Robust cattle valorise ecosystem services of marginal grassland

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Studienstiftung des deutschen Volkes

Grazing animals = driver of pasture characteristics

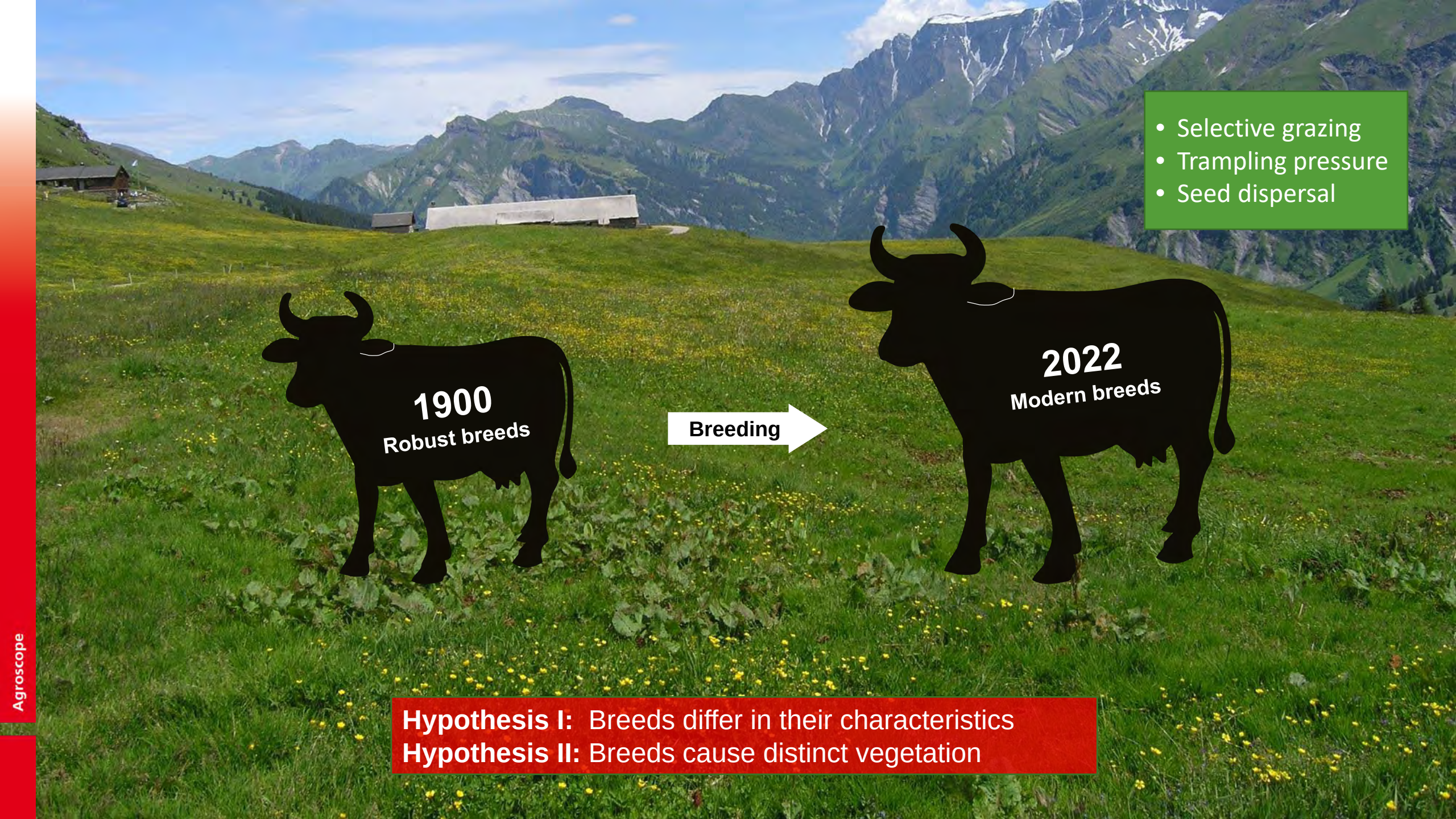
- Selective grazing
- Trampling pressure
- Seed dispersal

Created + maintain

Semi-natural, marginal grasslands

ES: biomass production, biodiversity, landscape aesthetic for recreation and tourism

Underused in modern agriculture → loss of ES


1900
Robust breeds
Breeding
2022
Modern breeds
• Selective grazing
• Trampling pressure
• Seed dispersal
Hypothesis I: Breeds differ in their characteristics
Hypothesis II: Breeds cause distinct vegetation

Hypothesis I: Breeds differ in their characteristics

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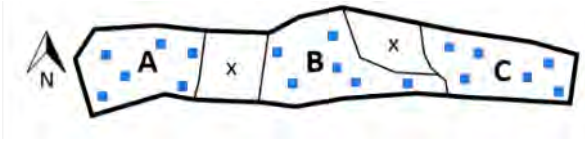
Methods I: Grazing experiment

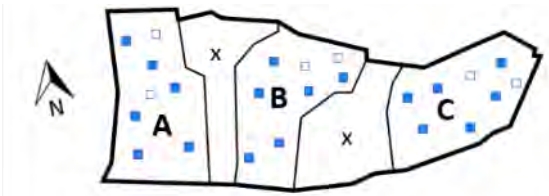
→ 9 suckler cows per breed

Methods I: Grazing experiment

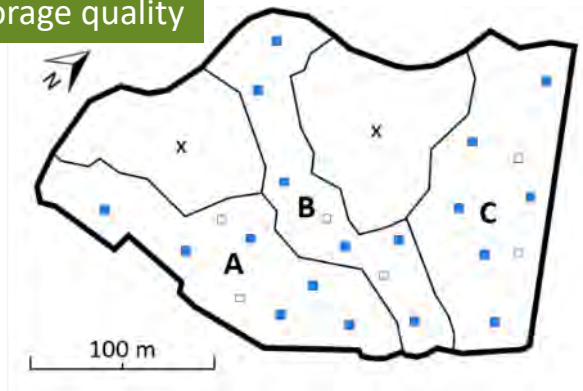
High forage quality



Medium forage quality



Low forage quality



Grazing experiment: Foraging behaviour

Forage observation +
biomass removal measurement
↓
preference
of plant species and traits
↓
selection evenness

