Do Farm Management Practices Alter Belowground Biodiversity And Ecosystem Function?

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Supporting the land-based industries for over a century

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ELM FARM RESEARCH CENTRE

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Talk structure

- Aims of review
- UK land use and farming systems
- Relationships between systems and practices – highlights!
- Experimental design & future research
- Conclusions

Aims of literature review

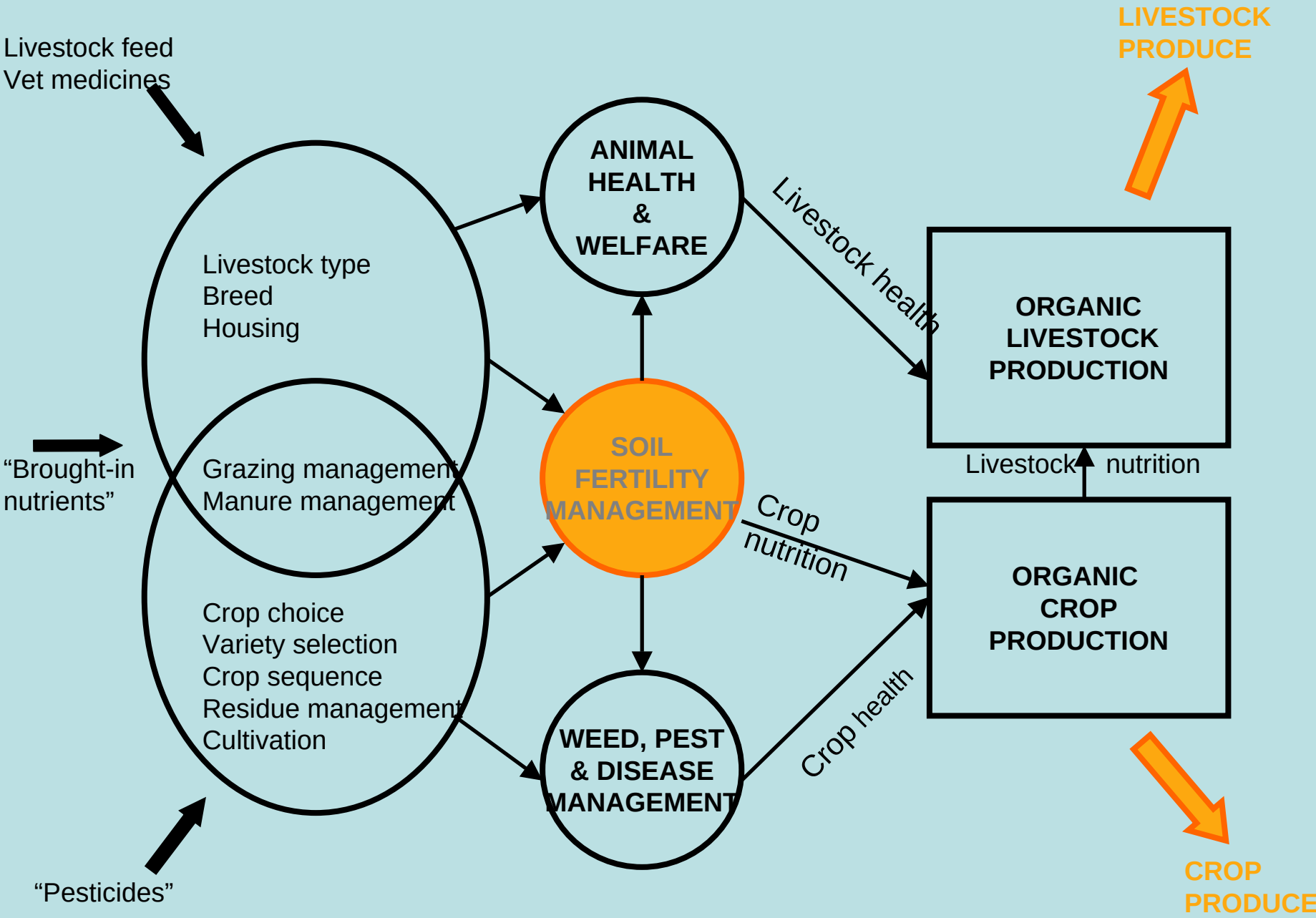
- Assess the evidence for the direct and indirect impacts of land management practices on species diversity and function in soil.
- Evaluate the implications for below-ground biodiversity and ecosystem function of modifications to land management approaches and farming systems, particularly the implications of organic agriculture.

