Mechanical loosening of grasslands – a risk to ecosystem services or a restorative practice?

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- Objective:
  To assess the impact of contrasting grass sward and cultivation treatments on forage yield and quality, plant species diversity and soil water infiltration rates.


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Floodgate Burn
Cockle Park
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Site details

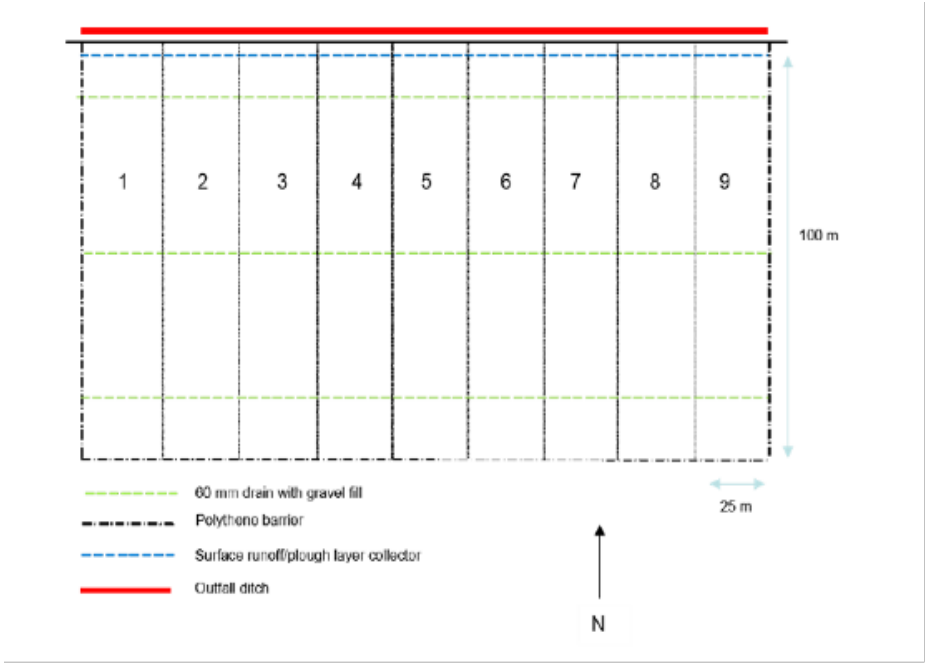
Nine (25 x 100 m) plots

Heavy clay loam soil (34% clay)

3 treatments:

- Control (grass clover sward – no loosening)
- Grass clover sward (loosened to 25 cm depth)
- Deep rooting herb and legume mix (MSS)

- Swards established in spring 2020



Deep-rooting herb & legume (MSS) mix

Latin name	Common name	% by mass of total mix
Deep-rooting herbs and legumes		
Achillea millefolium	Yarrow	5
Onobrychis	Sanfoin	20
Cichorium intybus	Chicory	10
Lotus corniculatus	Birdsfoot Trefoil	15
Plantago lanceolata	Ribwort Plantain	15
Trifolium pratense var. pratense (wild)	Wild Red Clover	5
Trifolium repens (small-leaved)	Small-leaved White Clover	2.5
Trifolium repens (large-leaved)	Large-leaved White Clover	2.5
Grasses		
Agrostis capillaris	Common Bent	5
Anthoxanthum odoratum	Sweet Vernal-grass	10
Cynosurus cristatus	Crested Dog's-tail	10

