

# Using genetics to delight Pork consumers

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**Topigs Norsvin**

PROGRESS IN PIGS

228 yen/100 g



780 yen/100 g



30 €/100 grams



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**Spain:**  
high quality  
Iberico hams

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# The pork production chain – also in R&D

Reproduction



Robustness &  
Animal welfare



Feed & feed-  
efficiency



Meat & carcass  
quality



**Genetics and Genomics**



# The pork production chain – also in R&D

**Meat & carcass  
quality**



**Genetics and Genomics**



# Traits, tools and results

Lean Meat by CT scan

Loin depth and Fat depth

Carcass yield

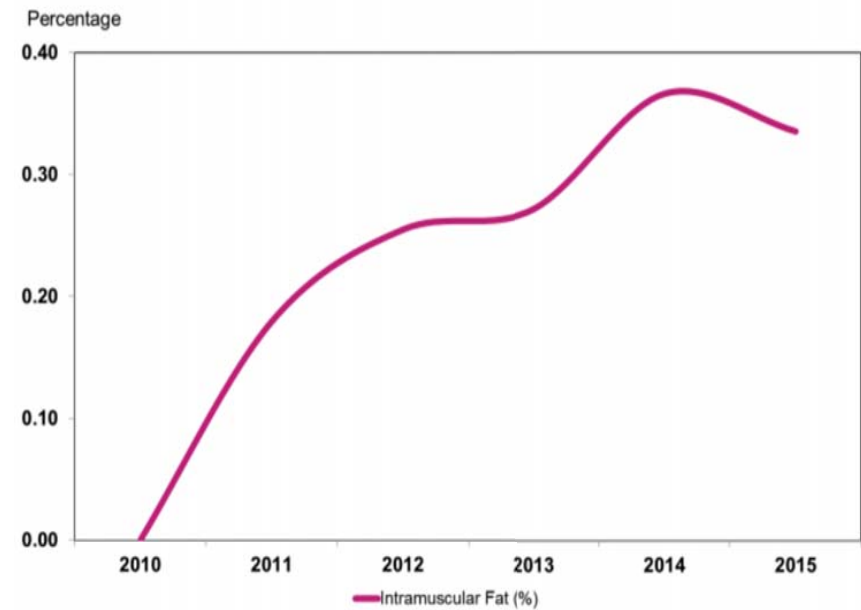
Carcass defects

Intra Muscular Fat

Water holding capacity

Boar taint – Human Nose Score

Meat colour



# Meat quality translated into traits

■ Carcass value

■ Meat quality

Boar taint – Human Nose Score

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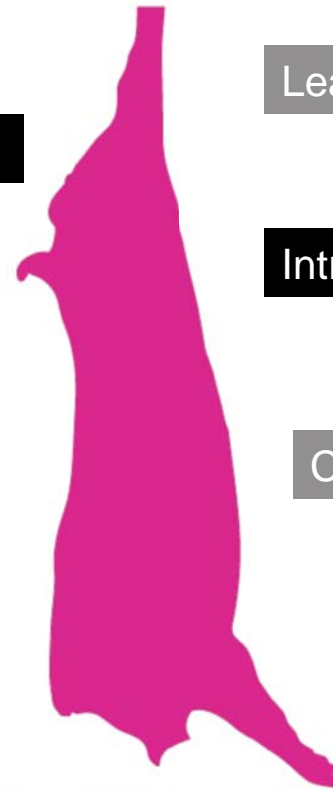
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Most quality translated into traits

# How to select for a king

– it's all about phenotyping and selection!





# Measuring tools

- **Computed tomography in boar station test**
  - Lean meat
  - Backfat
  - Loin depth
  - *Carcass yield – CT atlas*
- **Ultra sound in farms**
  - Backfat
  - Loin depth
  - Intra muscular fat
- **Human nose score**
  - Boar taint
- **Meat quality platform**
  - Intramuscular fat
  - Drip loss and pH
  - *Fatty acid composition*



