



INTERNATIONAL

The key to your profit!



Breeding for Alternative Systems

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H&N Cage-Free Academy - Cuxhaven, 15th May 2019

Data Recording – Breeding Farms

Single Cages



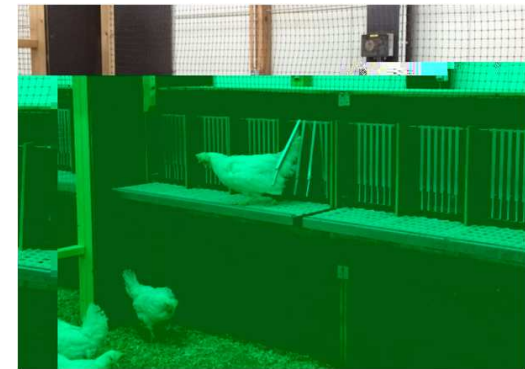
- ✓ Rate of Lay
- ✓ Feed Intake
- ✓ Egg Quality
- ✓ Hatchability

Group Cages



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

Floor System



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

Data Recording – Commercial Farms

Group Cages



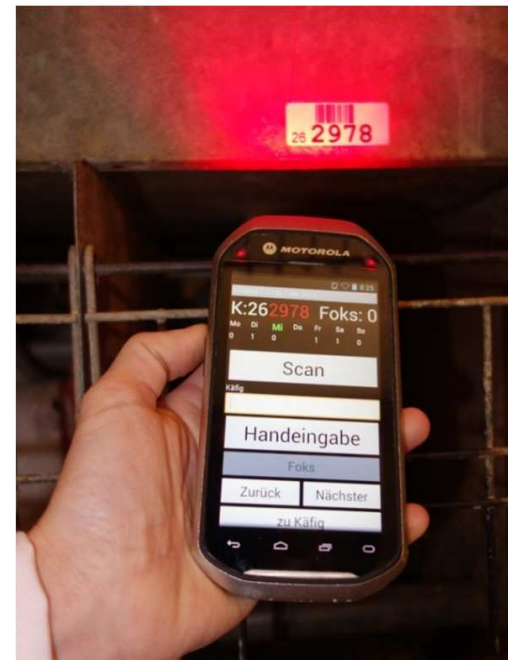
- ✓ Rate of Lay
- ✓ Feather Cover
- ✓ Mortality
- ✓ Adaptability

Free Range



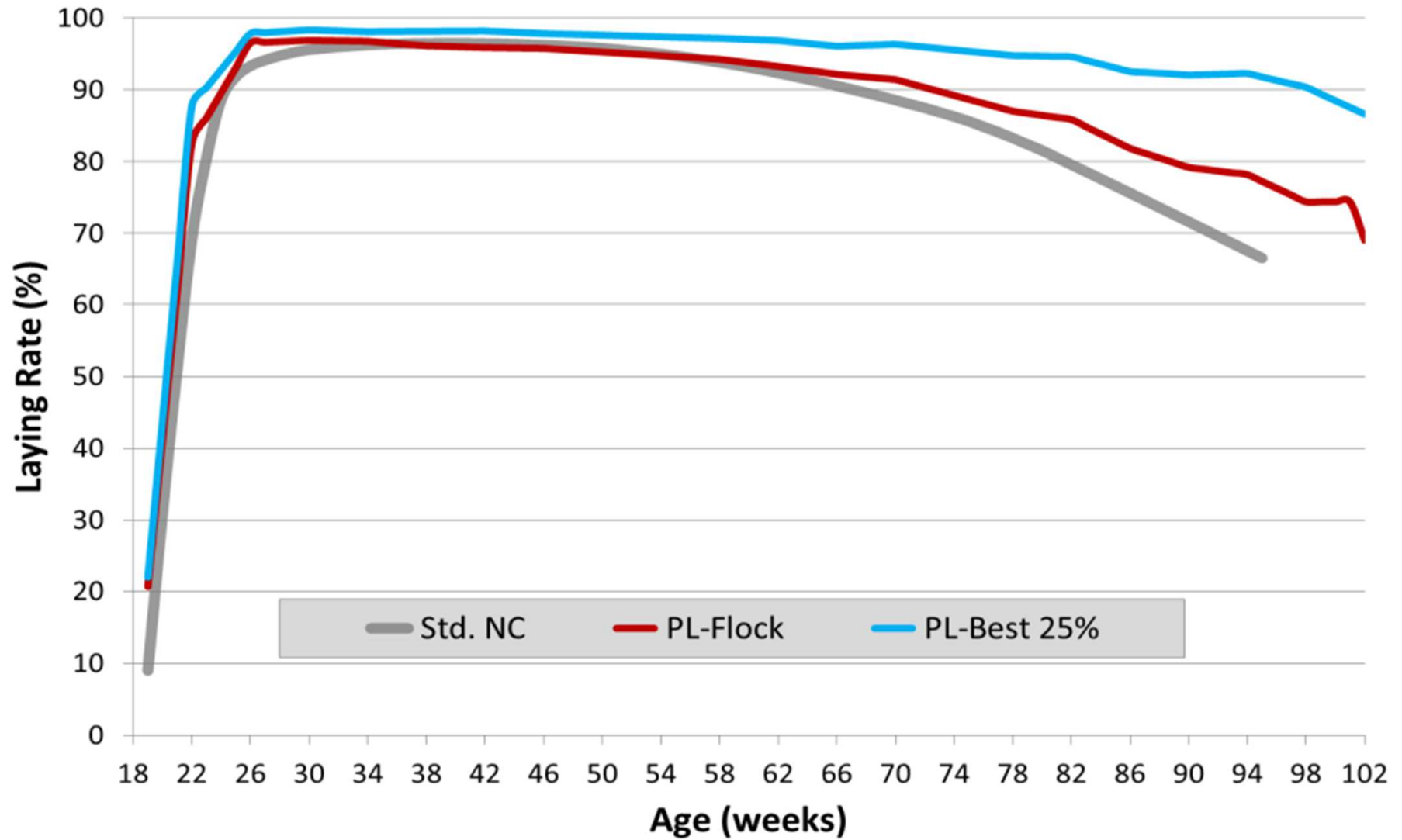
- ✓ Use of Nests
- ✓ Feather Cover
- ✓ Mortality

Daily egg recording

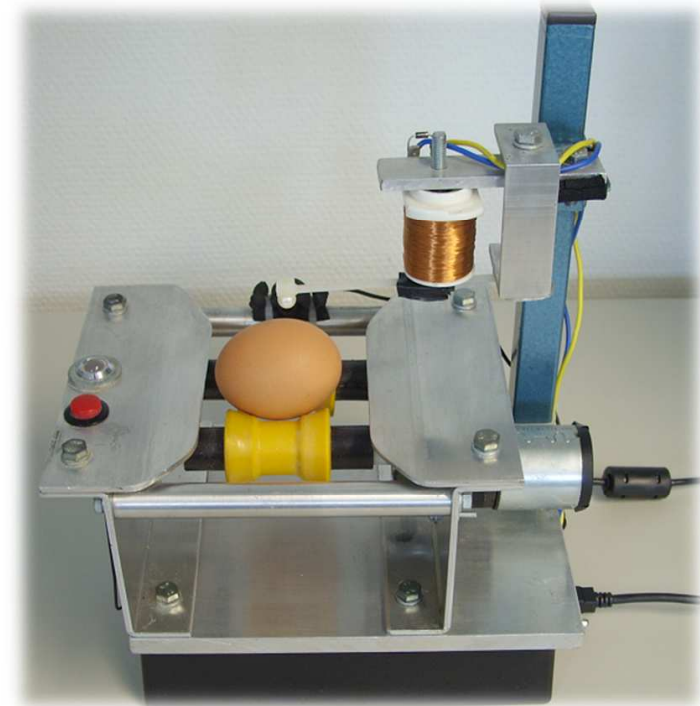


Only saleable eggs are counted!

