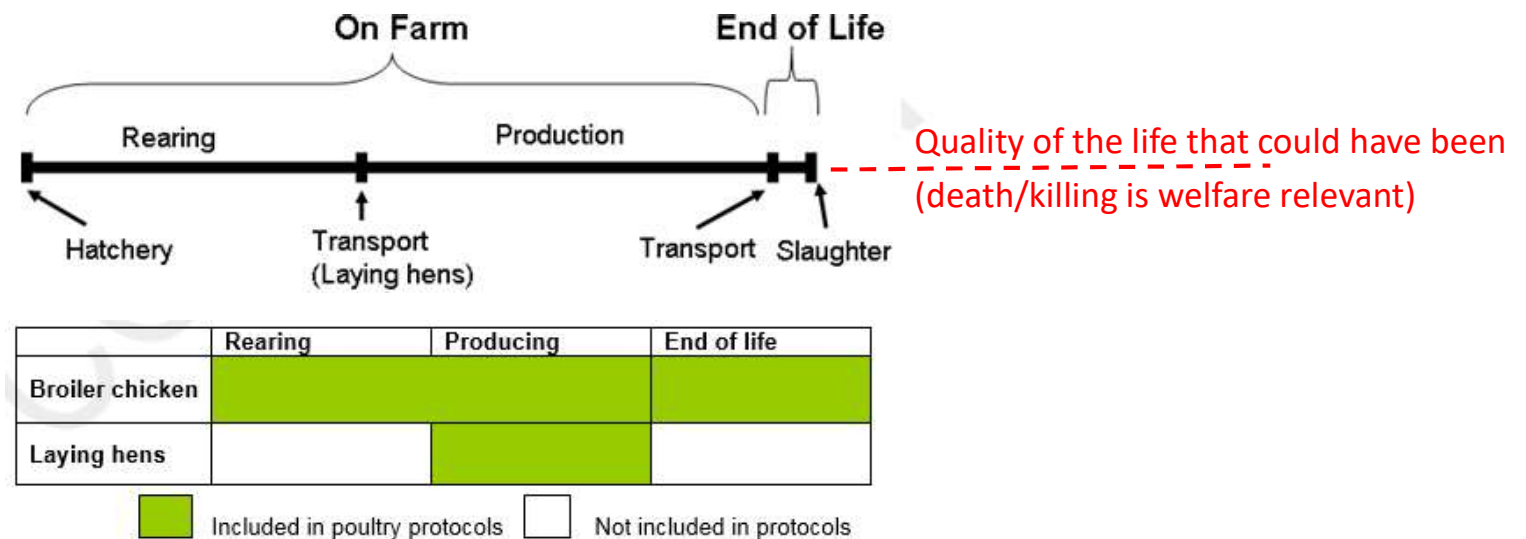


## 8. ASSESSING, MONITORING & LABELLING POULTRY WELFARE

- a) Defining animal welfare
- b) Animal welfare indicators** (practical week)
- c) Aggregating indicators & monitoring protocols  
(Legmoni - Dr N. Van Noten)
- d) Poultry welfare labels

## B. ANIMAL WELFARE INDICATORS: CONTEXT & GOAL?

- Individual - social group - livestock farm / region / country /...
- Snapshot - historical - future (risk analysis)



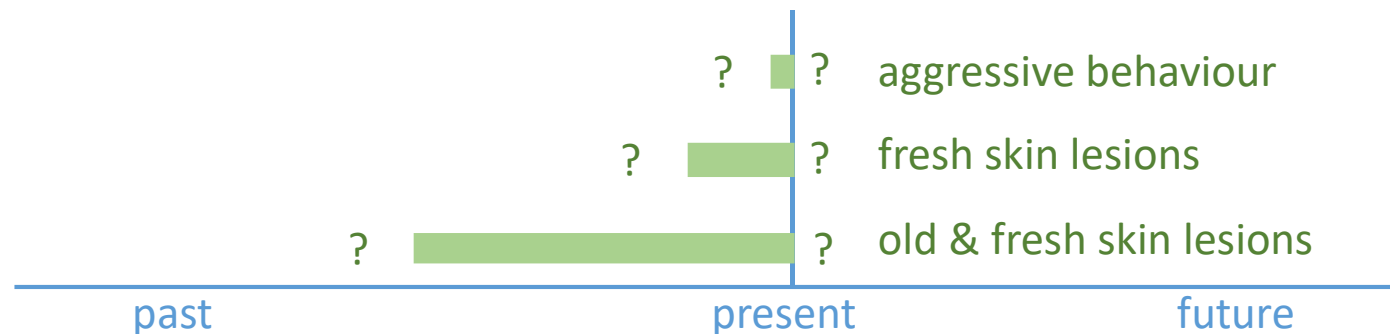
- **Application:**

- Exhaustive - pertinent
- Monitoring - comparable over time and across systems / countries / companies...
- Purpose (label, certification, benchmarking, feedback, research,...)

## B. ANIMAL WELFARE INDICATORS: CRITERIA?

### Features of a good welfare indicator:

- valid (e.g. incidence vs prevalence of stereotypic behaviour)
- animal-based (instead of environment-based)
- correct time frame (~ cf. objective)



- reliable (sample, inter- & intra-observer, test-retest, expectation bias / objective)
- logistically feasible (time, resources, disturbance, hygiene risk,...)
- robust (test-retest, not moment-dependent)

## B. ANIMAL WELFARE INDICATORS: **WELFARE QUALITY<sup>®</sup> (ON-FARM)**

[www.welfarequalitynetwork.net](http://www.welfarequalitynetwork.net)

(updates coming soon)



## B. ANIMAL WELFARE INDICATORS: WQ®

| Principles       | Criteria                                         | Dairy cattle                                                          | Growing pigs                                                                                                  | Broiler chicken                                    | Laying hen (2.0)                                                                                                        |
|------------------|--------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Good feeding     | Absence of prolonged hunger                      | BCS (% very lean animals)                                             | BCS (% lean animals)                                                                                          | Emaciation                                         | Keel bone prominence                                                                                                    |
|                  | Absence of prolonged thirst                      | Availability & cleanliness water                                      | Availability & cleanliness water                                                                              | Drinker space                                      | Availability of water                                                                                                   |
| Good housing     | Comfort around resting                           | Lying down duration; % collisions; on edge of lying area; cleanliness | Bursitis, manure on body                                                                                      | Plumage cleanliness; litter qual., dust sheet test | Perch (L & shape), red mites, dust sheet test                                                                           |
|                  | Thermal comfort                                  | -                                                                     | Shivering, panting, huddling                                                                                  | Panting, huddling                                  | Panting, huddling                                                                                                       |
|                  | Ease of movement                                 |                                                                       | avoidance                                                                                                     | Stocking density                                   | Stocking density; horizontal/vertical movement; perforated floors                                                       |
| Good health      | Absence of injuries                              |                                                                       | ...s; body & tail wounds                                                                                      | Lameness; dermatitis;                              | KBD; skin lesions; FPD; toe/beak damage                                                                                 |
|                  | Absence of disease                               | Respir./reprod./digestive diseases; SCC; dystocia; downer; mortality  | Mort; coughs; sneezes; pumping; twisted snouts; rectal prolapse; scouring; skin condition; ruptures & hernias | On-farm mort. & culls; rejections                  | On-farm mort. & culls; enlarged crops; eye pathol., respir. infections, enteritis, parasites; comb abnorm.              |
|                  | Absence of pain induced by management procedures | Mutilations (dehorning; tail docking; use of anaesthesia/analgesia)   | Castration; tail docking; use of anaesth./analg.)                                                             |                                                    | Beak treatment                                                                                                          |
| Appropri. behav. | Expression of social behaviour                   | Incidence agonistic interactions                                      | Social behav.                                                                                                 |                                                    | plum. damage back of head; comb pecking wounds                                                                          |
|                  | Expression of other behaviours                   | Access to pasture                                                     | Exploratory behav.                                                                                            | Free range, FR cover                               | Plum. dam. (back, tail, vent); nest space; litter; enrichment (use), FR (cover), covered veranda; comf. & forag. behav. |
|                  | Good human-animal relationship                   | Avoidance distance at feeding place                                   | Panic response to human walking in pen                                                                        | Avoidance distance test                            | Avoidance distance test                                                                                                 |
|                  | Positive emotional state                         | QBA                                                                   | QBA                                                                                                           | QBA                                                | Novel object test; QBA                                                                                                  |

Red = resource-based indicators  
 Green = farm records / interview  
 Blue = measured at SH

## B. ANIMAL WELFARE INDICATORS: WQ®

| Principles       | Criteria                                         | Dairy cattle                                                          | Growing pigs                                                                                                  | Broiler chicken                                    | Laying hen (2.0)                                                                                                        |
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|                  | Ease of movement                                 | Tethering                                                             | Space allowance                                                                                               | Stocking density                                   | Stocking density; horizontal/vertical movement; perforated floors                                                       |
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|                  | Positive emotional state                         | QBA                                                                   | QBA                                                                                                           | QBA                                                | Novel object test; QBA                                                                                                  |

## B. ANIMAL WELFARE INDICATORS: THIRST (BROILER)

**Number of chickens per drinker vs. recommended**



Nipple: 10 chickens



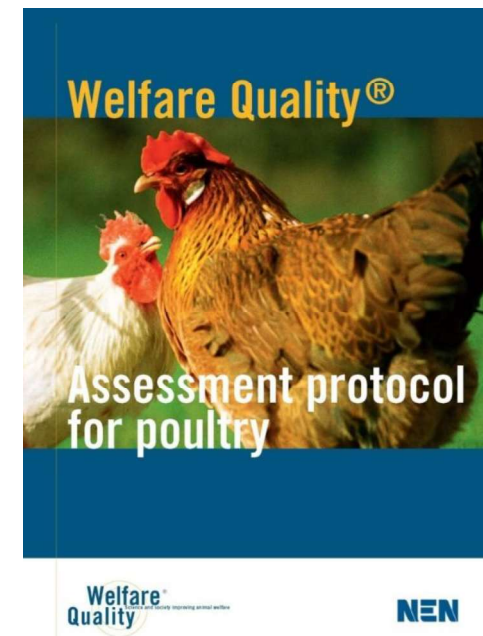
Cups: 28 chickens



Bell: 100 chickens

Good indicator?

Better?



