Setting the standard for sustainable animal breeding

Gosse Veninga

Director Product Excellence

BU Layers, Hendrix Genetics

Gosse Veninga

1988-1997

MSc degree in Animal Science

Thesis Animal Breeding & Genetics on reproduction parameters in dairy

Thesis Farm Economics on heifer replacement policy on dairy farms

Followed by number of R&D projects (1994-1997)

1997-2000

Hypor - Nutreco
Geneticist

Contribute to the breeding program of Hypor. Optimization of the structure, data processing and exchange including implementation of new database

2000-2004

Marine Harvest – Nutreco (Chile)
Manager Reproduction & Genetics

Responsible for the reproduction planning, breeding program of salmon, and 4 hatchery sites (45 fte)

2004-2015

Hybro – Nutreco
Cobb – Tyson Foods

- Chief Geneticist
- Director R&D Genetics Europe

Responsible for the breeding program of Hybro / Cobb – EMEA. Close connection with research (B4F consortium) and customers (6 fte)

2015-2018

CRV
Manager Genetic Products

Responsible for breeding program and supply chain of genetics, including barns, lab, and logistics (85 fte)

Close connection to the customers

2019-

Hendrix Genetics

- Area Director EMEA (layers)

Responsible for (G)PS & CS sales including 4 Distr. Opco's (250 fte)

- Director Product Excellence (April 2021)

R&D, innovation & market intelligence

Which persons can you expect – linked to HG?

- Caitlin Cooper – consultant of HG
  - Presentation this afternoon
- Marco do Almeida – Area Director South America
  - Wednesday
- Mark Tizard – research partner at CSIRO
  - Organizing committee
- Ana Granados Chapatte – Director EFFAB

- After this workshop
  - More connections with YOU!

Our vision – Hendrix Genetics

"Setting the standard for sustainable animal breeding"

