



Adaptability of broiler strains to the free range and agroforestry

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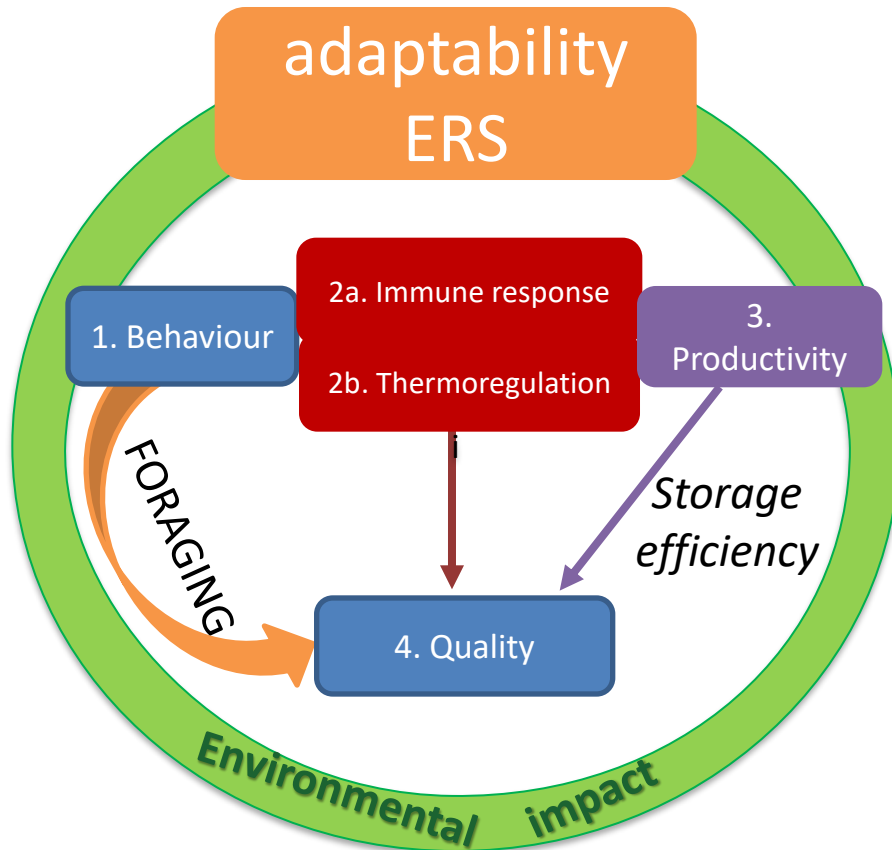
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PPILOW Final conference – Africa Museum, Tervuren (Brussels)

11th-12th June 2024

Extensive Rearing System (ERS) should **promotes biodiversity, environmental sustainability and food quality and safety**

(National Organic Standards Board, 1995)

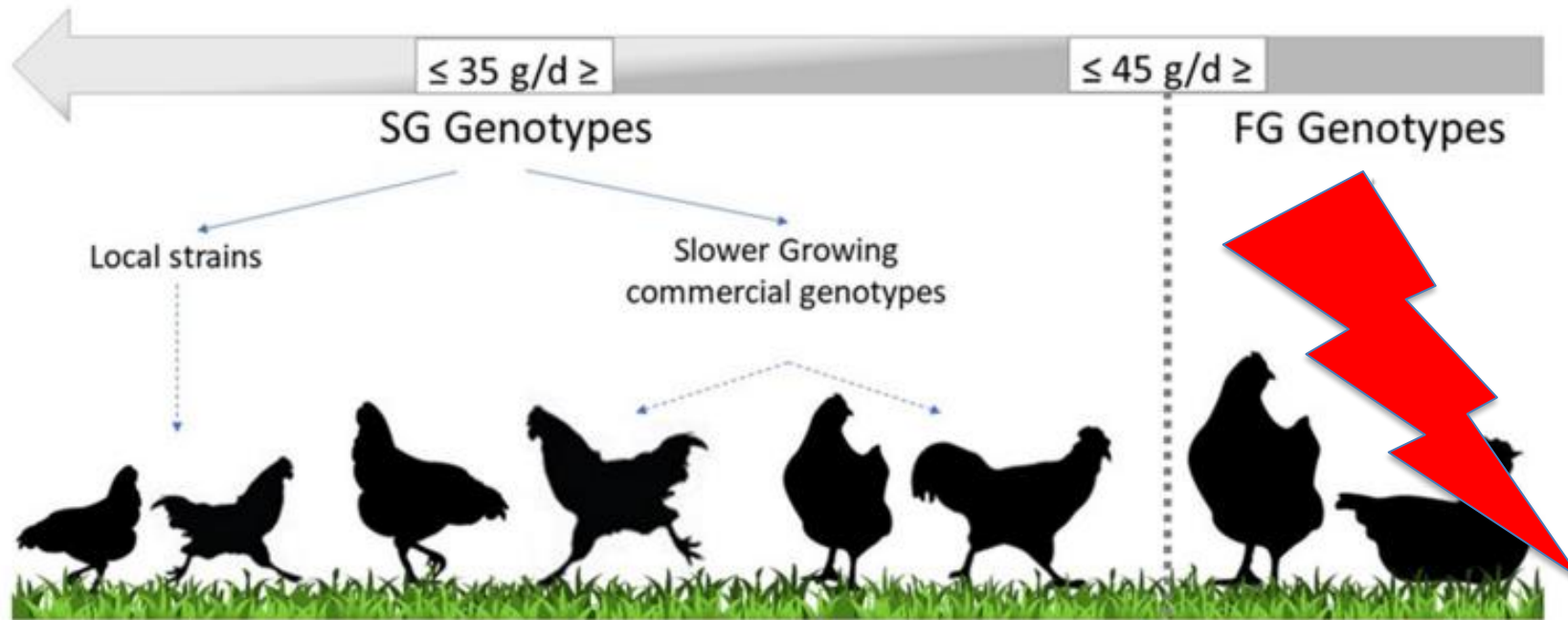


Accordingly, EU Regulation 848/2018 recommends the use of SG strains for organic systems and introduces the concept of adaptability to outdoor rearing