White Pure Line – 102 weeks

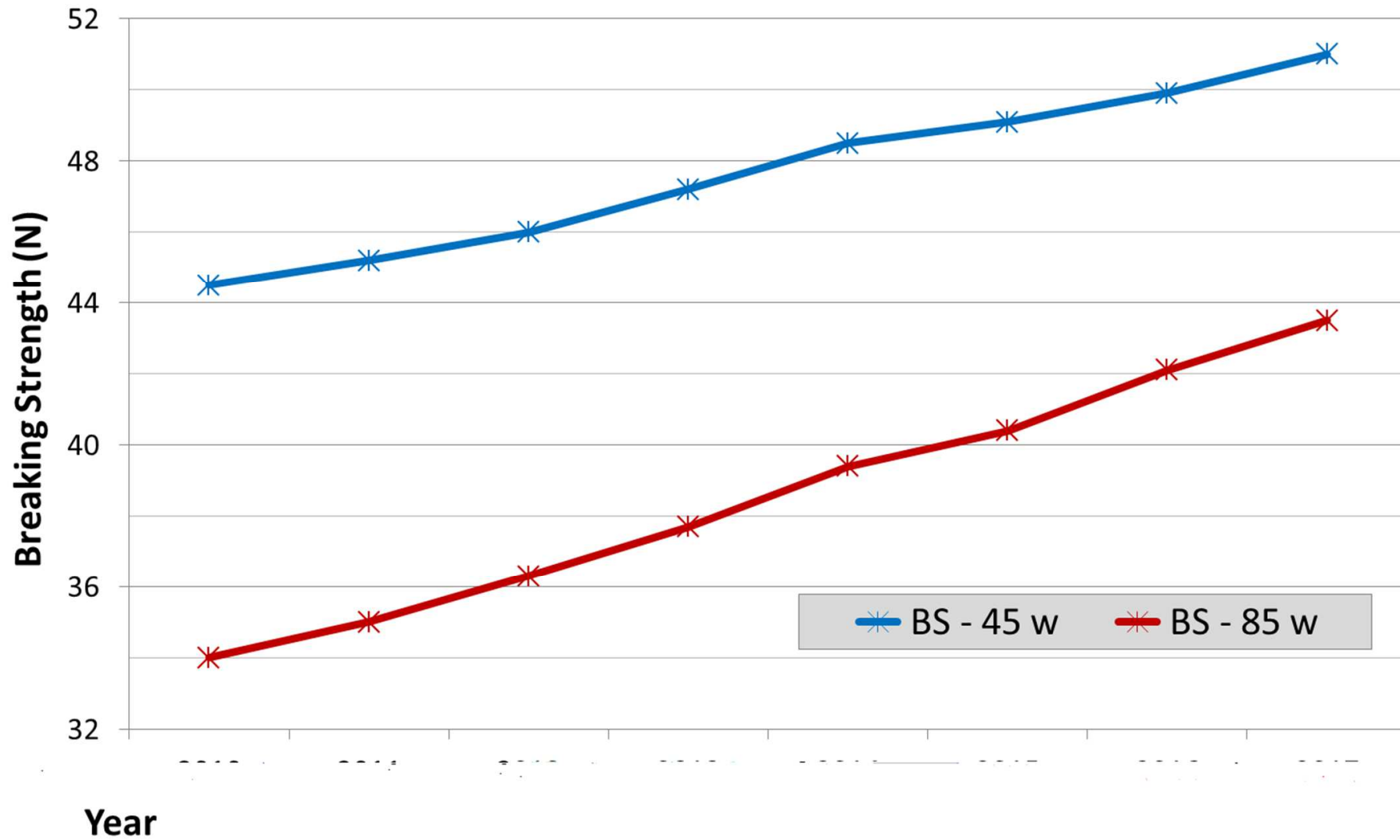


Selection for a Good Eggshell stability



Every day a saleable egg with an excellent shell!

Breaking Strength – Genetik Trend



Rearing: An investment for the future

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

Good
Immune
System



Feed
Intake
Capacity

Train the birds to eat and drink at different levels

Encourage bird activity throughout the system

Egg Weight



Influencing Factors:

- Light stimulation, Body Weight
- Feed
- Genetic – $h^2 \sim 0.6$

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

Feed efficiency

Selection for improved efficiency reflects:

- Recording individual feed intake at peak of production
- Sufficient feed intake at greatest nutrient demand
- Feed intake according to production
- No special high density diet – Flexible in raw material



Genomic Breeding Value Evaluation

Training Set
(reference population)

SNP Genotypes

Performance information
Conventional EBV

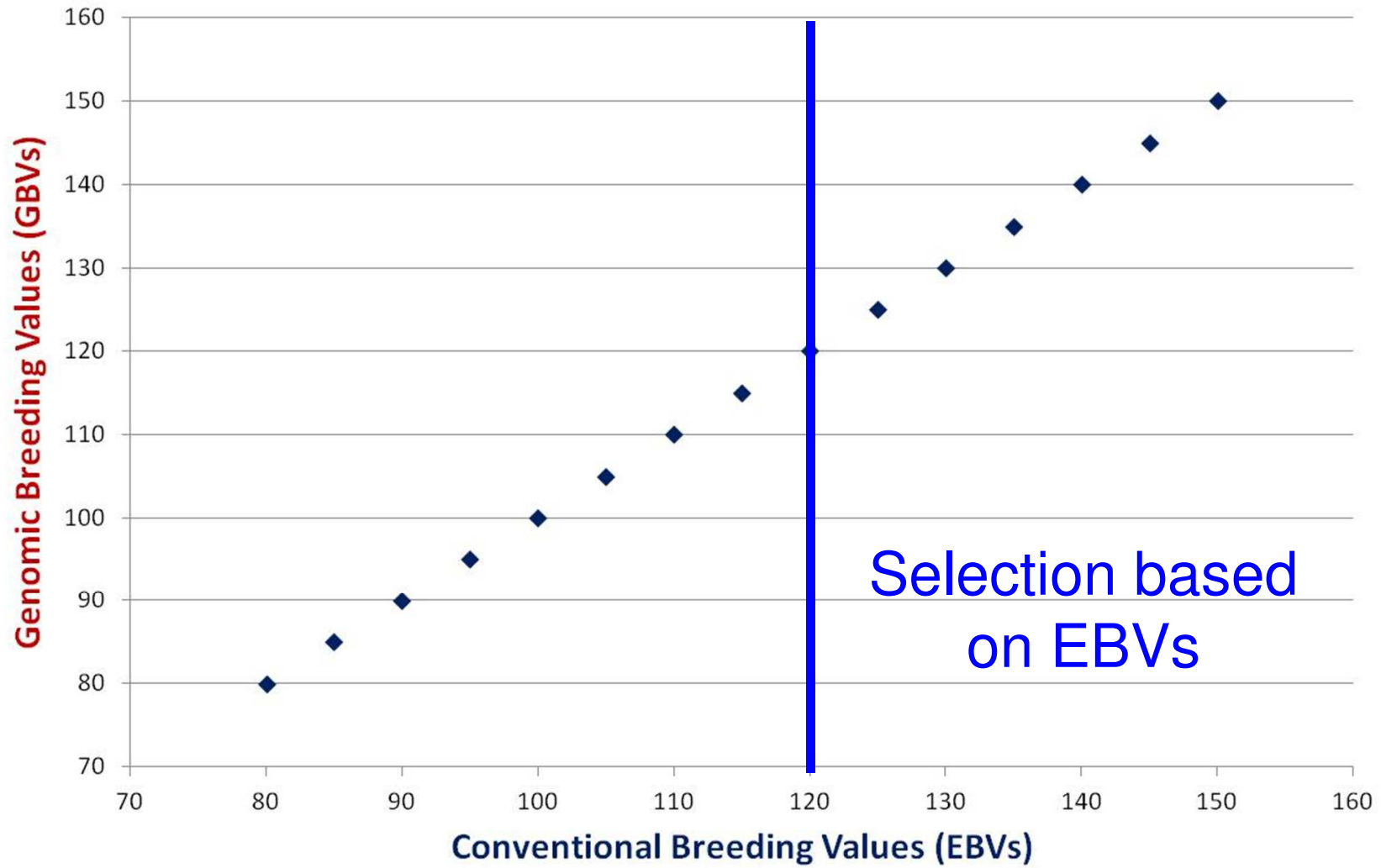
SNP - Estimation Equation

Selection Candidates
(without performance)

