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Range use relationship with welfare and performance indicators in four organic broilers strains



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Societal demand: Expression
of the natural behaviour of
animals

van Asselt et al., 2017



Production of free-range
and organic broilers

IFOAM, 2018

Issue: lack of range use by some batches of chickens

Range use linearly increases with time per animal but varies
within one flock

→ May be qualified as a personality trait

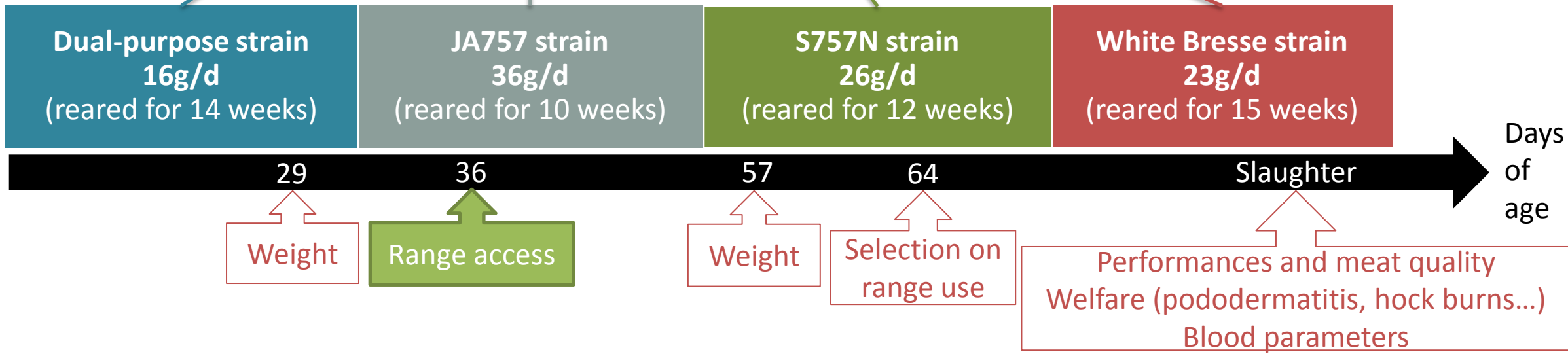
Ferreira et al., 2019; Bonnefous et al., 2023

What are the consequences of range use on animals and production ?

- Health and welfare
- Physiology and metabolism
- Performance and meat quality

PPILOW Method – Experiment from February until June 2021

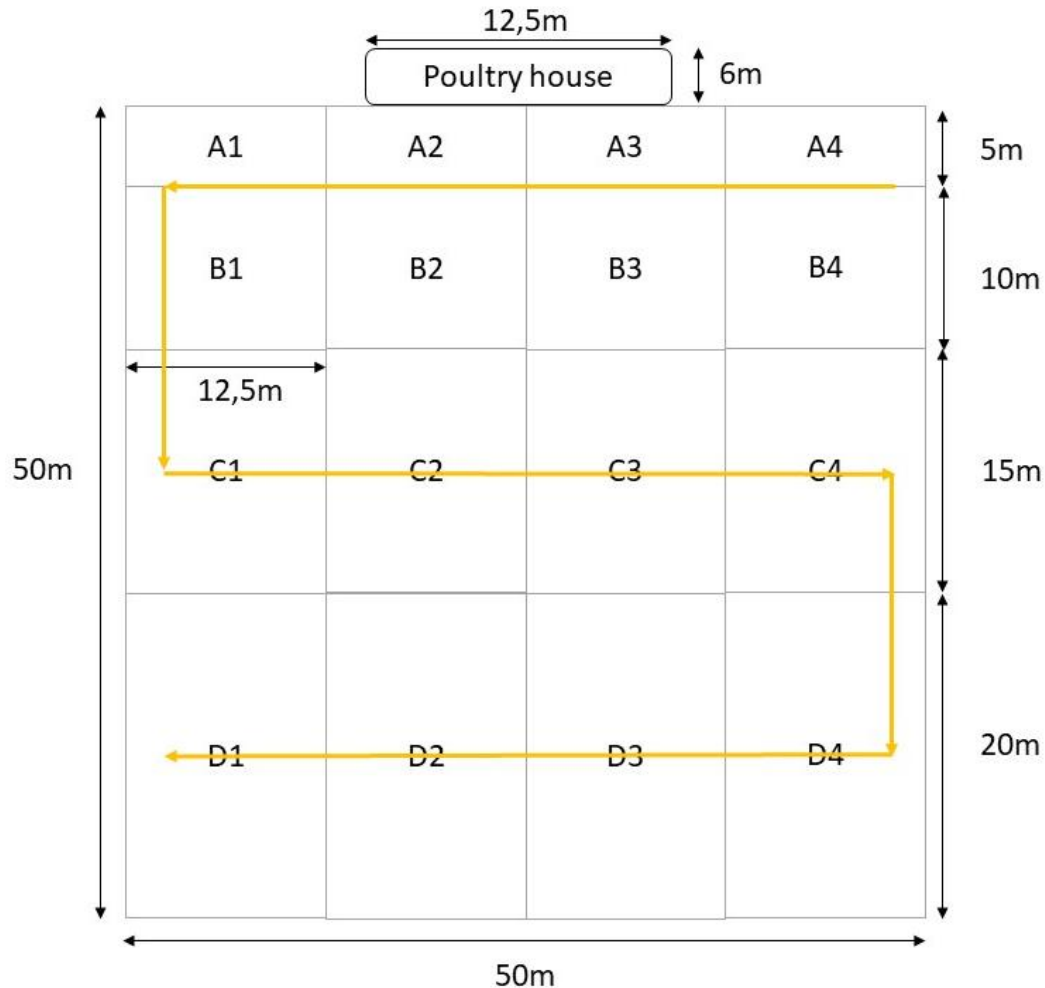
4 strains: 1 per range; 750 animals per strain ; 50% males, 50% females



