

PLANS OF THE FUTURE ACTIVITIES OF INTERBULL IN GENOMICS

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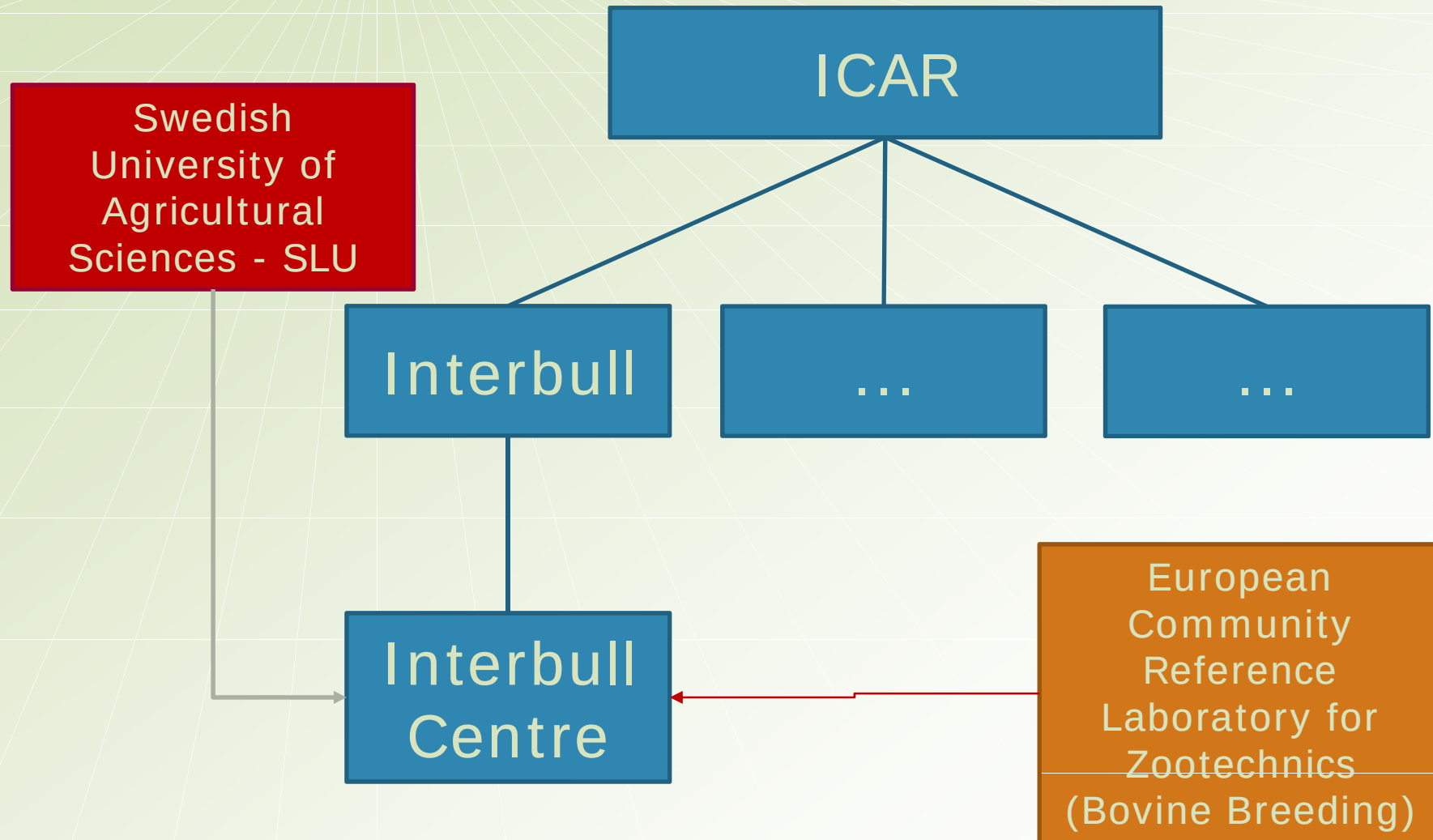