Plots 3, 5 and 7 loosened on 11-09-2020

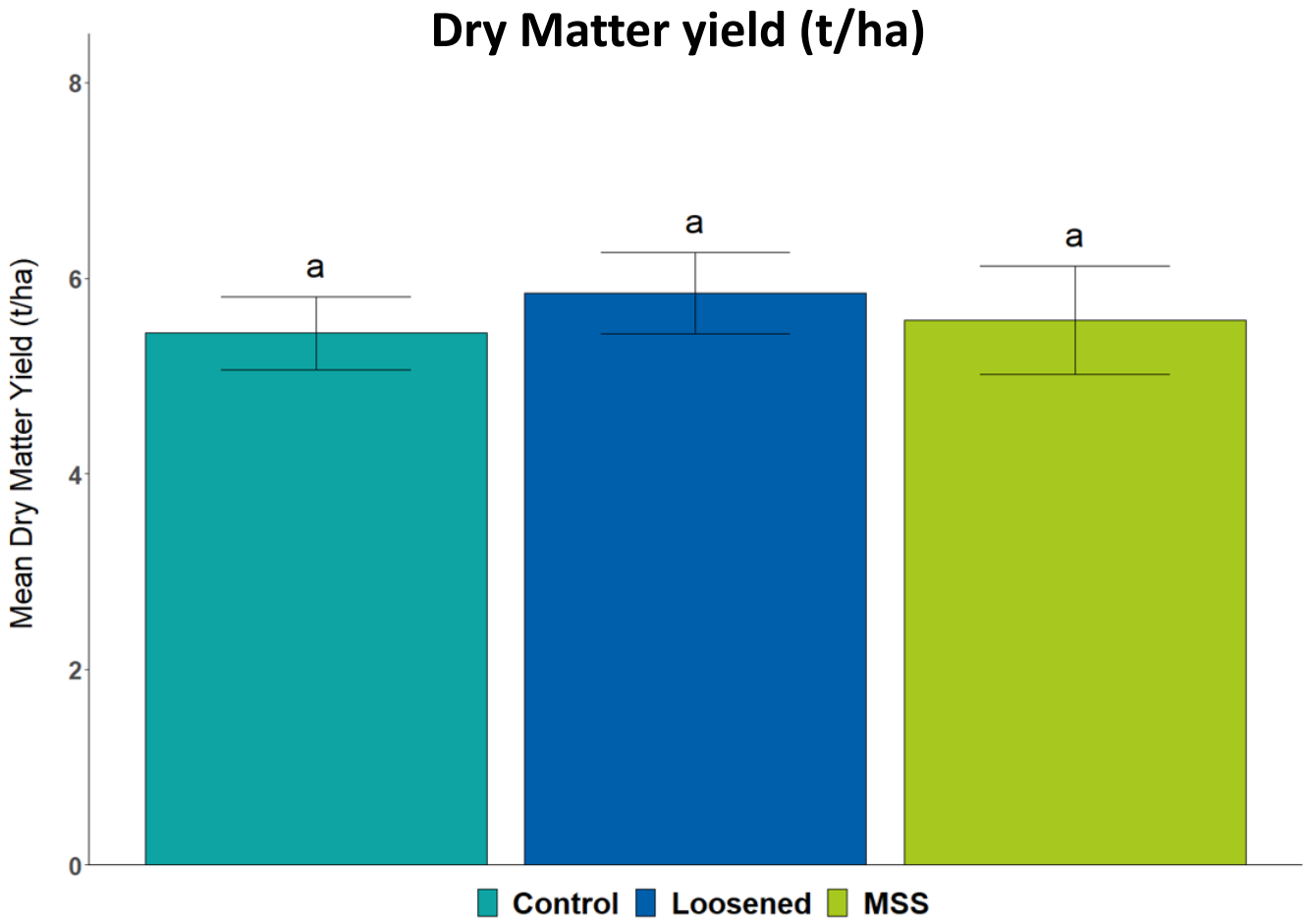
Soil and forage measurements

- **Dry matter yields**
- **Soil water infiltration rates**
- **Plant species diversity**