PPILOW Method – Experimentation from February until June 2021

Ferreira et al., 2019

FIGURE OF SCAN SAMPLING : ← Observer's path



7 times per day of scan sampling
from sunrise to sundown

11 to 15 days of scan sampling
depending on the rearing duration

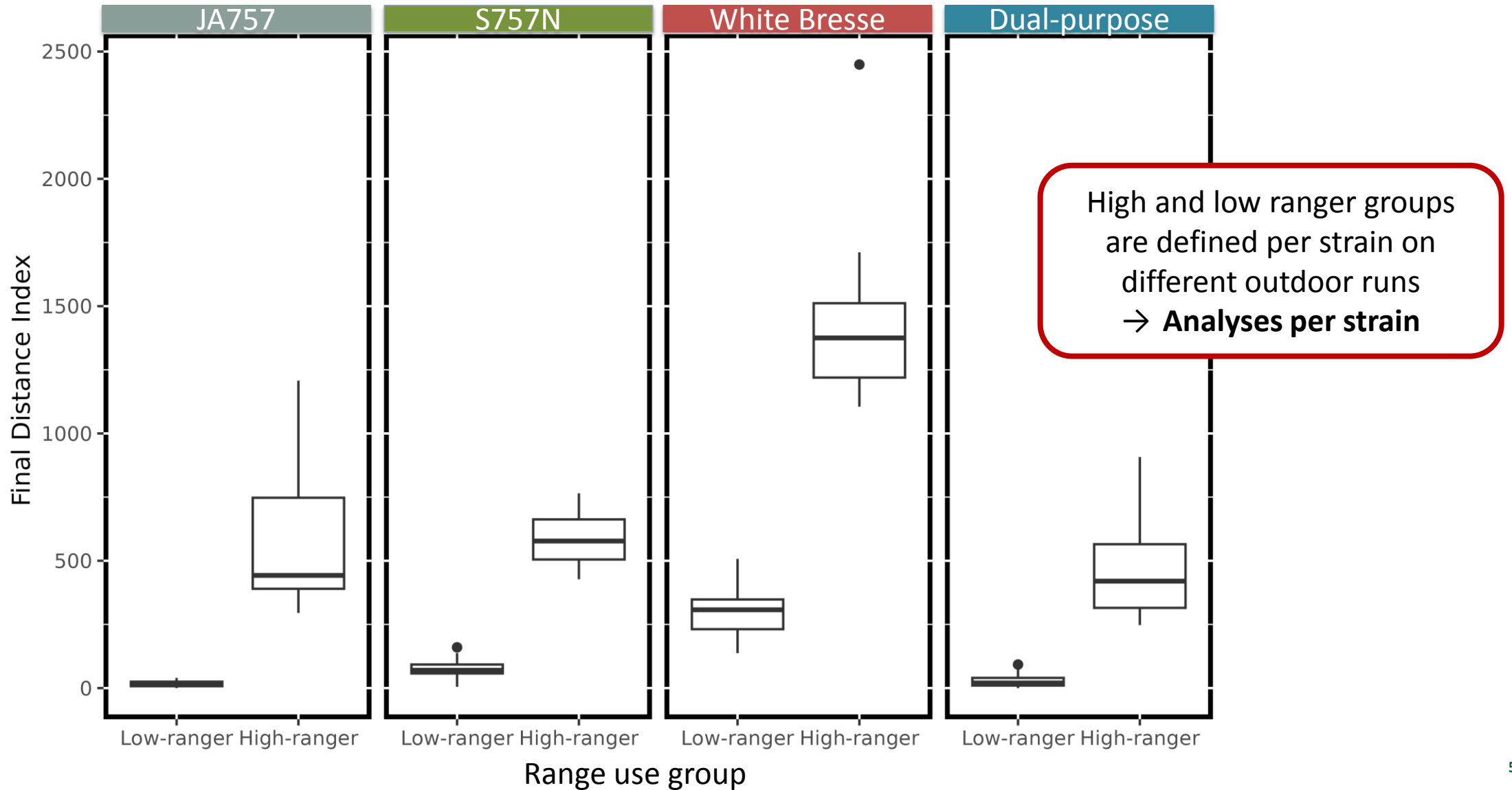
Distance Index =

number of times recorded in zone A * 2.5 +
number of times recorded in zone B * 10 +
number of times recorded in zone C * 22.5 +
number of times recorded in zone D * 40

Selection :

25 animals with the lowest final distance index
= low-rangers
25 animals with the highest final distance index
= high-rangers

