

Using genomics to manage progress and diversity: an industry perspective

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SAFE VERSION OF MY TALK

- Genomic selection did double genetic gain
- We expected genomics would also make it easier to balance progress & diversity
- So we did not anticipate the increase in inbreeding we see in the last years
- But, now we are aware, and will forcefully use genomic relationships and genomic inbreeding in our breeding programs and in the tools we use to support our customers

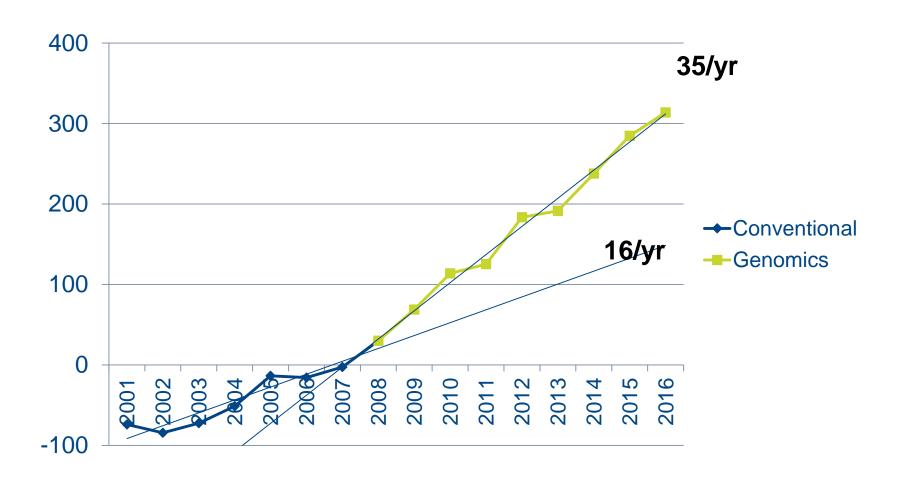








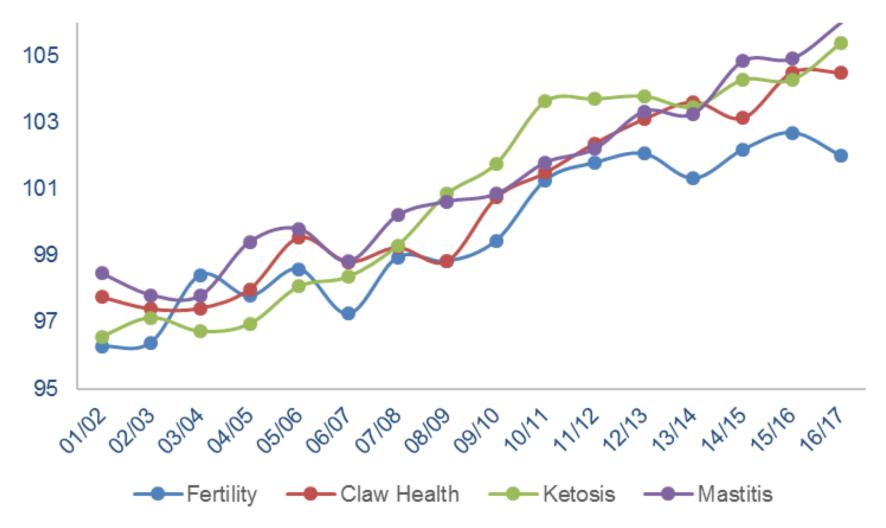
The Dairy Cattle breeding industry has been extremely successful in using genomics to drive genetic progress







