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Claire Bonnefous, Anne Collin, Laurence A. Guilloteau, Karine Germain, Sandrine Mignon-Grasteau, Maxime Reverchon, Simona Mattioli, Cesare Castellini, Vanessa Guesdon, Ludovic Calandreau, et al.

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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

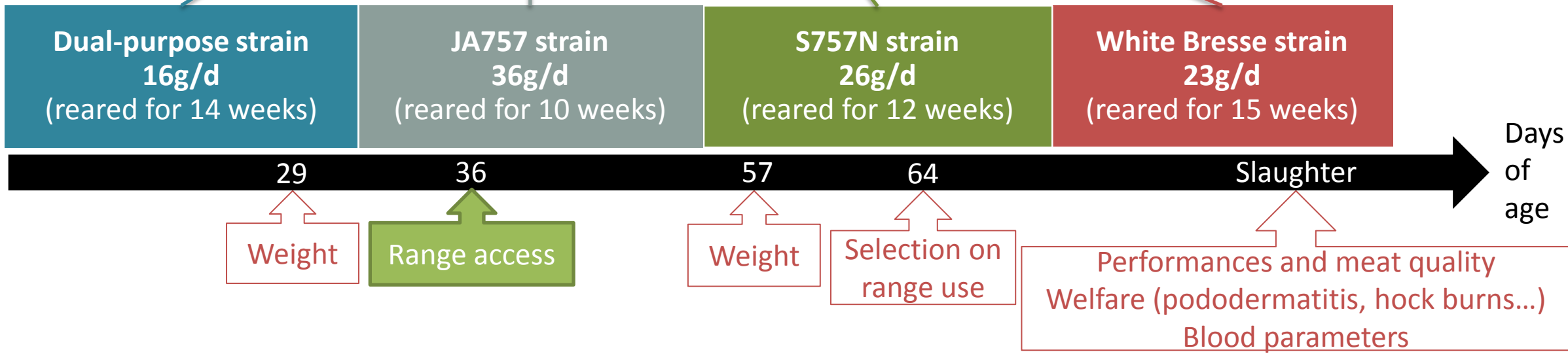
*Ferreira et al., 2019; Bonnefous et al., 2023*

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

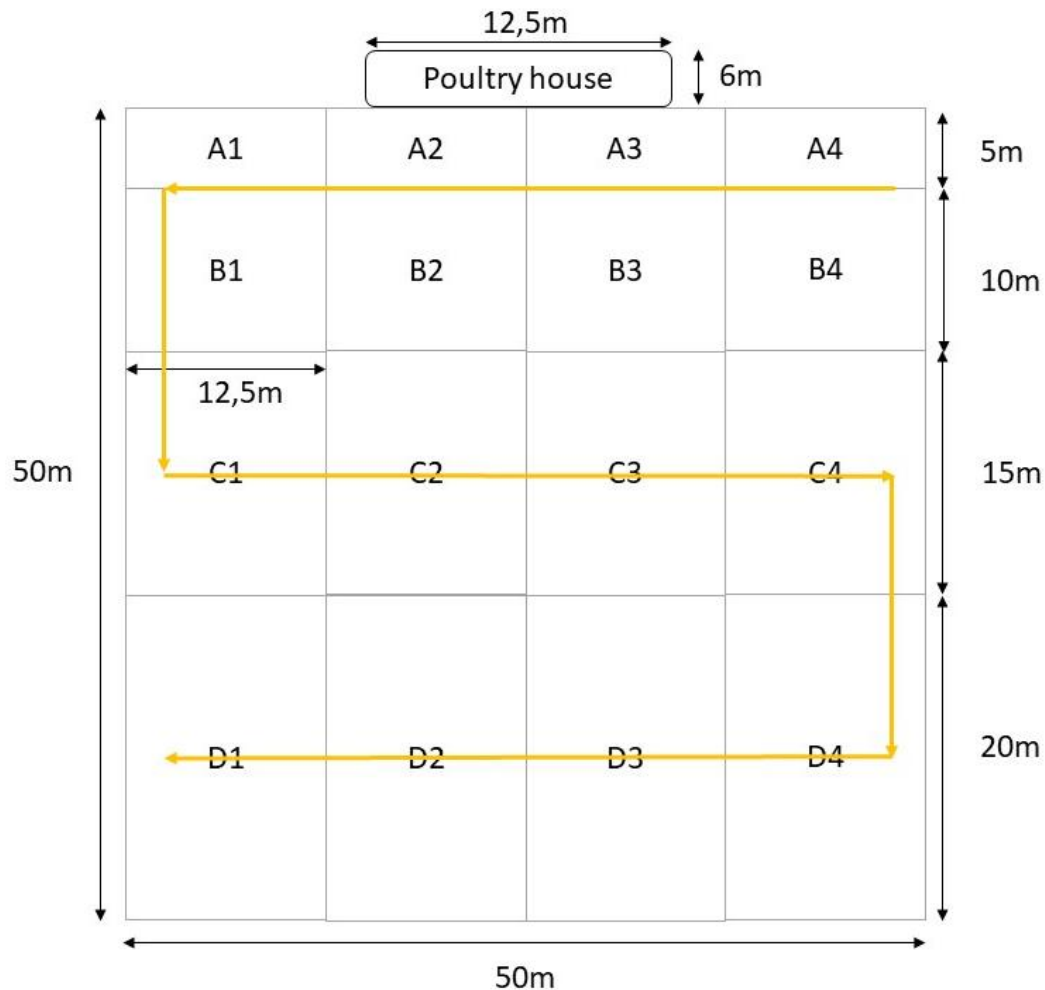
4 strains: 1 per range; 750 animals per strain ; 50% males, 50% females



