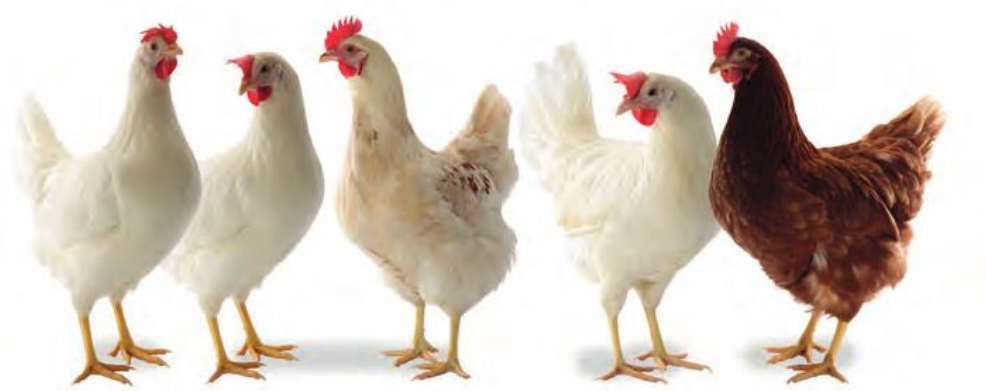
INTERNATIONAL

The key to your profit!



H&N Genetics and Breeding

Dr. David Cavero Pintado

H&N Academy – Cuxhaven 26.09.2019

Arthur Heisdorf

A Tradition of Progressive Poultry Genetics since 1945

- A pioneer geneticist with visions
- Crosses outperformed the pure lines
- Best line combination:
  - ”Nick Chick” ➔ **Nickability**
- Heterosis Conference (1949) in Iowa:
  - Recurrent Reciprocal Selection (RRS)
  - Family selection on the basis of cross-line information
  - A principle which is still being applied in breeding today

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Genetic Team

Since 1997: Lohmann and H&N breeding lines in Cuxhaven

- Different gene pools
- Similar breeding strategy
- ~~Same Genetics team~~ Since 2016 different genetics teams

LOHMANN TIERZUCHT

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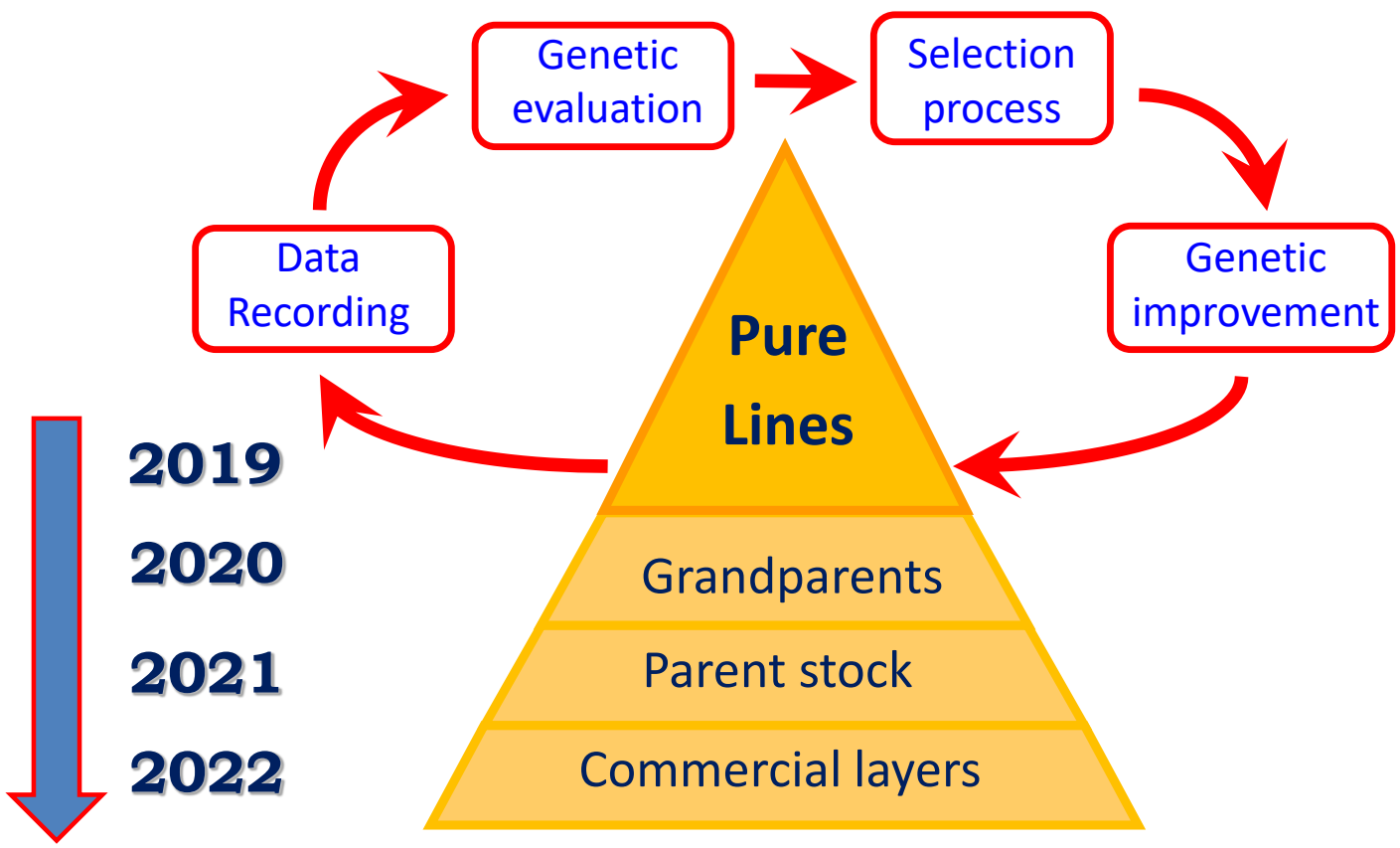
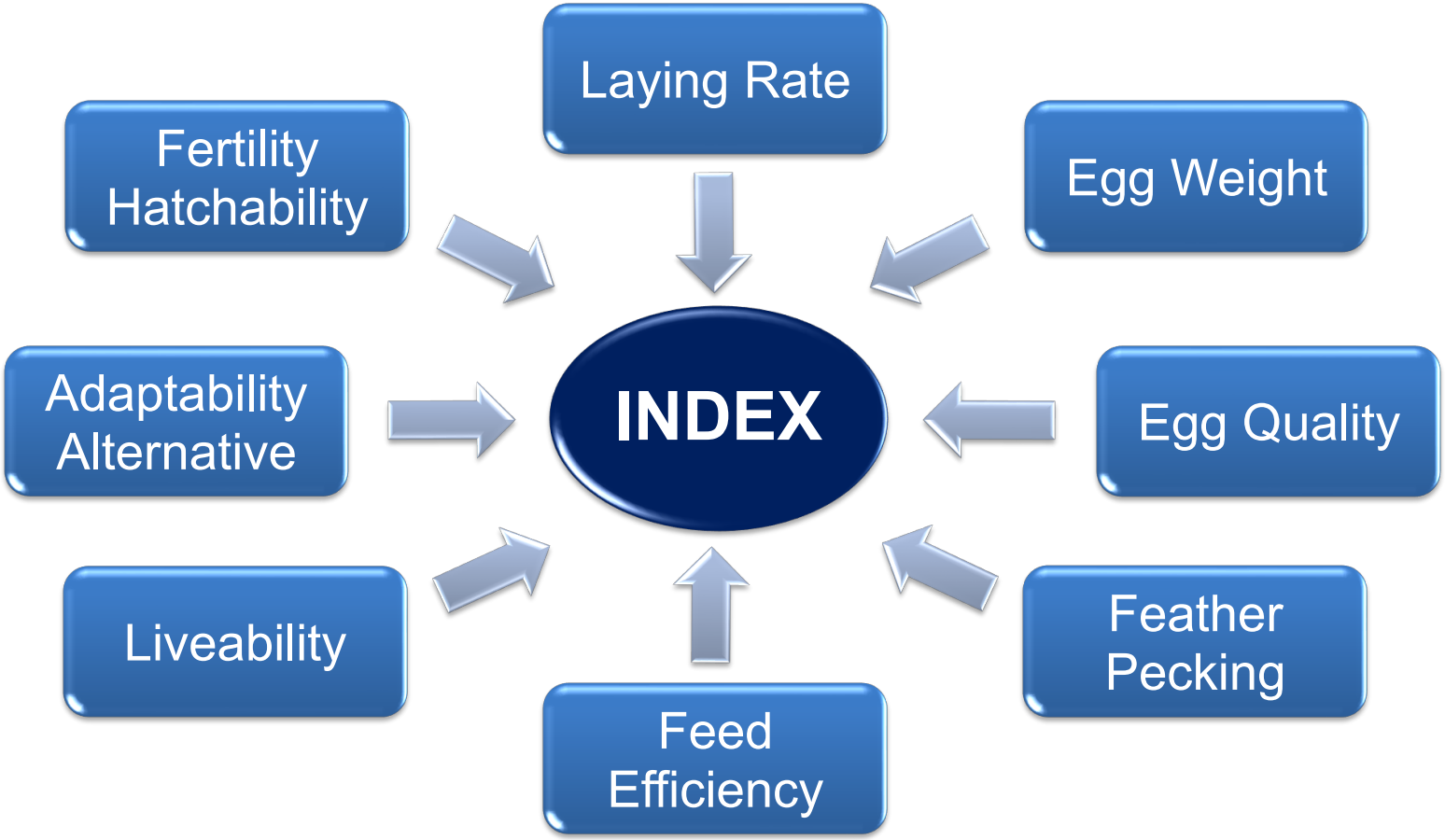
Structure of the Laying Breeding