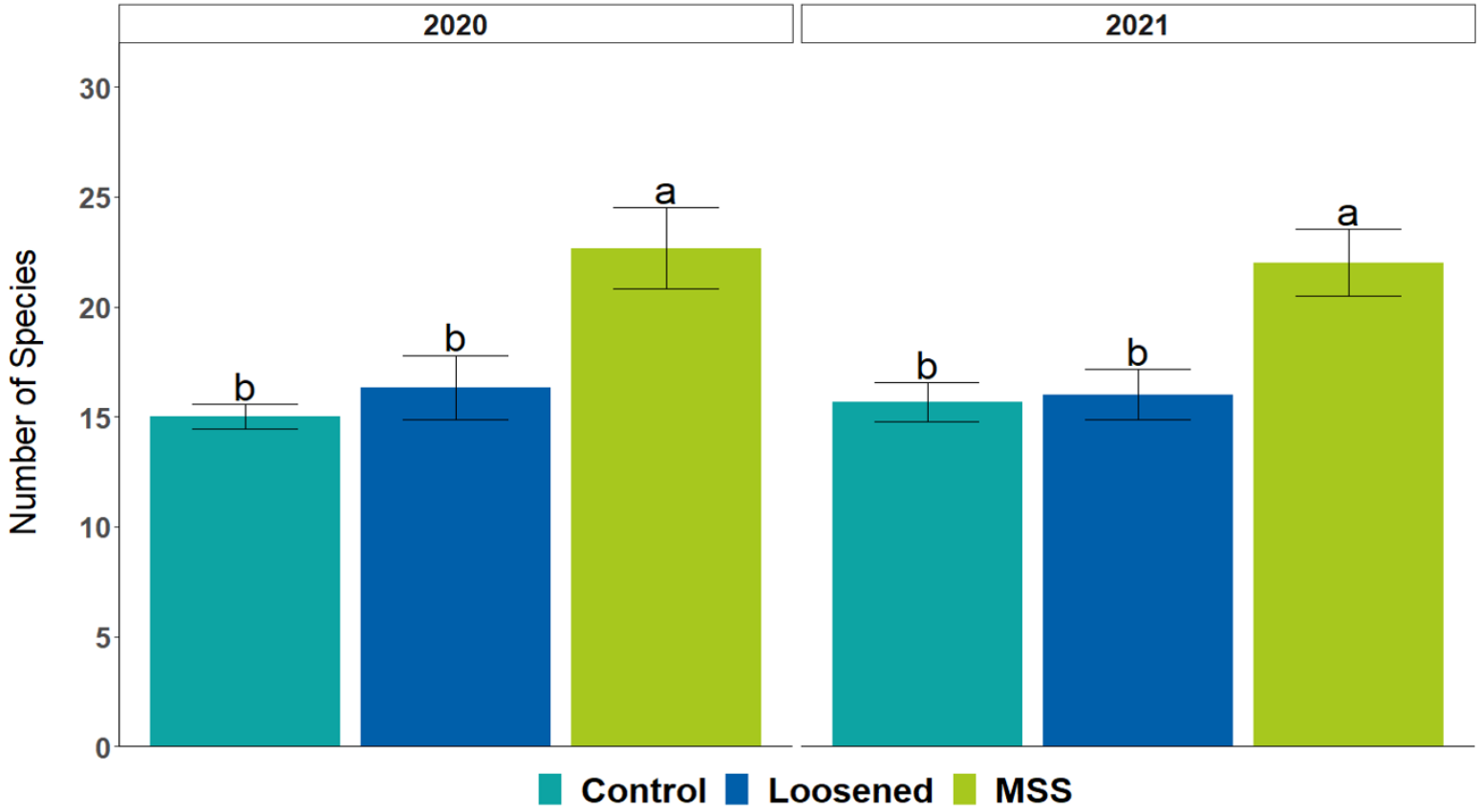
- Bulk density
- Visual evaluation of soil structure
- Forage quality

