

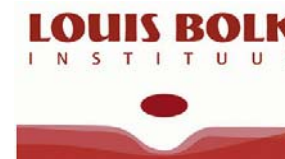


Development of integrated livestock breeding and management strategies to improve animal health, product quality and performance in European organic and 'low input' milk, meat and egg production



Search for the ideal laying hen for organic and free range systems

Ferry Leenstra, Veronika Maurer, Monique Bestman, Frans van Sambeek, Esther Zeltner, Thea van Niekerk, Fabien Galea and Berry Reuvekamp



Large Collaborative Project



Cattle, sheep, pigs and poultry

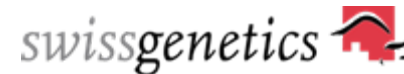
- › 2009 – 2014
- › 11 research centres
- › 6 industrial partners
- › 4 non-European partners
- › 15 countries

- › 94 person-years of research
- › Over 60 scientists

- › Budget: 8.9 M €
- › EC contribution: 6 M €



Universidad e Federal de Viçosa



Background



- › **Breeding for organic and ‘low input’ production systems neglected**
 - › small market
 - › diverse systems
 - › high costs
- › **Organic and ‘low input’ systems use traditional breeds or genotypes for ‘high input’ production with a high genetic potential**
- › **Housing, feeding, medication... differ from conventional**
 - › **Genotype x environment interactions need to be considered**
 - › **Functional traits need more attention**

Integrated approach



- › **Species-specific breeding strategies**
 - › **Molecular marker assisted selection (sheep)**
 - › **Genome-wide selection (cattle)**
 - › **Systematic evaluation of cross-breeding (cattle)**
 - › **Farmer participatory breeding systems (pigs, laying hens)**

- › **Innovative management approaches (all species)**
 - › **Feeding regimes**
 - › **Rearing systems**

Low input systems for laying hens



Commercial production of eggs

- ›Organic
- ›Free range

Hens receive complete diet (more or less ad libitum), but have outside access

In general conventional, commercial genotypes

In poultry real low input is back yard farming

see FAO E-conference on “Opportunities of the poultry breeding programs for the family poultry production in developing countries : The bird for the poor”

Goals



- › **Develop a participatory system to test and optimize genotypes specific for free range and organic systems**
- › **Optimize management issues for free range and organic farms with special emphasis on diets and feather pecking**
- › **Analyze how the productive life of laying hens can be extended (consequences for health)**
- › **Analyze/optimize egg quality characteristics**

Inventory of farms and genotypes

Characterisation, flock size



| Country | Switzerland | | France | | Netherlands | |
|------------|-------------|------|--------|------|-------------|-------|
| System | FR | Org | FR | Org | FR | Org |
| N farms | 35 | 91 | 31 | 11 | 48 | 57 |
| N flocks | 52 | 102 | 26 | 10 | 71 | 57 |
| Flock size | 3093 | 1635 | 7577 | 4682 | 17625 | 8077 |
| min | 500 | 500 | 1700 | 2298 | 1500 | 330 |
| max | 8014 | 2000 | 18000 | 9000 | 45050 | 18350 |

CH: mainly aviary, F: mainly floor, N: 50/50

Genotypes



20 different genotypes:

- › 10 brands of brown hens (1 – 51 flocks/brand)
- › 3 brands of white hens (4-28 flocks/brand)
- › 4 brands of silver hens (3-15 flocks/brand)
- › 3 other genotypes
- › 73 mixed flocks (brown and white, brown and silver, white and silver)

Some, but limited overlap between countries in genotypes

Genetic groups by country, number of flocks (number of different brands)



| Country | Switzerland | France | Netherlands | Total |
|---------------|---|---------------|--------------------------|-----------------|
| Brown | 38 (6) | 37 (6) | 51 (6) | 156 (10) |
| White | 35 (2) | 0 | 7 (2) | 42 (3) |
| Silver | 5 (2) | 0 | 36 (3) | 41 (4) |
| Mixed | 72 56 B+W 10 S+W 6 B+S | 0 | 1 1 B+S | 73 |

