meatquality.eu

Assessing the impact of extensive husbandry conditions on broiler meat quality using machine learning

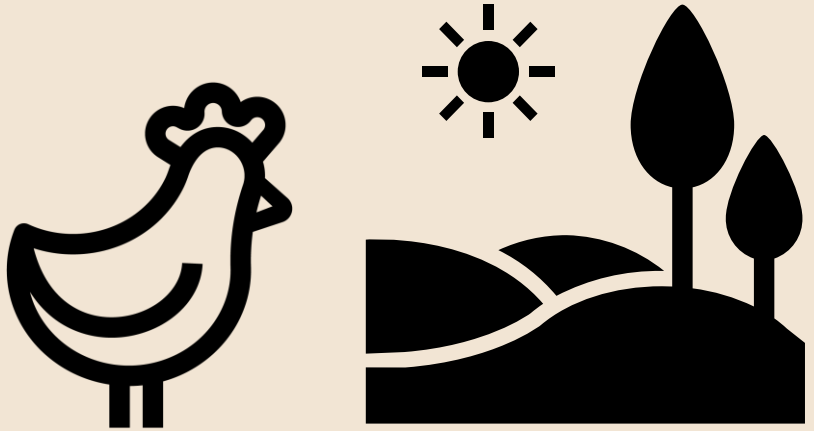
Z. Fendor, H. Louton, S. Erasmus,
A.J. Carnoli, L. Quirin, S. Yigitturk,
R.G. Hobé, J. Marchewka, M. Schou Grønbeck,
W. Hoenderdaal, P. Sztandarski, E.D. van Asselt
I.C. de Jong, A. Ludwiczak,

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".

mEAT quality

"Linking **extensive** husbandry practices to the **intrinsic quality of broiler meat**"



Funded by the European Union

WAGENINGEN UNIVERSITY & RESEARCH

mEAT quality

Husbandry practices

Space allowance	**Low density** (≤ 35 kg/m2)	**High density** (≥ 38 kg/m2)
Diet	**Roughage**	**No added roughage**
Genetics	**Slow-growing, male-layer, dual-purpose**	**Conventional fast-growing**
Quality of Space	**Enrichment** (barrier, perch, straw/lucerne bale, dust bath)	**No added enrichment**
Welfare	**High**	**Low**

Husbandry practices

- Space allowance
- Diet
- Genetics
- Quality of Space

Welfare score

- Cleanliness
- Gait score
- Hock burn
- Skin condition

Funded by the European Union

WAGENINGEN UNIVERSITY & RESEARCH

Intrinsic meat quality

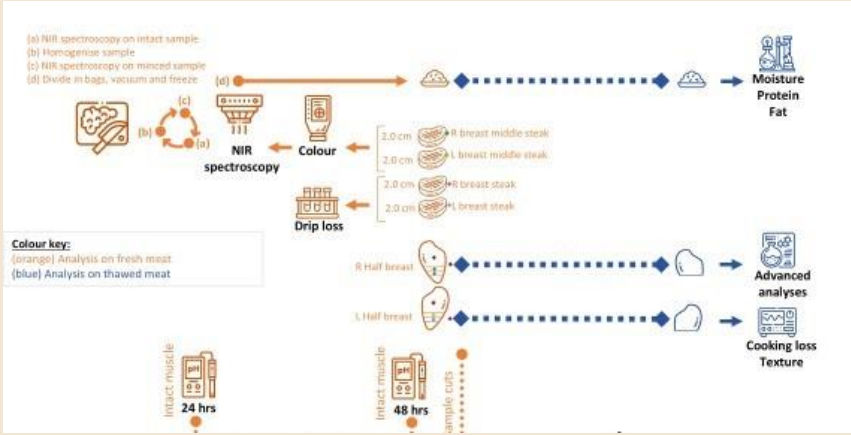
mEAT quality

Sensory

- Trained sensory panel (8 panelists)
- Appearance, odour, flavour, texture and aftertaste