## B. ANIMAL WELFARE INDICATORS: THIRST (BROILER)

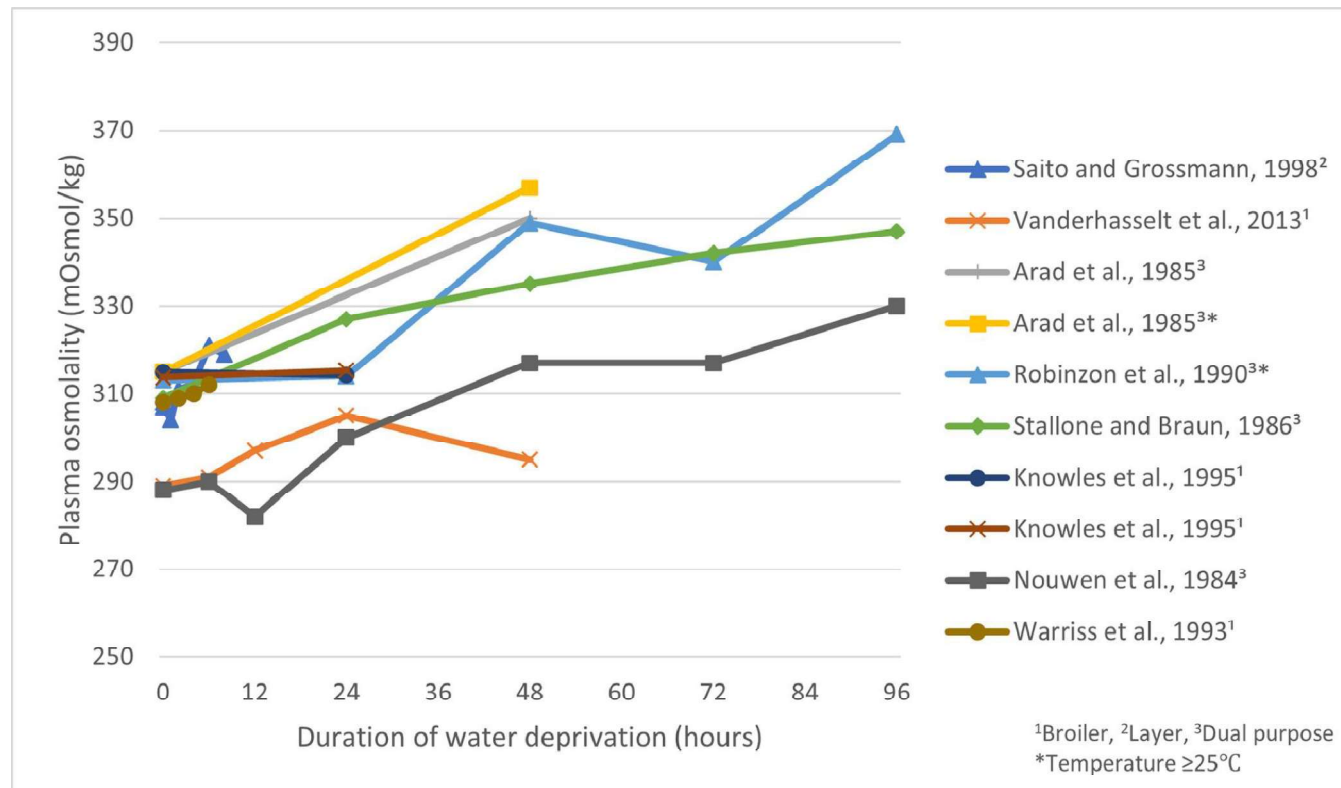
"No problem : thirst → ↓ feed intake → ↓ yield"

### Need for an animal-based indicator?

- Number of drinkers/chicken: low-accuracy, sensitivity, persuasive (flow/defects/position/water quality/...)
- Individuals cannot reach / make drinker work:
  - stunted (too small), sick/weak/lame animals
  - unnatural drinking position
  - at ↑ temperature → ↑ panting → ↓ drinking

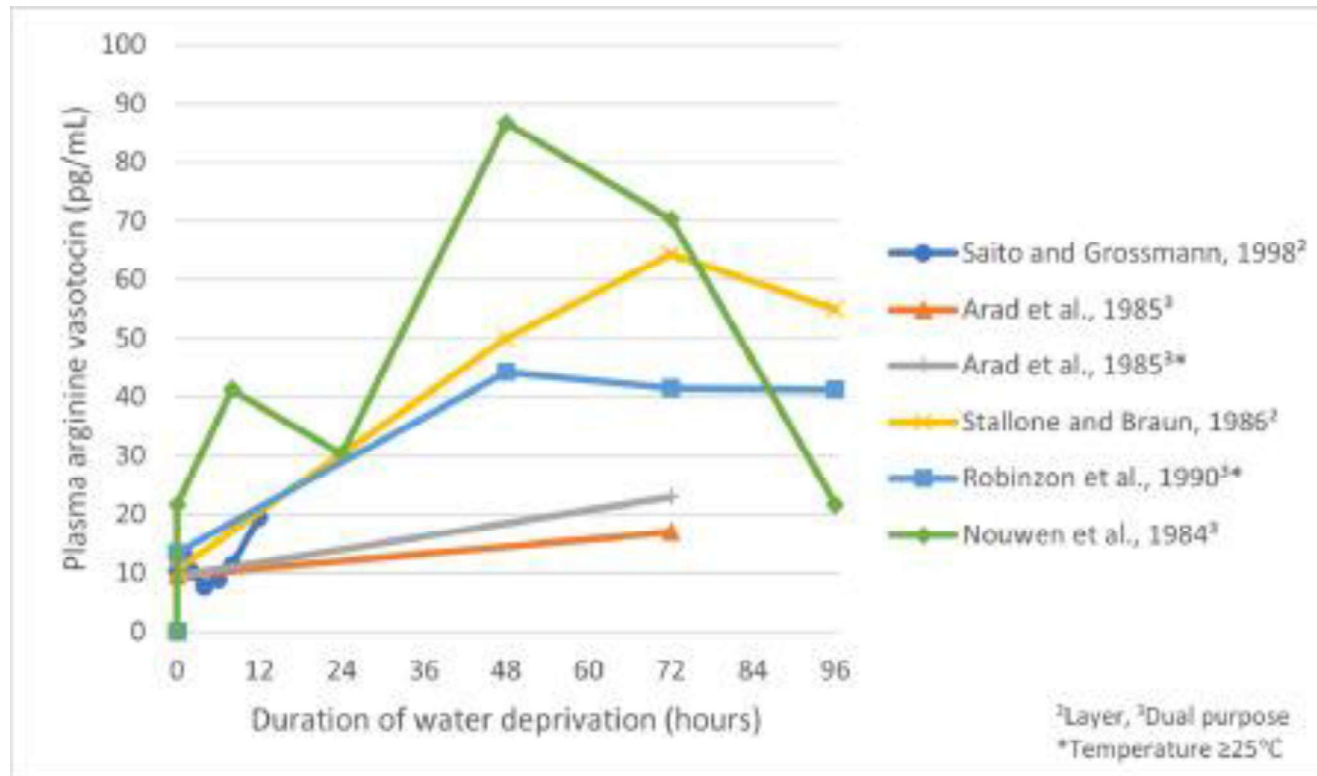
## B. ANIMAL WELFARE INDICATORS: THIRST (BROILER)

### Plasma osmolality



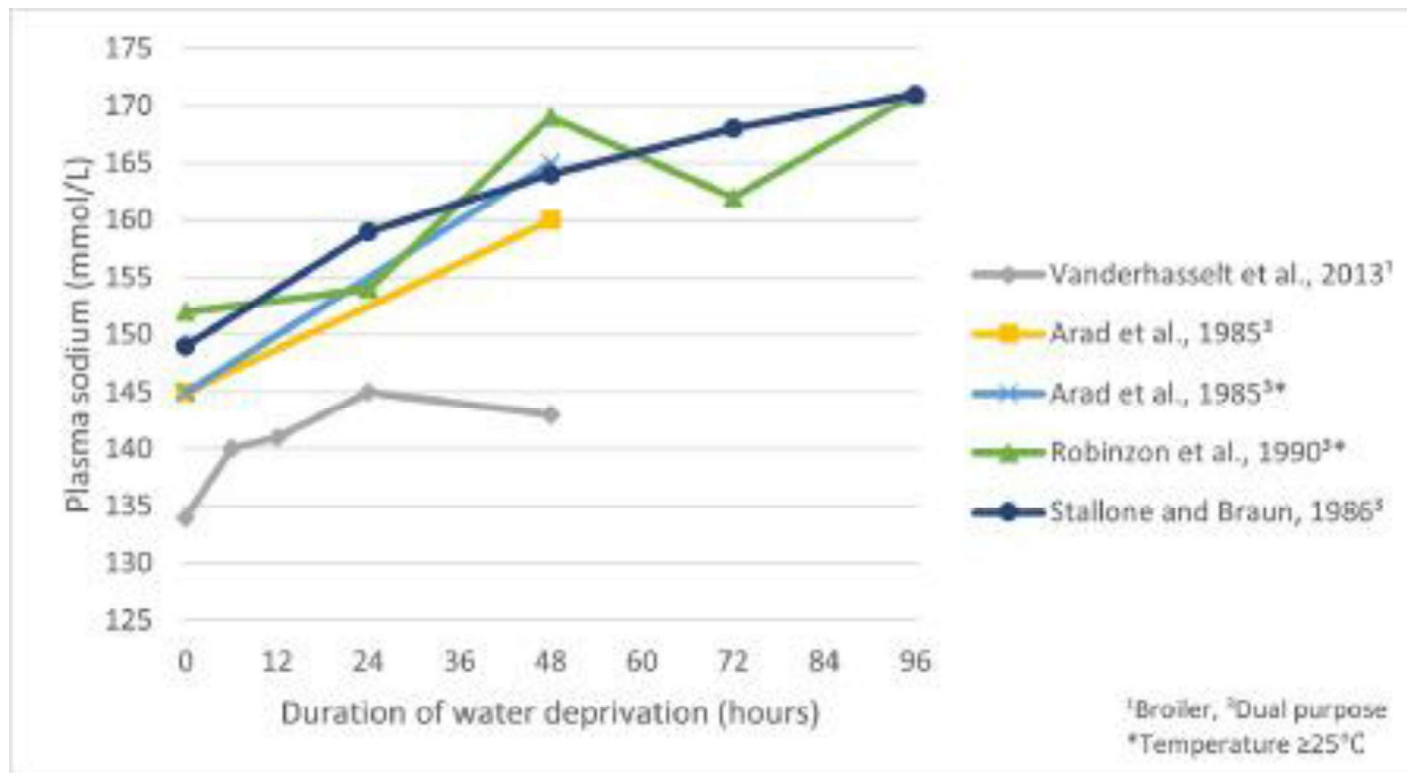
## B. ANIMAL WELFARE INDICATORS: THIRST (BROILER)