Performance by country and system



| Country | Switzerland | | France | | Netherlands | |
|-----------------|-------------|-------|--------|-------|-------------|-------|
| System | FR | Org | FR | Org | FR | Org |
| Egg production | 244.1 | 241.9 | 247.0 | 245.4 | 244.9 | 231.0 |
| Mortality (%) | 5.9 | 6.6 | 4.9 | 4.7 | 6.6 | 12.0 |
| Feather cover | 0.71 | 1.11 | 0.35 | 0.90 | 0.96 | 1.35 |
| Hens outside(%) | ND | 69 | 29 | 35 | 25 | 54 |

0: no birds, 1: <25%, 2:>25% birds with bad feather cover

Performance by genetic group



| | White | Brown | Silver | Brown+ Silver | Brown+ White | White+ Silver |
|-------------------------------------|--------------|--------------|--------------|------------------|-----------------|------------------|
| N Flocks | 32 | 120 | 31 | 5 | 28 | 4 |
| Free range (N eggs/ hh) | 248.7 | 246.2 | 237.8 | 248.0 | 200.0 | NP |
| Organic (N eggs/ hh) | 243.5 | 239.1 | 227.2 | 254.3 | 240.8 | 243 |
| Free range mortality (%) | 5.2 | 5.8 | 9.8 | 5.6 | 1.0 | NP |
| Organic mortality (%) | 3.5 | 8 | 13.4 | 9.6 | 7.1 | 10.4 |

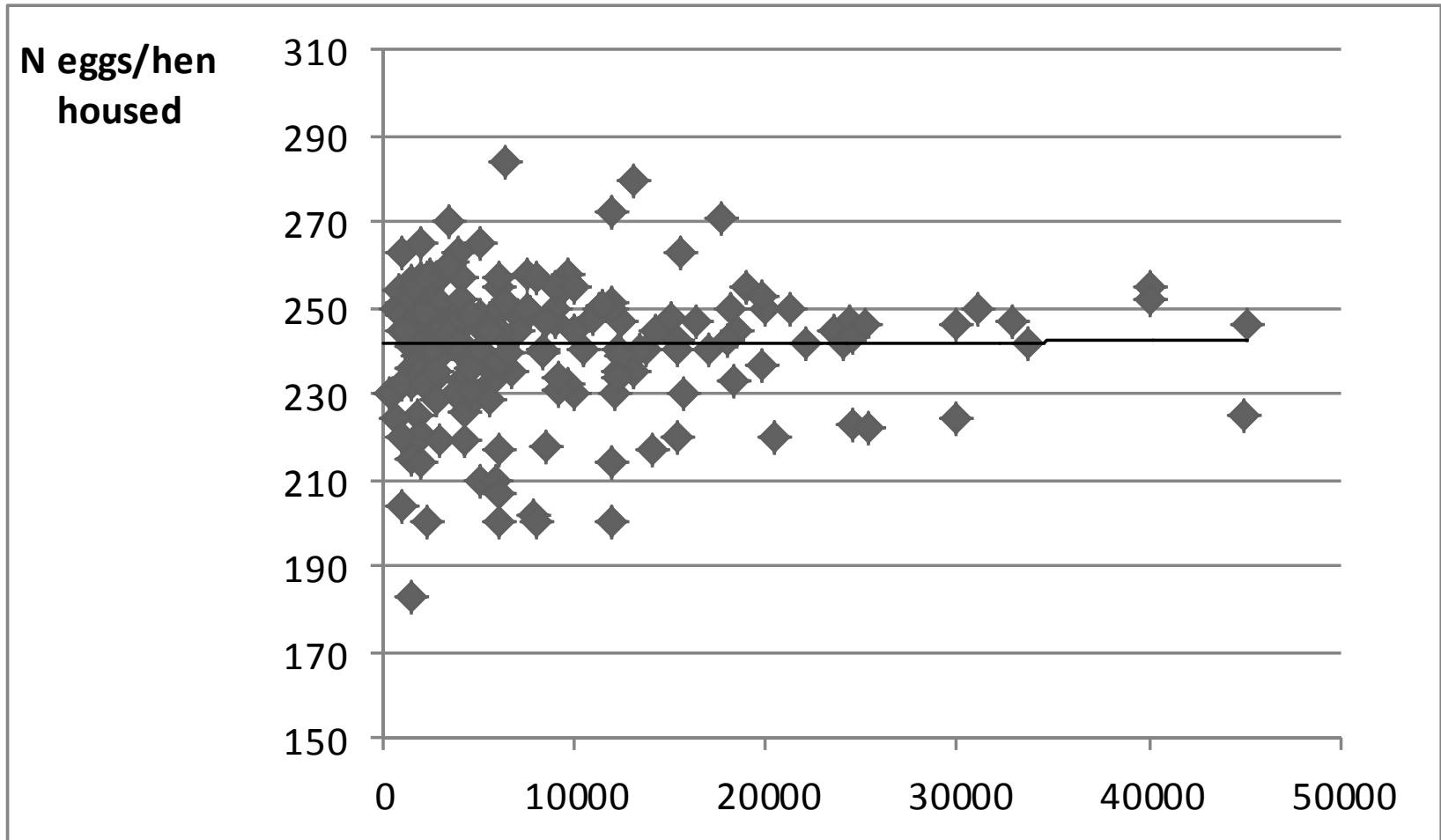
Brand/genetic group and country to some extent confounded, but organic lower production, higher mortality. Silver more problems than White or Brown