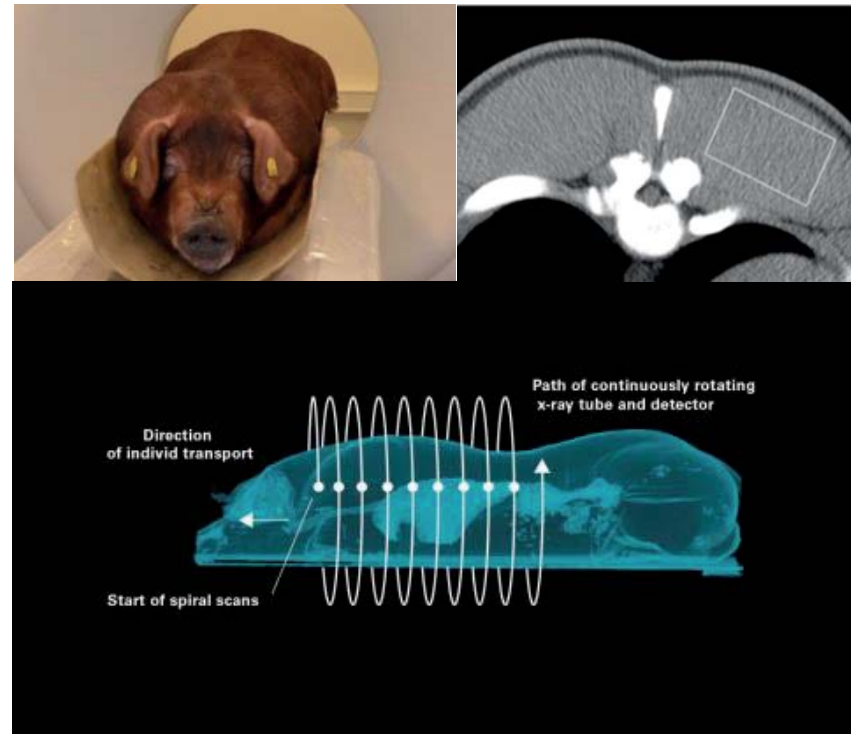


Delta, located in Norway, is a High Technology boar test station, for evaluation of carcass and production traits

## Norsvin Delta boar test station

### CT scanning

- 3,000 purebred boars tested annually
- ~1100 pictures/animal
- In-house software and infrastructure
- Fully automatic calculation of *in vivo* carcass quality
- High value for the breeding program:
  - High heritabilities
  - Data on the selection candidate
  - Large # animals tested



**Future: Tailor made pigs for your markets?**

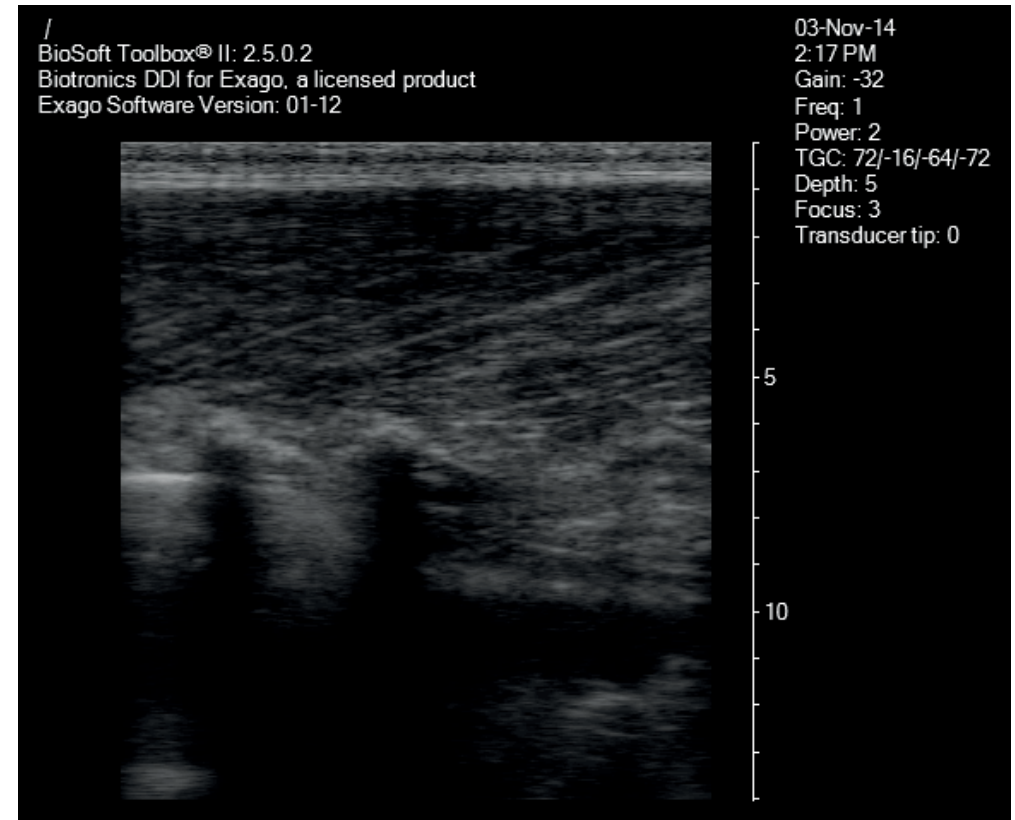


**You can't improve what you do not measure**



## Ultra sound measurement

- Fat and loin depth measurements on living animals for carcass quality
- **In vivo** predictions of IMF for improved meat quality
- Worldwide 70,000 measurements per year



## Human nose score for boartaint/odour

### Boar taint

- In Europe: Ban of castration in 2018?

