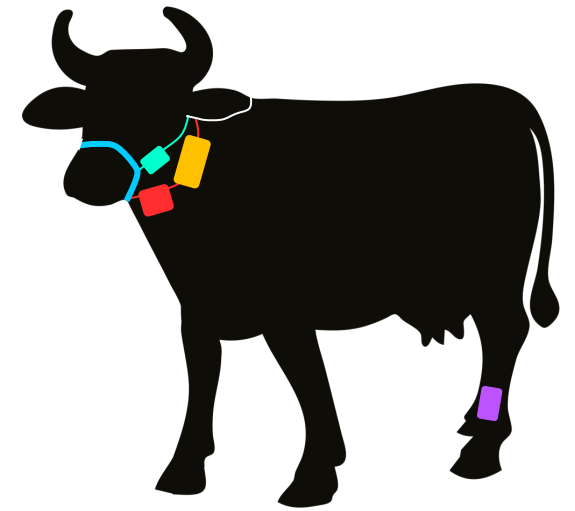




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Bildung und Forschung WBF

**Agroscope**



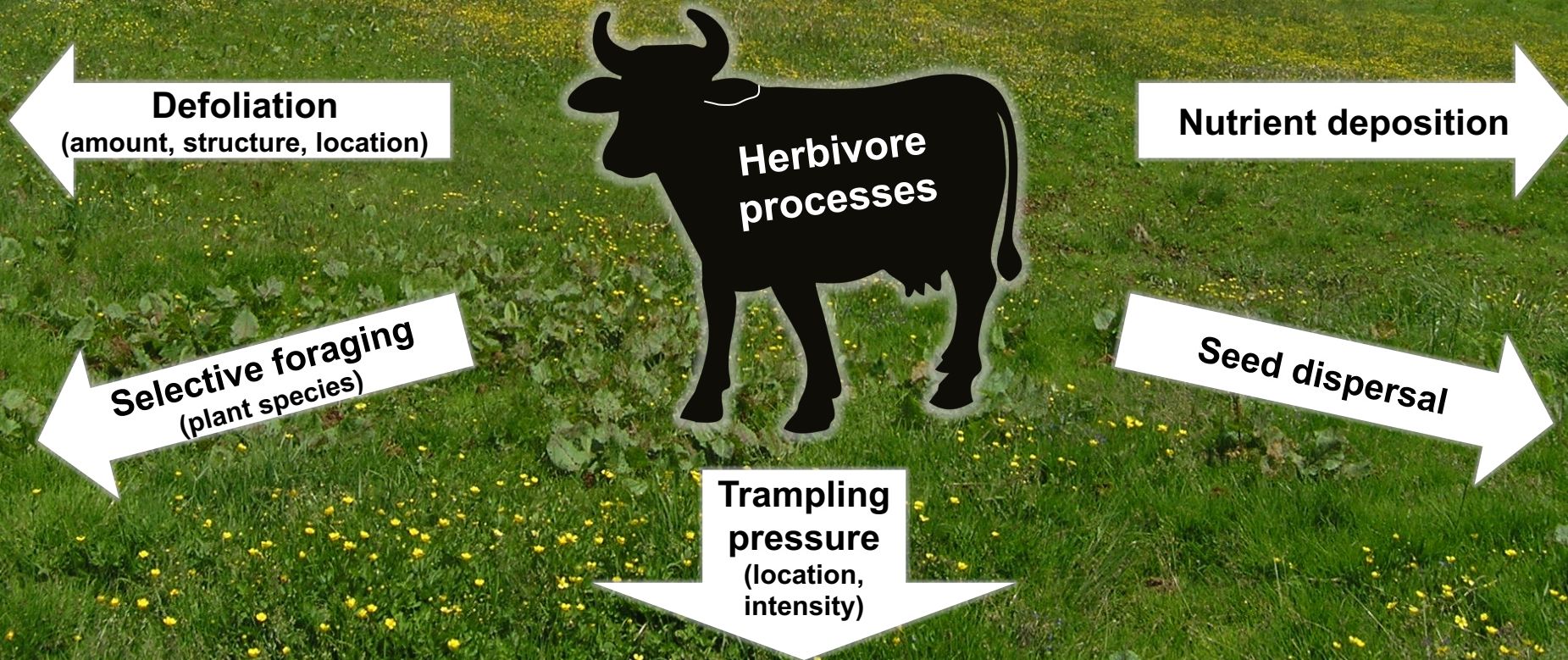
# Animal-borne sensors to monitor pastoral systems: opportunities and challenges