### Plasma arginine vasotocine



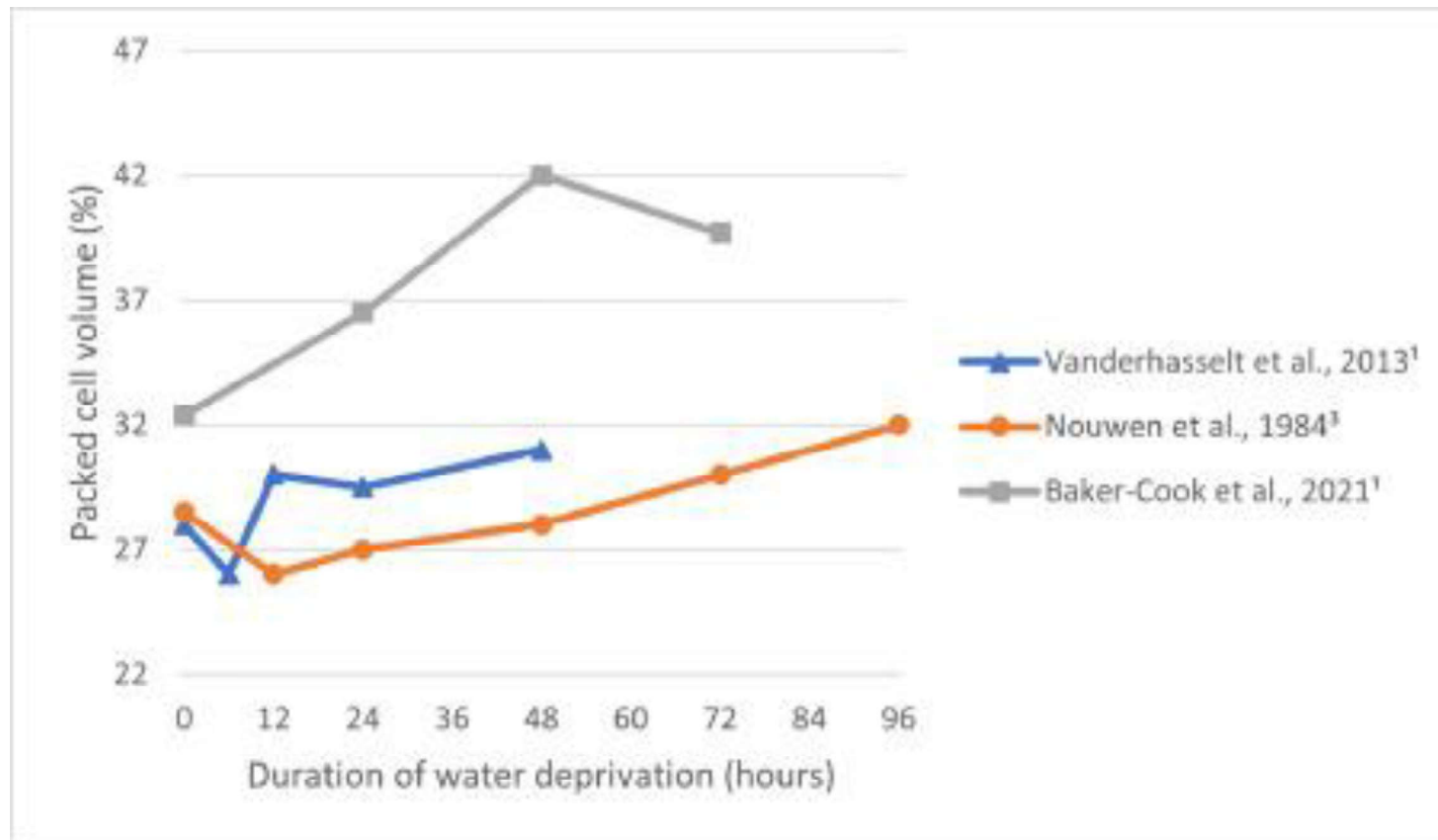
## B. ANIMAL WELFARE INDICATORS: THIRST (BROILER)

### Plasma sodium



## B. ANIMAL WELFARE INDICATORS: THIRST (BROILER)

### Blood packed cell volume

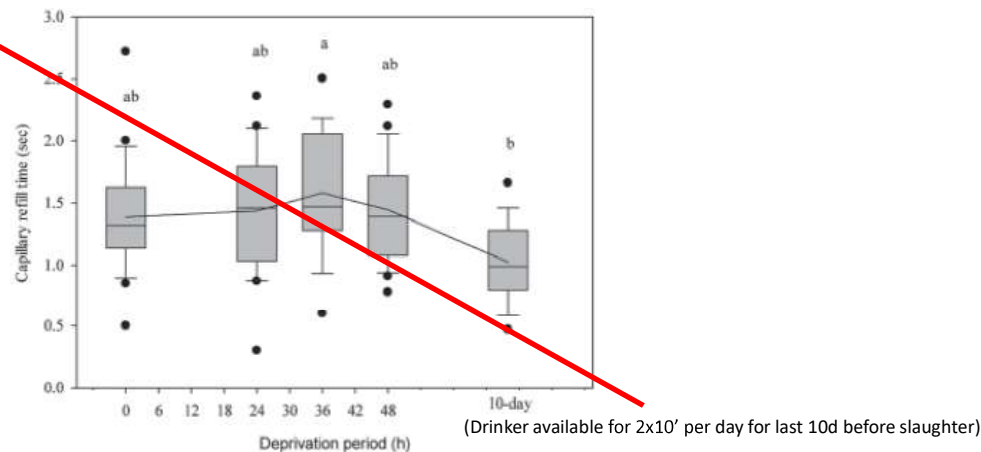


## B. ANIMAL WELFARE INDICATORS: THIRST (BROILER)

Unsuitable thirst indicators based on water-deprivation test:

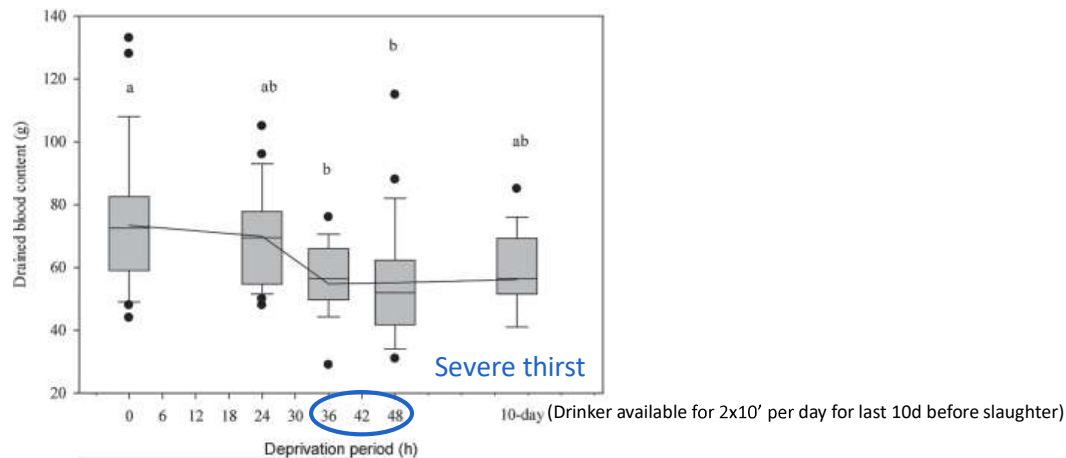
- Blood: plasma potassium, plasma calcium, haematocrit, albumin, uric acid, creatine
- Dry matter content excreta or intestinal contents
- Flesh: water retention capacity, tear strength
- Capillary refill, skin turgor, sunken eyes, organ weights

**Capillary refill time (lobe squeezing)**

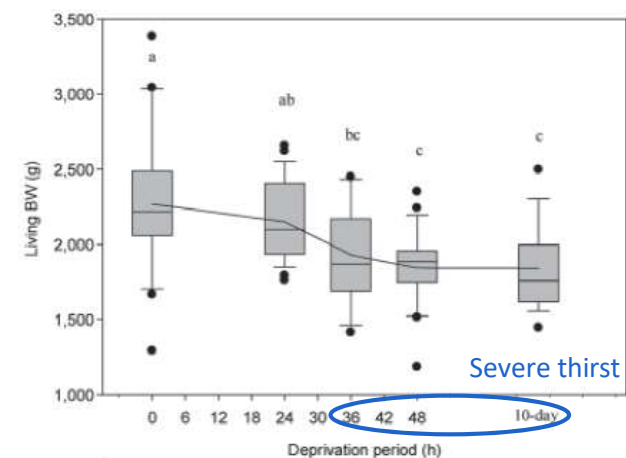


## B. ANIMAL WELFARE INDICATORS: THIRST (BROILER)

### Blood volume (bleeding for 1.5min)



### Body weight

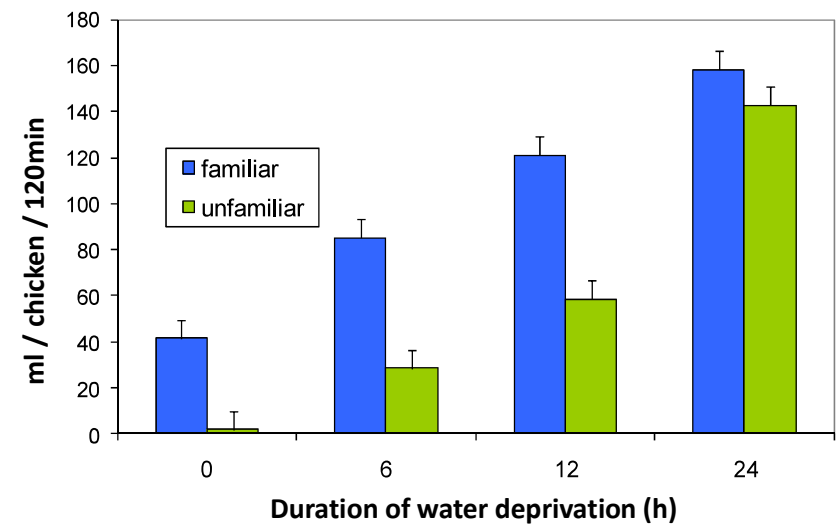
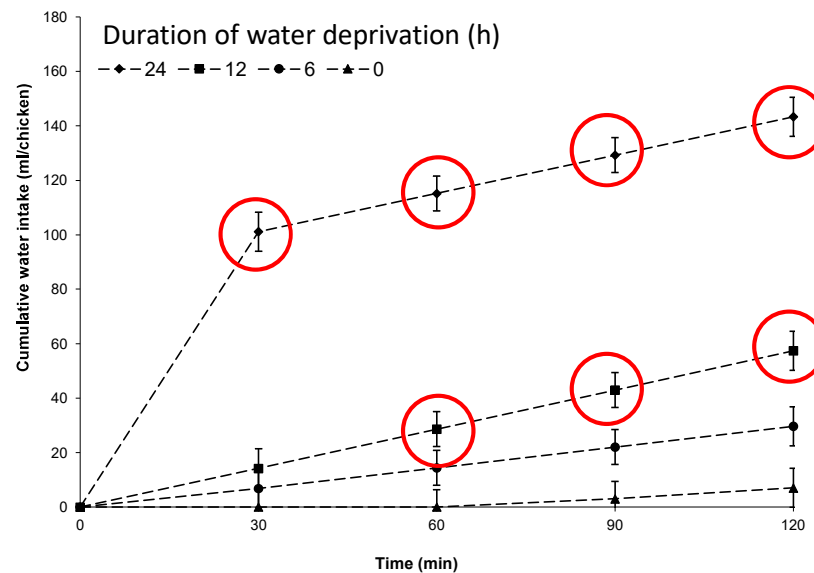


Specific??

