Proper grazing is nature-based solutions to restore soil nematodes and ecosystem multifunctionality in degraded grasslands

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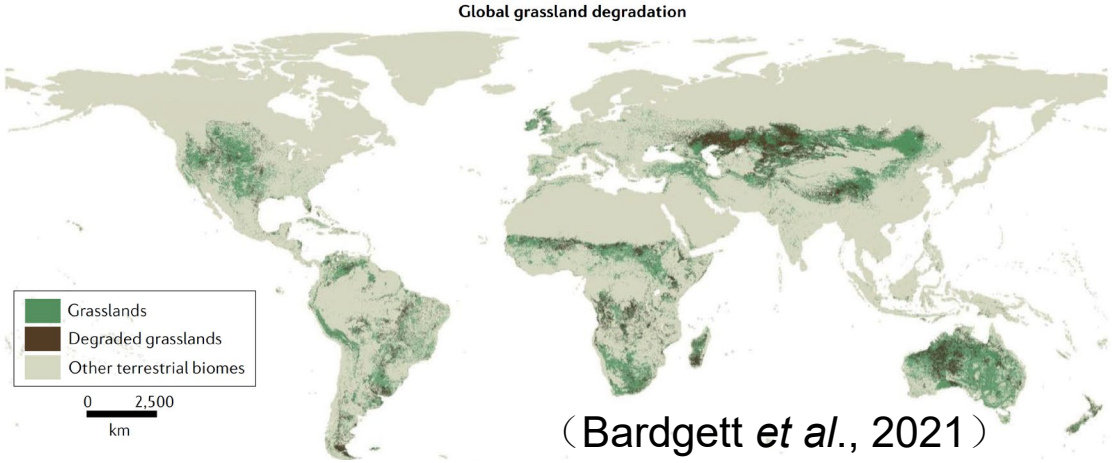
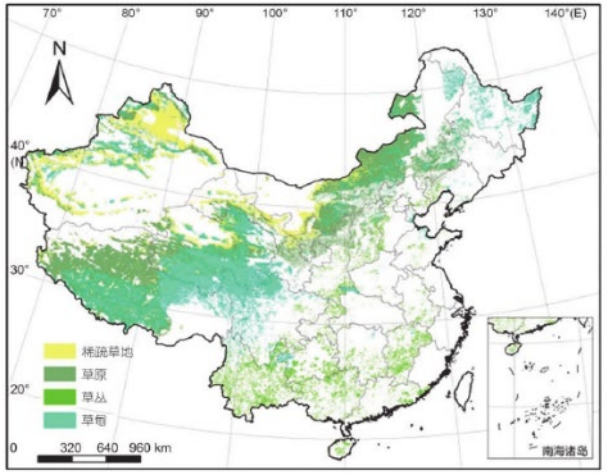
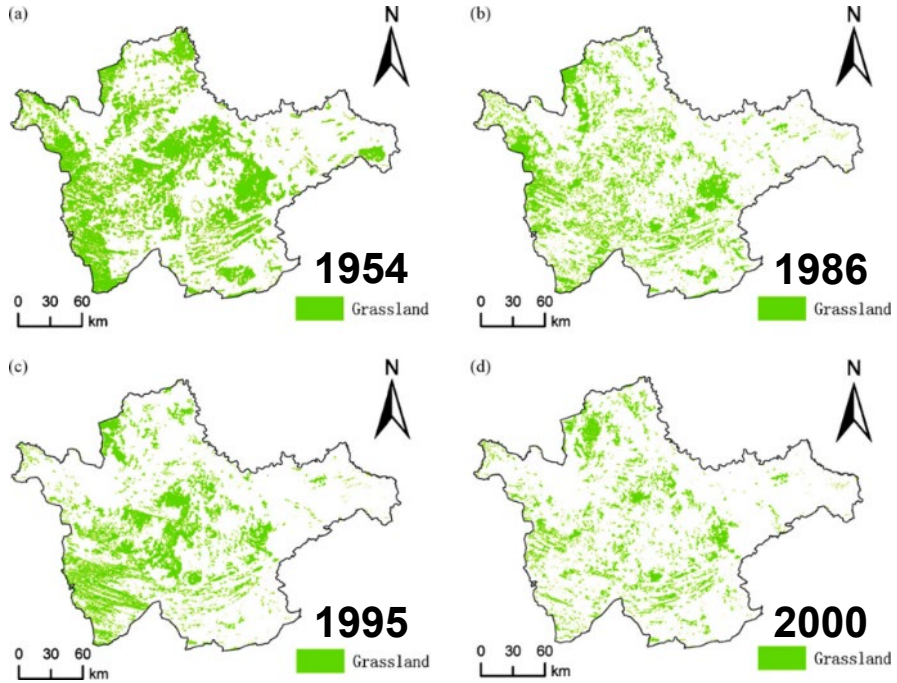


