

Enrico Santus
ANARB
(Italian Brown Swiss
Association)

The role of Interbull in the
successful implementation
of genomic selection in
breeds other than Holstein



10 years of
genomics?
OMG!



Other than HOL? Is there
ANYTHING beside HOL?

YES.. in this case Brown
Swiss



A case study on BSW...
is it interesting?

- BSW is small compared to HOL
- Everything is small compared to HOL
- BIG countries for traditional traits are often SMALL countries for novel traits
- BSW used an innovative approach
- Everyone could be potentially interested in BSW as a case study
- ..even HOL..



The introduction of
genomics as a new
technology

A challenge: the «New opportunities old inequalities paradox»

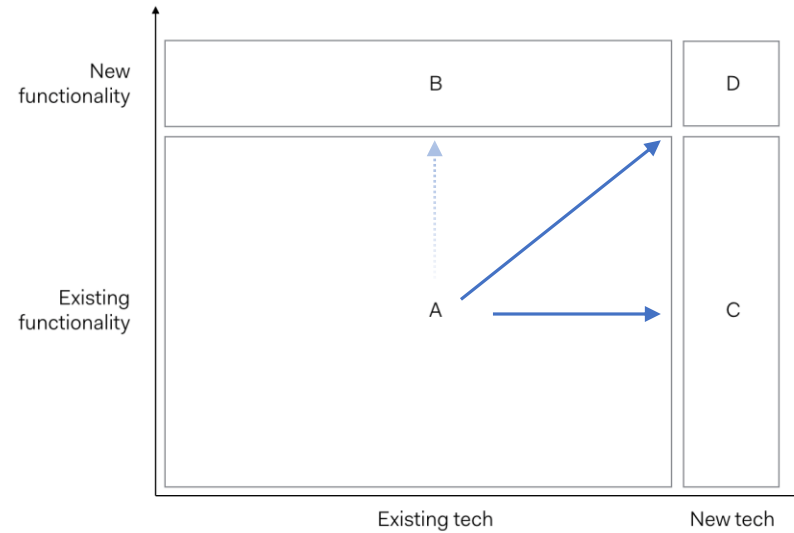
- Is the new technology helping to improve ALL populations ?
- Or is it only a tool to increase (even more) commercial competition in the major breed(s)?
- Who has more receives more?
 - Large numbers more opportunities