Organization structure Hendrix Genetics

HENDRIX GENETICS

Research & Technology Centre

Corporate Services

Turkeys

Layers

Traditional Poultry

Swine

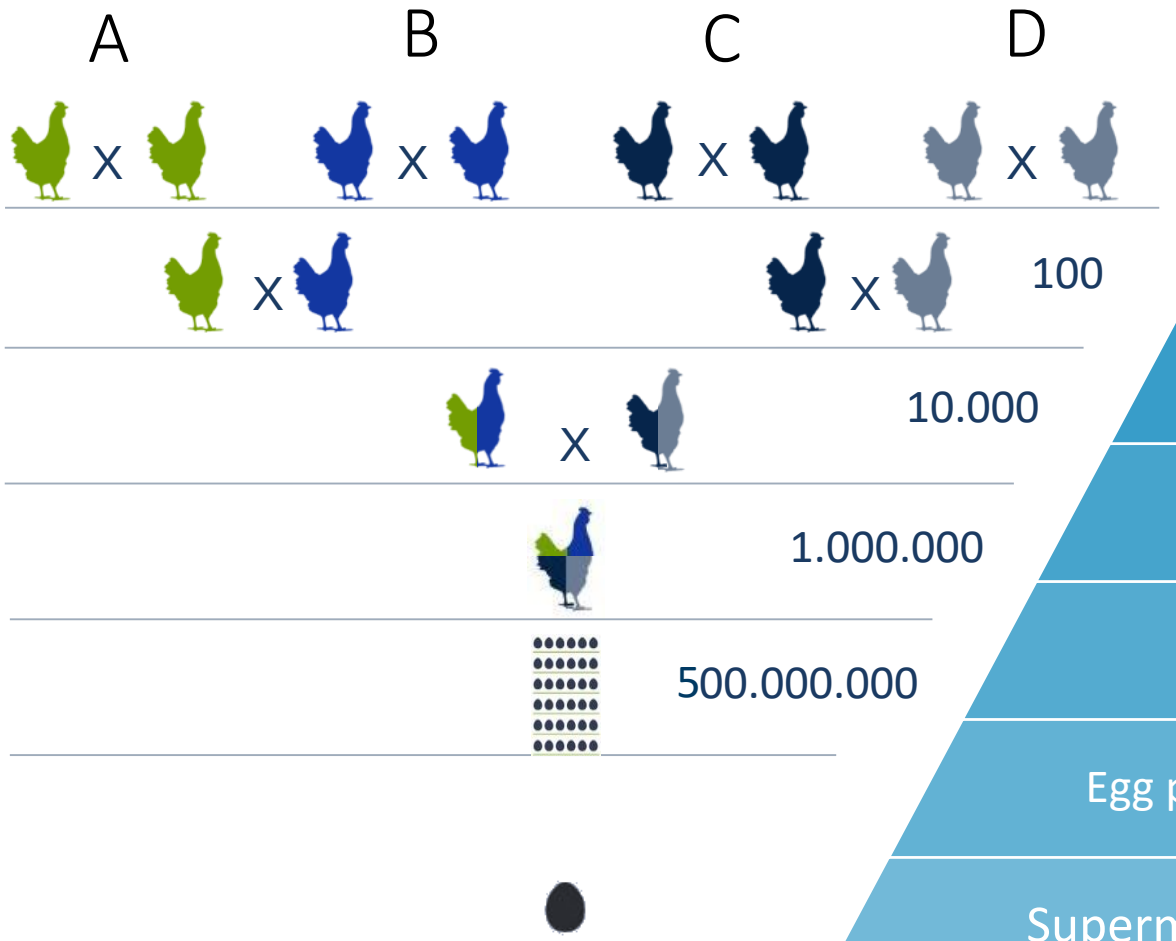
Aquaculture

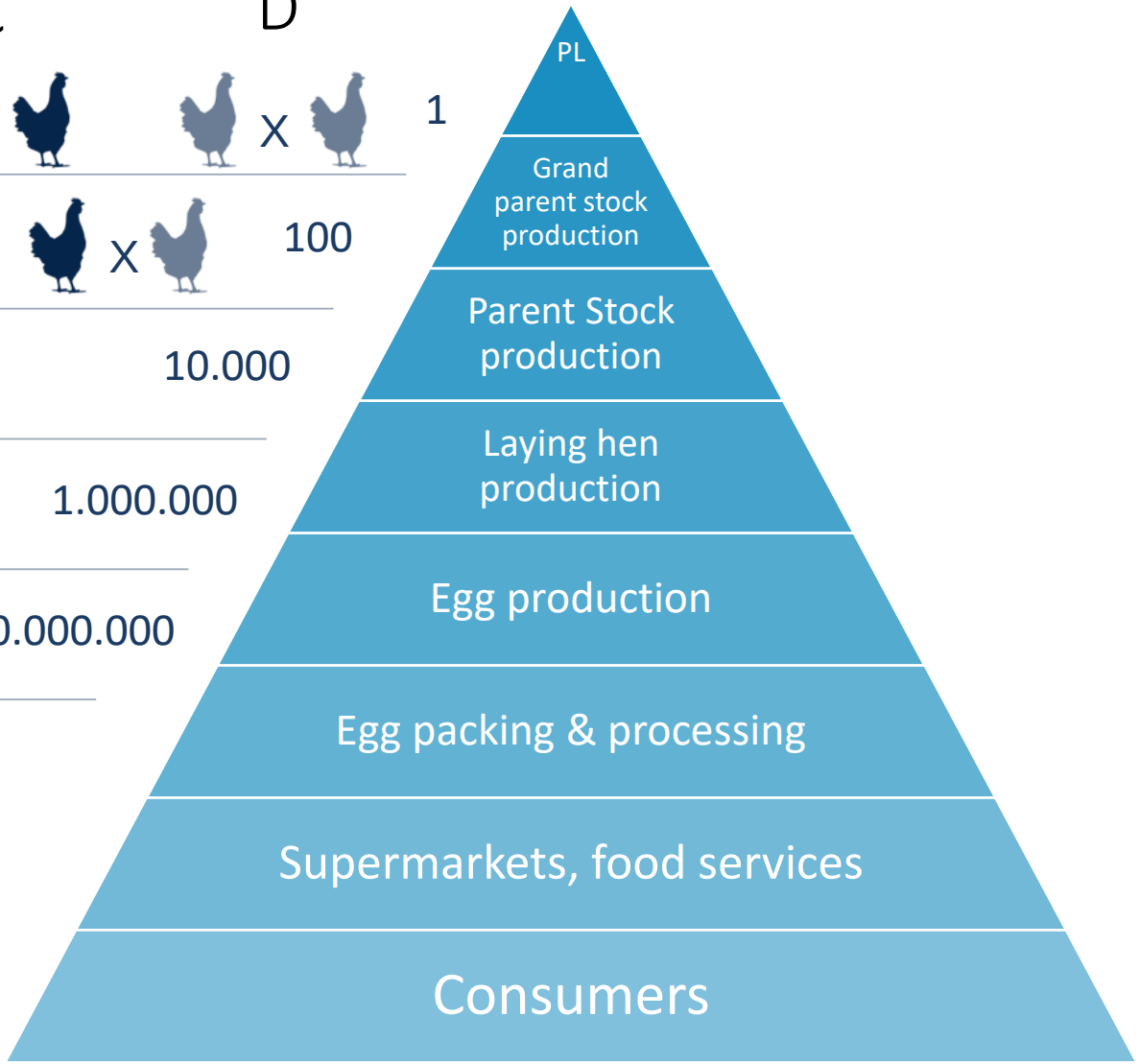
What is animal breeding?