### Human Nose Score

- Fast evaluation method

### Nador finisher boars

- Low boar taint boars
- Genomic selection



## Meat and fat quality evaluation



Photo: DMF

- Approximately 1600 boars of Norsvin Landrace and Duroc are tested annually



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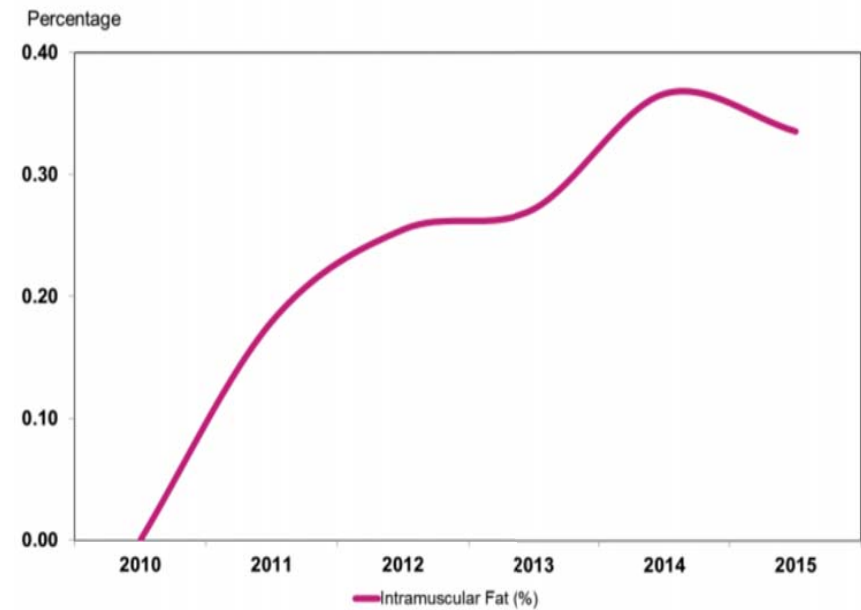
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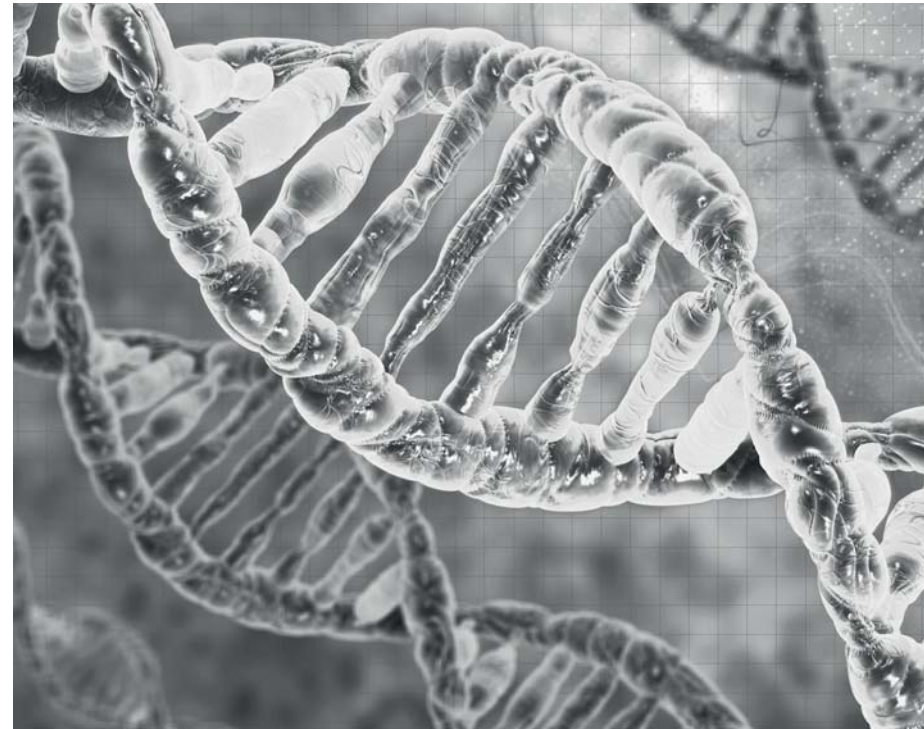


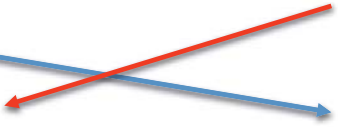
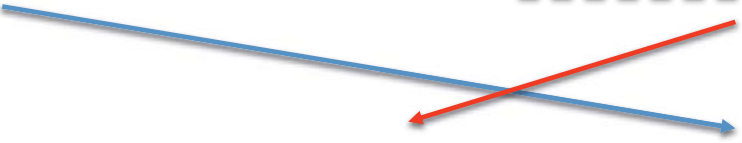


## Genomic tools

- DNA-samples from all animals born in GN-farms
- Annual genotyping of 100 000 animals for ~50 000 SNPs
- Focus on building matrixes
- Genom wide association studies...