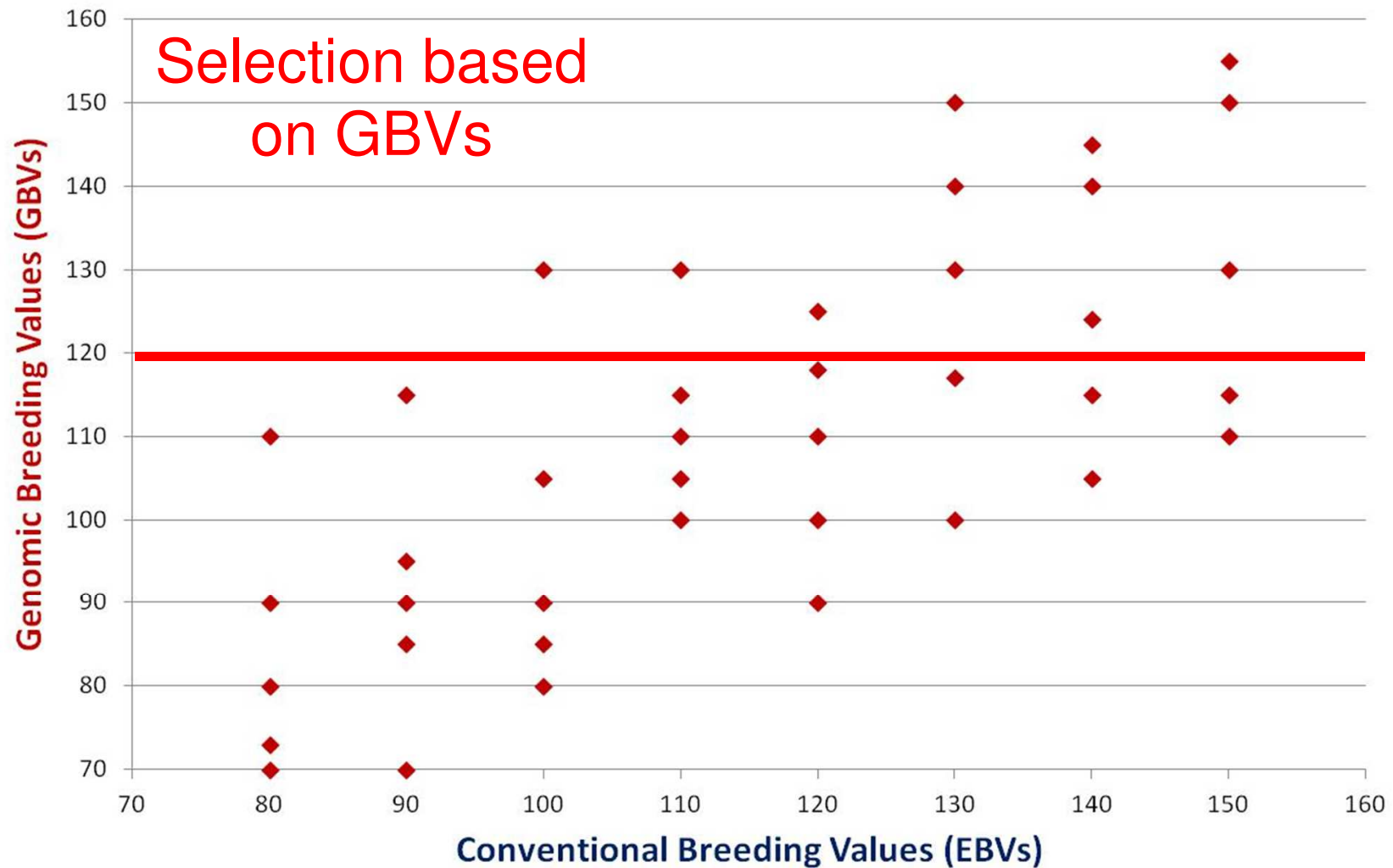
SNP Genotypes

**Genomic
Breeding Values**

Differentiation within full-sib family males



Differentiation within full-sib family males



Genomic Selection

- **More accurate Breeding Value estimation**
- **Better use of genetic variation**
- **More genetic progress**



Axiom® 384/96 Format (Affymetrix)



GeneTitan® Array Processing (Affymetrix)



Requirements for cage free systems

All the points mentioned before and additionally:

- Good bone quality
- Quiet behaviour – No pecking/cannibalism
- Good feathering until the end
- Good nest acceptance – Few floor eggs

Bone stability

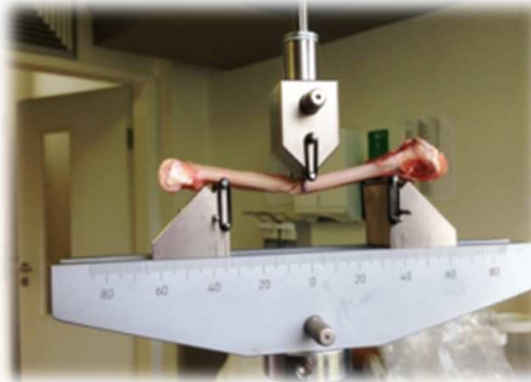
High productive birds with the age:

- Eggshell quality decreases
- Medullary bones deteriorate (structural bones)
- Bone weakness, porosity and osteoporosis
- Increased incidence of fractures and deformations
- Reduction of animal welfare

Solutions:

- Nutritional factors: P, Ca, Vit. D3, ...
- Genetic selection

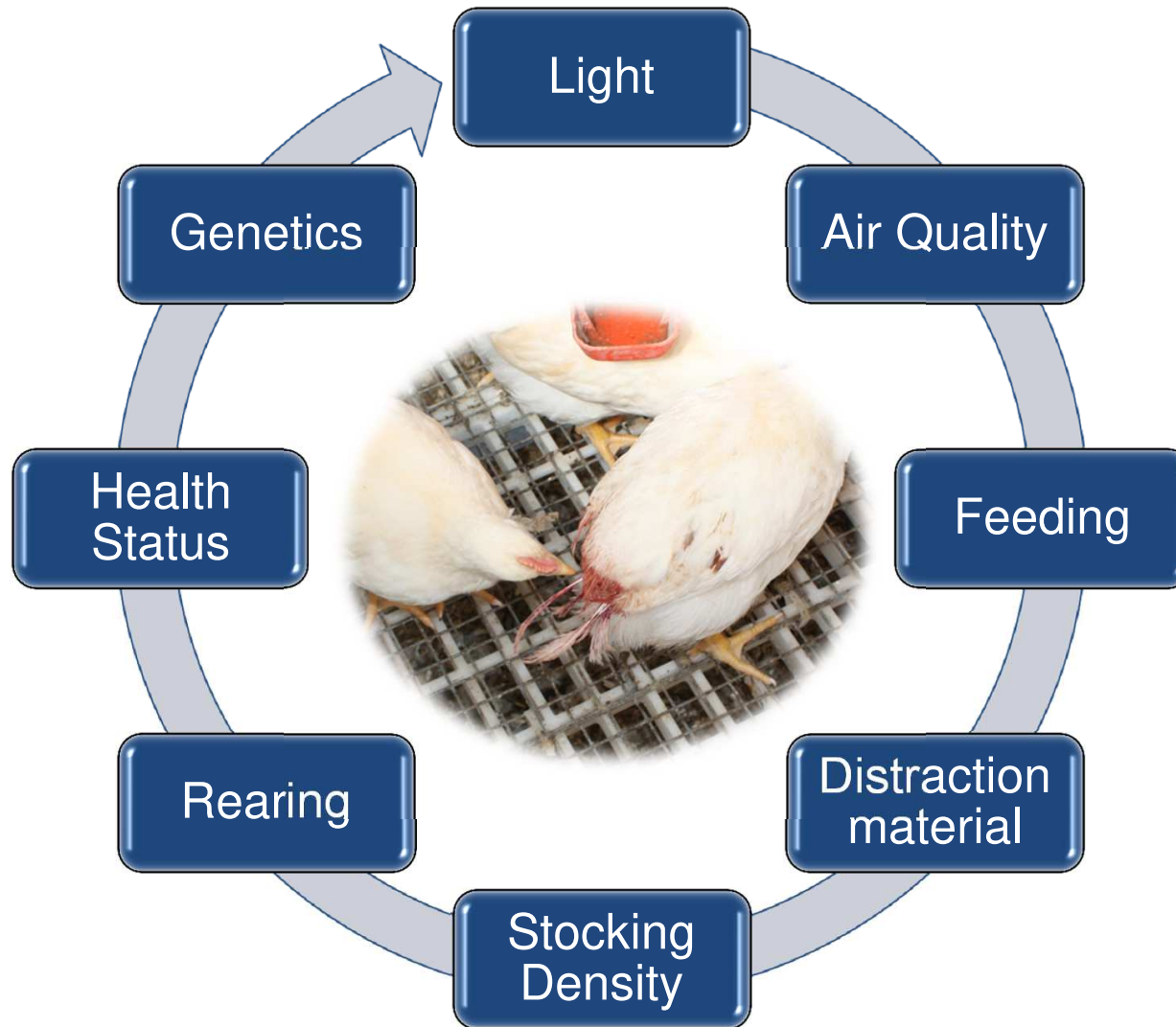
Bone Strength Improvement



Source: clker.com



Feather pecking & cannibalism



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

End of beak treatment...??



Selecting for better Beak Shape



Blunt Peak → less injuries!

$h^2 \sim 0.15 - 0.25$

Beak length



Beak length

-0.20

Feather cover

Different environments



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

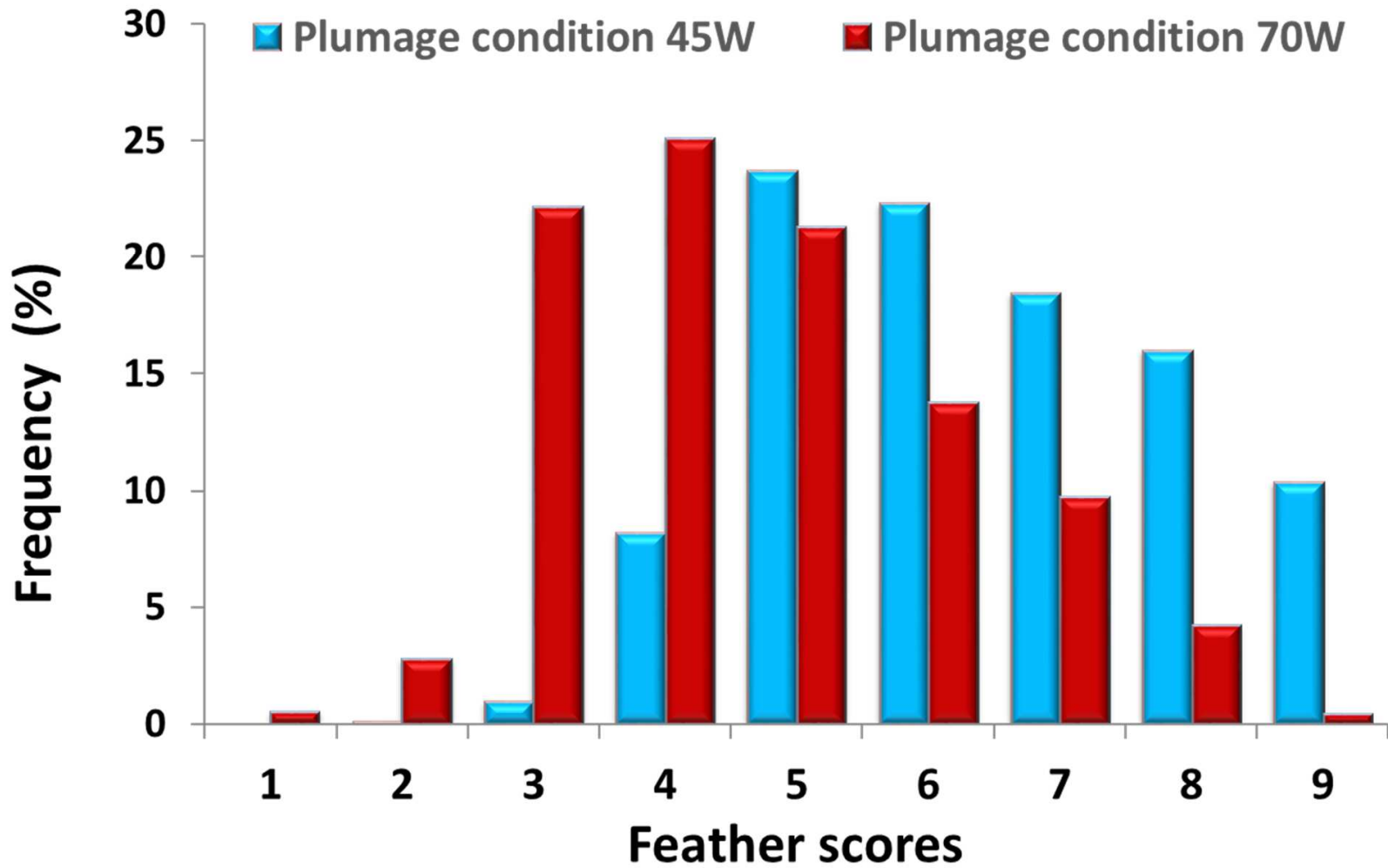


Better feather cover

Selection for low mortality and good feather cover



Purelines in Group Cages



Challenge Test for better feather cover

Pure-line birds (Sib-test)



- 72 hens/cage – No males
- Challenge Feed (No-Soja-Feed)
- High Light intensity & No beak treatment
- $h^2 \sim 0.23-0.42$