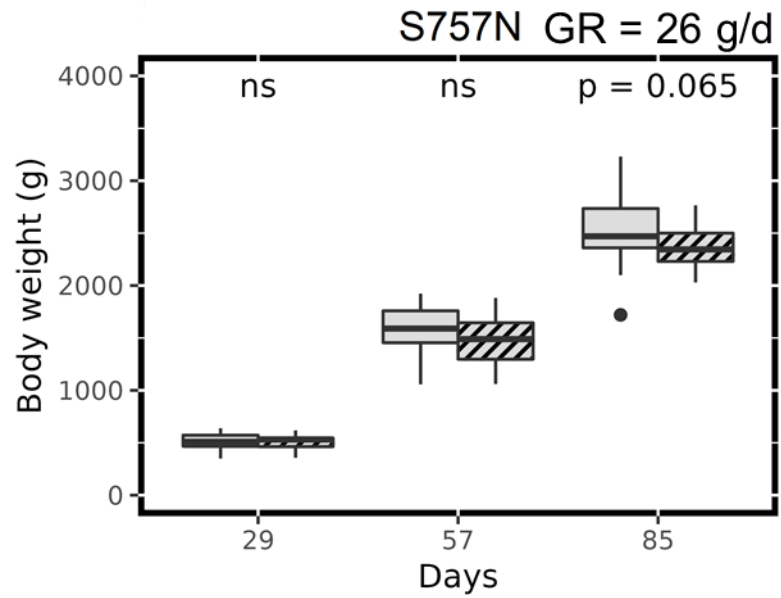
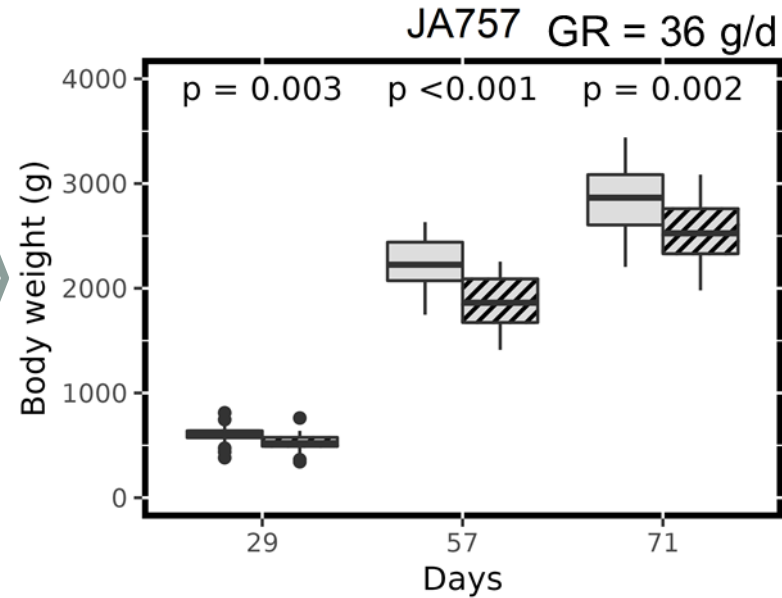
PPILOW Method – Experimentation from February until June 2021



PPILOW Results Performance : growth

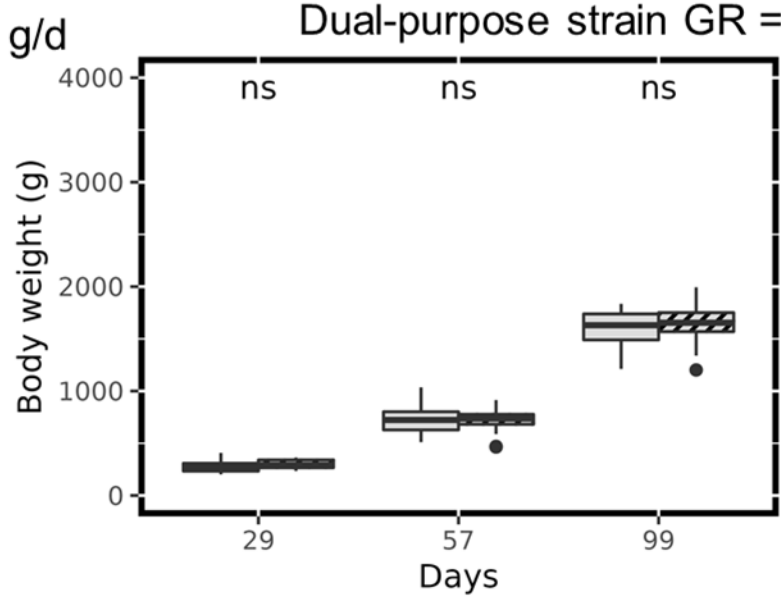
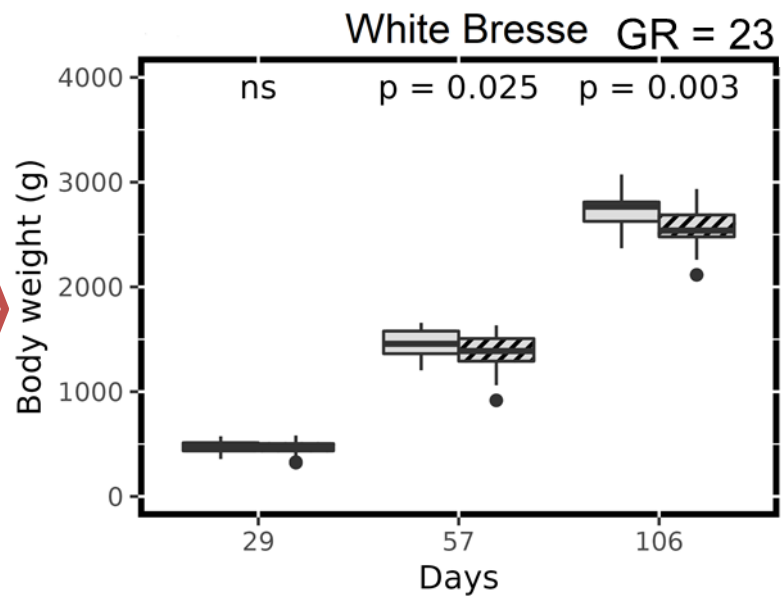
Low-rangers
 High-rangers

Differential body weight may be partly a cause of differential range use?



Differential body weight may be a consequence of differential range use?