CREAT
STORIES

CARTOON
MOVEMENT

New technology

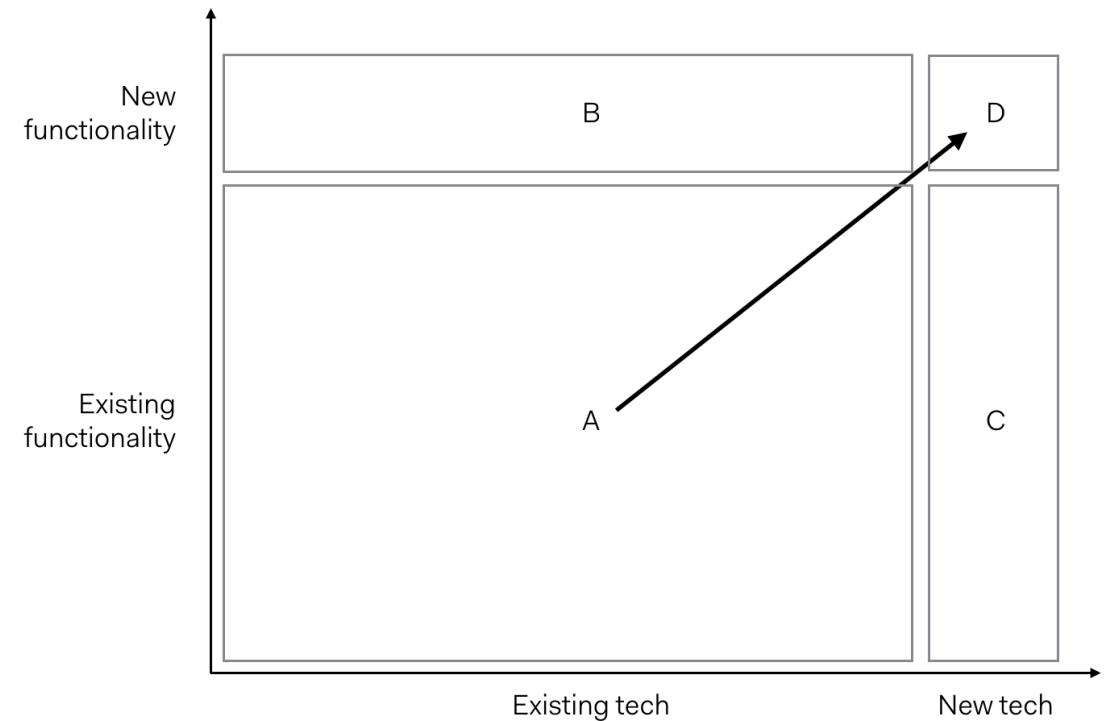


A = Existing functionality and technology
B = New functionality using existing technology
C = Existing functionality using new technology
D = New functionality using new technology

- new technology is introduced to either qualitatively **improve the current functionality** of products, or to **enable new functionality** that has not been possible before ([Panu Korhonen](#), 2018)

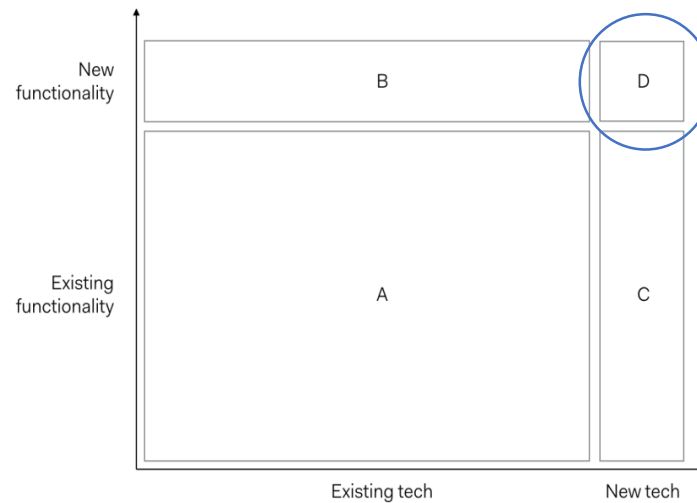
The ideal scenario