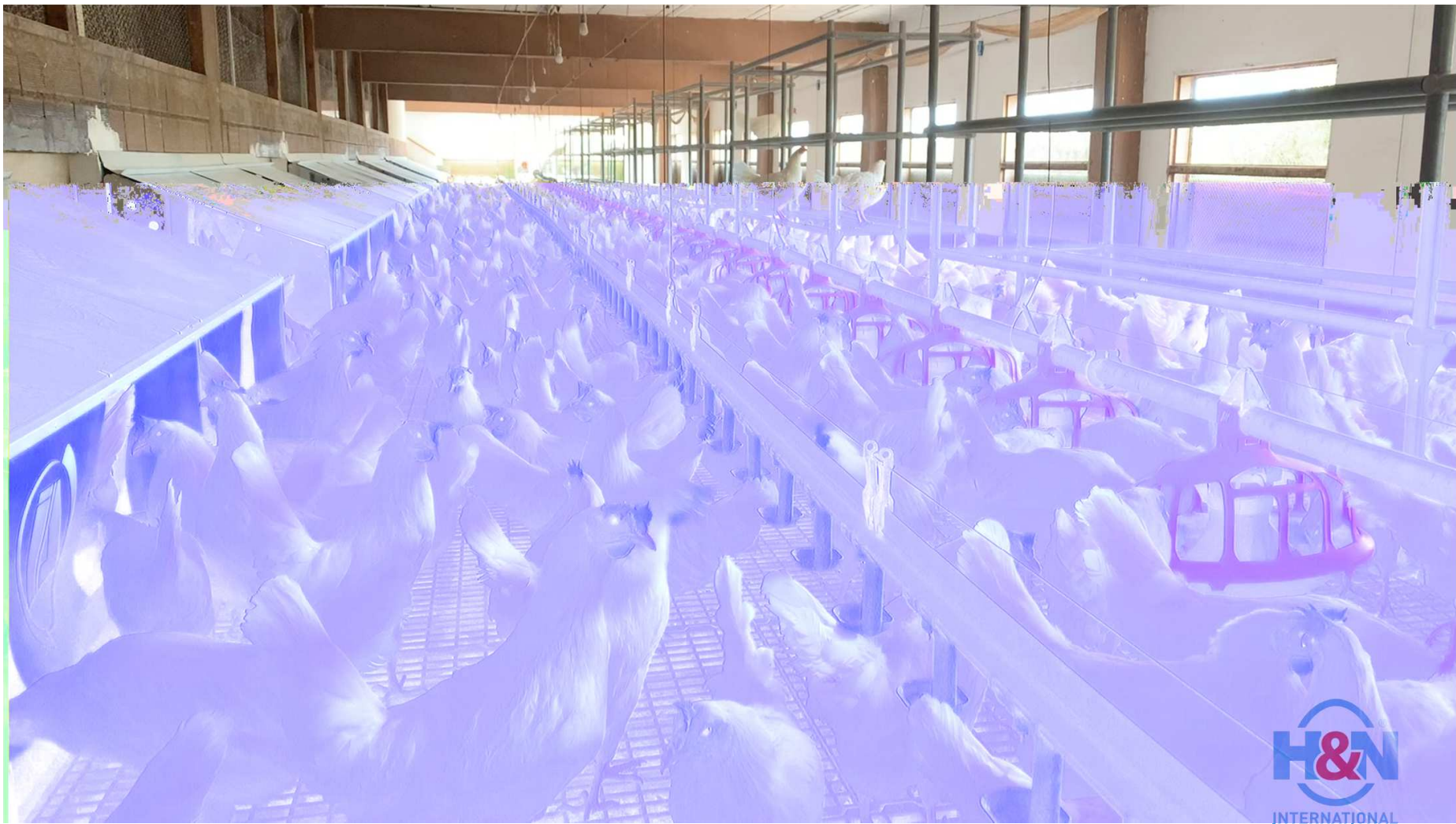
New Field test – Free Range



New Field test – Free Range



New Field test – Free Range



New Field test – Free Range



Field Test – Free Range

	Control	Challenge*
ME (kcal/kg)	2780	2750
Crude Prot. (%)	18	17
Crude Fat (%)	4.44	4.44
D Lys (%)	0.808	0.808
D Met (%)	0.429	0.386
D M+C (%)	0.680	0.605
D Thr (%)	0.568	0.568
D Trp (%)	0.183	0.183
D Ile (%)	0.648	0.648
D Val (%)	0.747	0.747
D Arg (%)	1.043	1.043
Linol. ac. (%)	2.3	2.3
Fiber (%)	3	3