Differential body weight may be a consequence of differential range use



No relationship between range use and body weight

PPILOW Results Performance: Meat yields and quality

Item	JA757			S757N			White Bresse			Dual-purpose		
	LR (n=25)	HR (n=25)	P	LR (n=25)	HR (n=25)	P	LR (n=25)	HR (n=25)	P	LR (n=25)	HR (n=25)	P
Growth performances												
Carcass weight (g)	1973 ± 268	1748 ± 227	0.006	1740 ± 243	1606 ± 150	0.047	1802 ± 131	1672 ± 145	0.006	997 ± 120	1026 ± 125	0.605
Carcass yield (% of BW)	69.4 ± 1.3	68.6 ± 1.5	0.072	69.0 ± 1.6	67.6 ± 1.3	0.006	65.7 ± 1.4	65.1 ± 1.4	0.176	63.2 ± 1.3	62.3 ± 1.1	0.009
Breast weight (g)	233 ± 37	201 ± 31	0.006	183 ± 30	168 ± 18	0.047	176 ± 15	165 ± 19	0.068	83 ± 13	84 ± 12	0.702
Breast yield (% of BW)	16.4 ± 1.1	15.8 ± 1.0	0.072	14.5 ± 1.1	14.1 ± 1.0	0.236	12.8 ± 0.7	12.8 ± 0.8	0.994	10.5 ± 0.9	10.3 ± 0.6	0.605
Thigh weight (g)	351 ± 48	315 ± 37	0.012	322 ± 39	300 ± 33	0.047	358 ± 27	332 ± 27	0.006	195 ± 23	199 ± 24	0.653
Thigh yield (% of BW)	24.7 ± 0.9	24.8 ± 0.5	0.518	26.0 ± 1.3	25.2 ± 1.0	0.047	26.2 ± 0.9	25.9 ± 0.8	0.316	24.8 ± 0.5	24.2 ± 0.6	0.018
Meat quality												
Yellowness (b*)	10.2 ± 1.2	11.3 ± 1.4	0.009	11.1 ± 1.4	11.1 ± 1.7	0.973	11.9 ± 1.3	11.8 ± 1.0	0.903	10.2 ± 1.4	12.0 ± 1.7	0.002

In overall, higher cut meat weights and yields in Low Rangers than in High Rangers

→ Trade-off between range use and performances

Higher foraging activity → higher consumption of grass containing carotenoids → higher intake of carotenoids (Mattioli et al., 2022)

PPILOW Results Physiology and metabolism : blood parameters at slaughter

- ★ JA757
- ★ S757N
- ★ White Bresse
- ★ Dual-purpose

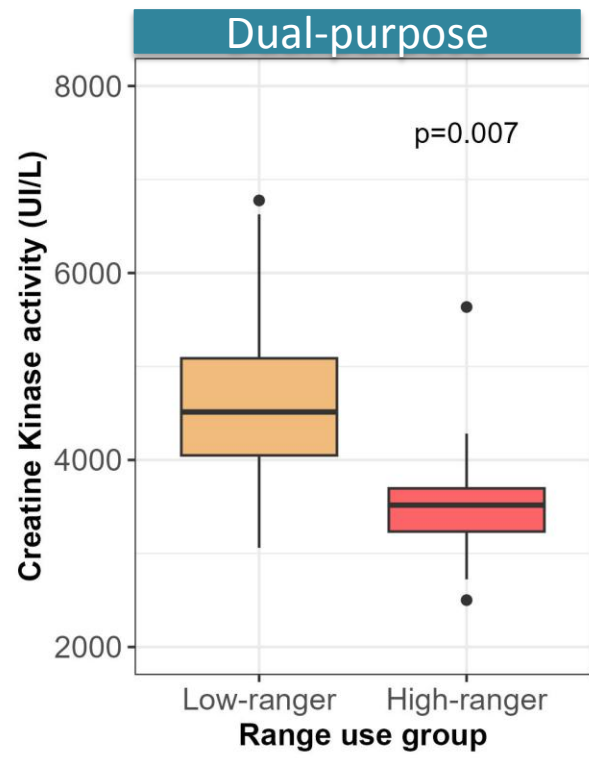
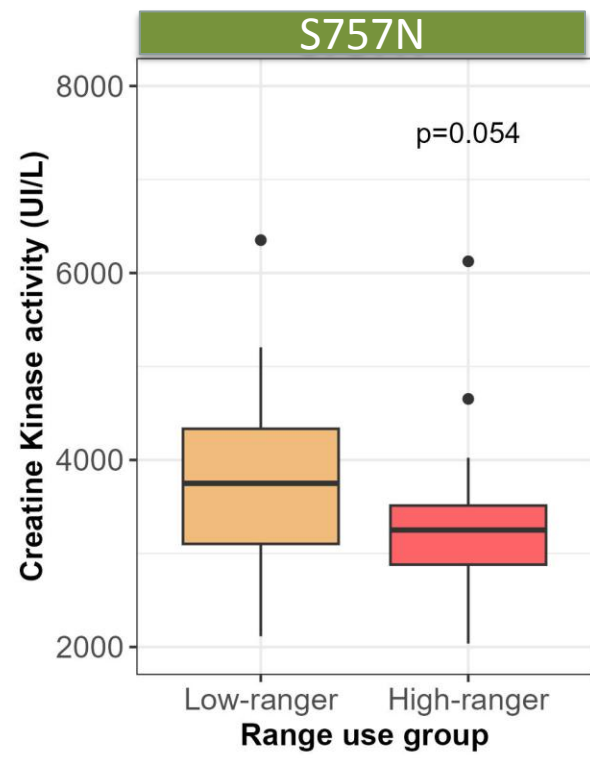
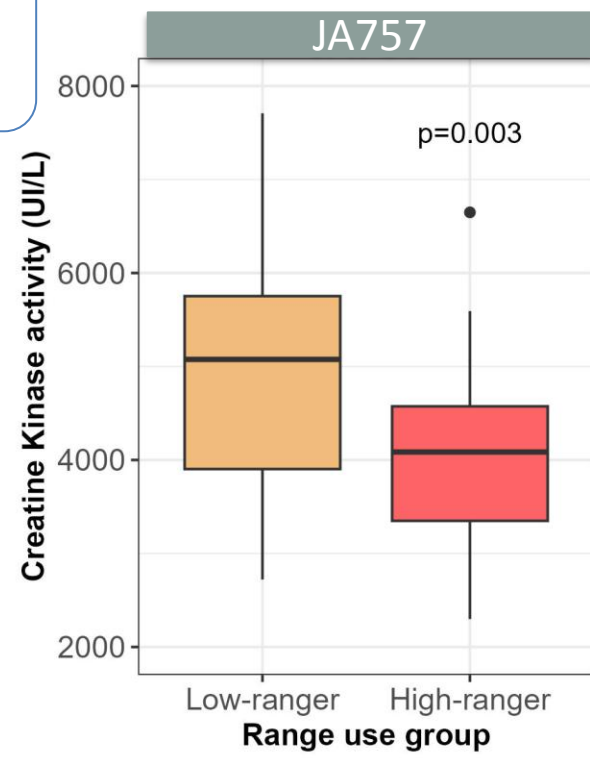
Range use