**Interbull: the worldwide network
providing genetic information services
for improvement of livestock**



Organization Structure

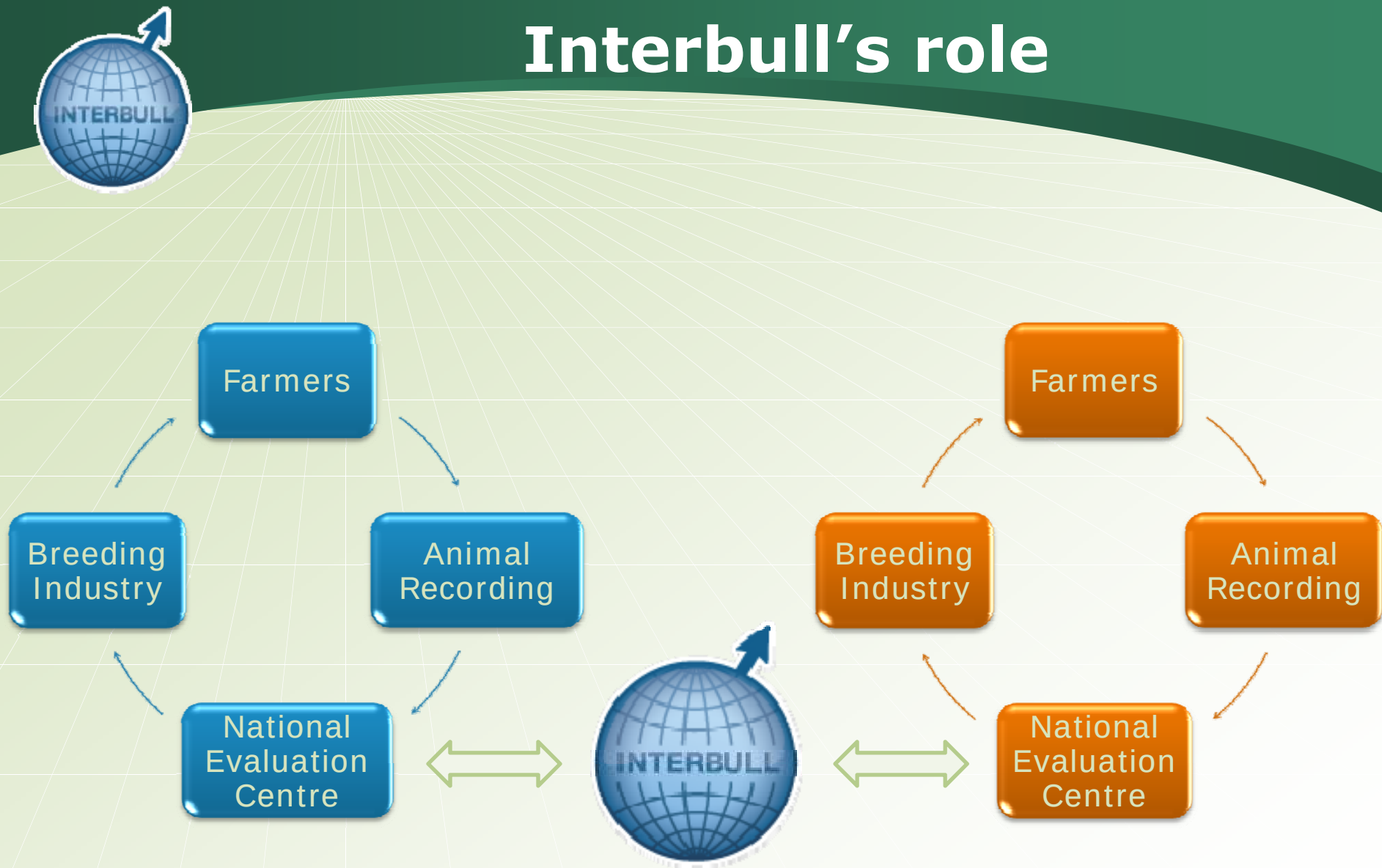




Countries participating in Interbull genetic evaluations

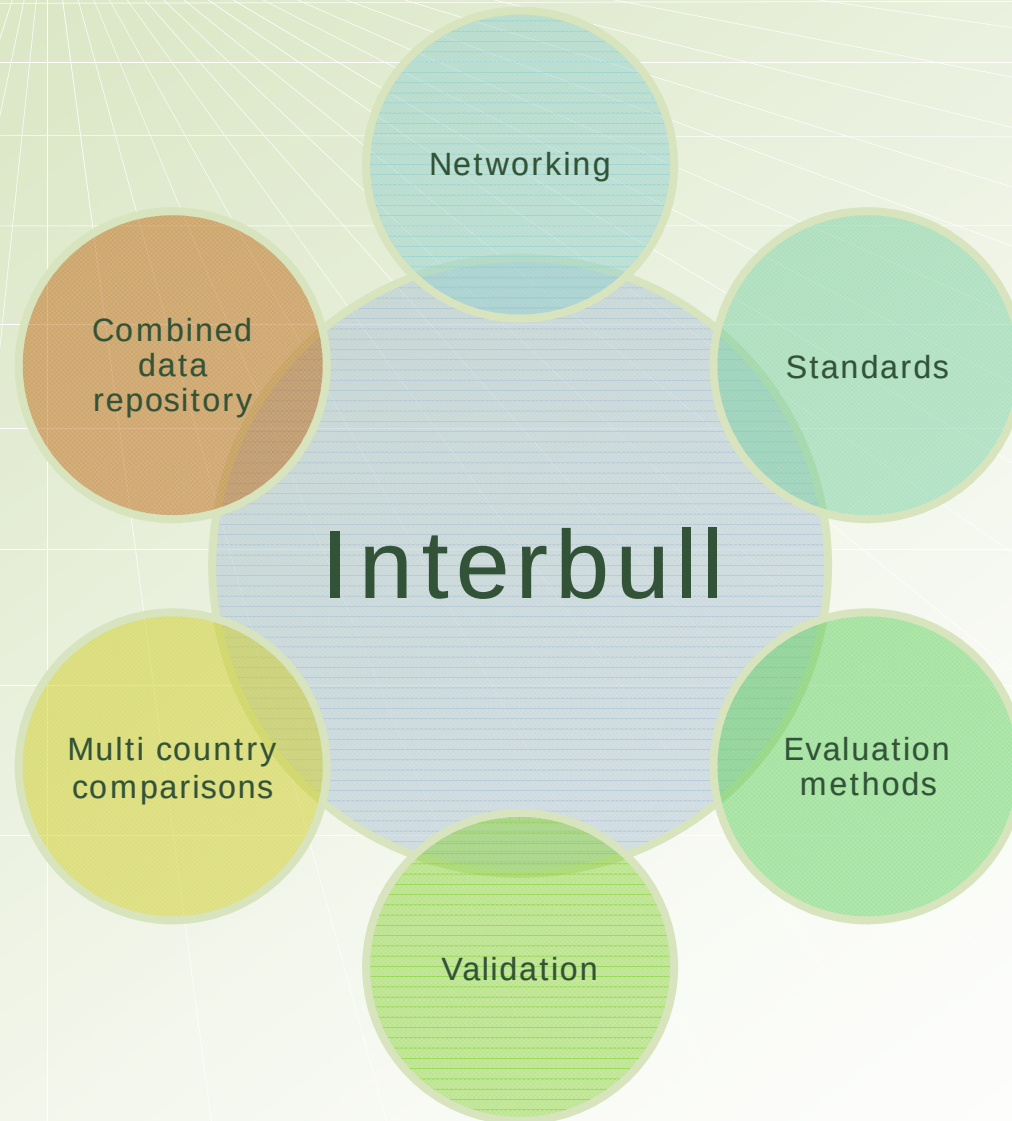


Interbull's role





Interbull's role



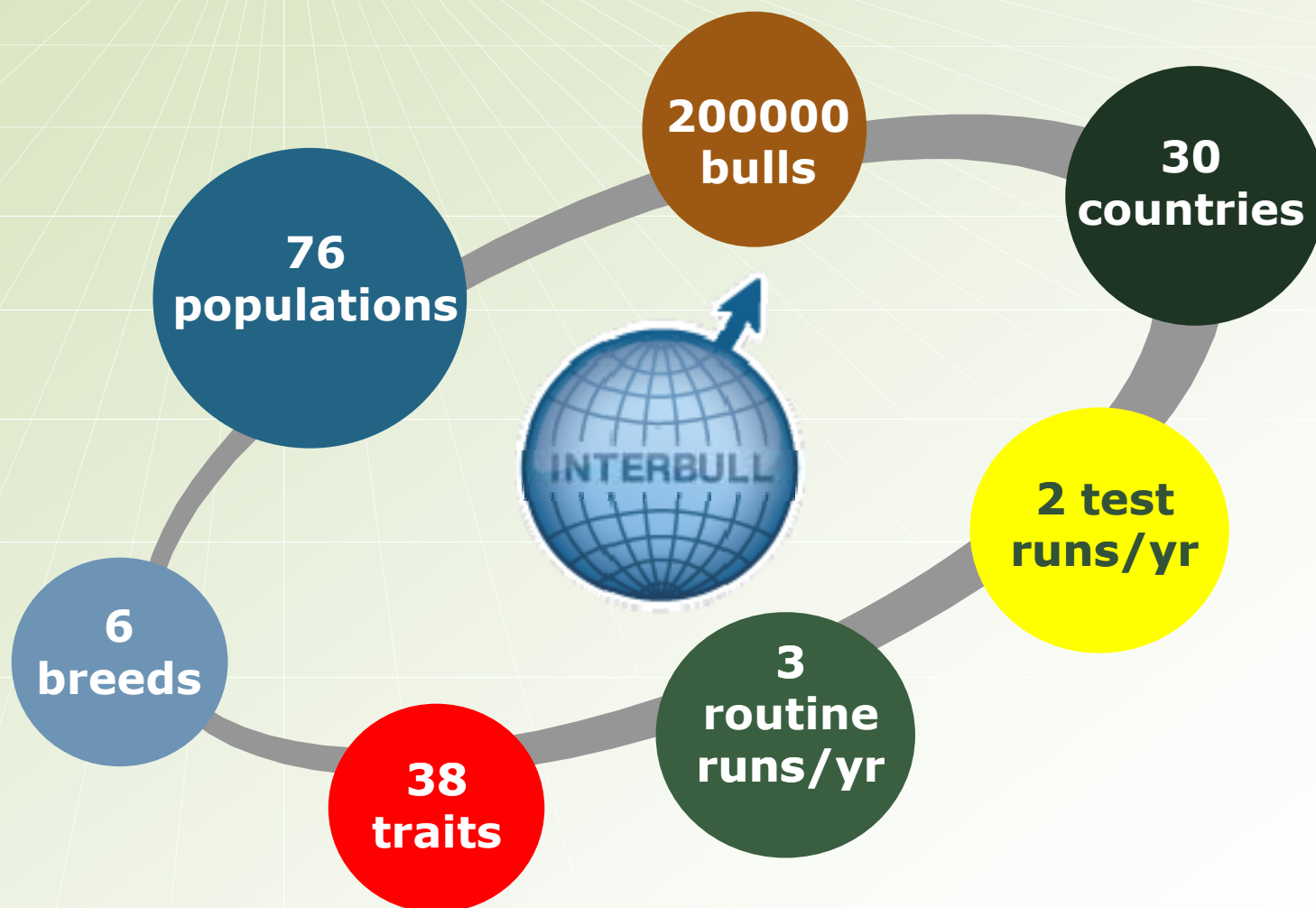


Interbull services portfolio

- ❖ International Pedigrees
- ❖ National EBVs Validation
- ❖ Documentation on national and international genetic evaluations
- ❖ MACE evaluations
- ❖ International forum
 - Events
 - Publications
- ❖ International guidelines and standards
- ❖ National GEBVs Validation