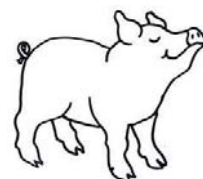
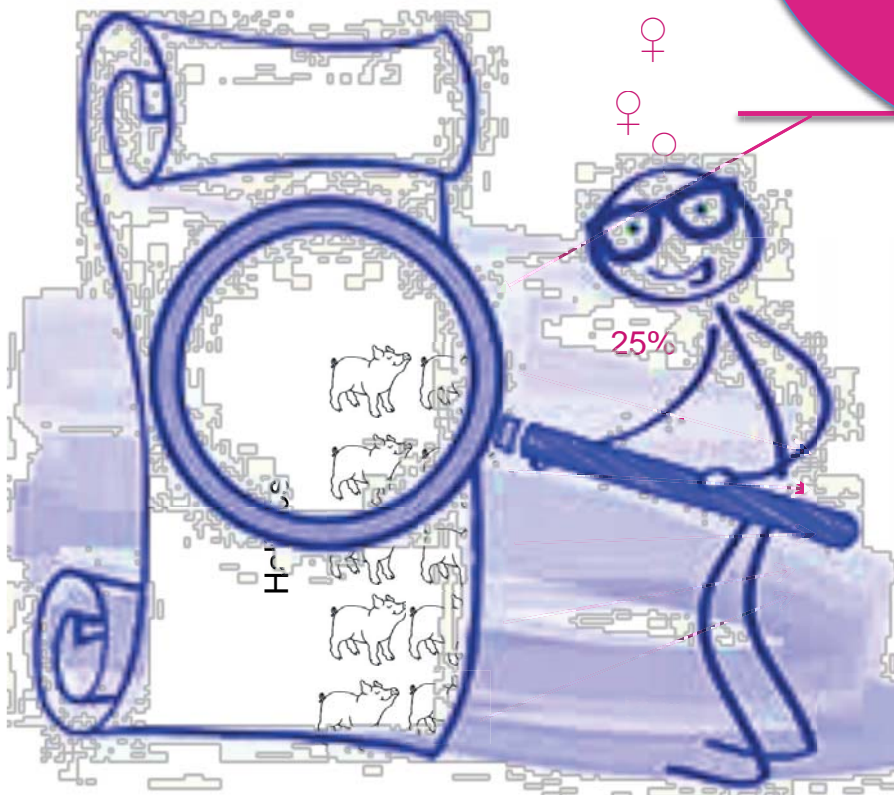
# Why?