（Bardgett *et al*., 2021）

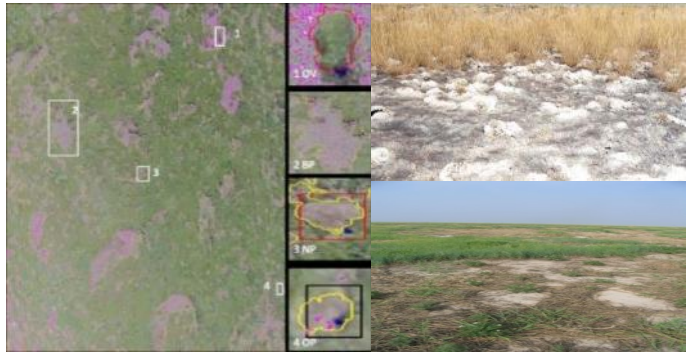


（Fang *et al*., 2018）



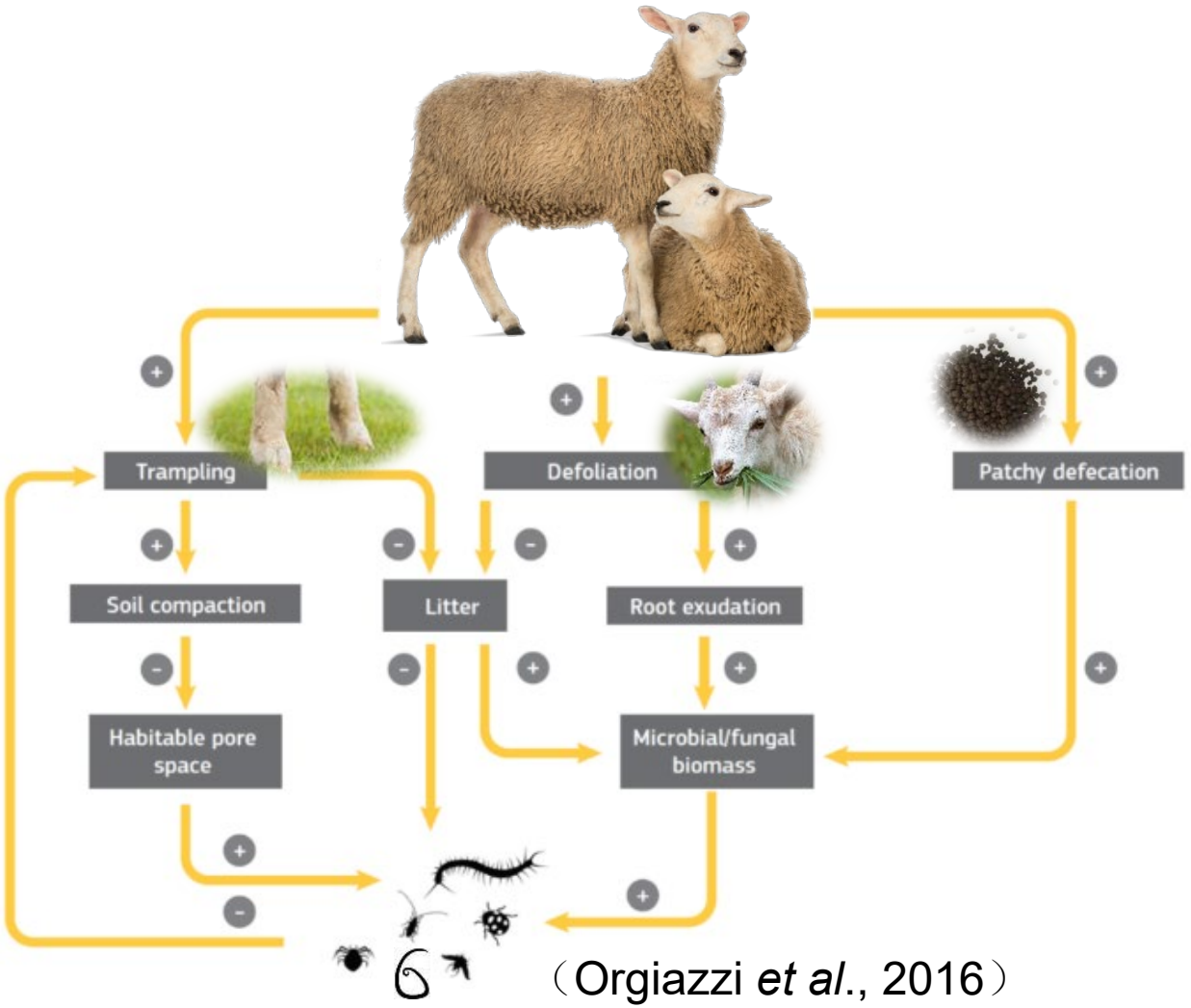
（Wang *et al*., 2009）

- **Grasslands cover about 40% of the Earth's surface.**
- **Grassland is 265 ×10^4 km^2 in China.**
- **90% of grasslands are under severe threat from ongoing degradation.**

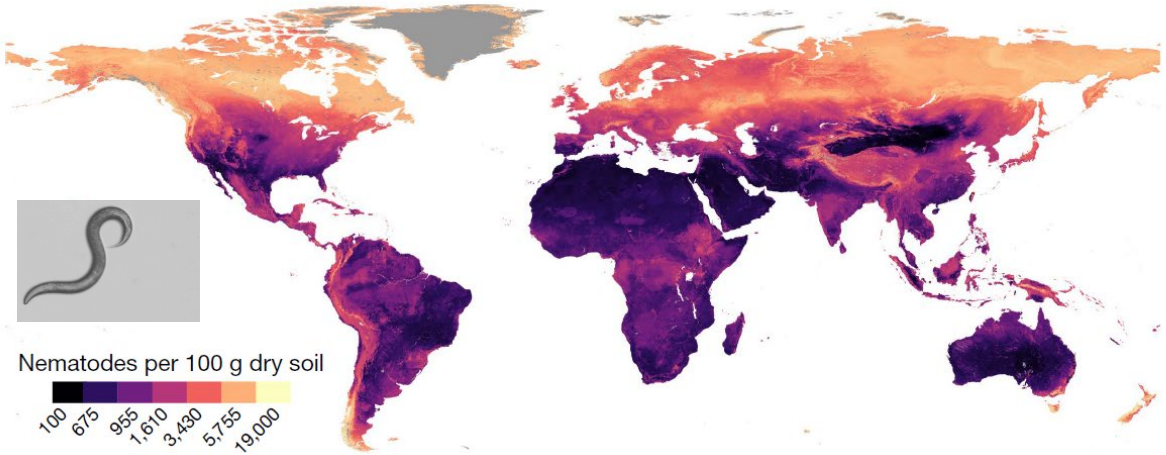


We rely on nature to reach "win-win" outcomes for grasslands, the environment, and households!

Livestock grazing is an important management tool for maintaining grassland health!