Frequent comment from friends:

Ooh, so you are genetically modifying the animals...

Overview of egg production supply chain





The evolution of breeding goals

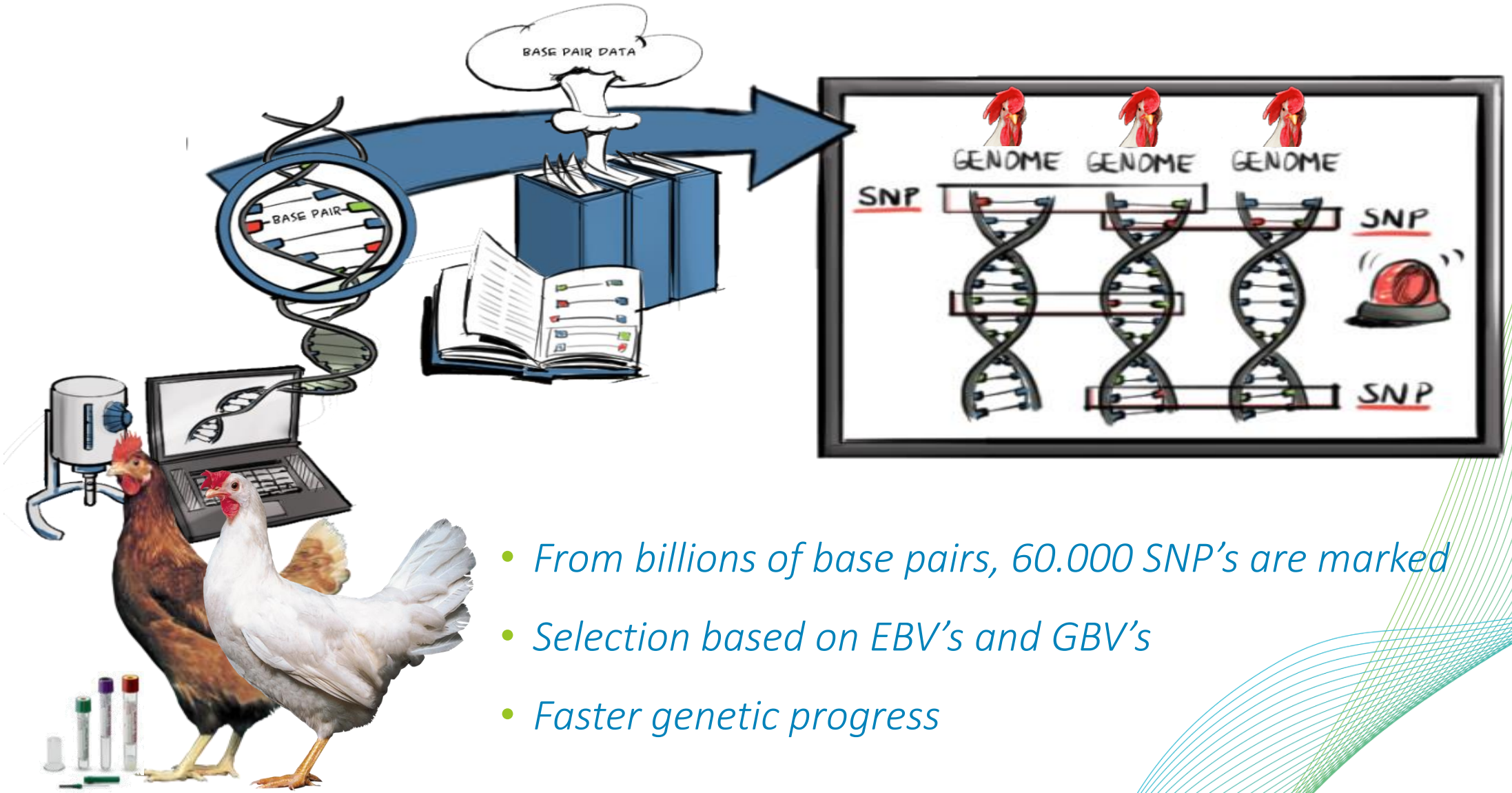
Improving livability: breeding the “social” hen