ENGLISH NATURE

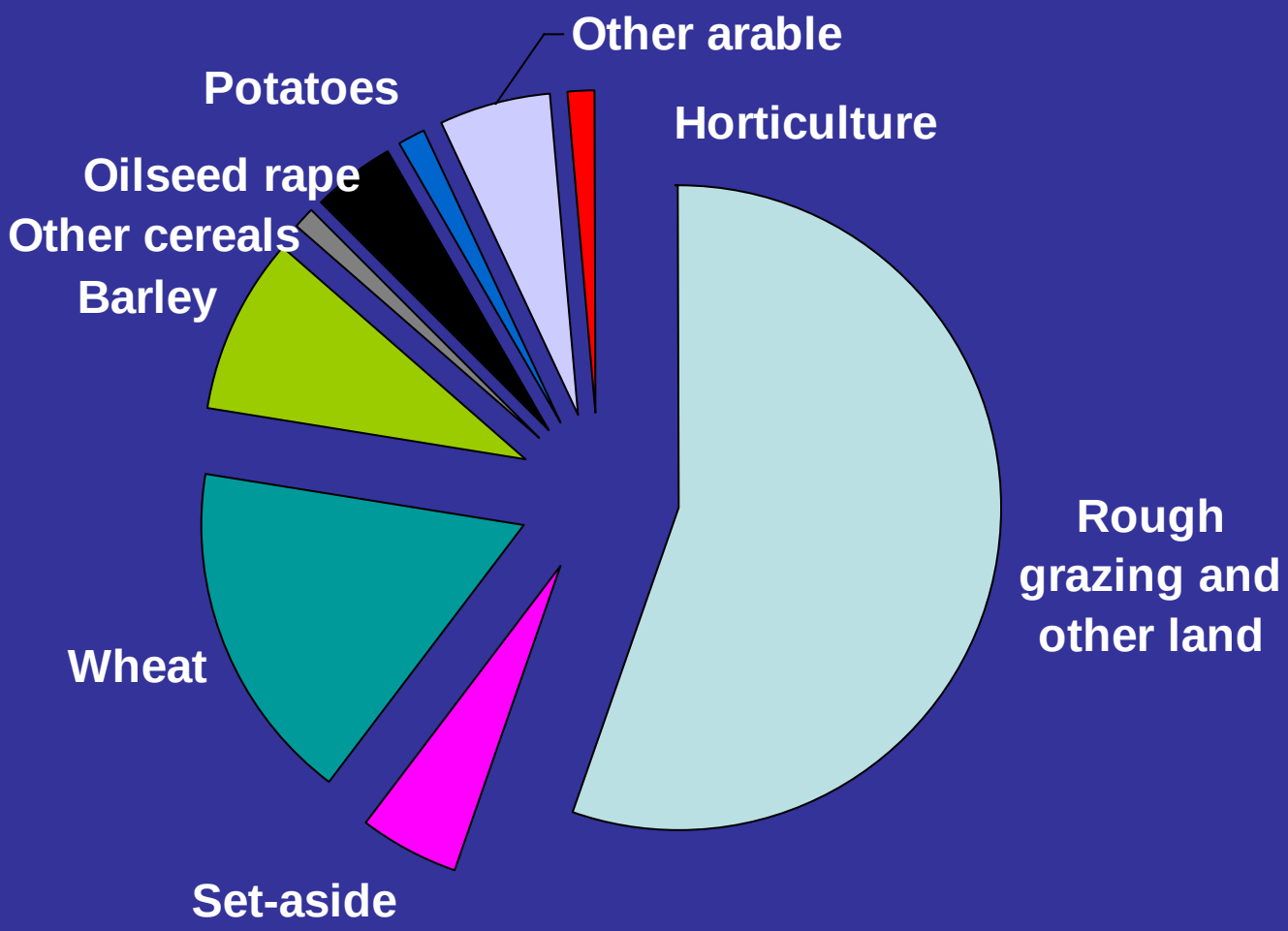
SCOTTISH NATURAL HERITAGE
DUALCHAS NADAIR na h-ALBA

