Update on the authorization of SG meat-type genotypes for conventional and alternative farming systems in the EU

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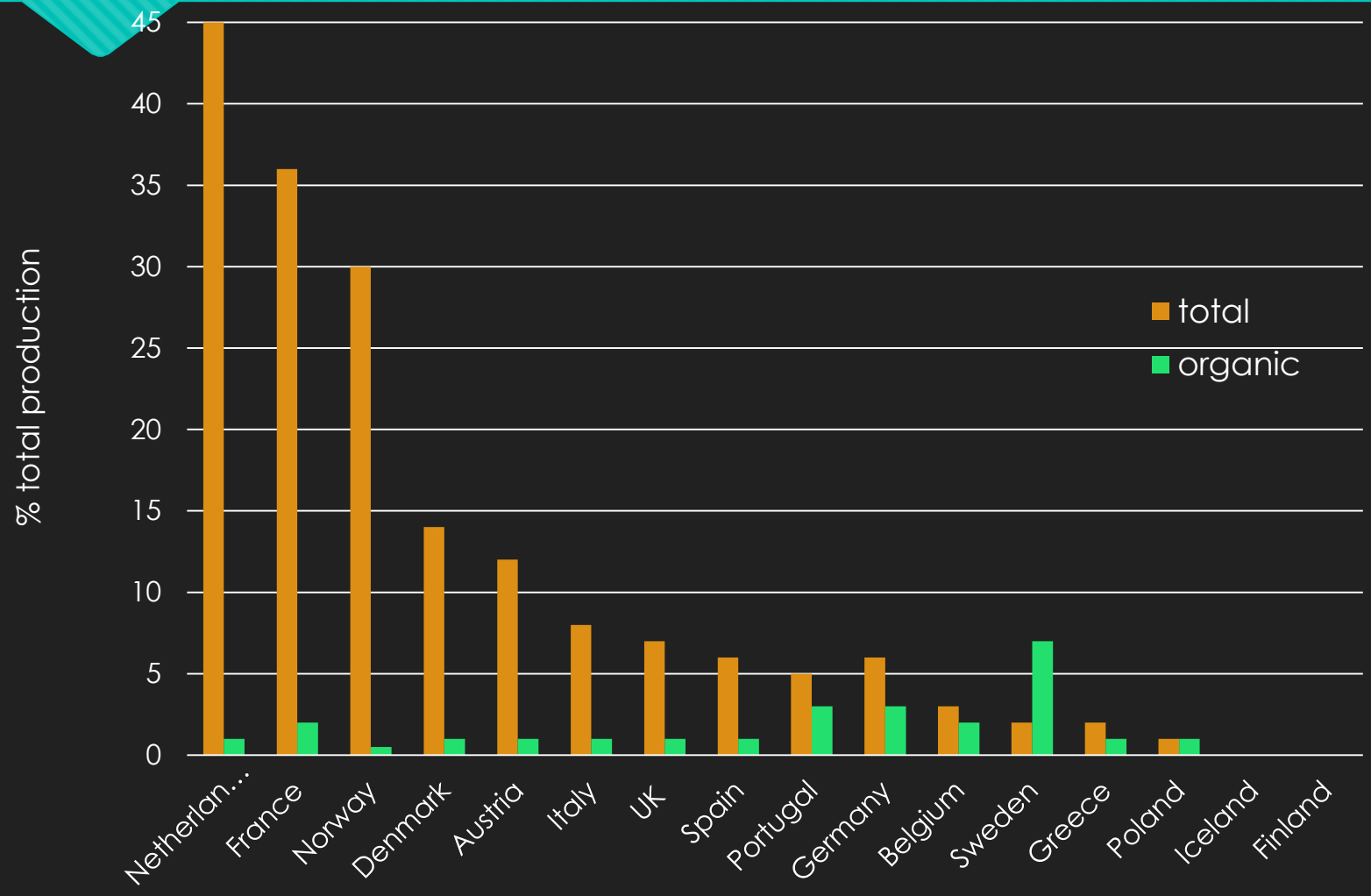
SG (%) diffusion in some EU countries

(data from different sources)



Consumers and ideal chicken farm

Escobedo del Bosque et al. (2021) & other surveys

- husbandry system with space for the animals including free-ranging
- circular farming (from fodder production to slaughtering) with remuneration of farmers for their efforts
- transparency about good animal conditions
- geographical proximity between place of production and consumption

Slow Growing (SG) poultry strains in EU

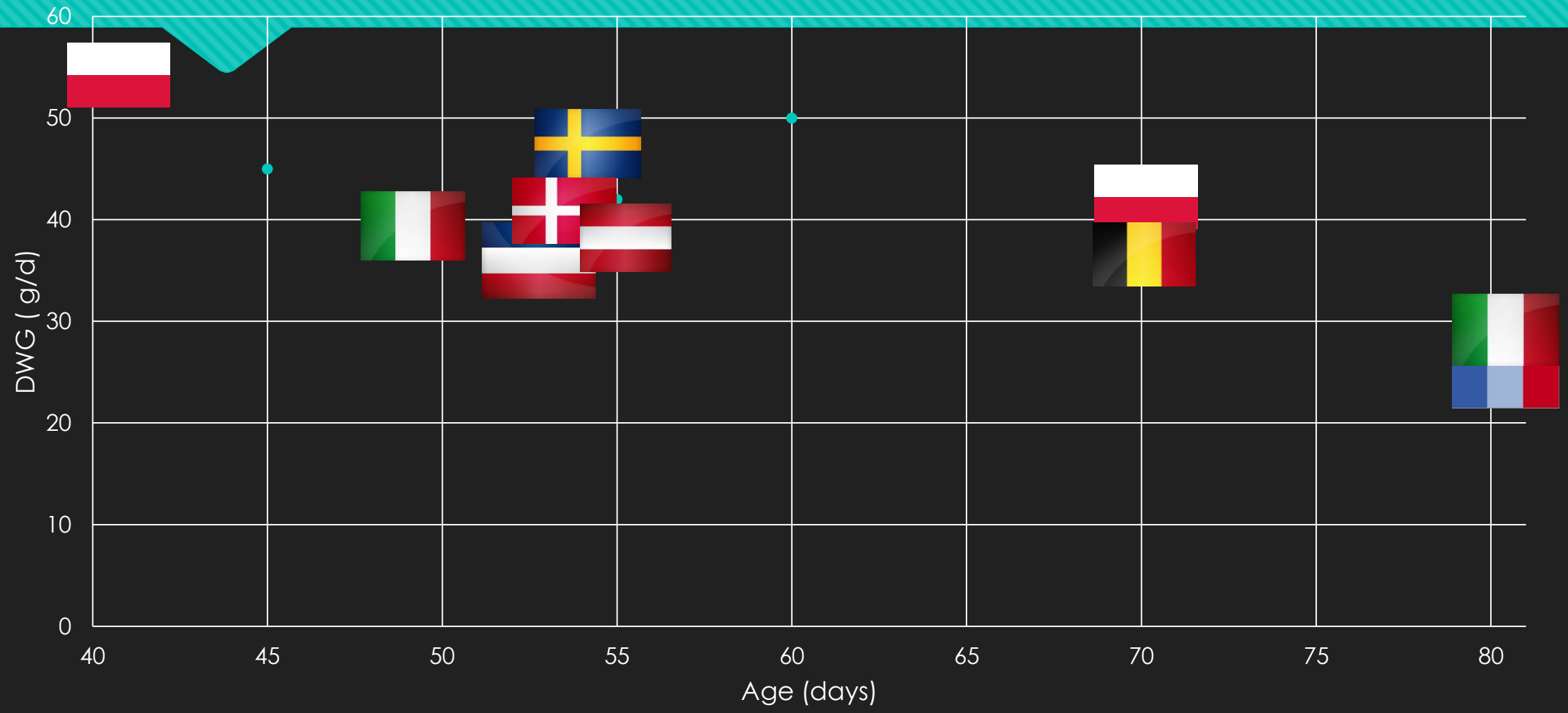
- Increasing attention of public opinion and regulatory agencies toward ethical issue (welfare) and qualitative traits of meat

- It is expected > use of SG and dual-purpose genotypes in both conventional & alternative systems