Functional Ecology
BRITISH ECOLOGICAL SOCIETY
RESEARCH ARTICLE | Open Access
Choosy grazers: Influence of plant traits on forage selection by three cattle breeds

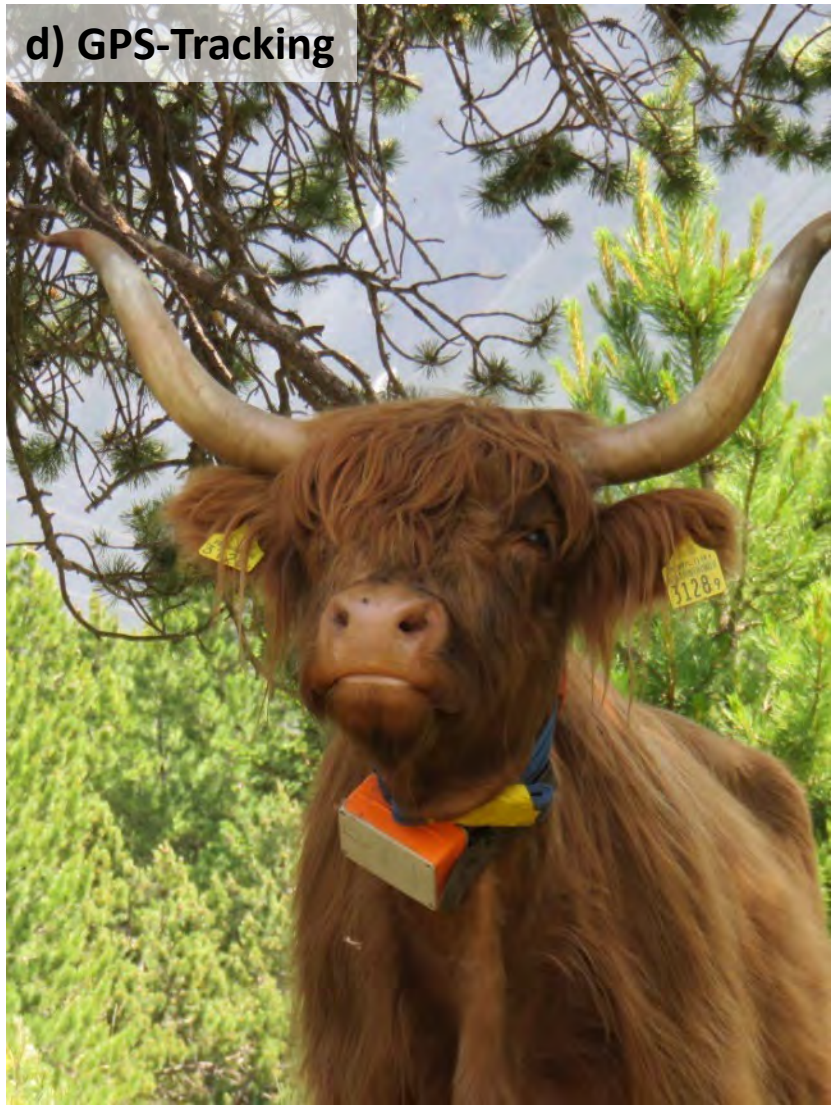
Frontiers in Veterinary Science
Animal Behavior and Welfare
Grazing allometry: anatomy, movement and foraging behavior of three cattle breeds of different productivity
Caren Manuela Pauler, Johannes Isselstein, Joel Berard, Thomas Braunbeck and Manuel K Schneider

Grazing experiment: Movement behaviour

← Steps per hour

Distance covered →

Space-use evenness →



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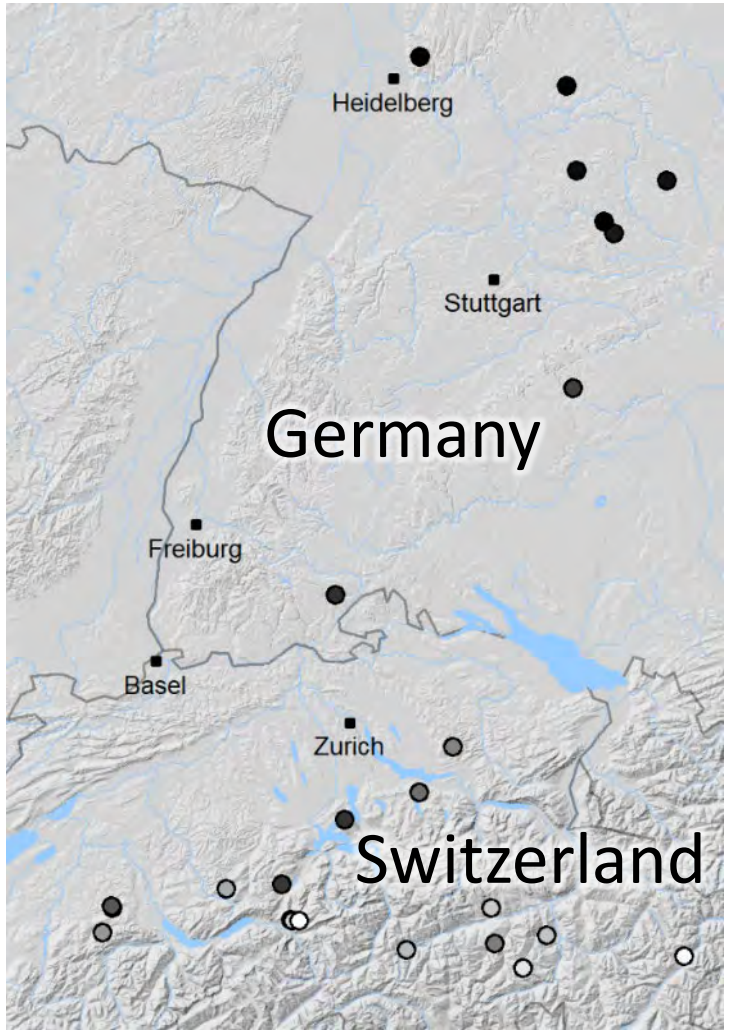
Hypothesis II: Breeds cause distinct vegetation