Selection for an overall index



Pedigree reproduction

Data Recording – Breeding Farms

Single Cages

- ✓ Rate of Lay
- ✓ Feed Intake
- ✓ Egg Quality
- ✓ Hatchability

Group Cages

- ✓ Rate of Lay
- ✓ Feather Cover
- ✓ Mortality

Floor System

- ✓ Use of Nests
- ✓ Feather Cover
- ✓ Mortality

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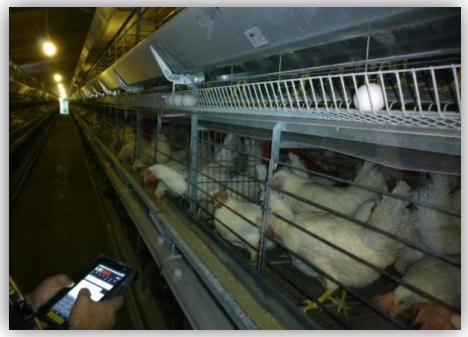
Data Recording – Commercial Farms

Group Cages



- ✓ Rate of Lay
- ✓ Feather Cover
- ✓ Mortality
- ✓ Adaptability

Free Range

- ✓ Use of Nests
- ✓ Feather Cover
- ✓ Mortality

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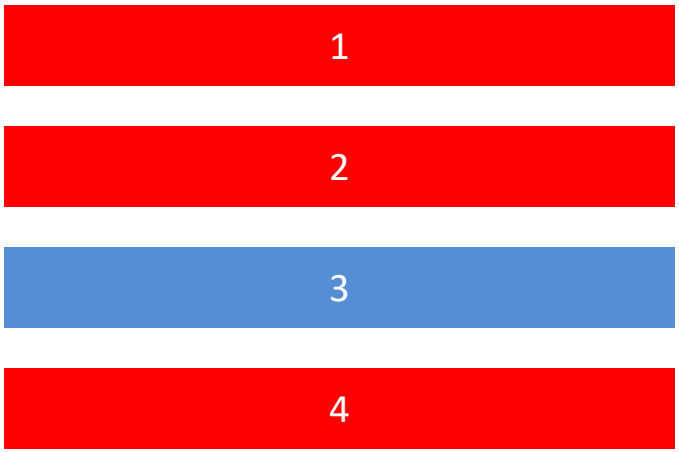
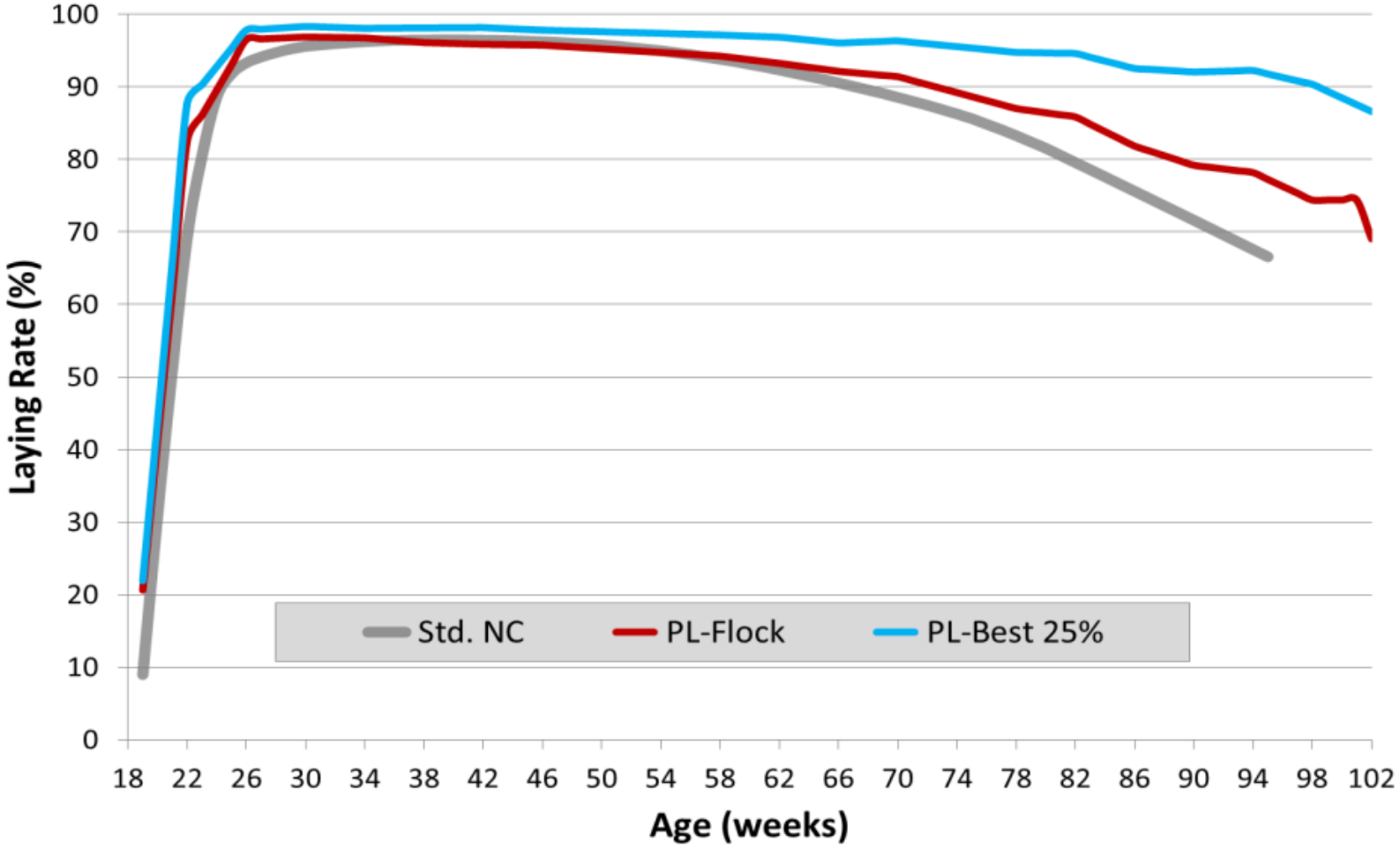
Daily Egg Recording

Where is put the main selection focus?