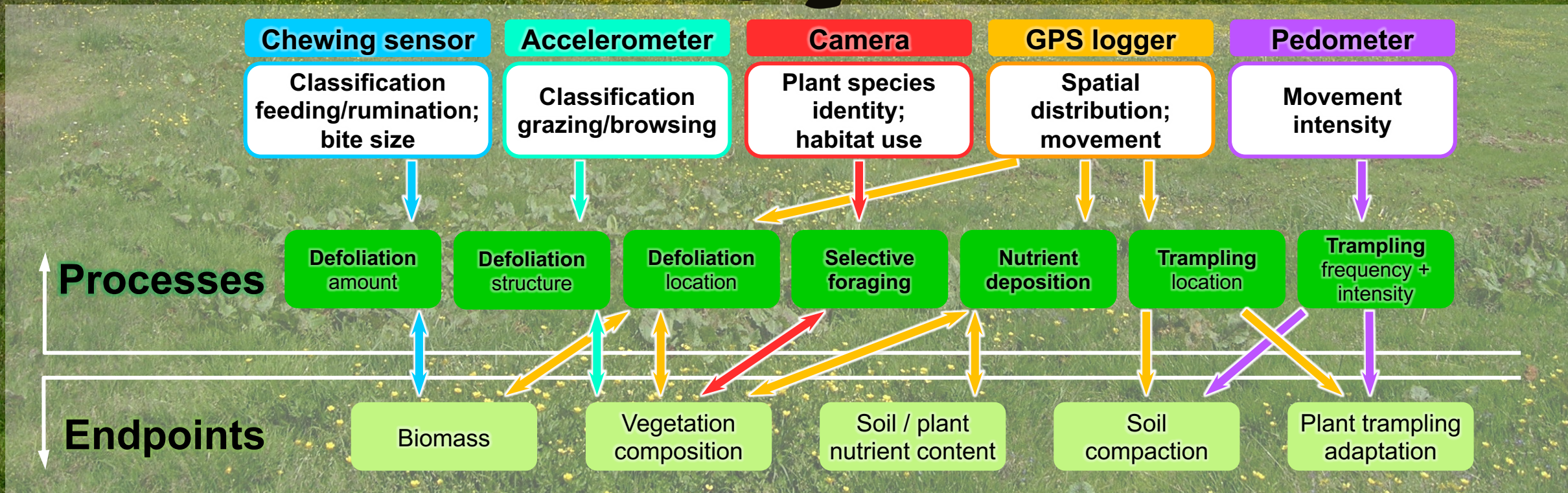
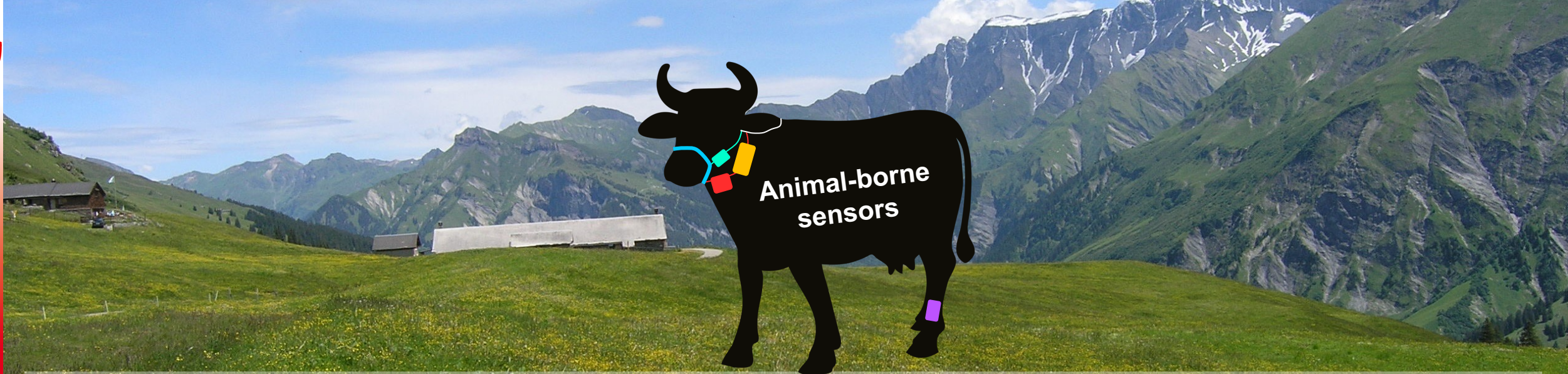
**Manuel Schneider and Caren Pauler**