Methods II: Observational study of vegetation adaptation



50 paired pastures

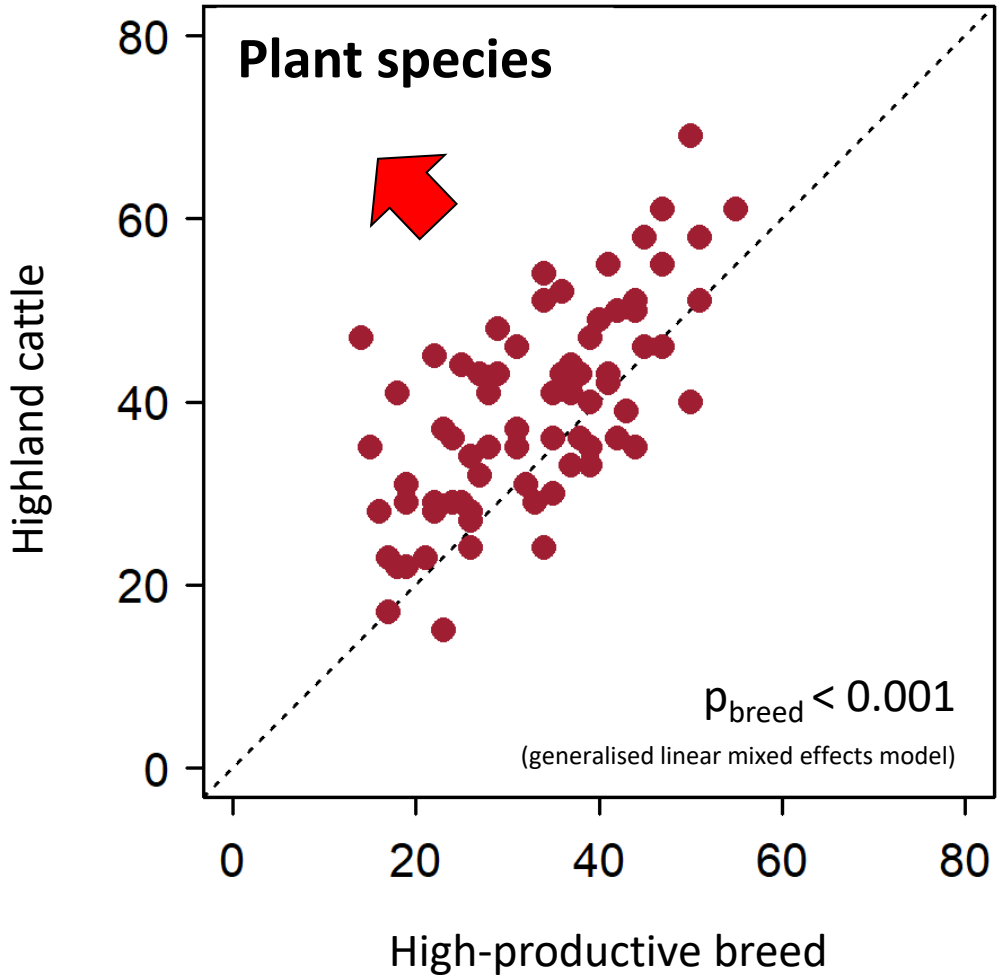
Highland cattle High-productive breeds

~ 475 plant species

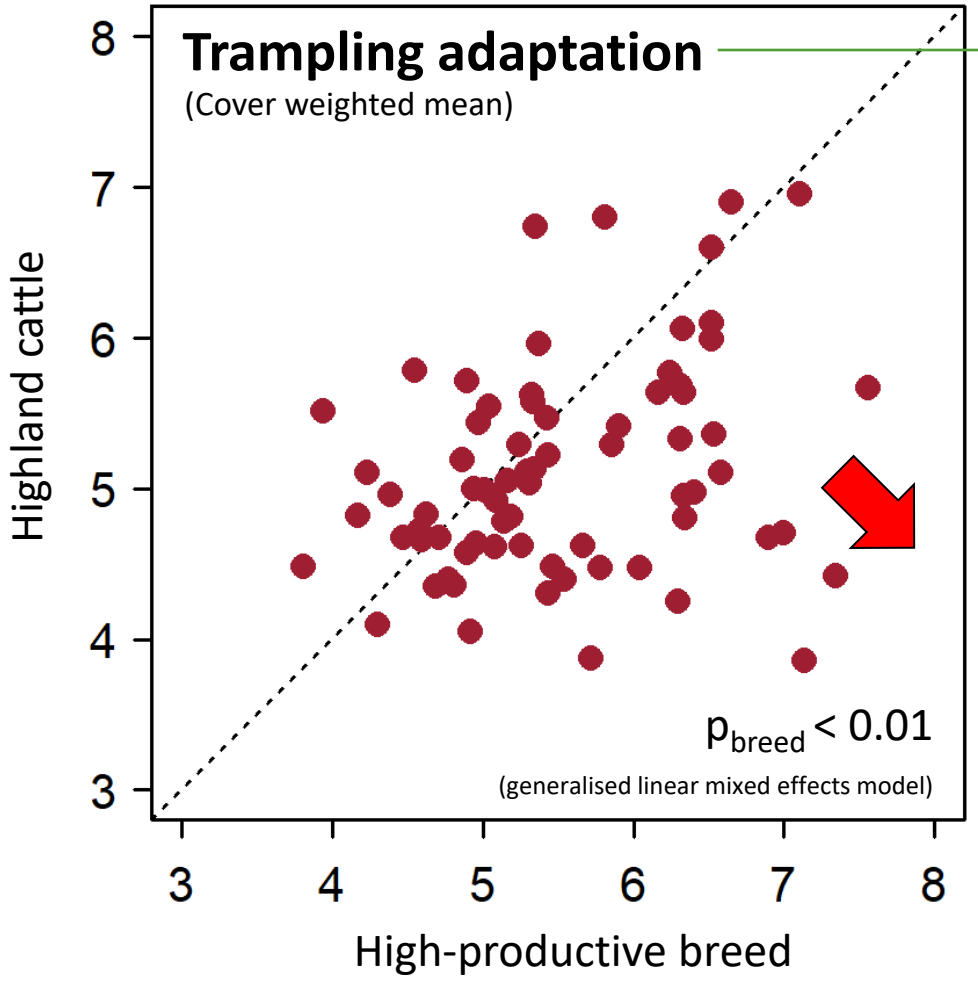
Agriculture, Ecosystems & Environment
Volume 284, 15 November 2019, 106585
ELSEVIER

