SpectroFood: Information Agrifood quality estimation using hyperspectral techniques

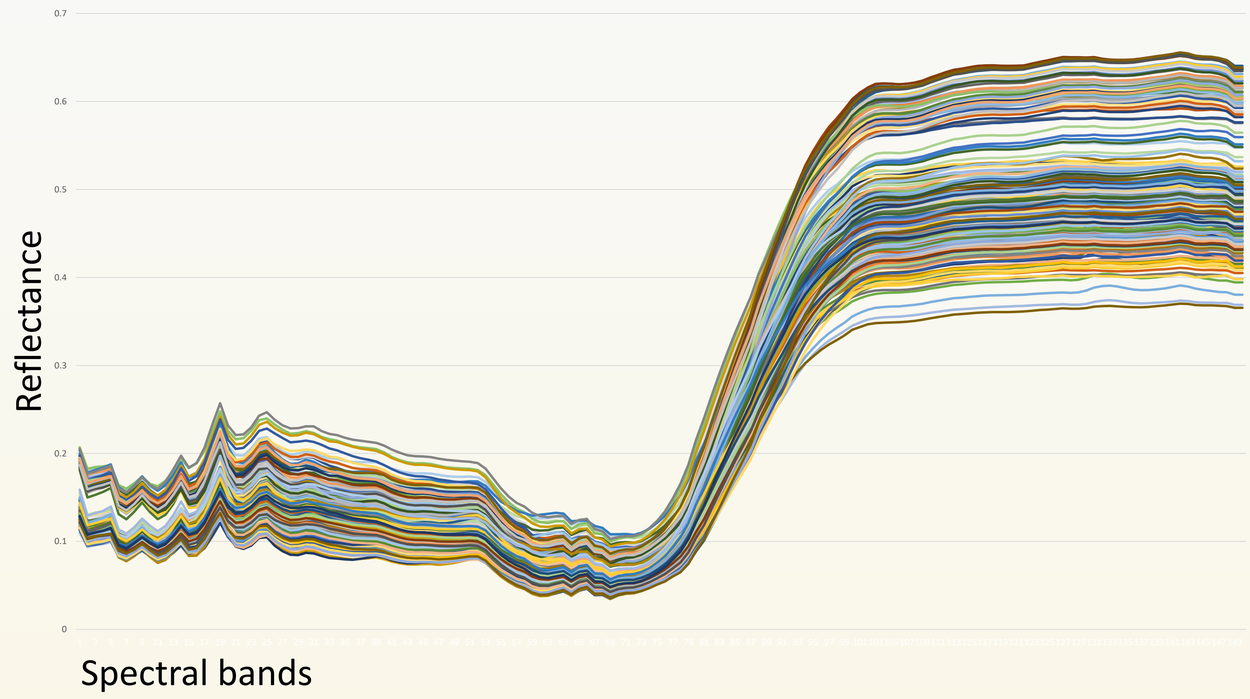
SpectroFood.

Summary

- Digital technology solutions for nondestructive, reliable, real-time and cost-efficient food quality assessment
- Pre- and post-harvest stages

Four use cases

- Apple (Germany)
- Broccoli (Greece)
- Leek (Belgium)
- Mushroom (Ireland)



Main objective/ research question

- ⬇food insecurity & ⬇food waste
- Nondestructive quality assessment research limited
- Focused on the post-harvest

Preliminary conclusions

- Limited available data
- Questionable repeatability of available models and results
- No hyperspectral data standards
- Transfer of ML/DL techniques from other domains

Potential impact

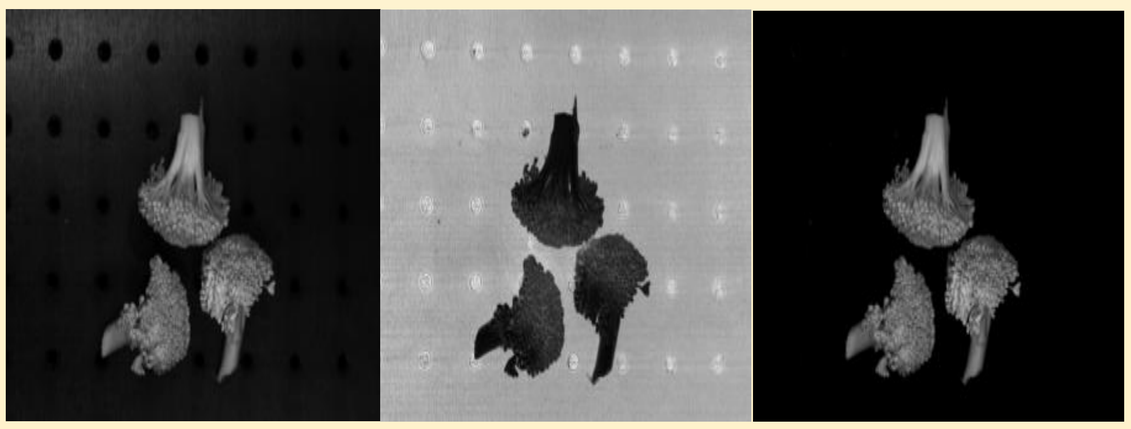
- Optimize production inputs
- Reduce food waste
- Increase food quality
- Democratize hyperspectral imaging