1. Early start of lay
2. Achieve a peak of production of 100%
3. Increase persistency at the end
4. Egg Numbers is not an important trait



White Pure Line – 102 weeks



Genetic Parameters – Laying rate

Month 1-2	Month 3-6	Month 7-9	Month 10-13	Month 14-21
.35	.20	.05	-.04	-.09
	.07	.90	.64	.40
		.10	.81	.52
			.16	.78
				.24

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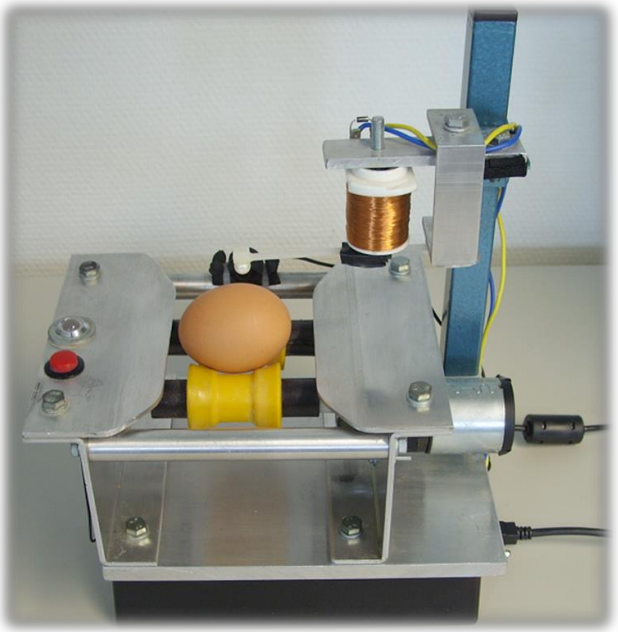
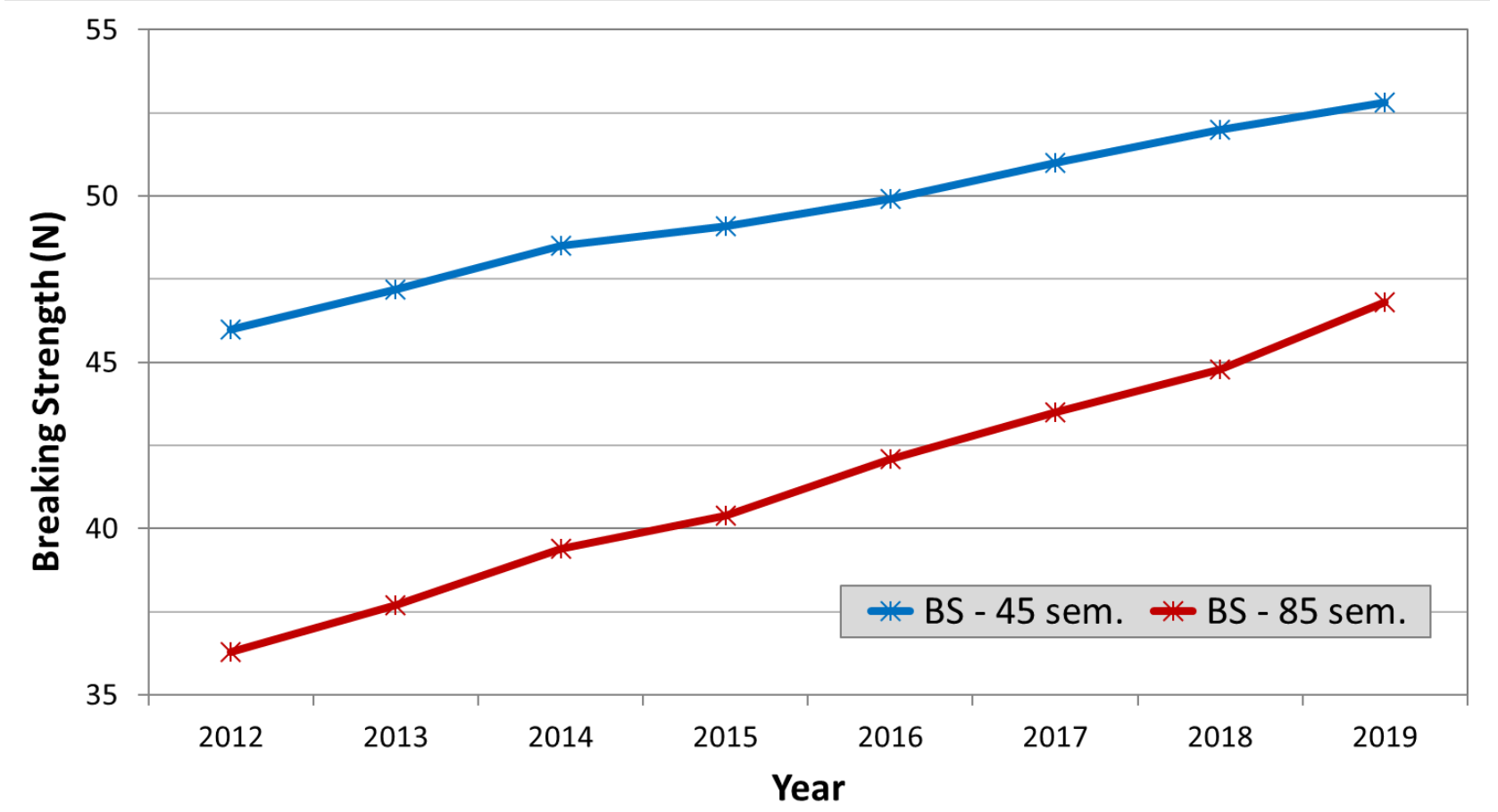
Better eggshell quality



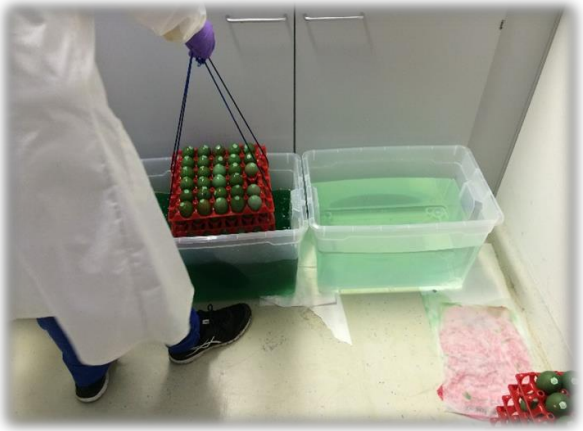
Every day a saleable egg with an excellent shell!

Breaking Strength – Genetic Trend



Improving Cuticle Coverage

- Protein barrier to bacterial penetration.
- Relatively easy to detect its presence using MST cuticle blue stain



Contamination of egg content	Cuticle coverage [1]	Shell thickness (mm)
with	3,0 ± .9	0,41 ± 0,04
without	2,0 ± 1.1	0,40 ± 0,02

[1] The lower the value, the better cuticle coverage!

- ✓ Diff in % reflectance at 650 nm pre & post-staining
- ✓ Moderate Heritability $h^2 = 0.27$

(Dunn, 2009; Bain et al., 2013)

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Egg Weight

Influencing Factors:

- Light stimulation, Body Weight
- Feed
- Genetic – h^2 ~ 0.6

Goal:

- Max. N. eggs in desired class
- Fast EW increase at the beginning
- Flat EW curve after 60 weeks