# Factors influencing pasture vegetation

- Climate
- Topography
- Soil



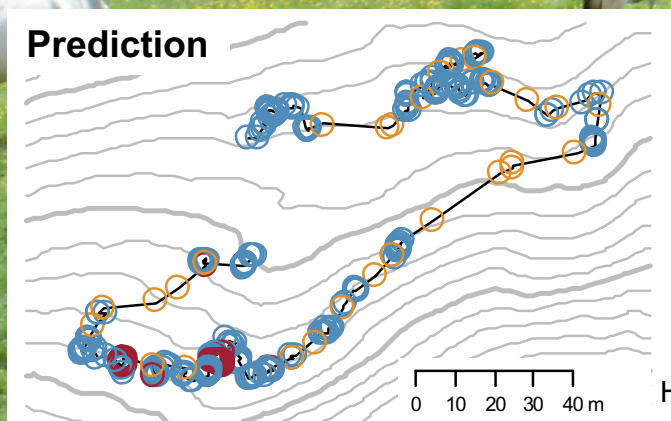
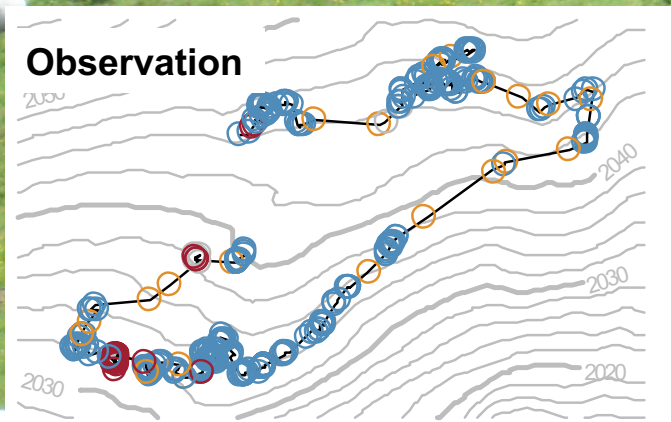