However, no common rules in EU define how to measure adaptability and how define “adapted” or “less adapted” “chicken strains

PPILOW - Range use and adaptability

Adaptability is often referred to the daily weight gain (DWG), even if in the presence of outdoor runs requires other specific characteristics (walking activity, thermotolerance, disease resistance)



Behavior

Health status

Environmental impact

Products characteristics

Interaction animals, grass and trees

Pasture



Environmental enrichment



- > Exploration outdoor area and grass intake
- Exhibit the full behavioral repertoire
- High-quality meat
- Reduction land use

UNIPG PPILOW results

TRIAL 1 - Forage behavior, grass and n-3 intake and body storage in different poultry strain strains



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TRIAL 2 - Kinetic activity, lipid metabolism and antioxidant profile/oxidative status

TRIAL 3 - Genotype and outdoor enrichment: on productive performance and meat quality

TRIAL 4 - MCDA



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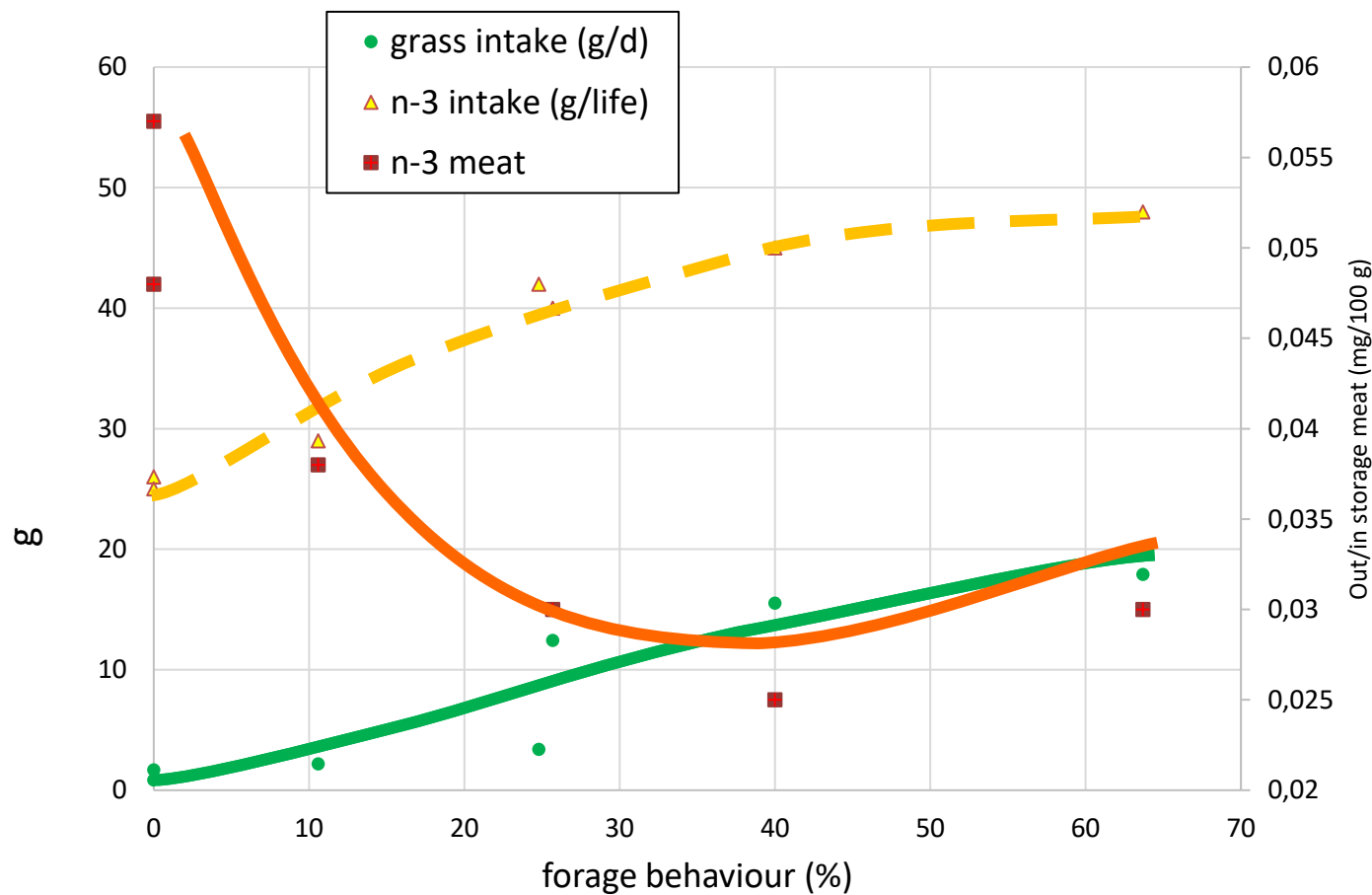


Elisa Angelucci

TRIAL 1

Forage behavior, grass and n-3 intake and body storage in different poultry strains

Intake of grass, n-3 and storage efficiency in different genotypes



Different grass intakes modified the proportion of some nutrients (n-3 and n-6, tocals and carotenes) ingested by poultry genotypes

