



meatquality.eu

mEAT
quality

Effect of extensification factors on broiler welfare and meat quality



Ingrid C. de Jong¹, Jerine A.J. van der Eijk¹, Seren Yigitturk², Sara W. Erasmus²

¹Wageningen Livestock Research; ²Food Quality and Design

Wageningen University and Research, the Netherlands



Funded by
the European Union

"This project has received funding from the European Union's Horizon 2020 Research And Innovation programme under Grant Agreement No 101000344".



Extensive broiler production systems include common housing and management factors:

- Reduction in stocking density
- Slow(er)-growing broiler strain
- Environmental enrichment
- Outdoor area
- Roughage or low-protein/energy diets

Considered beneficial for **broiler welfare** and to affect **meat quality aspects**



Aim and general setup

To determine whether extensification factors in broiler production systems have a beneficial effect on both broiler welfare and meat quality aspects

Two trials in a 2x2 factorial setup:

1. Effect of a reduction in stocking density and provision of roughage
2. Effect of a slow-growing breed and environmental enrichments



Trial 1 Experimental design

2x2 Factorial design

Stocking density

- 39 kg/m² (high)
- 21 kg/m² (low)

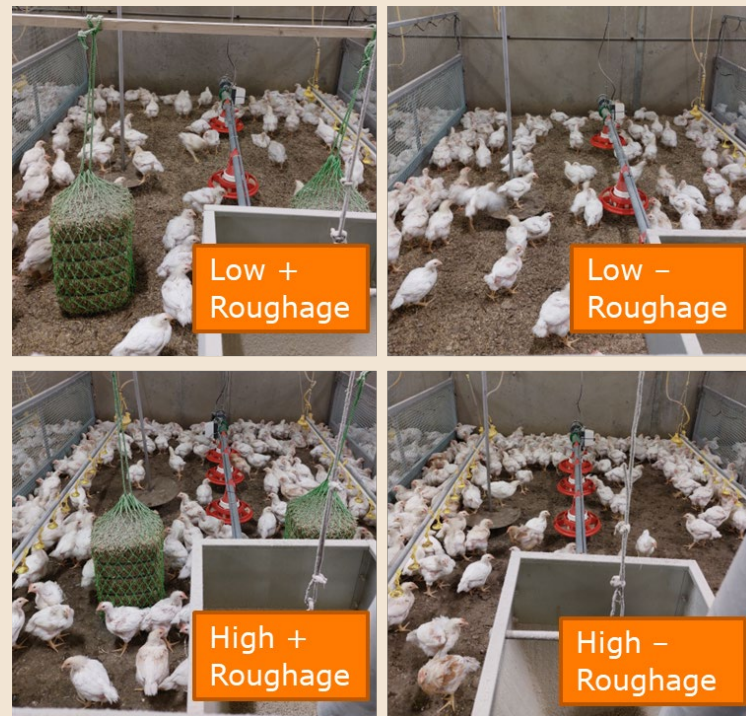
Roughage

- 2 lucerne bales
- No roughage

Breed: Hubbard JA757

(slower-growing breed applied in free range systems)

N=4 pens/treatment combination



Funded by
the European Union

Trial 2 Experimental design

2x2 Factorial design

Breed

- Hubbard JA787 ('fast-growing')
- Hubbard S757N ('slow-growing')

Enrichment

- Perch, dustbath and lucerne bale
- No enrichment

Stocking density: 31 kg/m²

N=5 pens/treatment combination

mEAT
quality



Funded by
the European Union

Measurements in both trials

- Performance
 - Behavioural observations (0.5, 1.1, 1.9 kg)
 - Behavioural tests (fearfulness, play) (0.5, 1.1, 1.9 kg)
 - Use of enrichment/roughage (0.5, 1.1, 1.9 kg)
 - Litter quality (0.5, 1.1, 1.9 kg)
 - Clinical welfare indicators: gait score, footpad dermatitis, hock burns, cleanliness and injuries (1.9 kg)
-
- Meat texture (at approx. 2 kg)
 - Meat colour (at approx. 2 kg)
 - Carcass yield (at approx. 2 kg)