# Example 1: Quantifying space use by dairy cows

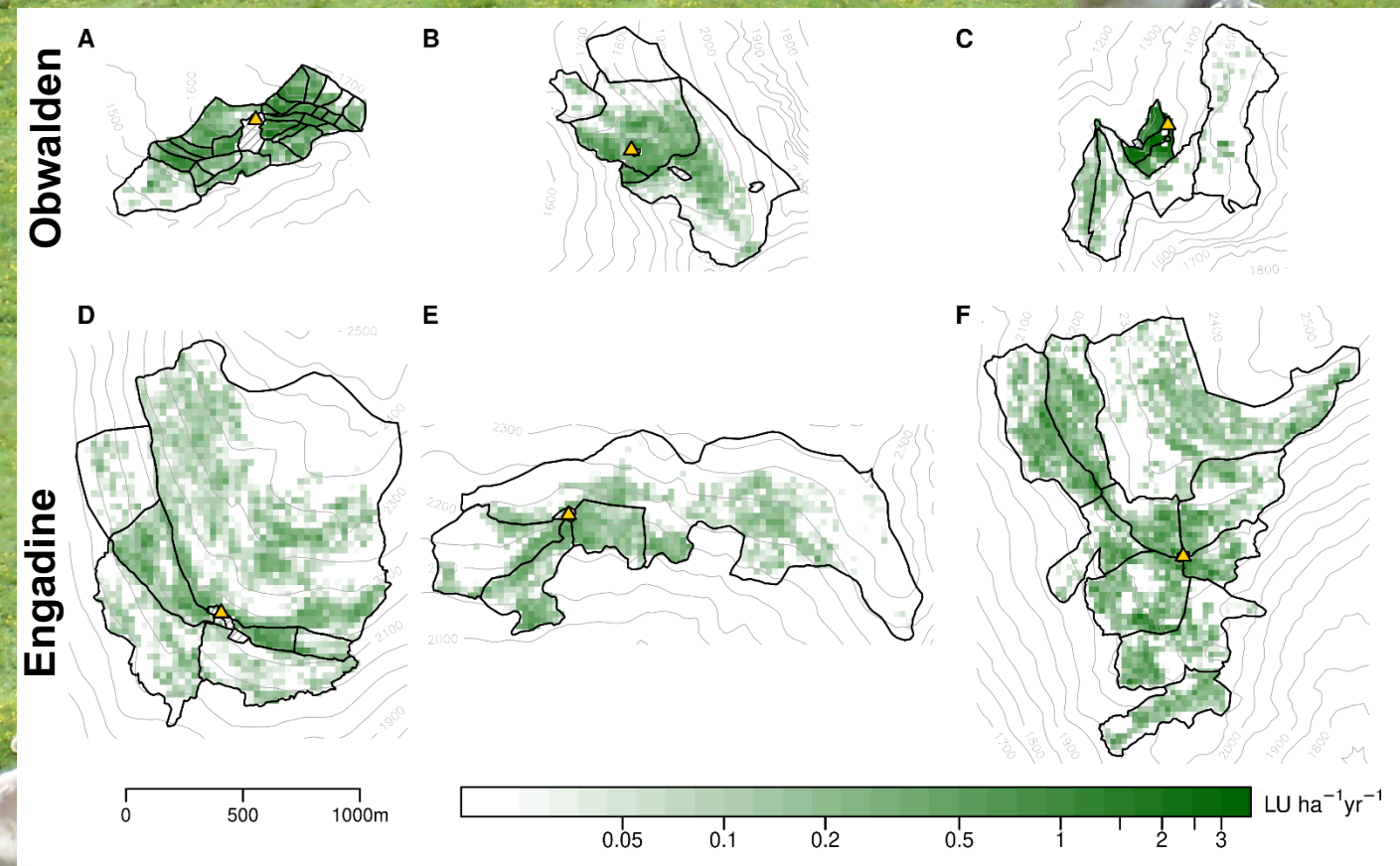


- Fitting 3-4 animals per herd with low-cost GPS trackers
- GPS records every 20 sec.
- Visual observations during totally 44 h.
- Classification of all records with an accuracy of 80%