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

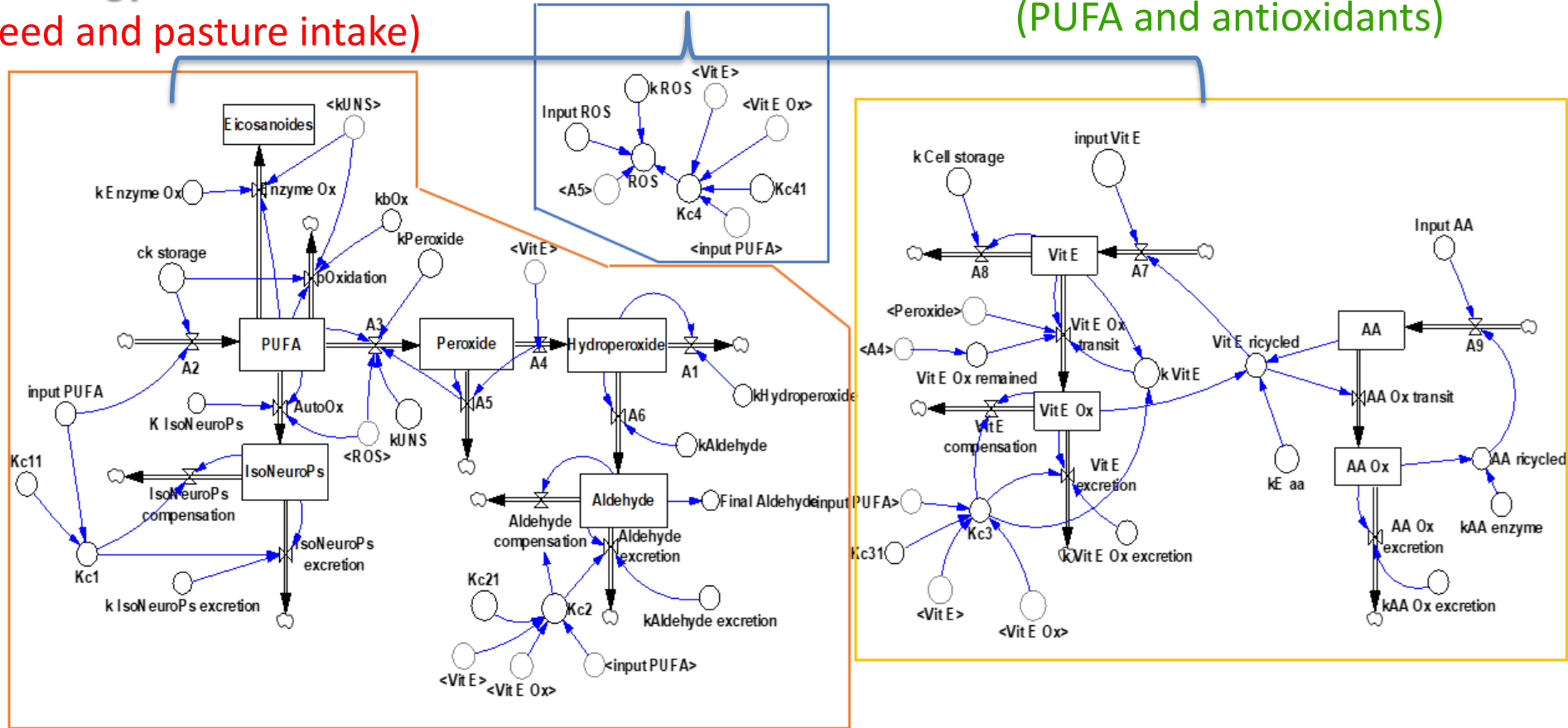


as grass intake increases, storage ability decreases

Kinetic Activity
(ROMs, antiox. equilibrium)

Energy metabolism
(feed and pasture intake)

Foraging behaviour
(PUFA and antioxidants)