Retained Energy?

Muscle growth

Creatine kinase activity

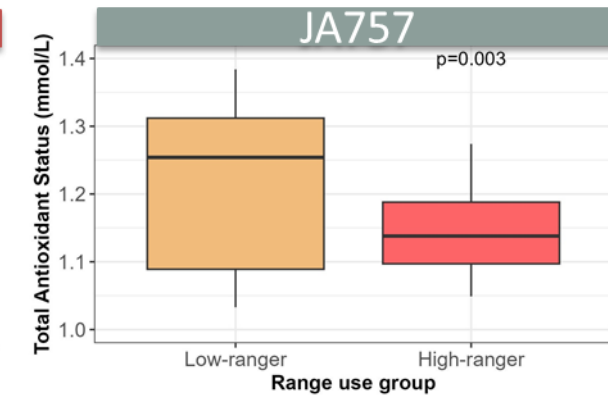
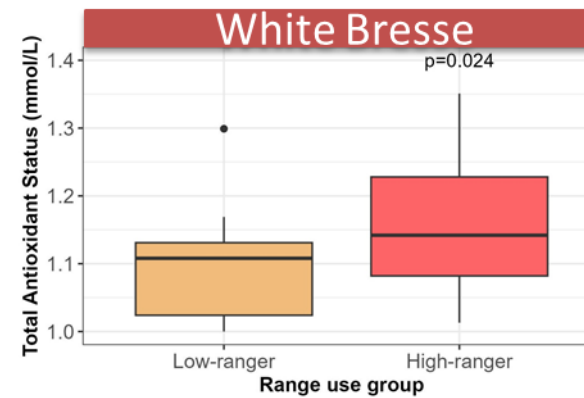
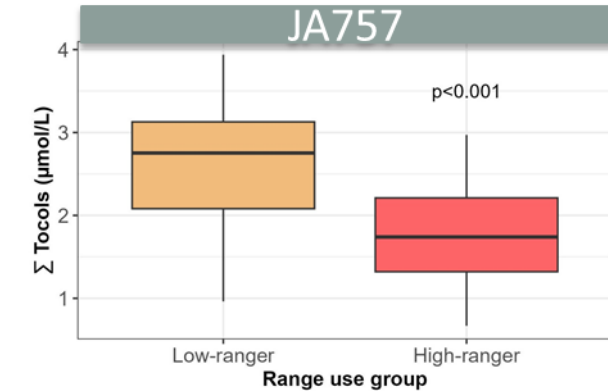
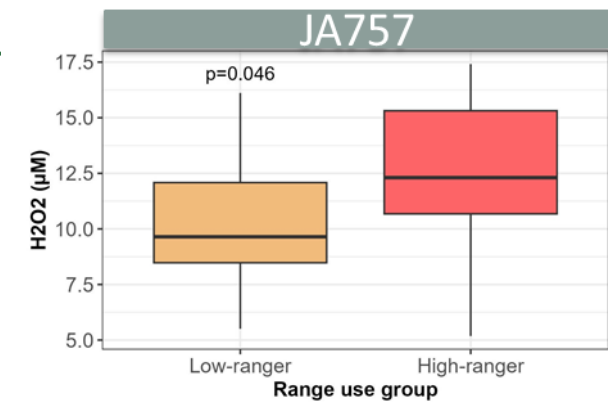
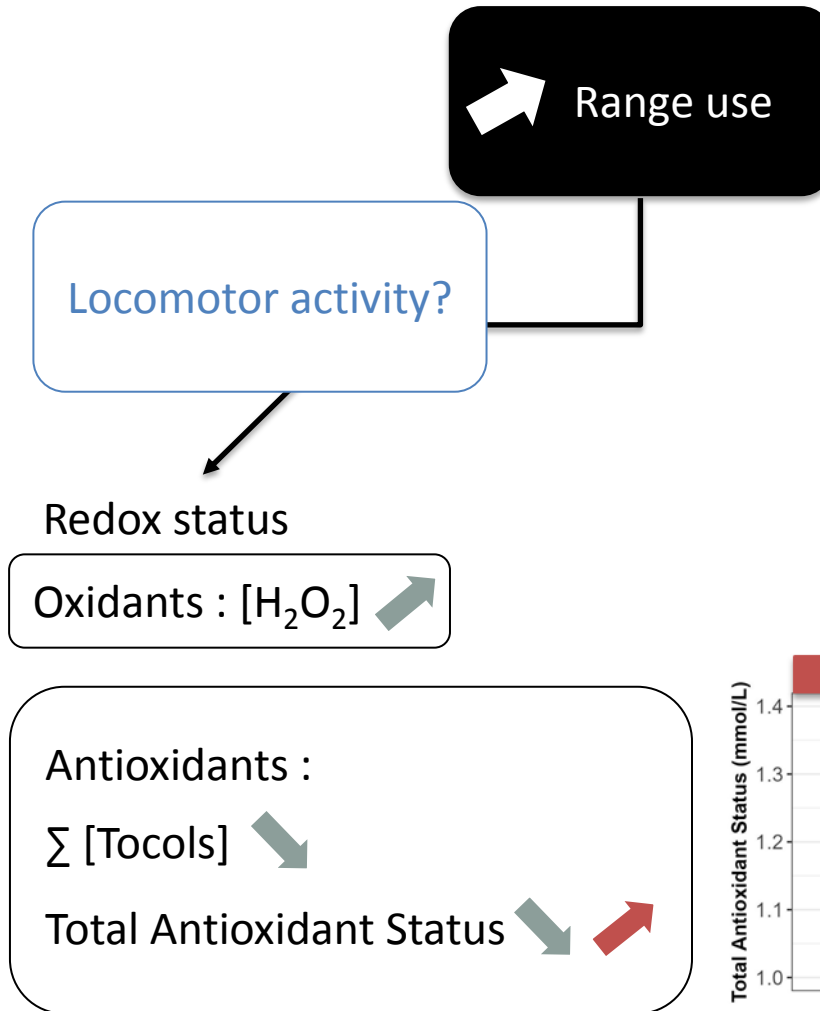
Less cellular stress?