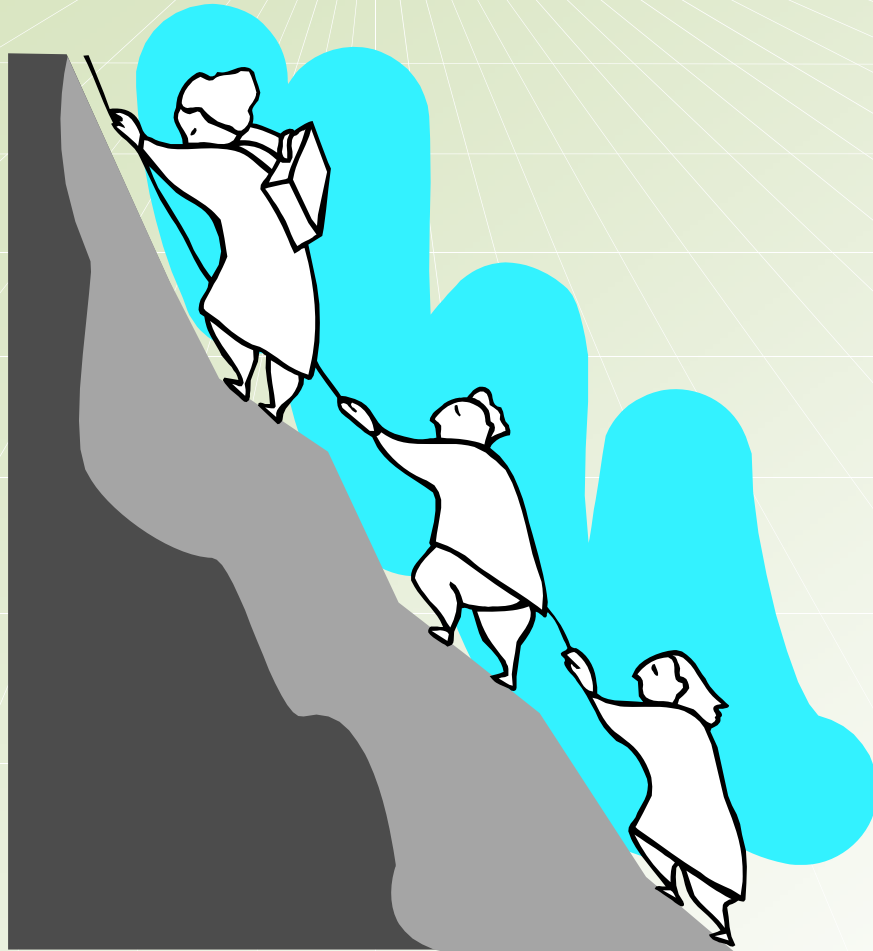


Summary of the operation





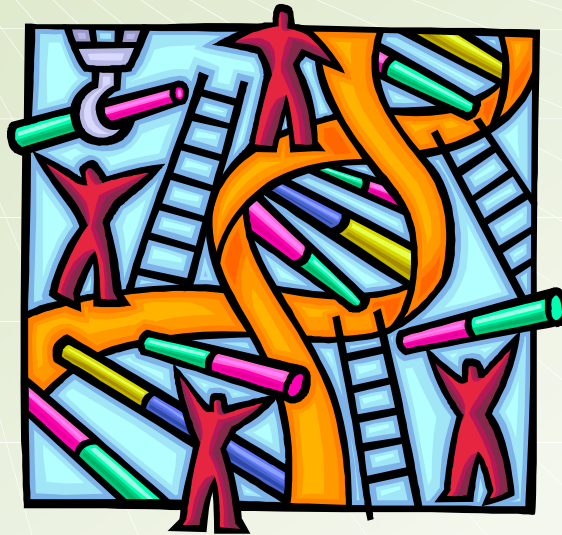
Interbull Ultimate Goal



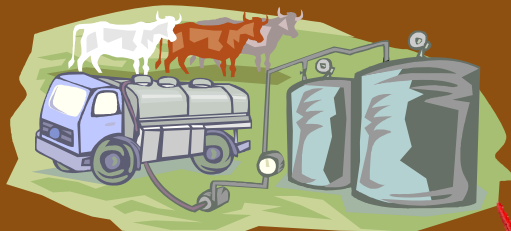
Facilitate
**INTERNATIONAL
TRADE** of cattle
genetics!



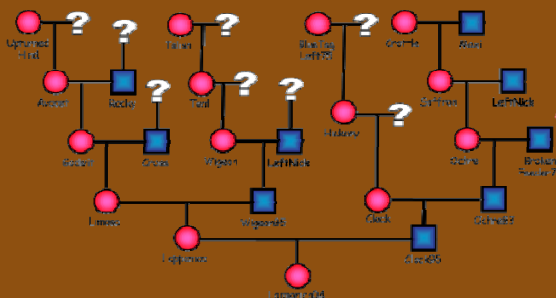
Genomics



Technology with the largest impact on dairy genetics since the introduction of artificial insemination.



Phenotypes

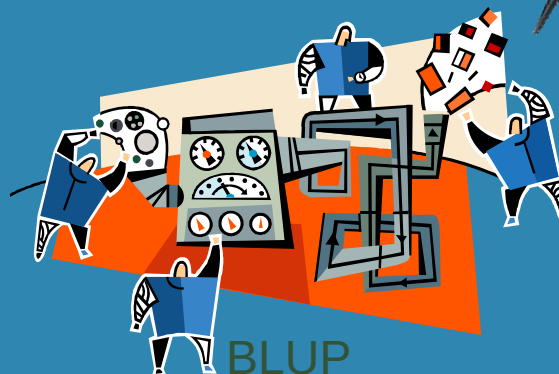


Pedigrees



Genotypes
(SNP)
REFERENCE
POPULATION

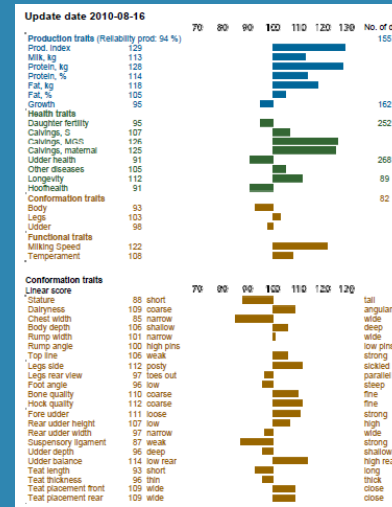
6/28/2011



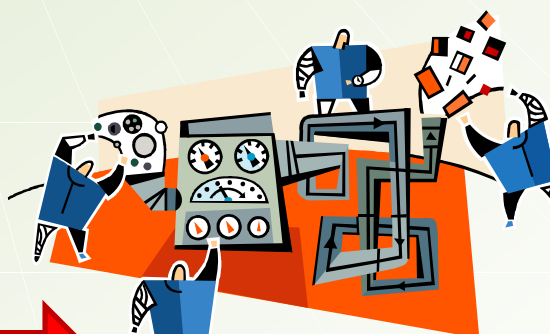
BLUP



GBLUP
Bayes A
Bayes B
Bayes C...