Challenging the birds via their environment:

- Different bird densities
- Different light intensity
- Intact beaks

Goal: to identify the “Social” families with good production and use these families as parents for future generations

Adding Genomic information



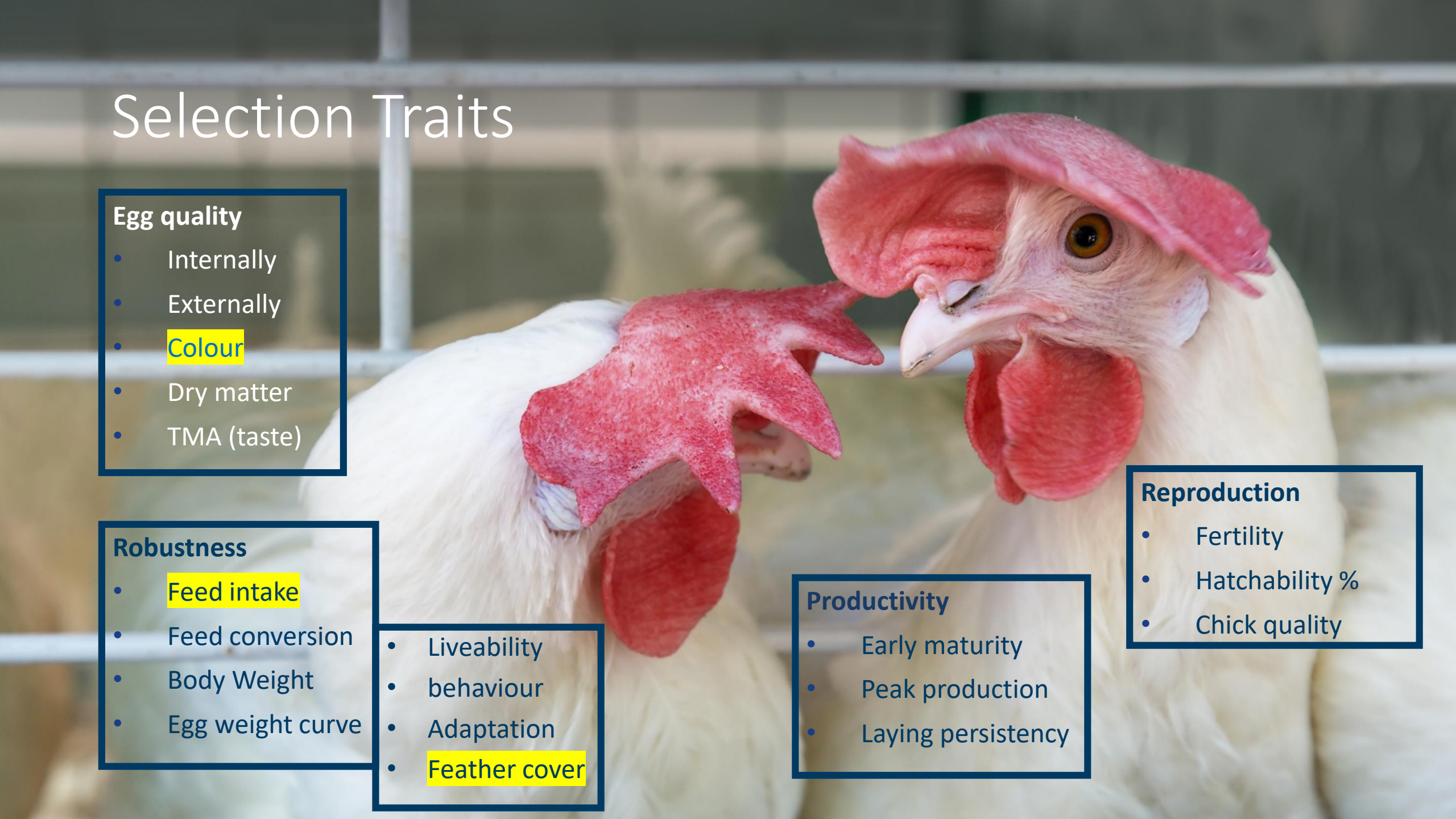
- *From billions of base pairs, 60.000 SNP's are marked*
- *Selection based on EBV's and GBV's*
- *Faster genetic progress*

"Breeding for the highest amount of 1st Quality Eggs per hen housed!"