Chemical

- pH, texture analysis, L*a*b* values, moisture content…



Funded by the European Union

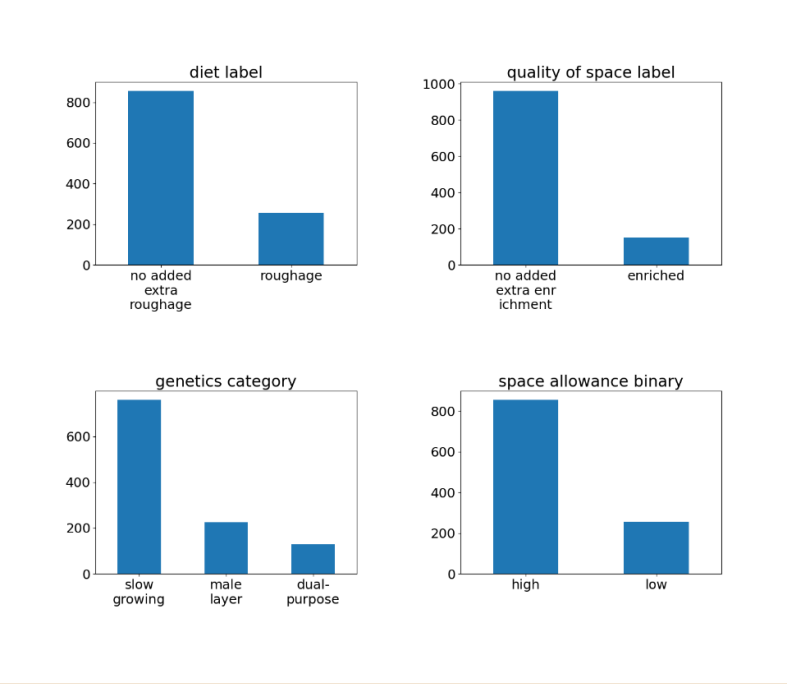
WAGENINGEN UNIVERSITY & RESEARCH

Data processing

80% train set (with cross-validation)
20% test set

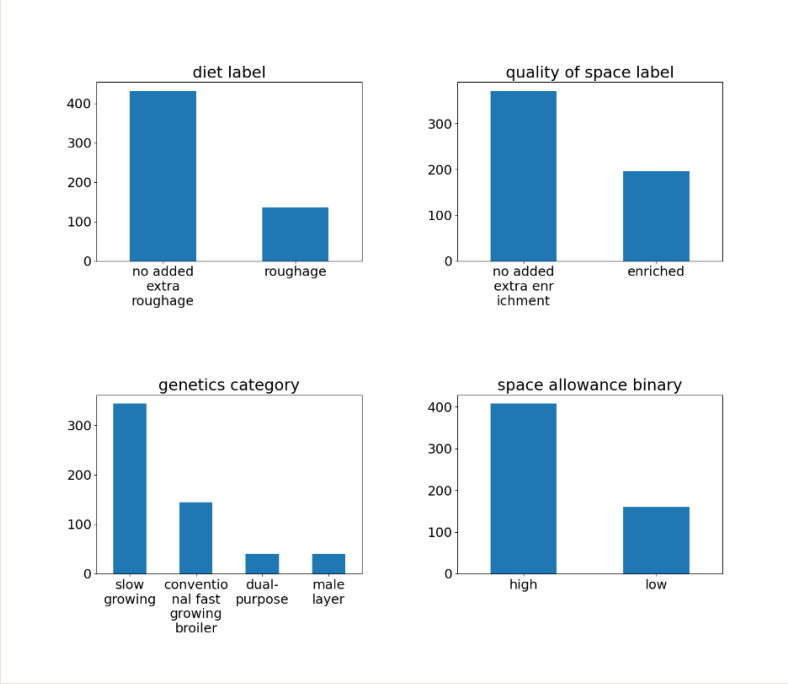
Sensory

- Panelist-wise z-score scaling



Chemical

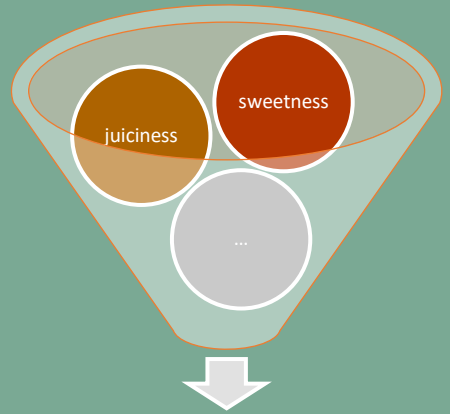
- Min-max scaling
- MICE imputation



Machine learning (ML) methodology

Can we trace back the extensiveness of a condition from the quality of meat?