Preliminary results

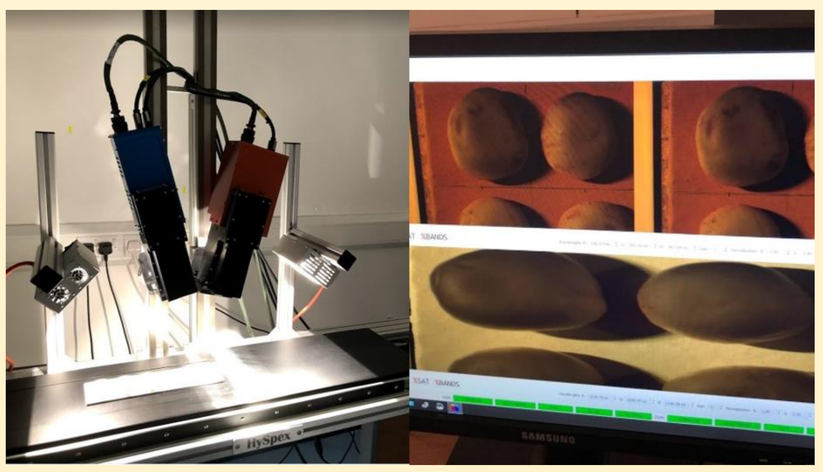
- Apple: Dataset preparation, correction, wavelength selection, ANN analysis. Shape correction
- Leak: Dry matter prediction R^2: 0.926, Dataset preparation for General preservability, quality, weight
- Mushroom: Browning correct identification >97%, Dataset preparation for moisture content determination and texture changes
- Broccoli: Moisture content prediction R^2: 0.8, Dataset preparation Vitamin C and "crunchiness" determination, PLS-ANN analysis

Publications

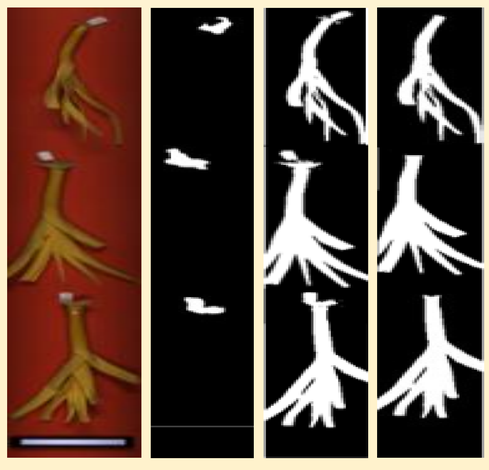
Wieme, Jana, et al. "Application of hyperspectral imaging systems and artificial intelligence for quality assessment of fruit, vegetables and mushrooms: A review." *Biosystems Engineering* 222 (2022): 156-176.



Raw image →Thresholding → Mask background →Broccoli



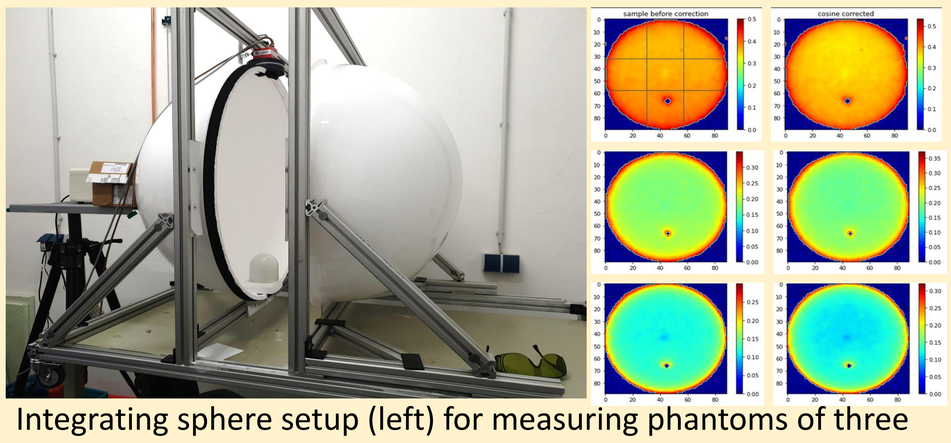
HSI acquisition setup



Raw image → Mask roots → Mask leek → Leek/Roots

Future research activities

- Bilateral measurements
- Validation of developed models
- Crop agnostic model development
- Measurement of additional quality parameters
- Apply post-harvest models to pre-harvest hyperspectral images



Integrating sphere setup (left) for measuring phantoms of three μa (right).

Topic 1: Data-driven ICT platforms and solutions to improve the sustainability of agri-food Systems

ERA-NET COFUND ICT-AGRI FOOD