✓ **Super Nick:** Max. Egg Mass, high EW

✓ **Nick Chick:** Max. Egg Number, moderate EW

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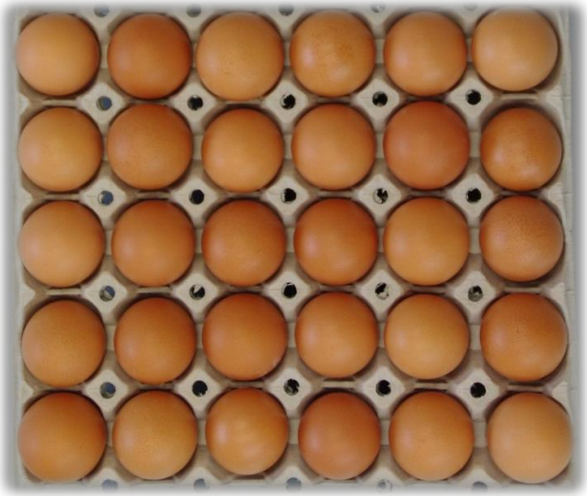
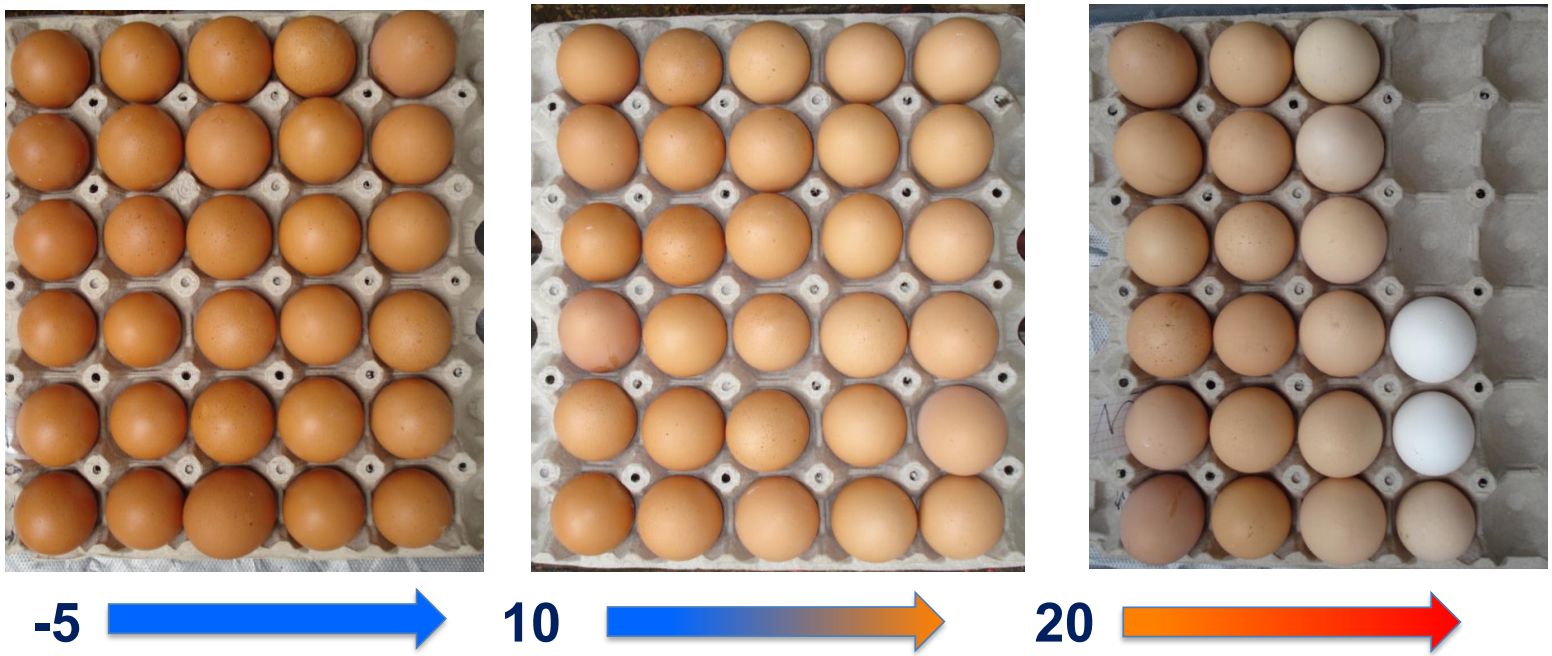
Selection for Eggshell Colour

- A nice pure white or uniform brown shell
- Good shell colour until the end of production



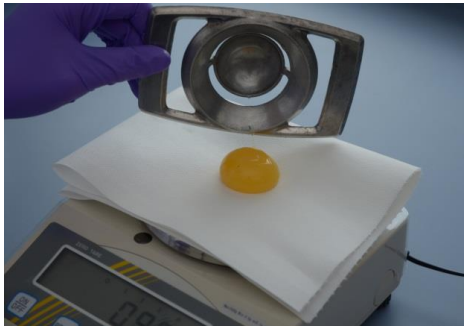
Eggshell Colour



Shell Colour Index = L-a-b

The smaller the better

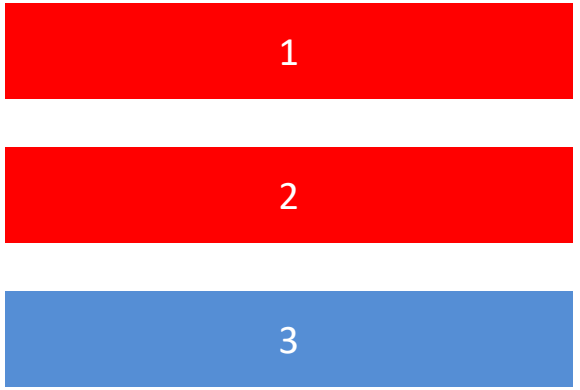
Selection for better internal egg quality



- H.U.: maintain the aesthetic appearance of a fresh egg
- Blood & meat spots: decrease number & size
- Yolk %: increase the % solids

How are we increasing feed efficiency?

1. Reducing body weight
2. Reducing feed intake
3. Keeping feed intake & increasing egg mass



Feed efficiency

- Recording individual feed intake at peak production
- **Sufficient feed intake at greatest nutrient demand**
- Focus is not only in FCR, but mainly in IOFC
- **Feed intake according to production**
- No special high density diet – Flexible in raw material

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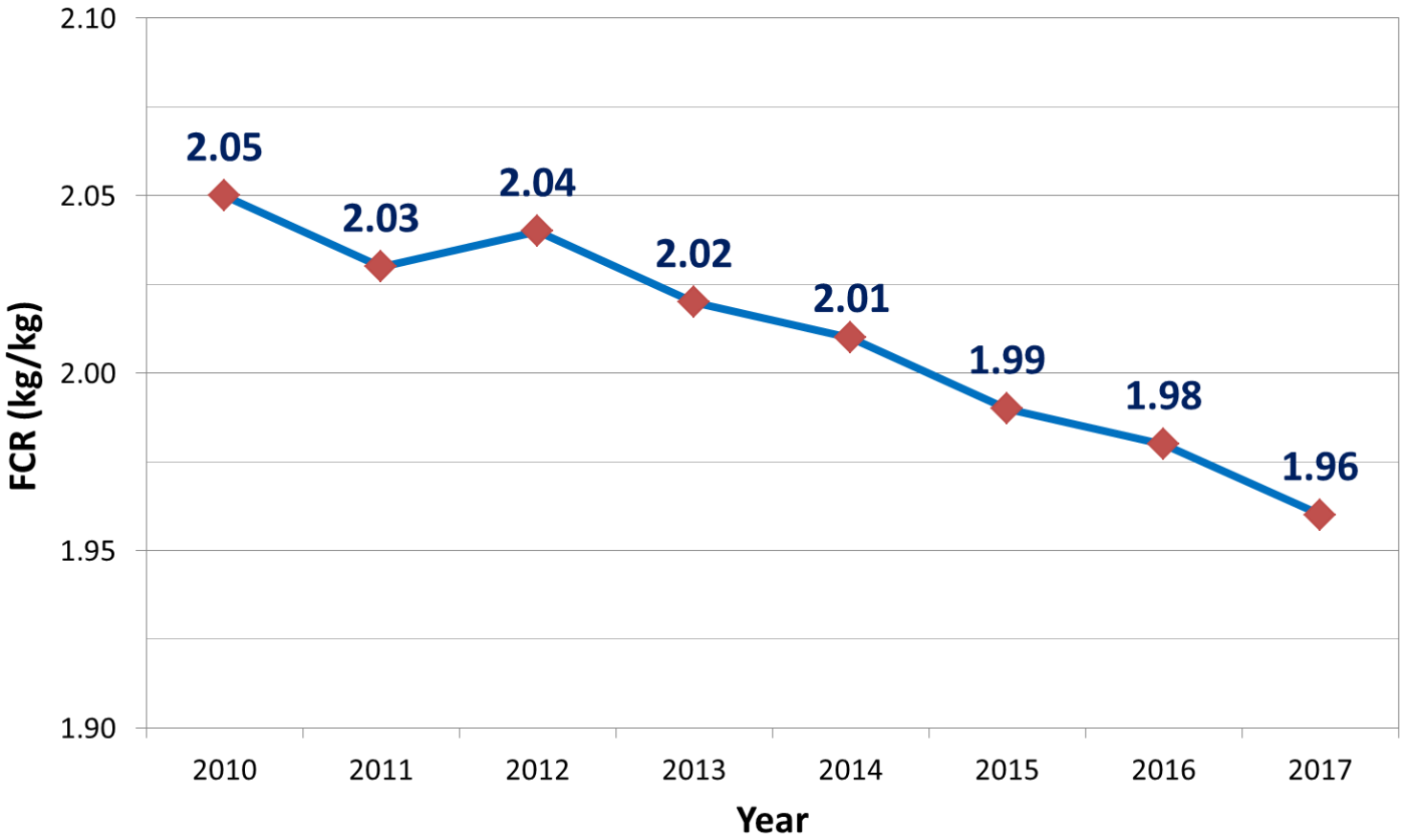
Efficient Feed Intake