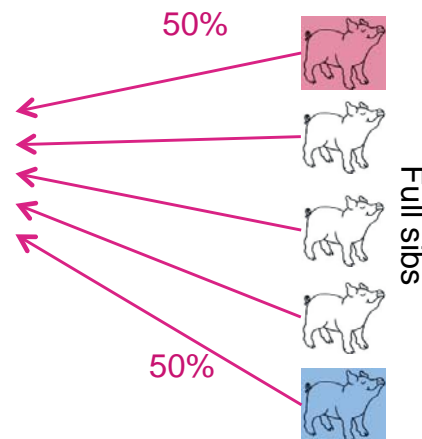
# Traditional relationship

Let's genotype lots of animals and implement **GENOMIC SELECTION!**

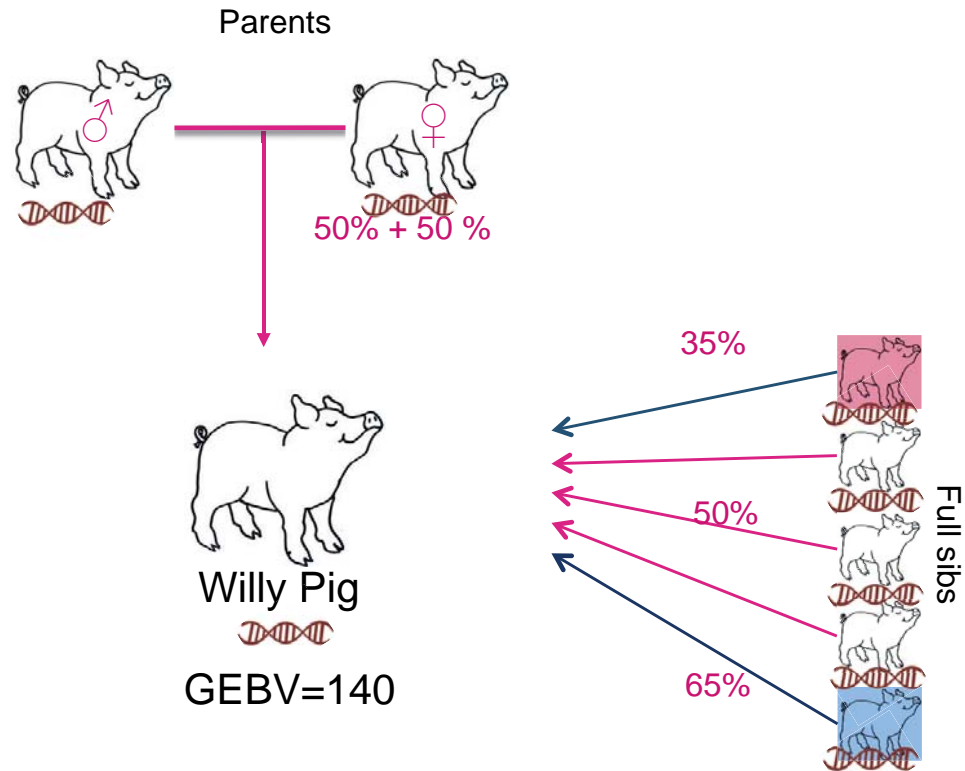


Willy Pig

EBV=120



# Traditional relationship vs. genomic relationship





# Genomic relationship?



$$\mathbf{H}^{-1} = \mathbf{A}^{-1} + \begin{bmatrix} 0 & 0 \\ 0 & \mathbf{G}^{-1} - \mathbf{A}_{22}^{-1} \end{bmatrix},$$

$$\mathbf{G} = \frac{(\mathbf{M} - \mathbf{P})(\mathbf{M} - \mathbf{P})'}{2 \sum_{j=1}^m p_j(1 - p_j)},$$

$$\begin{pmatrix} 1 & 0 & .5 & .75 & .375 \\ 0 & 1 & .5 & .25 & .625 \\ .5 & .5 & 1 & .75 & .625 \\ .75 & .25 & .75 & 1.25 & .75 \\ .375 & .625 & .625 & .75 & 1.125 \end{pmatrix}$$

# Estimating breeding values

EVERY DAY, GEBV's for:

- 35,000,000 pigs
- 70 traits
- 100,000 pigs genotyped annually



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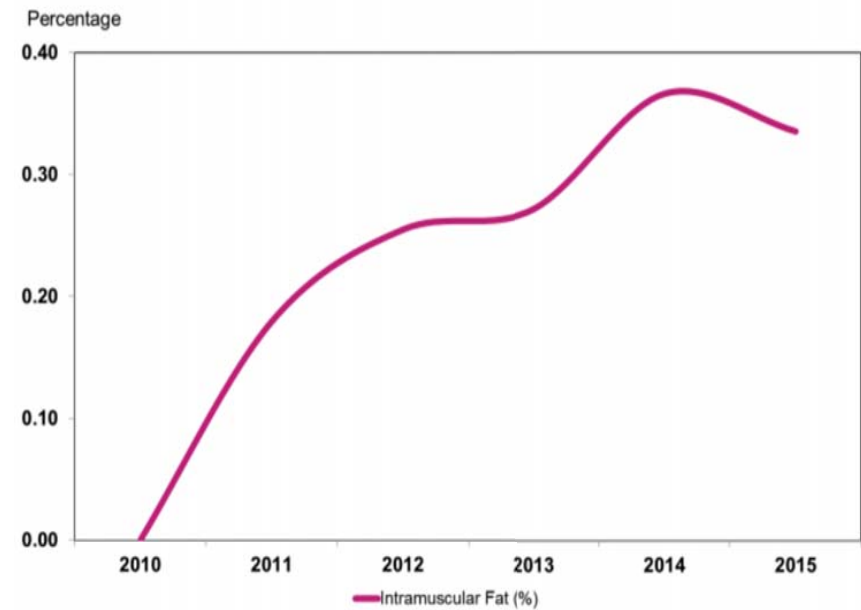
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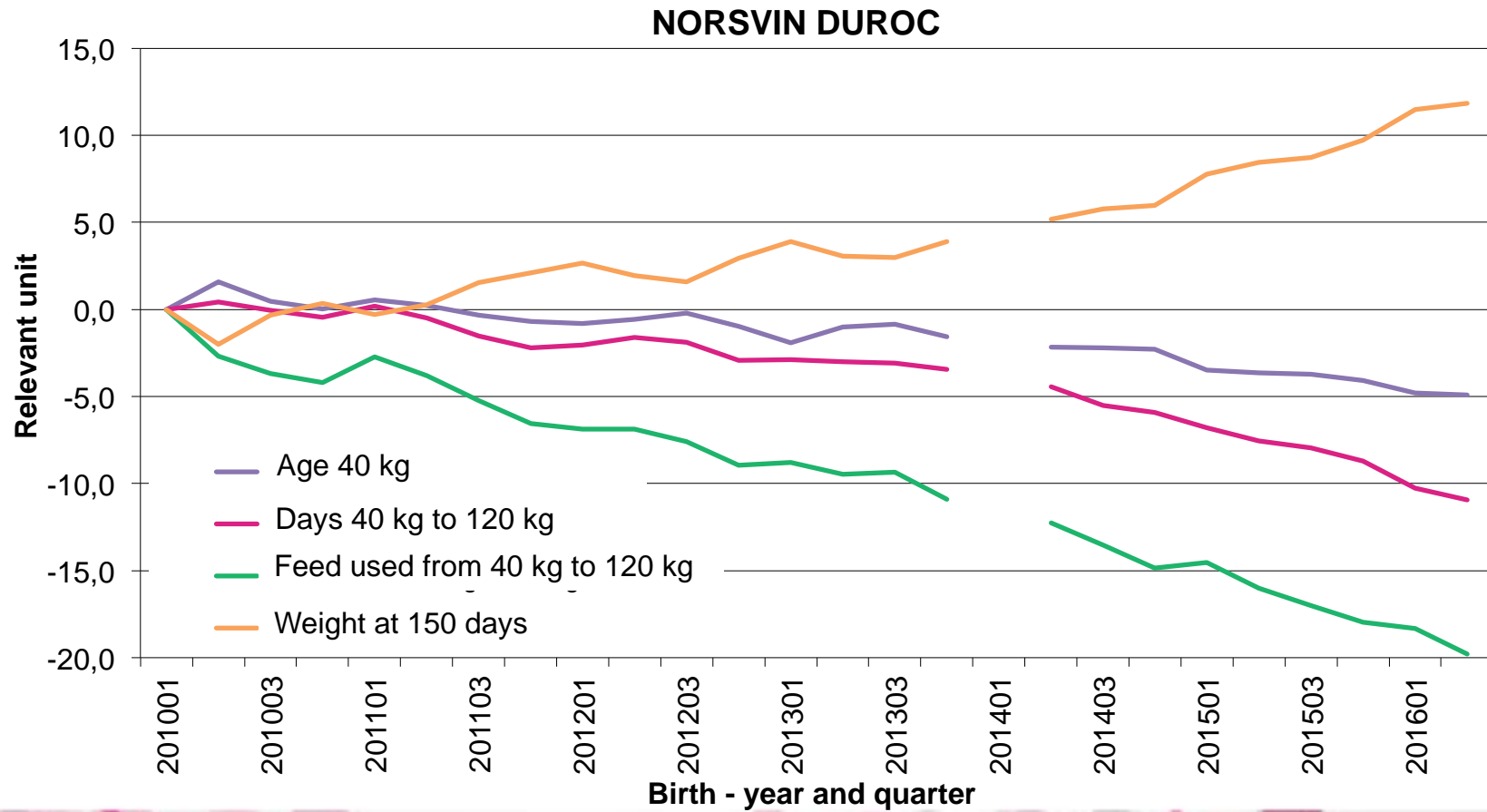
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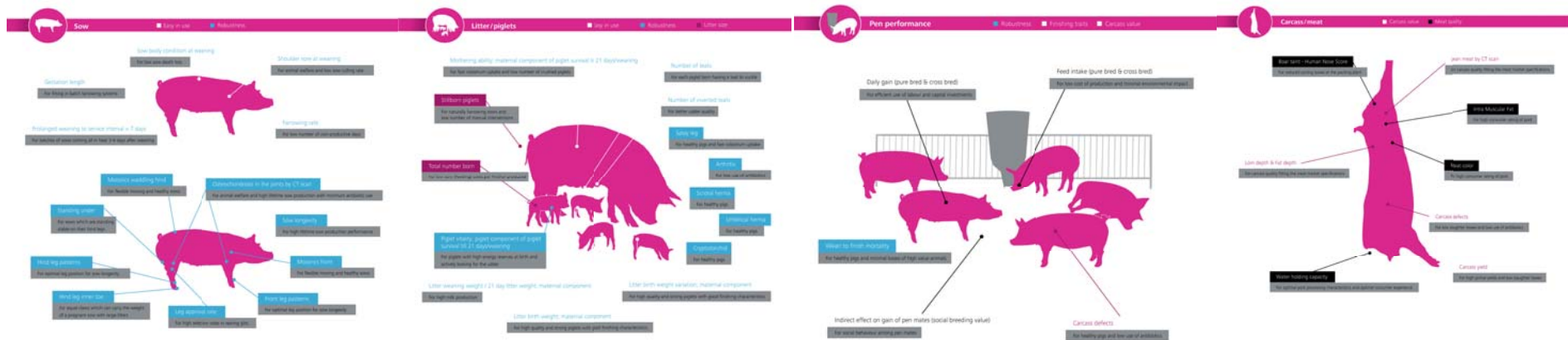