- to exploit fully the new technology introducing new functionalities:
«Velogenetics» in Meuwiessen, Hayes, Goddard 2001 paper (cited from Georges and Massey, 1991 and Haley and Visscher, 1998)



BUT

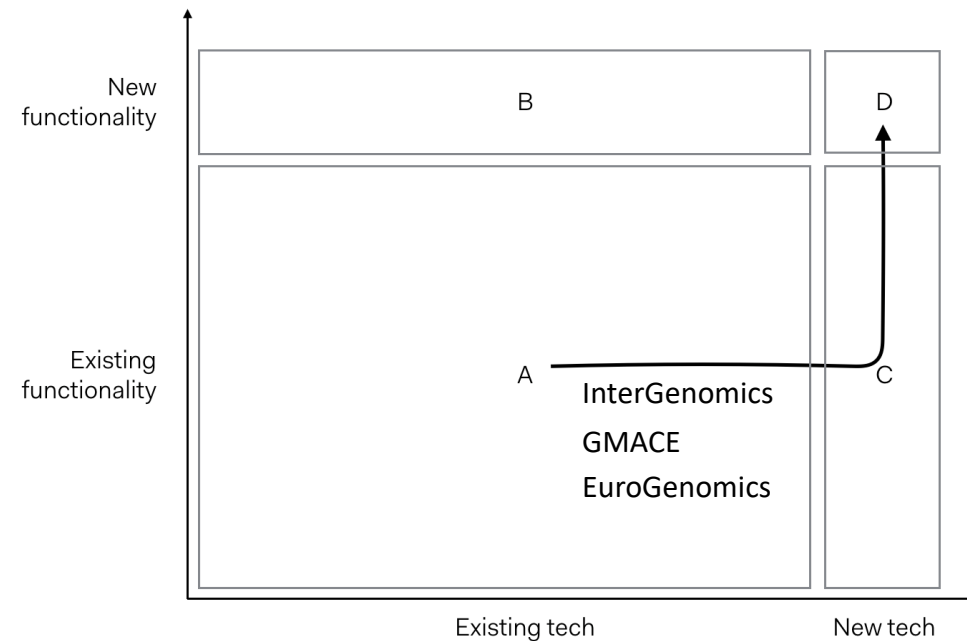
- quadrant D is likely to be relatively small compared to the existing product functionality and technology.
- If you use your technology development to improve many or all of your current features, you will have a lot more leverage for the technology
- **Plan wisely and don't leave your customers behind.**