body

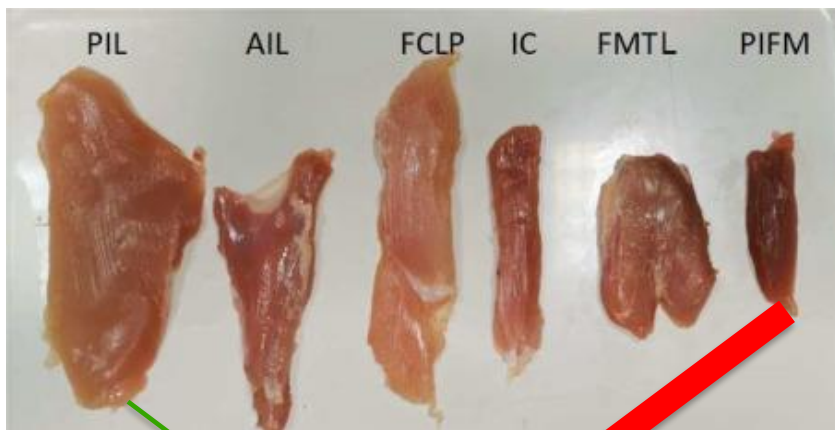
meat



TRIAL 2

Kinetic activity, lipid metabolism and antioxidant profile/oxidative status

M. iliotibialis lateralis postacetabularis (PIL, glycolytic)
M. puboischiofemoralis pars medialis (PIFM, oxidative)



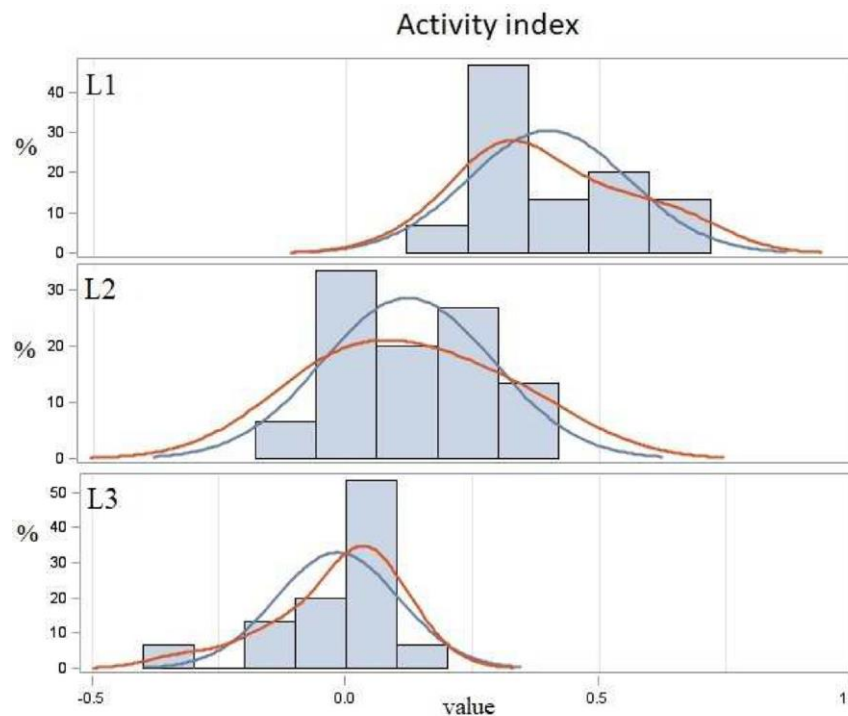
HUFA
as energy source

β-oxidation fatty acids

Commercial lines:
L1 = active commercial line

L2 = sedentary commercial line

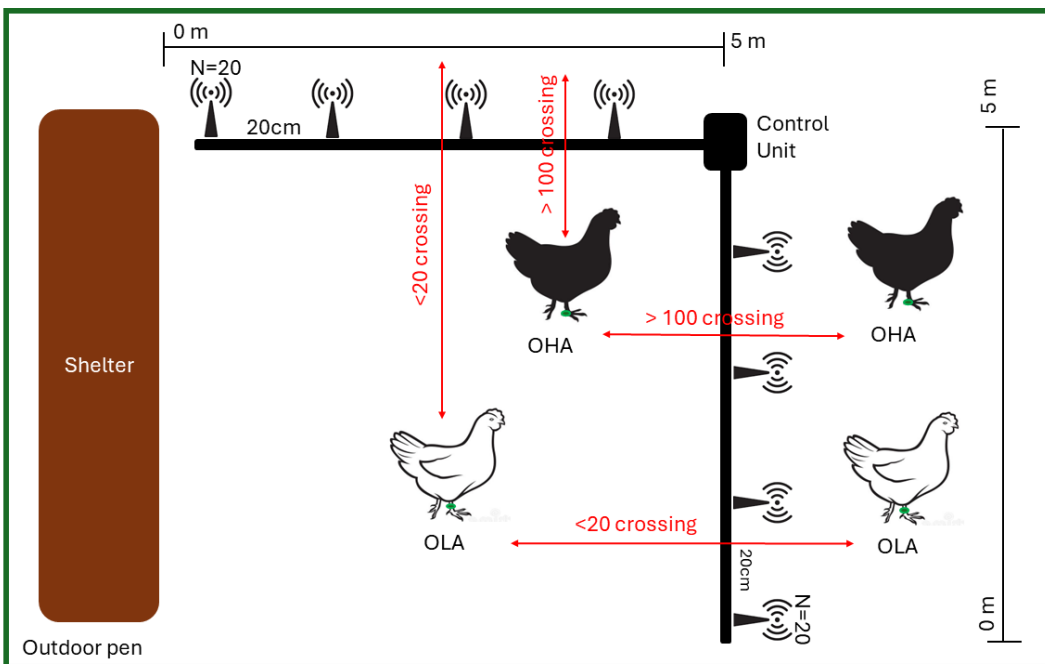
L3 = Fast Growing Ross 308.



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

Activity index based on HUFA differences between red and white thigh muscles of the same chicken estimate *ex post* their kinetic activity

Failla et al., 2021 – Poultry Science



120 Naked Neck chicks were reared

indoor (I)

(housing in indoor pen, 0.10 m²/bird)

outdoor (O)

(housing in an indoor pen, 0.10 m²/bird with access to a grassed paddock, 4 m²/bird)

A kinetic monitoring system, constituted by chips and antennas for recording the times that chicken pass through the area (LUNA GERB, Italy), outlined **two Outdoor group**

high active (OHA)

Low active (OLA)



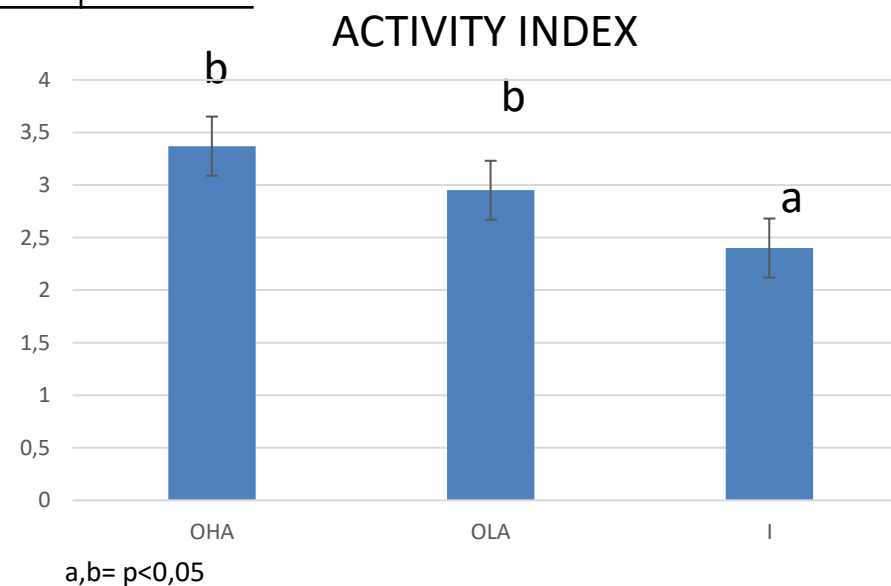
The trial was carried out at the experimental farm of the University of Perugia (Italy)

PUFA profile in the two leg muscles (PFIM- oxidative and PIL – Glycolitic) of chicken.