Feed efficiency

20 kg Egg

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New Phenotypes – Bone Strength

- 30-53% layers had at least one fracture *(Gregory y Wilkings, 1989; Sandilands, 2011)*
- More fractures in aviaries than in cages
- Weaker bones in cages *(Fleming y col., 1994; Newman y Leeson, 1998: Scholz y col., 2008)*
- Heritability: 0.15 – 0.45 (Bishop et al. 2000 ; Fleming y col. 2004; Andersson y col. 2018)

Source: clker.com

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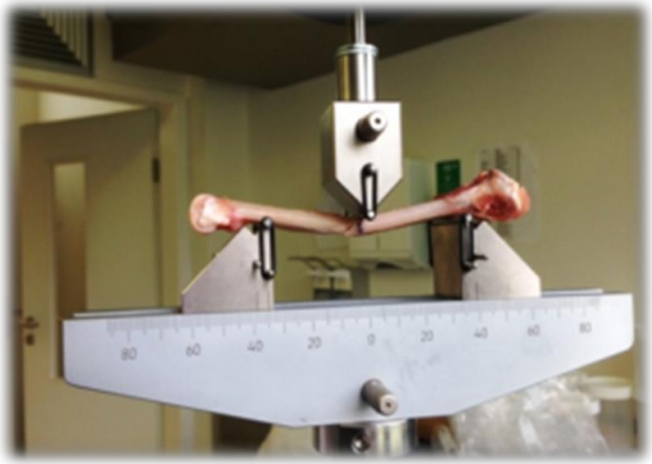
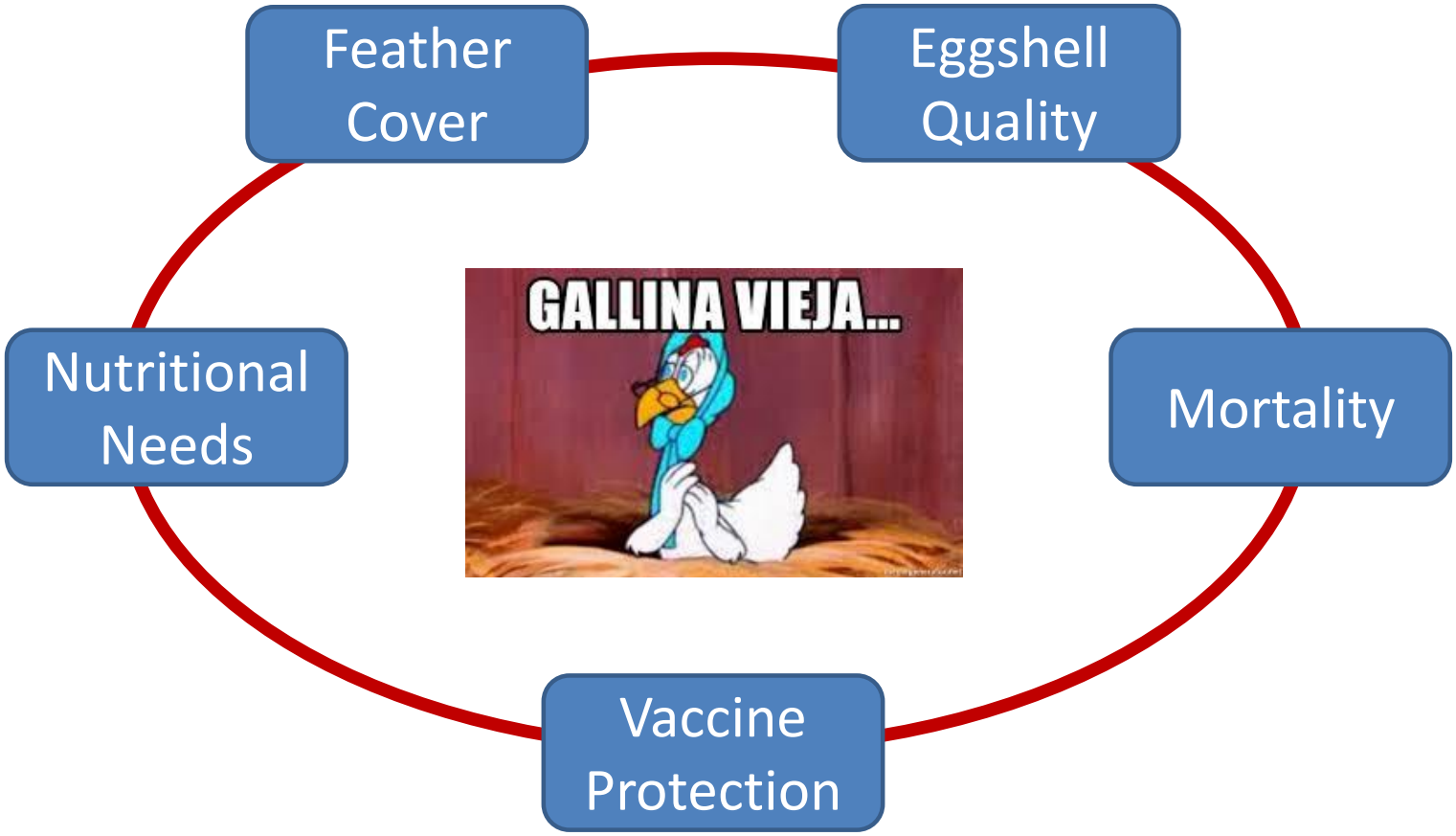
Improve Bone Stability



Source: clker.com

Increase Production Cycles: Challenges



Rearing: An investment for the future

Not only Costs! - BW & Uniformity: The key for success!

Good Immune System

Feed Intake Capacity

Good Body Weight Development & Uniformity:

- ✓ **Good start in production**
- ✓ **Persistent egg mass production**

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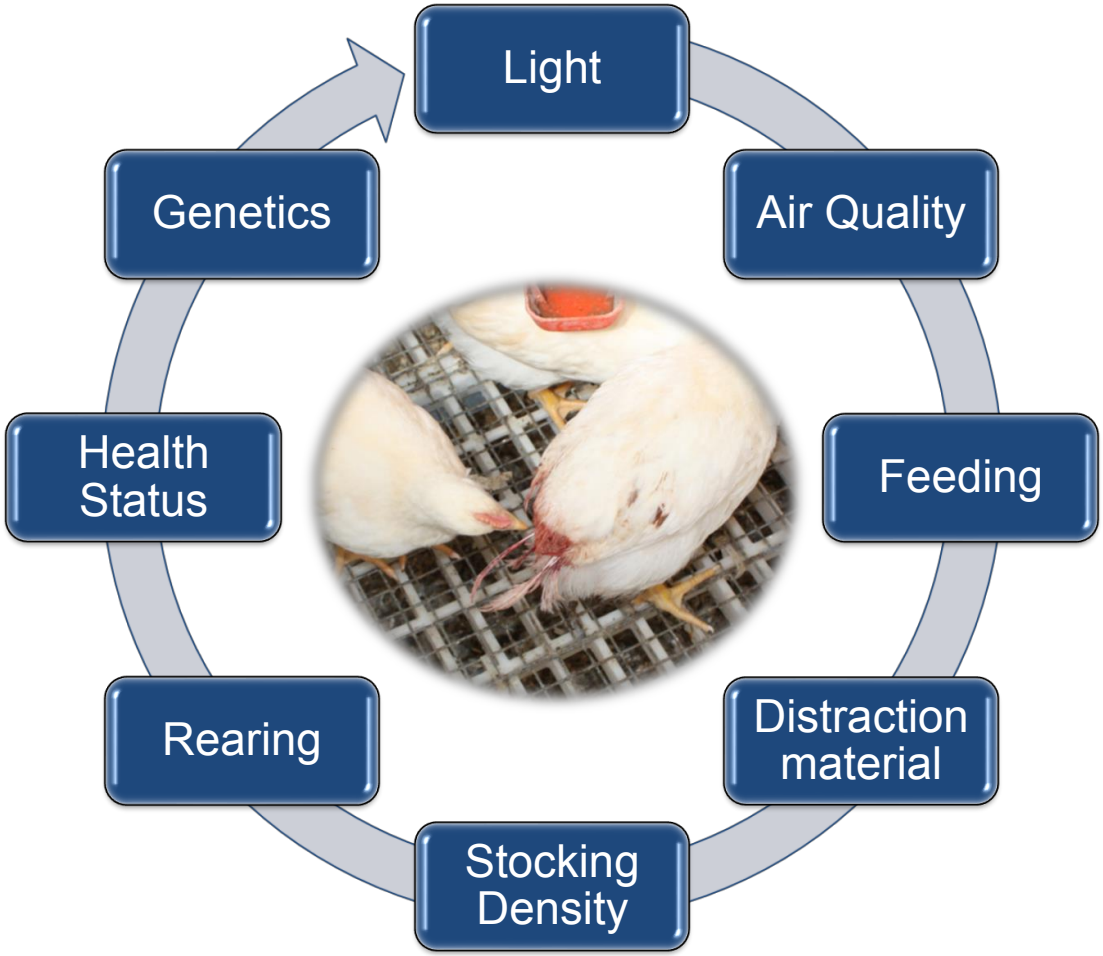
Feather pecking & cannibalism - Multifactorial



