP**
Pedigree,
genotypes and
phenotypes



**Genotyped
and
phenotyped**



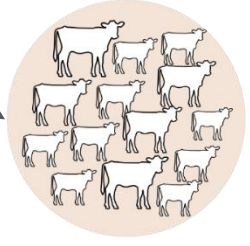
High reliability GEBVs



Genotyped



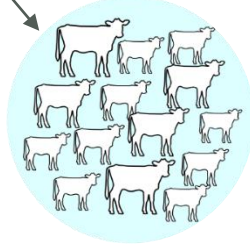
**Medium-High reliability
GEBVs**



**Non-
genotyped
phenotyped**



**Medium reliability of
GEBVs**



**Non-
phenotyped
non-genotyped**



Low reliability of GEBVs



Sum-up

- About 10% extra reliability with ssGBLUP compared to PBLUP
- Validation show good results for the ssGBLUP to be implemented
- Genotyped animals show larger changes in breeding values than non-genotyped
- Implementation of GEBVs for weight/growth and carcass traits in November 2024

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What is next?

- Estimation of genomic reliabilities
- Check results for small populations
- Single step genomic breeding values for calving traits for 2025

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