# 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

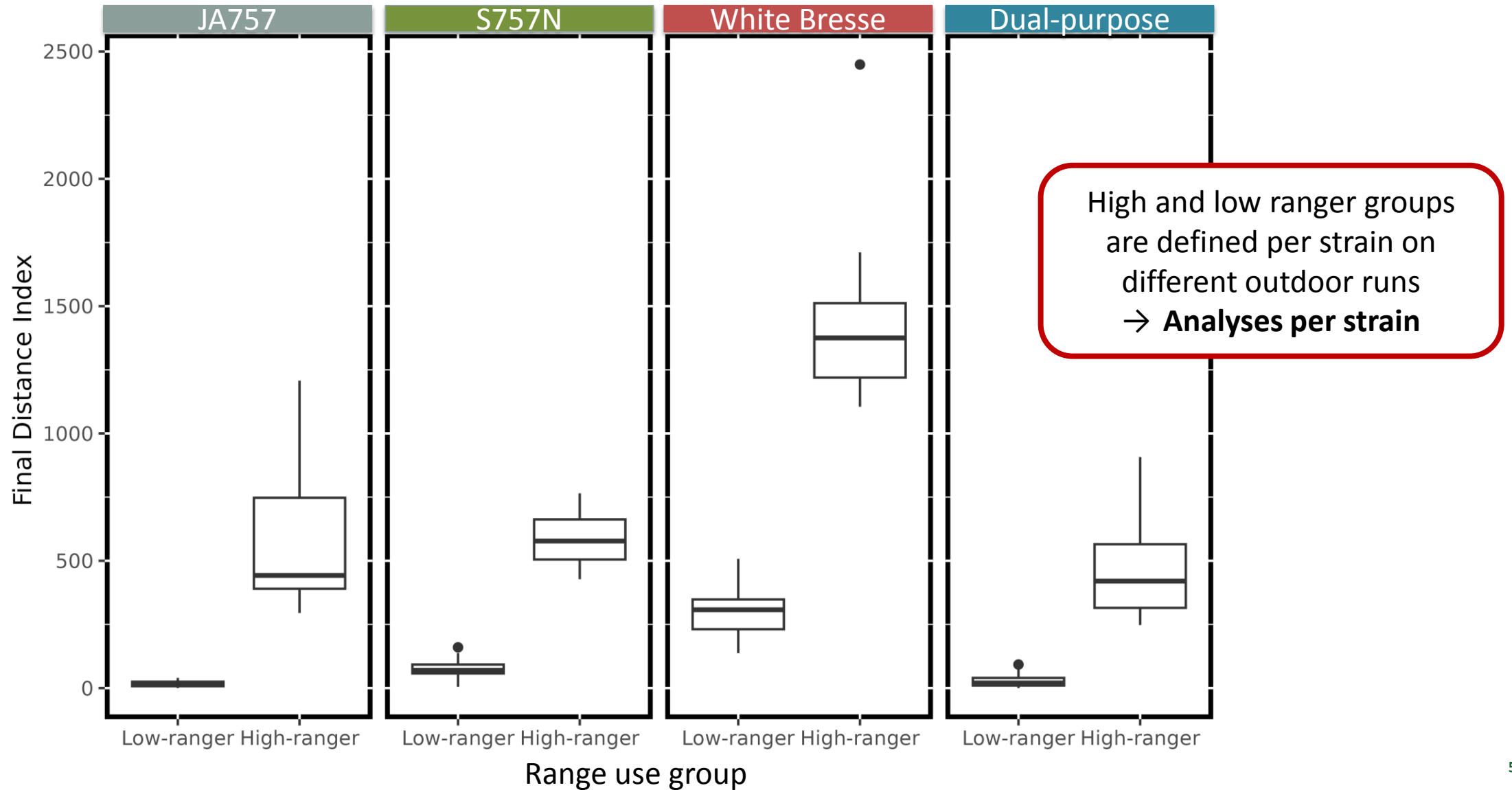
Distance Index =

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

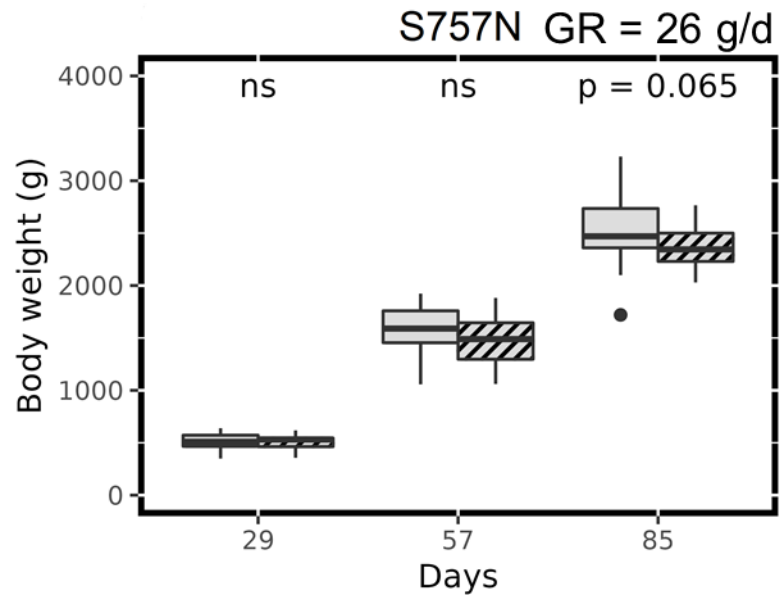
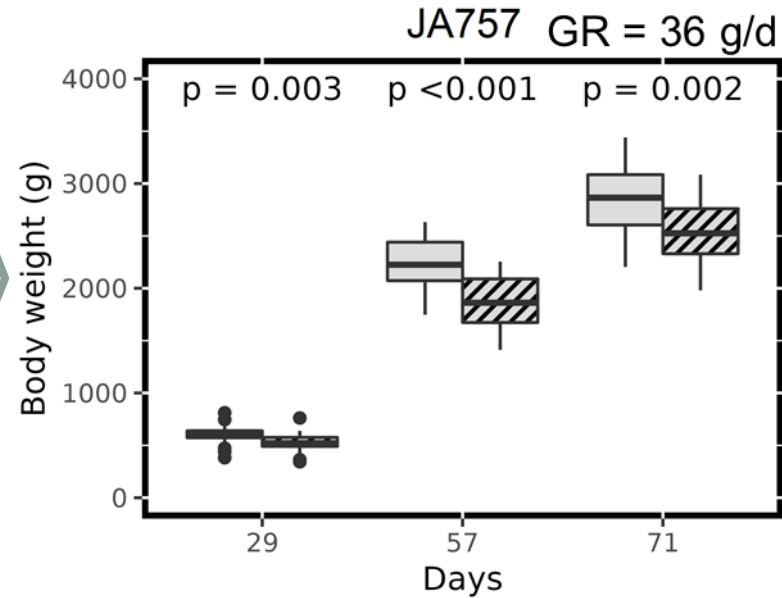
# PPILOW Method – Experimentation from February until June 2021



# PPILOW Results Performance : growth

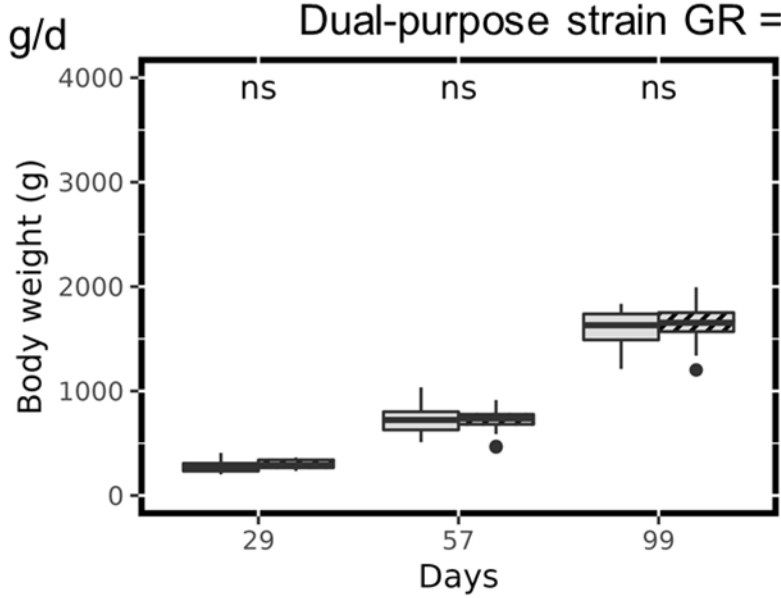
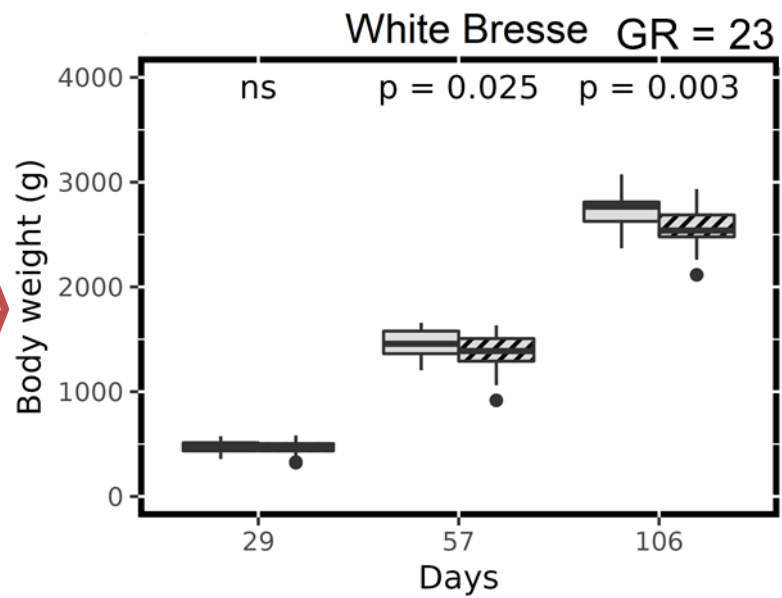
Low-rangers  
 High-rangers

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	<b>0.006</b>	1740 ± 243	1606 ± 150	<b>0.047</b>	1802 ± 131	1672 ± 145	<b>0.006</b>	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	<b>0.006</b>	65.7 ± 1.4	65.1 ± 1.4	0.176	63.2 ± 1.3	62.3 ± 1.1	<b>0.009</b>
Breast weight (g)	233 ± 37	201 ± 31	<b>0.006</b>	183 ± 30	168 ± 18	<b>0.047</b>	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	<b>0.012</b>	322 ± 39	300 ± 33	<b>0.047</b>	358 ± 27	332 ± 27	<b>0.006</b>	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	<b>0.047</b>	26.2 ± 0.9	25.9 ± 0.8	0.316	24.8 ± 0.5	24.2 ± 0.6	<b>0.018</b>
Meat quality												
Yellowness (b*)	10.2 ± 1.2	11.3 ± 1.4	<b>0.009</b>	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	<b>0.002</b>