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What happened in Cattle breeding schemes

- First : the improvement of known functionalities (a «Turbo» mode for traditional AIPT schemes)
- Second: the exploitation of new functionalities (Single steps, repro technologies synergy, novel traits, mixed ref populations..)



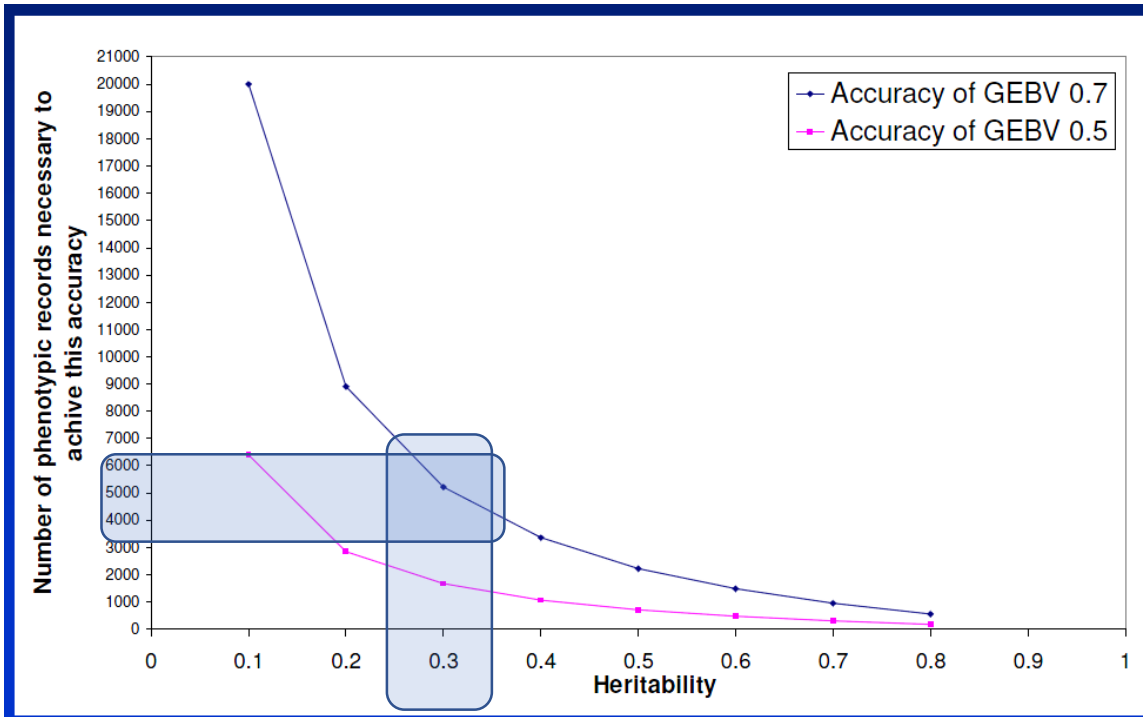


First step: introducing
the new technology



The «new» approach

- No more mendelian approach as in QTL detection or MAS
- A quantitative approach instead
- Expensive genotype analysis made on males only
- No real phenotypes on males..
- EBV used as proxy for phenotypes in reference populations