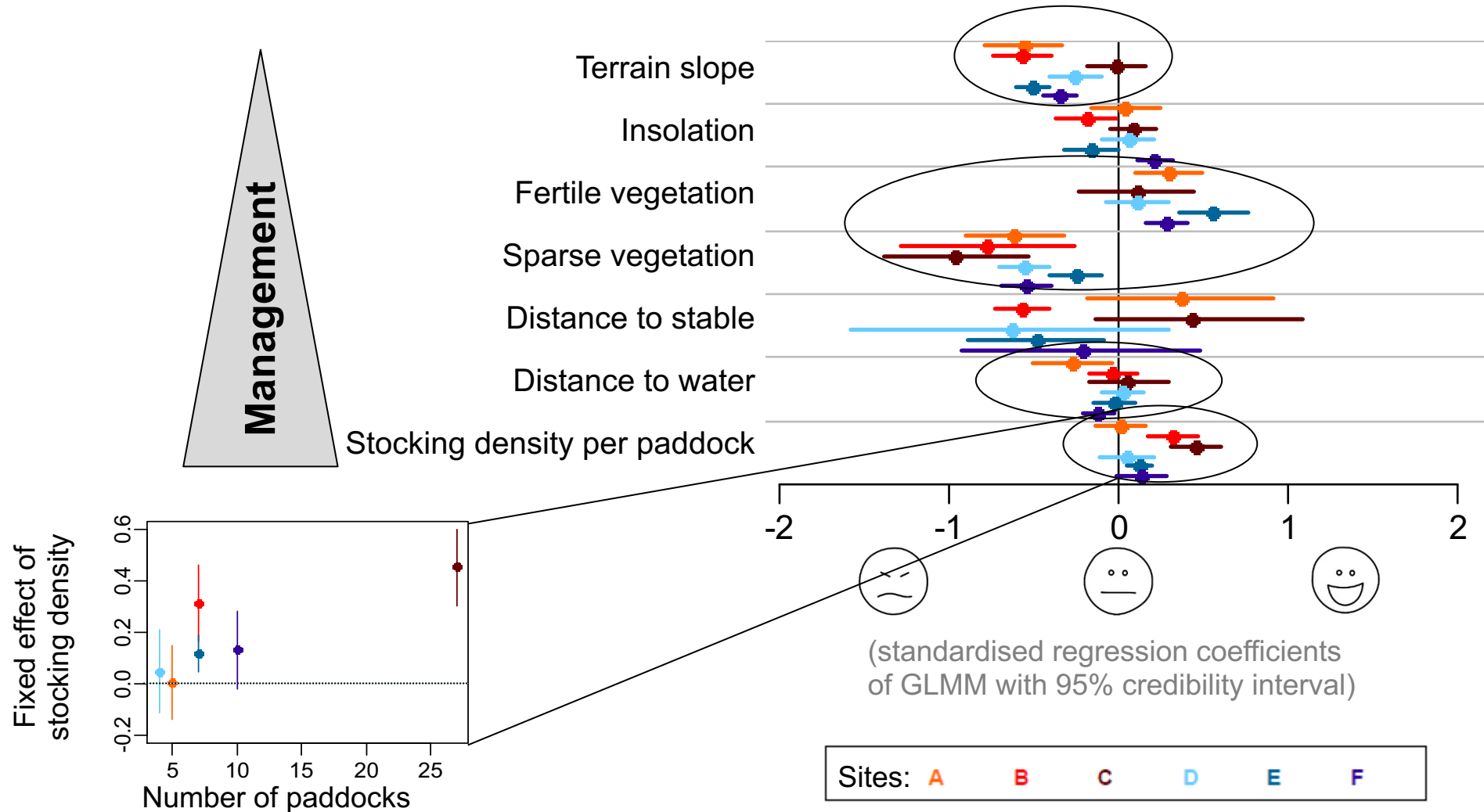
- Grazing
- Walking
- Resting

Homburger et al. 2014





# Drivers of space use

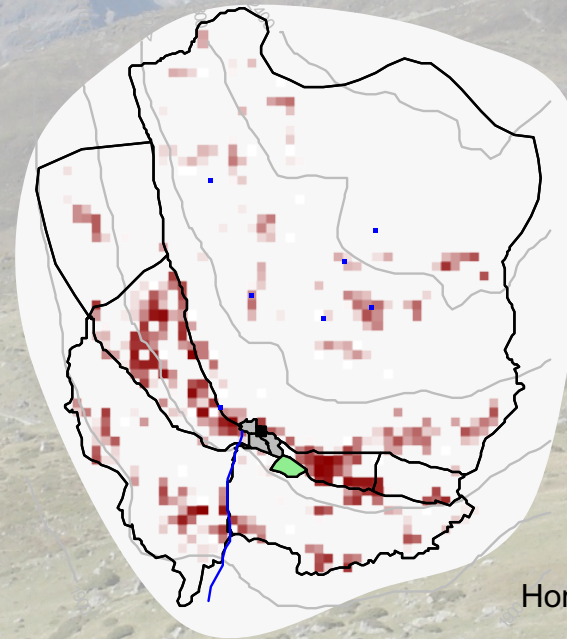
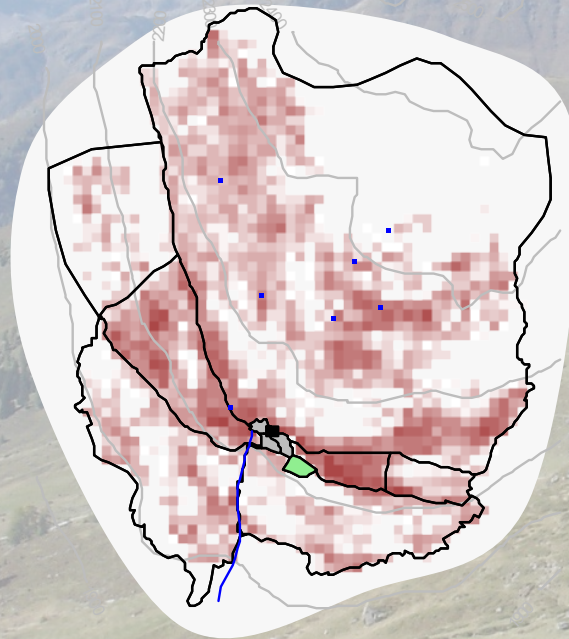




# Example 2: Animal activities and P redistribution

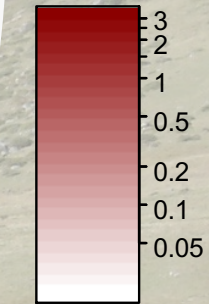
**Process:** Grazing

Resting



- Stable area
- Meadow
- Water sources
- Paddocks

LU ha<sup>-1</sup> yr<sup>-1</sup>



Homburger et al. (2015)