Influence of Highland and production-oriented cattle breeds on pasture vegetation: A pairwise assessment across broad environmental gradients

Differences in plant species richness



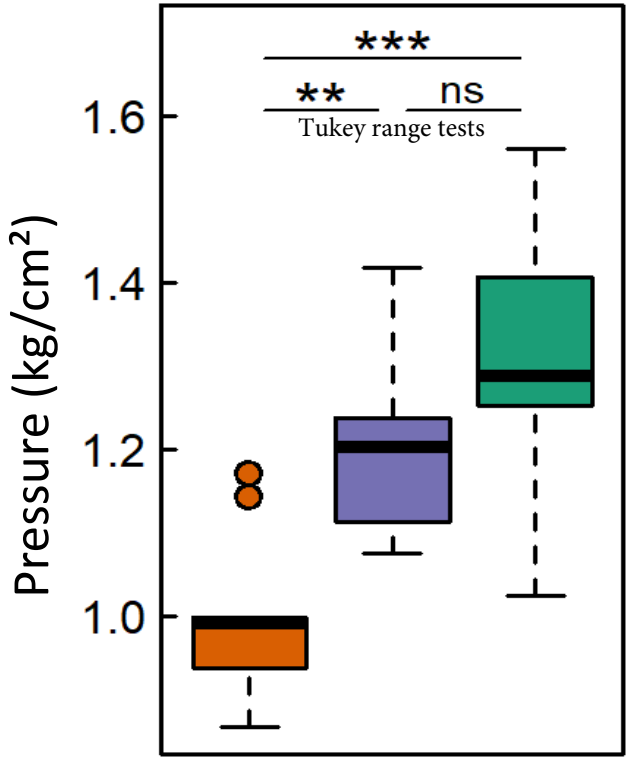
Differences in vegetation trampling adaptation