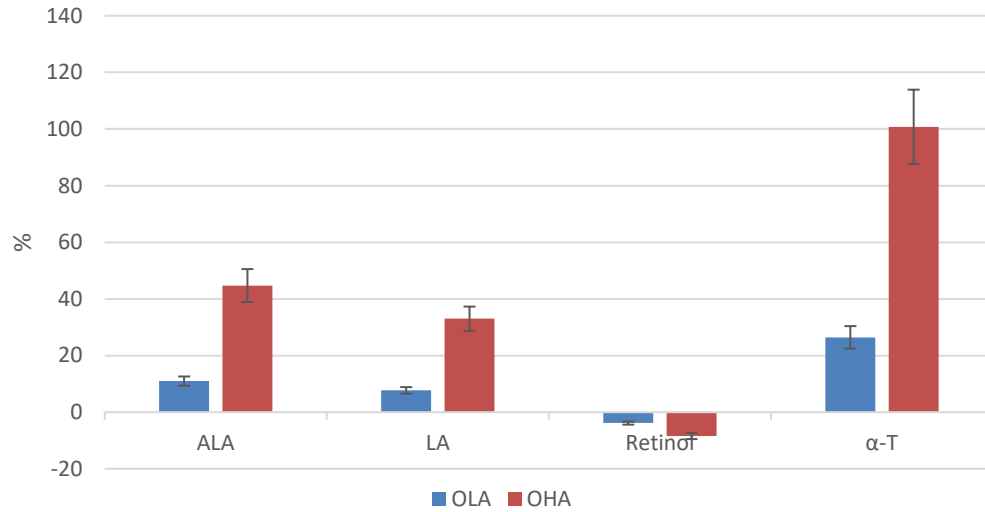
	OHA		OLA		Indoor		p value
	PIL	PIFM	PIL	PIFM	PIL	PIFM	
C18:3 n-3, α-ALA	0,60	0,83	0,61	0,74	0,78	0,83	0,002
C20:5n-3, EPA	1,60	0,95	1,48	0,76	1,16	1,04	0,000
C22:5n-3, DPA	0,80	0,40	0,61	0,23	0,53	0,39	0,000
C22:6n-3, DHA	1,63	1,24	1,71	0,69	1,58	2,01	0,096
n-3 HUFA/ALA	6,77	3,18	5,13	2,27	4,38	4,25	0,004
n-3 HUFA	4,02	2,59	3,80	1,68	3,27	3,45	0,030

n-3 HUFA=Σ (C20:5n-3, C22:5 n-3, C22:6 n-3); ALA = C18:3 n-3
 PIL (M. iliotibialis lateralis postacetabularis) thigh white muscle
 PIFM (M. puboischiofemoralis pars medialis) thigh red muscle

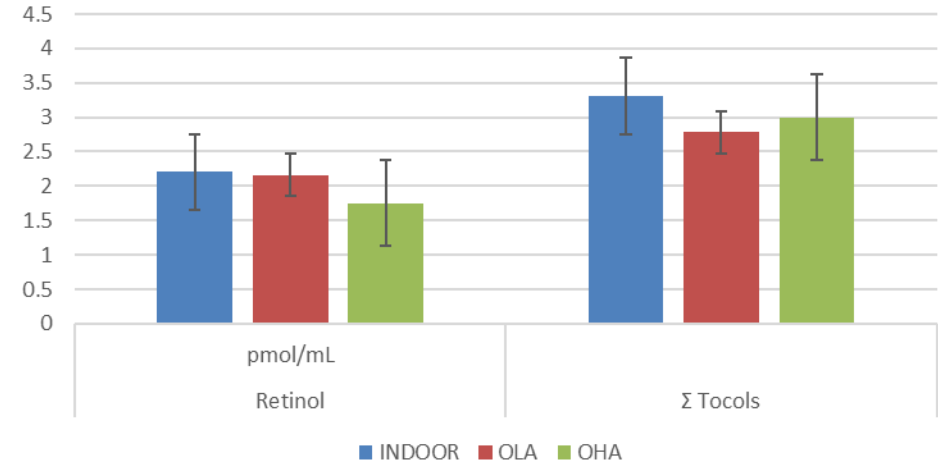
Activity index = n-3 HUFA/ALA (PIL) – n-3 HUFA/ALA (PIFM).



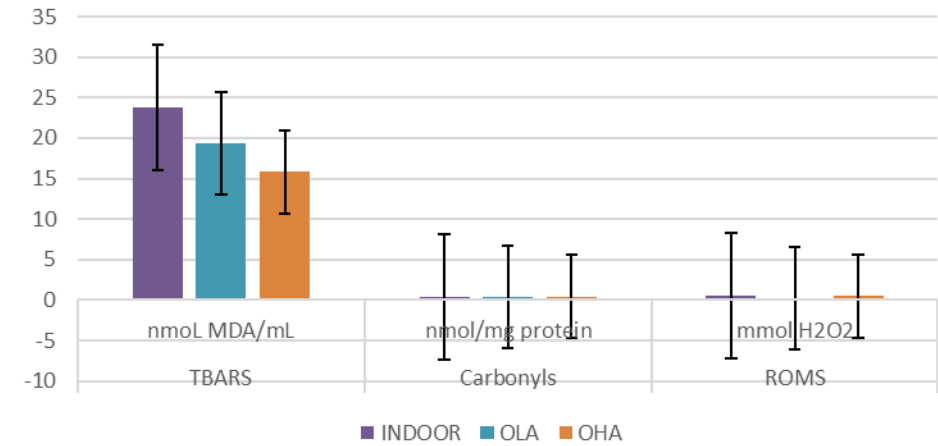
Nutrient intake in outdoor (OLA and OHA) chicken normalized for the chickens indoor