## B. ANIMAL WELFARE INDICATORS: THIRST (BROILER)



**Spontaneous water intake from  
additional drinker / time unit / chicken**



## B. ANIMAL WELFARE INDICATORS: THIRST (BROILER)

Expt. OBJECTIVE = Integrate spontaneous water intake test (SWT) into WQ<sup>®</sup> assessment of 10 Belgian + 10 Brazilian broiler farms:

1. Testing **validity and sensitivity** under commercial conditions
2. Identify **confounding factors** (biases)
3. Compare with **WQ<sup>®</sup> resource-based indicator of thirst (drinker space)**



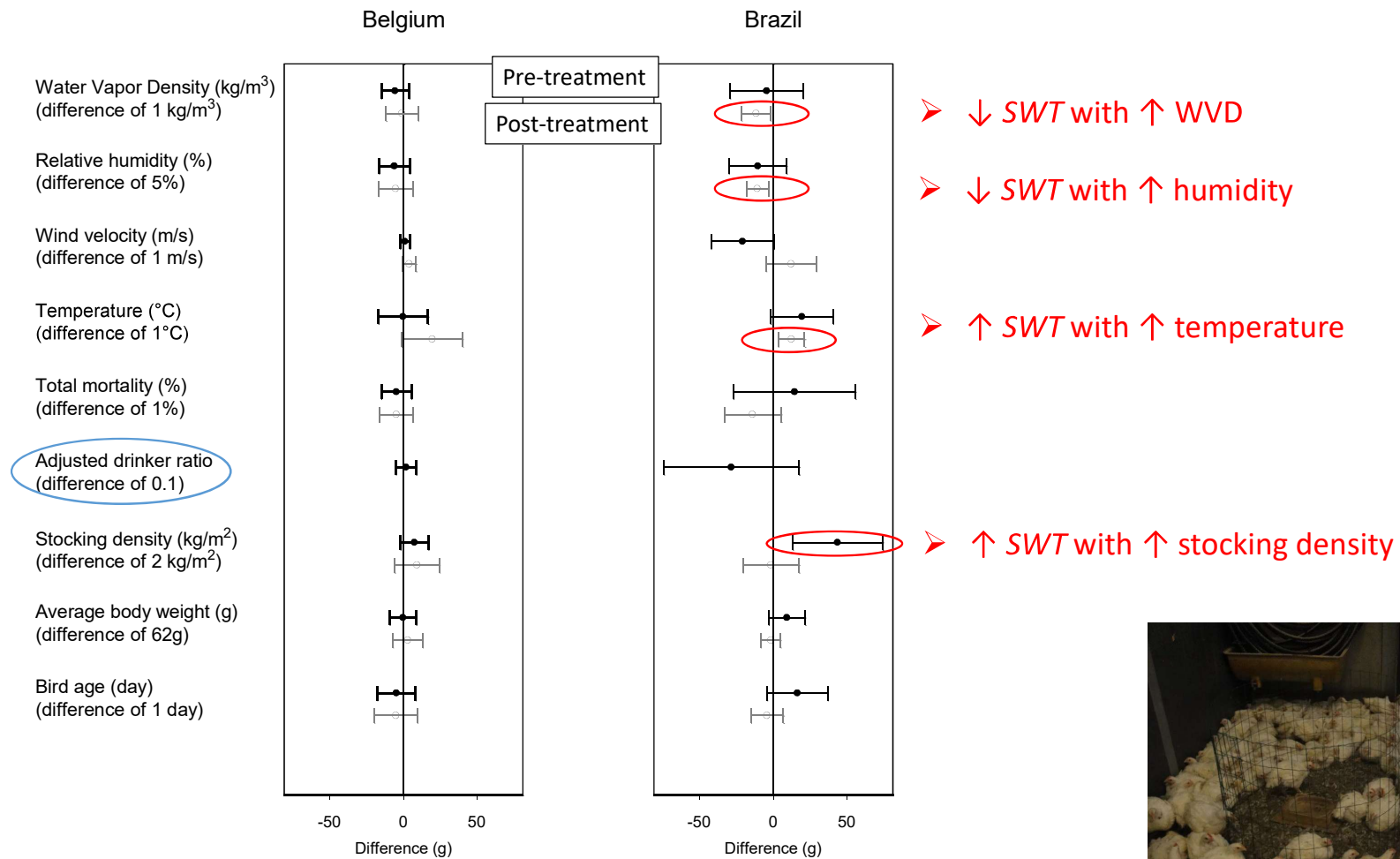
## B. ANIMAL WELFARE INDICATORS: THIRST (BROILER)

| Country | WQ-thirst score<br>(0-100)                        |      | SWC test<br>(g/bird/90min)                       |      |
|---------|---------------------------------------------------|------|--------------------------------------------------|------|
| BE      | $\bar{X} = 48.9$<br><br>$(P < 0.001)$<br>$\wedge$ | 86.8 | $\bar{X} = 7.9$<br><br>$(P < 0.001)$<br>$\wedge$ | 10.7 |
| BE      |                                                   | 80.2 |                                                  | 16.6 |
| BE      |                                                   | 38.6 |                                                  | 0.4  |
| BE      |                                                   | 34.0 |                                                  | 6.3  |
| BE      |                                                   | 46.3 |                                                  | 3.6  |
| BE      |                                                   | 48.2 |                                                  | 11.1 |
| BE      |                                                   | 67.8 |                                                  | 4.3  |
| BE      |                                                   | 40.6 |                                                  | 18.7 |
| BE      |                                                   | 30.5 |                                                  | 0.4  |
| BE      |                                                   | 16.3 |                                                  | 6.6  |
| BR      |                                                   | 97.7 |                                                  | 36.7 |
| BR      | $\bar{X} = 90.6$<br><br>$\wedge$                  | 91.1 | $\bar{X} = 35.8$<br><br>$\wedge$                 | 18.9 |
| BR      |                                                   | 83.9 |                                                  | 46.7 |
| BR      |                                                   | 100  |                                                  | 72.8 |
| BR      |                                                   | 81.7 |                                                  | 55.7 |
| BR      |                                                   | 86.5 |                                                  | 4.3  |
| BR      |                                                   | 100  |                                                  | 29.8 |
| BR      |                                                   | 86.3 |                                                  | 21.8 |
| BR      |                                                   | 91.4 |                                                  | 50.0 |
| BR      |                                                   | 87.3 |                                                  | 21.6 |

"least  
Thirsty"

"least  
Thirsty"

## B. ANIMAL WELFARE INDICATORS: THIRST (BROILER)



## B. ANIMAL WELFARE INDICATORS: THIRST (BROILER)

### CONCLUSIONS SWT

#### 1. Validity & sensitivity:

- SWT detects 6h deprived chickens in BRA, but not in BE (though 12h)

#### 2. Confounding factors:

- NOT: location, drinker type/ratio, age/weight of hens,...
- Country / genotype (BRA=Cobb need to drink more for body fluid homeostasis / more sensitive to dehydration?)
  - ↳ More sensitive to effects of stocking density & barn climate



Interpretation test: consider genetic lineage and barn climate

#### 3. Agreement with WQ® scores of thirst:

- Contrary conclusion on which chickens (BE vs BRA) are most thirsty
- Not correlated: doubts about validity of WQ thirst scores

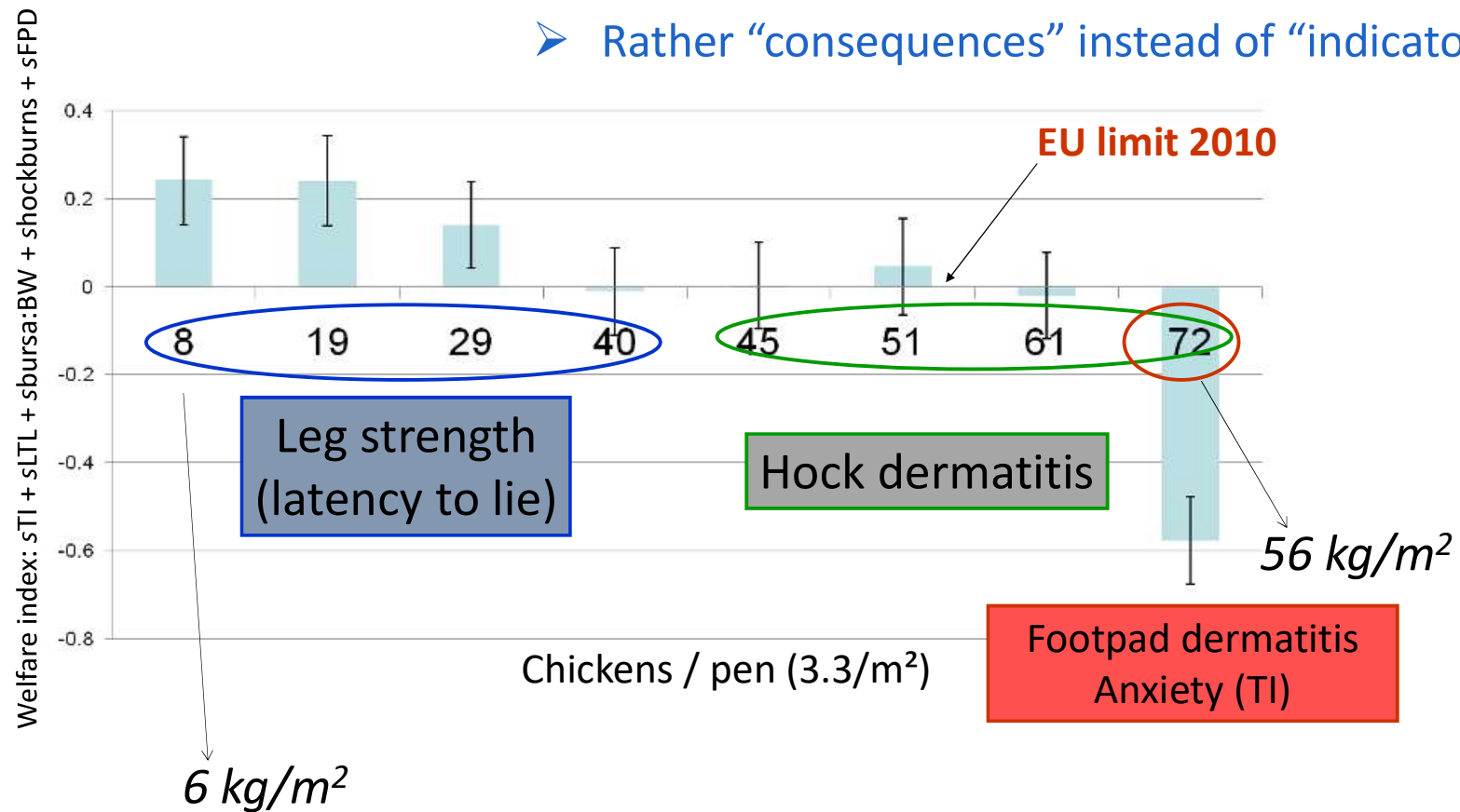
## B. ANIMAL WELFARE INDICATORS: WQ

| Principles       | Criteria                                         | Dairy cattle                                                          | Growing pigs                                                                                                  | Broiler chicken                                    | Laying hen (2.0)                                                                                                        |
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| Good housing     | Comfort around resting                           | Lying down duration; % collisions; on edge of lying area; cleanliness | Bursitis, manure on body                                                                                      | Plumage cleanliness; litter qual., dust sheet test | Perch (L & shape), red mites, dust sheet test                                                                           |
|                  | Thermal comfort                                  | -                                                                     | Shivering, panting, huddling                                                                                  | Panting, huddling                                  | Panting, huddling                                                                                                       |
|                  | Ease of movement                                 | Tethering                                                             | Space allowance                                                                                               | Stocking density                                   | Stocking density; horizontal/vertical movement; perforated floors                                                       |
| Good health      | Absence of injuries                              | Lameness; integument alterations                                      | Lameness; body & tail wounds                                                                                  | Lameness; dermatitis;                              | KBD; skin lesions; FPD; toe/beak damage                                                                                 |
|                  | Absence of disease                               | Respir./reprod./digestive diseases; SCC; dystocia; downer; mortality  | Mort; coughs; sneezes; pumping; twisted snouts; rectal prolapse; scouring; skin condition; ruptures & hernias | On-farm mort. & culls; rejections                  | On-farm mort. & culls; enlarged crops; eye pathol., respir. infections, enteritis, parasites; comb abnorm.              |
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| Appropri. behav. | Expression of social behaviour                   | Incidence agonistic interactions                                      | Social behav.                                                                                                 |                                                    | plum. damage back of head; comb pecking wounds                                                                          |
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|                  | Good human-animal relationship                   | Avoidance distance at feeding place                                   | Panic response to human walking in pen                                                                        | Avoidance distance test                            | Avoidance distance test                                                                                                 |
|                  | Positive emotional state                         | QBA                                                                   | QBA                                                                                                           | QBA                                                | Novel object test; QBA                                                                                                  |