EBVs, rel



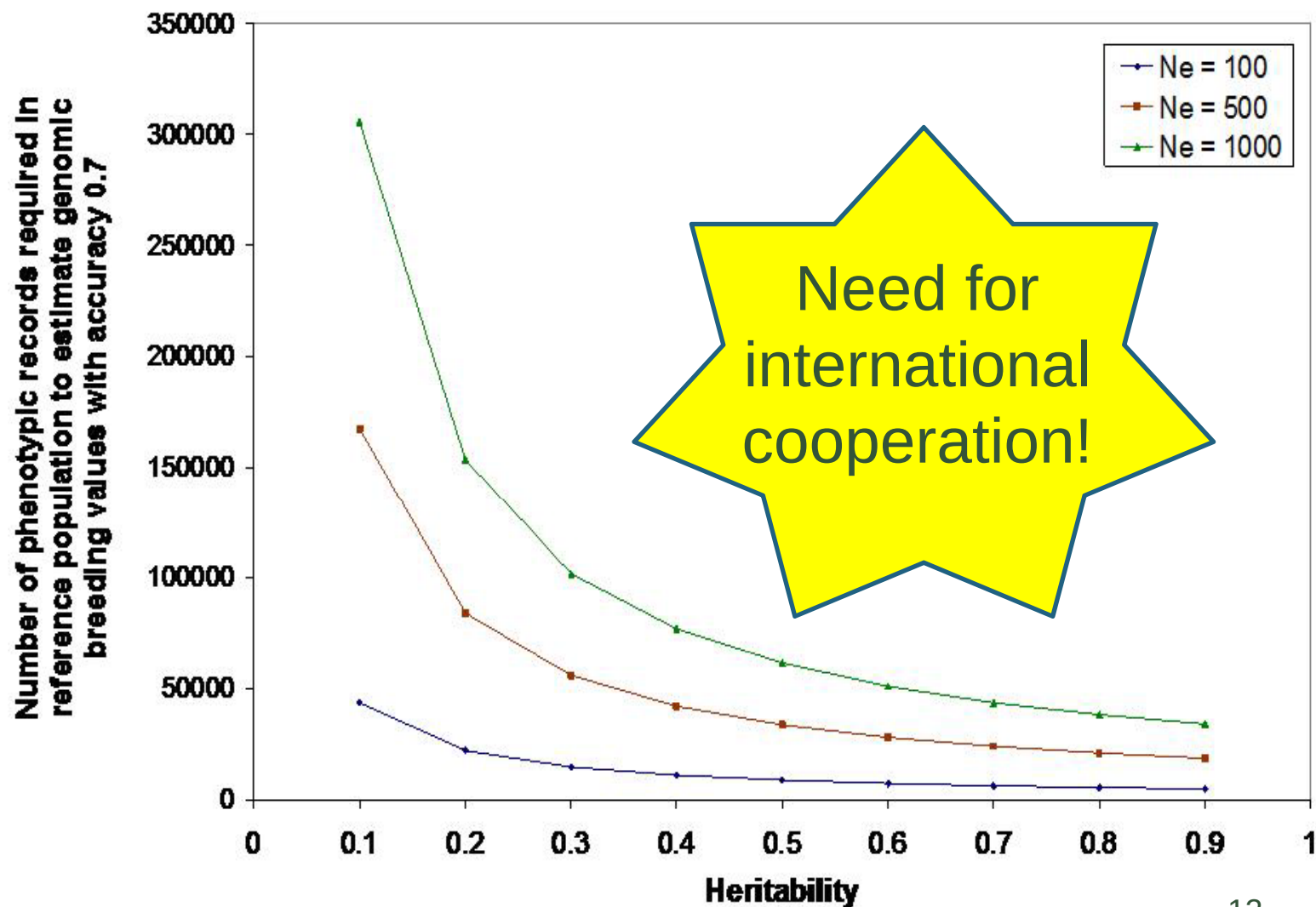
Prediction
Equations

GEBVs,
Grel

11



Theoretical number of records in the reference population





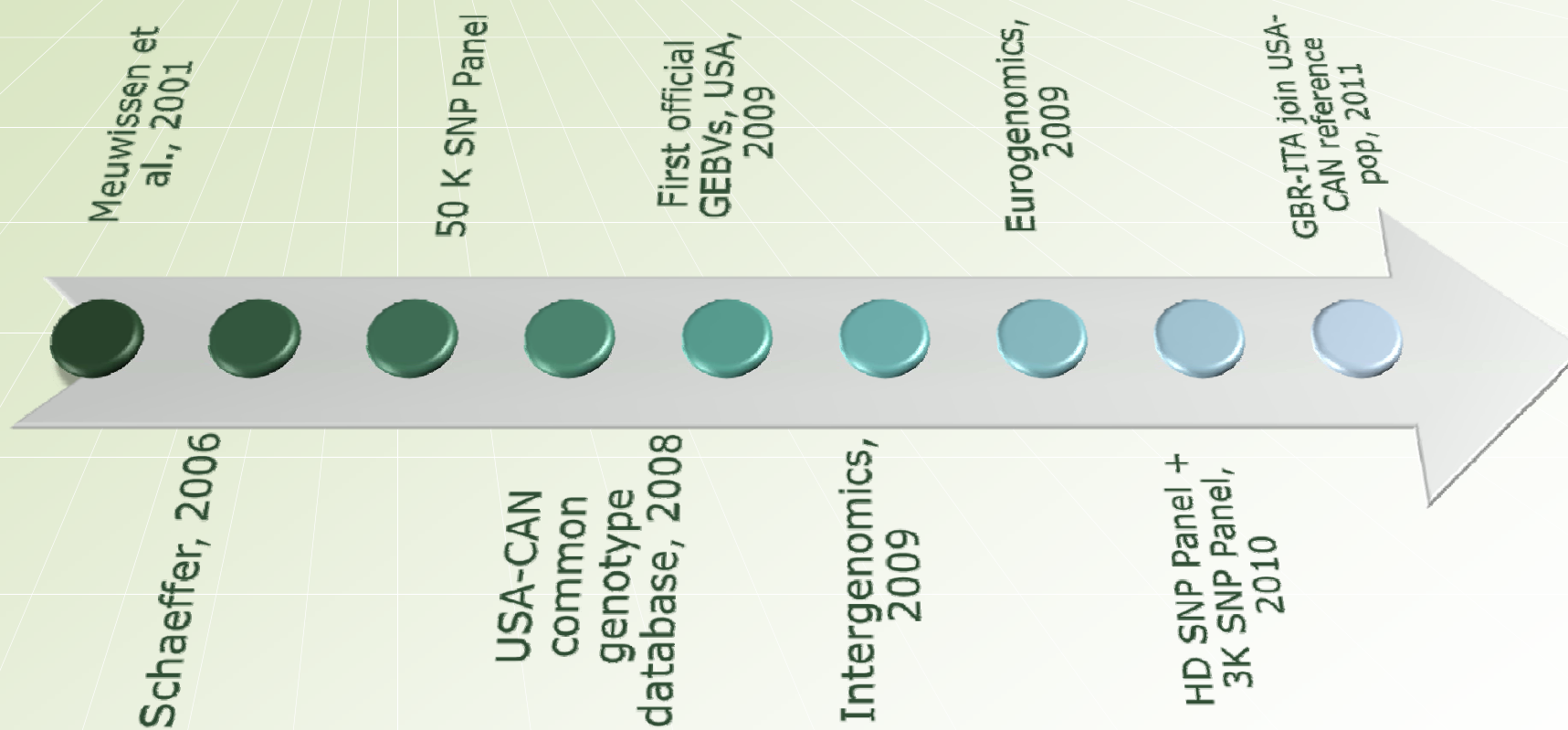
Industry Needs

- ❖ More and better phenotypic records
- ❖ Sufficiently large reference populations
- ❖ Flexible choice of SNP panels
- ❖ Affordable SNP panels
- ❖ Reliable genomic predictions
- ❖ Customers comfortable with the new technology
- ❖ Profitable selection scheme