Measurements in both trials

- Performance
- Behavioural observations (0.5, 1.1, 1.9 kg)
- Behavioural tests (fearfulness, play) (0.5, 1.1, 1.9 kg)
- Use of enrichment/roughage (0.5, 1.1, 1.9 kg)
- Litter quality (0.5, 1.1, 1.9 kg)
- Clinical welfare indicators: gait score, footpad dermatitis, hock burns, cleanliness and injuries (1.9 kg)
- Meat texture (at approx. 2 kg)
- Meat colour (at approx. 2 kg)
- Carcass yield (at approx. 2 kg)

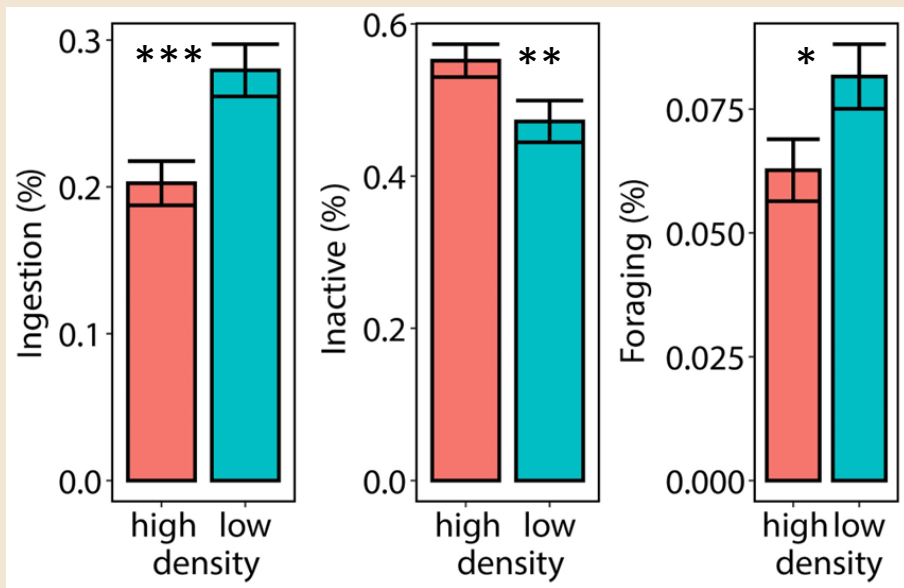


Trial 1 results: welfare and meat quality effects of reduced stocking density and roughage provision