Indicator of trampling adaptation defined by Briemle *et al.* 2002

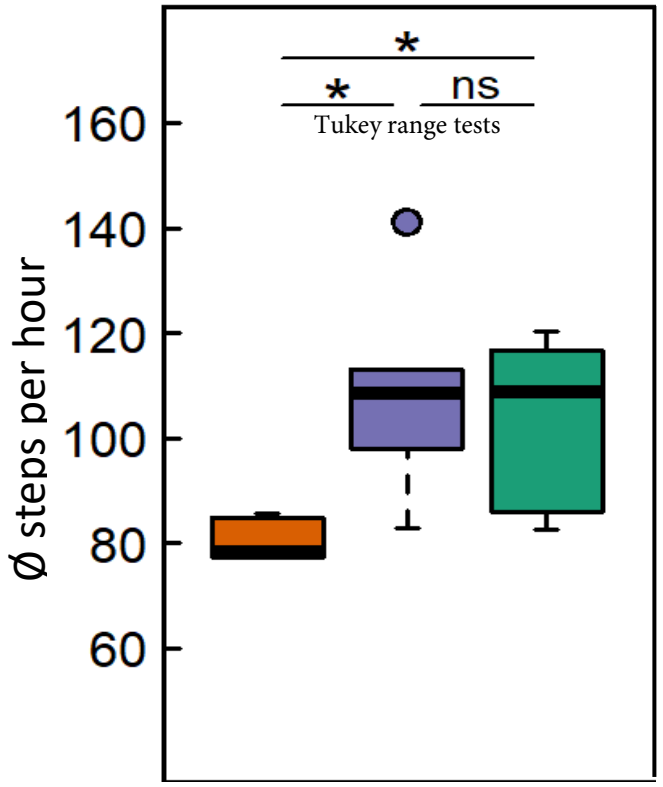
Differences in body weight and claws

$$\text{Pressure} = \frac{\text{Weight}}{\text{Base area}}$$

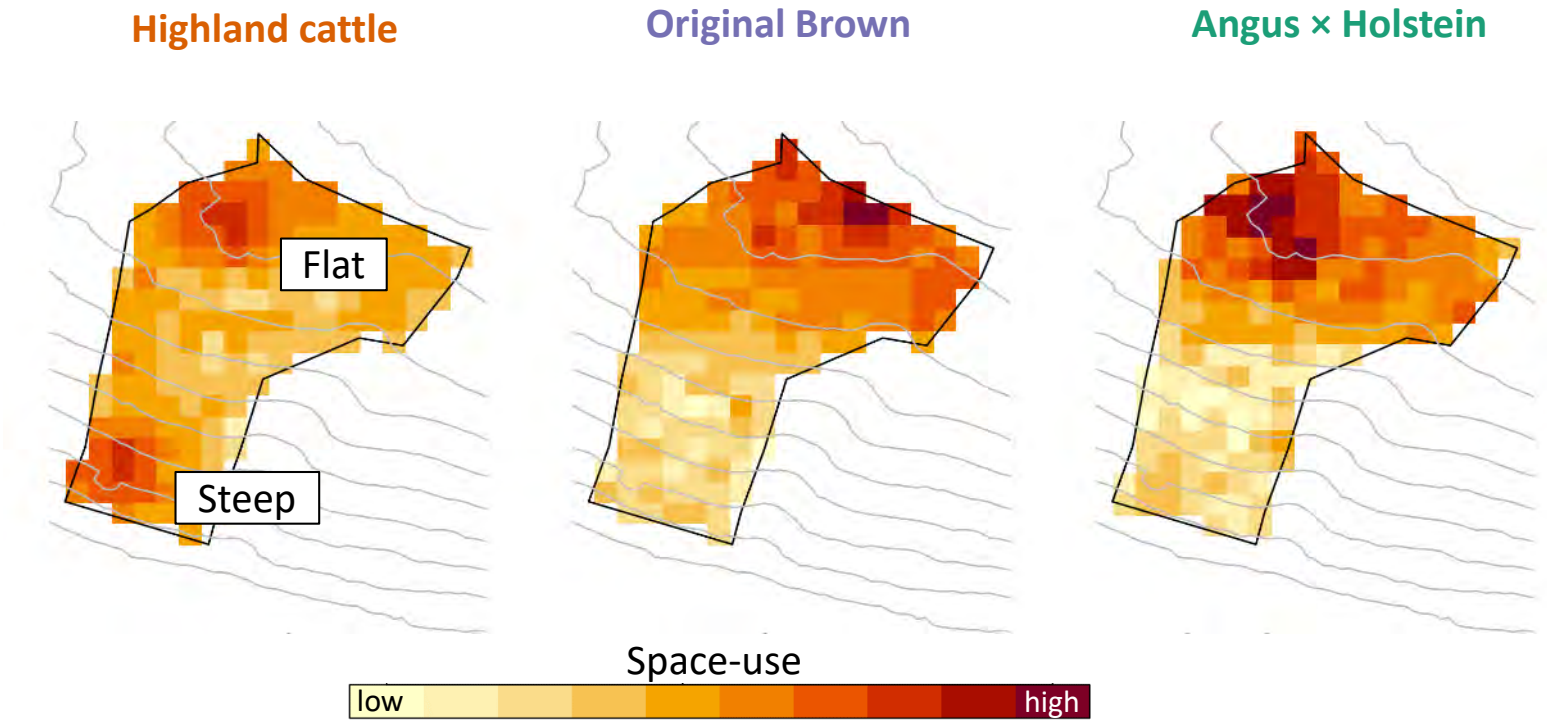


Highland cattle
Original Brown
Angus × Holstein

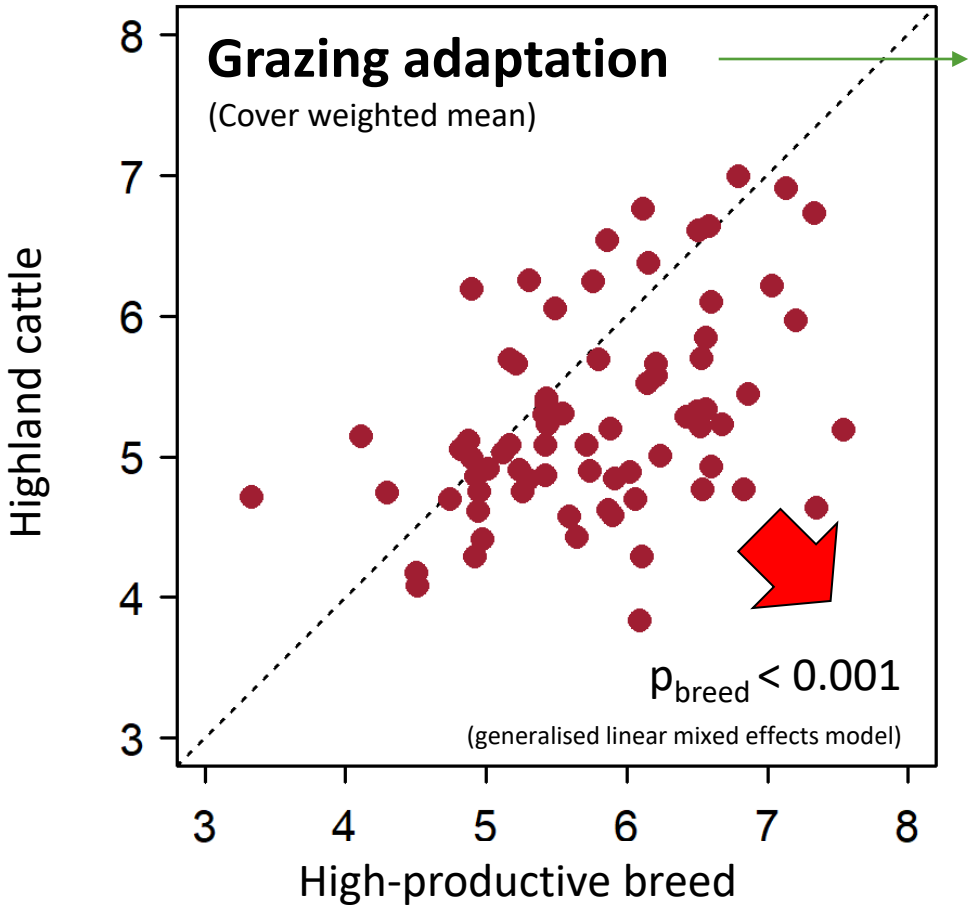
Differences in movement behaviour



Highland cattle
Original Brown
Angus × Holstein

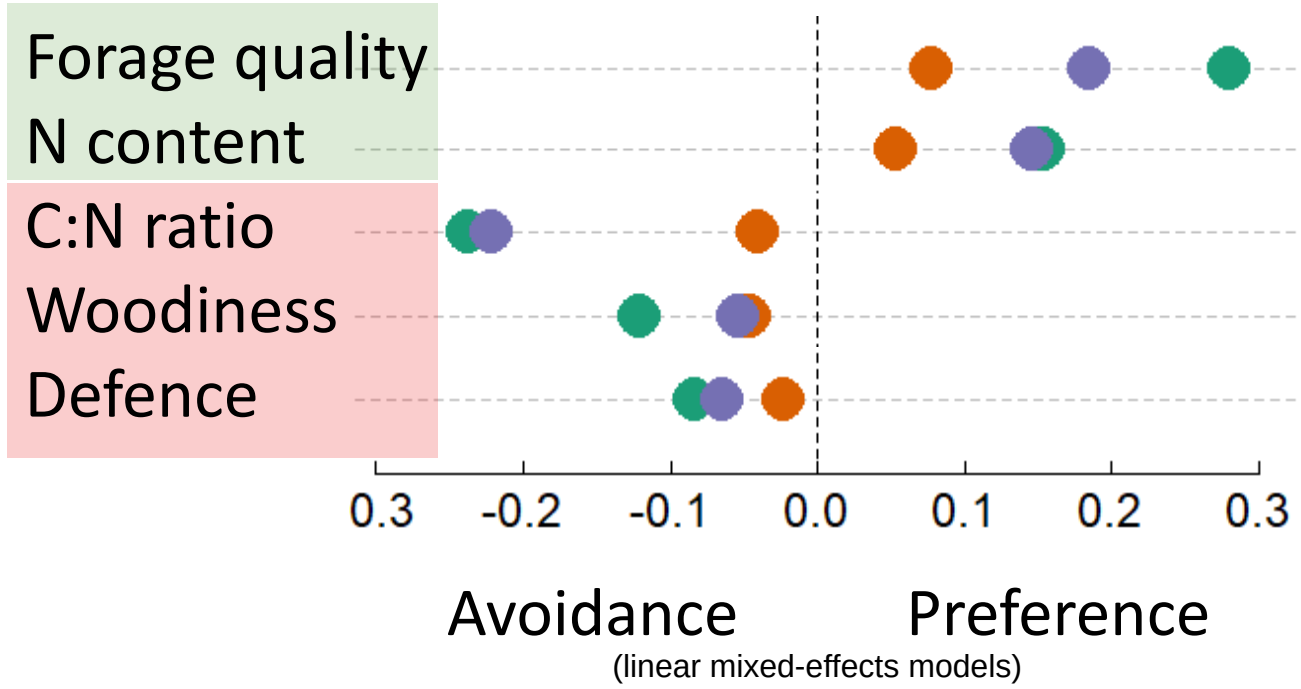


Differences in vegetation grazing adaptation



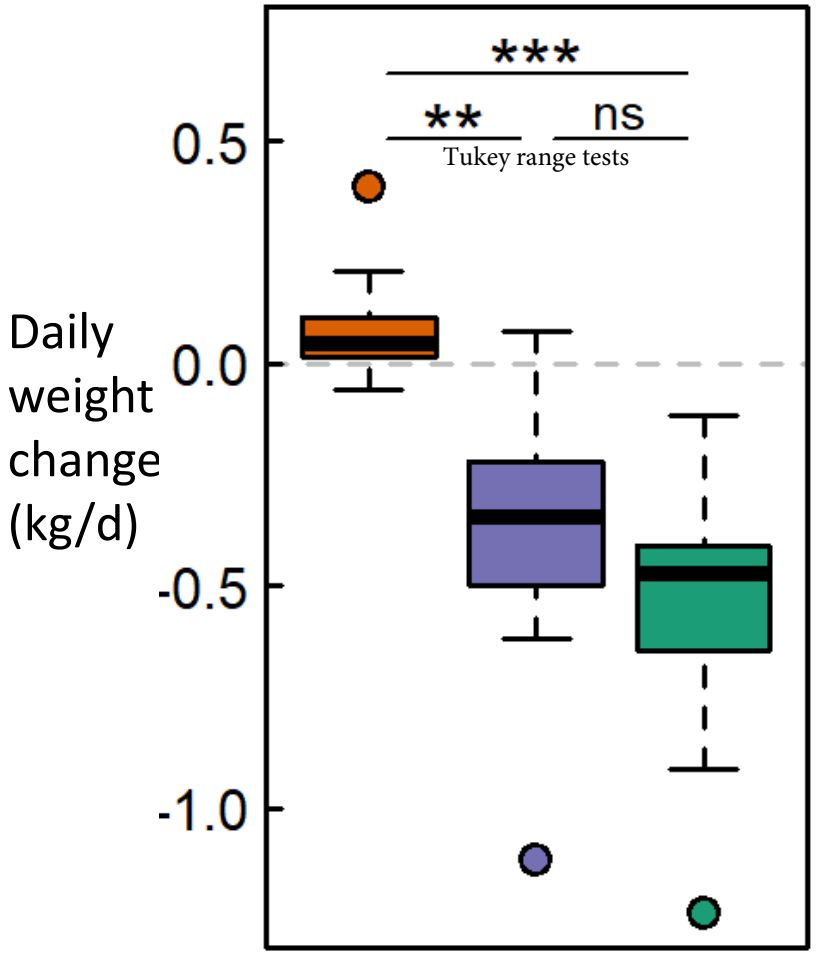
Indicator of grazing adaptation defined by Briemle *et al.* 2002

Consumption:
Differences in plant trait preference



Highland cattle
Original Brown
Angus × Holstein

Foraging behaviour: Differences in forage quality and daily weight gain



Highland cattle
Original Brown
Angus × Holstein

Conclusion

- ✓ Breeding unintentionally modified anatomy, movement and foraging behaviour.
- ✓ Breed is an overlooked driver of pasture vegetation.
- ✓ Robust breeds valorise ecosystem services of marginal grassland better (biodiversity, meat production, landscape aesthetic).

***Pauler et al.*, 2019**. Vegetation composition
***Pauler et al.*, 2020**. Plant traits and forage selection
***Pauler et al.*, 2020**. Anatomy, movement, foraging

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Thank you for your attention!