- Management – 3 cuts plus grazing
- Fertiliser applied according to RB209

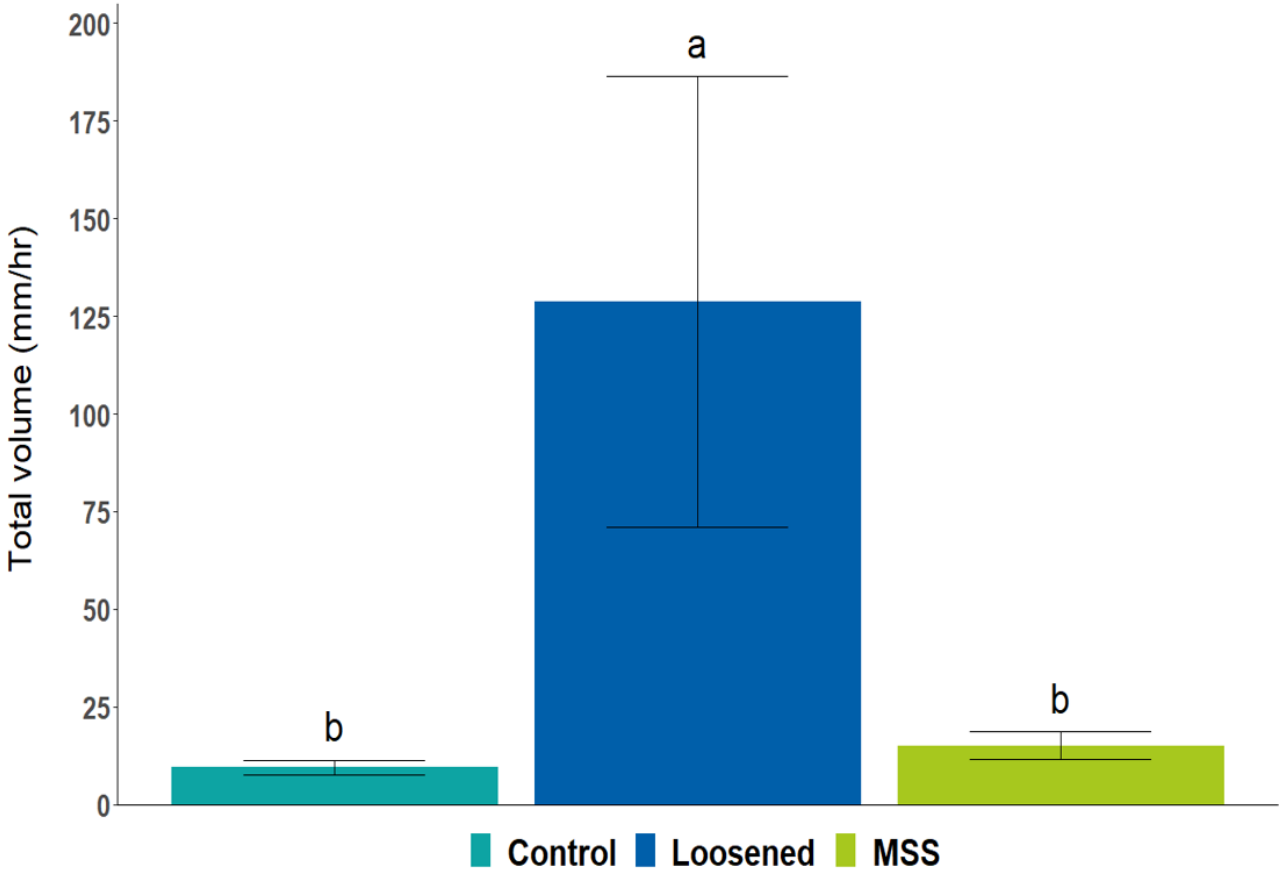
Results


Dry Matter yield (t/ha)
Mean Dry Matter Yield (t/ha)
0
2
4
6
8
a
a
a
Control
Loosened
MSS

Plant species diversity (no. of species)