Funded by
the European Union

Trial 1 results: home pen behaviour



No interaction effects between stocking density and roughage provision

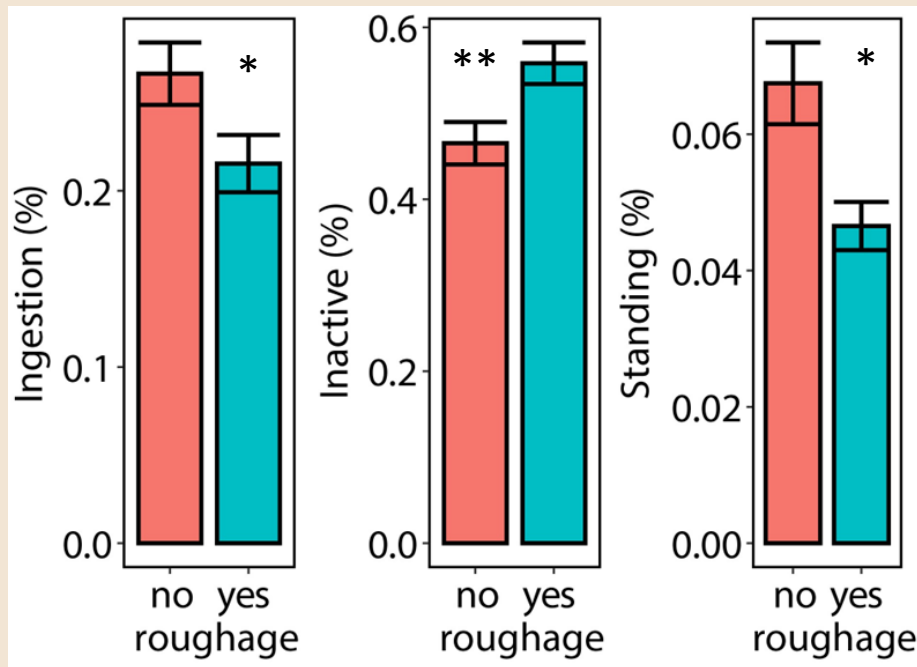
Effects of stocking density

Low density ↓ inactive and ↑ ingestion (eating, drinking) and foraging behaviour compared to high density



Funded by
the European Union

Trial 1 results: home pen behaviour



Effects of roughage provision

Roughage ↓ ingestion and standing and
inactive behaviour ↑ compared to no
roughage

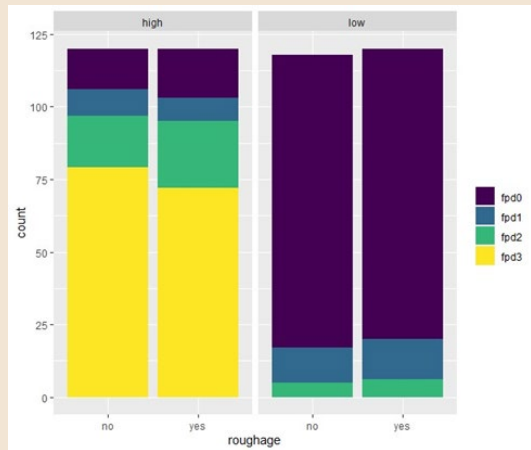


Funded by
the European Union

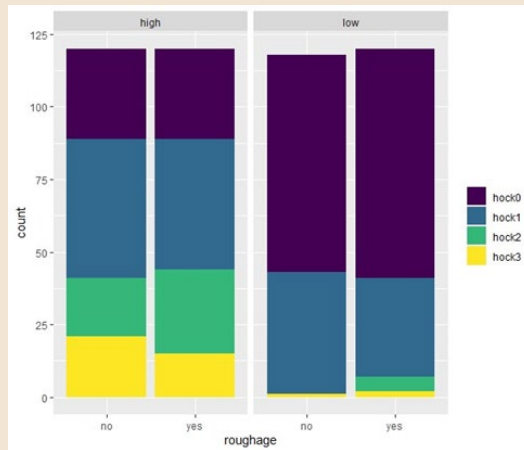
Trial 1 results: clinical welfare indicators

meAT
quality

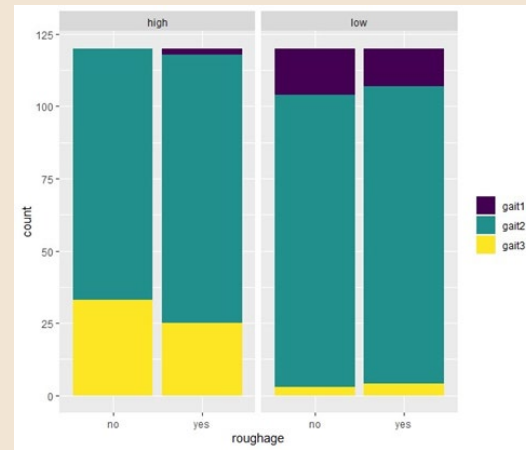
Effect of stocking density ($P < 0.001$), not of roughage provision