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

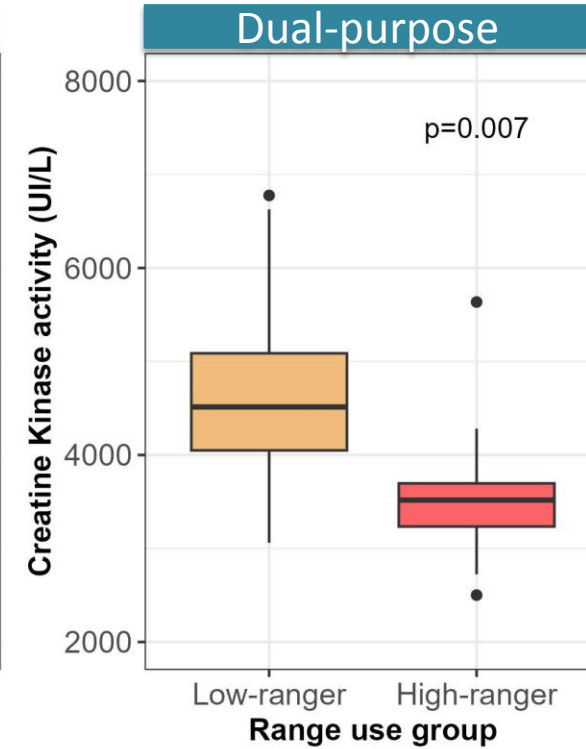
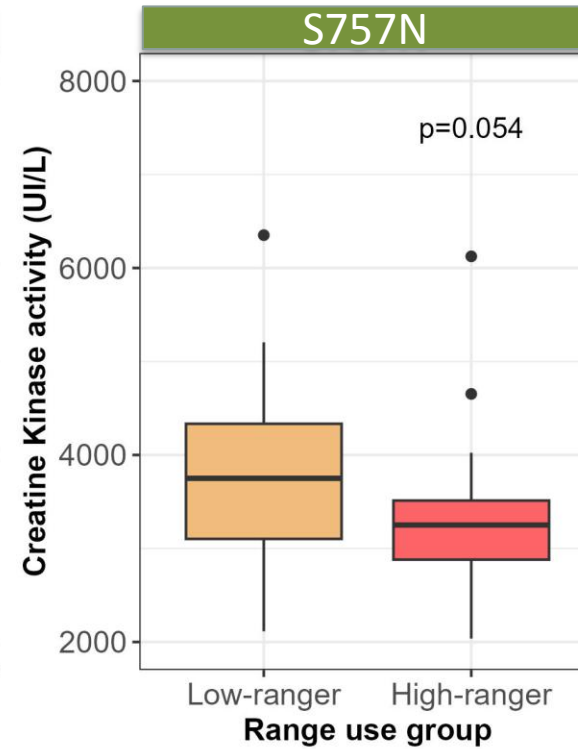
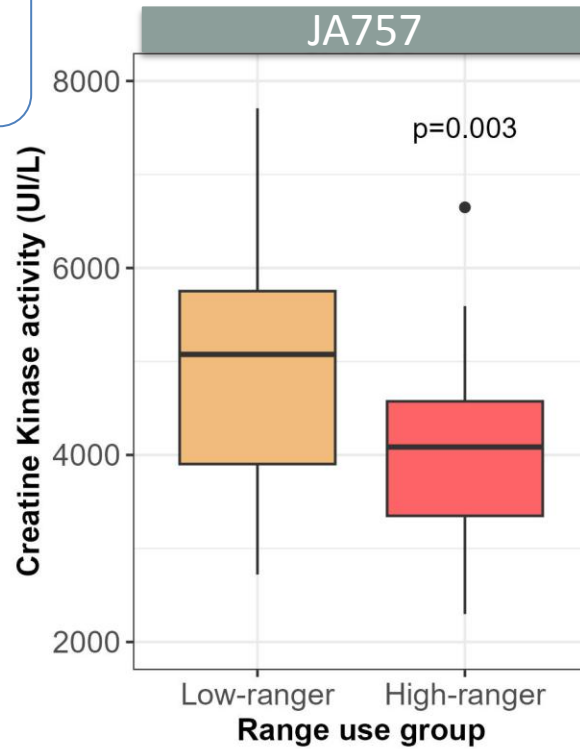
Retained Energy?