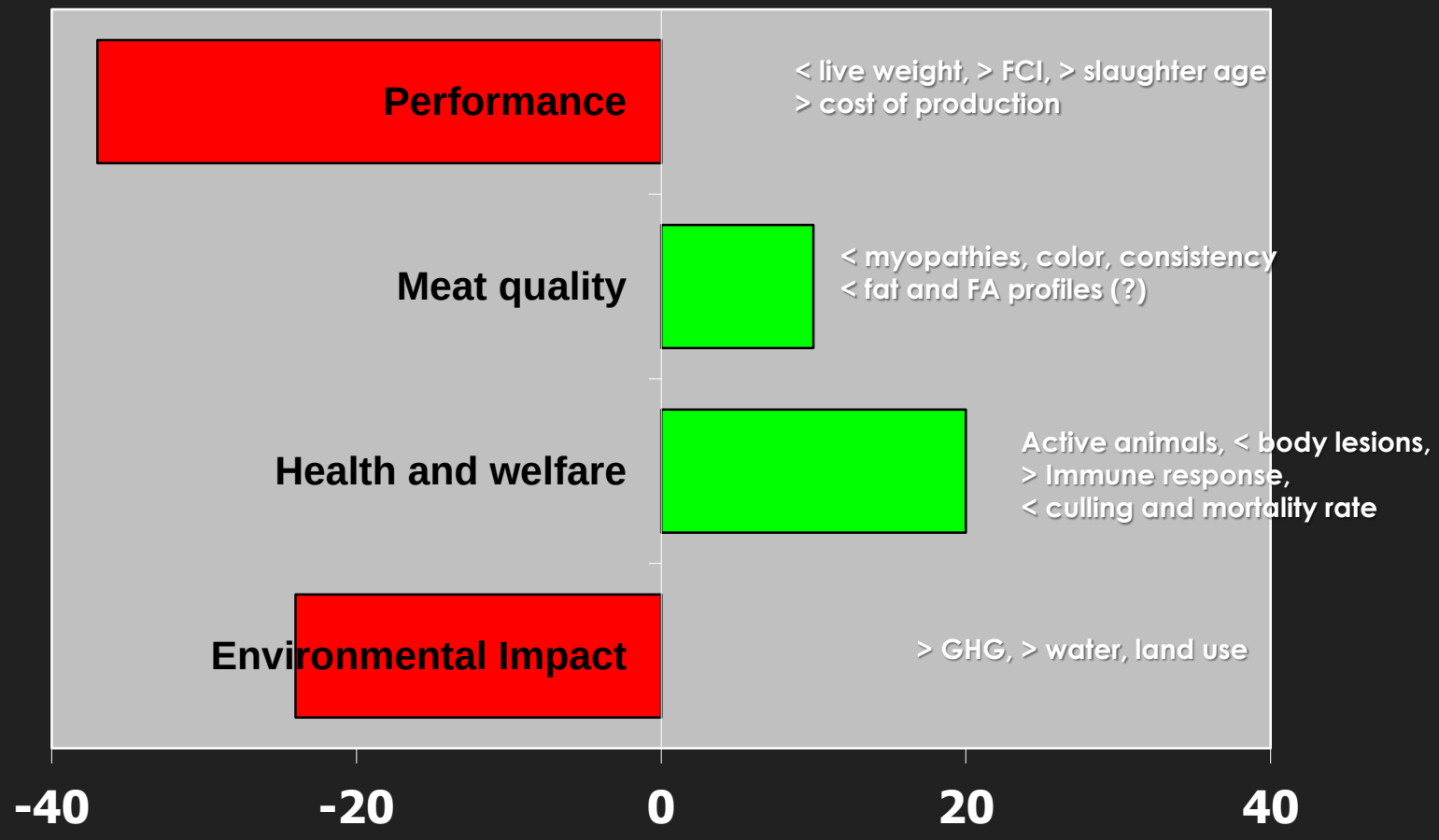
Assessment of SG use in EU

- Many of these National assessments consider only DWG (in g or in %) with no harmonization or rules (density), DWG thresholds (from 27 to 55 g/day) and minimal age (from 40 to 81d)
- **Generally, SG definition is the same for conventional and organic production**
- This render the EU market distorted

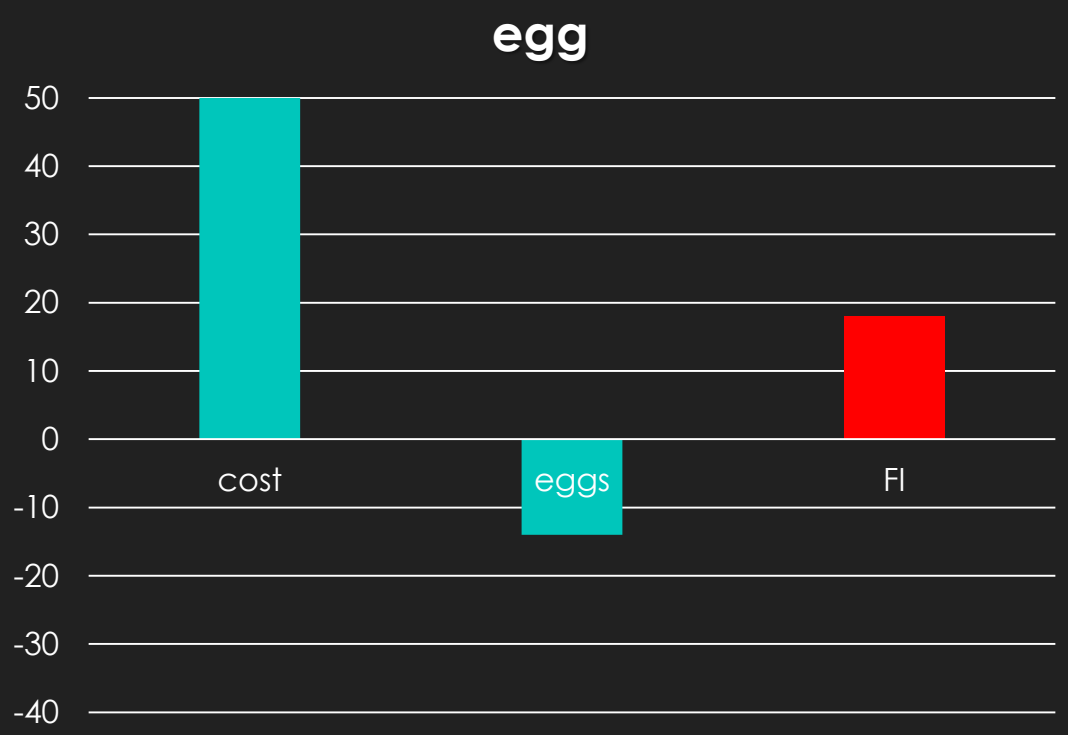
DWG required in organic production
(source ERPA, 2024)

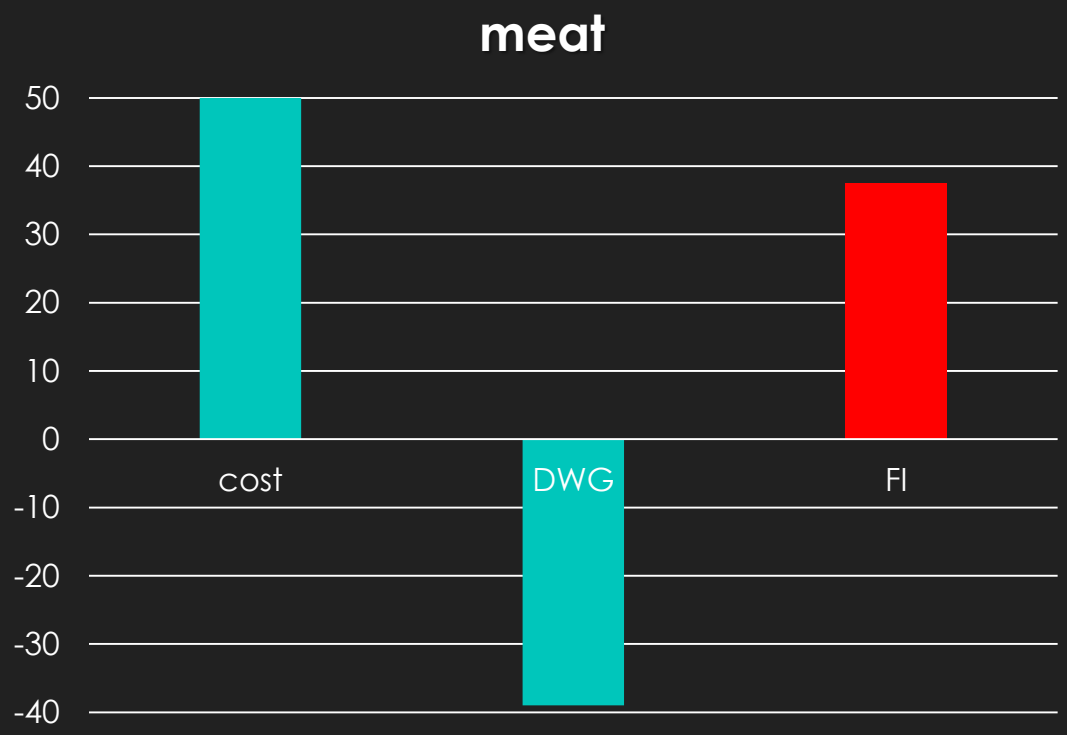


Reported effects of SG on the main endpoints (AVEC and other sources)



Reported effect of Dual pourpose chicken on the main endpoints (lohmann data)





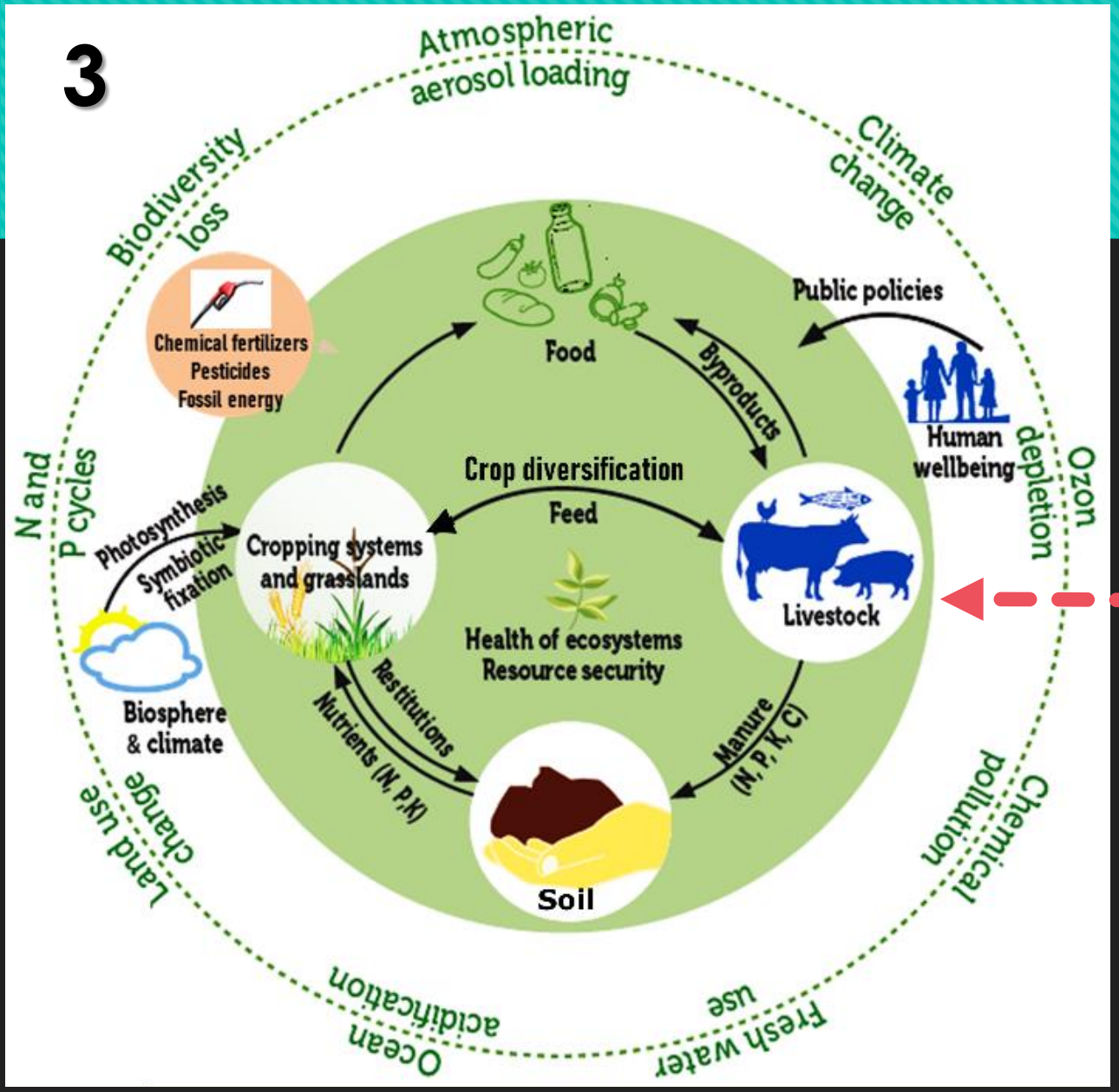
Main criticism of SG assessment

- The use of SG implies changes in the whole system.
- A multidimensional approach would be needed
- Lack or common RULES and **TOOLS**