1) Train ML models to classify husbandry conditions and welfare
2) Performance assessment (ROC-AUC)
3) Feature importance analysis



Funded by the European Union

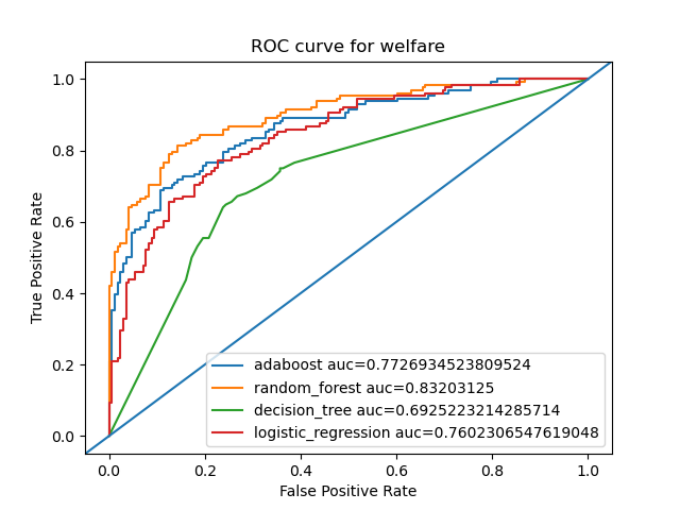
WAGENINGEN UNIVERSITY & RESEARCH

Performance assessment

Architecture space:

AdaBoost, Random Forest, Logistic Regression, Decision Tree

Best results:



	Sensory		Chemical	
	ROC-AUC	Model	ROC-AUC	Model
Genetics	0.77	Random Forest	0.94	AdaBoost
Welfare	0.83	Random Forest	0.92	Random Forest

Feature importance analysis

SHAP value-based explanations

Genetics:

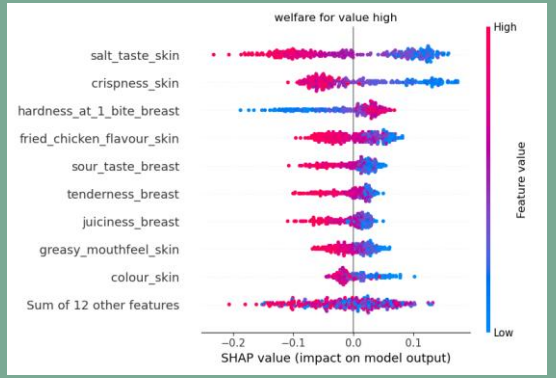
sensory: crispiness skin, colour skin, and saltiness skin

chemical: colour (a*, b*) and texture (BMORS shear energy)

Welfare:

sensory: saltiness of skin, crispiness of skin and hardness at first bite

chemical: colour (a*b*), cooking loss, and texture(BMORS shear energy)



Funded by the European Union

WAGENINGEN UNIVERSITY & RESEARCH

Conclusion

Genetics and **welfare** have the strongest link to meat quality

Funded by the European Union

Upcoming…

- Publication of “Assessing the impact of husbandry factors on poultry meat quality using a machine learning approach ”
- Data available at request*
-

* After the end of the project

Funded by the European Union

WAGENINGEN UNIVERSITY & RESEARCH

POZNAŃ UNIVERSITY OF LIFE SCIENCES

DANISH TECHNOLOGICAL INSTITUTE

INSTITUTE OF GENETICS AND ANIMAL BIOTECHNOLOGY of the Polish Academy of Sciences

Excellent Category A+ IGAB PAS

Universität Rostock Traditio et Innovatio

mEAT quality

Thank you for your attention

Zuzanna Fendor

zuzanna.fendor@wur.nl

WAGENINGEN UNIVERSITY & RESEARCH

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

meatquality.eu