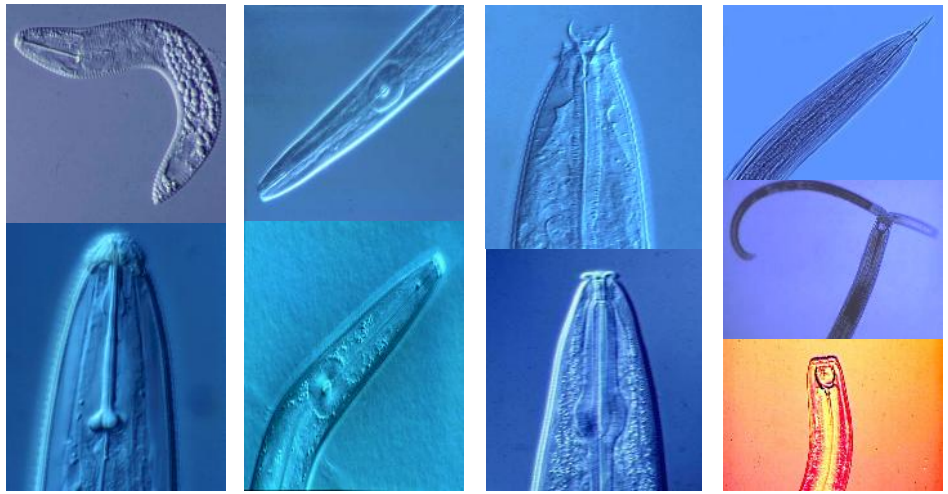


（Orgiazzi *et al.*, 2016）

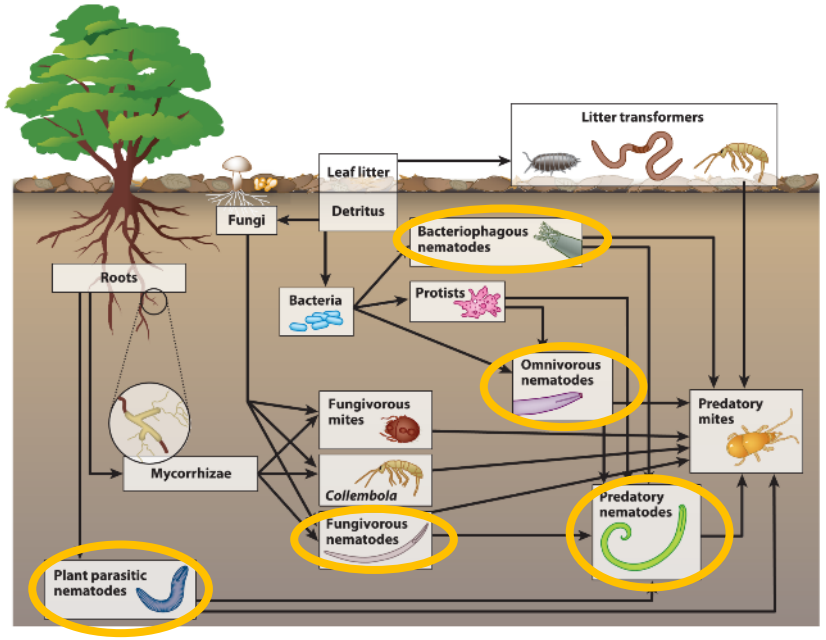


Soil nematodes are the most abundant animals on Earth, filling all trophic levels in the soil food web.

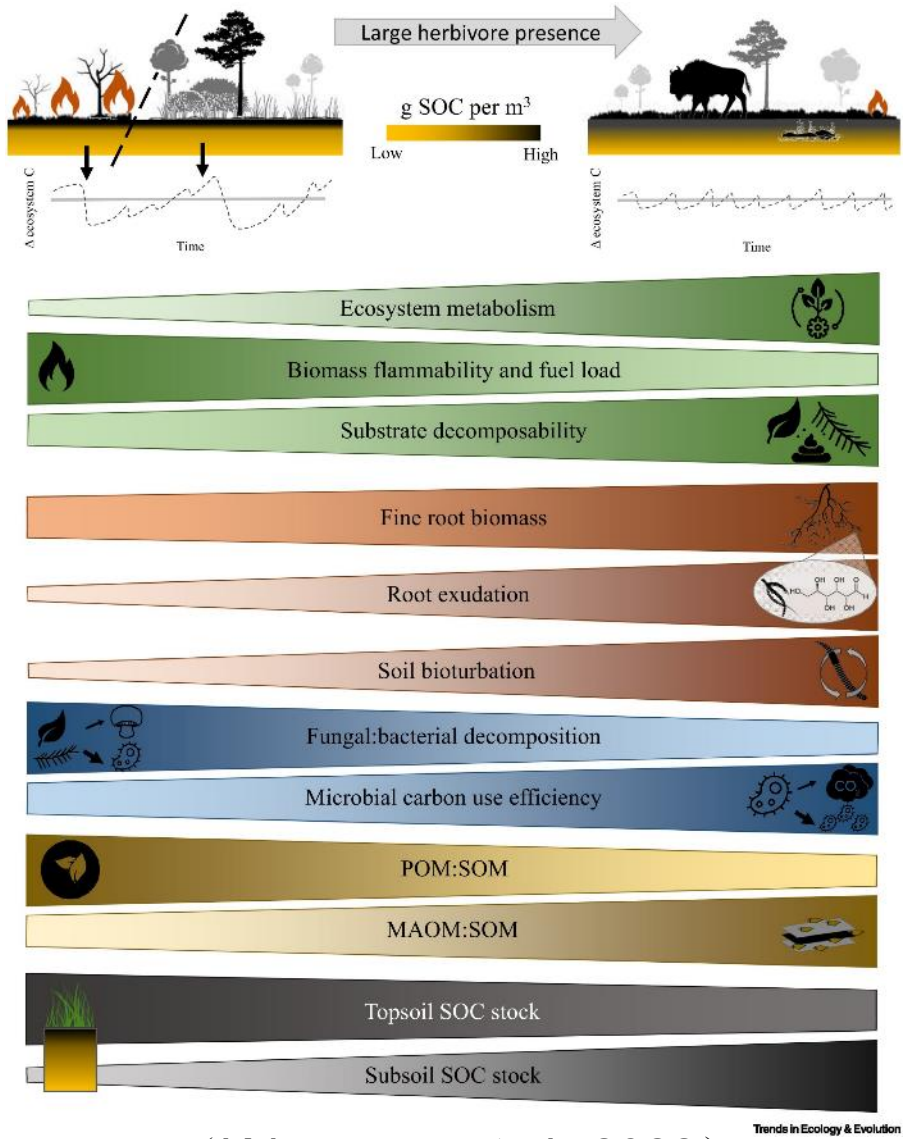
（Hoogen *et al*., 2019）



Plant parasites **Fungivores** **Bacterivores** **Omnivore-predators**

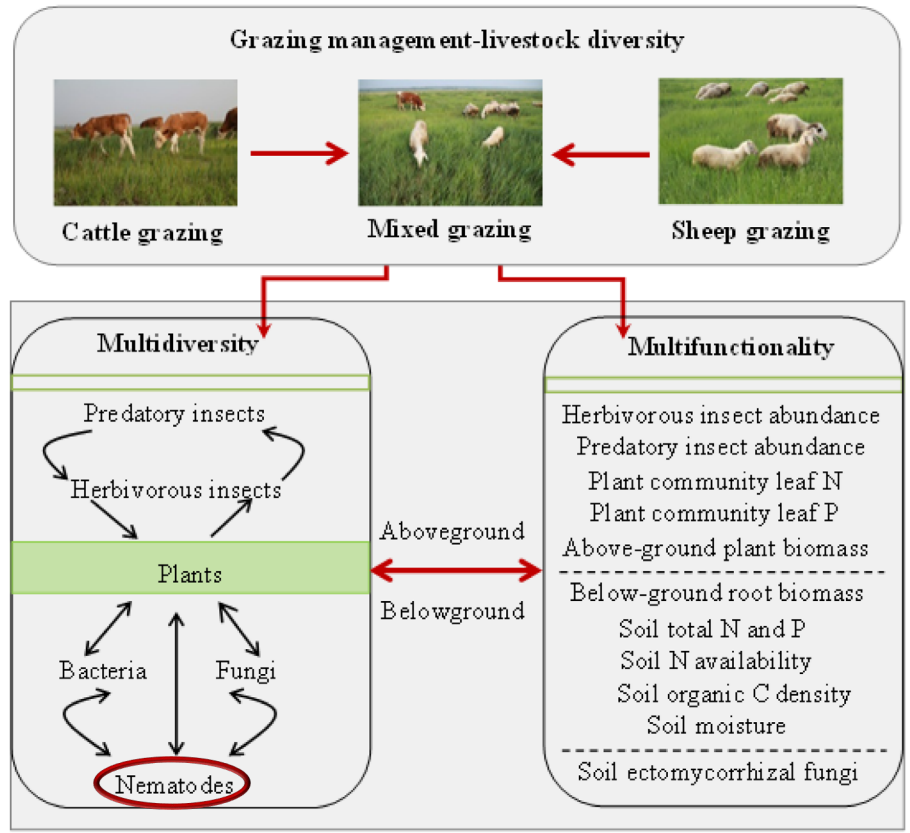


（Nielsen *et al*., 2015）



（Kristensen *et al*., 2022）

Ecosystem multifunctionality is a potential predictor for assessing the response of entire ecosystem to grazing, providing more reliable and holistic information.（Zhang *et al*., 2021）