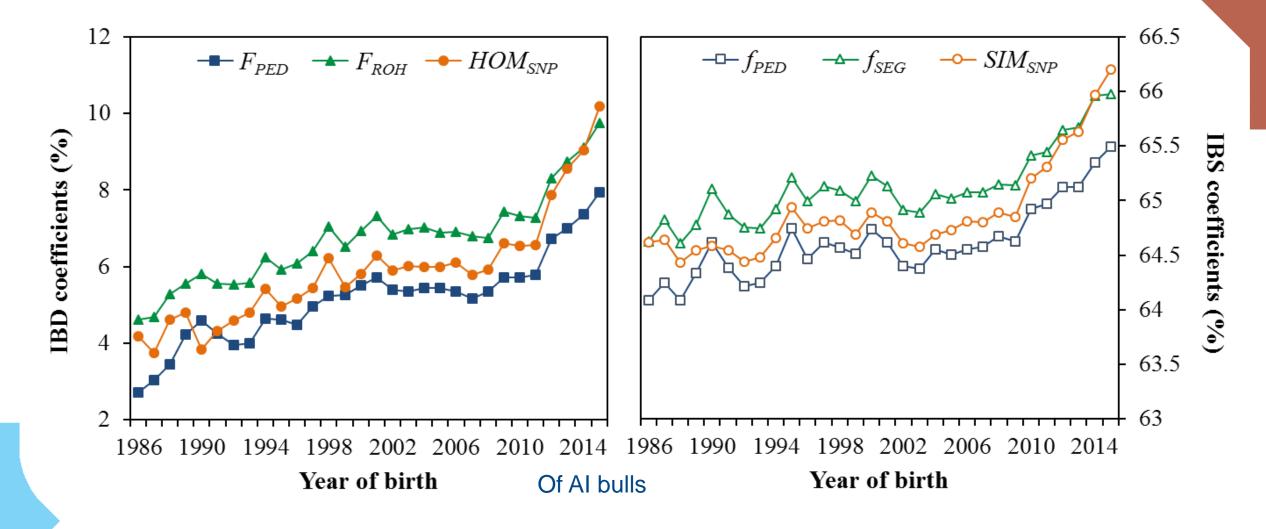
The progress is of high quality







But in the same time, rate of inbreeding is increasing







We have been here before

For birth-year 1990:

5 sires were responsible for

50% of the

5000 bulls from 18 countries evaluated by Interbull

(Wickham & Banos, 1998)















Characteristics of Optimum breeding schemes (Bijma, 2000)

- No Truncation Selection
- More focus on progeny testing, less on sib information
- Increased generation intervals
- Increased accuracy at the expense of selection intensity
- A mating strategy that accelerates the mixing of ancestral lines within the population









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Segmentation

Expected success in 5 different market segments

Relatedness

Proportion of cow population a bull can be mated to

Proportion of the cow population a bull can be mated to

Simulate future cow population based on current population and current sire use

Use inbreeding rules of CRV mating program

 Compute for each bull the proportion of the cow population the bull can be mated to without running into inbreeding problems







WE ARE ALL TRUNCATERS!

- Interbull
- Herdbooks
- Al organisations
- Scientists
- Press
- Maybe farmers are the exception







More focus on progeny testing, less on sib information

- Underexplored territory under genomics
- Gut-feeling: no focus on new Mendelian Sampling
 All focus is on "best" haplotypes from reference population
- Haplotypes from outcross pedigrees never selected as "best"
- Rethink how we design cow reference populations
- Rethink how we analyse cow reference populations
- Investigate how we can detect and propagate new Mendelian sampling







Increased generation interval

- I.e. favouring animals that have expressed their Mendelian Sampling
- Genotyping exceptional cows
- Re-use the best progeny tested bulls

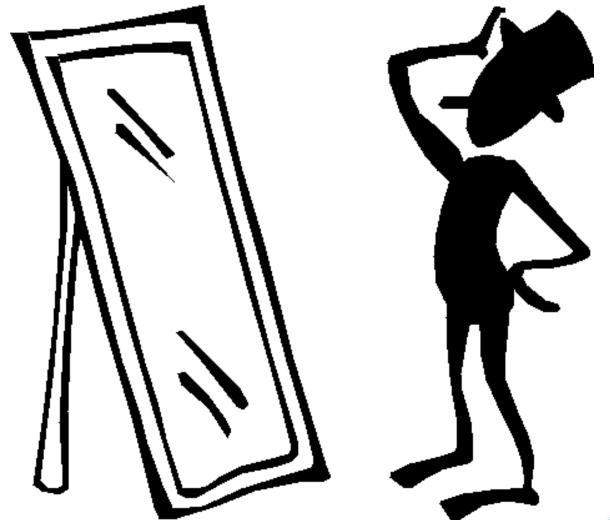
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Increased accuracy at the expense of selection intensity









A mating strategy that accelerates the mixing of ancestral lines within the population

Mate every mating sire to every bull dam [exploit IVP]

Deliberately mate super elite cows to outcross bulls









Selection & mating at farm level

 As an industry, we should educate ourselves and farmers that with genomic inbreeding new rules are required [inbreeding < 0.0625 no longer possible]

Show farmers inbreeding trends and genetic make-up of herd

Show farmers relatedness of bulls to enable proper bull selection

Then apply genomic mating







THIS TALK

- Genomic selection did double genetic gain
- We expected genomics would also make it easier to balance progress & diversity
- So we did not anticipate the increase in inbreeding we see
- We have to upgrade our tools to support selection and mating decisions of our customers
- But more importantly, as an industry we have to rethink how to balance progress and diversity in our breeding programs