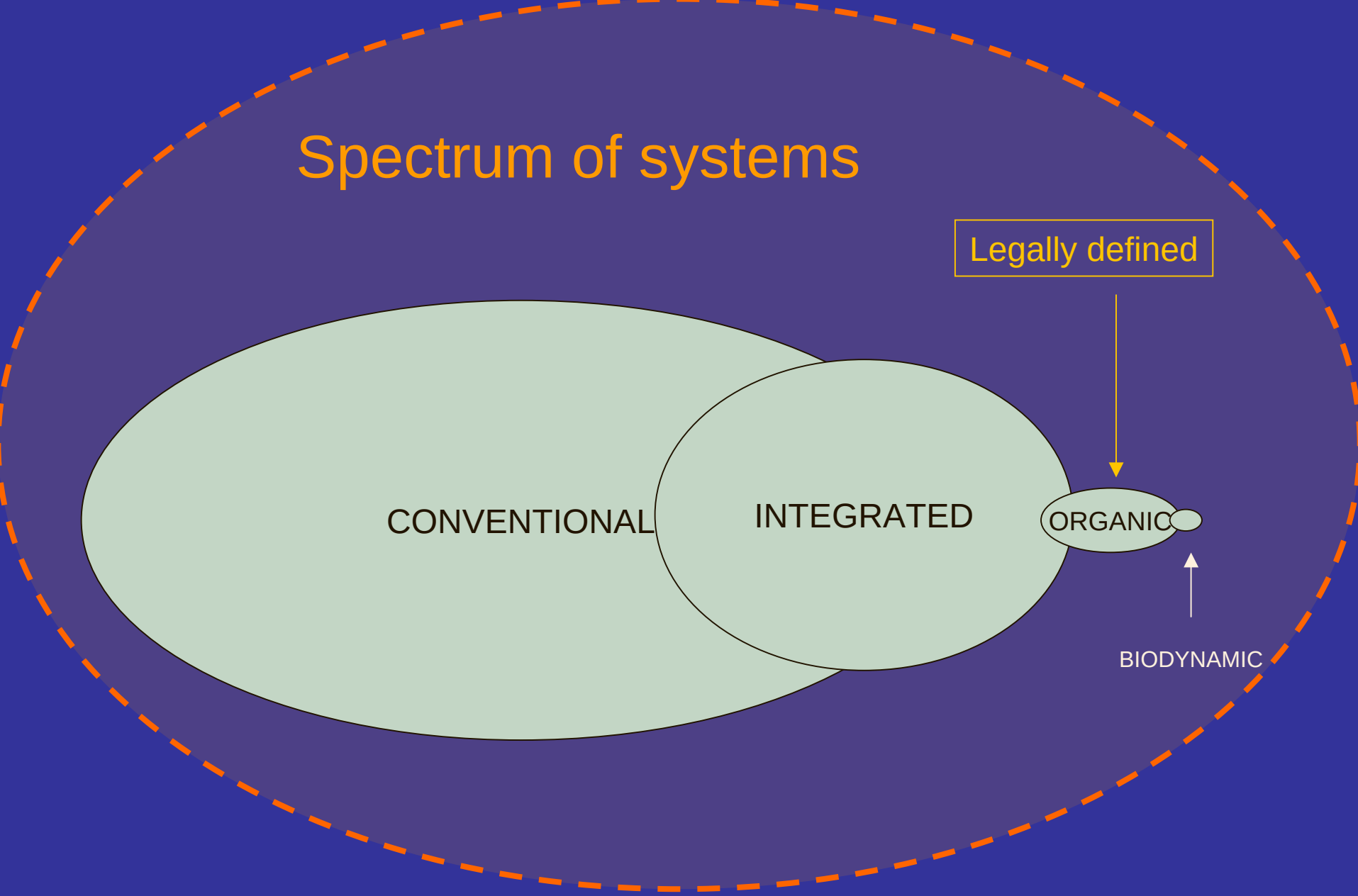
CYNGOR CEFN GWLAD CYMRU
COUNTRYSIDE COUNCIL FOR WALES

defra
Department for Environment Food and Rural Affairs


Livestock feed
Vet medicines
Livestock type
Breed
Housing
Grazing management
Manure management
Crop choice
Variety selection
Crop sequence
Residue management
Cultivation
"Brought-in nutrients"
"Pesticides"
ANIMAL HEALTH & WELFARE
SOIL FERTILITY MANAGEMENT
WEED, PEST & DISEASE MANAGEMENT
Livestock health
Crop nutrition
Crop health
ORGANIC LIVESTOCK PRODUCTION
ORGANIC CROP PRODUCTION
Livestock nutrition
LIVESTOCK PRODUCE
CROP PRODUCE