Selection for better plumage condition

- Test relatives in breeding farms & field conditions
- **Selection for low mortality and good feather cover**
- Family cages (full-sibs or half-sibs)
- No beak treatment

Heritability ~ 0,20 - 0,30

Beak Treatment

- Effective preventive measurement against feather pecking
- Ethical reservations in the EU against it (Amputation)
- **Some countries have already banned this practice**

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Selecting for better Beak Shape

$h^2 \sim 0.20$

-0.20

Beak Length

Feather Cover

Different environments









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Field Test under Field Conditions

Since birds are under different environments…

Target: To breed hens with a very **good adaptability**

- ✓ Test under different field conditions

Colombia

Spain

Russia

Field Test - Performance recording

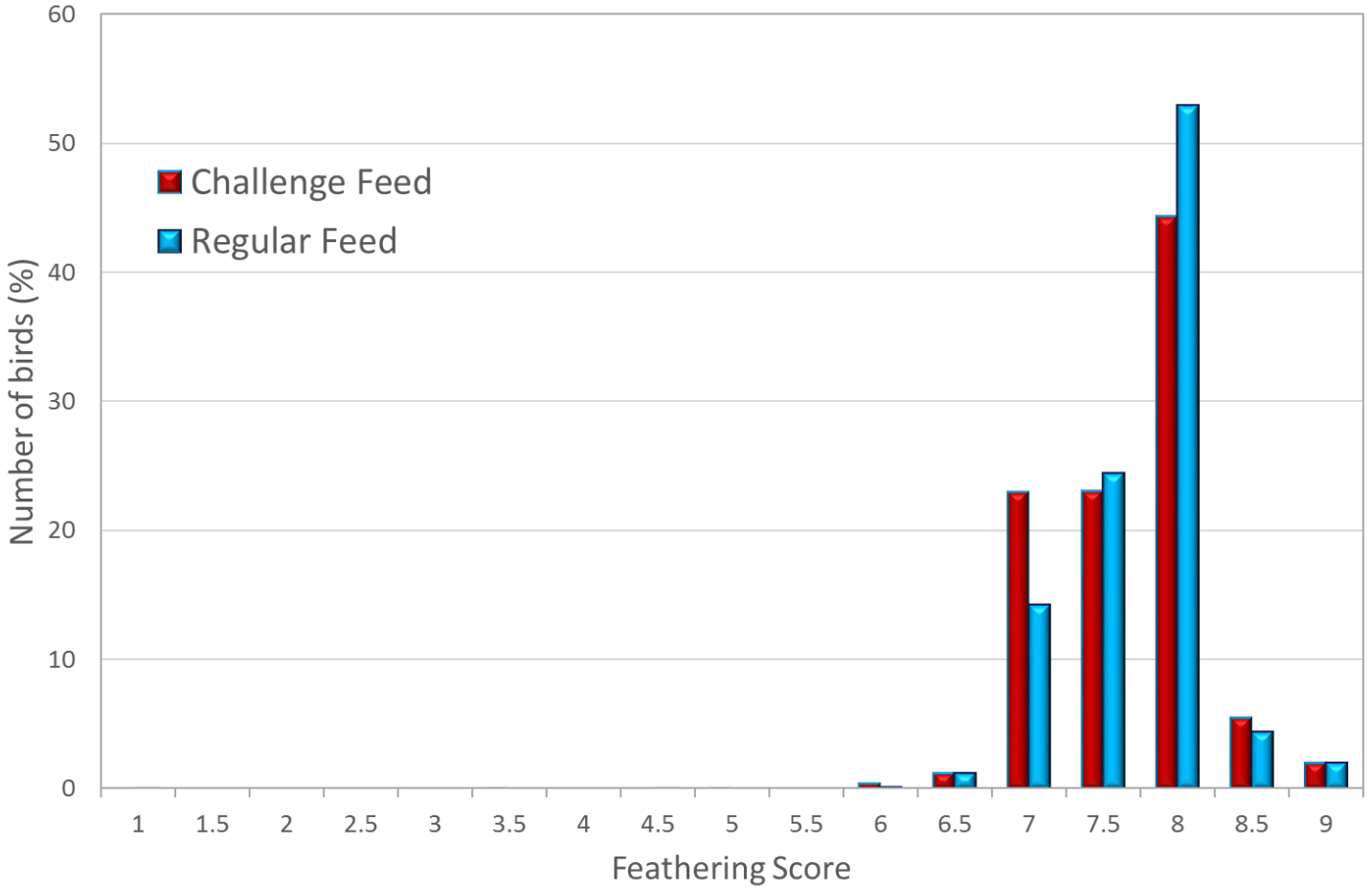
- ✓ Egg Production
- ✓ Livability
- ✓ Plumage Condition
- ✓ Pecking / Cannibalismus
- ✓ Egg Quality

New Field test – Free Range

New Field test – Free Range

Feathering Score – 43 weeks of age

First Evaluation – Challenge Feed – (43 w of age)