## B. ANIMAL WELFARE INDICATORS: SPATIAL NEEDS (BROILER)

### Conventional animal-based welfare indicators

➤ Rather “consequences” instead of “indicators”

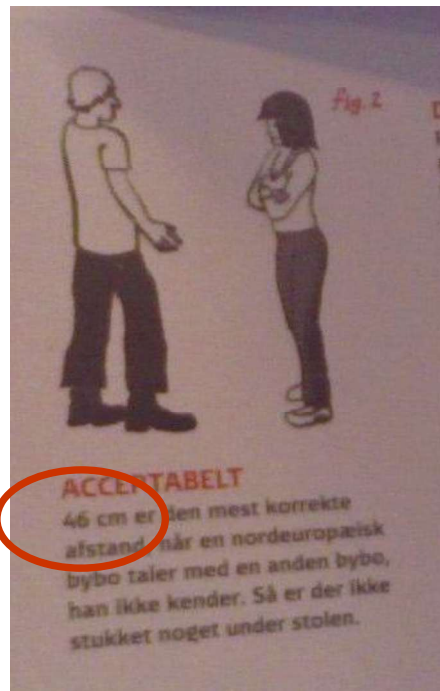


## B. ANIMAL WELFARE INDICATORS: SPATIAL NEEDS (BROILER)

High density perceived as negative

*Because*

Being close to another is perceived as negative



The woman **withdraws** when the man's proximity is perceived as **negative**.

As a result, she is **further away** from the man than she would be **if she did not care** how close she was to him

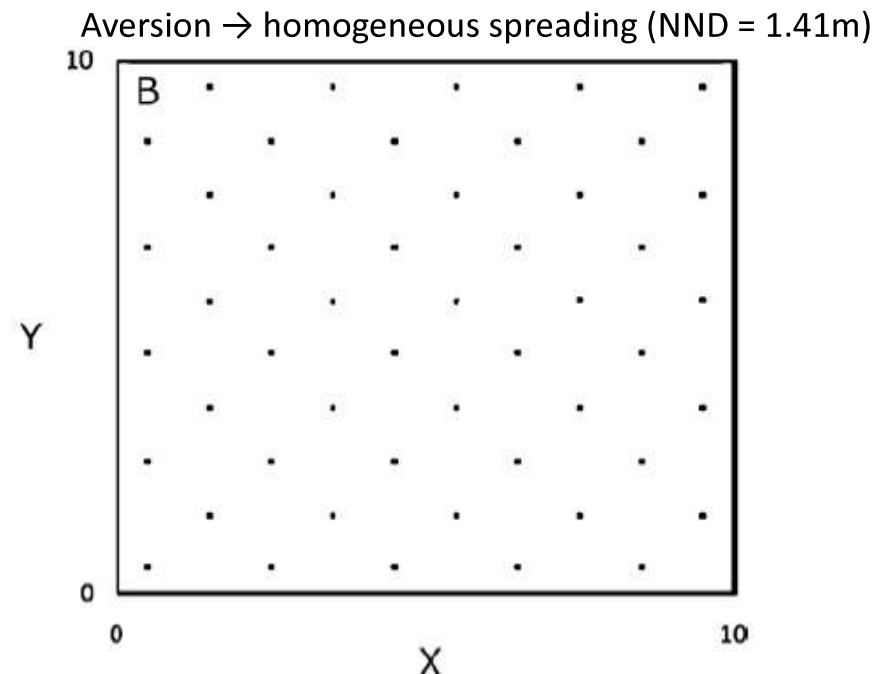
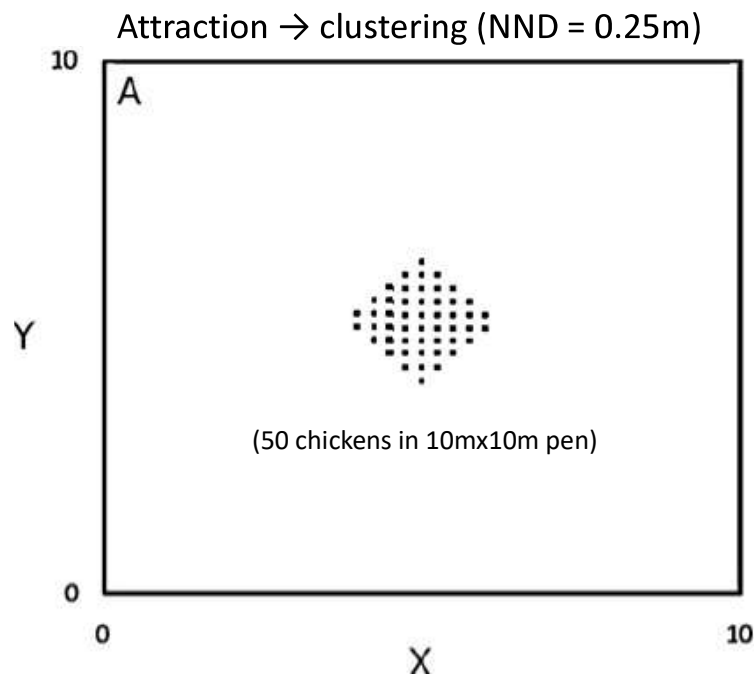
## B. ANIMAL WELFARE INDICATORS: SPATIAL NEEDS (BROILER)

Distribution of animals over the pen

If animals are hindered by **lack of** space

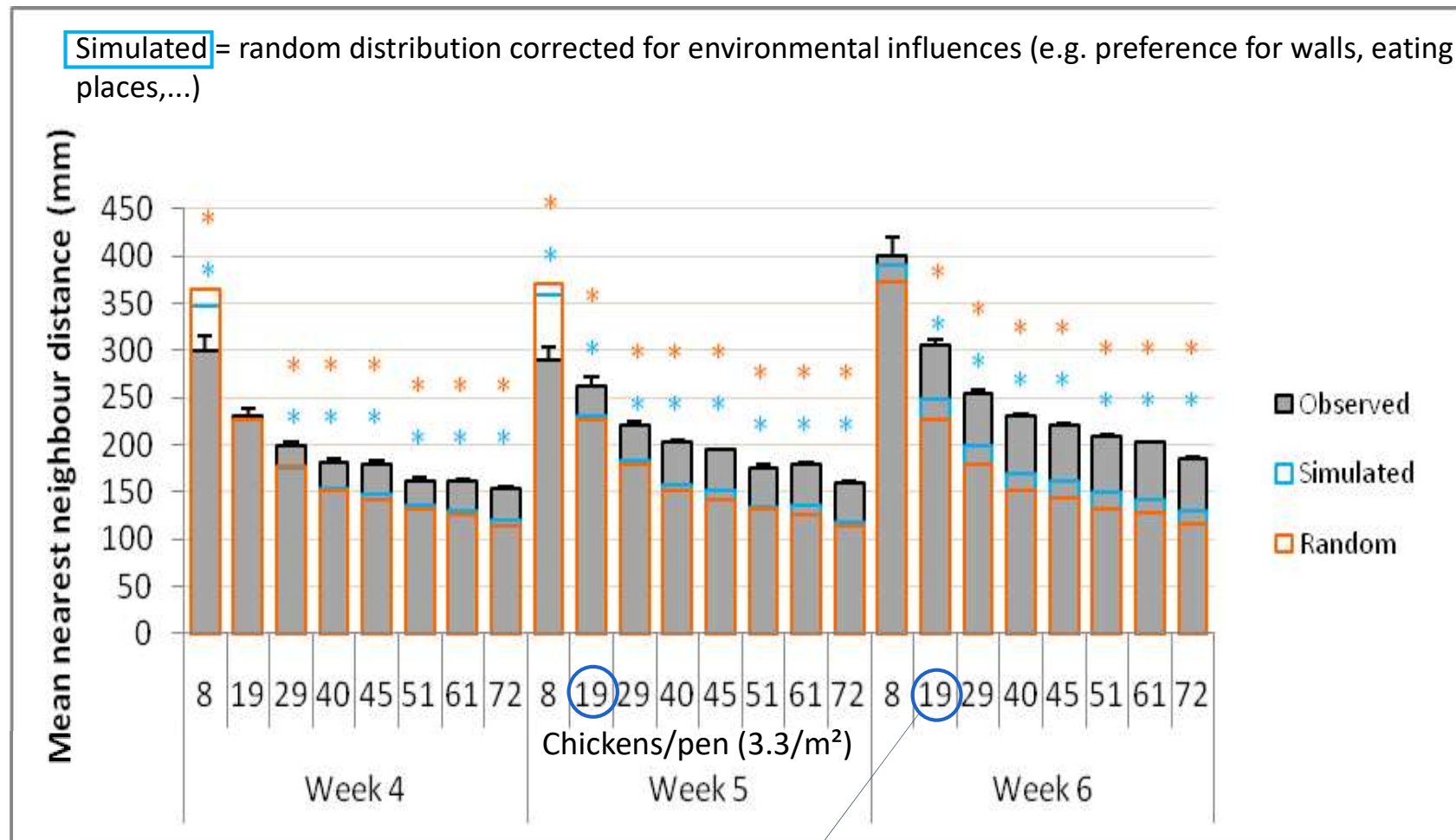
they will move further **apart**

and thus achieve a **more homogeneous distribution**



## B. ANIMAL WELFARE INDICATORS: SPATIAL NEEDS (BROILER)

**Simulated** = random distribution corrected for environmental influences (e.g. preference for walls, eating places,...)



## B. ANIMAL WELFARE INDICATORS: SPATIAL NEEDS (BROILER)



If animals feel **restricted** in their **space**, they will  
**fill** open spaces **more quickly**

## B. ANIMAL WELFARE INDICATORS: SPATIAL NEEDS (BROILER)

How quickly chickens fill an empty space when kept at

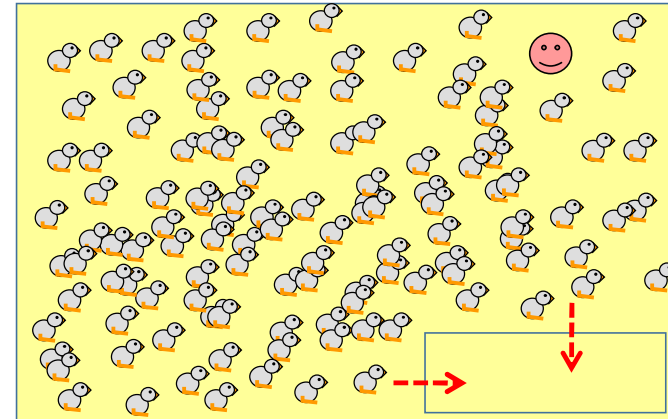
13 vs 20 animals / m<sup>2</sup> ?