**Finisher traits**  
**Genomic selection started January 2014**

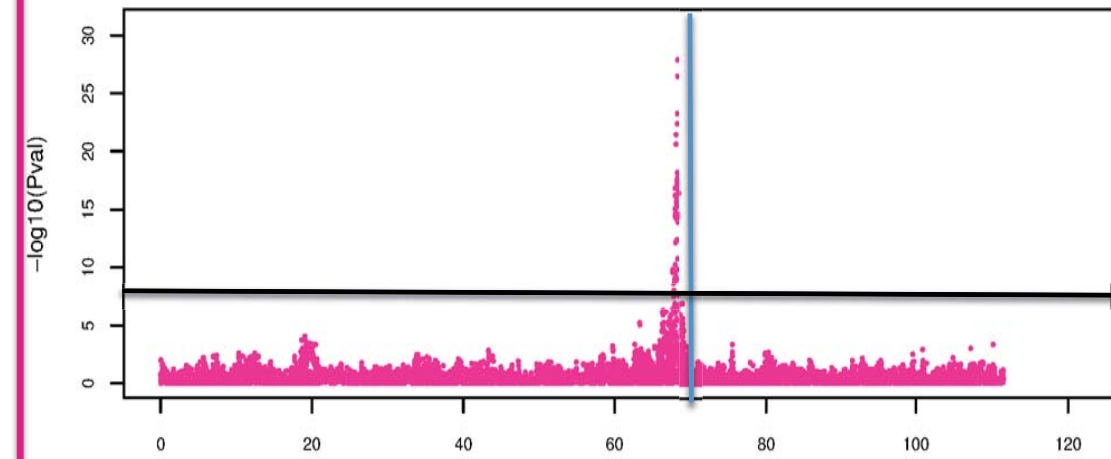




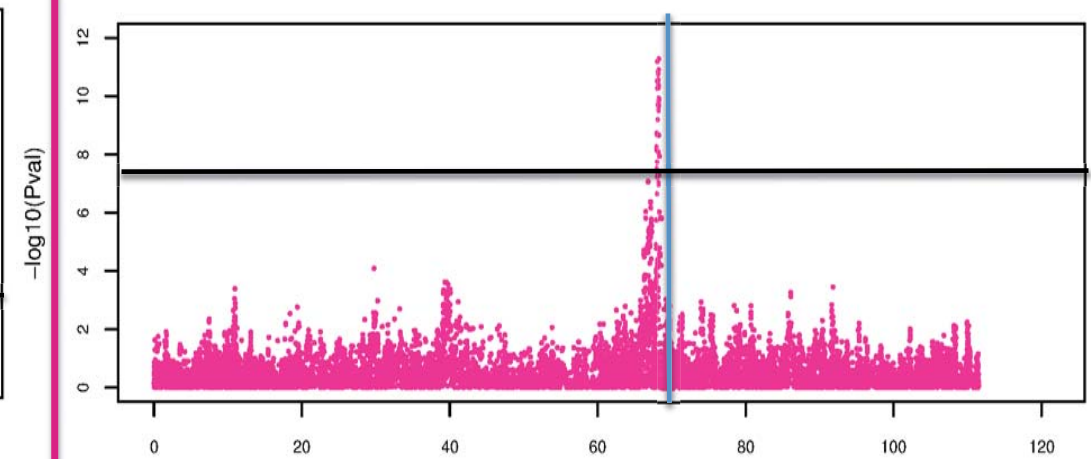
# Why so many traits?