- ❖ Animal Fat,
easy to oxidize
- ❖ Low level Vit. E
- ❖ Use of DDGS

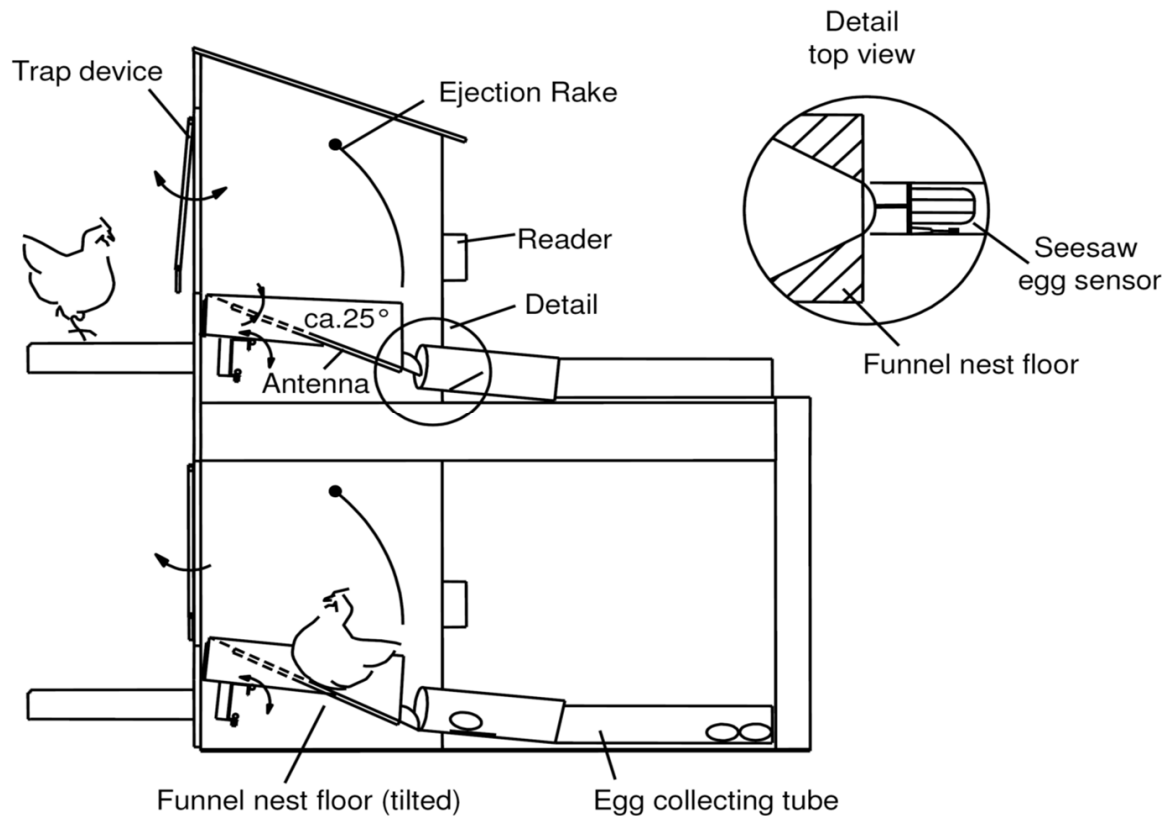


Test in Floor System



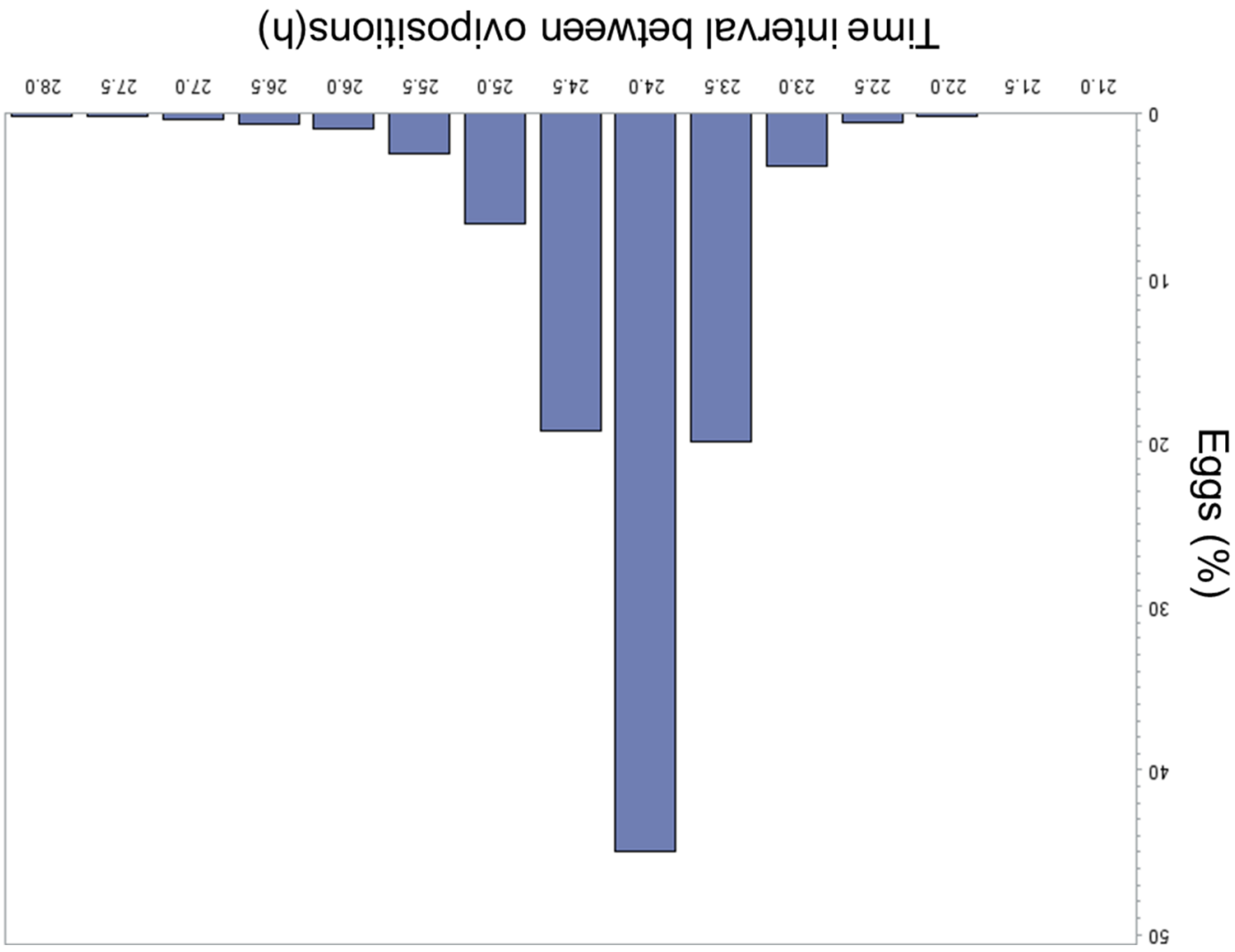
Floor house testing

→ Increase of Saleable Nest Eggs



Transponder





Genetic Parameters

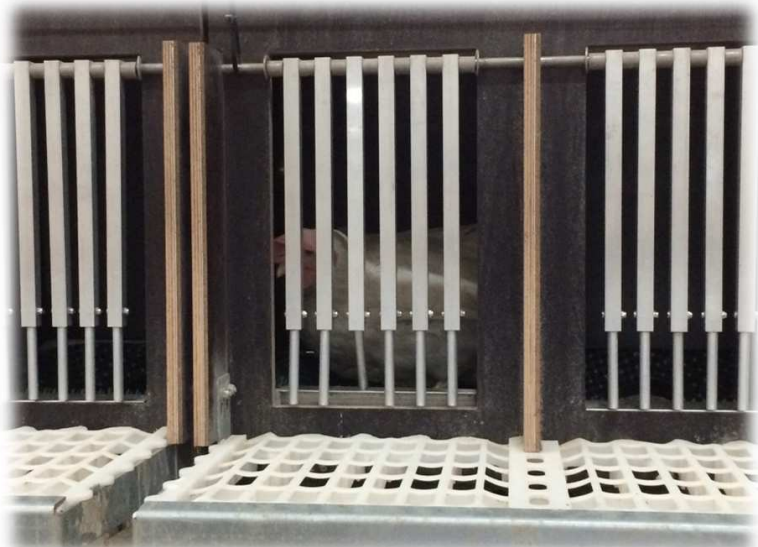
	Floor Housing h^2	Single Cages h^2	r_g
Oviposition time	0,23	—	
Time in the nest	0,27	—	
Early Production	0,28*	0,31	0,82
Peak Production	0,35*	0,12	0,28
Egg weight	0,55	0,70	0,92
Breaking strength	0,24	0,35	0,61