- Experimental Poultry Centre (Geel, Belgium)
- Group sizes: 975 vs 1500 animals

## B. ANIMAL WELFARE INDICATORS: SPATIAL NEEDS (BROILER)

### Test

- Frames of 1 m<sup>2</sup>
- Habituation (3 days / 2 hours)
- Count number of animals in frame before start
- Carefully remove animals from frame
- Count number of animals in the frame (every half minute for 10 minutes)



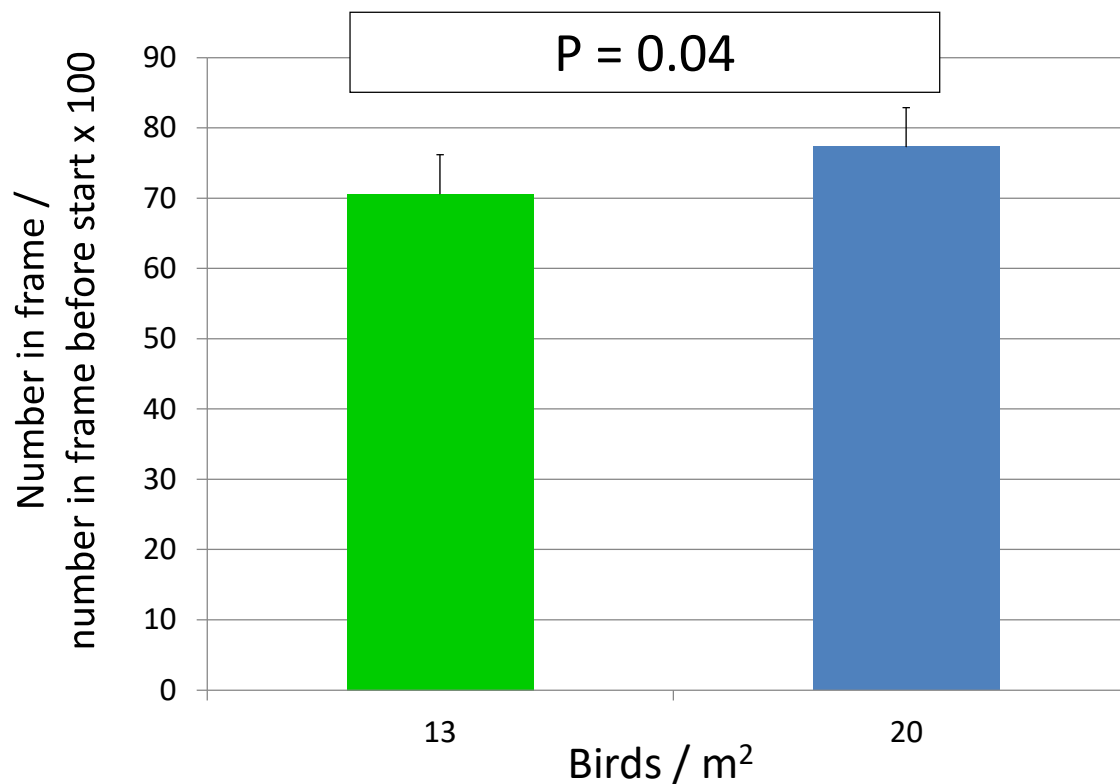
### Data

- 2 rounds
- 8 pens / density / round  
(4 per breed Ross 308 / 708)
- 3 locations: front, centre, rear
- 2 measurements per round / pen / location  
(repeated observation)



## B. ANIMAL WELFARE INDICATORS: SPATIAL NEEDS (BROILER)

$$\text{Filling ratio} = \frac{\text{Number at } t=1 + \text{number at } t=2 + \dots + \text{number at } t=20}{\text{Number in undisturbed state} \times 20}$$



## B. ANIMAL WELFARE INDICATORS: WQ

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|                  | Positive emotional state                         | QBA                                                                   | QBA                                                                                                           | QBA                                                | Novel object test; QBA                                                                                                  |

## B. ANIMAL WELFARE INDICATORS: NOVEL OBJECT TEST (HENS)

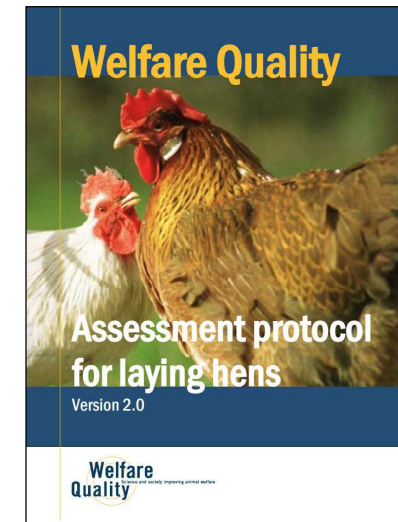
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|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Title</b>              | <b>Novel Object Test (NOT)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Scope</b>              | Animal-based measure: Laying hens                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Sample size</b>        | Sample size according to § 5.1.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Method description</b> | <p>Select 4 locations in the caged henhouse to represent the distribution of the flock. In non-cage houses the locations of the novel object (NO) will be on the litter floor.</p> <p>The NO used in this test is a 50 cm long and 2.5 cm diameter stick with a series of coloured bands (see photographic reference).</p> <p>Choose 4 locations in the litter area in the house. Wait for 5 minutes after entering the house (to let the birds settle) and then place the NO in the litter and step back 1.5 m. Starting immediately, record the number of hens at a distance of less than 1 birds length of the NO (=30 cm). This measure is repeated every 10 seconds for a 2 minute period. Thus, there will be 12 counts per location. If 16 or more birds are within 30 cm of the NO, it would be difficult to count more in the 10 sec period so just note 16 birds.</p> <p>In cage houses the Novel Object (NO) is positioned in/on the feed trough of the cage that is at the same level as that of the assessor's chest (see picture) and the number of hens in the front half of the cage is counted. The maximum number of hens counted depends on cage size and thus the number of hens in the cage. Differences in positioning of the NO and the maximum number of recordable hens make it difficult to compare results from non-cage and cage systems. This is a known problem for which no solution is (yet) available.</p> |
| <b>Classification</b>     | <p><b>Flock level:</b></p> <p>Average number of hens within 30 cm (=hen length) of the stick</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |



Novel Object in litter



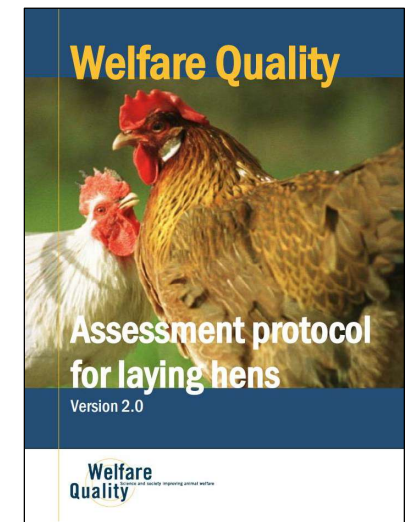
Novel Object position for cages



## B. ANIMAL WELFARE INDICATORS: QBA (HENS)

| Title                                                    | Qualitative Behaviour Assessment (QBA)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                              |     |   |   |     |   |     |   |   |                                                          |    |    |     |   |   |     |   |     |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----|---|---|-----|---|-----|---|---|----------------------------------------------------------|----|----|-----|---|---|-----|---|-----|
| Scope                                                    | Animal-based measure: Laying hens                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                              |     |   |   |     |   |     |   |   |                                                          |    |    |     |   |   |     |   |     |
| Sample size                                              | Animal unit (depending on number of observation points, see method description)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                              |     |   |   |     |   |     |   |   |                                                          |    |    |     |   |   |     |   |     |
| Method description                                       | <p>Qualitative Behaviour Assessment (QBA) considers the expressive quality of how animals behave and interact with each other and the environment i.e. their 'body language'.</p> <p>Select between one and eight observation points (depending on the size and structure of the henhouse) that together represent the different areas of the poultry house. Decide the order in which to visit these observation points, wait a few minutes to allow the animals to return to undisturbed behaviour. Watch the animals that can be seen well from that point and observe the expressive quality of their activity at group level. It is likely that the animals will initially be disturbed, but their response to this can be included in the assessment. Total observation time should not exceed 20 minutes, and so the time taken at each observation point depends on the number of points selected for a farm:</p> <table><tr><th>Number of observation points</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr><tr><th>Duration of observation per observation point in minutes</th><td>20</td><td>10</td><td>6.5</td><td>5</td><td>4</td><td>3.5</td><td>3</td><td>2.5</td></tr></table> <p>When observation at all selected points has been completed, find a quiet spot and score the 20 descriptors using the visual analogue scale (VAS). Please note that scoring is not carried out during observation, and that only one integrative assessment is made per farm.</p> <p>Each VAS is defined by its left 'minimum' and right 'maximum' point. 'Minimum' means that at this point, the expressive quality indicated by the term is entirely absent in any of the animals you have seen. 'Maximum' means that at this point this expressive quality is dominant across all observed animals. Note that it is possible to give more than one term a maximum score; animals could for example be both entirely calm and content.</p> <p>To score each term, draw a line across the 125 mm scale at the appropriate point. The measure for that term is the distance in millimetres from the minimum point to the point where the line crosses the scale. Do not skip any term.</p> <p>Please be aware that are 10 positive and 10 negative terms. When scoring the negative terms (marked below in <i>italics</i>) there is an inverse relationship between score and so-called positive states, i.e. higher scores mean more negative states.</p> | Number of observation points | 1   | 2 | 3 | 4   | 5 | 6   | 7 | 8 | Duration of observation per observation point in minutes | 20 | 10 | 6.5 | 5 | 4 | 3.5 | 3 | 2.5 |
| Number of observation points                             | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2                            | 3   | 4 | 5 | 6   | 7 | 8   |   |   |                                                          |    |    |     |   |   |     |   |     |
| Duration of observation per observation point in minutes | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 10                           | 6.5 | 5 | 4 | 3.5 | 3 | 2.5 |   |   |                                                          |    |    |     |   |   |     |   |     |

|                     |      |  |      |
|---------------------|------|--|------|
| Active              | Min. |  | Max. |
| Relaxed             | Min. |  | Max. |
| Comfortable         | Min. |  | Max. |
| Fearful             | Min. |  | Max. |
| Agitated            | Min. |  | Max. |
| Confident           | Min. |  | Max. |
| Depressed           | Min. |  | Max. |
| Calm                | Min. |  | Max. |
| Content             | Min. |  | Max. |
| Tense               | Min. |  | Max. |
| Unsure              | Min. |  | Max. |
| Energetic           | Min. |  | Max. |
| Frustrated          | Min. |  | Max. |
| Bored               | Min. |  | Max. |
| Friendly            | Min. |  | Max. |
| Positively Occupied | Min. |  | Max. |
| Scared              | Min. |  | Max. |
| Nervous             | Min. |  | Max. |
| Happy               | Min. |  | Max. |
| Distressed          | Min. |  | Max. |