Promising approach

1. **Animal based assessment** – adaptability (behaviour, welfare, performance, quality)
2. **Complete assessment** (environmental and social impacts) "ONE WELFARE"

Multidimensional vs reductionist approach



1. ADG

2. adaptability

1. BEHAVIOUR

2 PHYSIOLOGY
2a. Immunity
2b. Thermoreg.

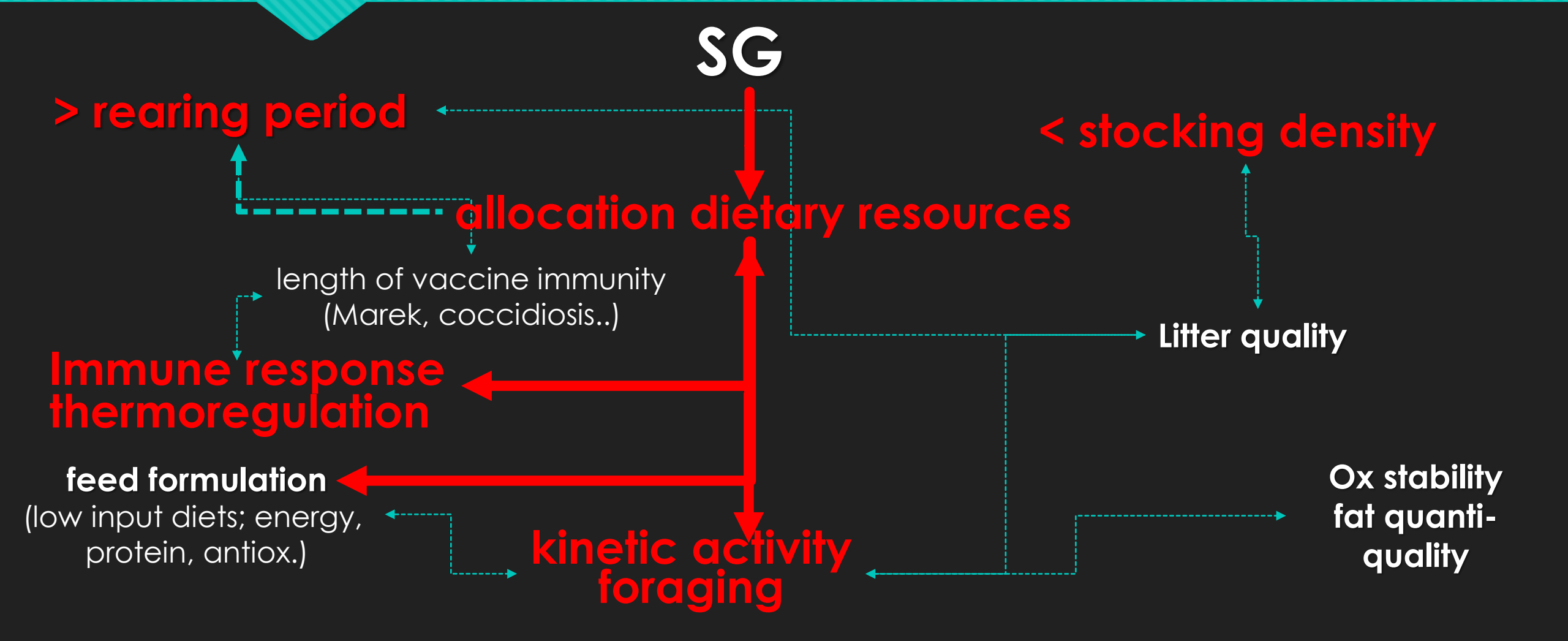
3. PRODUCTIVITY

Kinetic and foraging

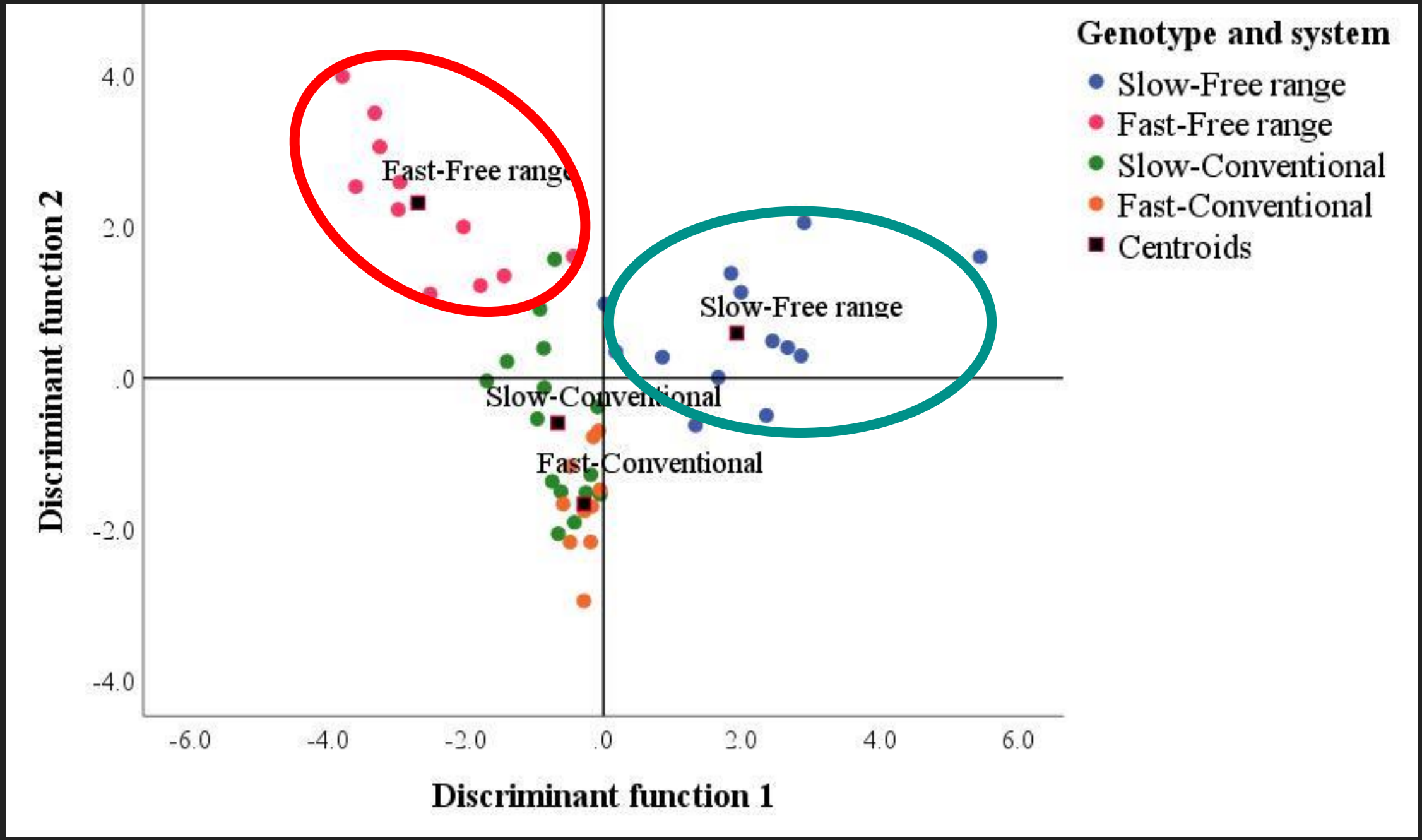
Storage efficiency of body

4. Quality

2. Genotype x environment interaction (adaptability)

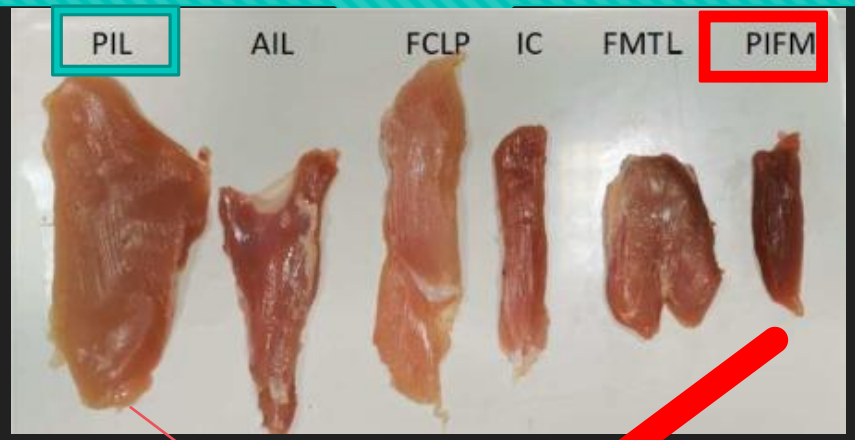


Immunity



STEFANETTI et al. 2023 Poultry Science, https://doi.org/10.1016/j.psj.2023.103110.