* Nest Eggs

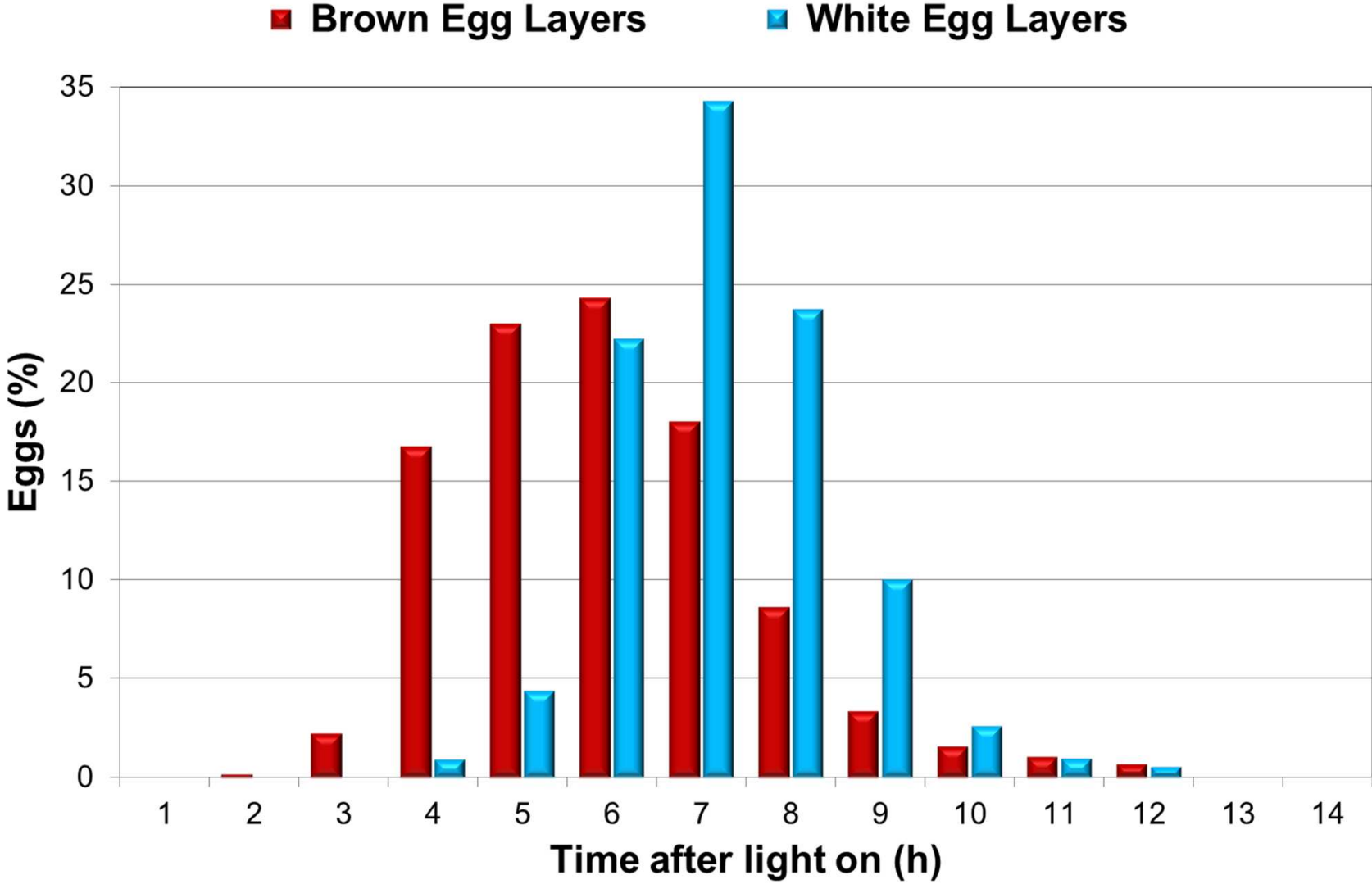
Nesting behaviour

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



Nesting behaviour



Floor Test

Family Nest and wide pop-hole

High Frequency
Transponder



Nesting Behaviour

Time spent in Nest (Minutes)

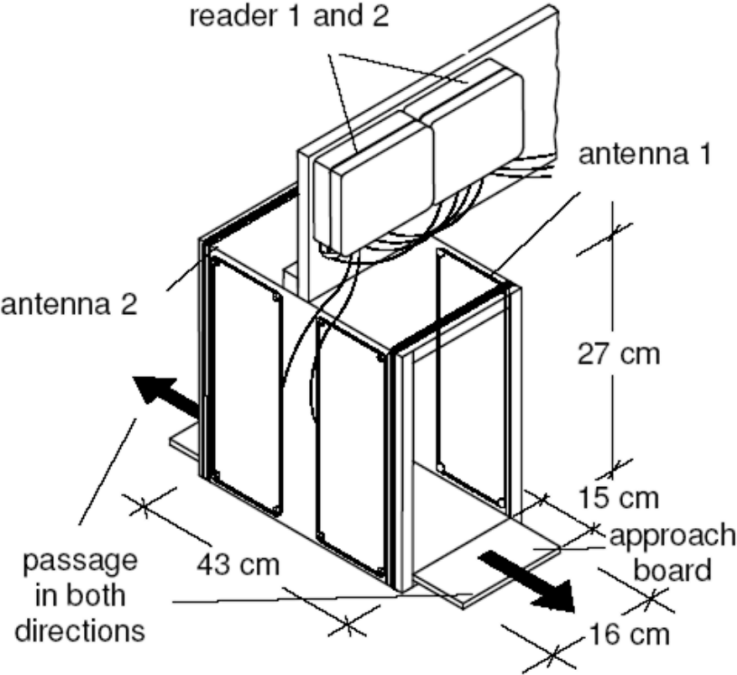
	Individual Nest		Family Nest	
	<i>with oviposición</i>	<i>no oviposición</i>	<i>per visit</i>	<i>per day</i>
Brown Layers	30	10	25	35
White Layers	45	30	45	75



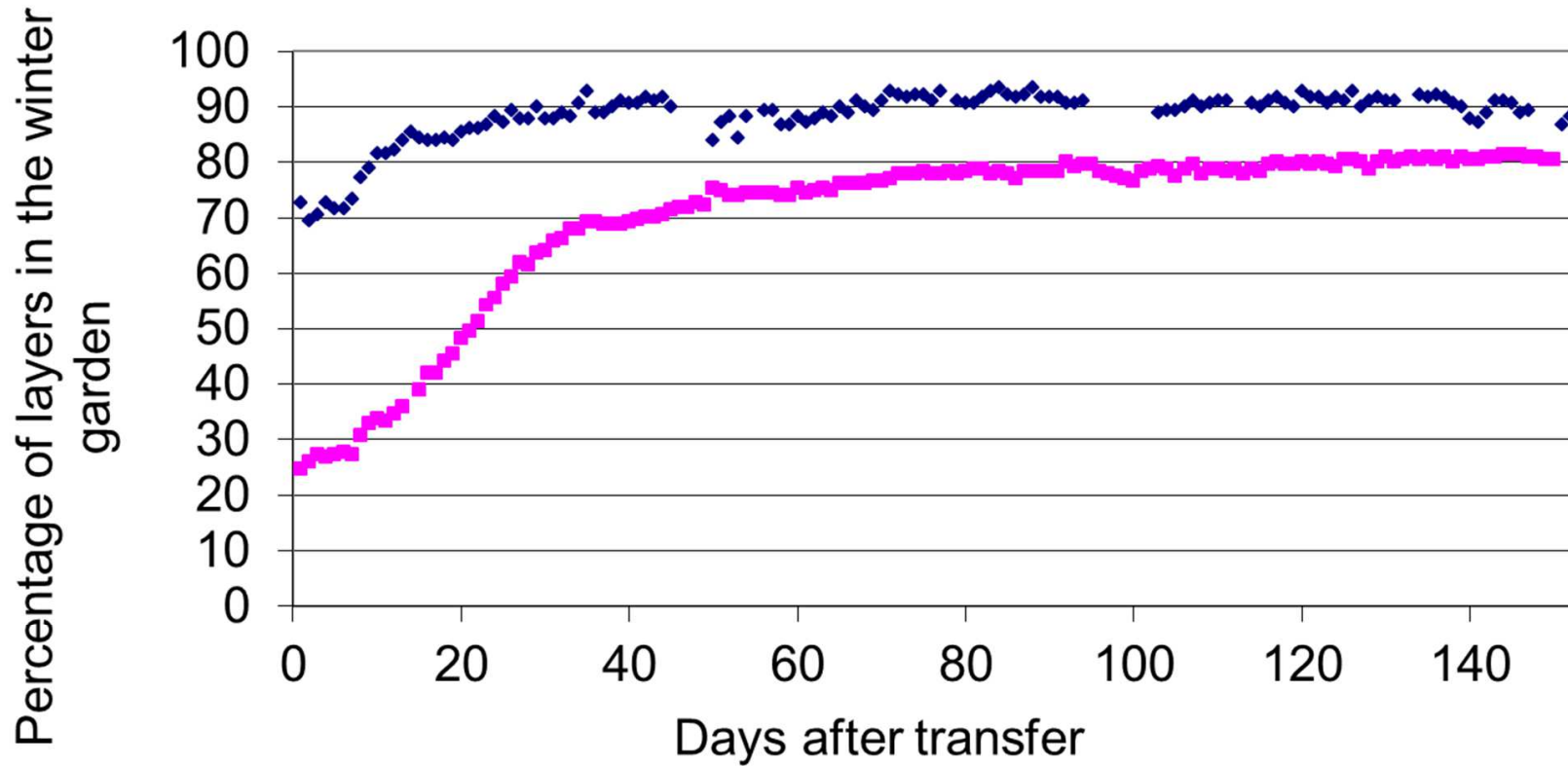
Implications – Nest Capacity

- **White birds at peak production hour:**
 - 0.35 (% hens laying) * 0.75 (h in Nest) * 120 (hens/m²)
 - This gives a stocking density: 30 hens/m² Nest
 - Plus additional visits without laying
 - **Better not to go above 100 hens/m² Nest**
- **Brown birds at peak production hour:**
 - 0.25 (% hens laying) * 0.5 (h in Nest) * 120 (hens/m²)
 - This gives a stocking density: 15 hens/m² Nest