Size matters: the “5000” rule of thumb

Talking about «size»: a brief digression

Almost everyone is «small» with regards to new traits

Big is not anymore a function of «traditional traits» recorded cows

Breeders driven organization should take advantage of the international environment we are used to work in



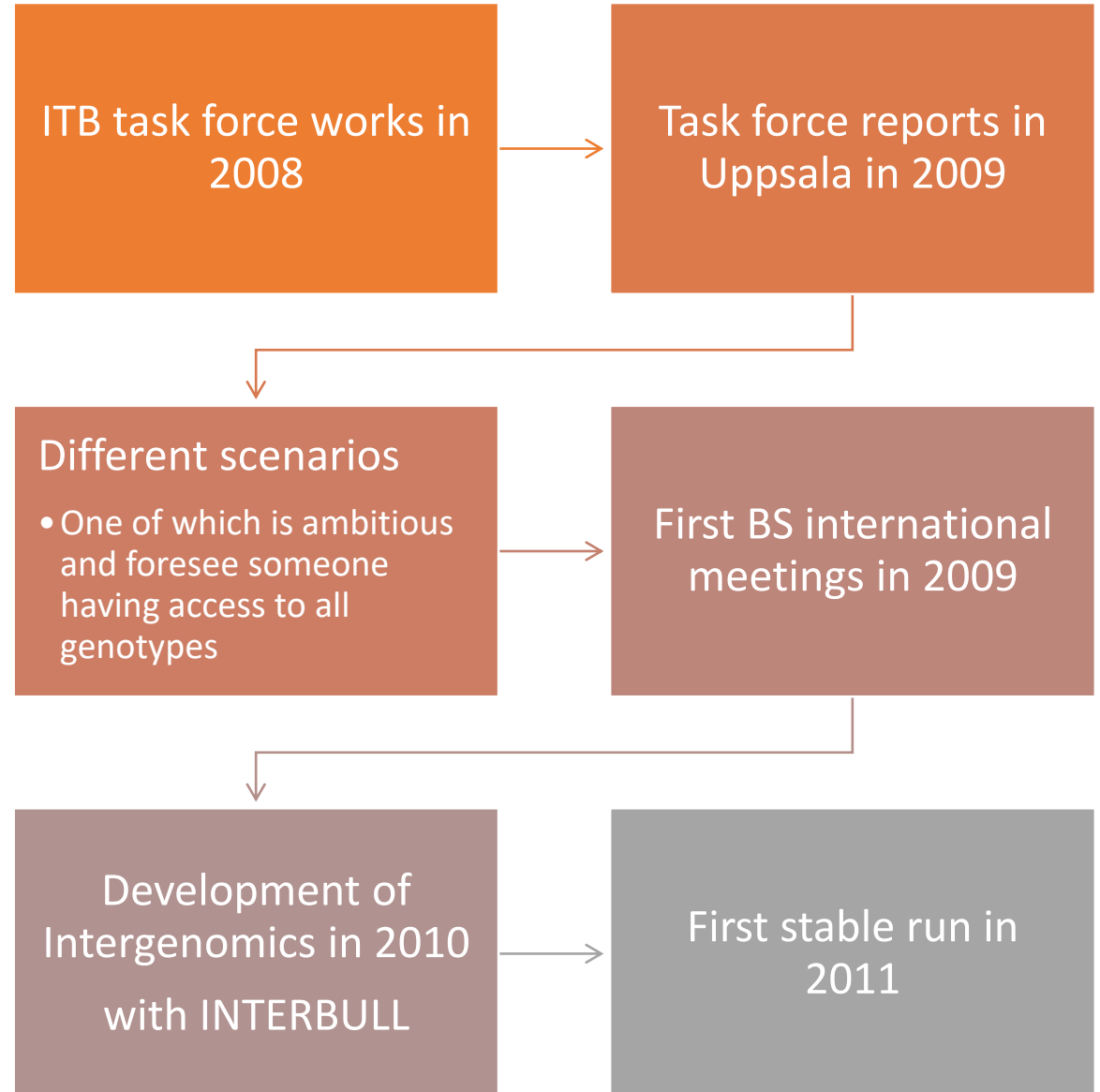
BSW favourable conditions

- No dominant player
- Strong international framework
 - EBSF (www.brown-swiss.org)
- The role of breeders
 - The sake of the breed
 - Not only market

The international framework



A little history



Why Interbull?