Muscle functions
(activity, lipid metabolism & oxidative status)



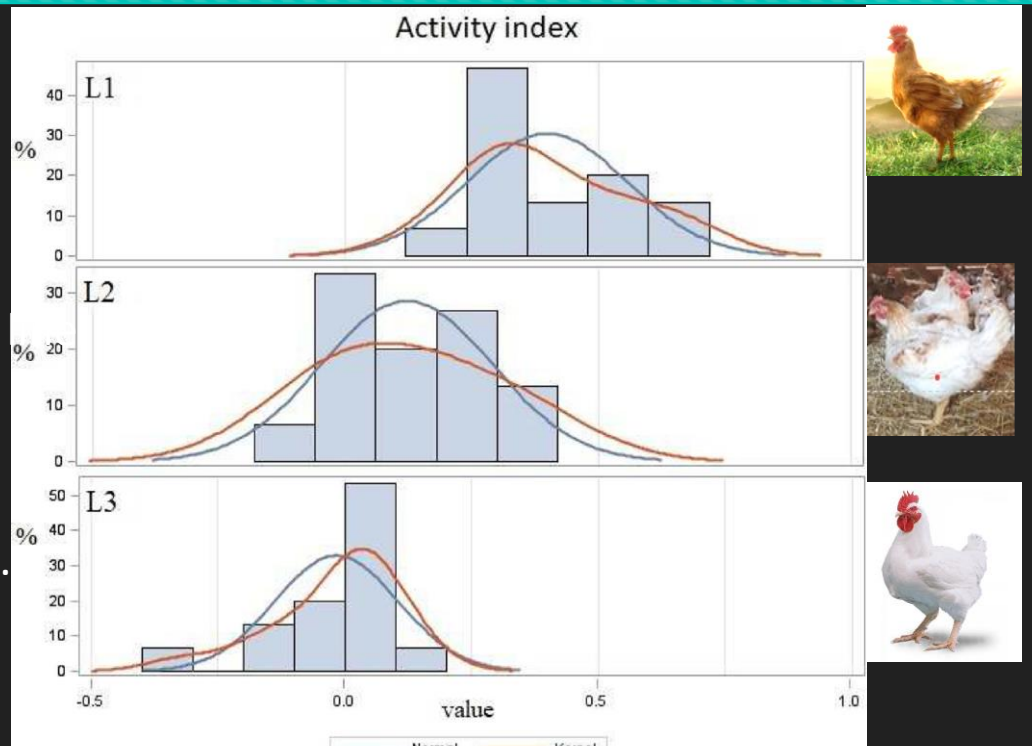
HUFA
as energy source

β-oxidation **fatty acids**

L1 = active commercial line

L2 = sedentary commercial

L3 = Fast Growing Ross 308.



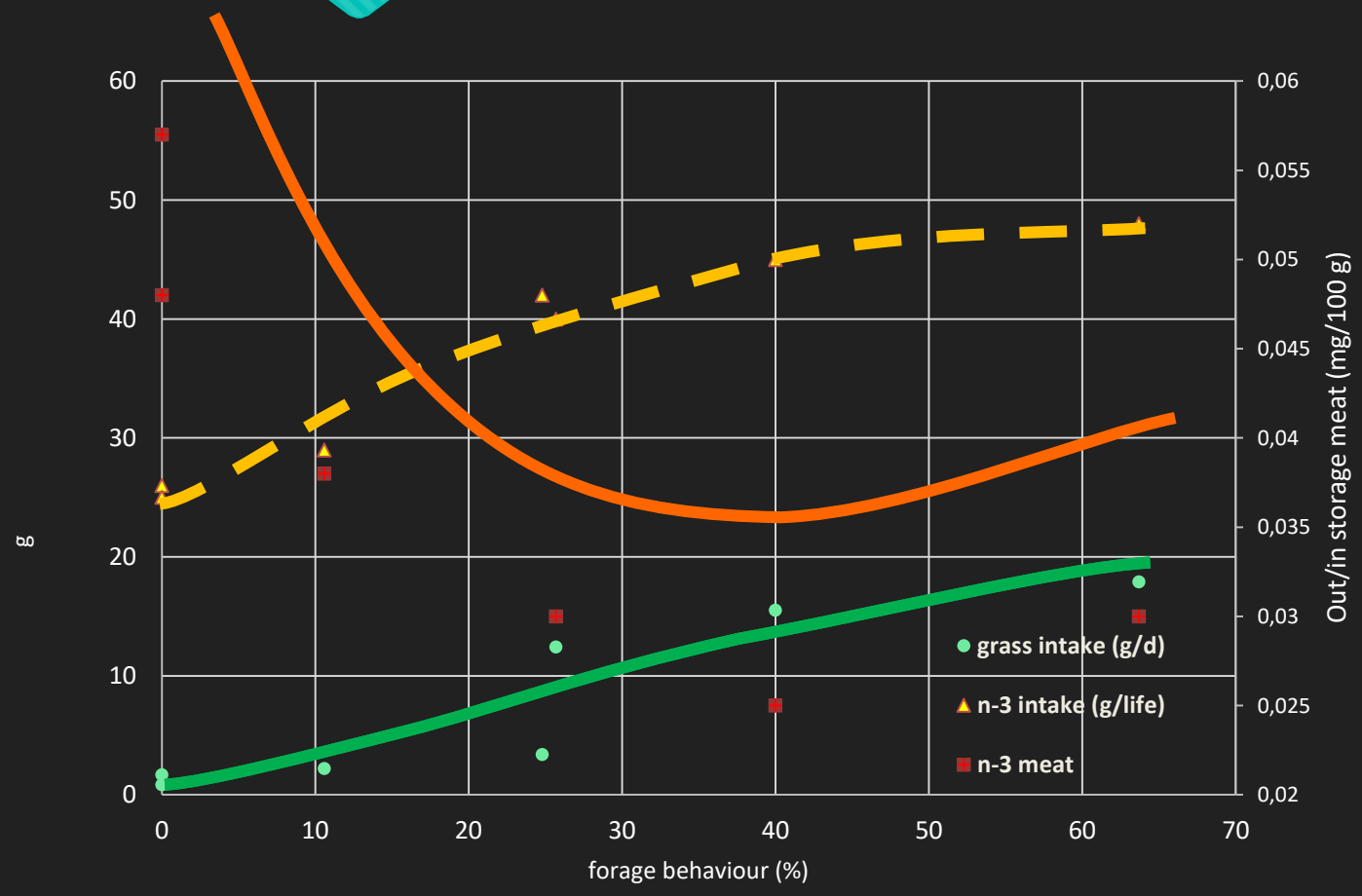
$$\text{Activity index} = \text{White m (n-3 HUFA)/ALA} - \text{Red m (n-3 HUFA)/ALA}$$

Activity index based on HUFA in red and white thigh muscles estimate *ex post* kinetic activity

Failla et al., 2021 – *Poultry Science*

Muscle composition

(grass, n-3 & storage efficiency)



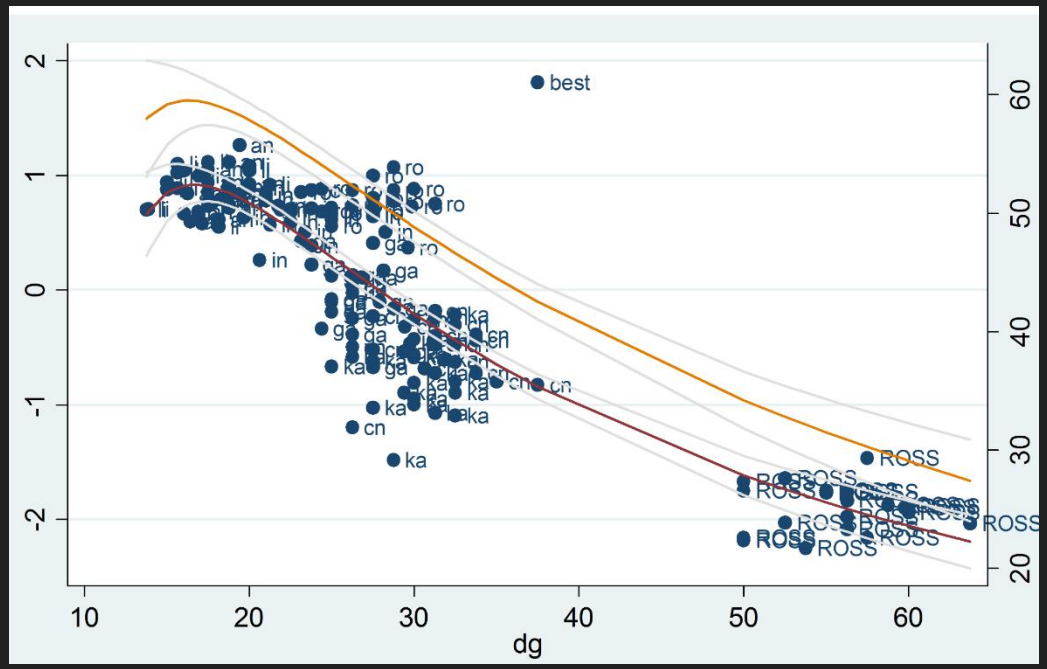
Grass intakes modified the ingestion of n-3 and n-6, tocols and carotenes

The chicken strains with higher grass intake also had lower storage efficiency

➢ **grass intake < storage ability**

2. Adaptability

The multi trait index (≈ 100 variables)