BLOOD antioxidant status



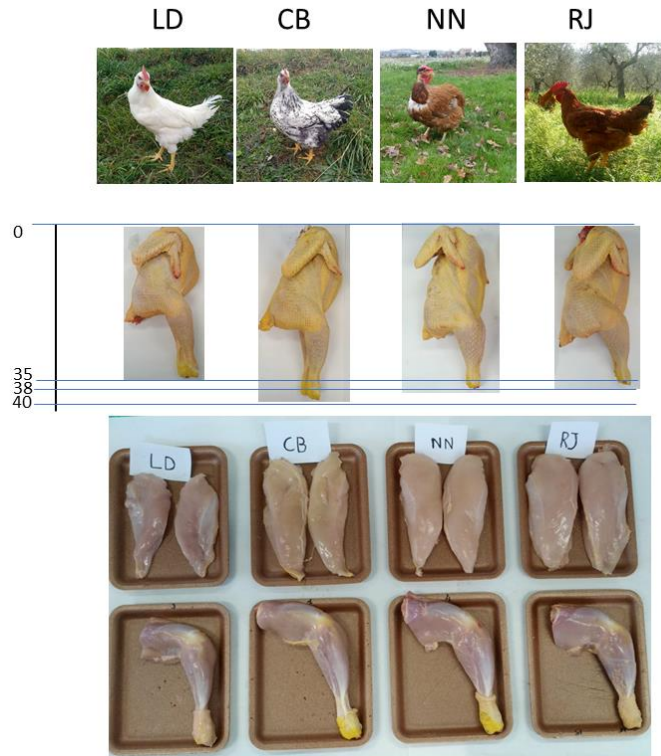
BLOOD oxidative status



TRIAL 3

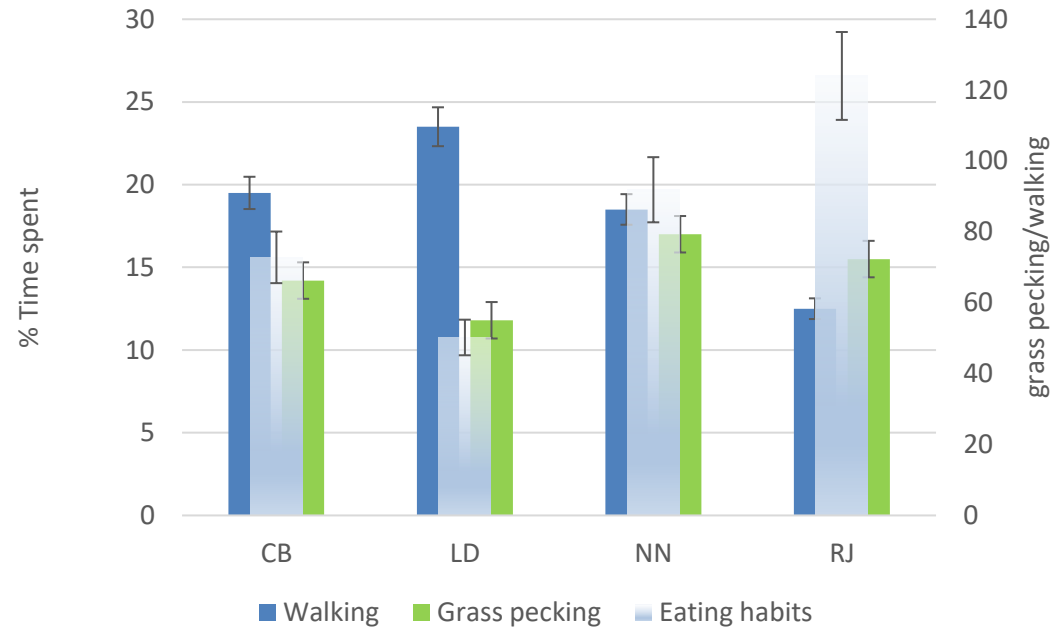
Genotype and outdoor enrichment: on productive performance and meat quality

Effect of genotype and outdoor enrichment on productive performance and meat quality of slow growing chickens



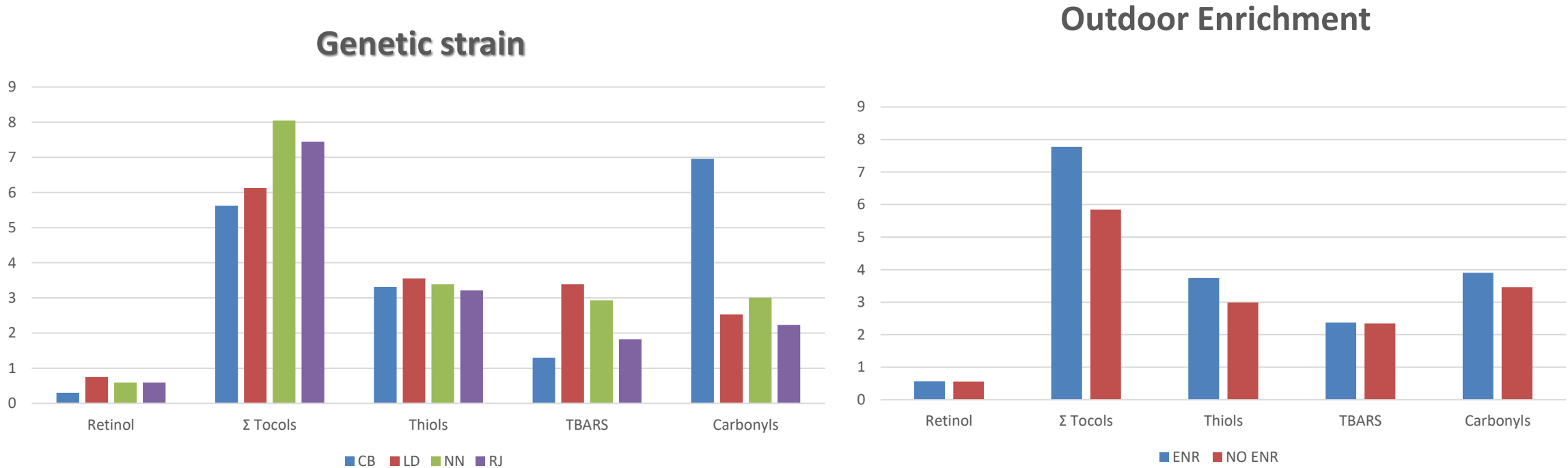
Carcasses and meat cuts (breast, thigh and drumstick) of four chicken genotypes reared outdoor with (ENR) or without (NO ENR) enrichment (sorghum strips)

CB: crossbreed Robusta Maculata x Sasso, LD: Lohmann Dual, NN: Naked neck, RJ: Red JA57. *Subm. POULTRY SCIENCE*



Time spent (%) in walking activity and grass eating of 4 slow growing chicken genotypes (95% lower and upper limits).