Muscle growth

Creatine kinase activity



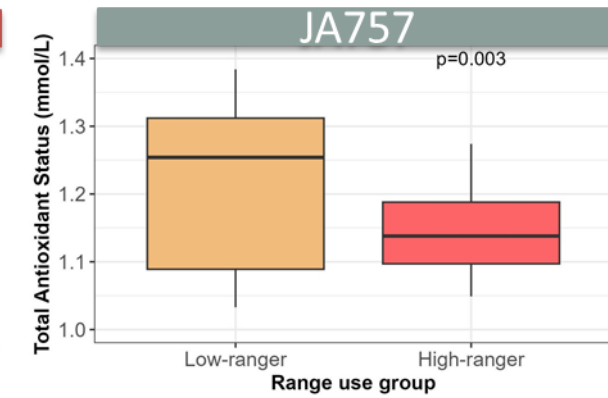
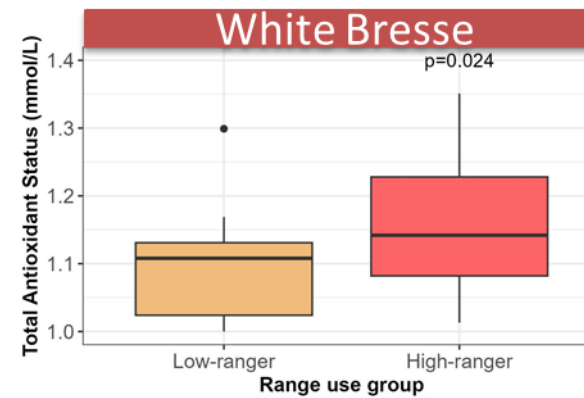
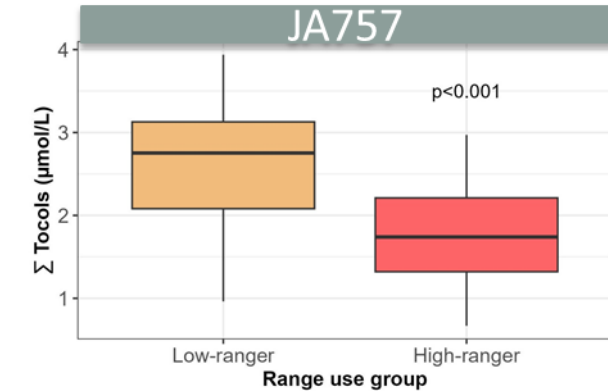
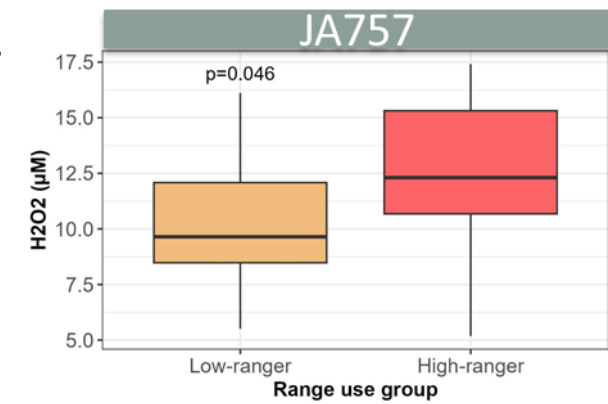
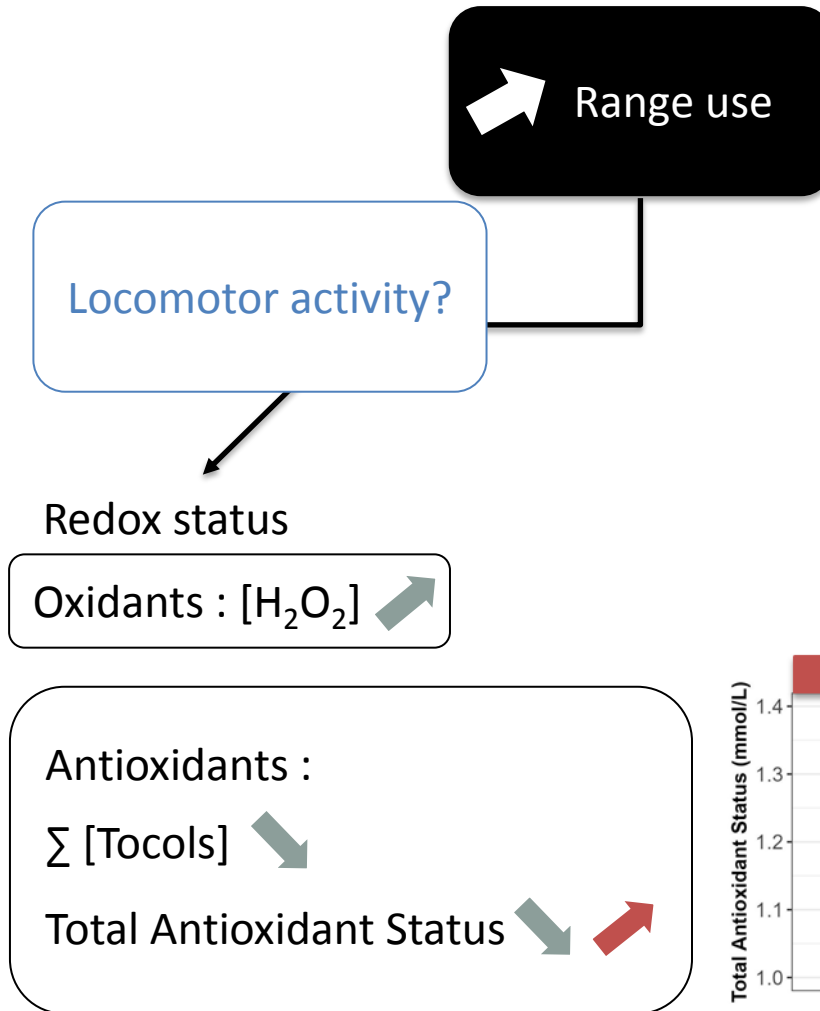
Less cellular stress?