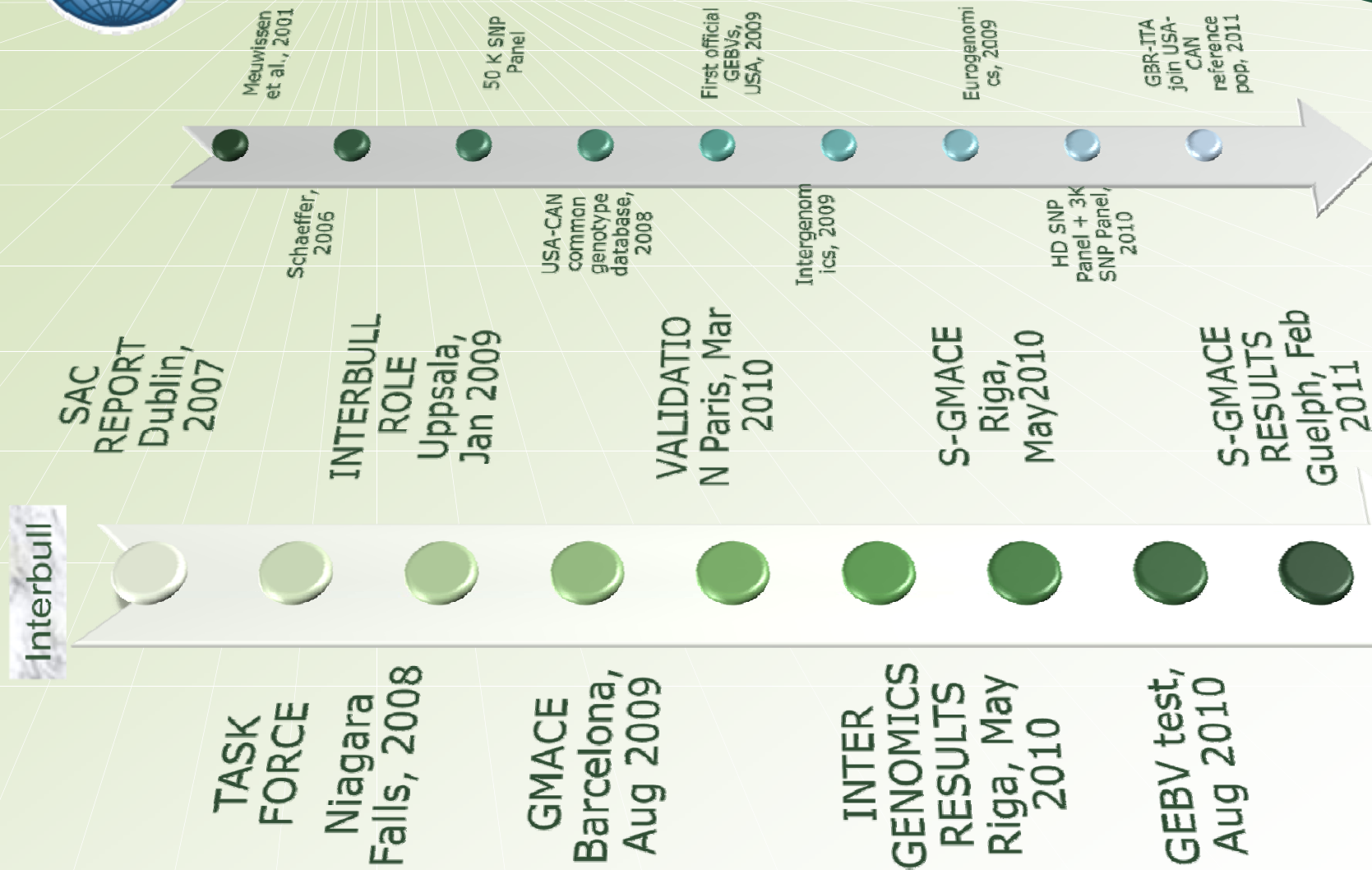


Genomics: short history, long story





Genomics: short history, long story





Interbull: a privileged forum

- ❖ Task force on genomics (2008-2010)
- ❖ Two join sessions with ICAR on genomics:
 - Niagara Falls, 2008
 - Riga, 2010
- ❖ Three international workshops:
 - Uppsala, 2009
 - Paris, 2010
 - Guelph, 2011



Two dimensions of the topic

- ❖ Which are the tools that need to be developed in order to incorporate genomics into the solid genetic evaluation machinery that is already in place both national and internationally
- ❖ How will the new developments affect international cooperation and consequently the equilibrium between exporters and importers of dairy genetics



Further developments needed

- ❖ Reliability of genomic breeding values (GEBVs)
- ❖ Double counting of phenotypic information when using foreign reference animals
- ❖ Pre-selection biases
- ❖ Validation of prediction equations
- ❖ Estimation of SNP effects with high density panels
- ❖ Reliable international comparisons of national GEBVs through Interbull



Main projects already implemented or under development at Interbull

- ❖ Validation of national GEBVs (GEBV test)
- ❖ Simplified Genomic MACE (S-GMACE)
- ❖ Joint genomic evaluation of Brown Swiss populations (Intergenomics)
- ❖ Common repository of international genomic information.



GEBV test

❖ Principle:

- The inclusion of genomic information in international comparisons for dairy breeds requires that the national genomic breeding values (GEBVs) are validated by Interbull as a pre-condition to participate in international comparisons.



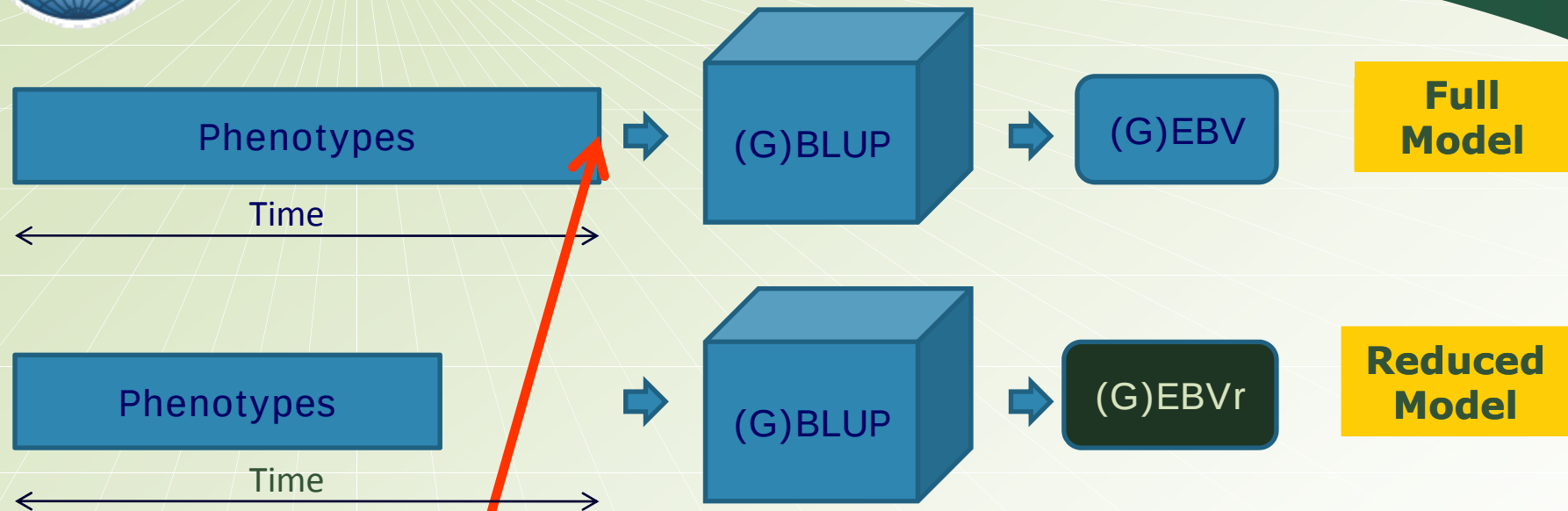
GEBV test

❖ Quality assurance:

- GEBVs from models that have been tested can be referred to as breeding values estimates with appropriate reliability, and be converted to other country scale breeding values using conversion formulas derived by Interbull.