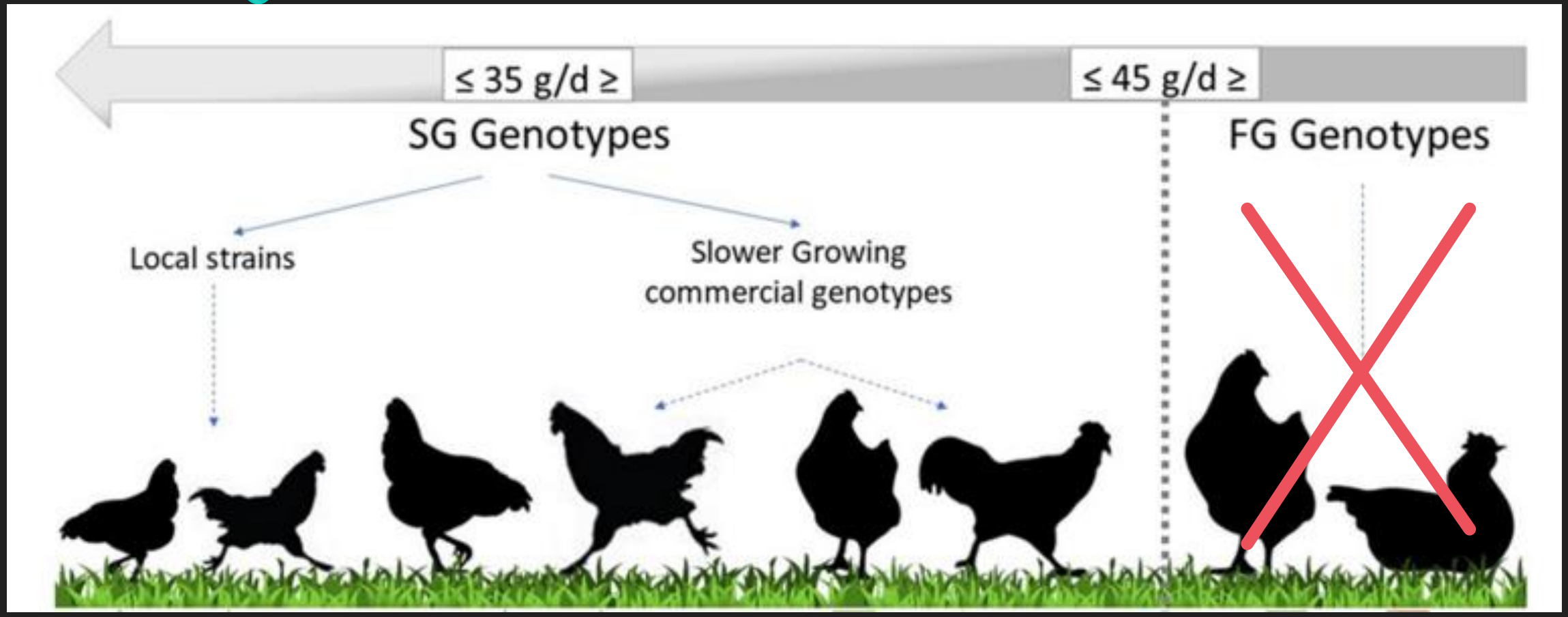
Behavior, welfare

Performance

Meat quality

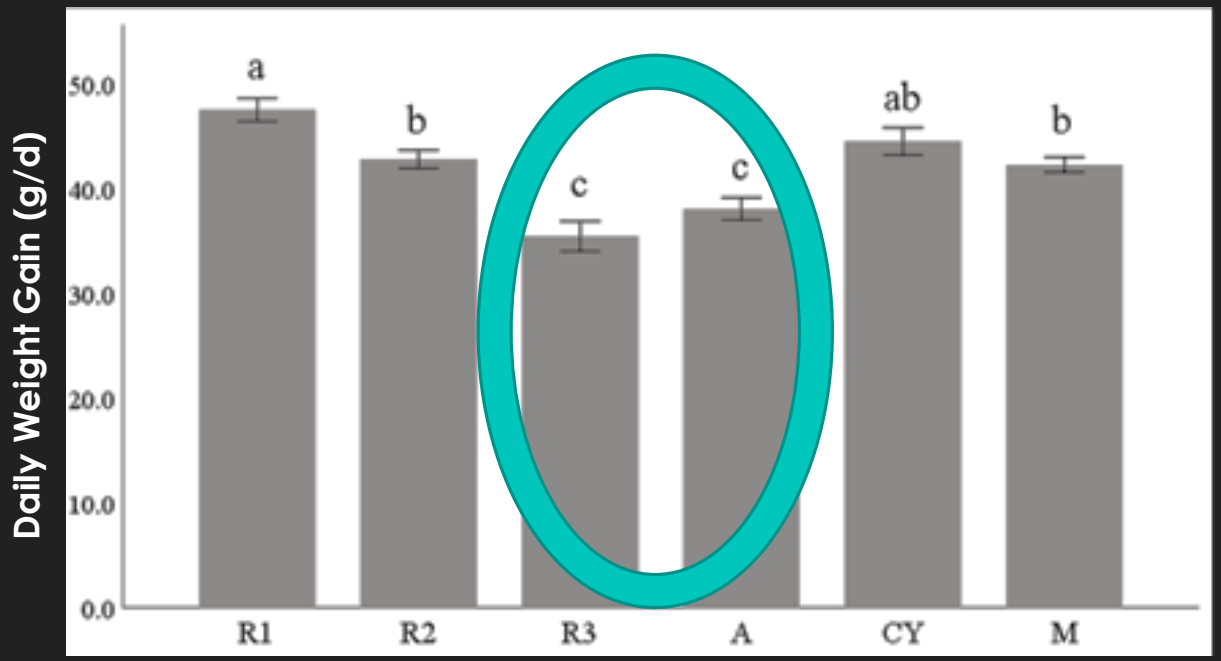
PREREQUISITE

(walking activity, thermotolerance, disease resistance)