## B. ANIMAL WELFARE INDICATORS: WQ

| Principles       | Criteria                                         | Dairy cattle                                                          | Growing pigs                                                                               | Broiler chicken                                    | Laying hen (2.0)                                                                                           |
|------------------|--------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Good feeding     | Absence of prolonged hunger                      | BCS (% very lean animals)                                             | BCS (% lean animals)                                                                       | Emaciation                                         | Keel bone prominence                                                                                       |
|                  | Absence of prolonged thirst                      | Availability & cleanliness water                                      | Availability & cleanliness water                                                           | Drinker space                                      | Availability of water                                                                                      |
| Good housing     | Comfort around resting                           | Lying down duration; % collisions; on edge of lying area; cleanliness | Bursitis, manure on body                                                                   | Plumage cleanliness; litter qual., dust sheet test | Perch (L & shape), red mites, dust sheet test                                                              |
|                  | Thermal comfort                                  | -                                                                     | Shivering, panting, huddling                                                               | Panting, huddling                                  | Panting, huddling                                                                                          |
|                  | Ease of movement                                 | Tethering                                                             | Space allowance                                                                            | Stocking density                                   | Stocking density; horizontal/vertical movement; perforated floors                                          |
| Good health      | Absence of injuries                              | Lameness; integument alterations                                      | Lameness; body & tail                                                                      | <div>Snapshot<br/>(↔robust)</div>                  | BD; skin lesions; FPD; toe/beak amage                                                                      |
|                  | Absence of disease                               | Respir./reprod./digestive diseases; SCC; dystocia; downer; mortality  | Mort; coughs; sneezes; twisted snouts; rectal scouring; skin condition; ruptures & hernias |                                                    | On-farm mort. & culls; enlarged crops; eye pathol., respir. infections, enteritis, parasites; comb abnorm. |
|                  | Absence of pain induced by management procedures | Mutilations (dehorning; tail docking; use of anaesthesia/analgesia)   | Castration; tail docking; use of anaesth./analg.)                                          |                                                    | Beak treatment                                                                                             |
| Appropri. behav. | Expression of social behaviour                   | Incidence agonistic interactions                                      | Social behav.                                                                              | <div>Subjective<br/>(judgement bias)</div>         | plum. damage back of head; comb pecking wounds                                                             |
|                  | Expression of other behaviours                   | Access to pasture                                                     | Exploratory behav.                                                                         |                                                    | dam. (back, tail, vent); nest litter; enrichment (use), FR, covered veranda; comf. & behav.                |
|                  | Good human-animal relationship                   | Avoidance distance at feeding place                                   | Panic response to human walking in pen                                                     |                                                    | Avoidance distance test                                                                                    |
|                  | Positive emotional state                         | QBA                                                                   | QBA                                                                                        |                                                    | Novel object test; QBA                                                                                     |

## B. ANIMAL WELFARE INDICATORS: QBA (HENS)

Trial



|                                     | Group A      | Group B      |
|-------------------------------------|--------------|--------------|
| Video 1                             | Conventional | Organic      |
| Video 2<br>(mirrored<br>& brighter) | Organic      | Conventional |

### Mixed regression model:

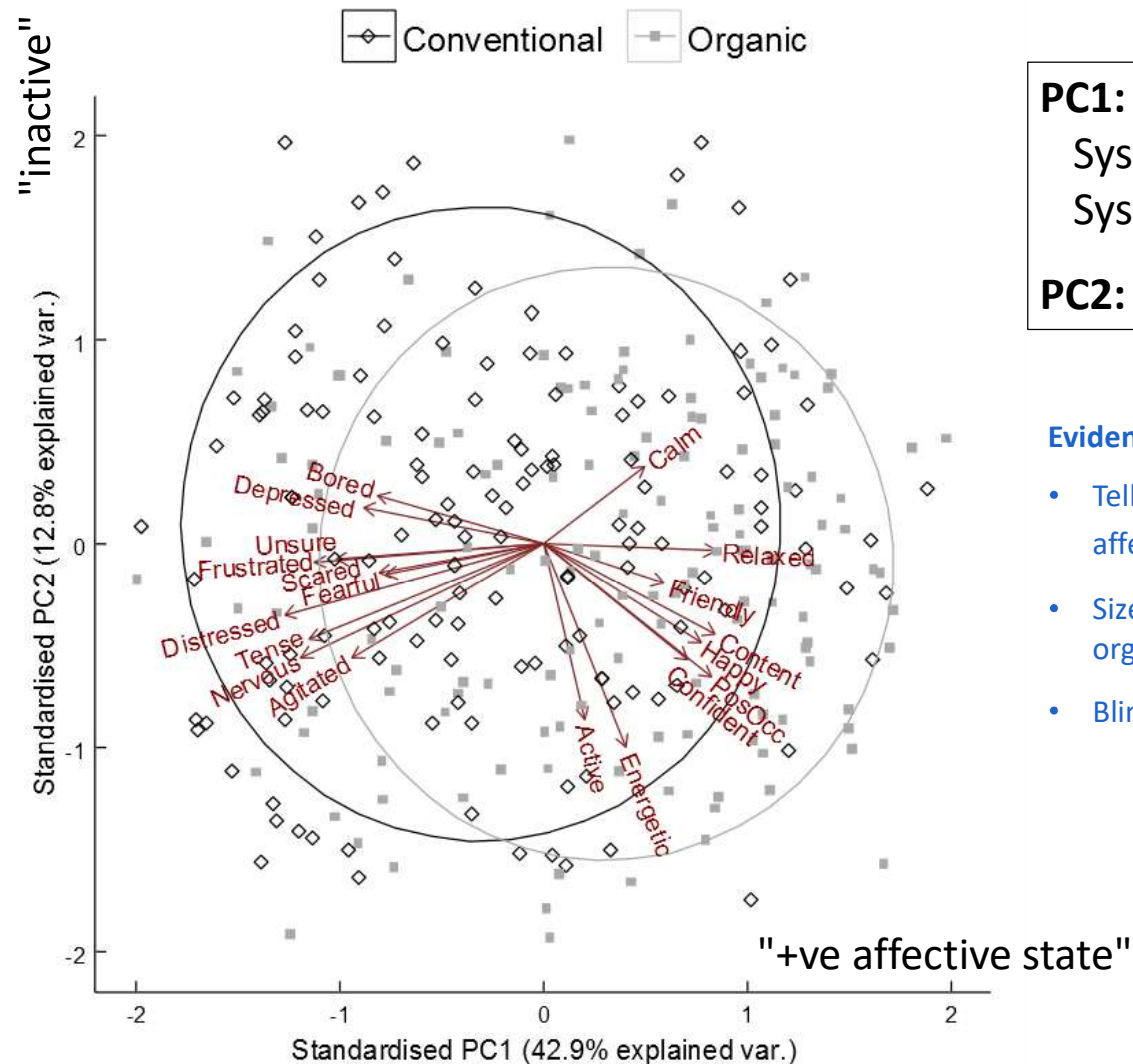
Random effect: student

Fixed effects:

- system (conventional vs organic)
- video (original vs modified)
- opinion (about organic hen welfare)
- group (A vs B)
- interactions

} if  $P < 0.05$

## B. ANIMAL WELFARE INDICATORS: QBA (HENS)



### PC1:

System:  $P < 0.001$

System x opinion:  $P < 0.001$

### PC2: NS

#### Evidence of expectation bias:

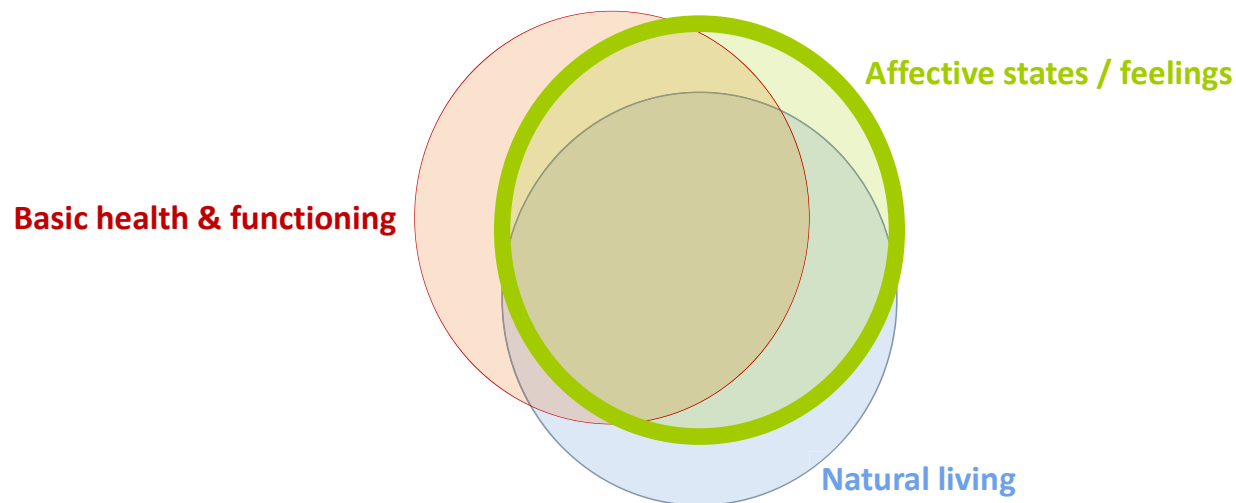
- Telling students that hens were from an organic system affected their QBA scores (more positive)
- Size of this effect ~ their opinion about hen welfare in organic vs conventional systems
- Blinded ("masked") researchers !?