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

# PPILOW Results Physiology and metabolism : blood parameters at slaughter

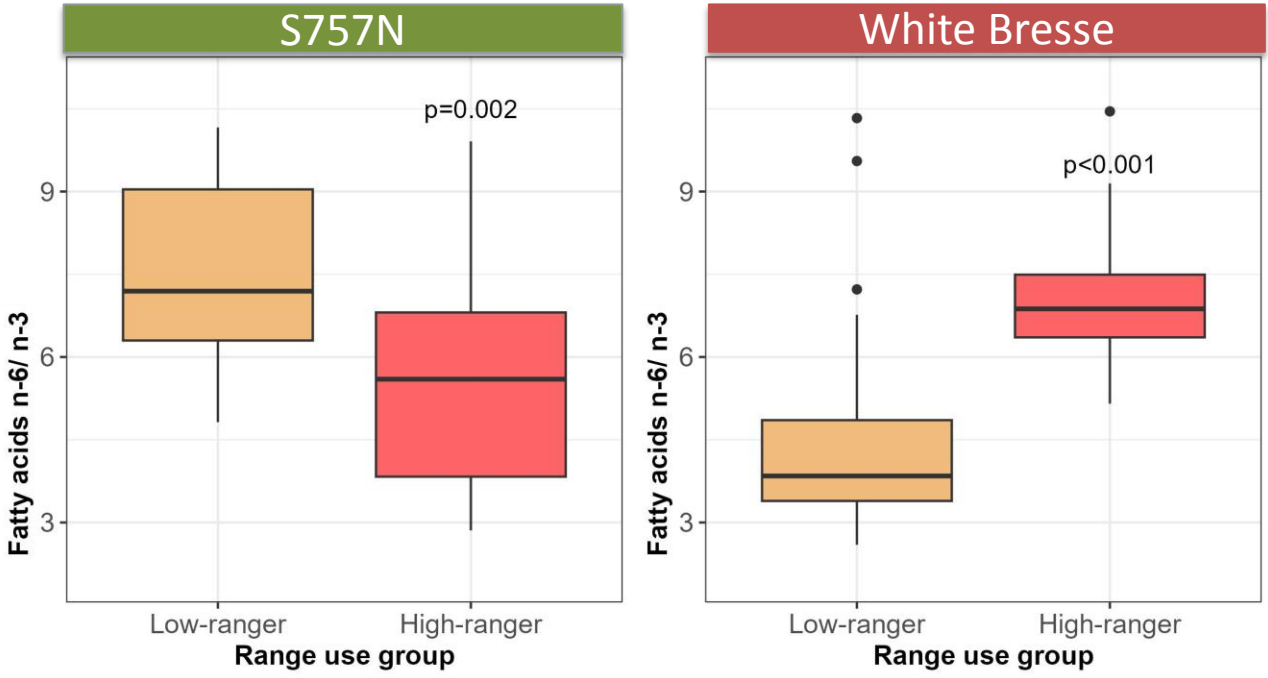
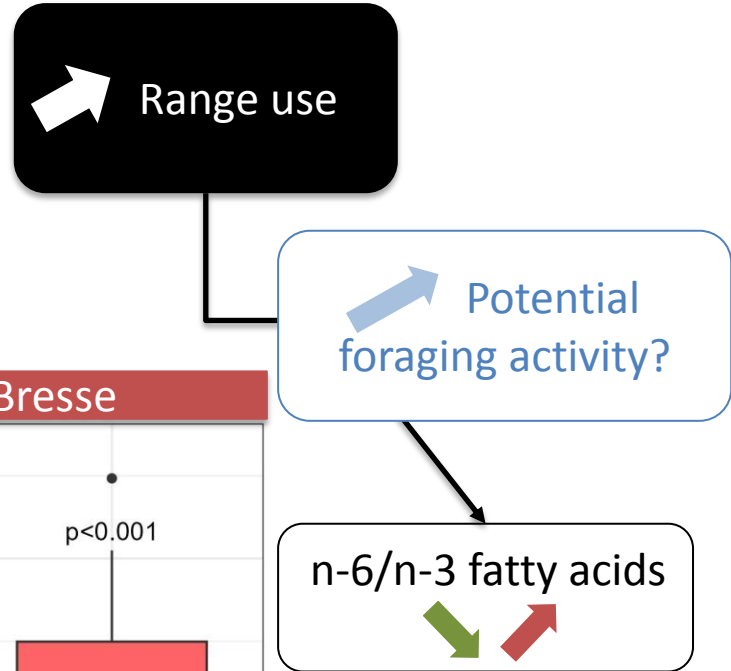
- ★ JA757
- ★ S757N
- ★ White Bresse
- ★ Dual-purpose



Antioxidants (TAS, vitamin E) decrease and oxidation indicator (H<sub>2</sub>O<sub>2</sub>) increases with locomotor activity (Mattioli et al., 2017)