Validation principle



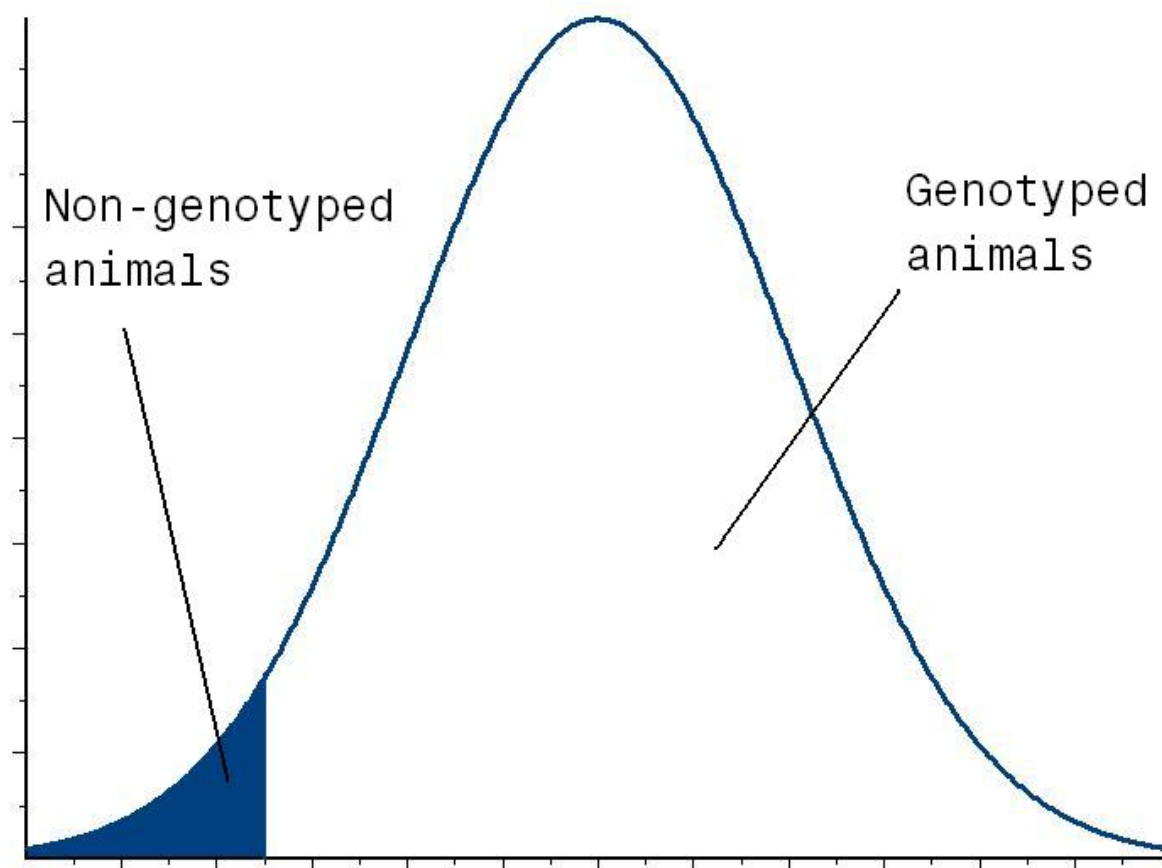
TEST BULLS: first progeny test in the end of the period and have only parent information in the reduced model

$$\text{Current phenotype} = b_0 + [b_1 * (G)EBVr] + \square$$

$E(b_1) = 1$
 $R^2 > \text{Model with PAs}$



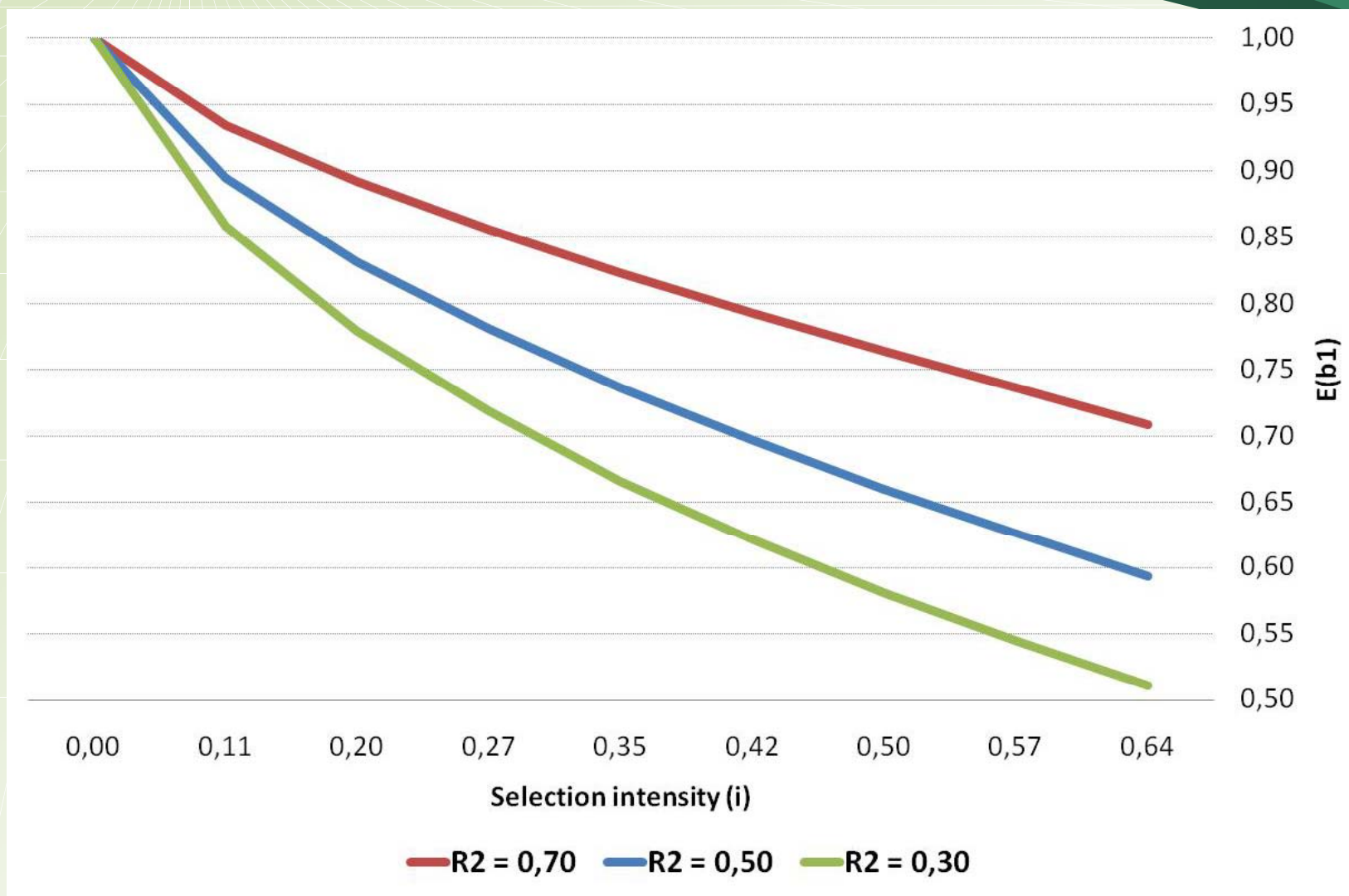
$$E(b_1) \neq 1$$



Which should be the expected b_1 value?