Creatine kinase activity is associated with muscle growth rate (Berri et al., 2007)

PPILOW Results Physiology and metabolism : blood parameters at slaughter

- ★ JA757
- ★ S757N
- ★ White Bresse
- ★ Dual-purpose



Antioxidants (TAS, vitamin E) decrease and oxidation indicator (H₂O₂) increases with locomotor activity (Mattioli et al., 2017)

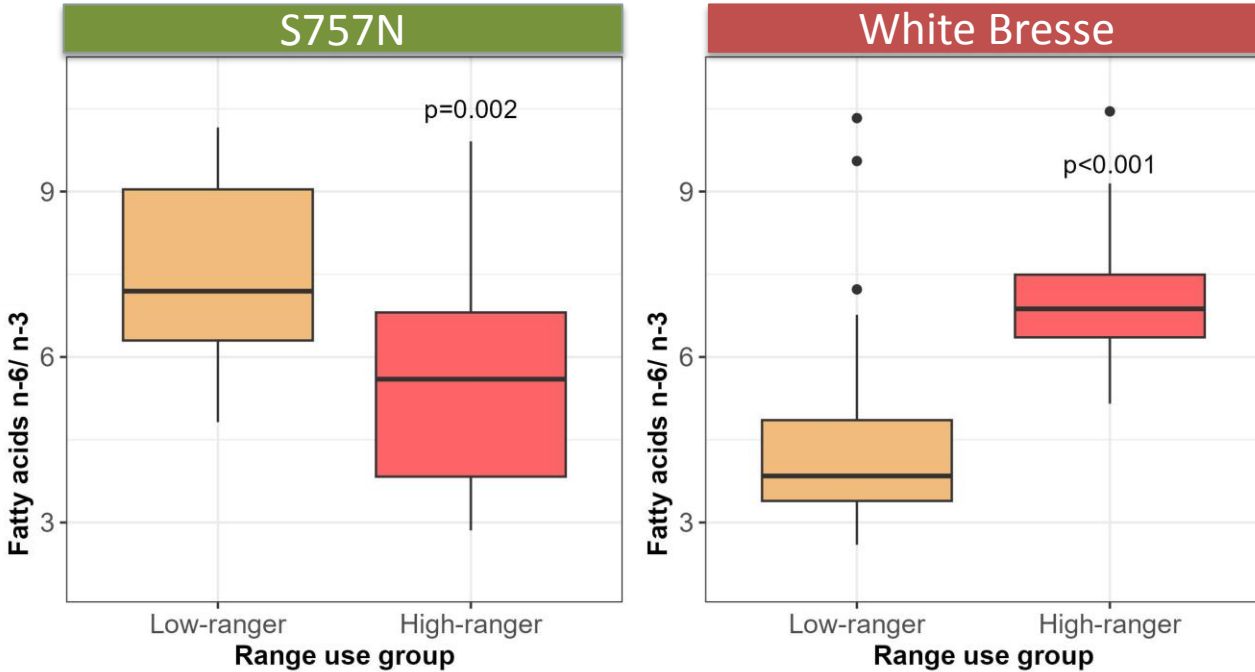
PPILOW Results Physiology and metabolism : blood parameters at slaughter

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Range use

Potential foraging activity?