Feather cover and use of range area by genetic group



| | White | Brown | Silver | Brown+ Silver | Brown+ White | White+ Silver |
|--------------------------------------|-------------|-------------|-------------|------------------|-----------------|------------------|
| N Flocks | 32 | 120 | 31 | 5 | 28 | 4 |
| Free range Feather cover | 0.58 | 0.85 | 1.00 | 1.00 | 0.22 | NP |
| Organic Feather cover | 0.30 | 1.00 | 1.46 | 1.60 | 1.47 | 1.10 |
| Free range % hens outside | 34.7 | 24.9 | 28.6 | nd | nd | nd |
| Organic % hens outside | 48.0 | 53.2 | 62.1 | 74.0 | 69.9 | 72.0 |

Flock size and egg production per hen housed



Conclusions from inventory



- › **No clear relation between flock size and mortality (or production)**
- › **Small flocks more variation**
- › **White hens perform quite well compared to brown or silver hens. Silver hens relative high mortality (NL?)**
- › **Organic in general lower production and higher mortality than free range, except for France (beak treatment?)**
- › **Feather damage (as judged by farmer): more in organic than in free range**
- › **% hens outside (as judged by farmer): more in organic than in free range**

Next flock different genotype?



| | Same | Different | Don't know |
|-----------------|------|-----------|------------|
| Free range | 103 | 25 | 12 |
| Organic | 66 | 97 | 8 |
| | | | |
| Switzerland | 69 | 77 | 0 |
| France | 32 | 6 | 0 |
| The Netherlands | 68 | 29 | 20 |

Free range less shift in genotype than organic
Switzerland: egg trader and/or hatchery decides

Data recording



- › **>50% farms have a data management program**
- › **Also on-line packages available (independent, feed company, hatchery)**
- › **Provided there is sufficient cooperation and willingness to share data: genotype (brand) comparisons are possible and might serve as a substitute for Random Sample Testing**

Workshops 'Ideal hen'



Workshops with farmers in CH and NL.

Results quite similar:

- › **Longevity (with or without moulting)**
- › **Adaptability (fast recovery)**
- › **Behaviour**
 - › **Curious, bold, calm, 'optimistic'**
 - › **Nesting behaviour, no smothering**
- › **Eating capacity, bit more body mass**
- › **Good persistence more important than high peak**

Next steps



Farm visits (20/system/country)

- › What determines slaughter age
- › More insight in management factors
- › Feather score, breast bone, foot pads
- › Try new genotype?
- › Egg quality characteristics

- › Experimental setting
- › Genotype x diet interaction
 - › Genotype: new vs currently common? (or ...)
 - › Diet: with and without animal proteins



Archived at <http://orgprints.org/20558/>

The authors gratefully acknowledge co-funding from the European Commission, under the Seventh Framework Programme for Research and Technological Development, for the Collaborative Project LowInputBreeds (Grant agreement No 222623)

The work of Wageningen LR and Louis Bolk is partly funded by the Dutch Ministry of Economics, Agriculture and Innovation