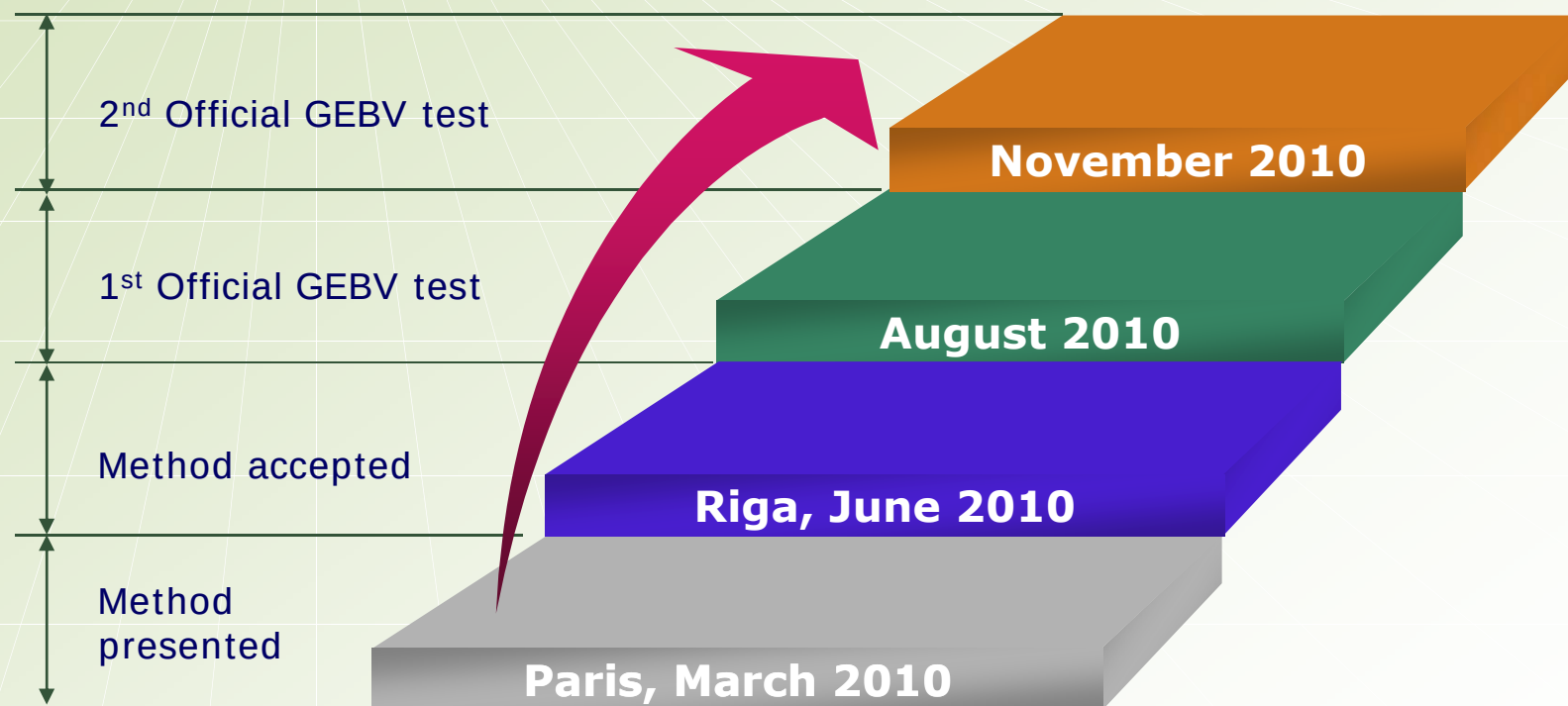


i vs. $E(b_1)$





Implementation calendar





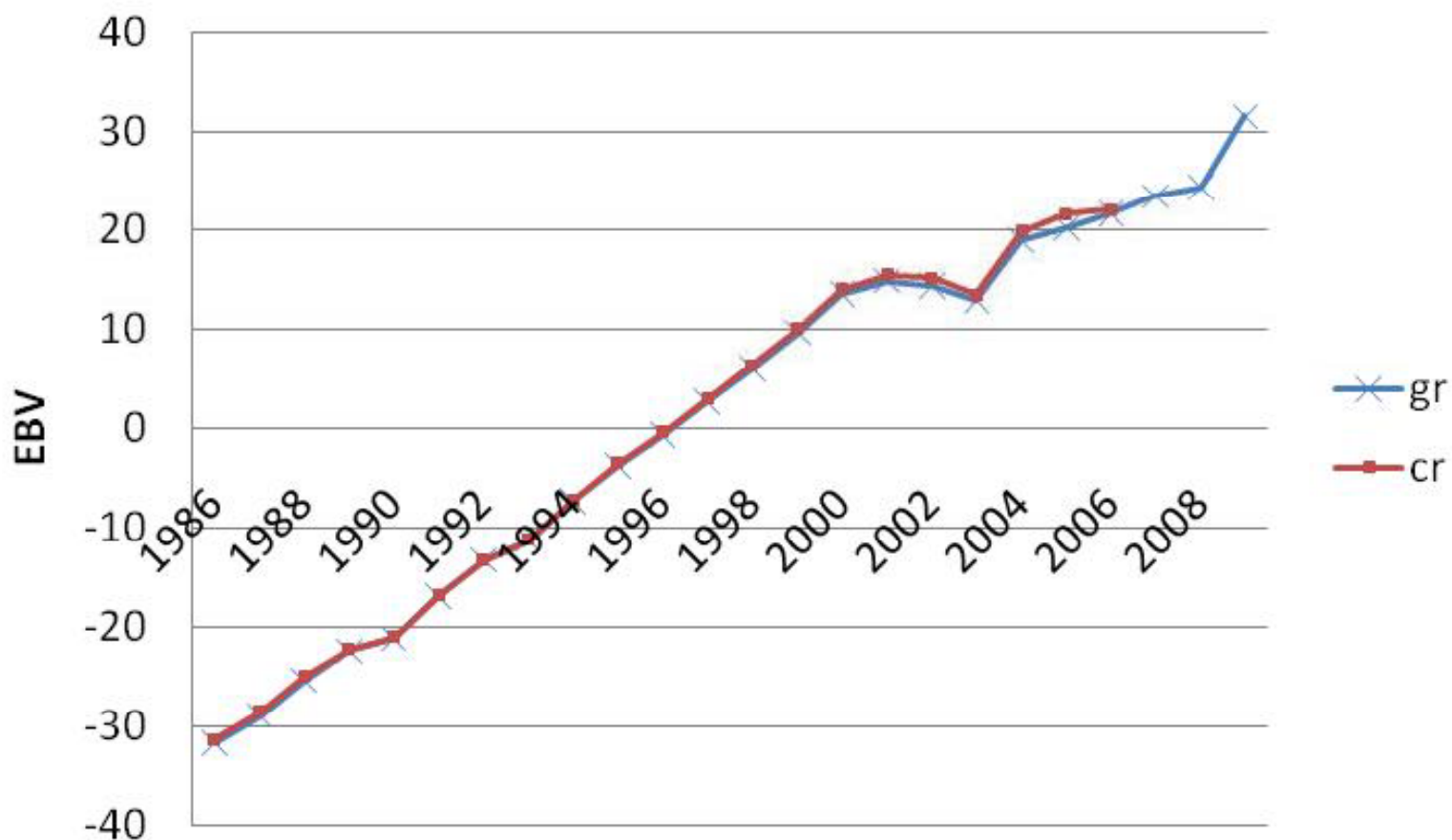
S-GMACE

- ❖ GMACE methodology (Sullivan & VanRaden)
- ❖ Software needs to handle proportion of shared genotypes among countries (c-factor)
- ❖ Simplified version of GMACE - > consider only one source of GEBV and use CEBV from alternative source
- ❖ Data edits before going into SD-MACE
- ❖ Edits of SD-MACE