- Independent
- Trusted
- Reliable

- And willing to play!



interGenomics

The role of Interbull



- Not easy to decide from an Interbull perspective
- The critical points
 - Interbull as a possible threat to Genetic Evaluation Units
 - Interbull not having enough experience in the field
 - (not completely different from point above)
 - Interbull doing «new» things not included in the traditional business model
 - (not completely different from the future challenges)
 - Interbull exposing itself as a provider of a final product (GEBVs)

Why it was good FOR Interbull



Experience



Competence



**Relevant in
the genomic
era**



**A Clear message
of willingness to
explore new
models/systems**

Very similar to the
present situation
and SNPMACE



interGenomics^{1.0}

Genotypes accessible to INTERBULL
ONLY

No «sharing», but a common pool

Unique computation of GEBVs at
international level



Structure and rules



8 Countries



A Management Committee



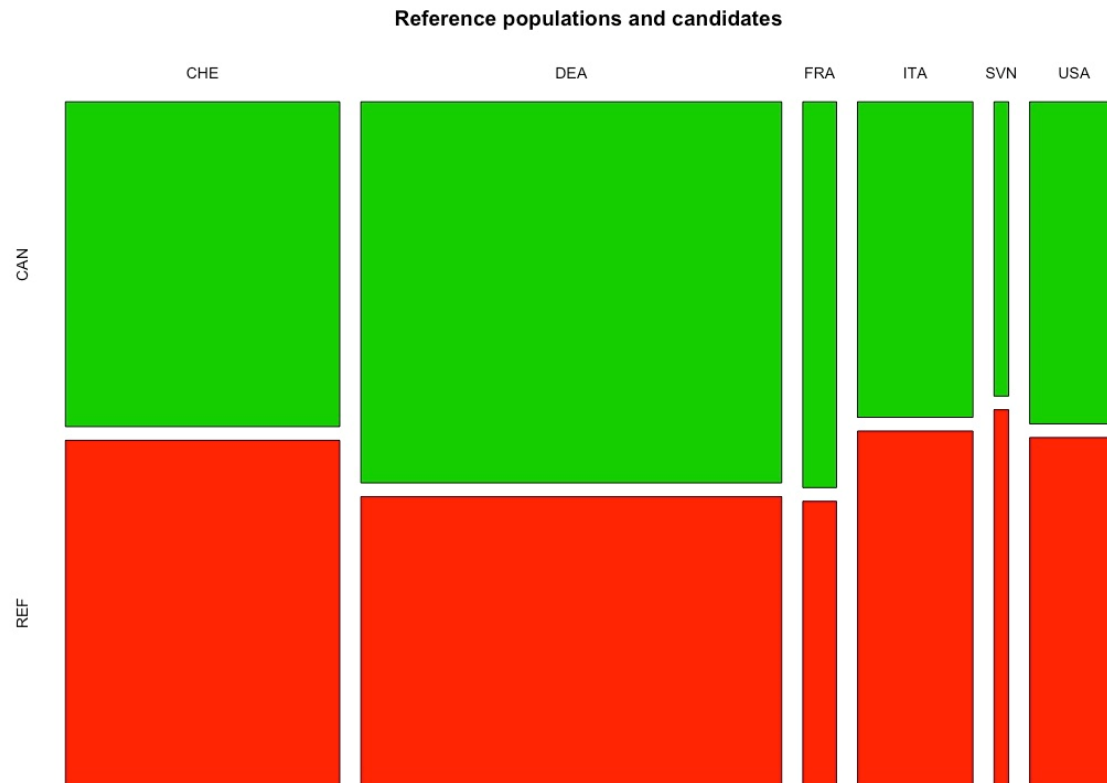
A Technical Committee



Interbull part of both committees

A system developed together

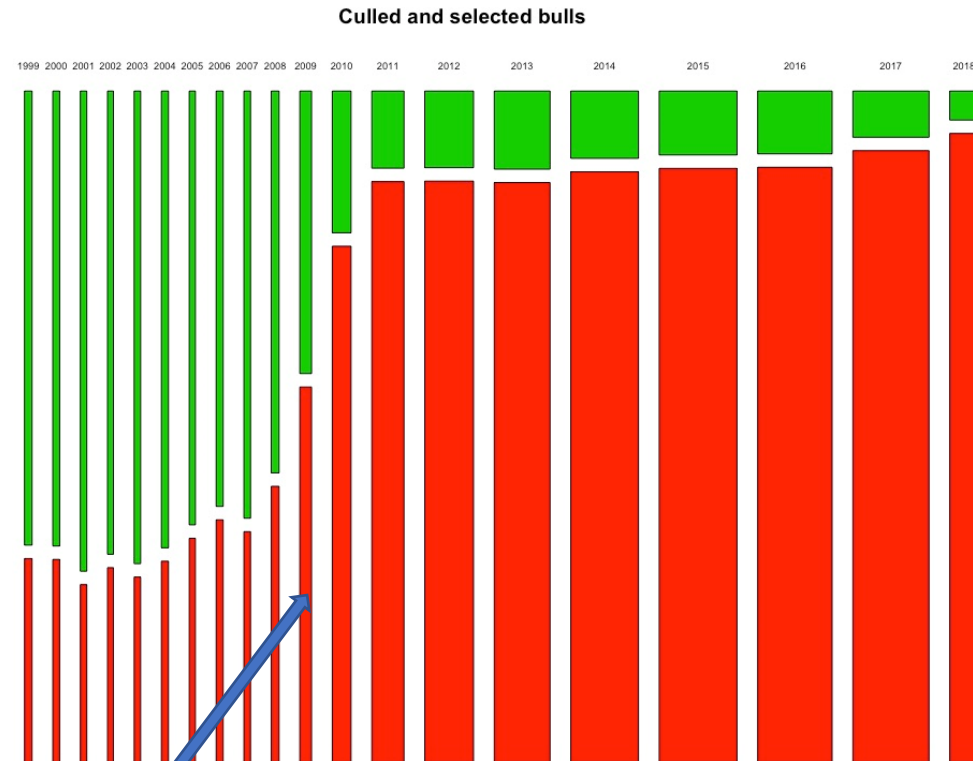
From Theory to Practice



- Candidate vs Reference populations
- Used to be : MOST Reference sires and SOME candidates
- The green bars are getting more and more important
- And we are talking about males only..