Selecting for

- Persistency
- Livability
- Optimal Curves
- Egg shell Quality

Selection Traits



Egg quality

- Internally
- Externally
- Colour
- Dry matter
- TMA (taste)

Robustness

- Feed intake
- Feed conversion
- Body Weight
- Egg weight curve

- Liveability
- behaviour
- Adaptation
- Feather cover

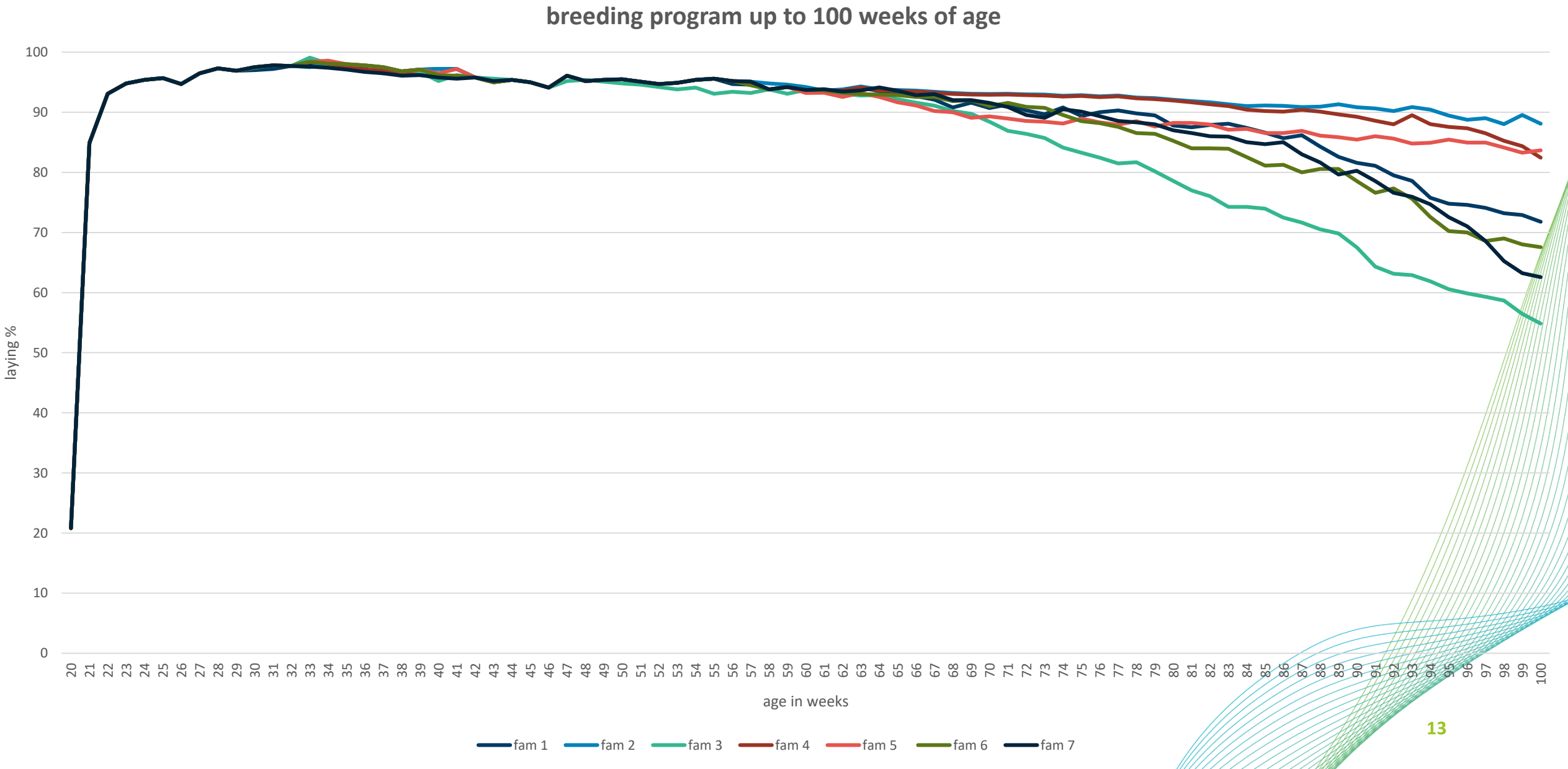
Productivity

- Early maturity
- Peak production
- Laying persistency

Reproduction

- Fertility
- Hatchability %
- Chick quality

Todays' breeding program



The Result

Our position on GE / GMO

Use of gene editing in animal breeding

1. Better understanding of function of variant
   - To proof impact of certain variant
   - When variant is present but at low frequency: select animals based on genetic test
2. Introducing a “new” variant into population

Use of gene editing in animal breeding

1. What would be the focus traits?
   - Animal welfare
   - Disease resistance
   - Genetic security (avoid mixing wildlife & farm populations)
   - Human health

   - NOT: production traits (to start with)

Position statement Hendrix Genetics

- HG is currently not using gene editing - in their products
- Gene editing is an promising technology and we will actively follow the developments in this domain
- An application of gene editing in the future requires a careful evaluation
- Improving animal welfare is most promising domain

Gene editing

Position statement published in 2018: exciting technology which might offer new opportunity provided it is applied in a responsible manner

We are involved in three research projects related to gene editing:

- Castration-free swine project (icw Acceligen, USA, started in 2019)
- Disease resistance in salmonids (icw Roslin Institute, UK, started in 2019)
- Development of sex-detectable layer line (icw CSIRO, Australia, started in 2021)

Updates on projects:

- Disease resistance in Salmonids: identified functional mutation IPN, currently testing relevance of this unique finding for trout
- castration-free swine project: we were unable to find a way for “fertility rescue” ➔ decided to stop the project at end of 2021.

Steps in use gene editing for introduction “new” variant

1. Finding the target (what edit to make)
2. Testing the impact of the edit:
   - Does it have the predicted effect?
   - Are there consequences for other traits?
3. Introducing the variant in breeding population
   - Editing 100’s of animals (nucleus)
   - Dissemination to target animals

Responsible innovation

Technology is available. Should we use it?

1. Is it legal: is it allowed?
2. Is it ethical: can we justify it?
3. Will society accept the product?

Ethical evaluation

Responsible application requires an ethical framework and involvement of society in discussion

Elements of framework

- What is the benefit of the application
- What is the impact on the animal
- Is there an alternative approach to realise same benefit

Framework will help in the public discussion provided we are open

Responsible research and Innovation (RRI)

- Anticipation: we need to be proactive
- Reflection: Challenge own assumption and roles
- Inclusion: involve multi stakeholders and citizens
- Responsive: act loyally on what you learn

- **Our objective of this workshop?**
  - **Get to know the experts / active players**
  - **Learn from present cases**
  - **Explore options to implement**
  - **Communicate in an open way = key**
  - **…**

Setting the standard for sustainable animal breeding >> **via responsible innovation**

Thanks for your attention!