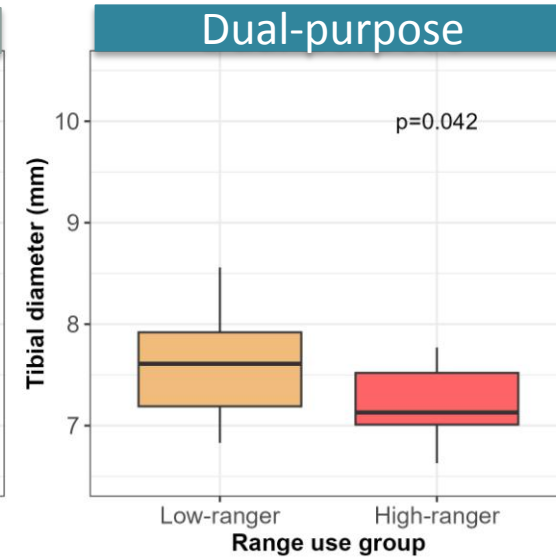
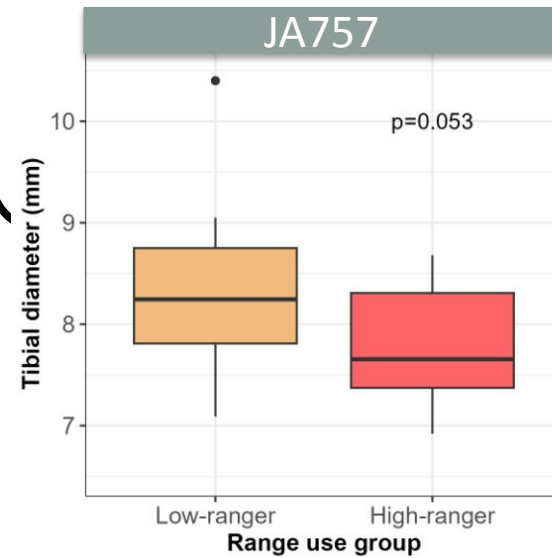
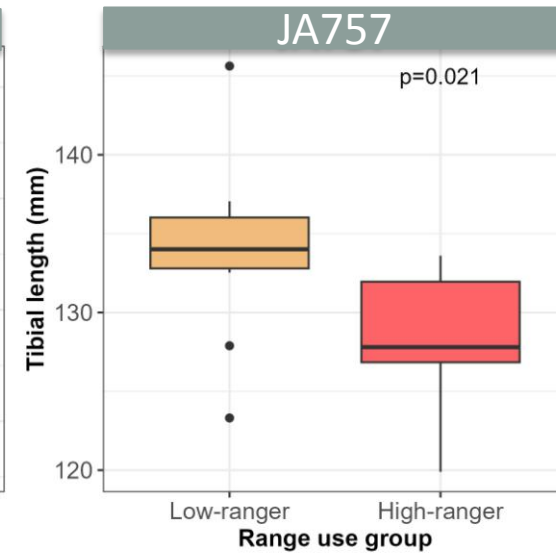
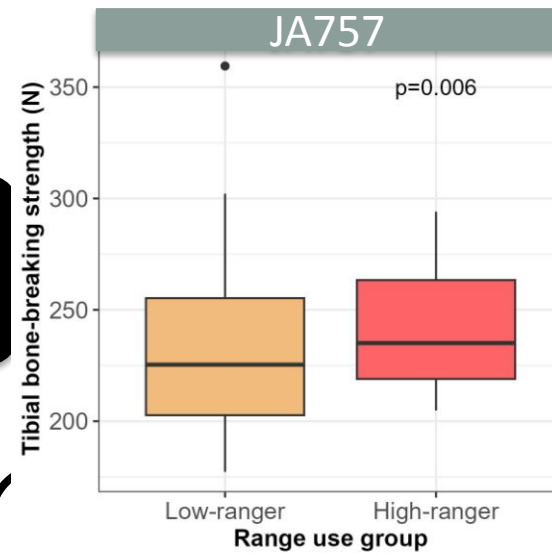
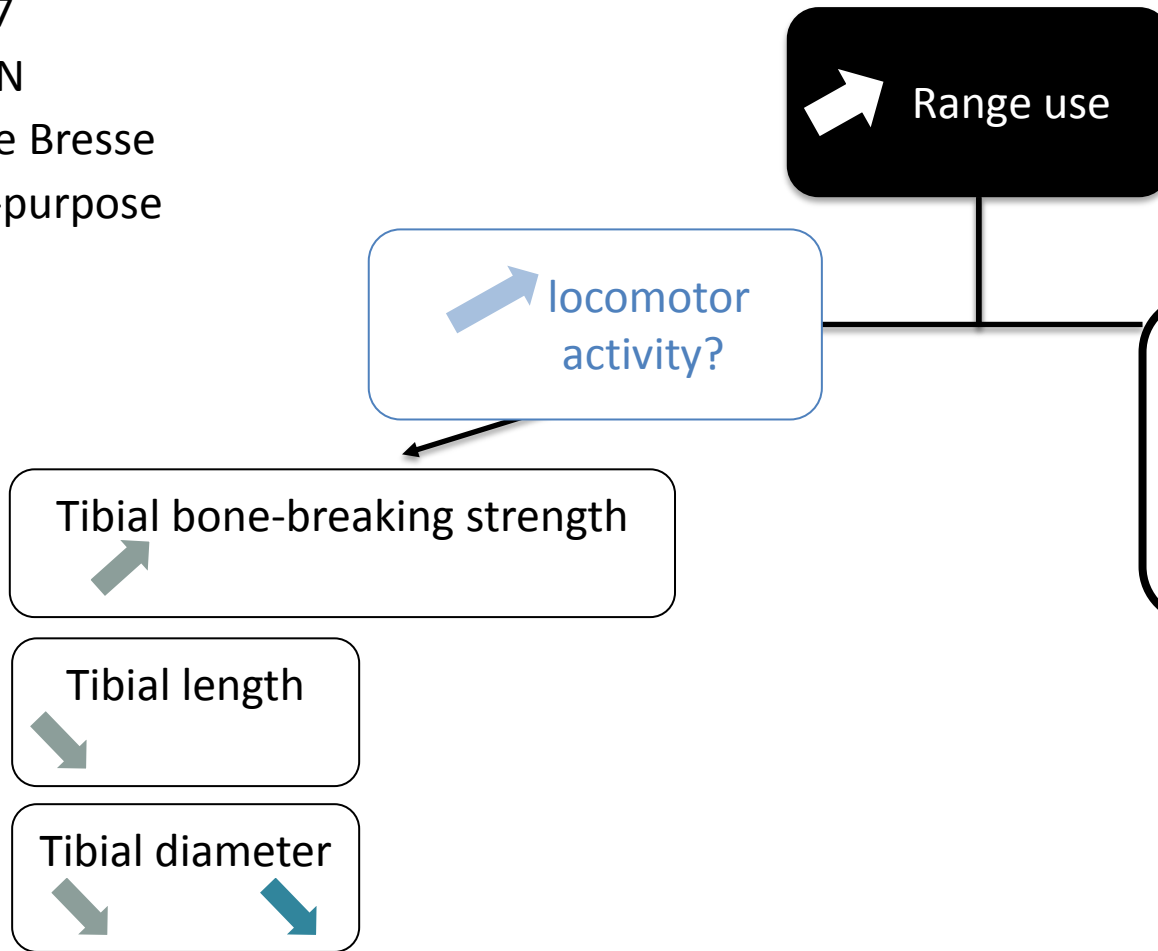
n-6/n-3 fatty acids