Low density better
footpad dermatitis scores



Low density better hock
burn scores



Low density better gait
scores



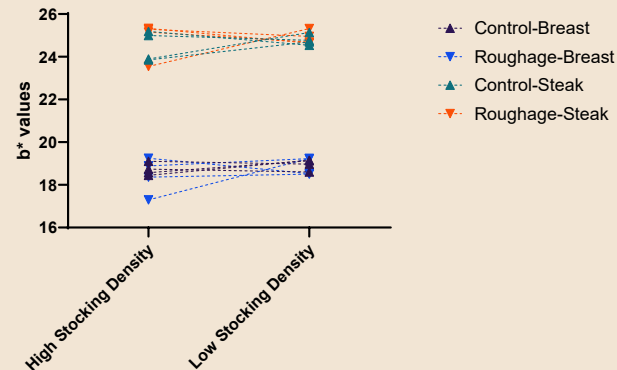
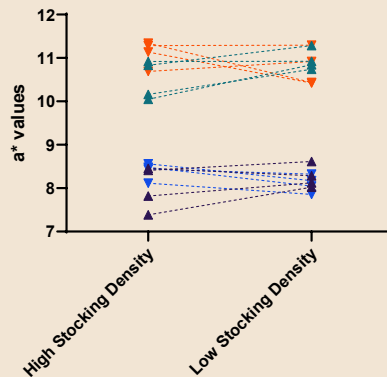
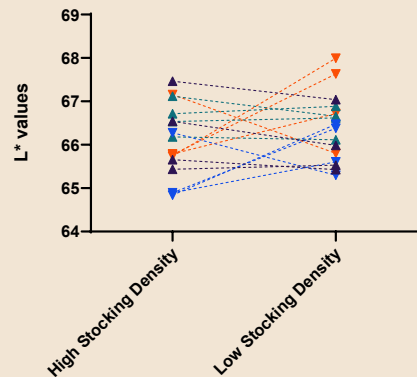
Funded by
the European Union

Low density: cleaner birds and
better litter quality

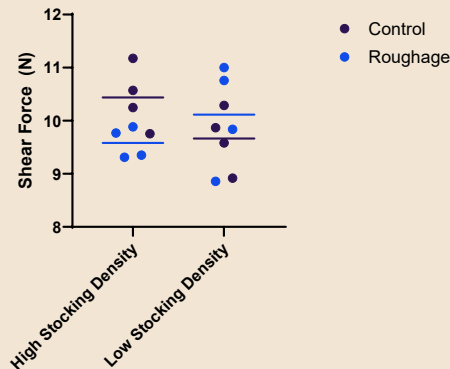
Trial 1 results: meat quality aspects

mEAT
quality

Colour L*a*b* values



Texture BMORS analysis (max shear force)



No treatment or interaction effects
on texture and colour of meat



Funded by
the European Union

Trial 1 conclusions: low stocking density & roughage provision

- Low stocking density had most beneficial effects on broiler welfare
- Roughage provision had some beneficial effects on behaviour
- No effects on meat texture and colour

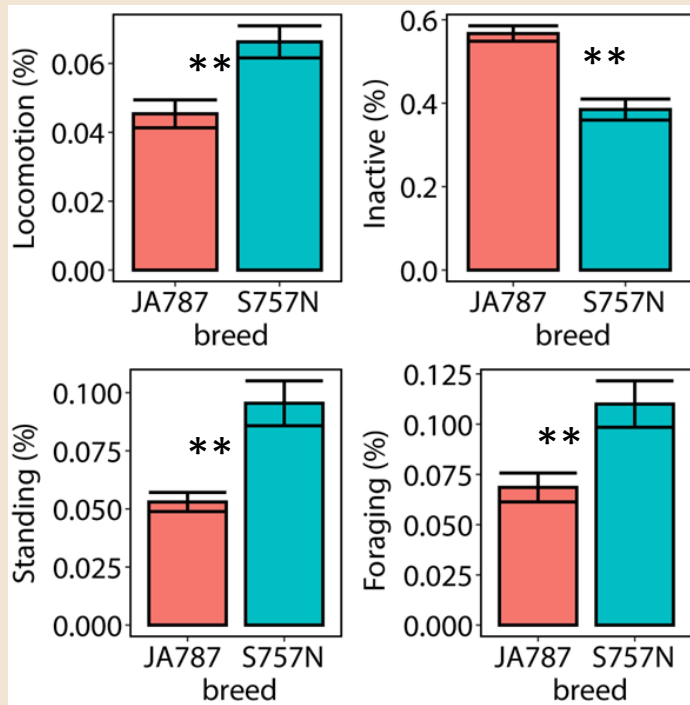


Trial 2 results: welfare and meat quality effects of a slow-growing breed and providing environmental enrichment