# PPILOW Results Physiology and metabolism : blood parameters at slaughter

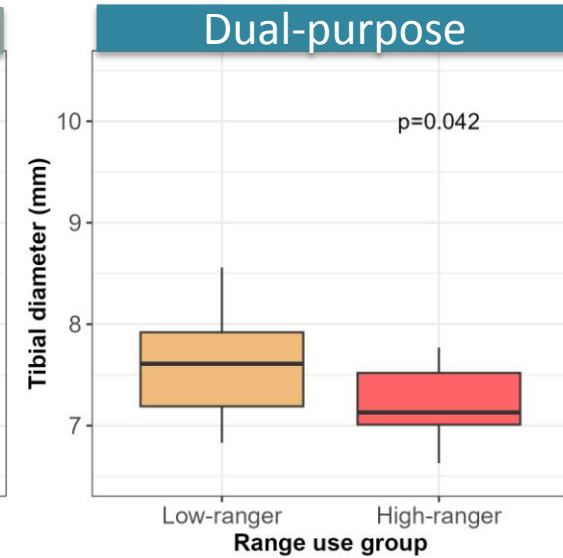
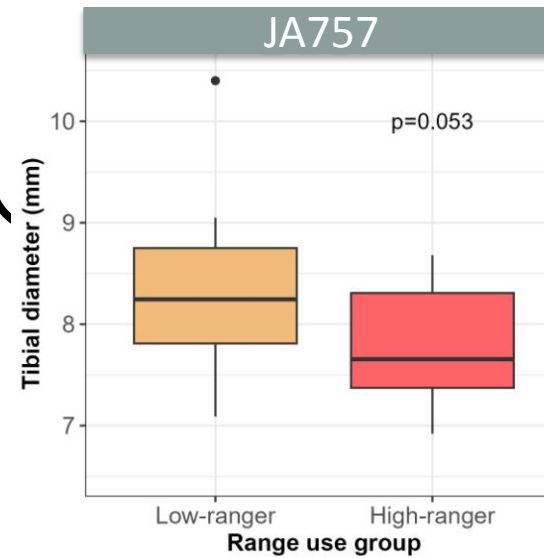
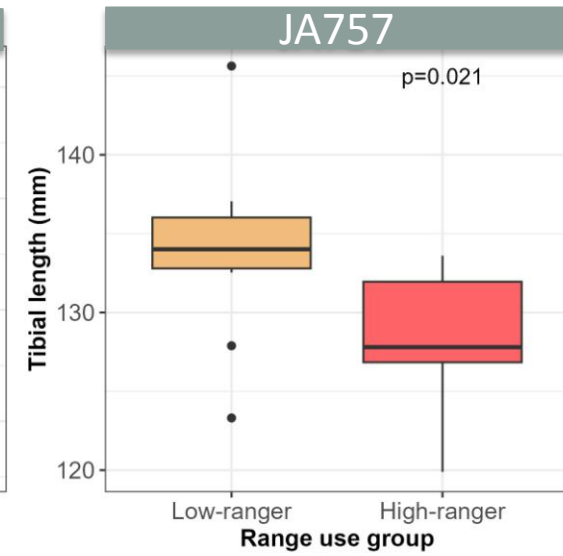
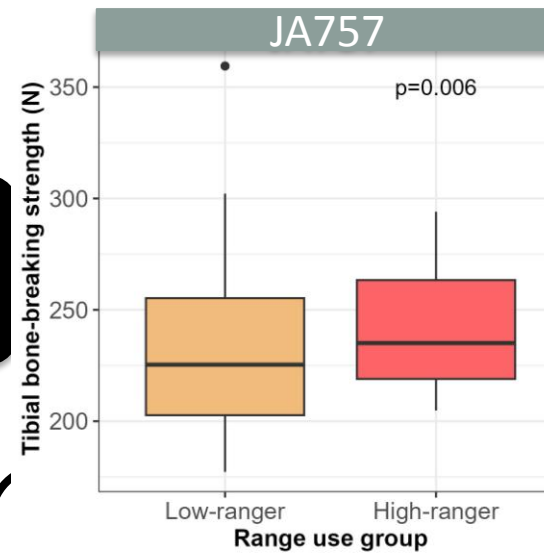
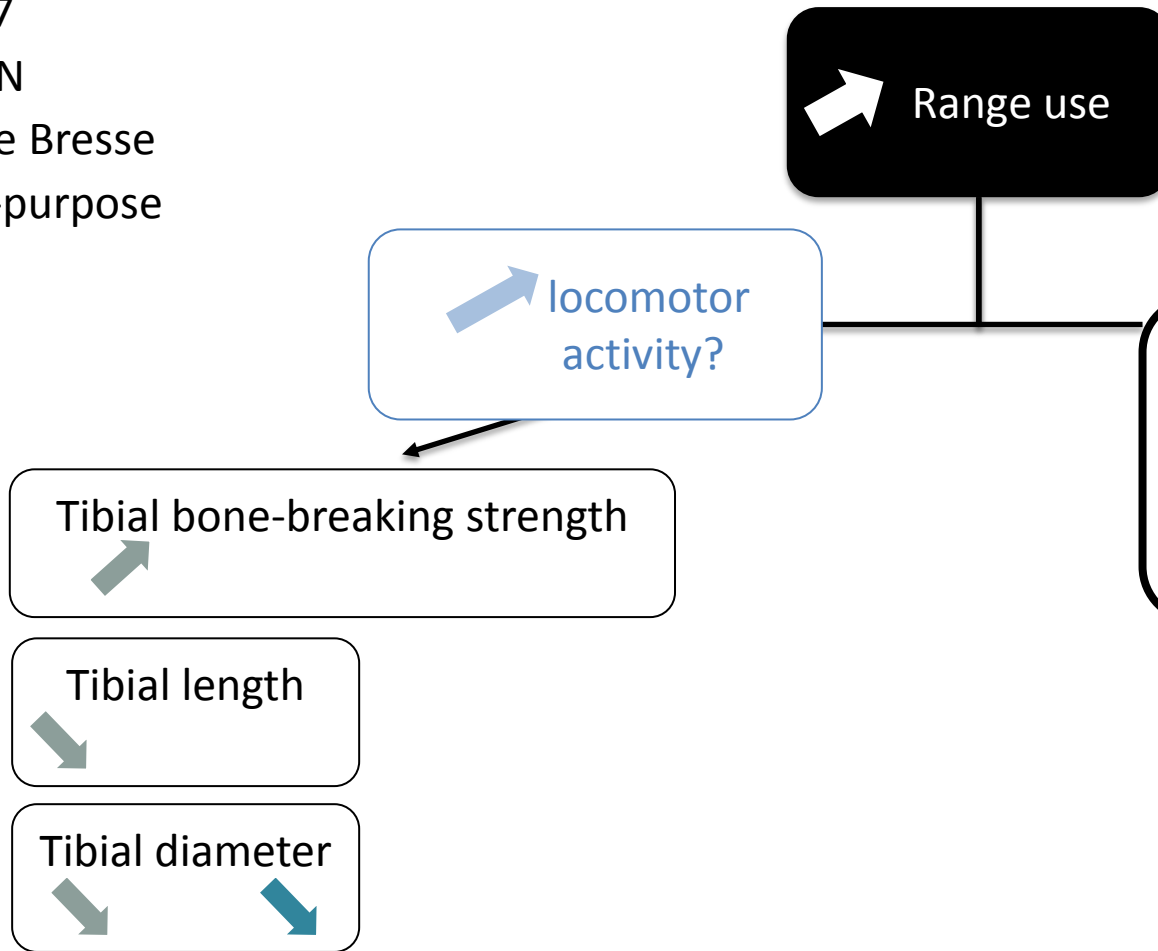
- ★ JA757
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- ★ White Bresse
- ★ Dual-purpose