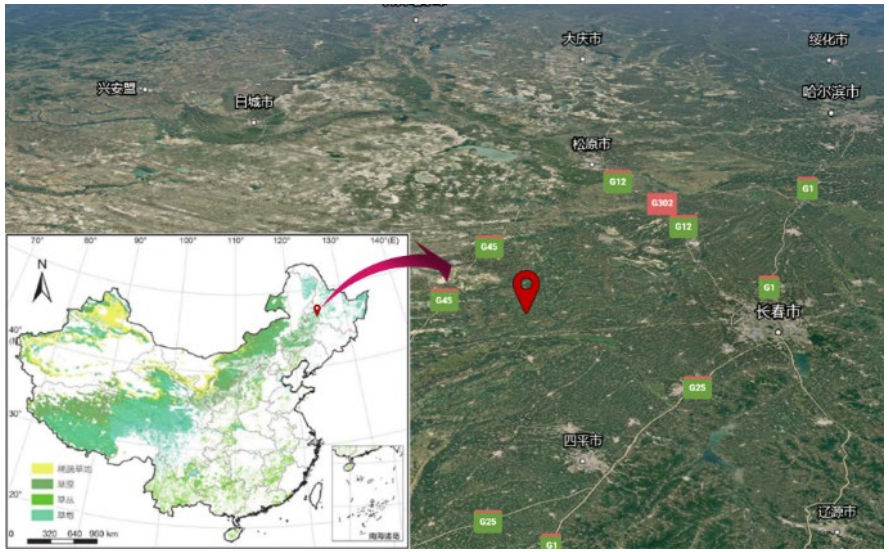
（Wang *et al*., 2019）

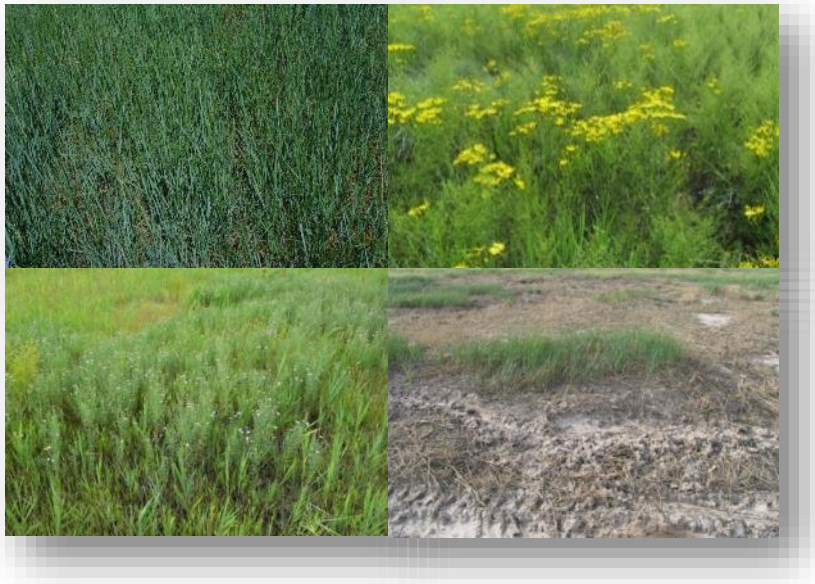
Scientific questions:

How does moderate grazing affect soil nematode communities and ecosystem multifunctionality in degraded grasslands?