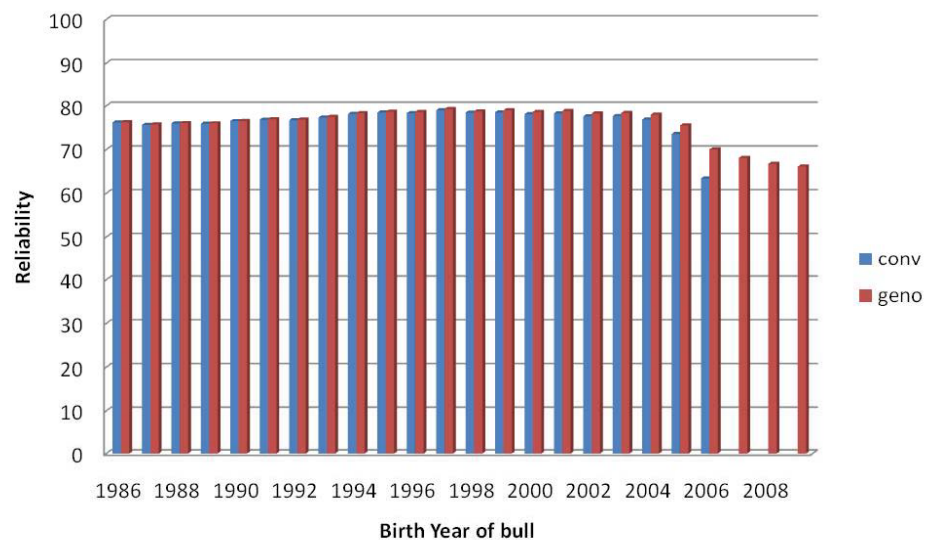


S-GMACE: Genetic Trend

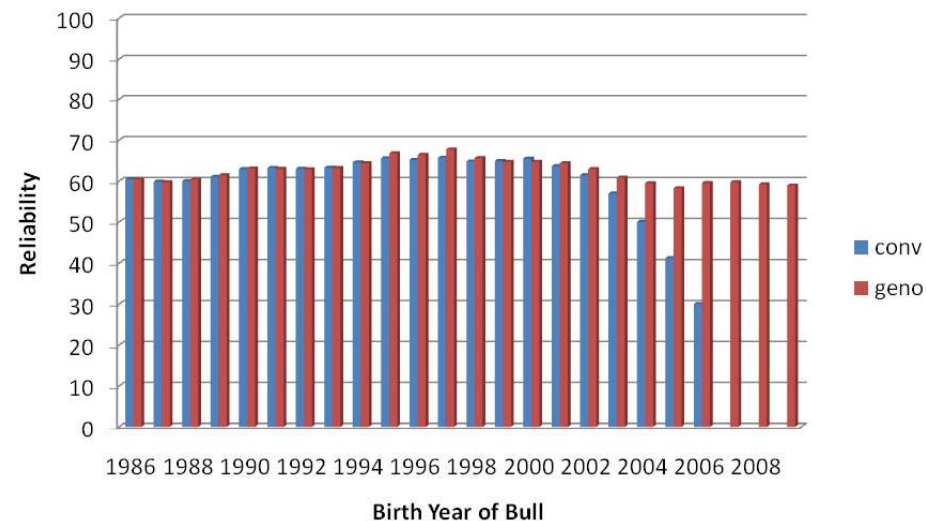
Genetic trend for protein on DEU scale for reduced S-GMACE (gr) and MACE (cr)



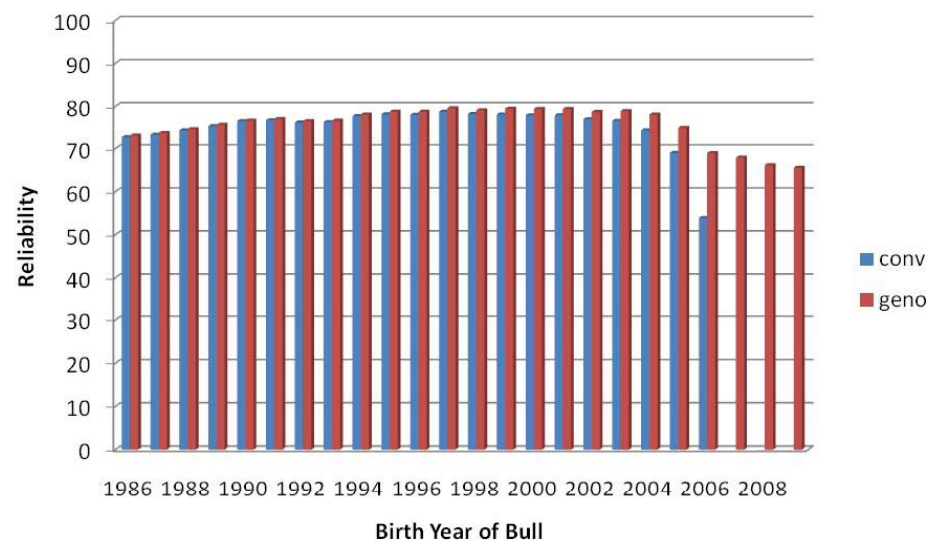
Avr international reliability for **protein** on DEU scale pr birth year of bull



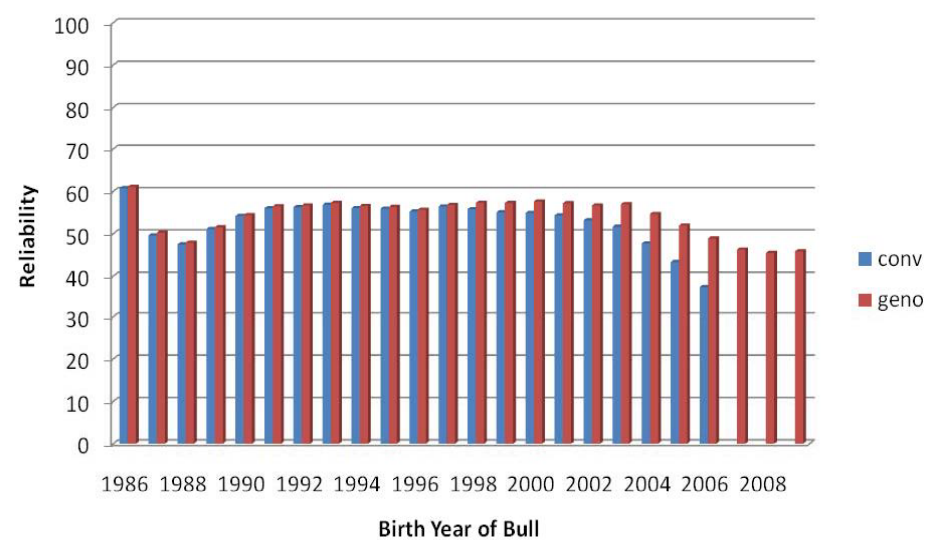
Avr international reliability for **longevity** on DEU scale pr birth year of bull



Avr international reliability for **SCS** on DEU scale pr birth year of bull



Avr international reliability for **CC1** on DEU scale pr birth year of bulls





S-GMACE

- ❖ The procedure works
- ❖ Important with harmonized input data in order to fairly select among GEBVs from several sources
- ❖ Young bulls with no daughters appear on top-100 lists
- ❖ Increase in average international reliability when comparing run including GEBVs to run not including GEBVs



interGenomics

Project
Agreement
between
countries &
Interbull

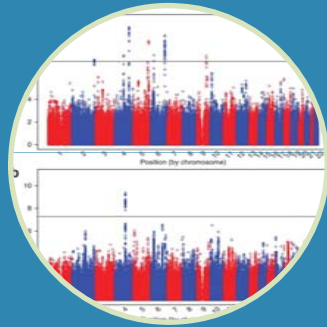
Technical
Committee:
countries
expertise +
Interbull Centre

International
genotype
database at
Interbull

R&D: develop
SNP predictions
in country scale
from common
reference
population



interGenomics



A set of prediction equation
for all traits available at
Interbull for the BSW
breed, based on all
genotypes available



A validation system that
will pass the International
checks





interGenomics

Each GEU is responsible for genomic evaluation at home

Each GEU needs a set of prediction equations based on last EBVs available in order to provide service for candidate bulls, young bulls etc

EBVs are computed 3 times/year (MACE)

Service: a set of prediction equations to be released 3 times/year after the MACE runs



Genomic data repository

- ❖ Standards for genomic data storage and exchange
- ❖ Genomic information exchange ("bull list")
- ❖ Genotype data repository
- ❖ International service for parentage verification (survey)
- ❖ International service to facilitate imputation of genotypes
- ❖ Networking for bovine sequencing research groups (survey)

2011 Interbull Meeting

**2011 EAAP - Stavanger, Norway
August 26-28, 2011**



Thank You !

www.interbull.org