Agricultural land use in the UK 2004



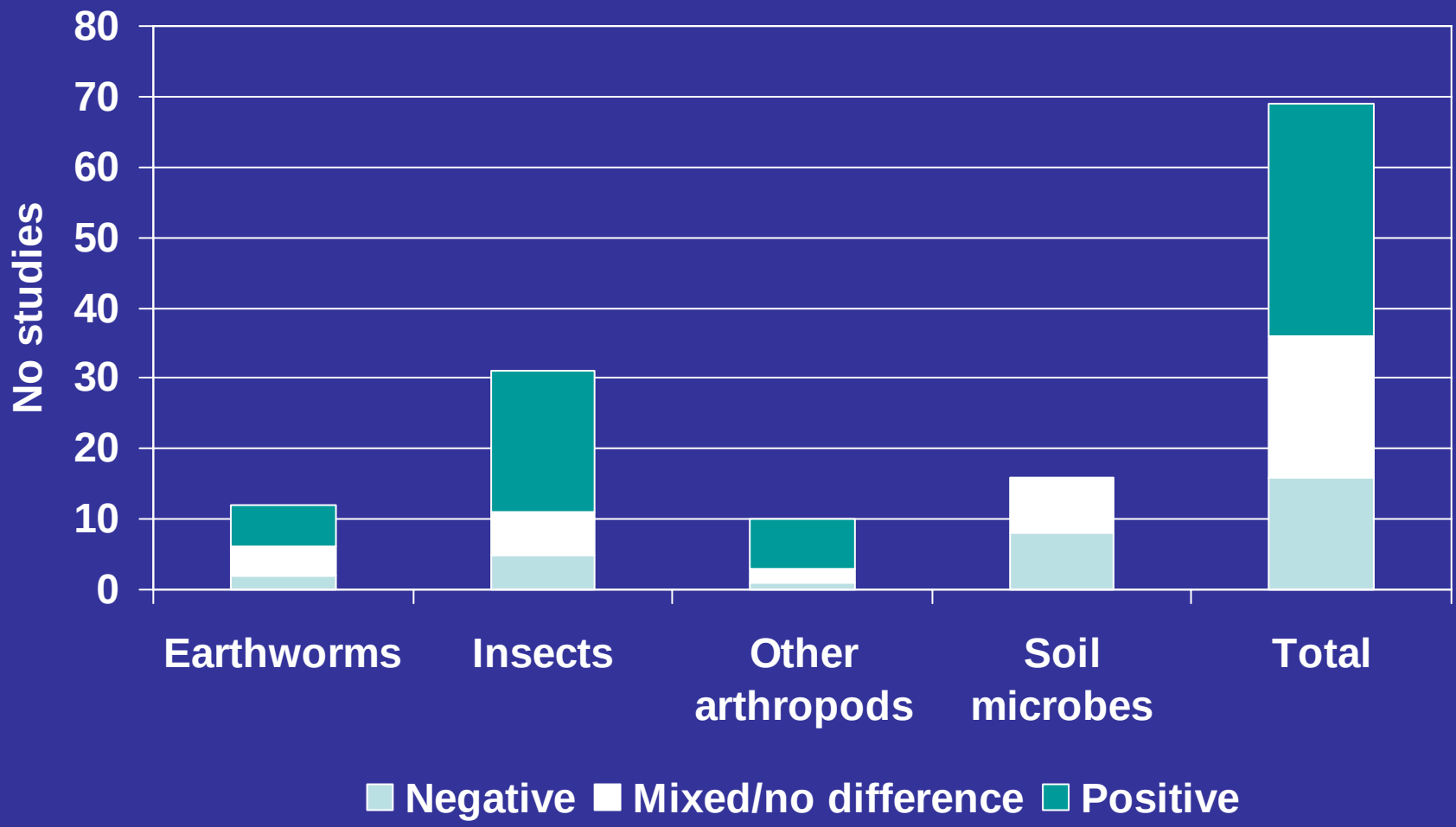


Range and combination of practices

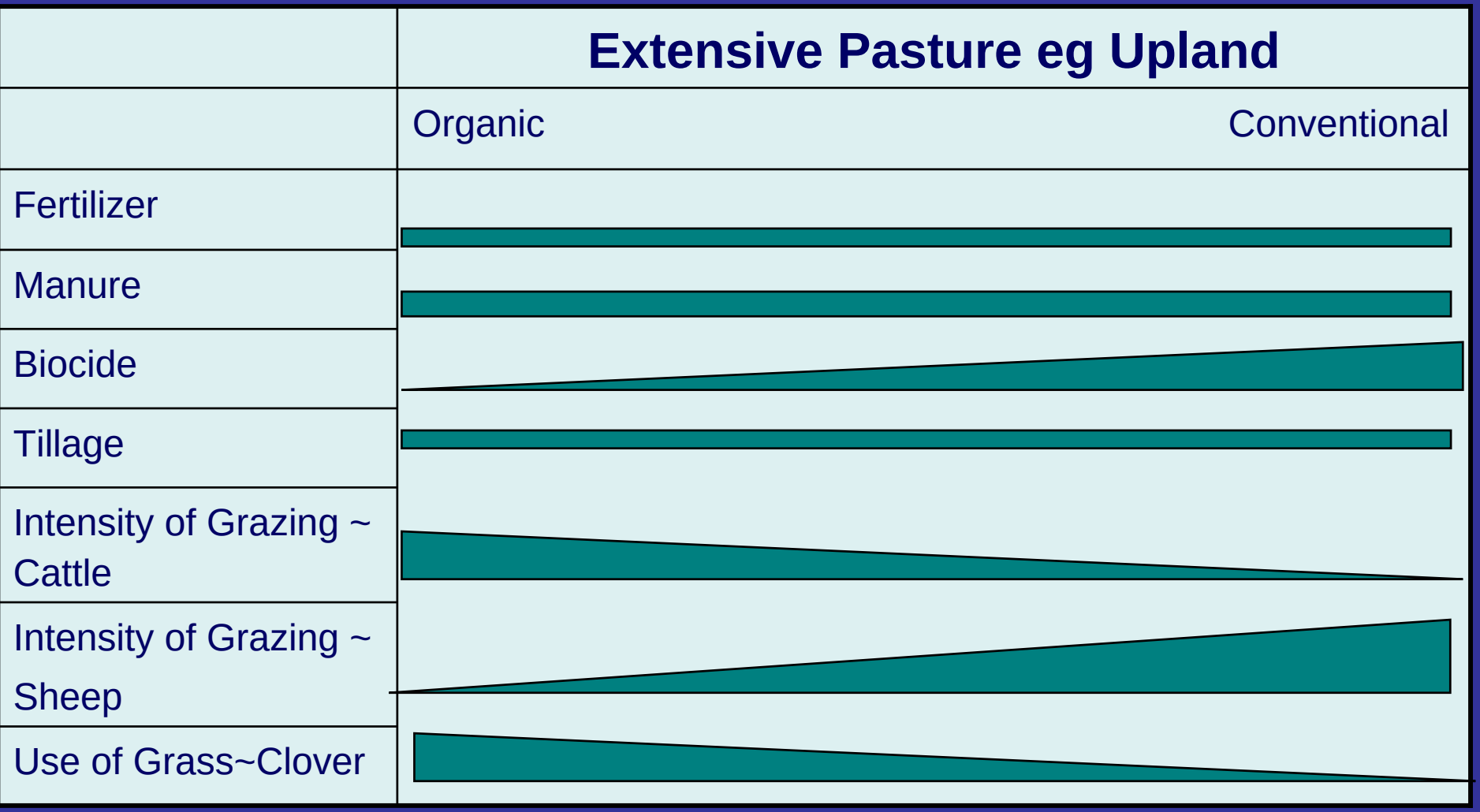
Practices and systems

	Pasture Intensive	Pasture Extensive	Ley/arable	Arable	Horticulture
Grazing	***	**	**		
Manure	***	*	***	*	*
Fertilizer	**	*	**	***	**
Lime	*	*	**	**	**
Vet medicines	***	**	**		
Drainage	**	*	**	**	**
Species diversity	*	**	***	*	**
Biocides	*	*	**	***	***
Tillage	**	*	**	***	***

Studies of organic v conventional farming: Hole et al. (2005)