Study site

Jilin Songnen Grassland Ecosystem National Observation and Research Station





Location: 44°40′~ 44°44′N
123°44′~ 123°47′E

Elevation: 140~160 m

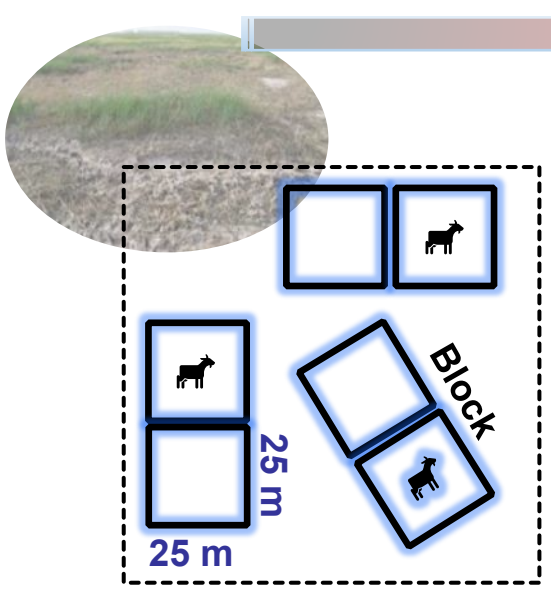
Climate: semiarid continental monsoon

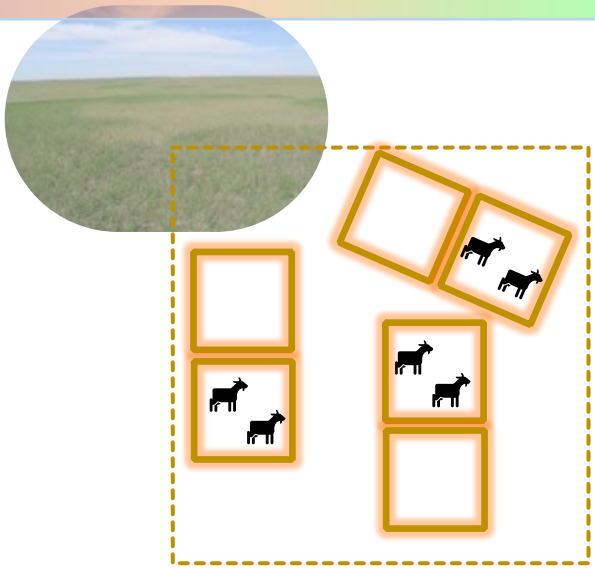
Temperature: 4~9℃

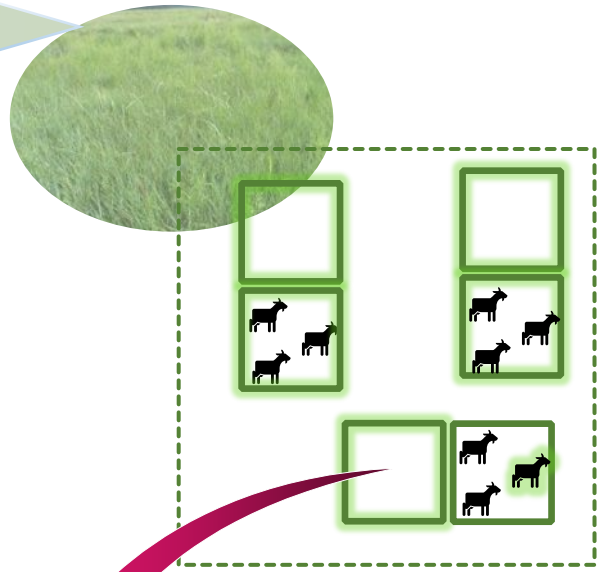
Precipitation: 280~450 mm

Experimental design

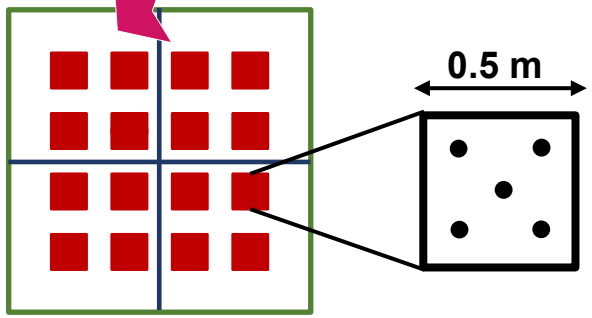
Severely degraded grassland **Moderately degraded grassland** **Lightly degraded grassland**





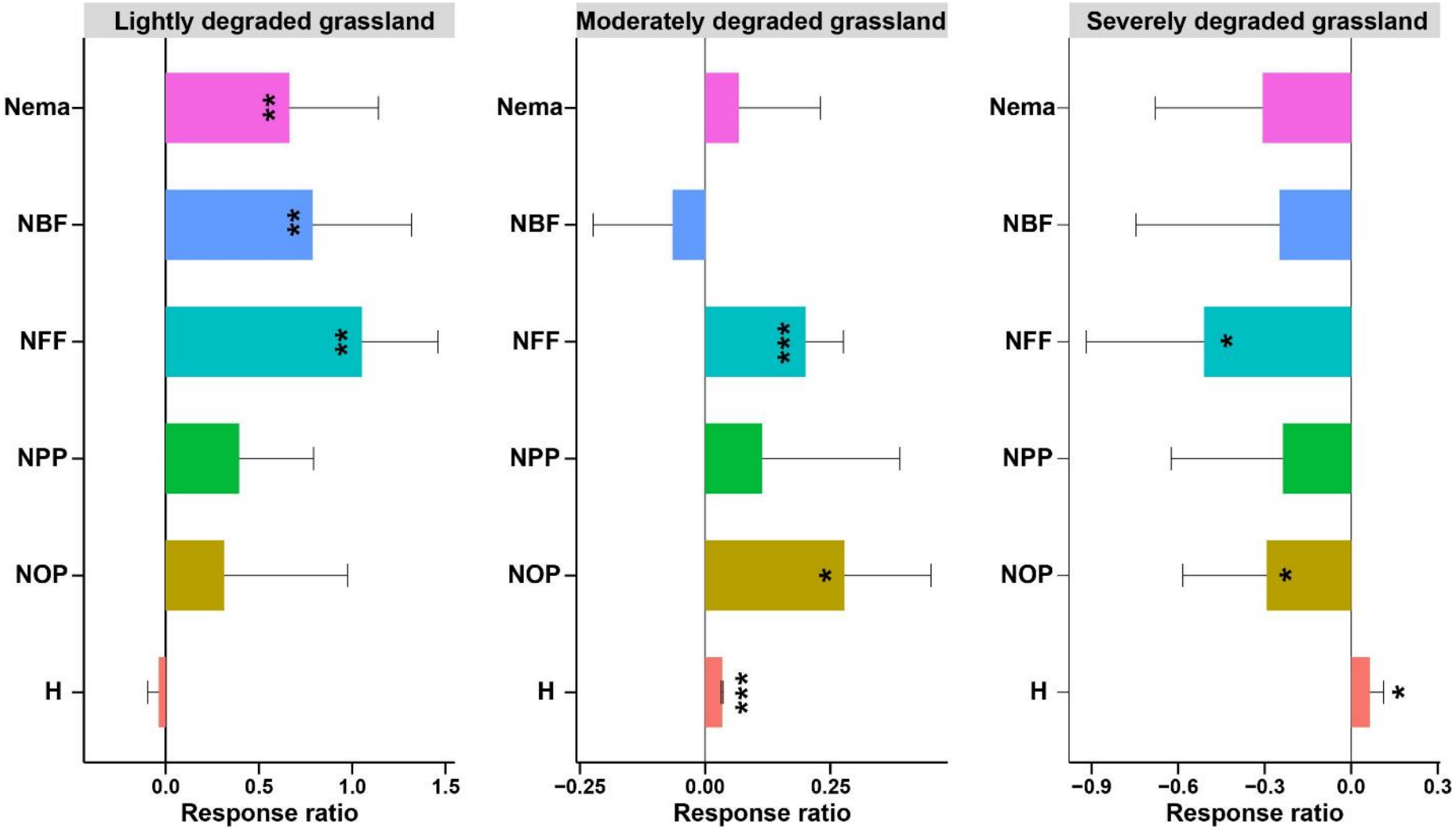


- **Completely randomized block design**
- **Stocking rates: removal 50% of above-ground biomass**
- **Grazing from June to September 2017-2019**