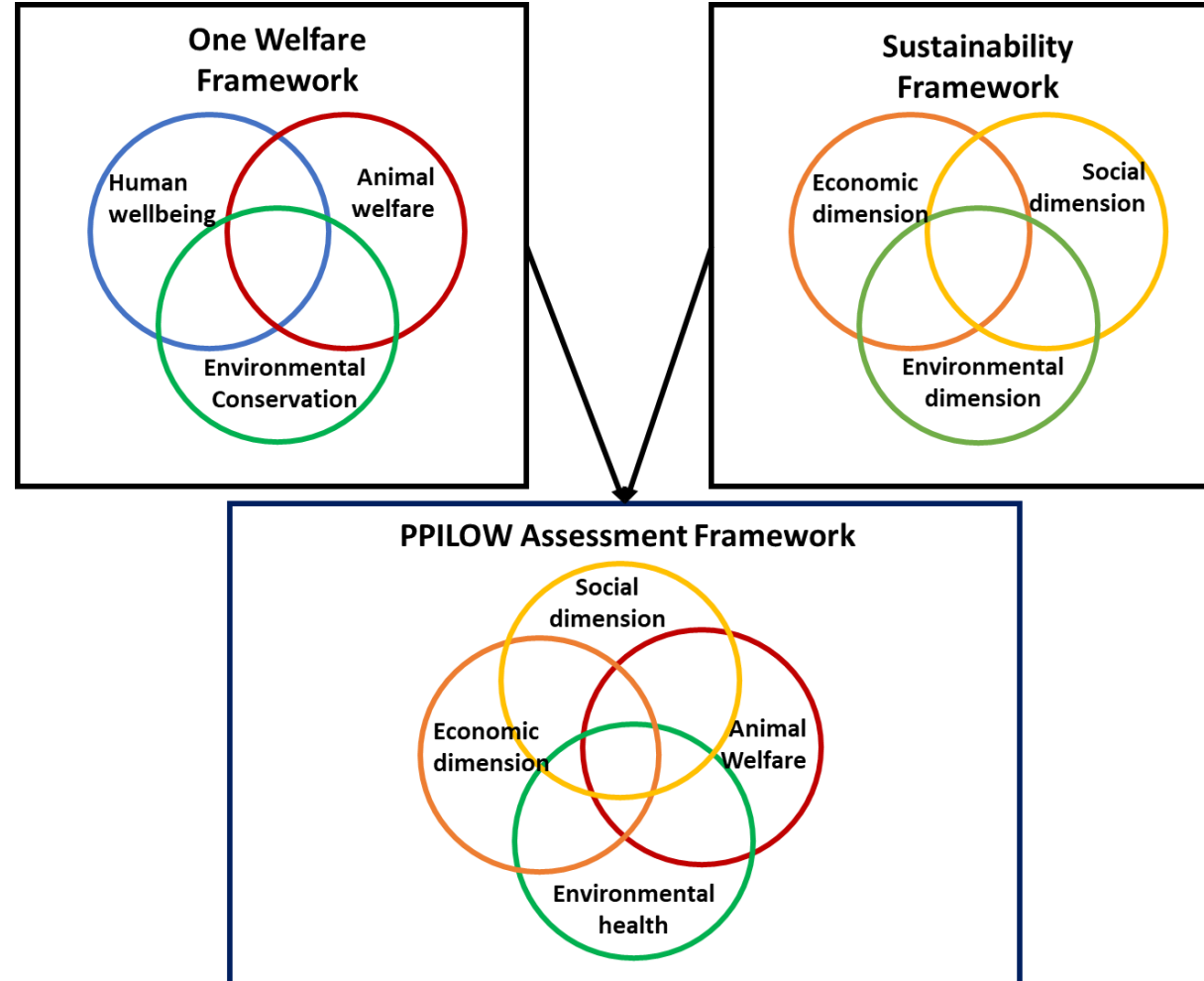
Drumstick oxidative status of slow growing chicken genotypes reared with (ENR) or without (NO ENR) outdoor enrichment