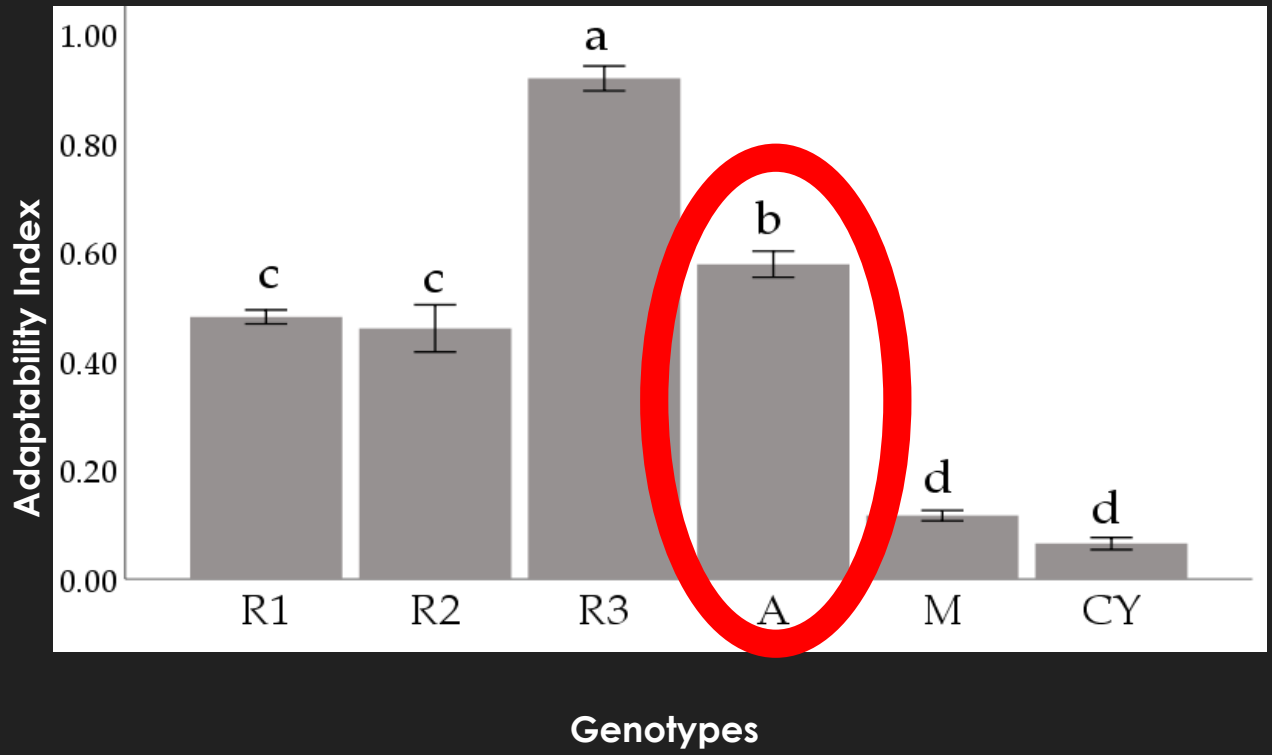


ADG and adaptability in SG

Daily weight gain of six poultry genotypes on the entire rearing cycle



Adaptability Index of six poultry genotypes



Suitable Tools

LCA revised
One welfare & Multicriteria analysis

Conceptual framework of LCA and main gaps

LCA

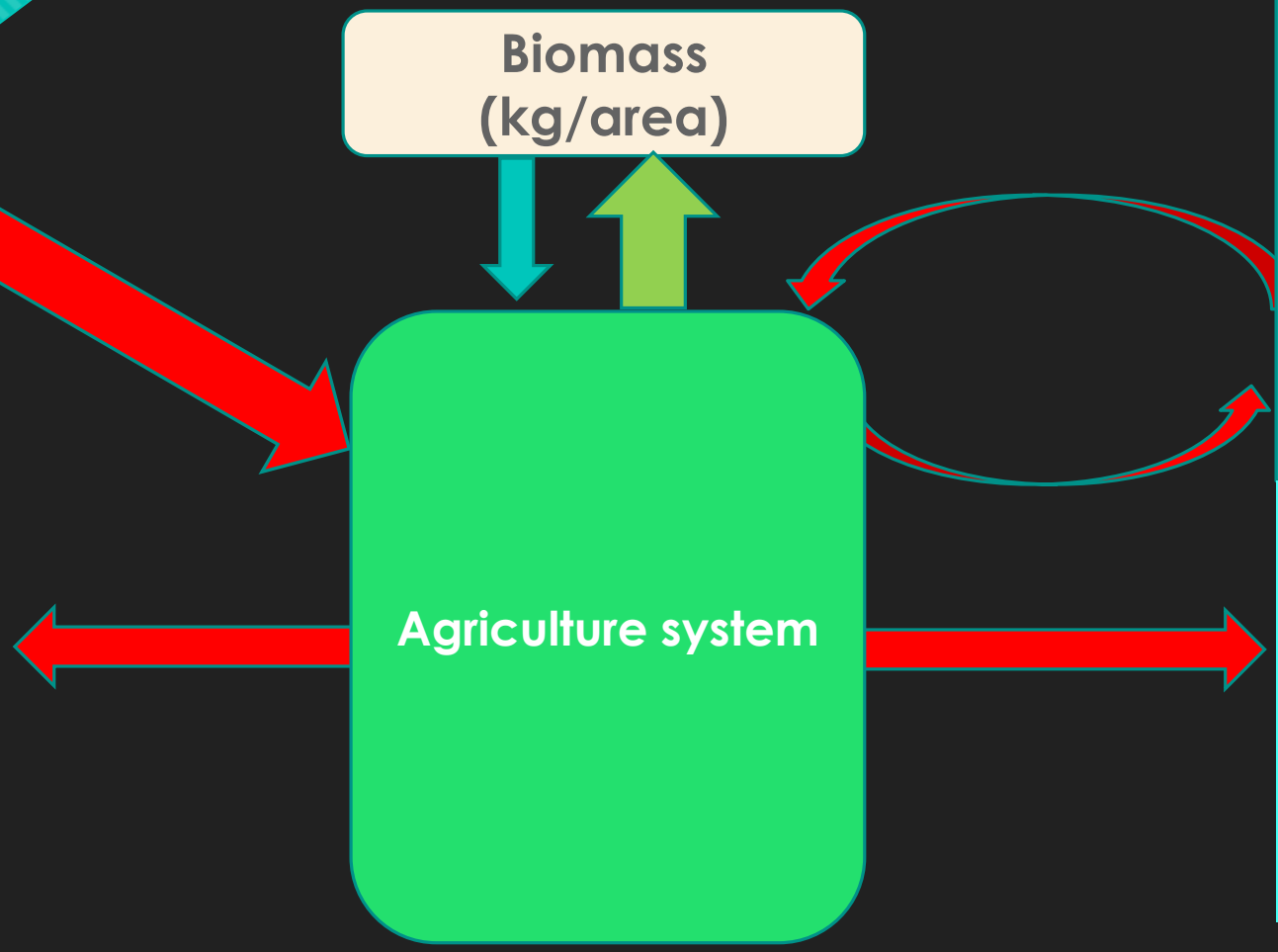
Impact resources

- Land use
- Water use
- Minerals
- Fossil fuel

Ecosystem and human health

- Climate change
- Ozone depletion
- Ionising radiation
- Particulate
- Acidiphication
- Eutrophization
- Human and ecotoxicity

production



Main gaps

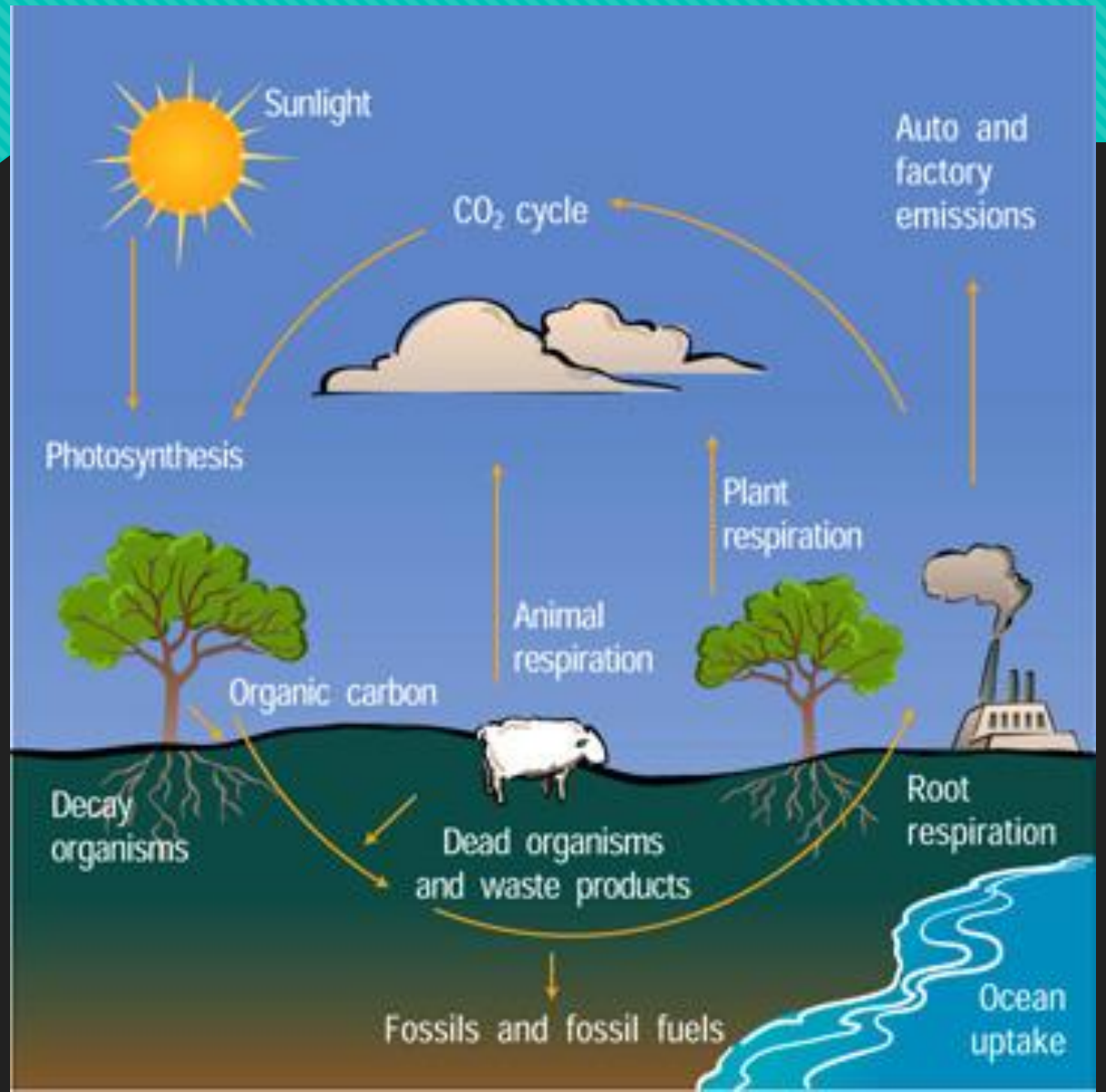
Regulation & maintainance

- Erosion
- Water flow
- Pollination
- Pest and disease control
- **Soil (C sink),** water and air quality
- Climate

Socio-cultural aspects

- Cultural and heritage values
- **Type of land (marginal..)**
- Aestetic values
- Reacreation
- Citizen agreement

Carbon cycle

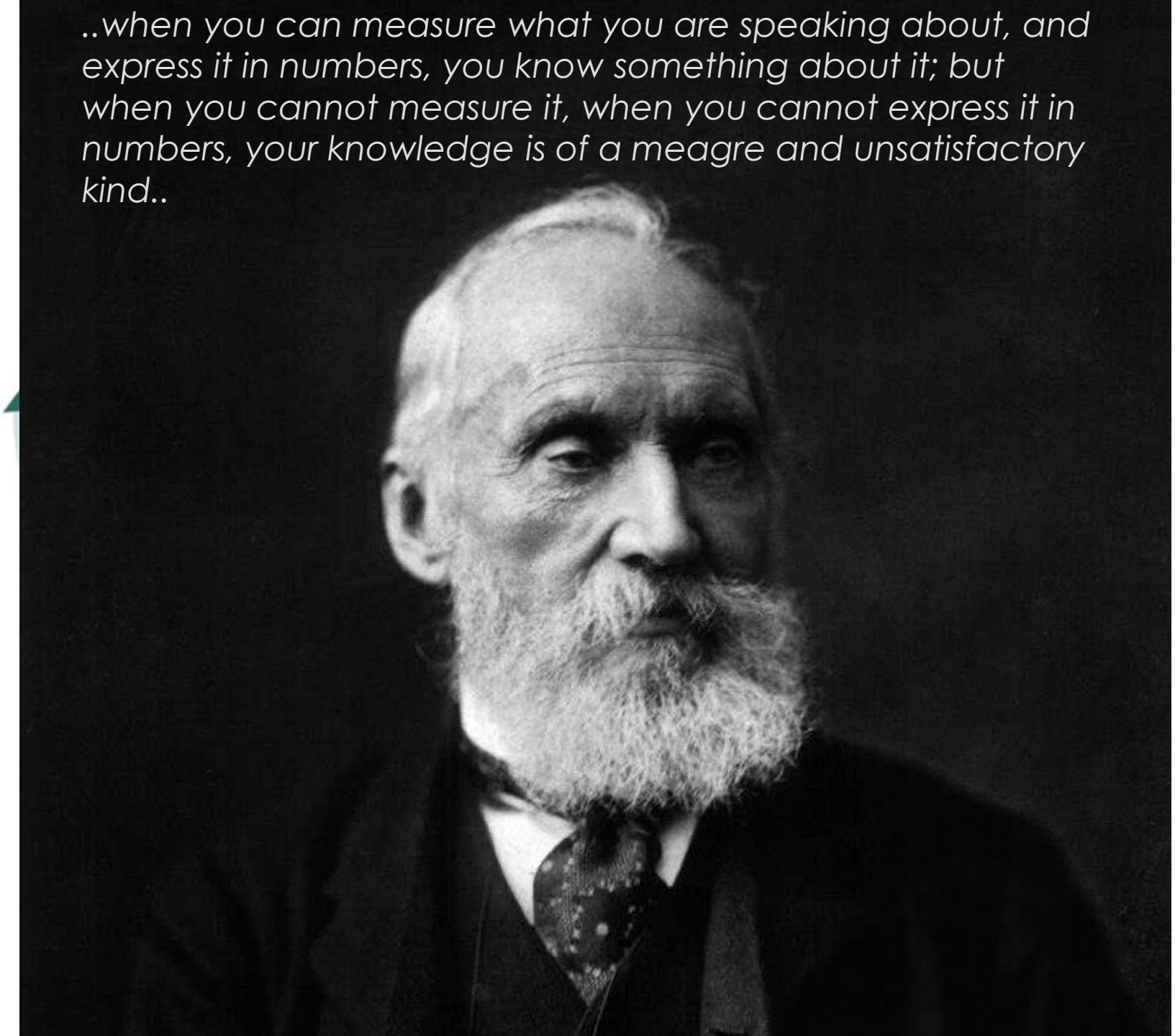


Criticism of LCA in agriculture

1. LCA focuses on negative impacts rather than positive
2. lack of indicators for key issues i) **resource efficiency** (recycling; renewable resources); ii) **resilience of soil** (C sink) and animal (health and welfare), **biodiversity**; iii) socio-cultural values
3. inconsistent modelling of indirect effects.
4. the choice of functional units (area, kg, kg of nutritive compounds)