Results

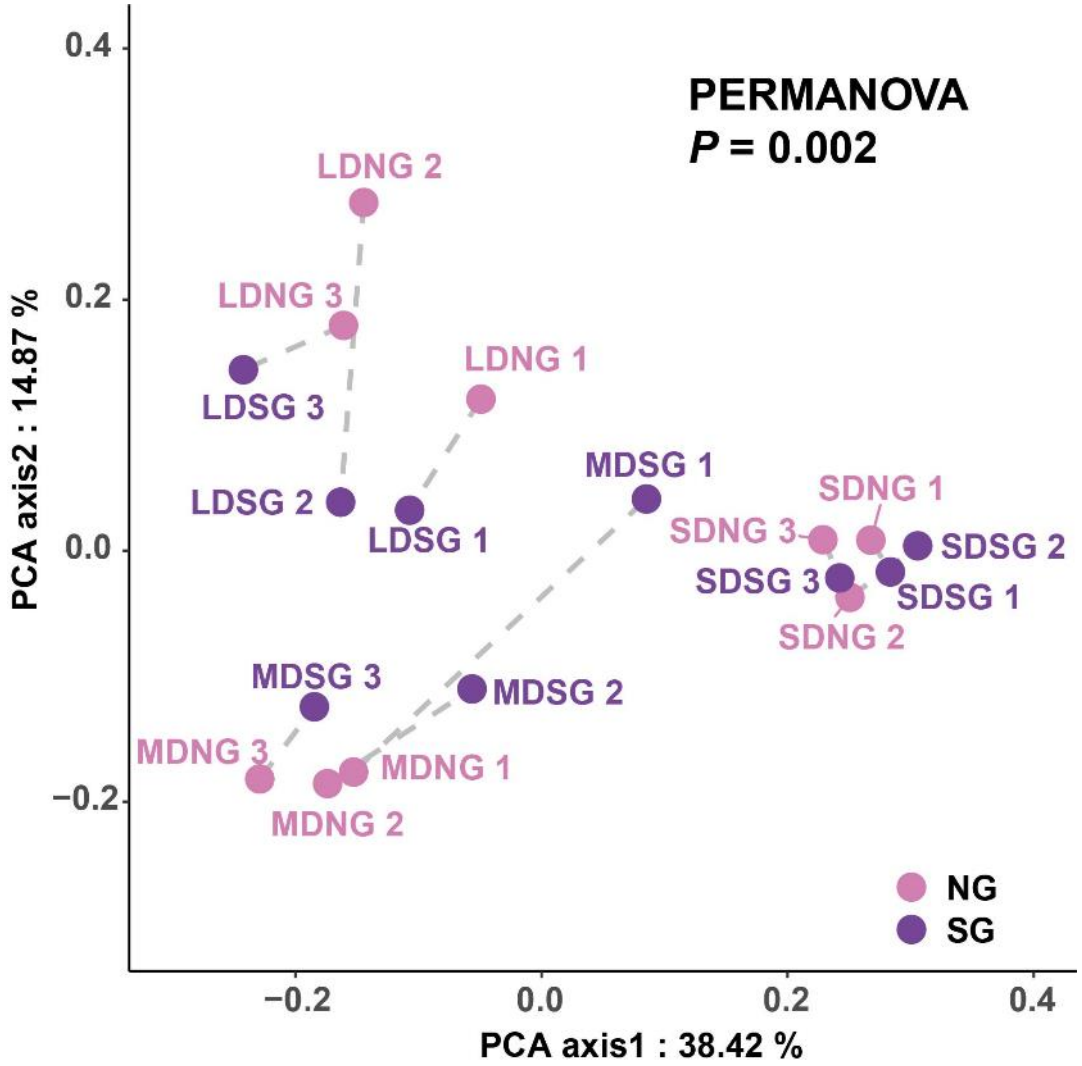
Abundance and diversity



Results

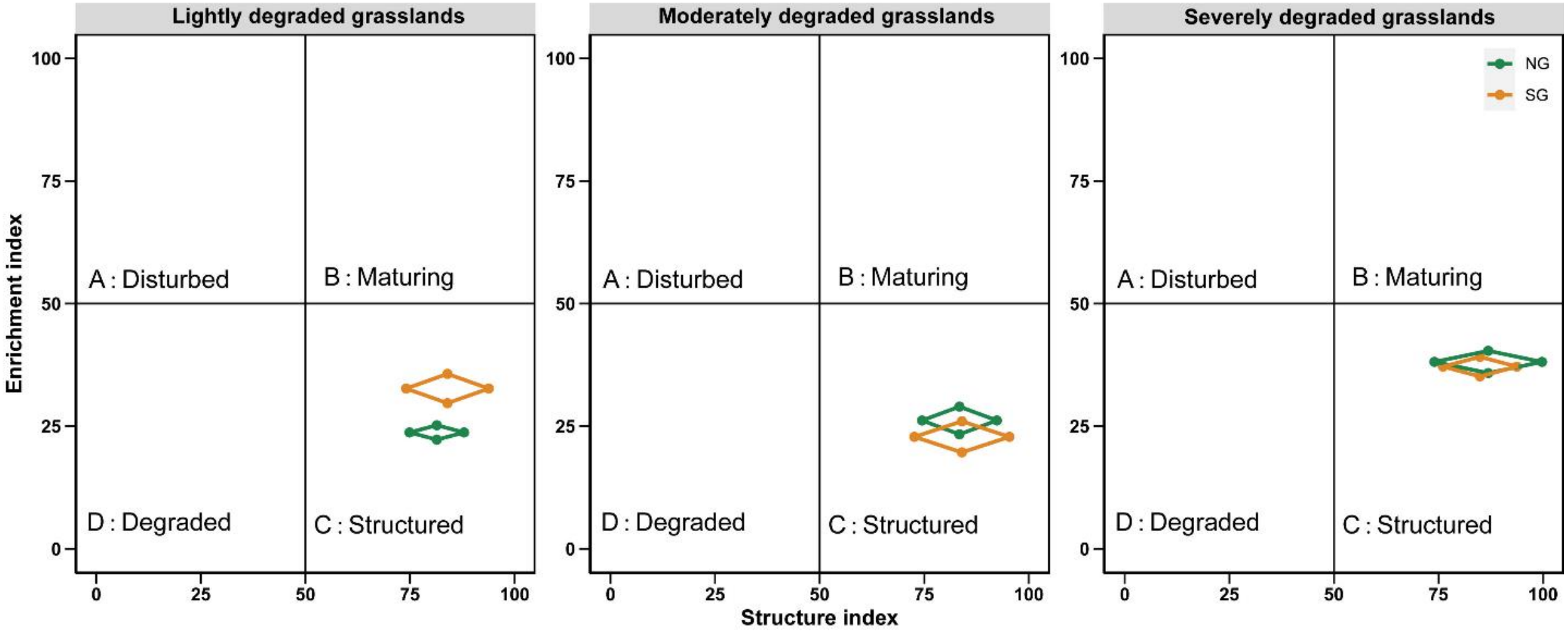
Community structure

Grazing has a significant effect on soil nematode community structure.