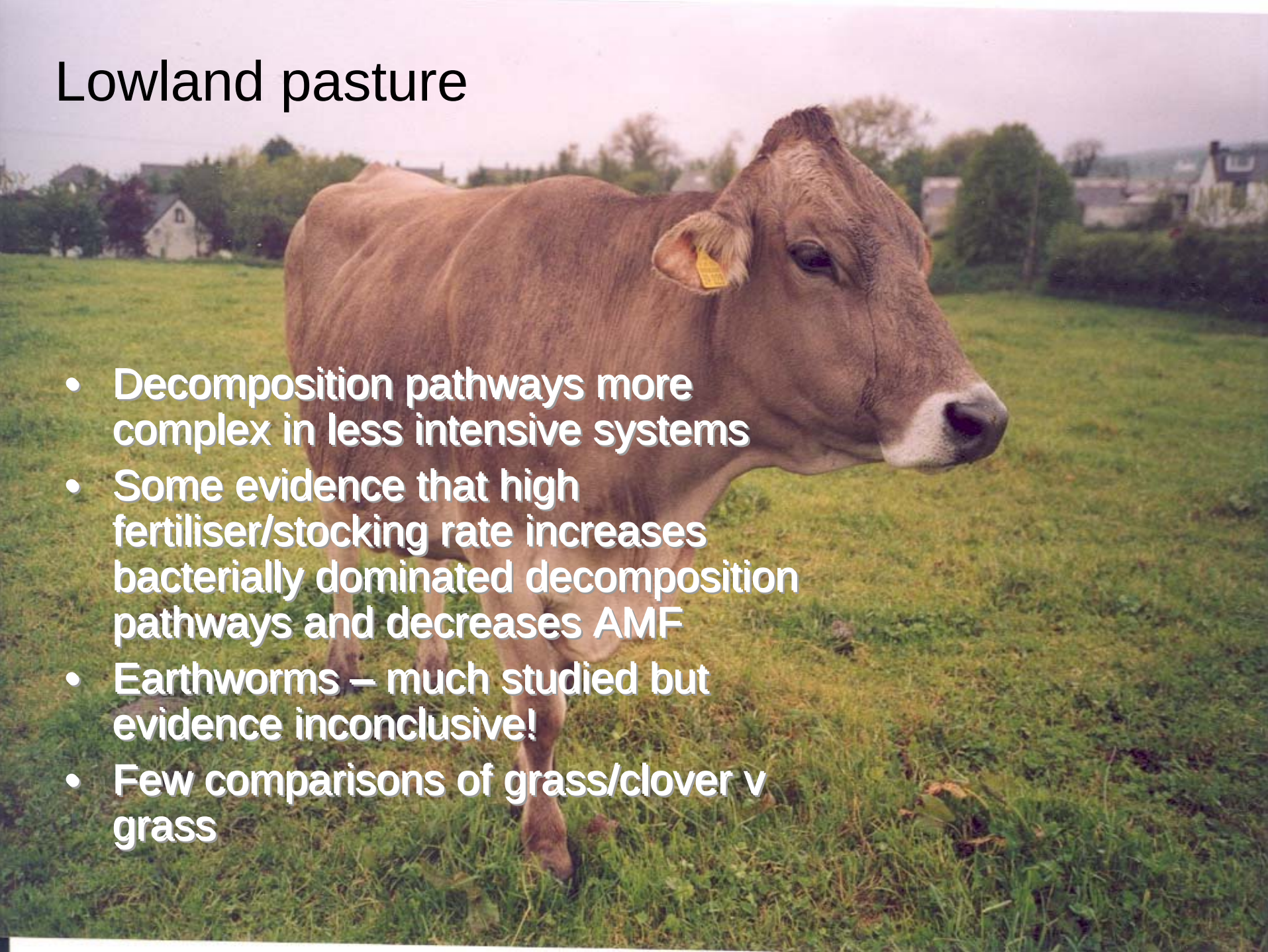
Farming systems (indicates tendency to particular practices)