The impact of an agreement

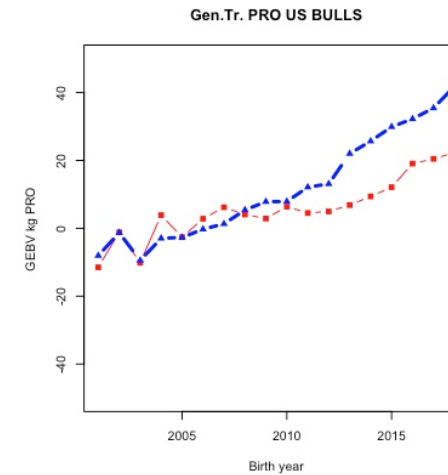
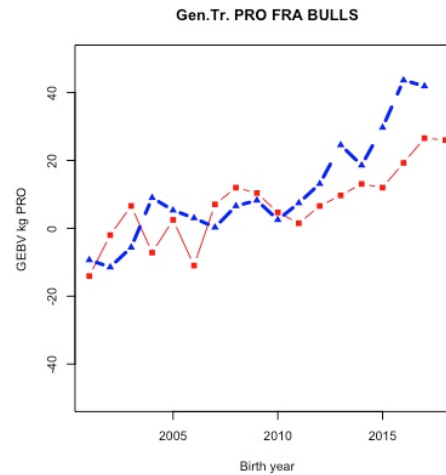
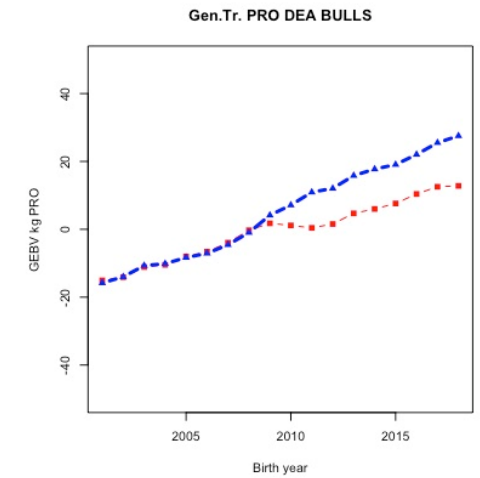
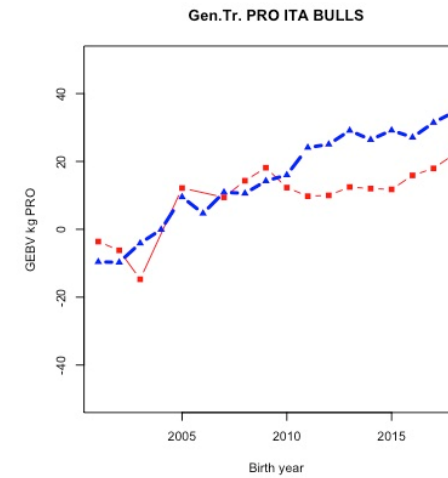
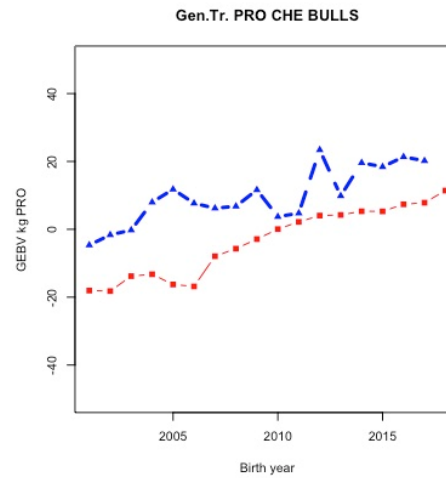
- Thickness of the bar is proportional to the total number of candidates
- Ratio between RED and GREEN is how strong selection is in BSW breed all over the world
- The genomic era in BSW starts with Intergenomics project