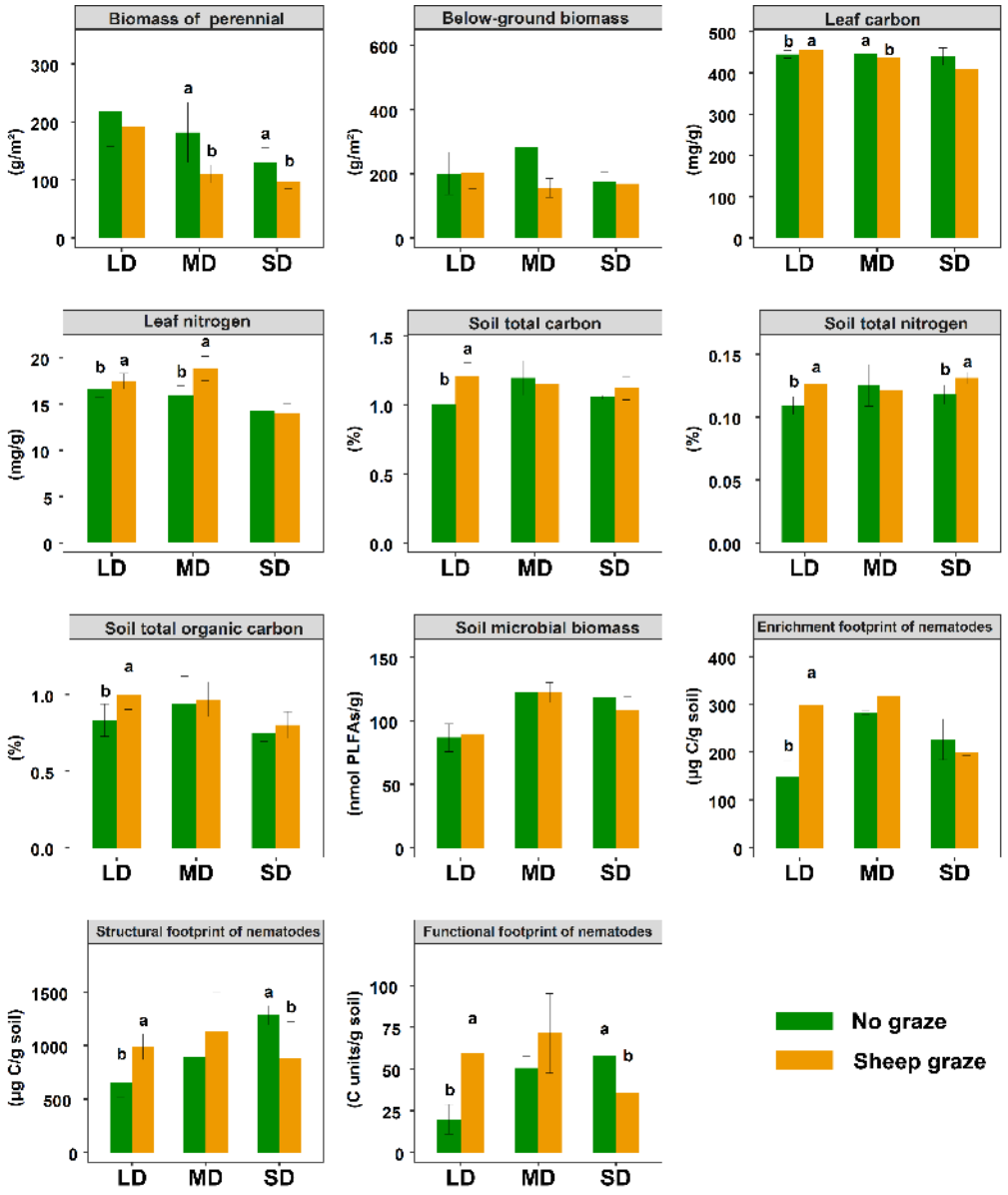
Results

Metabolic footprint



Results

Ecosystem functions

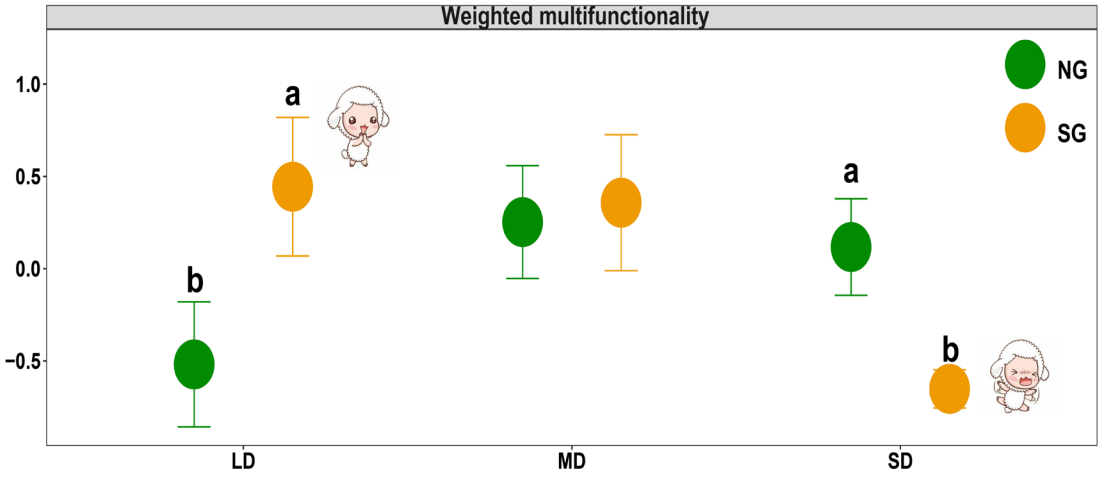


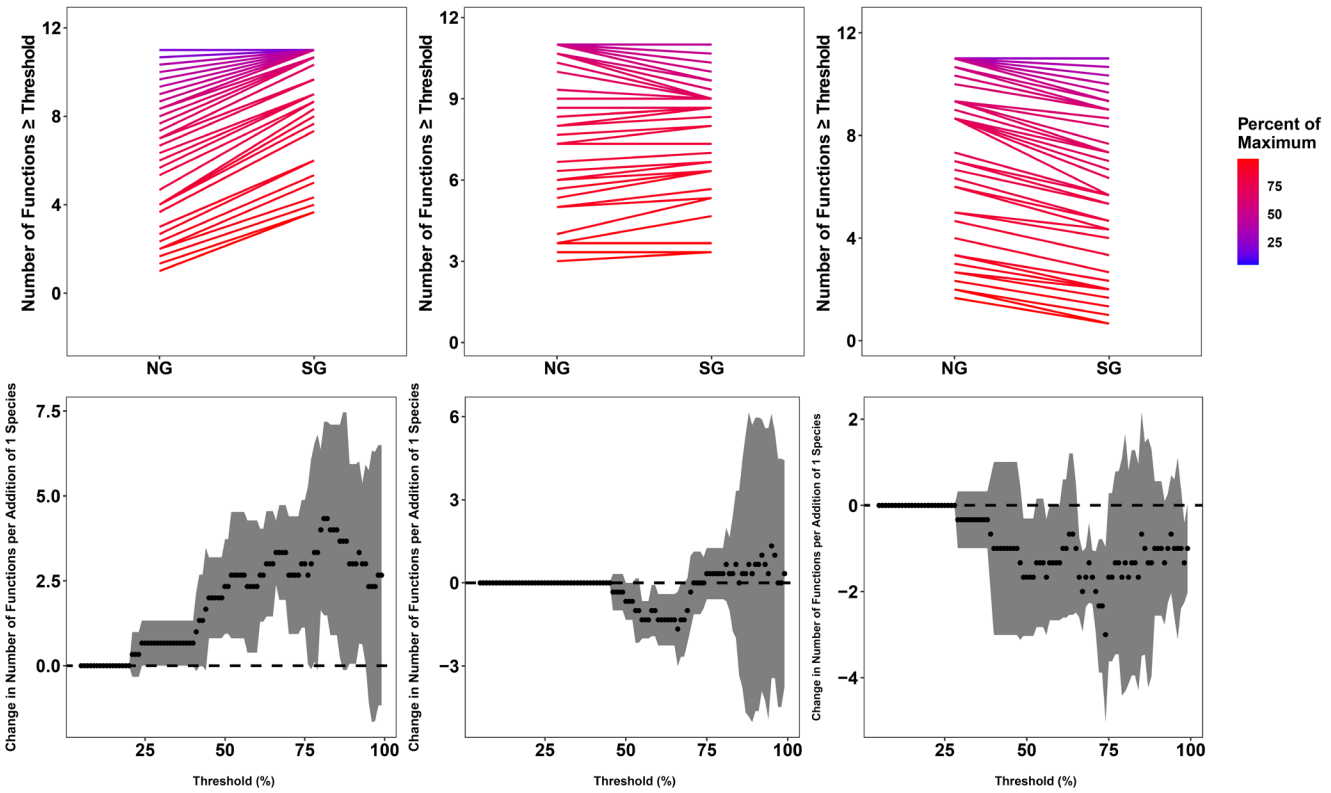
Functions	Graze	Degradation	Graze × Degradation
Biomass of perennial		*	
Below-ground biomass			
Leaf carbon			
Leaf nitrogen			
Soil total carbon	**	**	*
Soil total nitrogen	*		
Soil total organic carbon			
Soil microbial biomass		*	
Enrichment footprint of nematodes	***	**	**
Structural footprint of nematodes		*	*
Functional footprint of nematodes	*	**	*