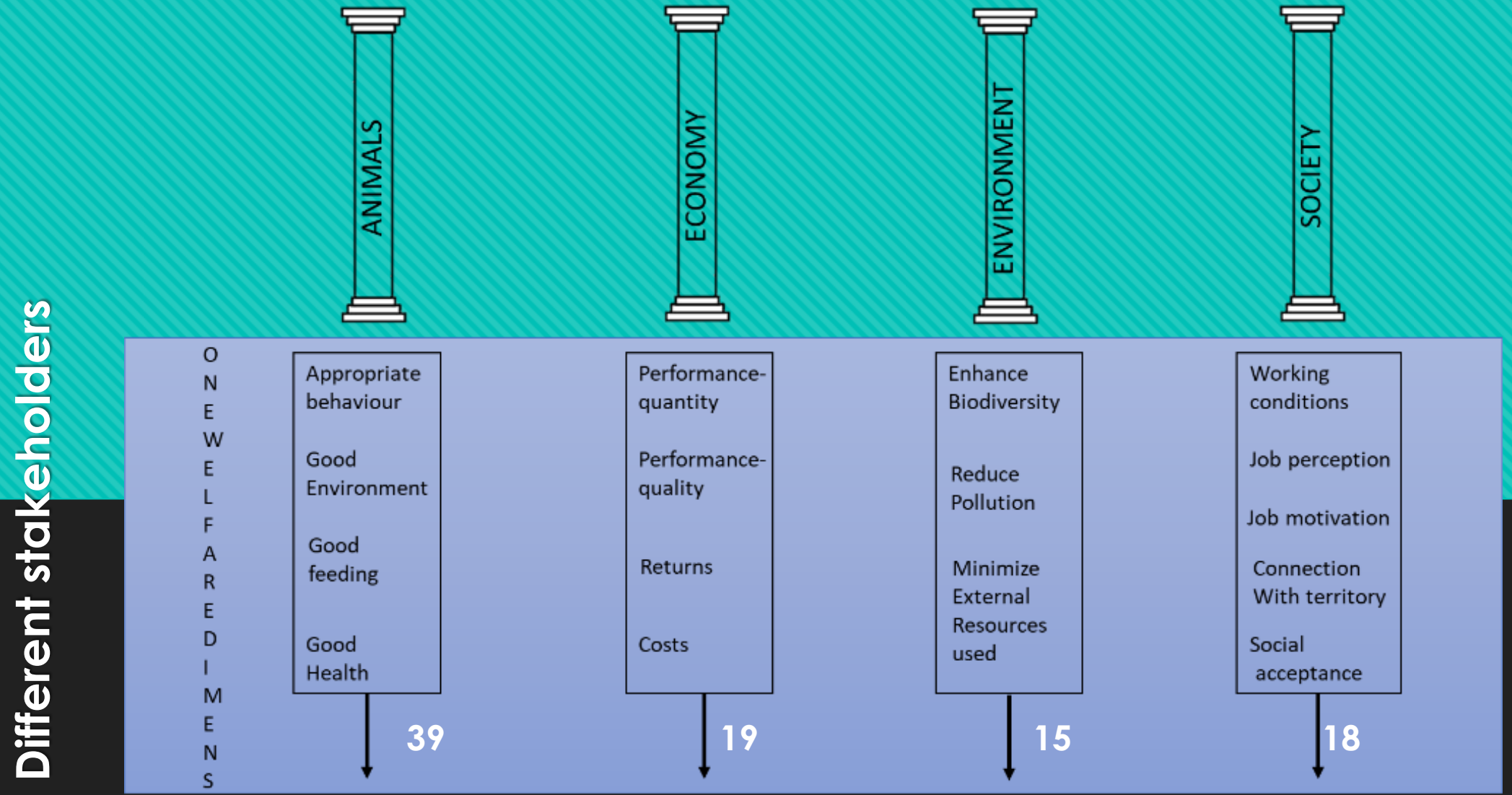
One welfare & Multicriteria analysis

..when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind..



One Welfare assessment

criteria and indicators



MCDA can show the effect of different factors and different point of views on the whole system

. non absolute values

. strenght and weakness

Multicriteria analysis

Establish Decision matrix

n alternatives
x
k attributes

Calculate normalized decision matrix

$$z_{ij} = \frac{y_{ij}}{\sqrt{\sum_{i=1}^{n} y_{ij}^2}}$$

$i = 1, \ldots, n;$
$j = 1, \ldots, k$

Calculate weighted normalized decision matrix

$$x_{ij} = w_j z_{ij},$$
$i = 1, \ldots, n;$
$j = 1, \ldots, k.$

Determine positive ideal solutions and negative ideal solutions

$a^* = \{(\max_i x_{ij} \mid j \in J), (\min_i x_{ij} \mid j \in J\hat{}) \mid i = 1, \ldots, n\} = \{x_1^*, x_2^*, \ldots, x_k^*\}$
$a^- = \{(\min_i x_{ij} \mid j \in J), (\max_i x_{ij} \mid j \in J\hat{}) \mid i = 1, \ldots, n\} = \{x_1^-, x_2^-, \ldots, x_k^-\}$

Calculation of separation measurement according to Euclidean distance

$$S_i^* = \sqrt{\sum_{j=1}^{k} (x_{ij} - x_j^*)^2},$$

$i = 1, \ldots, n;$

$$S_i^- = \sqrt{\sum_{j=1}^{k} (x_{ij} - x_j^-)^2},$$

$i = 1, \ldots, n.$

Calculate the closeness of alternatives to the ideal solution

$$C_i^* = \frac{S_i^-}{S_i^- + S_i^*}$$
$i = 1, \ldots, n$

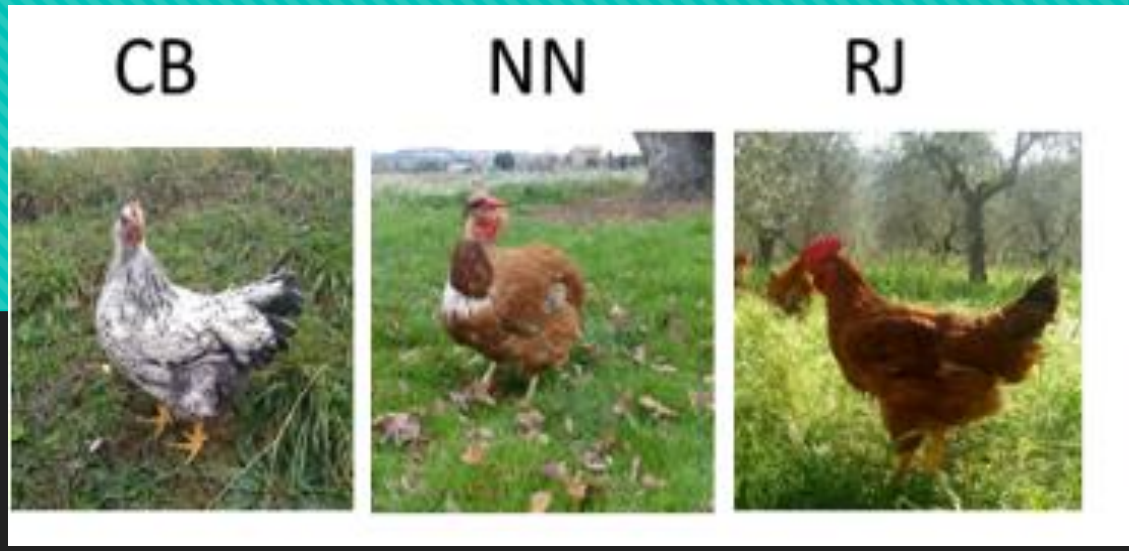
Ranking solutions.