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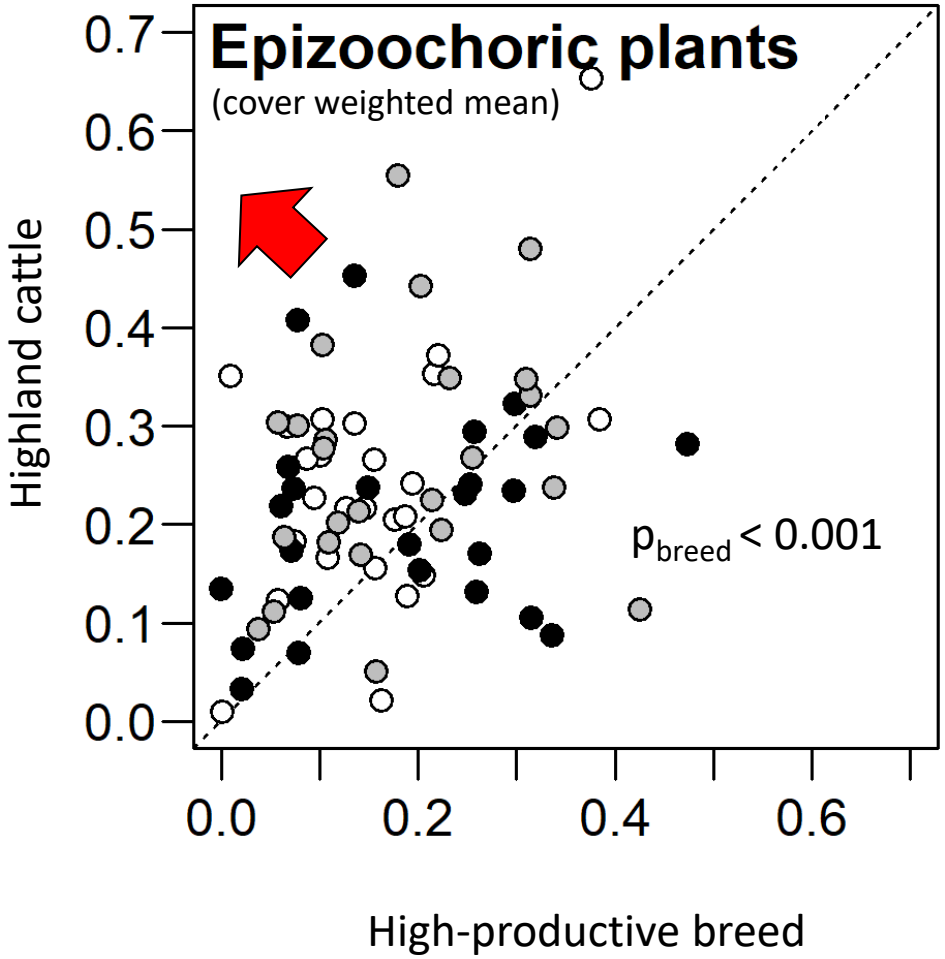
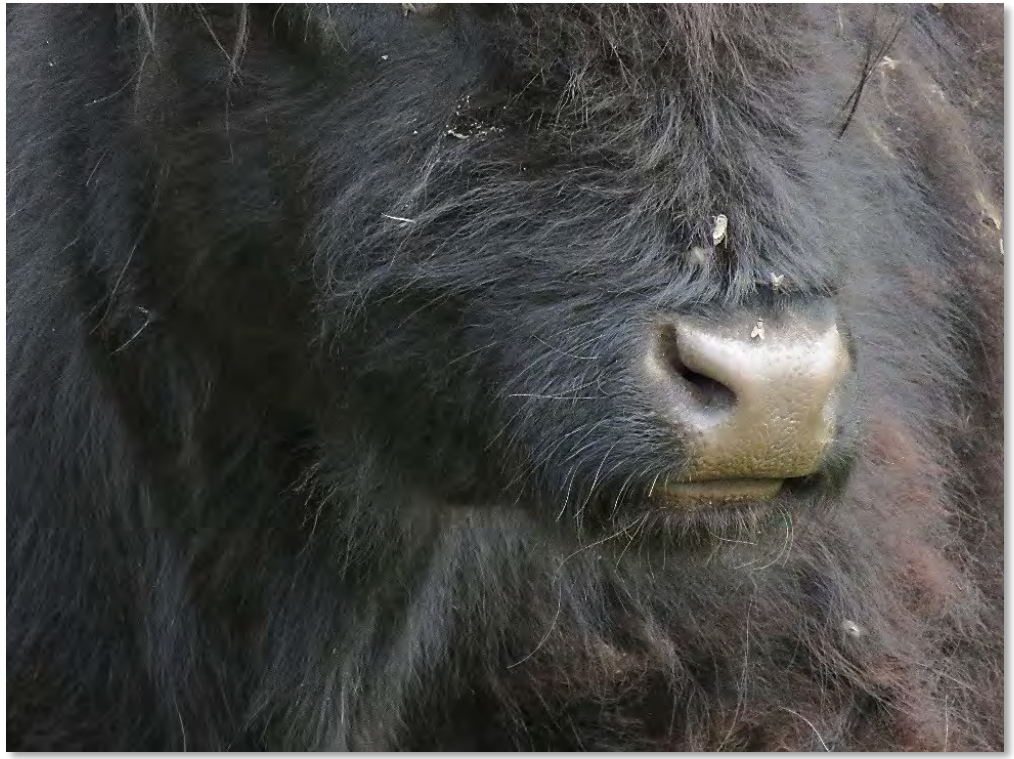
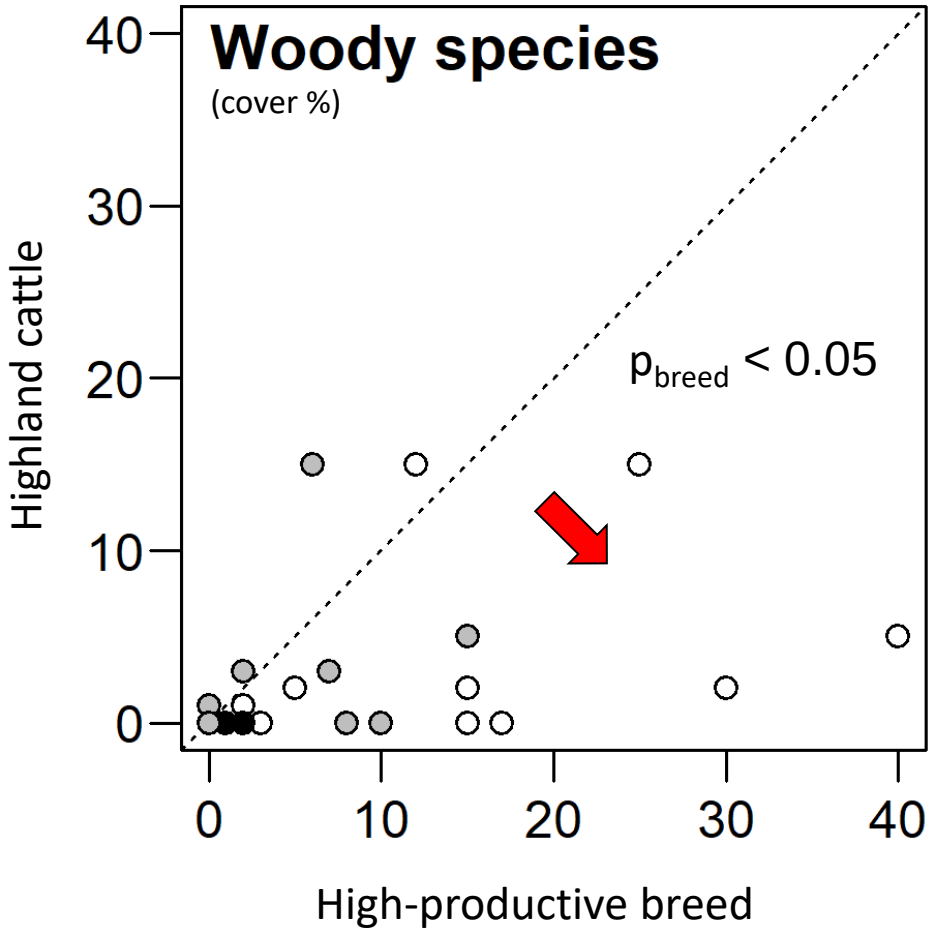
Differences in vegetation seed dispersal