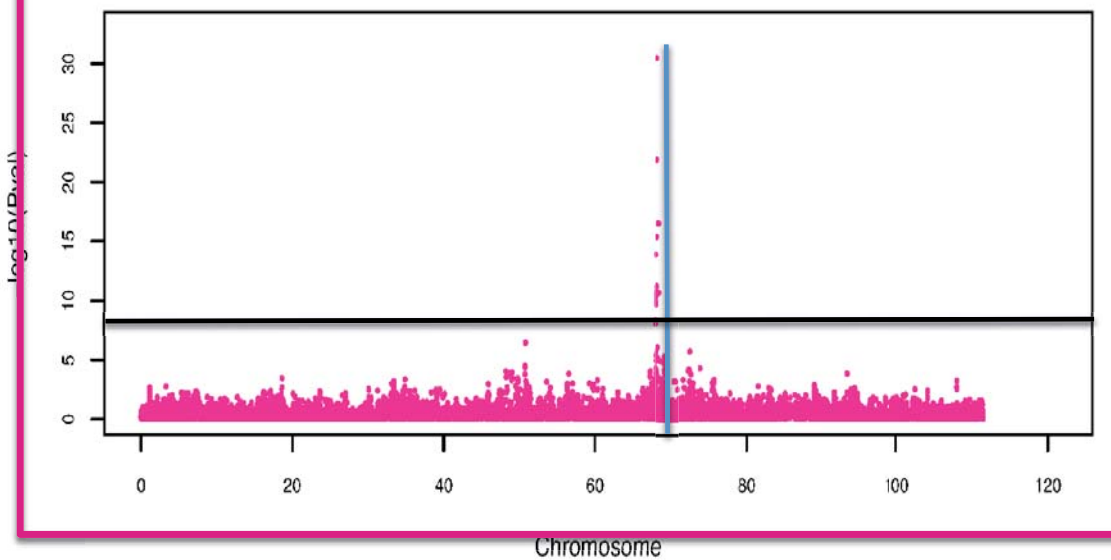
CHR 5 GWAS PPPF EBV TRAIT BFE



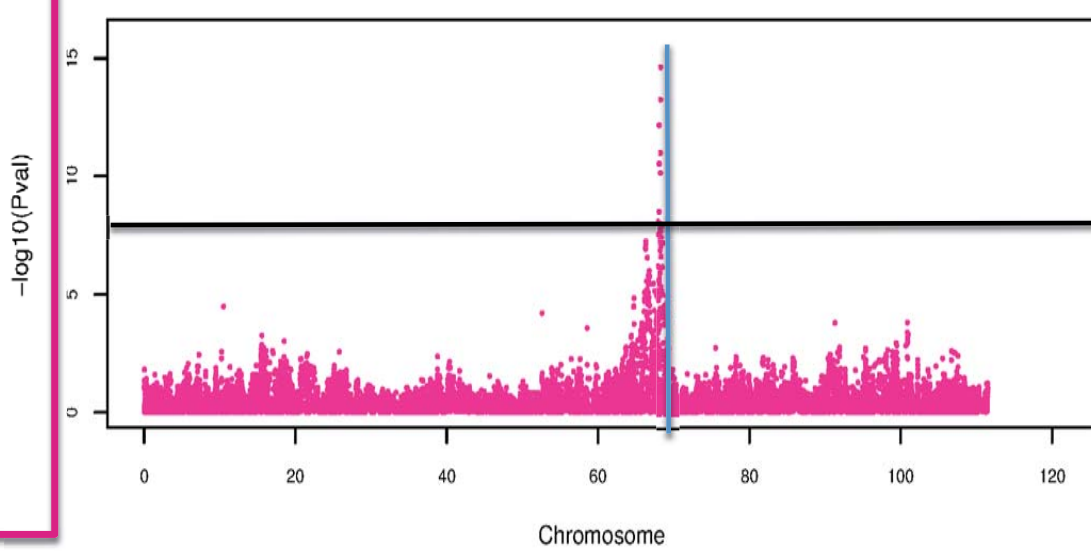
CHR 5 GWAS PPPP EBV TRAIT IMF



CHR 5 GWAS ZZZZ EBV TRAIT BFE



CHR 5 GWAS PPPP EBV TRAIT HNS



# Genetic correlations between meat quality traits

Breeding for lean meat percentage,  
growth and feed efficiency



Less intramuscular fat ( $r = 0,81$ )  
More drip loss ( $r = 0,24$ )



# Consumers feedback can be somewhat confusing

*Caroline Kealey , Meat Science Director JSR Genetics*

**...but if consumers pay, we can breed!**

*Torunn Aasmundstad, Senior Scientist Norsvin*



# Thank you for your attention

Topigs Norsvin – Turning vision into value



**Topigs Norsvin**

PROGRESS IN PIGS