according to C^*_i
$C^*_i > C^*_j$ then a_i
"surpasses in degree" a_j

Case study

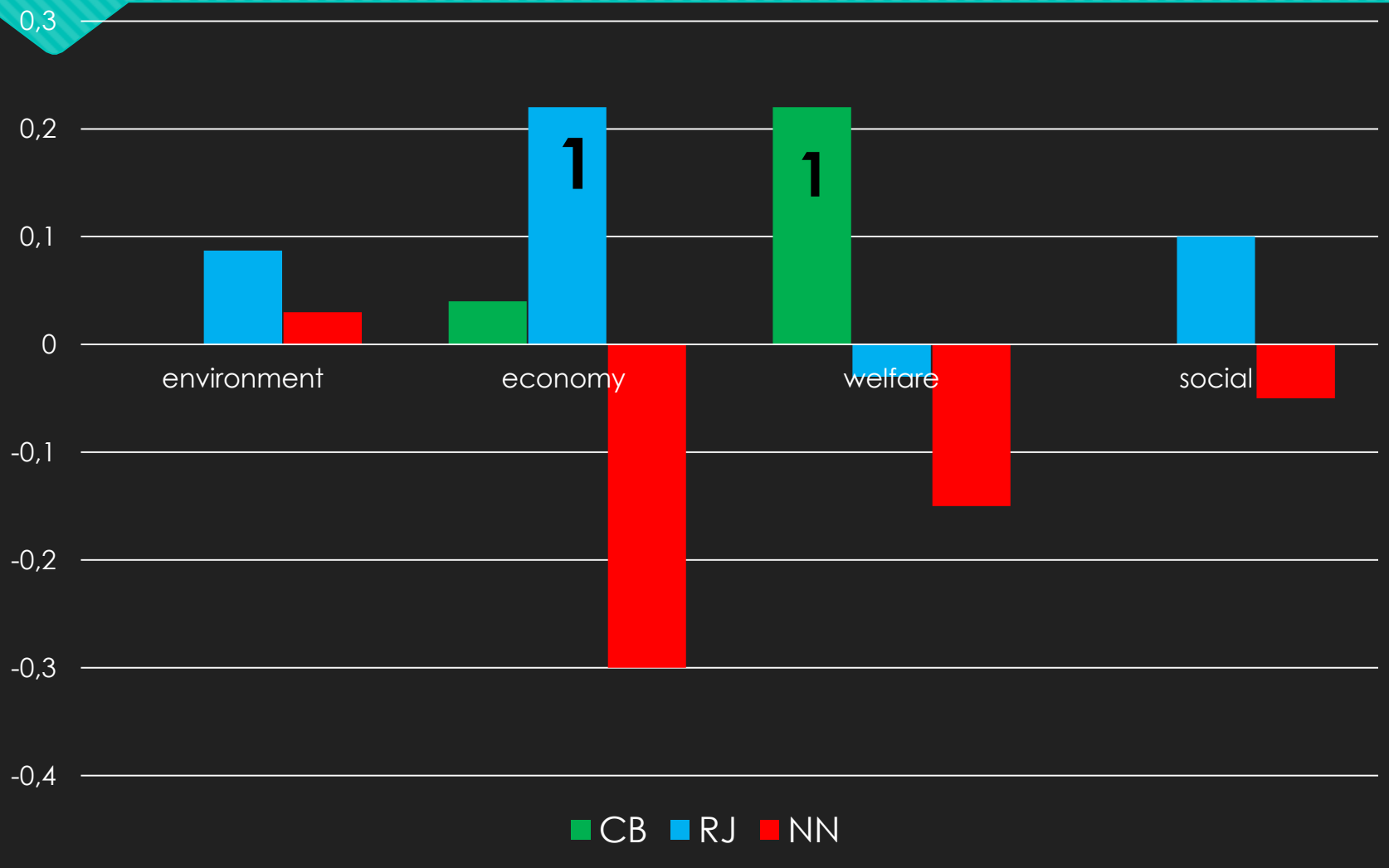
Organic

Different strains

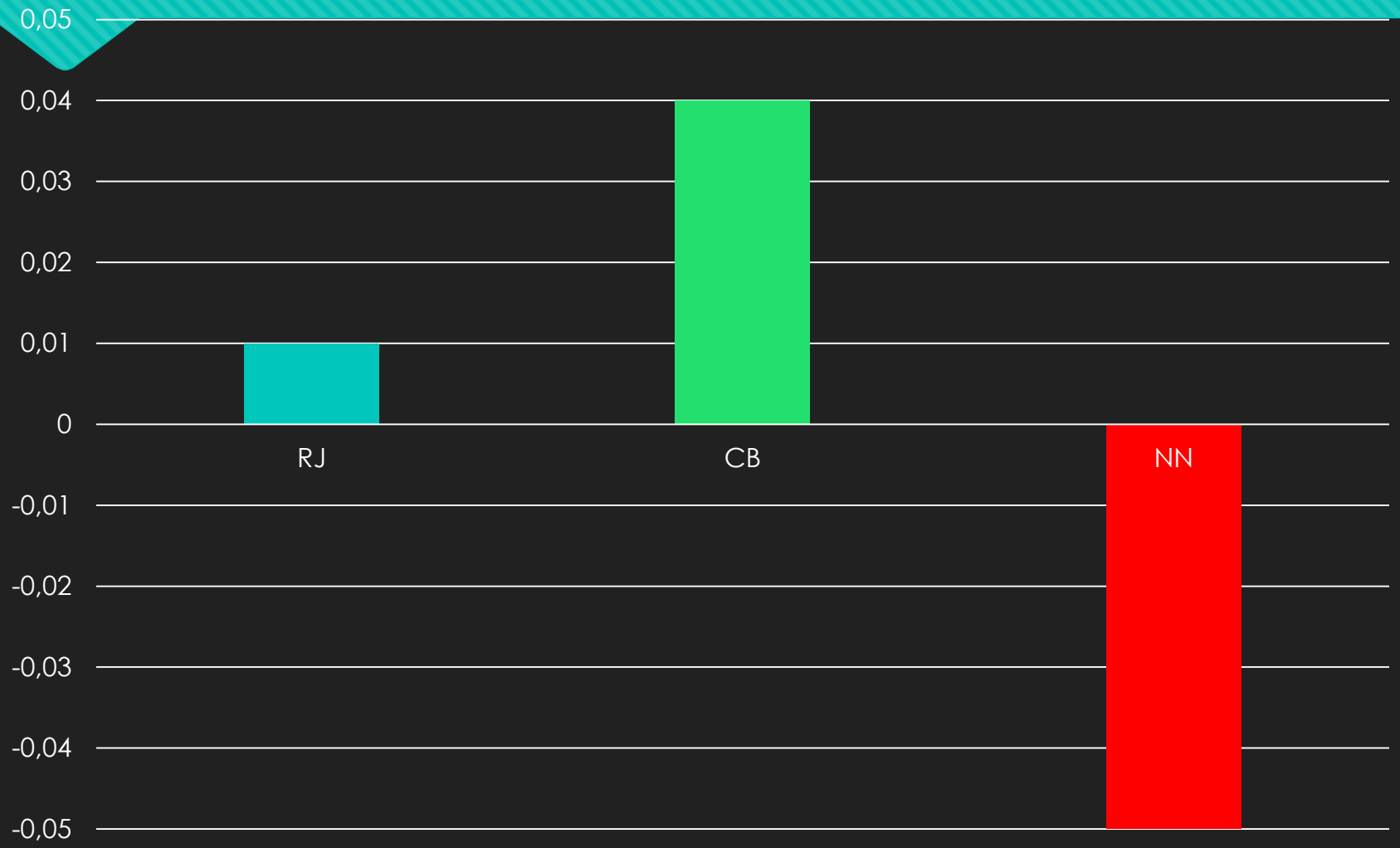


Different outdoor enrichments

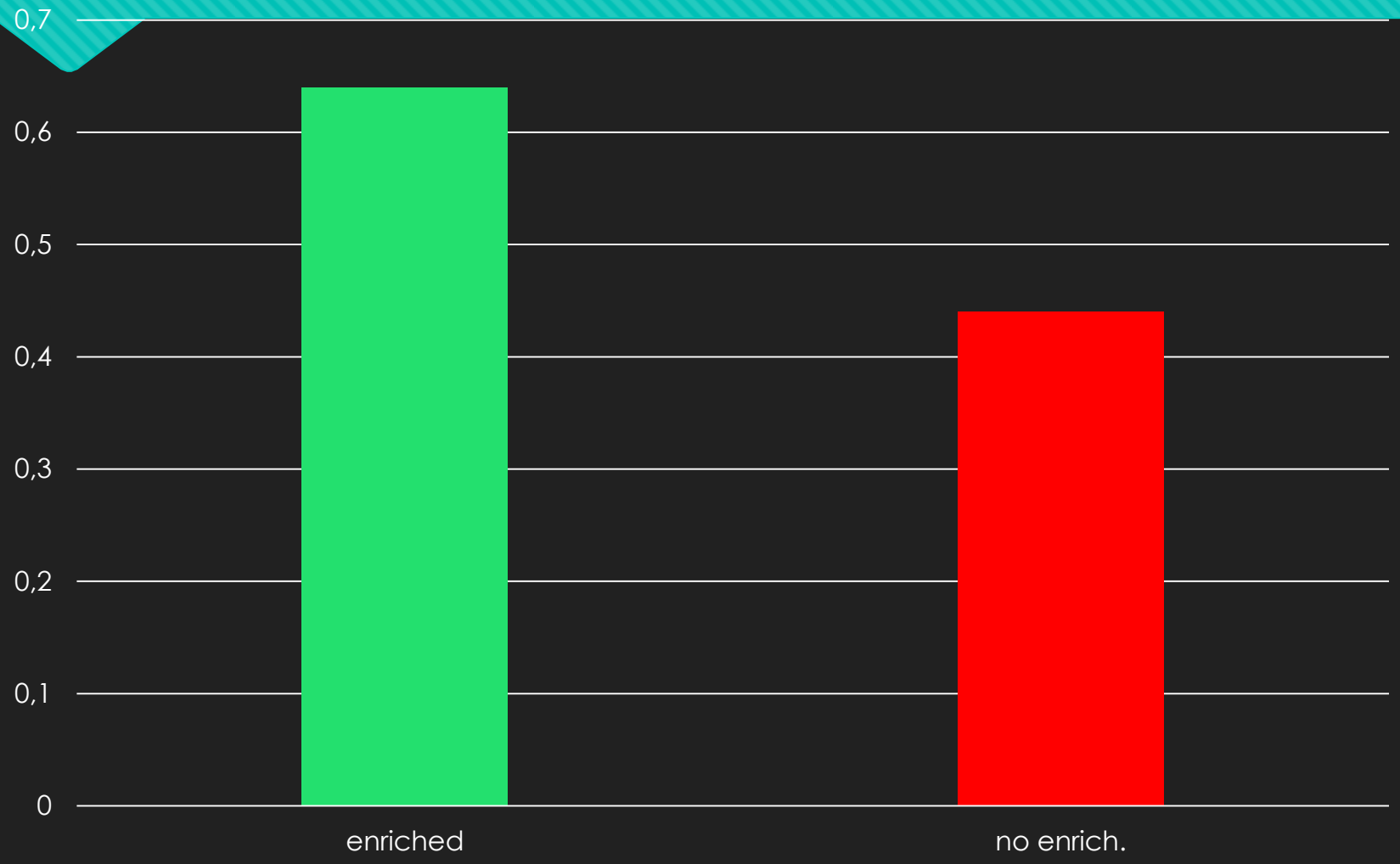
Comparison of traits



FINAL RANKING
(Genotype)



FINAL RANKING
(enrichment)



Take home message

- Use of SG affects welfare, behaviour, performance, environment, meat quality
- Harmonization of criteria and tools in EU
- MCDA & OWA are suitable approaches, which requires further fine-tuning of criteria

UNIPG - poultry and MCDA unit

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