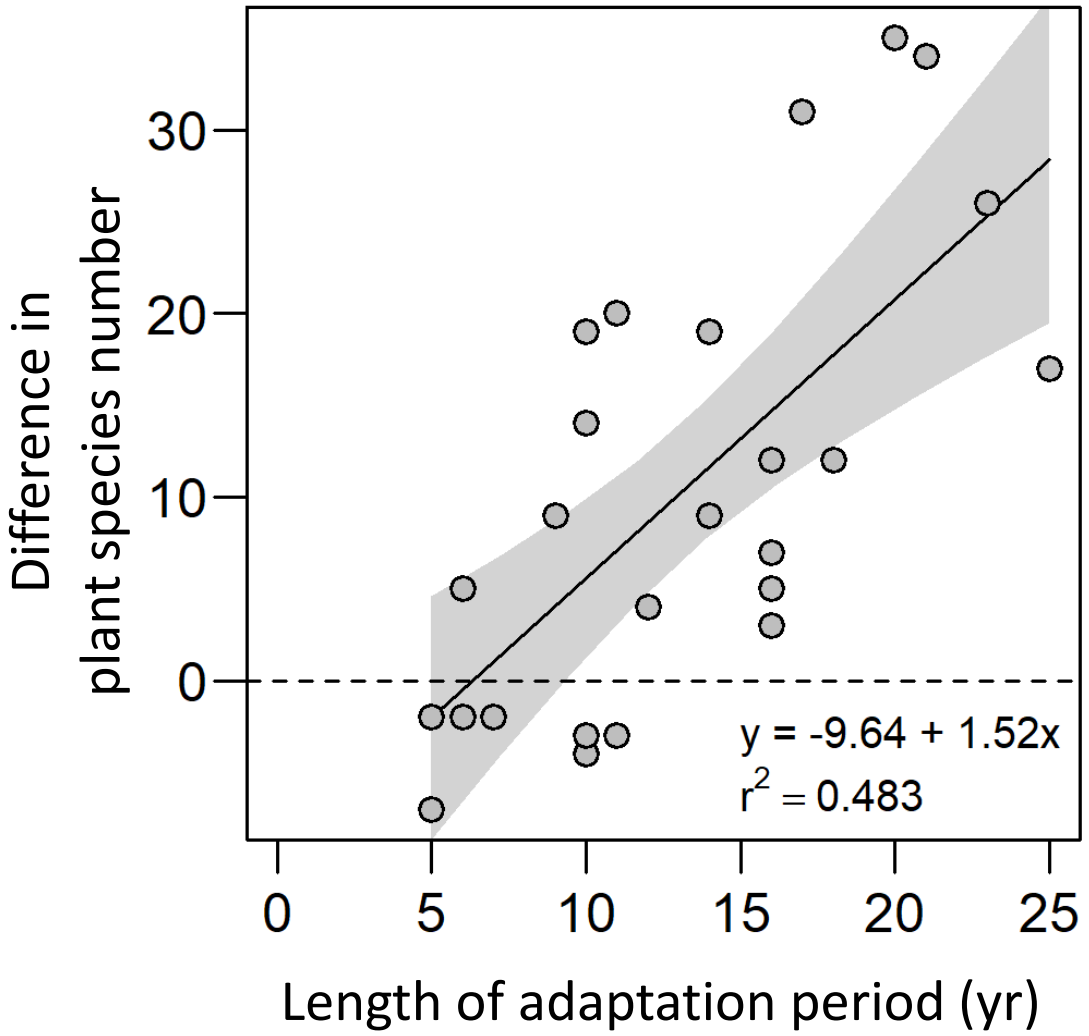


→ biotope cross-linking

Vegetation adaptation: Differences in wood cover



Vegetation differences increase with adaptation time



* Pairwise difference in number of plant species between pastures grazed by Highland cattle and high-productive breeds (γ diversity)