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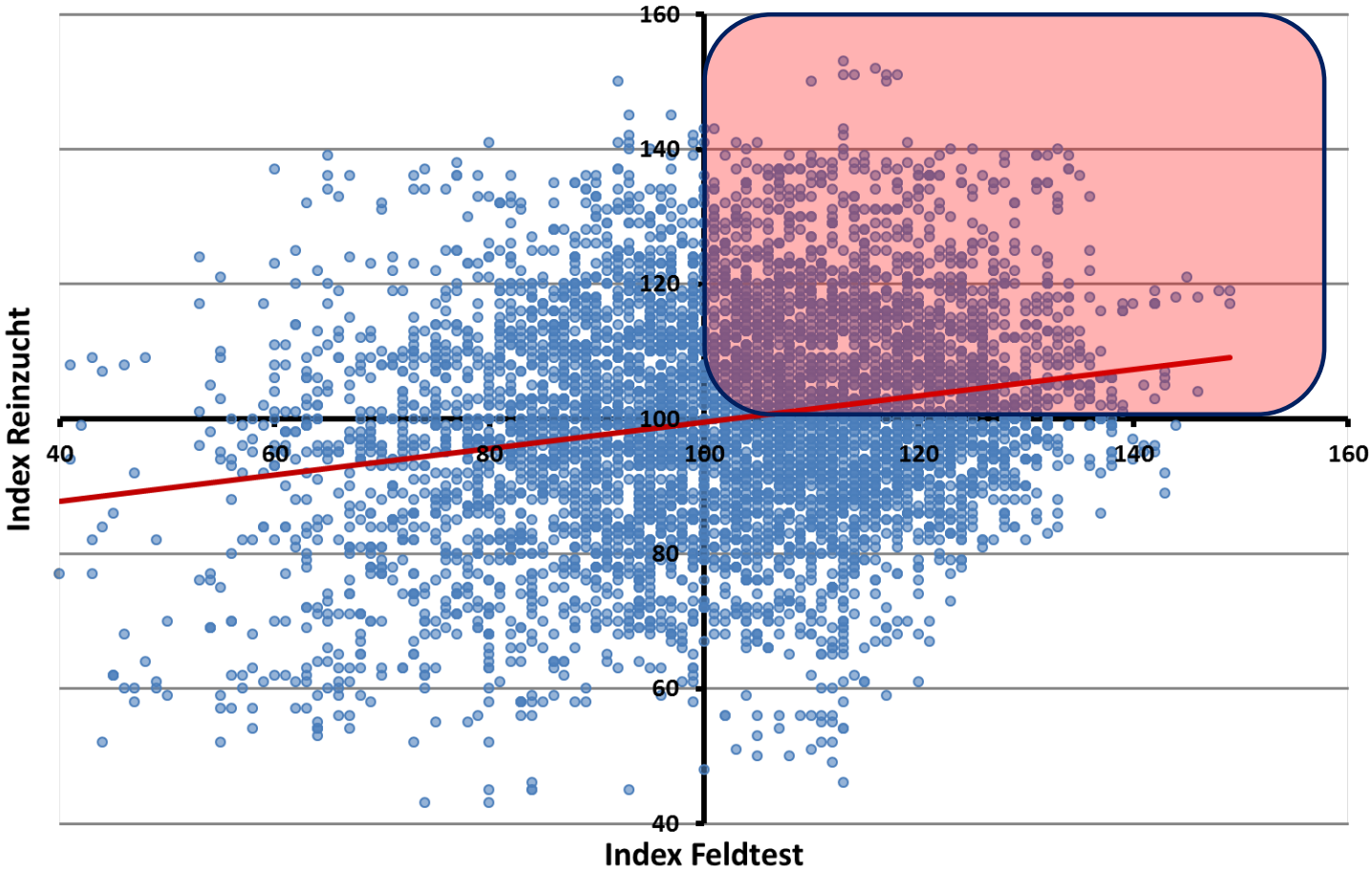
Field Test – New test in Spain 2 Feed Treatments

Correlation Field test & Pure-Line test



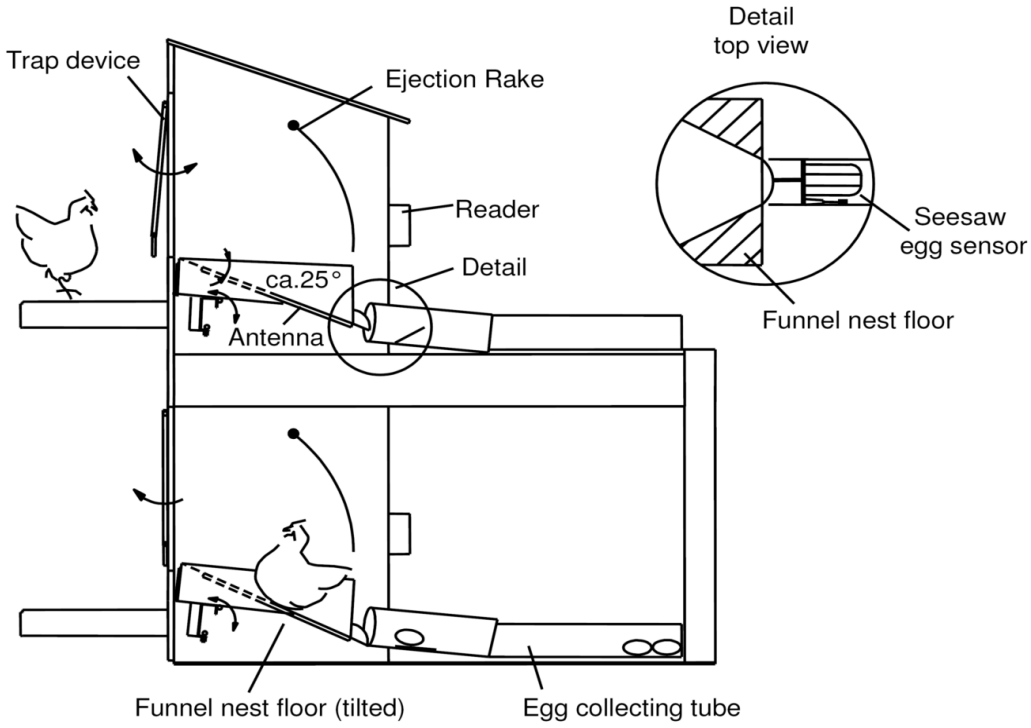
Requirements for cage free systems

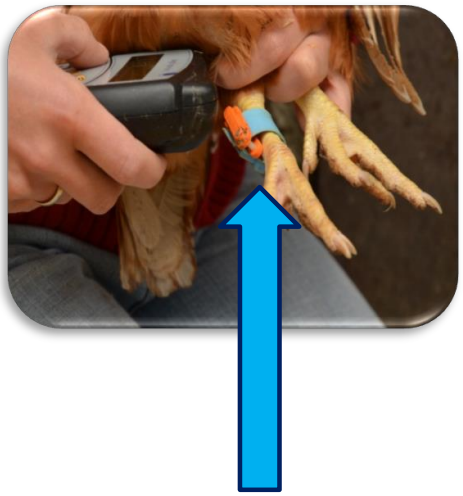
- Good egg production & egg quality
- Feed intake according to performance & activity
- Good feathering until the end
- Quiet behaviour – No pecking/cannibalism
- Good adaptability
- Adequate distribution and movement in the system
- Good nest acceptance – low number of floor eggs

Test in Floor System

Floor house testing

➔ Increase of Saleable Nest Eggs





Transponder

Less floor eggs → Better eggshell quality

Nesting behaviour

Trait	Brown layer	White layer
Oviposition time	8:00	9:45
Stay in Nest with oviposition	30 min	45 min
Stay in nest without oviposition	10 min	28 min

* Switch on the light at 3:00

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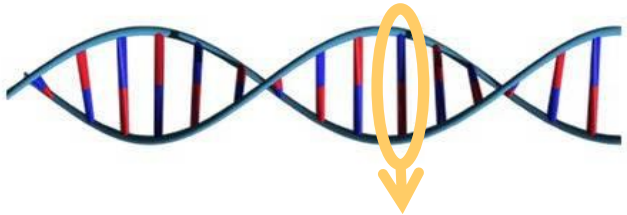
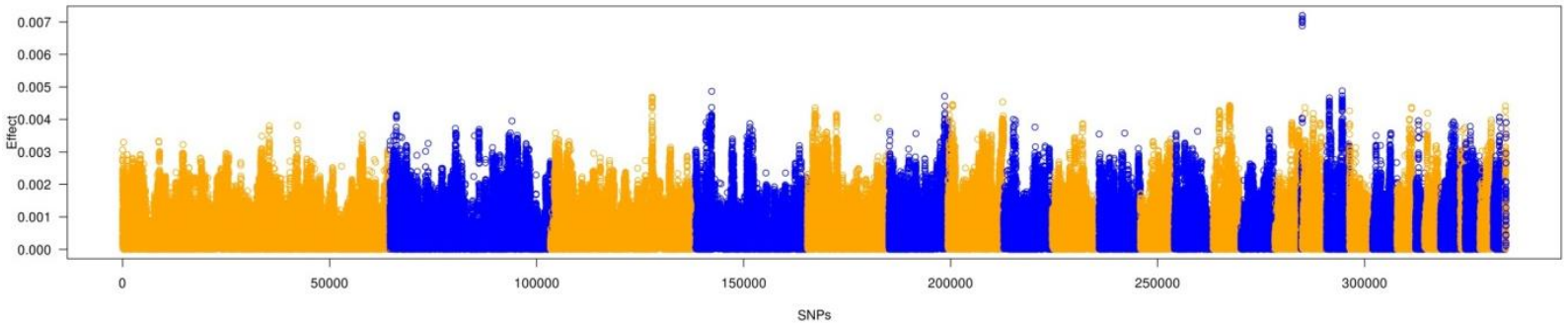
Genomic Prediction



M^+ or m^-

Allele substitution effects for all markers (**simultaneously** estimated)



Why GS improve accuracy?

$$A_i = \frac{1}{2} A_s + \frac{1}{2} A_d + m_i$$

In Practice

BLUP: increases the estimation of A_s and A_d

GBLUP: increases the estimation of m_i

(Daetwyler et al., 2007)