Babcock

DEKALB®

ISA

SHAVER

Hisex

BOVANS®

Taking Feather scores to improve liveability

Score = 0

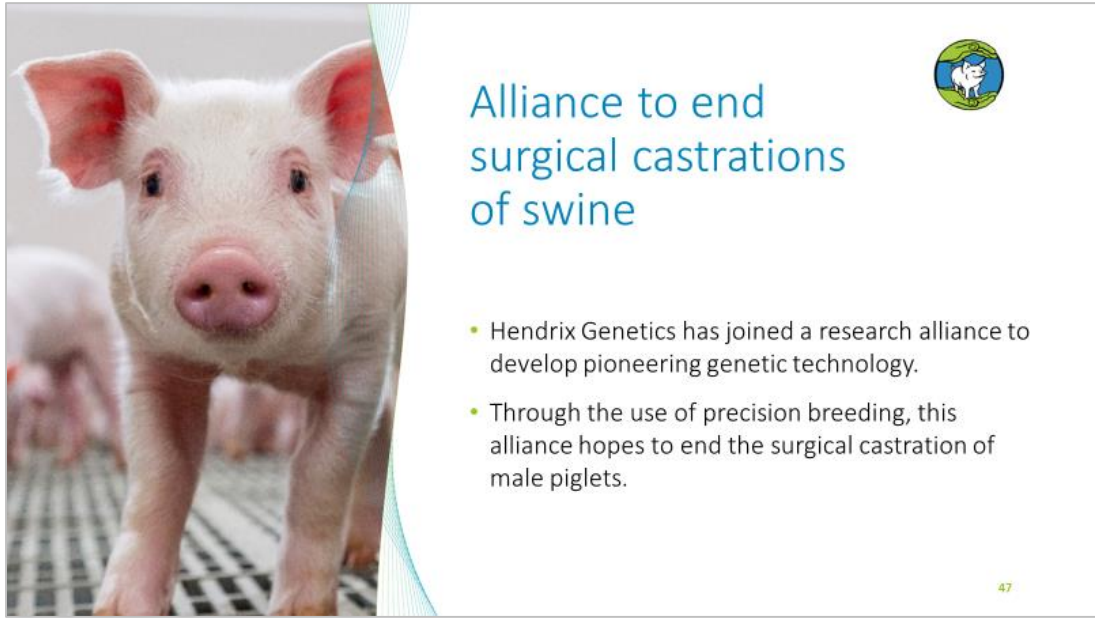
Score = 1

Score = 2

Pictures derived from www.Featherwel.org

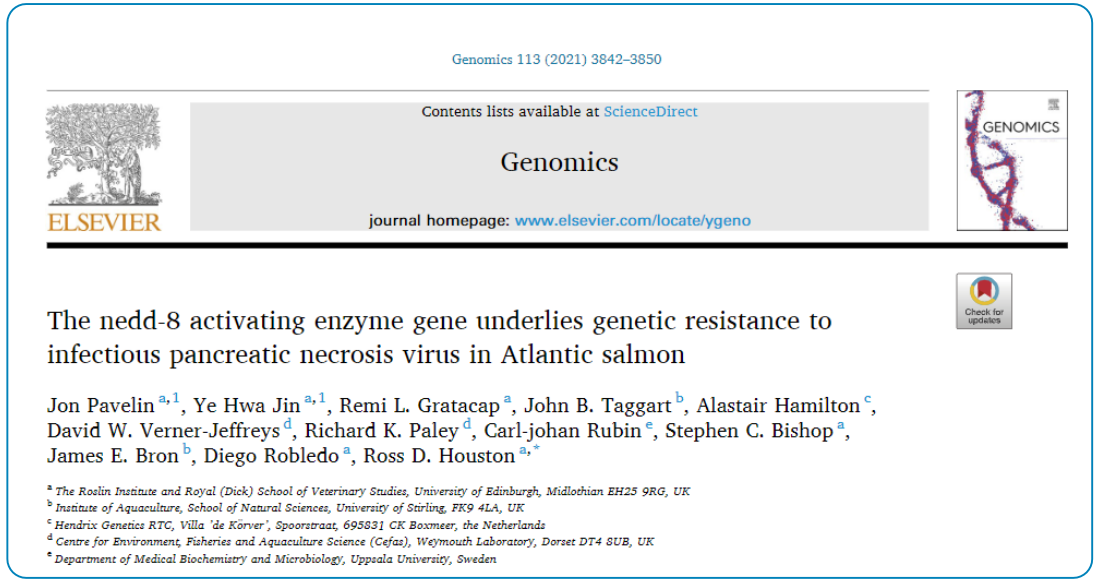
Castration-free pig project

- Aim: Preventing boar taint
- How: Precision breeding that results in boars born naturally castrated
- Why: current practice of surgical or chemical castration impact animal well-being and add health risks to animals from potential side effects.
- Our knowledge on the genome is limited ➔ research started to determine the impact on performance of animal



Gene editing to understand disease resistance: collaboration with Roslin Institute (Scotland)

Causal mutation for IPNV



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Genomics

journal homepage: www.elsevier.com/locate/ygeno

The nedd-8 activating enzyme gene underlies genetic resistance to infectious pancreatic necrosis virus in Atlantic salmon

Jon Pavelin [a,1], Ye Hwa Jin [a,1], Remi L. Gratacap [a], John B. Taggart [b], Alastair Hamilton [c], David W. Verner-Jeffreys [d], Richard K. Paley [d], Carl-johan Rubin [e], Stephen C. Bishop [a], James E. Bron [b], Diego Robledo [a], Ross D. Houston [a,*]

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IPNV

Using gene editing, we have been able to detect the mutation that is responsible for resistance to IPNV.