Upland pastures

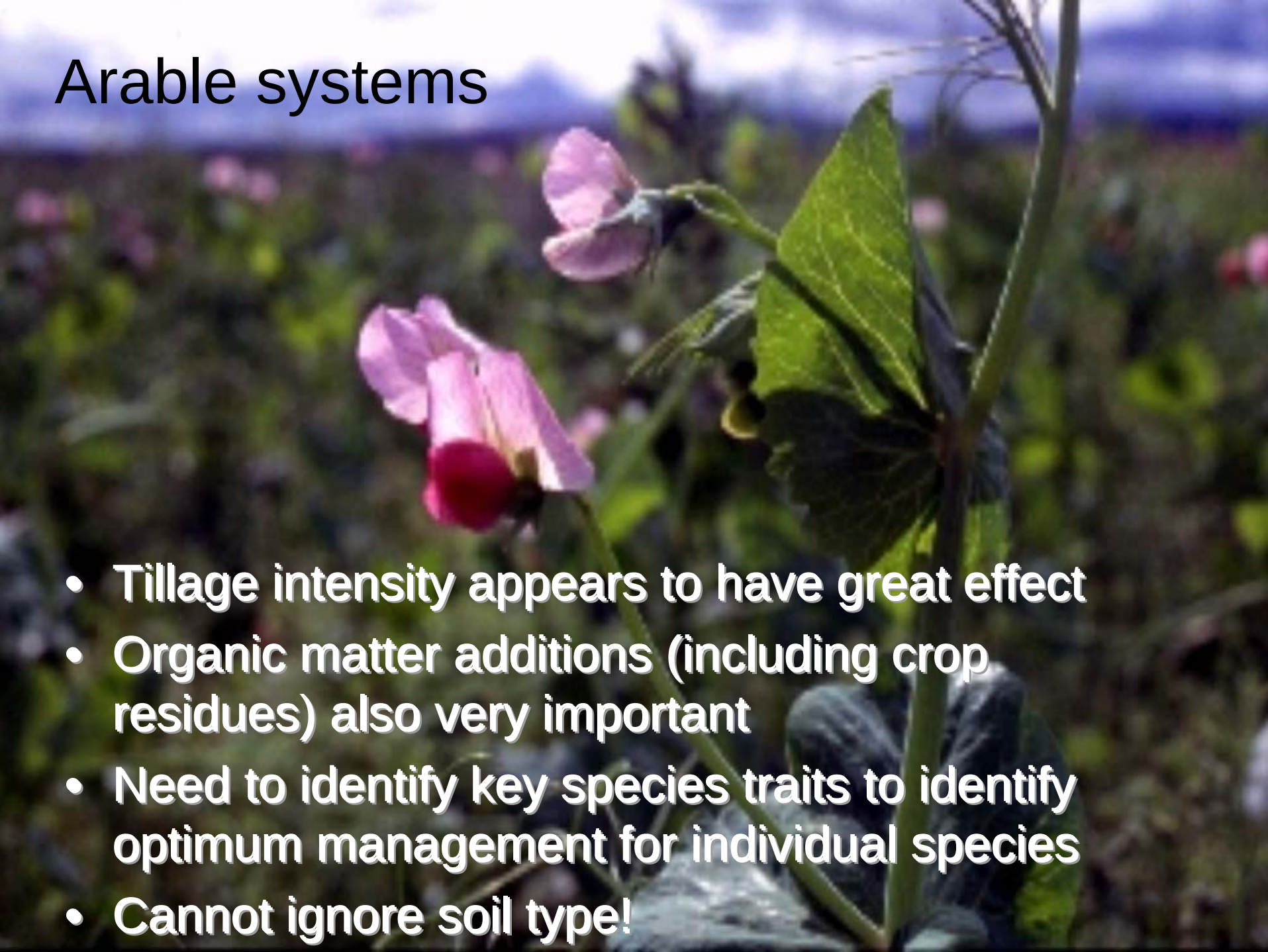
- Almost no work has been done to study the impact of differences between farming systems in upland pastures.
- Possible negative effects of reduced stocking density associated with organic farming
- Some evidence of reduced dung beetle activity in systems using vet medicines

Lowland pasture



- Decomposition pathways more complex in less intensive systems
- Some evidence that high fertiliser/stocking rate increases bacterially dominated decomposition pathways and decreases AMF
- Earthworms – much studied but evidence inconclusive!
- Few comparisons of grass/clover v grass

Arable systems



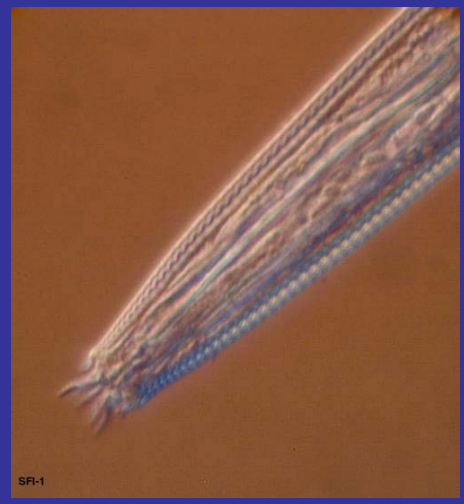
- Tillage intensity appears to have great effect
- Organic matter additions (including crop residues) also very important
- Need to identify key species traits to identify optimum management for individual species
- Cannot ignore soil type!