**Endpoint:**  $P \text{ balance} = P \text{ deposition} - P \text{ consumption}$

P deposition:

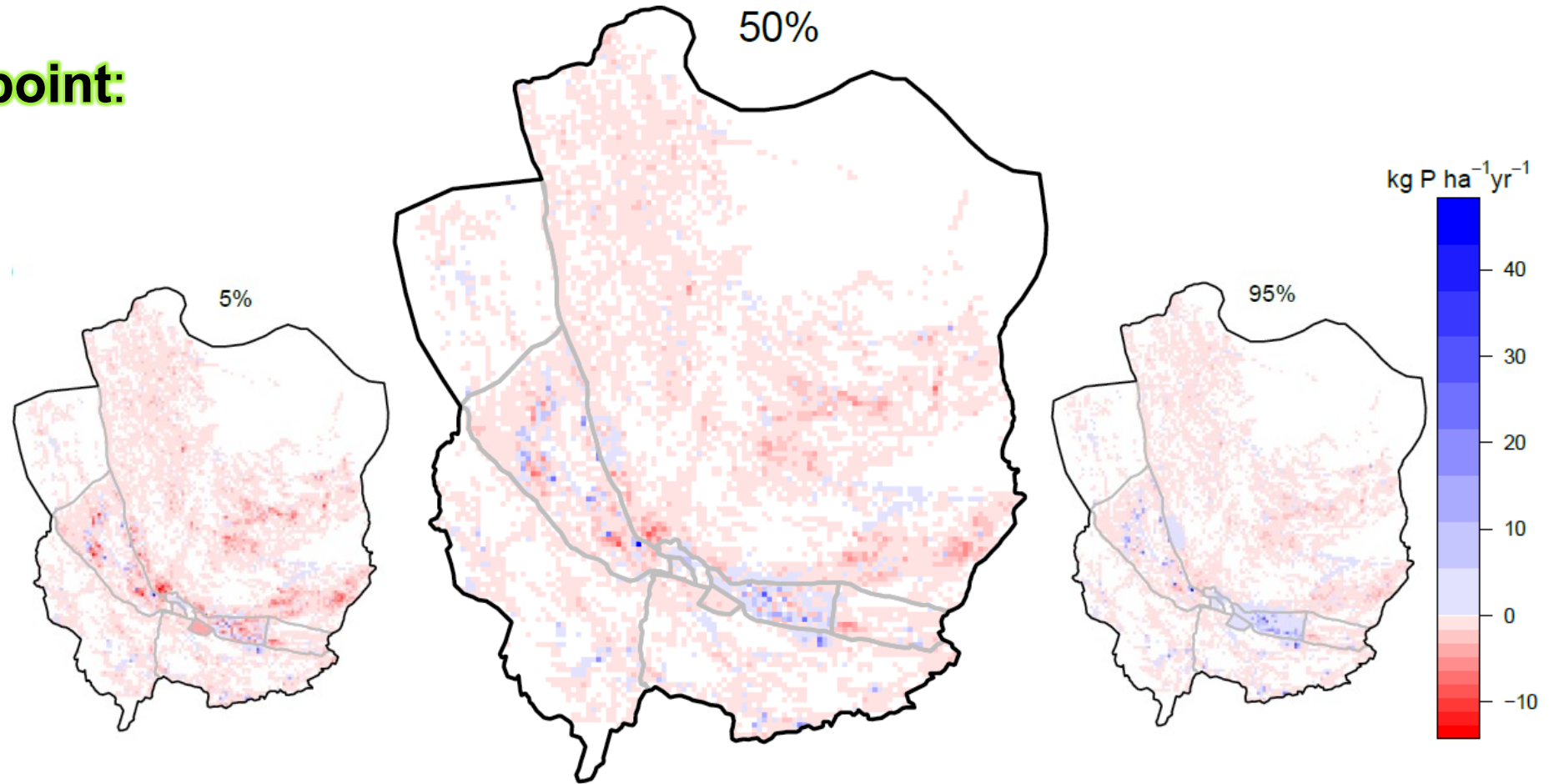
- at fixed rate based on literature
- according to total presence
- stable manure redistribution

P consumption:

- according to grazing activity
- measured forage P contents
- estimated yield on hay field