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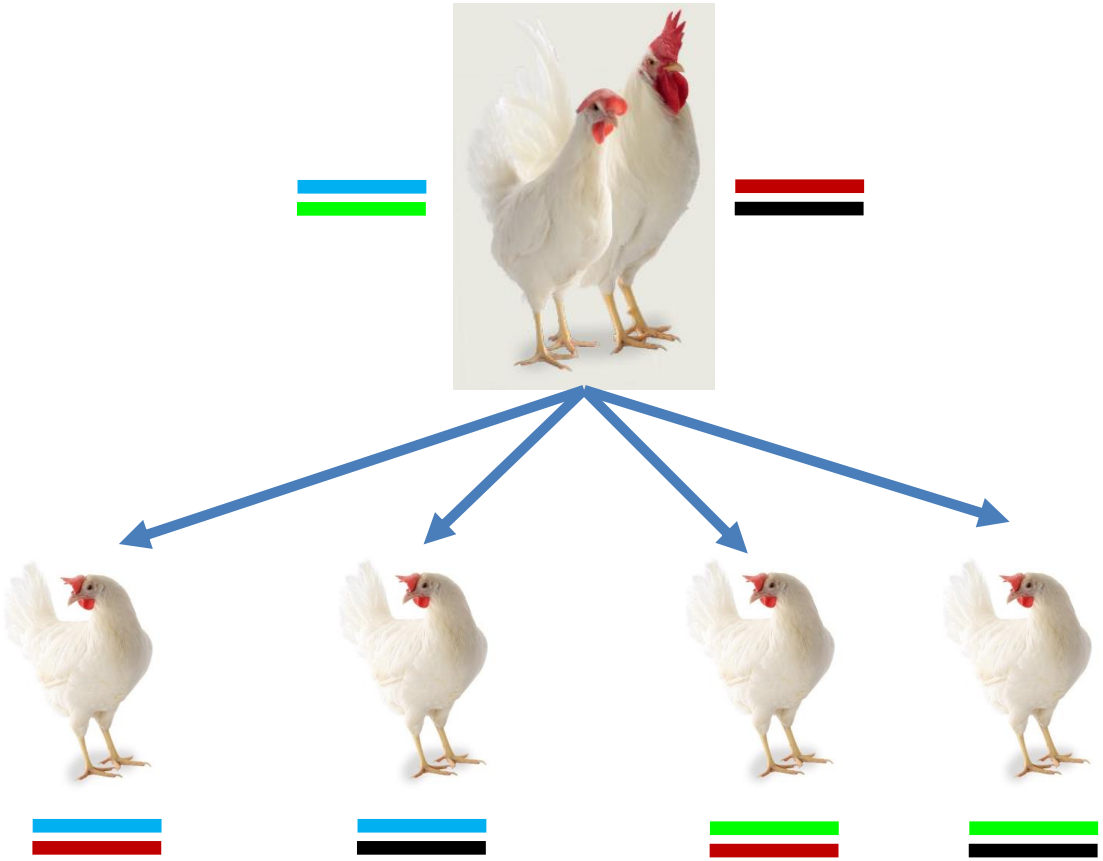
Mendelian Sampling



Conventional BLUP

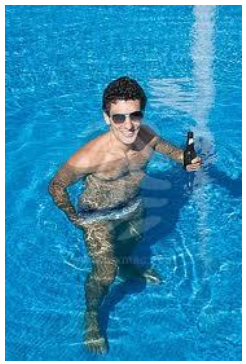
Estimates same breeding value for new-born siblings
(without phenotypes)

PREDICTION

Genomic Selection

Different breeding value for new-born siblings
(without phenotypes)

PREDICTION



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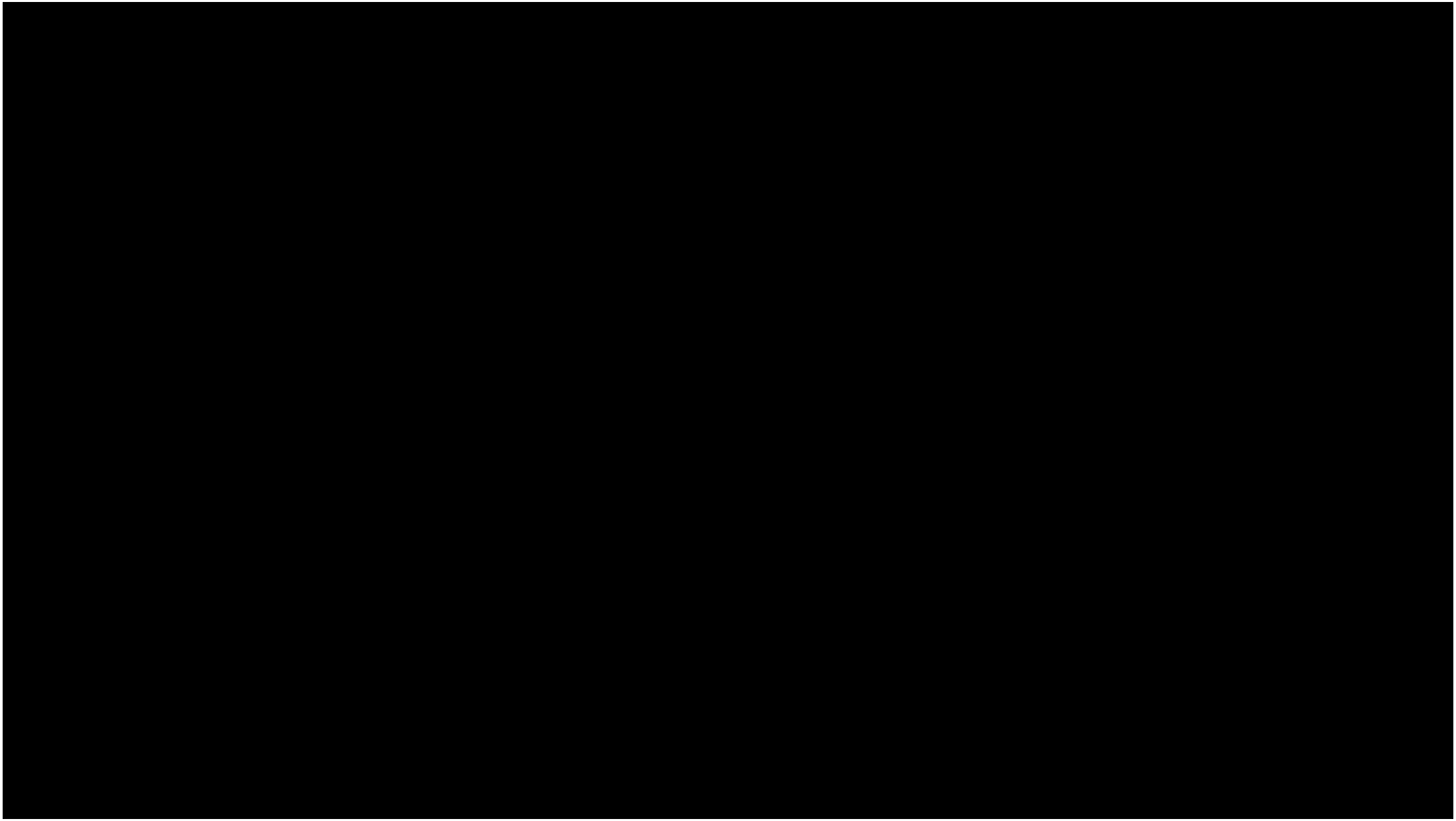
Reality…afterwards

REALITY



Genomic Selection

- MD 50k SNP-Array
- **More accurate Breeding Value estimation**
- Higher genetic progress in layers (10-30% more)
- Better use of genetic variation
- By-product: Pedigree check

Axiom® 384/96 Format (Affymetrix)

GeneTitan® Array Processing (Affymetrix)

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Conclusions

Best Profit of H&N birds:

- ✓ Excellent N. of saleable eggs
- ✓ Outstanding egg quality
- ✓ Great feed efficiency (IOFC)
- ✓ Good adaptability worldwide

Genetic Progress greater than 20 years ago

- ➢ Extension of testing capacities & new traits
- ➢ More powerful computers & improved methods
- ➢ Use of molecular information

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Thank you very much for your attention!

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