Welcome to Nantes

Global layer breeding with special focus on sustainability

Presented by:
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World hunger

• Progress in production is urgently required in several parts of the world!

• Dual purpose hampers the progress of productivity (biological antagonism leads to higher losses in improvement)

• The rate of genetic progress is correlated with population size (small populations are less competitive)
How can genetic diversity contribute?

• Chronic hunger in third world countries
• Lower productivity in agriculture
• Low input systems are not the solution but a delusion!!
• Local breeds should have special advantages in
  ❖ *Vitality*
  ❖ *Nutritional requirements*

• Relevance of a variety of breeds are being overrated (genetic difference in phenotype is used as marker for biodiversity)
Poultry Breeding I

• Programmes and genetic stocks owned by private companies
• Intensive selection and reproduction within large closed gene pools
• Comprehensive phenotypic data recording
  – pure lines (high biosecurity)
  – cross lines (commercial farms)
• The science of genomics might have advanced greatly, but it is still very expensive – relative to the actual value of a breeding bird!
Poultry Breeding II

- Hybrids of multiple line crosses are used for table egg and meat production worldwide.

- Cross-line birds have better:
  - fertility (parents)
  - livability (parents and commercials)
  - egg production

- Birds have to perform in a wide range of environments
Layers have to be ...

- Adaptable to different environments (housing systems, climate, feed quality)

- Feather or colour-sexable as day-olds
  (if commercials are used for breeding, there will be a significant drop in performance and the possibility to perform easy sexing will be gone)
# Globally active layer breeding companies

<table>
<thead>
<tr>
<th>Group of co.</th>
<th>Breed</th>
<th>Year of acquisition</th>
<th>Breeding farms</th>
<th>No. white strains</th>
<th>No. brown strains</th>
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<td>1959</td>
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Rate of genetic progress

• Comprehensive and precise performance testing
• The testing environment and the production environment should be similar

Tests in the following environments:

- Cage housing
- Aviary housing
- Free-range

(Genotype and Environment Interaction)
More saleable eggs per hen housed

- More persistent rate of lay
- Persistent shell quality
- Persistent internal egg quality

Breeding for success … together
Data recording in practical breeding

Housing conditions which challenge undesired behaviour:

- High light intensity
- Without beak trimming
- Family cages with 4 or 12 half-sibs in each cage

Agressors and victims within one cage originate from the same family.
Losses per family for line 1 as a result of cannibalism among non-beak trimmed hens at high light intensity

Mean = 12.6%
Losses per family for line 2 as a result of cannibalism among non-beak trimmed hens at high light intensity

Mean = 6,0 %
Selection

• Combination of single, group, family cages and small aviaries:
  – Vitality
  – Laying performance of each hen housed

• Combination of floor, aviary and free-range housing
  – Single nest
  – Family nest
  (Floor eggs, length of stay in the nest, usage of the free-range area)
Phases of a nest visit

Entry  Oviposition  Exit

Transponder
Selection for Overall Performance Index

Laying Performance
Sexual Maturity
Peak
Persistency

Feed Conversion
Feed Intake
Egg Mass Output
Body Weight

Liveability
Coli / PN
General Liveability
(Mortality)

Egg Weight
Early
Late
Shape of Curve

Behaviour
Feather Pecking
Cannibalism

Alternative housing
Nesting Behaviour (floor eggs)
Ranging Behaviour

Egg Quality
Breaking Strength
Crack-Detektor
Shell Colour
Inclusions
Dark Brown Spots (LB)
Mottling (LSL)
Pimples (LSL)
Haugh Units
Yolk-%, Dry Matter
Egg Shape

PS-Performance
Fertility
Hatchability

Others
Plumage Colour (LB)
Comb Size (LSL)
Faeces Consistence

Breeding for success... together
Local breeding programmes

• Parent stock can be distributed worldwide (as hatching eggs or day-olds)

• A new generation every year

• Local breeding programmes in Asia are based on European or North American genetic stocks

• In Africa, local strains still contribute a significant share to chicken production (dual purpose)
Local programmes

- If balanced diets are available, local strains will be replaced by imported parent stocks – a general trend

- Major difference in feed efficiency and egg quality (size and shell strength)

- Lack of infrastructure for reliable performance testing as major input for selection and annual progress
Future market needs

• To forecast needs for producers and consumers, at least 5 years ahead of market realisation

• Diverse markets can be served by different line combinations (mainly male lines)

• Extensive gene pools with a variety of elite lines to generate specific commercial products
Sustainable programmes

• Continuous genetic progress in pure lines (annually)

• Limited increase in inbreeding
  (large pure lines, special mating scheme)

• Developing new lines

• High costs for testing, selecting, reproduction
  - Investment: € 150/bird per year
  - Husbandry: € 50 / bird per year
    For 5000 birds = € 1 million / year

• Very good skills in quantitative genetics
Biodiversity

• Genomic polymorphisms have to be analysed

• Use of high density panels (600 K SNP Array)

• Association studies for performance and vitality traits using local and commercial strains (to preserve the genomic merit) of native breeds
Conclusion

Programmes are only sustainable if;

• The population size is large
  ➤ 3000 birds/line
• More than 4 lines are available
  - for brown eggs as well as for white egg stock
- There are sufficient parent stock sales to cover costs and generate significant revenue
• PS can be imported at any time and with any volume to hatch commercials for growing layer operations
Conclusion

Those who do not test, cannot select and are thus unable to make any progress in breeding.

Only if these test alternatives for all housing systems are available for pure and cross-lines, can continuous genetic progress be achieved!!
Do you have any questions?