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

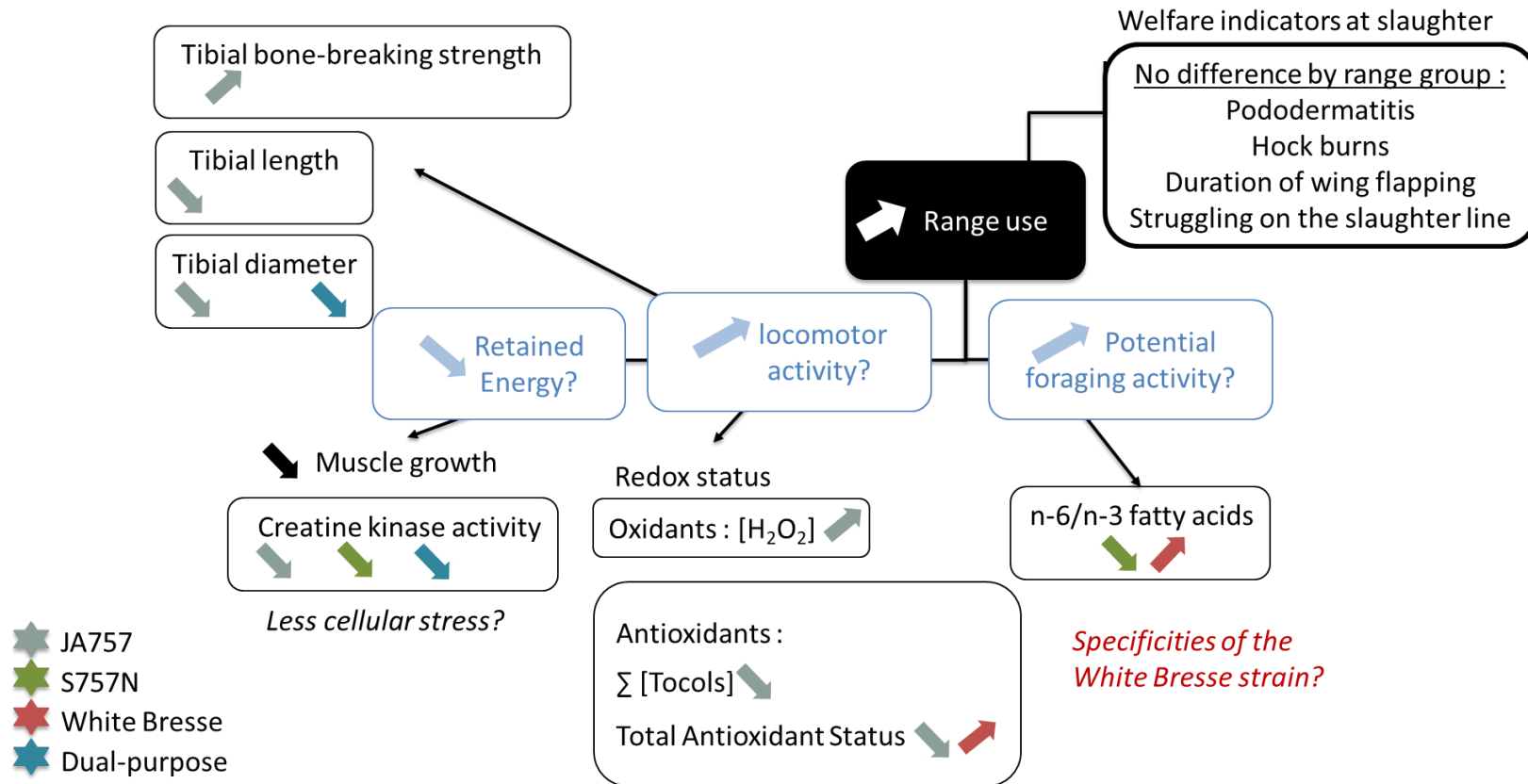
- ★ JA757
- ★ S757N
- ★ White Bresse
- ★ Dual-purpose



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*

[www.ppilow.eu](http://www.ppilow.eu)



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