Results

Ecosystem multifunctionality

	d.f.	*F*	*P*
Graze	1,10	29.33	<0.001
Degradation	2,10	10.73	<0.01
Graze × Degradation	2,10	23.72	<0.001





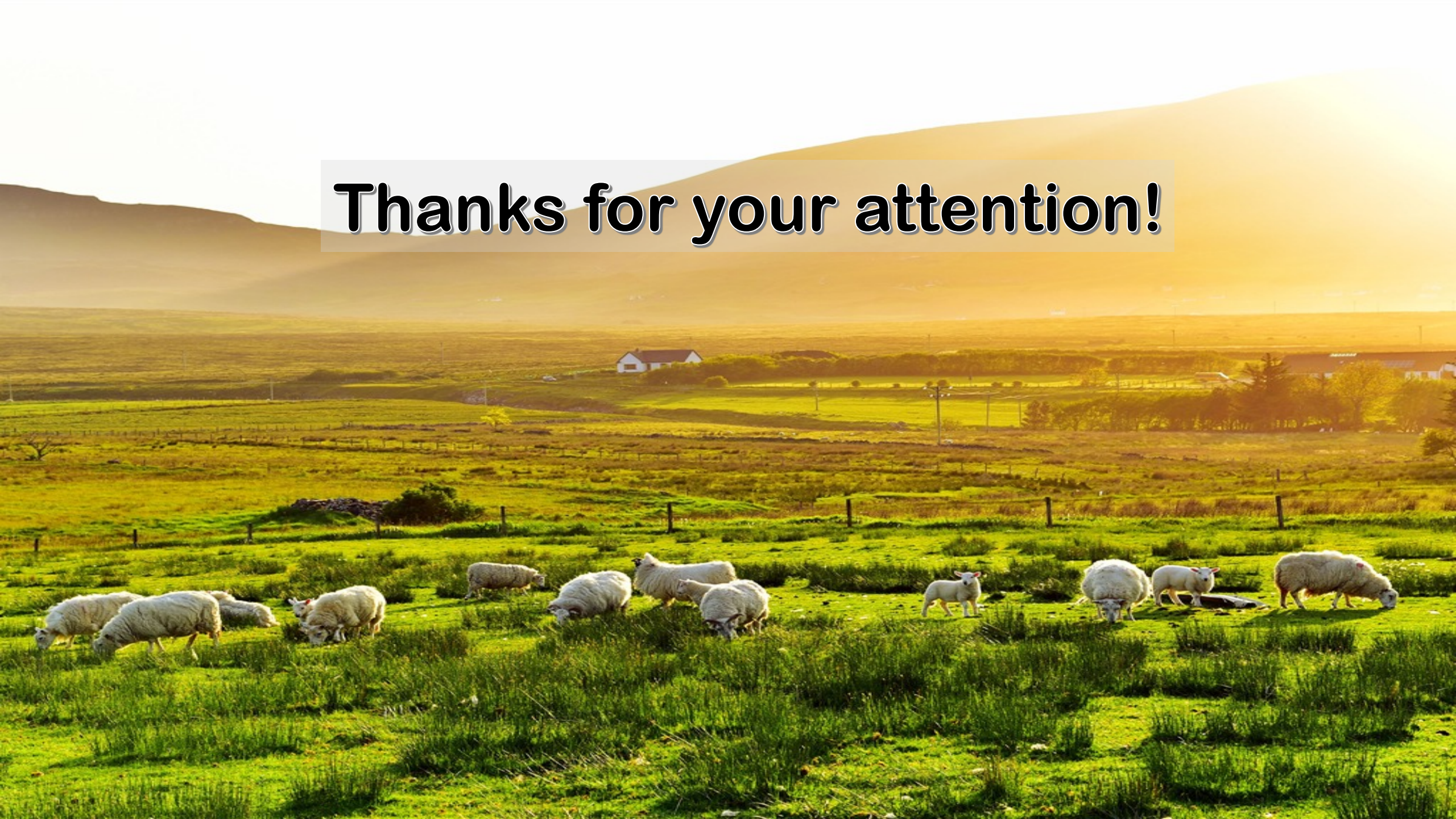
Conclusions

Soil nematodes and ecosystem multifunctionality

Lightly degraded grassland	Increase
Moderately degraded grassland	Maintain
Severely degraded grassland	Decrease

Livestock, as ecosystem engineers, can promote soil nematode communities and ecosystem multifunctionality in lightly degraded grasslands.

Acknowledgements


Thanks for your attention!