## B. ANIMAL WELFARE INDICATORS: COMBINATION

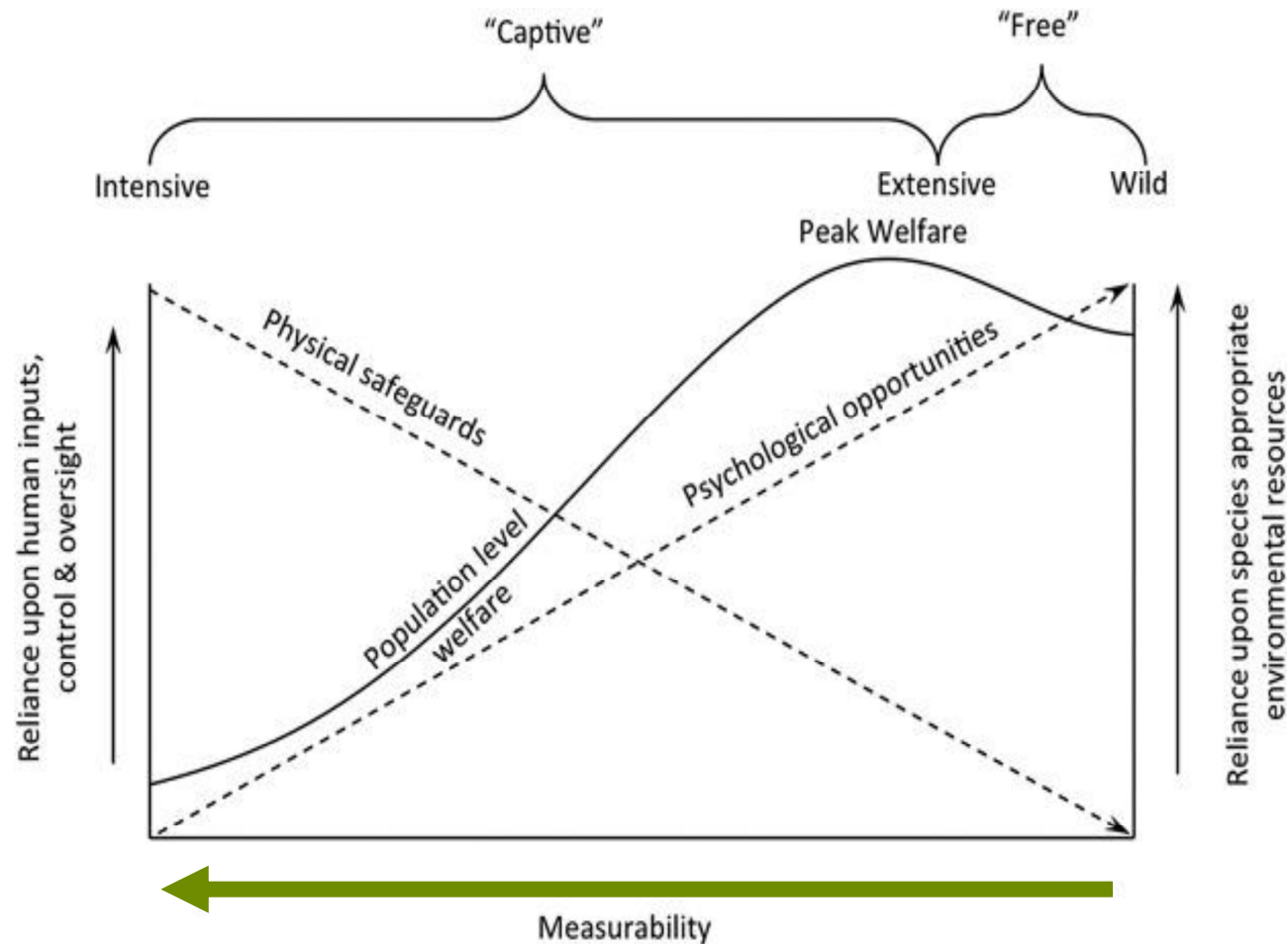
### Features good combination indicators:

- (mutually exclusive)
- exhaustive (holistic) / main welfare aspects
- balanced (~ cf. definition)

} Shortage of good animal-based indicators  
(+ve affective state)  
- limited/one-sided sensitivity  
- not all dimensions



## IF INDICATORS DON'T MATCH WITH THE DEFINITION OF AW...



Veasy 2017: Although AW is predominantly about affective state, assessments of AW often prioritise physical (health) problems (+ve and emotional underexposed)

→ **bias** intensive > extensive systems

## B. ANIMAL WELFARE INDICATORS: ICEBERG INDICATORS

- Mortality ?
- Corticosterone (built into hair/feathers/scales/...) ?
- QBA (Qualitative Behaviour Assessment) ?
- Fluctuating asymmetry ?

## B. ANIMAL WELFARE INDICATORS: FLUCTUATING ASYMMETRY

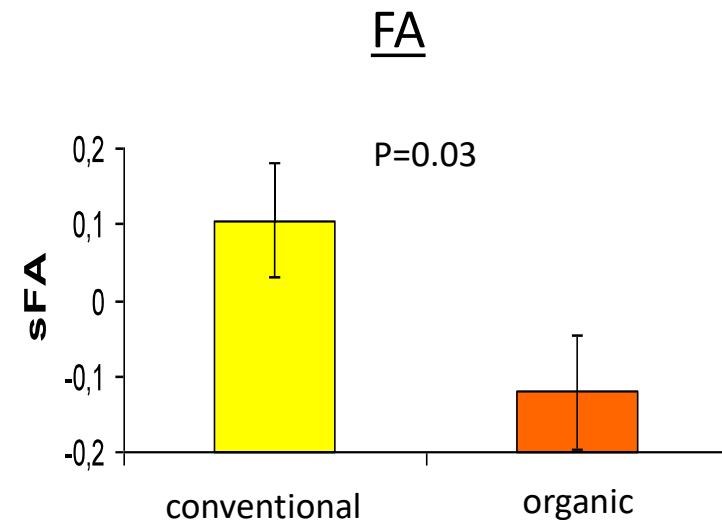
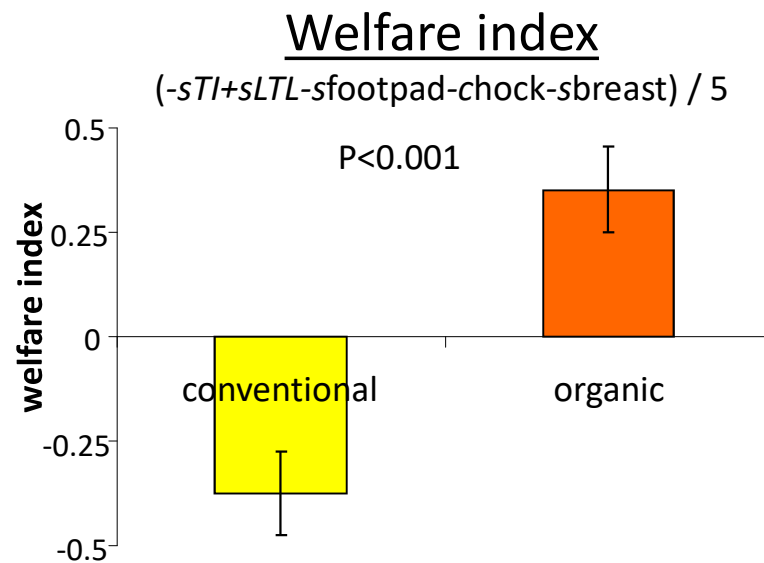
**FA** = small random deviations from a perfect symmetrical development in morphological features that are genetically encoded to be bilaterally symmetrical.

### 2 Hypotheses:

- $|L-R|$  indicates the degree to which organisms were able to cope with environmental stress during their development
- FA is an indication of an animal's welfare during its development

## B. ANIMAL WELFARE INDICATORS: FLUCTUATING ASYMMETRY

**Expt.1:** 140 broiler chickens (slaughter age)  $\begin{cases} 7 \text{ conventional farms} \\ 7 \text{ organic farms} \end{cases}$



## 2.1 INDICATORS: FLUCTUATING ASYMMETRY

### Expt.2 Influence of housing (meat rabbits)



#### 6 welfare-friendly parks

Platform

Shelter

Chew stick

Low stocking density (17/pen)

FA



#### 6 barren parks

No enrichment

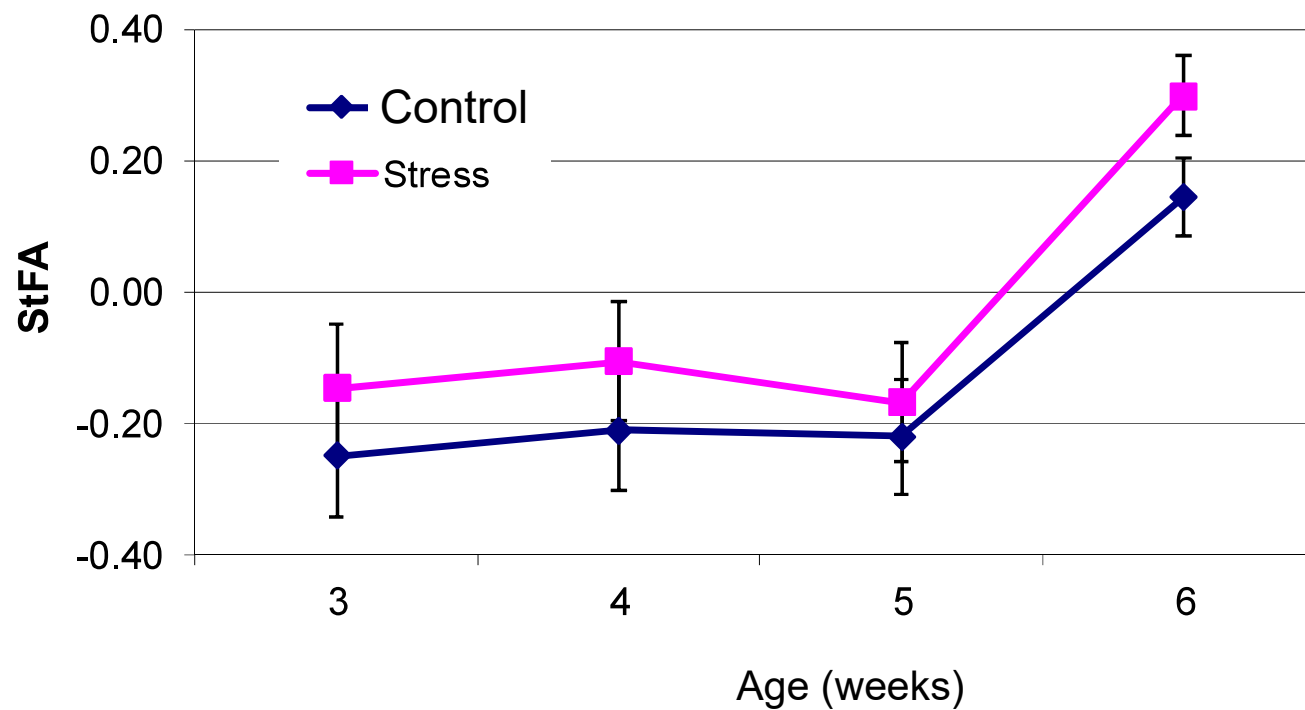
High stocking density (34/pen)

FA (P=0.03)

<

## B. ANIMAL WELFARE INDICATORS: FLUCTUATING ASYMMETRY

**Expt.3:** Effect cold stress broiler chickens → short stressor: 2<sup>e</sup> week of life



## B. ANIMAL WELFARE INDICATORS: FLUCTUATING ASYMMETRY

### Traditional features

*Linear measurements*  
*carcass or bones*  
*using digital calipers*



*Weight TMT*



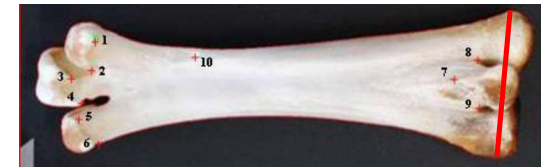
## B. ANIMAL WELFARE INDICATORS: FLUCTUATING ASYMMETRY

### *2D measurements (digital photos)*

Carcass - head (8 landmarks)



Bones - TMT (10 landmarks)  
- width joint TMT



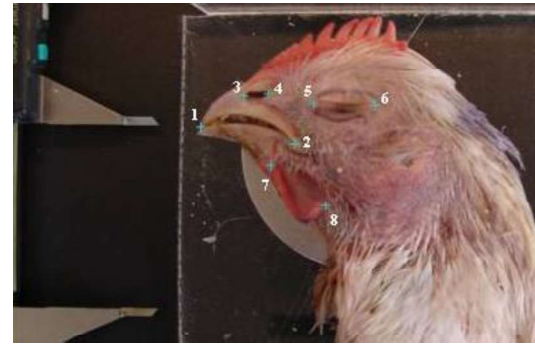
Surface femur



## B. ANIMAL WELFARE INDICATORS: FLUCTUATING ASYMMETRY

### *3D measurements (Microscribe)*

Carcass - head (8 landmarks)



Bones - TMT (11 landmarks)