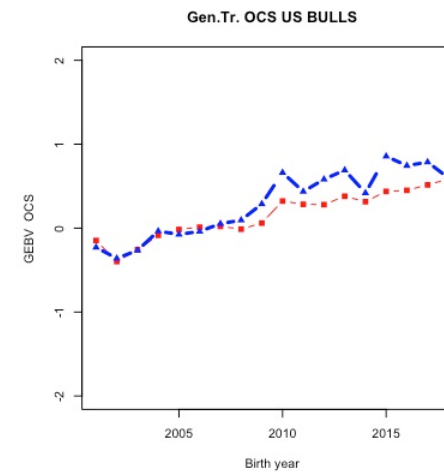
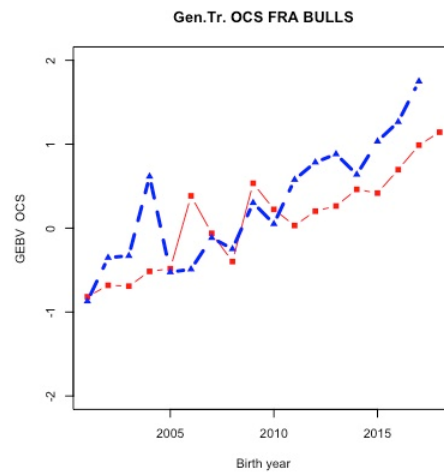
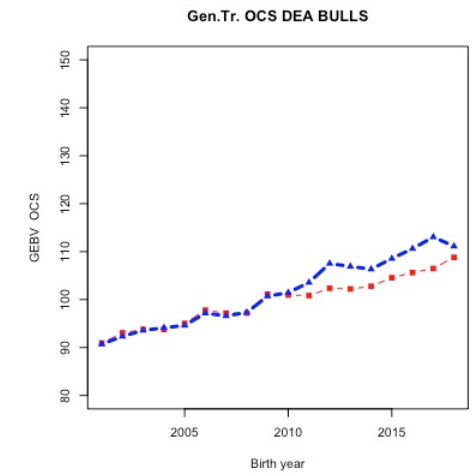
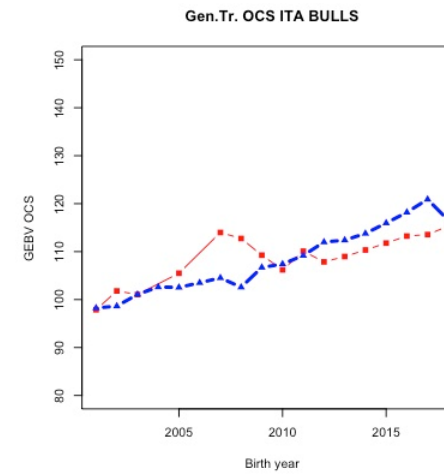
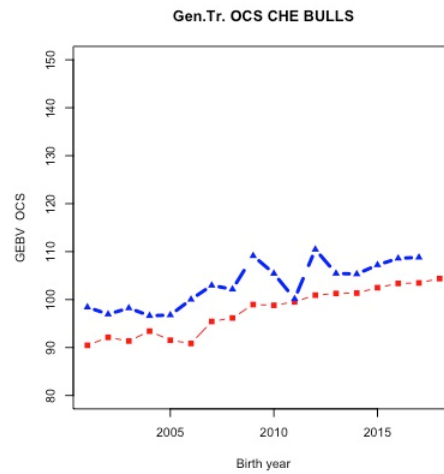
Intergenomics agreement signed

Genetic trends PROTEIN

- As soon as selection pressure increases the trends for culled and selected bulls start to split
- Different countries are pushing on specific traits with different speed



Genetic trends TYPE





interGenomics^{2.0}

- Sharing of genotypes
- Different calculation methods
- Interbull needs to redefine its role
 - A platform for sharing genotypes is a VERY limited role



The future in now

- A new double paradigm
 - From Males to Females
 - From Genotypes sharing to Phenotype sharing
 - InterPhenomics?

A crossroad for the whole industry

- Systems based on males (only) are solid but are the past
- The need of new traits is growing
- New traits are often costly to collect and have low h^2
- Building « phenotypes » via genetic evaluation of males is not efficient
- Real phenotypes are the ones to be used for new traits calibration
 - Reference populations of females (also)



A crossroad for Interbull

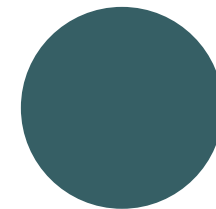
- Concentrate on back office
 - MACE until male paradigm holds
 - Certification
 - Sharing support
- Get into the future
 - Females are the future: Intercow? 😊
 - The need of a new business model
 - Sharing of phenotypes might be the next challenge



- Clear governance:
 - nothing happens if not governed
- Mutual trust:
 - No way to work together if you do not trust others
- A vision from both ends:
 - The ability to see beyond what is needed in 1 or 2 years.
- Successive goals:

 - When you reach a goal use it a starting point for the next step

Lessons learned



Interbull role:conclusions



W/O INTERBULL INTERGENOMICS
WOULD NEVER HAVE HAPPENED



INDEPENDENCE IS THE KEY
FACTOR

Thanks

thanks & A
LATTIE 