Use of Wintergarden



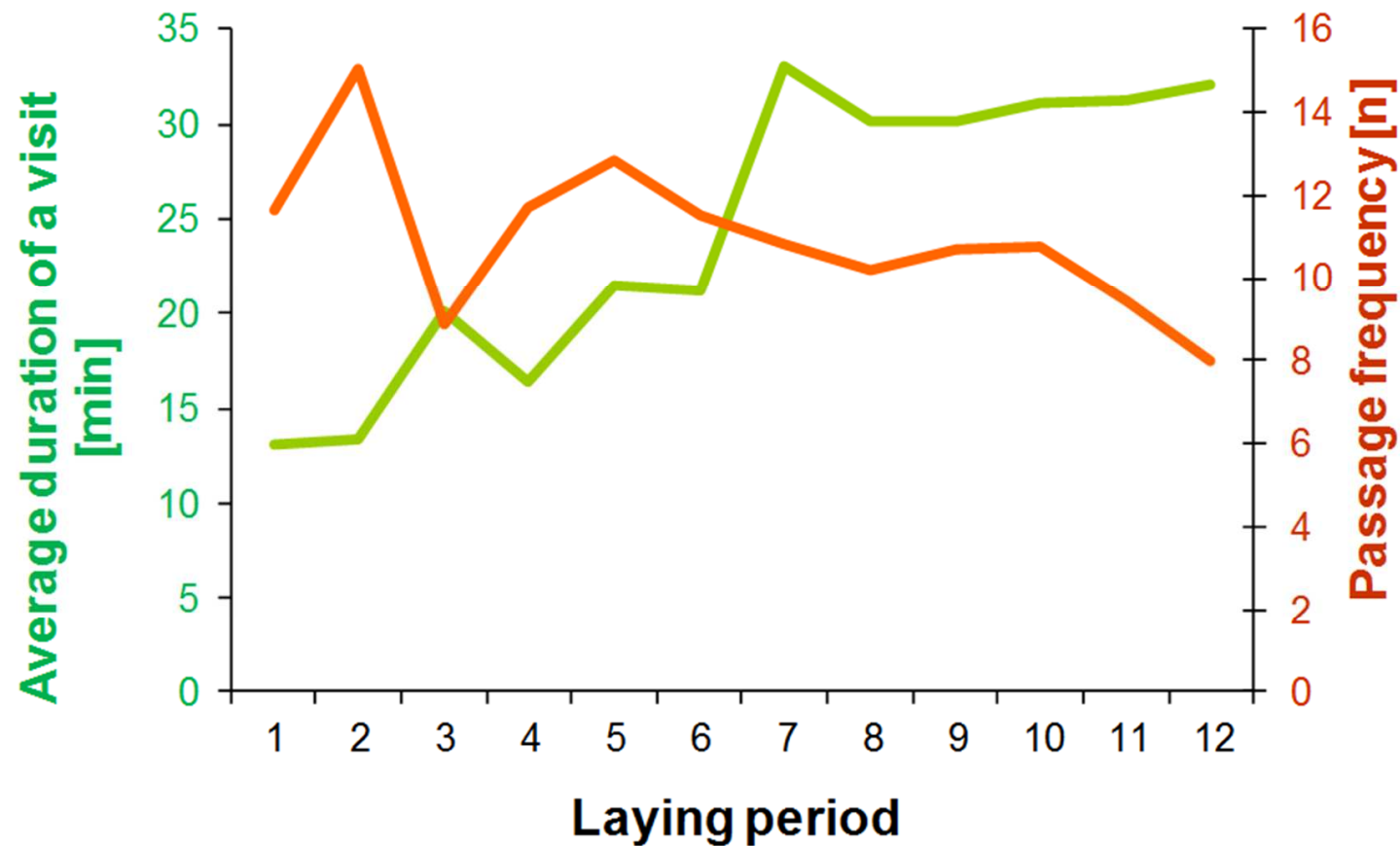
Use of the winter garden



◆ Wide electronic pop hole

■ Single hen pop hole

Stay in the winter garden



— length of stay for a single visit — passage frequency

* Only birds using the range are accounted



Performance and free-range traits

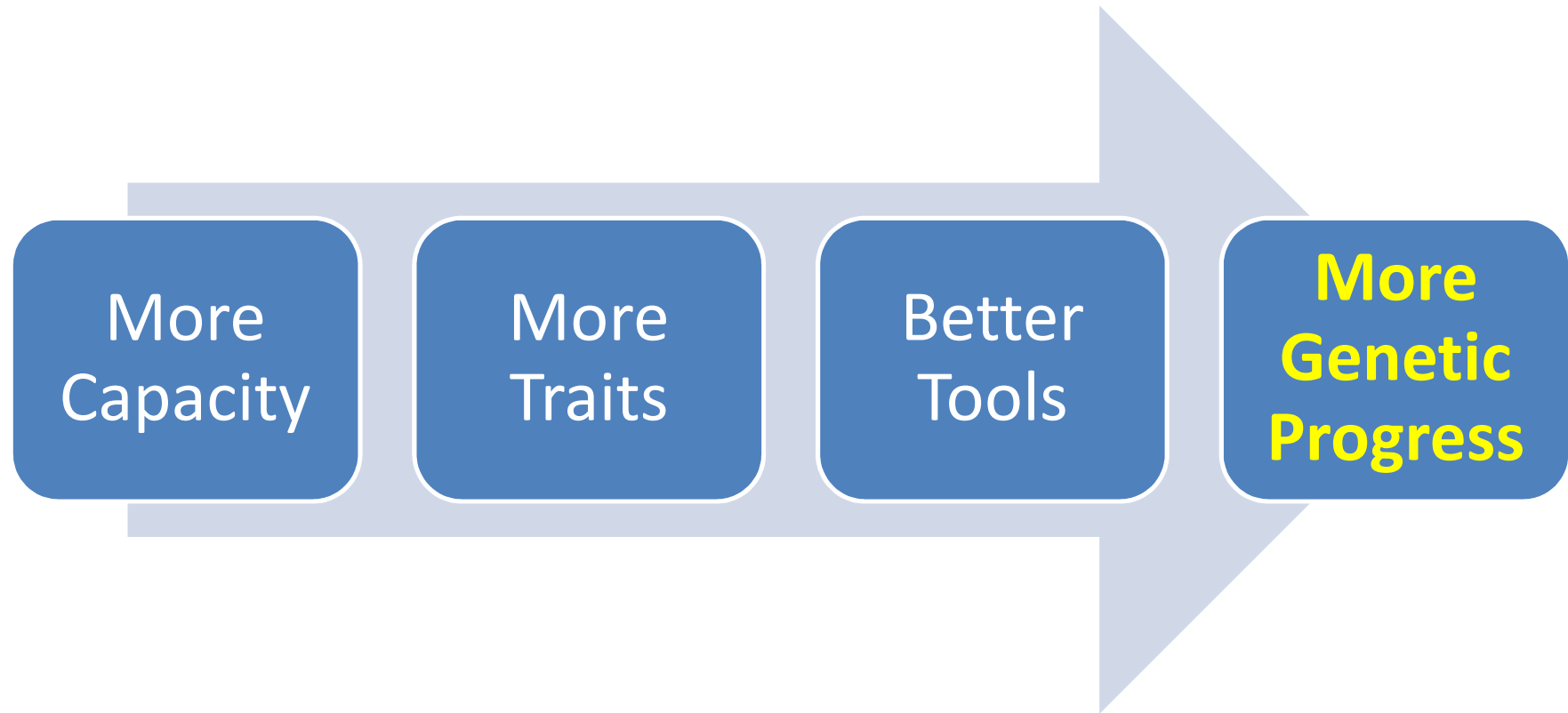
Genetic Parameters

	laying performance	frequency of passages	length of stay in a winter garden
laying performance	0.16	-0.08	-0.34
frequency of passages		0.24	+0.82
length of stay in a winter garden			0.24

(Icken et al., 2008)



General Outlook



...also for Alternative Systems!