# Distribution of P balance

**Endpoint:**



Monte Carlo simulations to estimate uncertainty of model output



# Example 3: Behaviour of cattle breeds

**Process:** movement and foraging behaviour

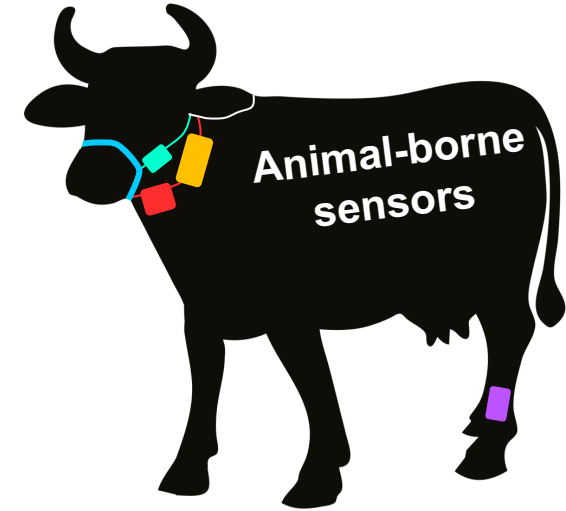


Methods I:

- Pedometer
- Chewing sensor
- Feeding observation
- Accelerometer
- GPS



Pauler et al. (2020)

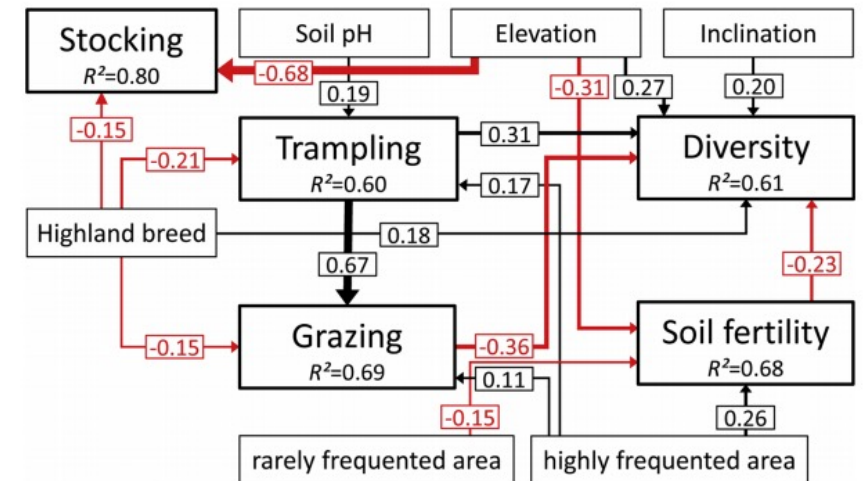


**Endpoint:** long-term impact on pasture vegetation



Methods II:

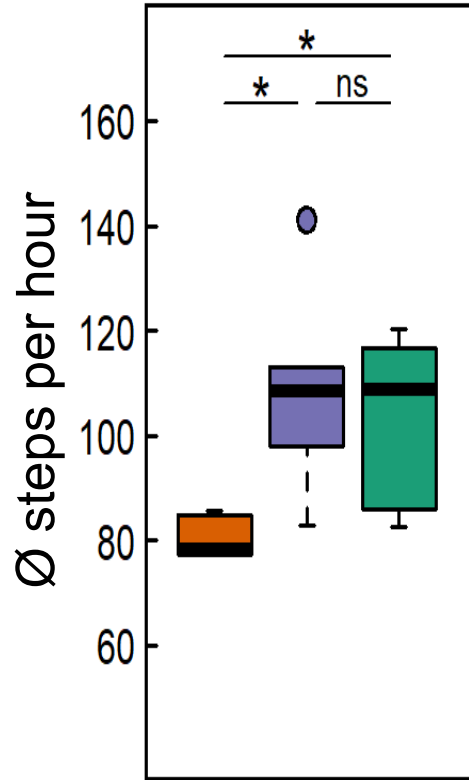
Vegetation survey







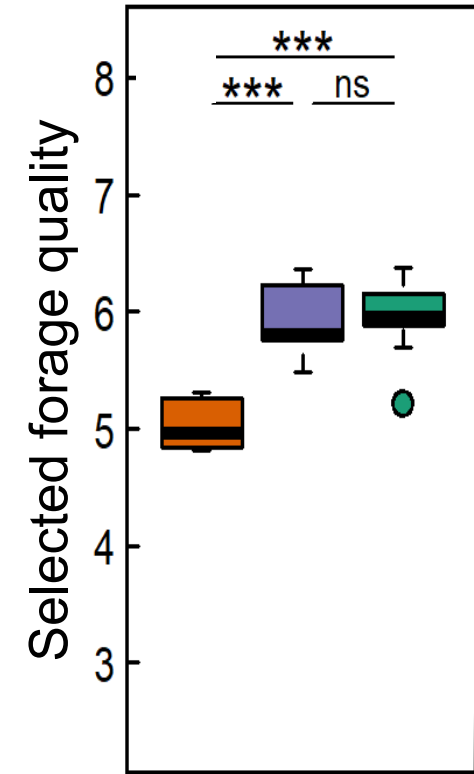
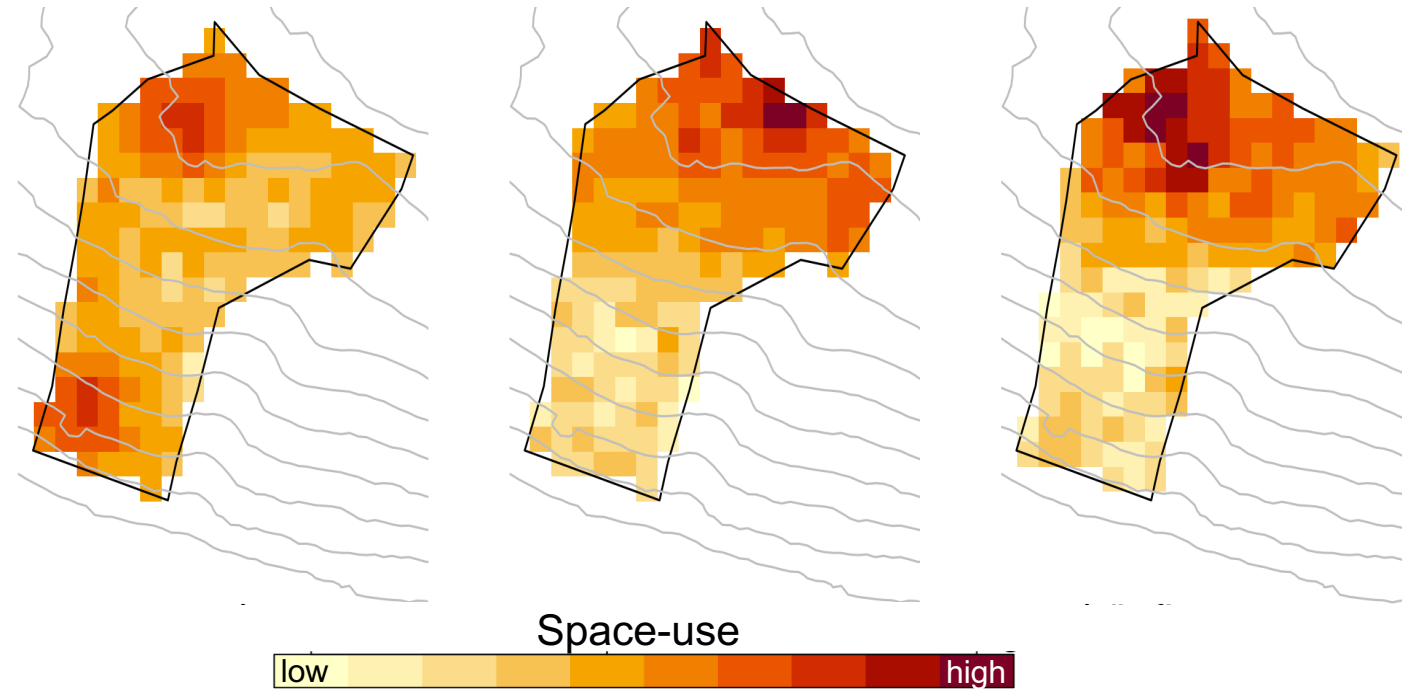
# Differences between breeds



Highland cattle

Original Brown

Angus × Holstein





# Outlook and conclusion

- Sensor technology is a fast-advancing field.
- Increased frequency and storage capacity offer new potential for data interpretation.
- Great potential in combination with other data sources.
- Importance of ground truthing, validation and process understanding.





Thank you!