Experimental design and future research

- How do we design systems comparisons?
  - systems themselves
  - plot size
- Management practices and combinations
  - realism!
- Need for more information on soil properties in papers

Conclusions

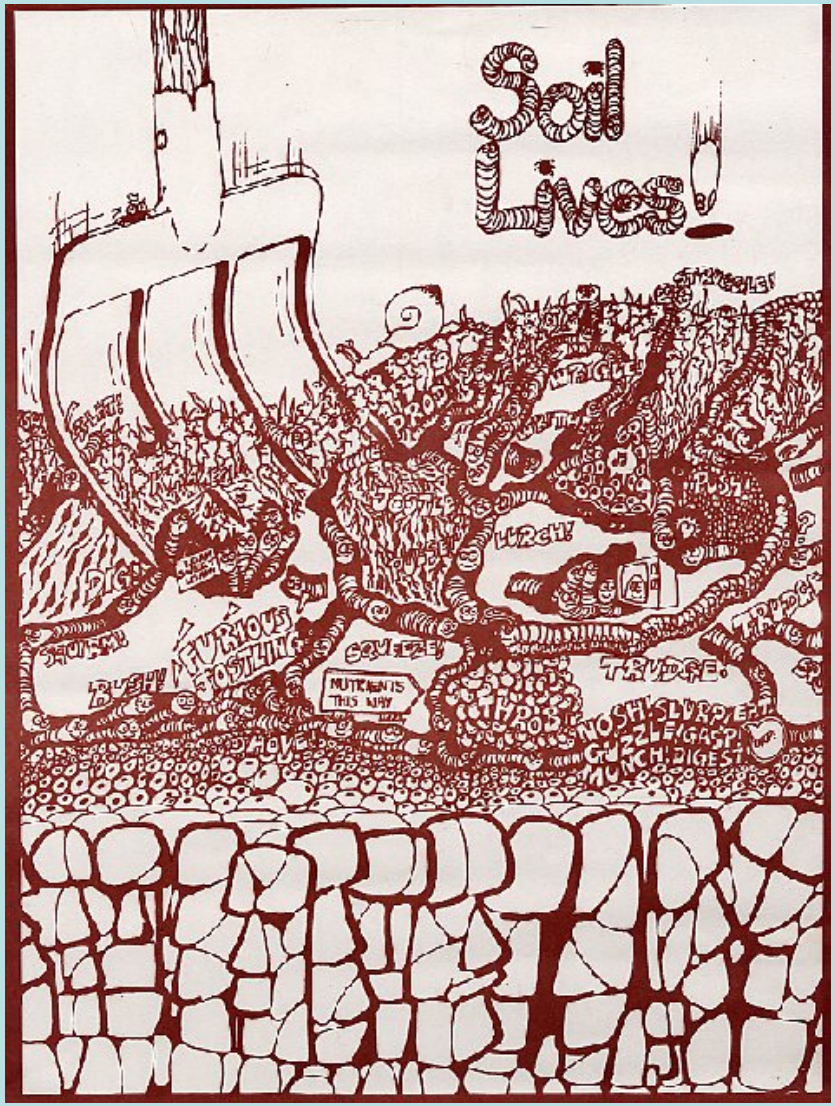
- Farm management practices do alter below-ground biodiversity and ecosystem function
- The evidence base is not strong enough to conclusively distinguish between the benefits of organic and integrated farming in lowland arable systems
- Best practice is likely to be farm, and even micro-site, specific.



Future priorities

- Do we want increased soil biodiversity in the uplands and from what baseline?
- How can science/policy use the knowledge base held by farmers?
- What knowledge is ready for transfer to farmers? And what is the best way of transferring it?
- We need to address the social/economic impacts of managing for belowground biodiversity

Thank-you!



- The report will be published at www.jncc.gov.uk

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~Implications for Sustainable Land Management.

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