Foraging activity → consumption of grass with low n-6/n-3 fatty acids → low n-6/n-3 in the blood (Mattioli et al., 2022)

PPILOW Results Health and Welfare

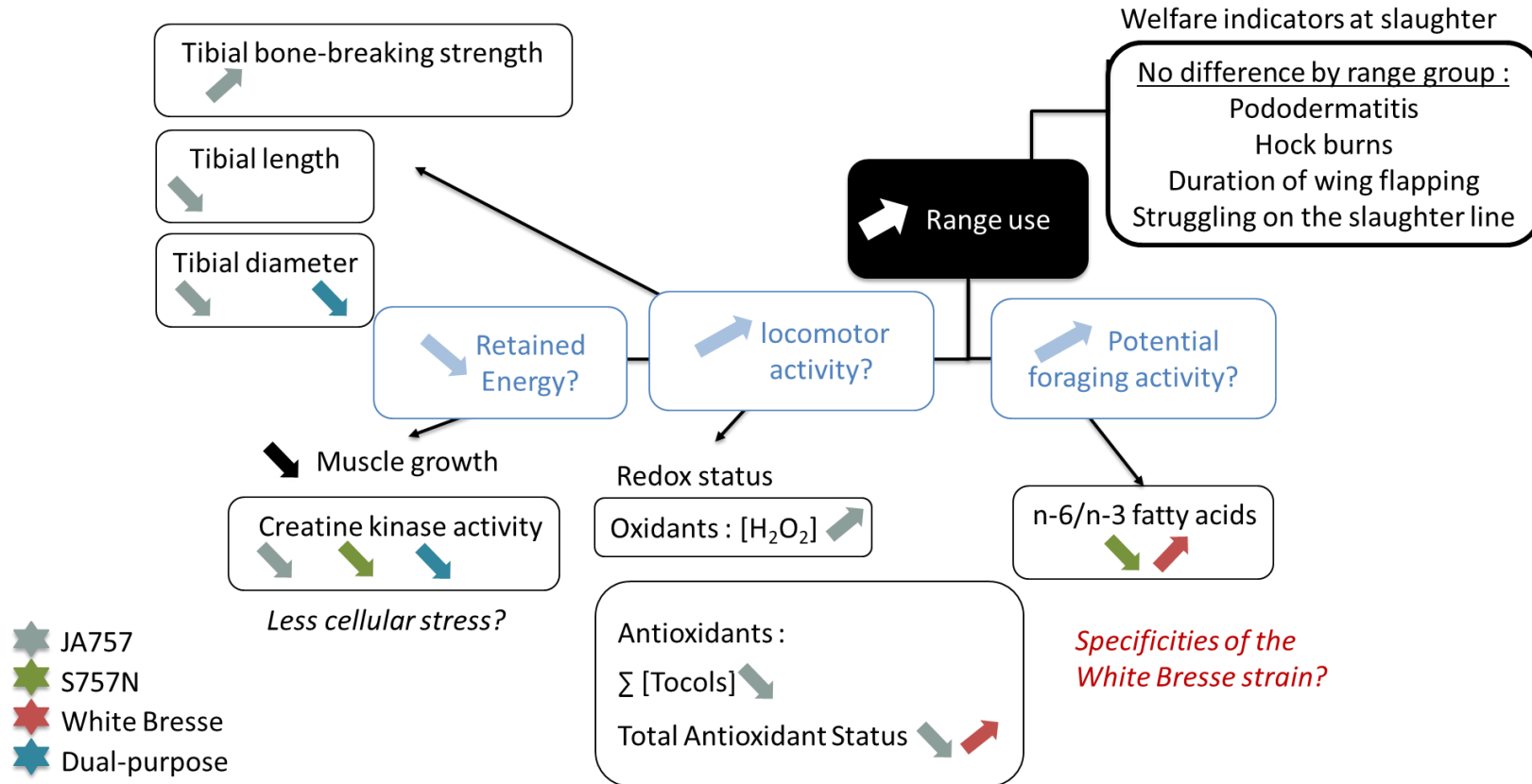
- ★ JA757
- ★ S757N
- ★ White Bresse
- ★ Dual-purpose



Decreased length and stronger tibial bone in chickens in free-range compared to indoor systems (Fanatico et al., 2005; Stadig et al., 2016)
 Decreased tibial length association with forced exercise (Foutz et al., 2007)

PPILOW Conclusions

- Little effect of greater range use in slow-growing birds on welfare and meat quality indicators except meat yellowness
- Confirmed negative relationship of high range use with performance
- Strain-dependent effects on redox status and blood fatty acids, bone and muscle health
- Many effects observed in JA757: highest growth rate and largest HR/LR Final distance index ratio



Genetic selection possibilities to obtain a compromise between ranging behaviour, performance and health?

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PPILOW PARTNERS



Thank you for your attention

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