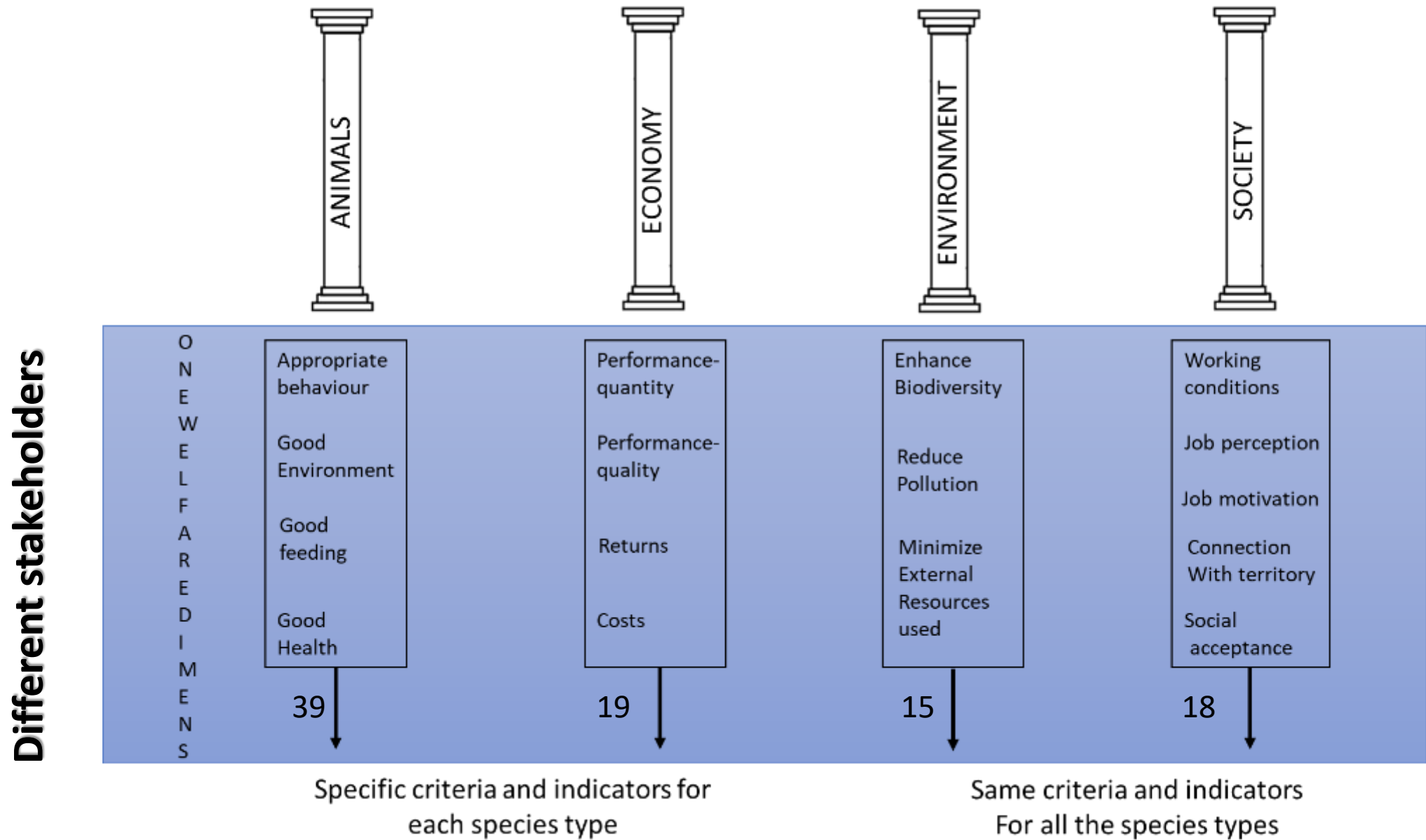


CB: crossbreed Robusta Maculata x Sasso. LD: Lohmann Dual. NN: Naked neck. RJ: Red JA57.

Trial 4. One welfare

Multicriteria analysis





Case study - poultry

Organic

Different strains

Different outdoor enrichments

CB

NN

RJ

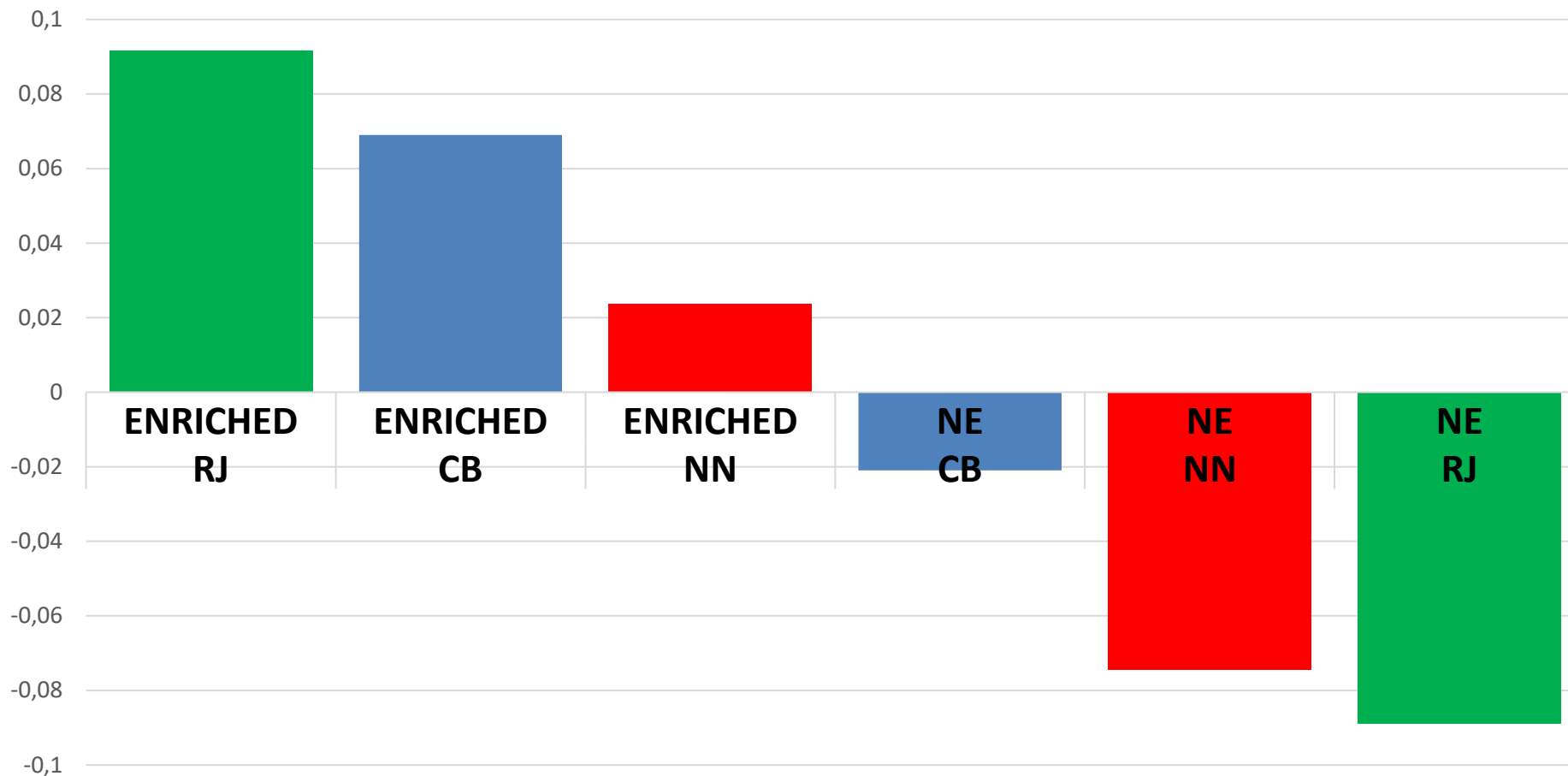


E

NE



RANKING OWA



Take home message

- Chicken strain affects welfare, behaviour, performance, quality
- Outdoor enrichment is important but specific characteristics should be better defined
- OWA is a suitable tool and requires a fine-tuning of criteria (number, type..)

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Thank you for your attention

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