Funded by
the European Union

Trial 2 results: home pen behaviour



No effect of environmental enrichment, or interaction breed * enrichment

Breed effect

S757N ↑ locomotion, standing and foraging and ↓ inactive as compared to JA787

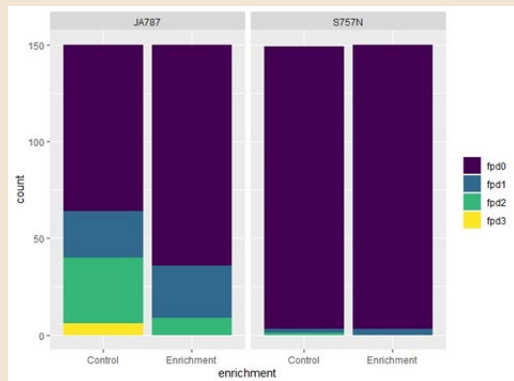


Funded by
the European Union

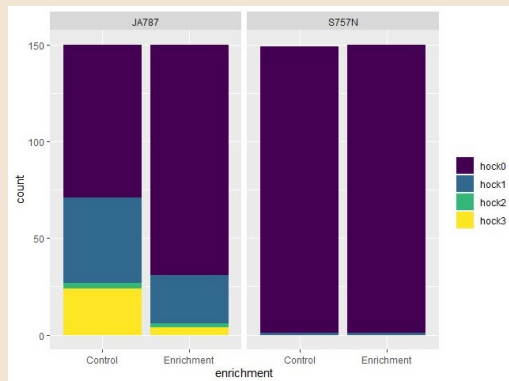
Trial 2 results: clinical welfare indicators

Breed effect ($p < 0.05$), no effect of environmental enrichment

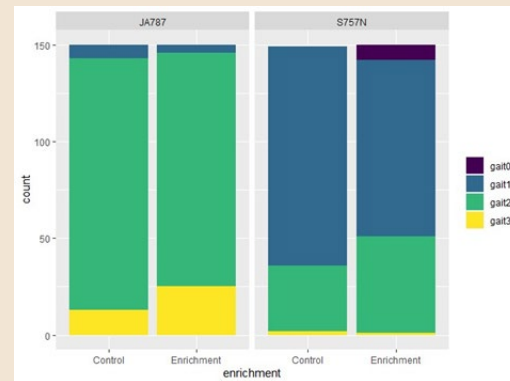
meAT
quality



Slow-growing breed
footpad dermatitis scores



Slow-growing breed
better hock burn scores



Slow-growing breed
better gait scores

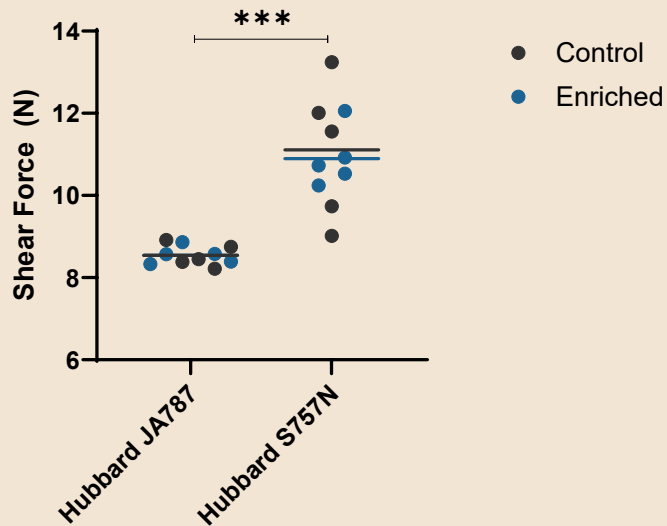
Slow-growing breed: cleaner birds and better litter
quality, environmental enrichment better litter quality



Funded by
the European Union

Trial 2 results: meat quality aspects

mEAT
quality



No effect of enrichment, no interaction effect

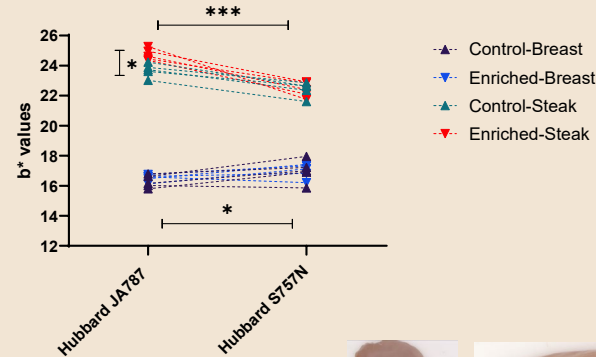
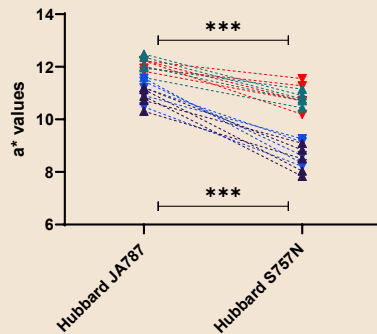
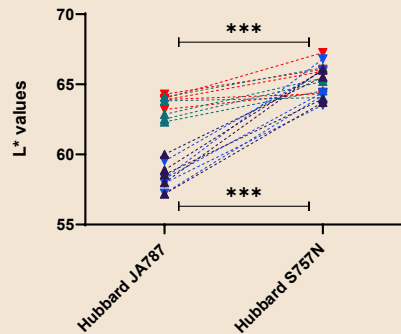
Slow-growing breed showed higher shear force ($p < 0.001$) (tougher meat)



Funded by
the European Union

Trial 2 results: meat quality aspects

mEAT
quality



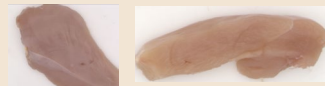
Breed effect: darker colour (pink/red) shades of meat

↑ L* (light); ↓ a* (red); ↓ b* (yellow) in slow-growing broilers

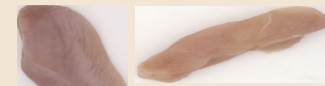
Enrichment effect: enriched = ↑ b* (yellow)

Enrichment * breed effect on b* (yellow)

JA787-Control



JA787-Enriched



S757N-Control



S757N-Enriched



Funded by
the European Union

Trial 2 conclusions: slow-growing breed and environmental enrichment

- Using a slow-growing breed had the most beneficial effect on welfare
- Enrichment had a minor effect on welfare
- Breed significantly impacts the colour characteristics of the meat, with meat of JA787 (faster-growing) being darker, redder, and more yellow, while S757N (slower-growing) is lighter, less red, and less yellow.
- Enrichment had a minor effect on colour aspects of meat (only yellowness affected)





Overall conclusions

mEAT
quality



- From the extensification effects that have been tested, stocking density (trial 1) and a slow-growing breed (trial 2) had the most beneficial effects on broiler welfare
- Minor but positive effects on welfare found for roughage provision (trial 1) and environmental enrichment (trial 2)
- Meat colour and texture are most affected by breed, minor effects of enrichment on colour, no effects of roughage or stocking density
- Consumer choice for higher welfare broiler systems might be affected by meat quality aspects



Funded by
the European Union

mEAT
quality

Thank you for your
attention - questions?

Ingrid.dejong@wur.nl



Funded by
the European Union

This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement No 101000344

Thanks to Hubbard
Breeders for providing
the chickens



meatquality.eu