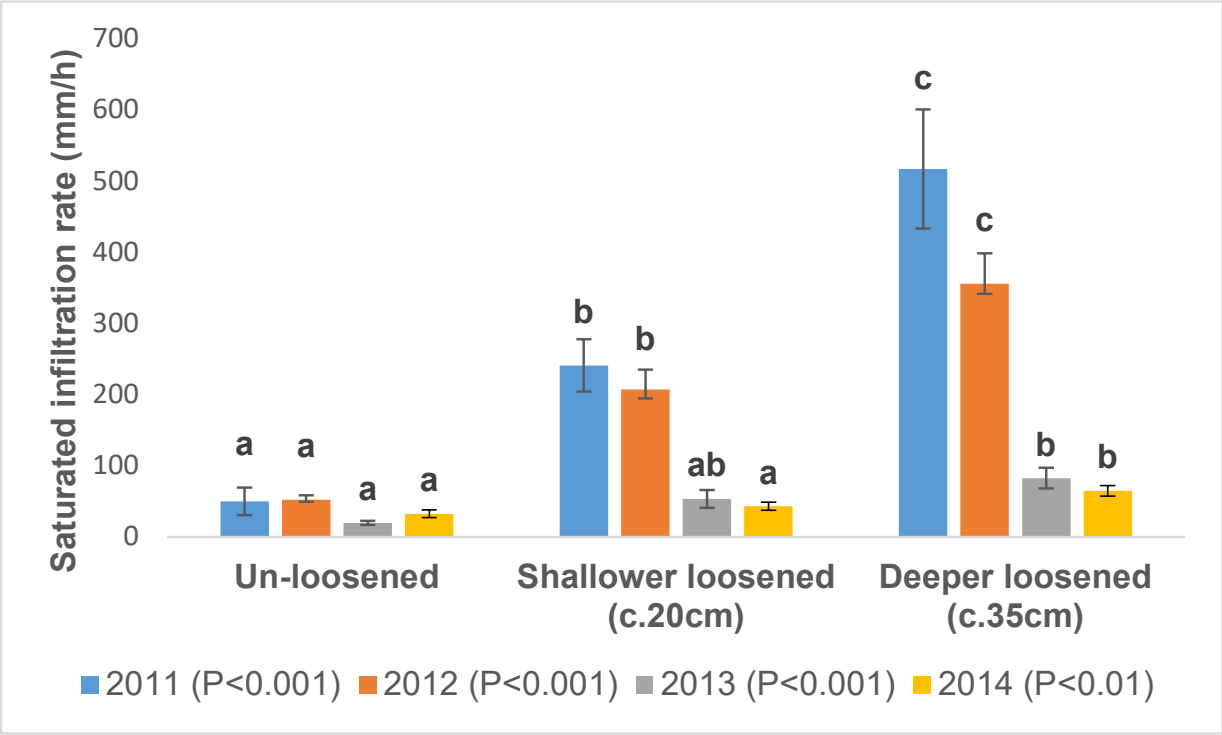


Saturated water infiltration rate (mm/h)



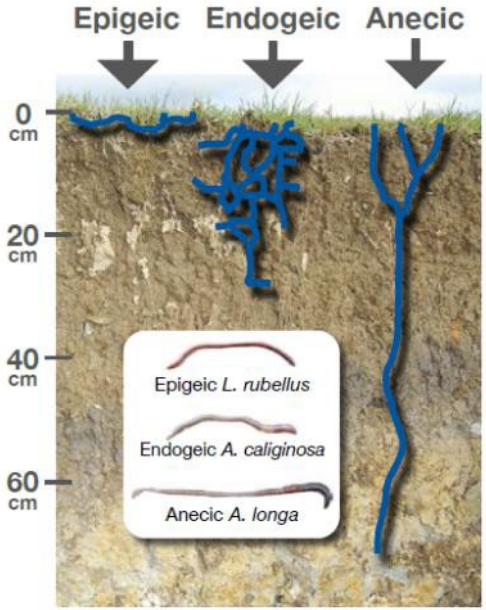
Effect of mechanical loosening

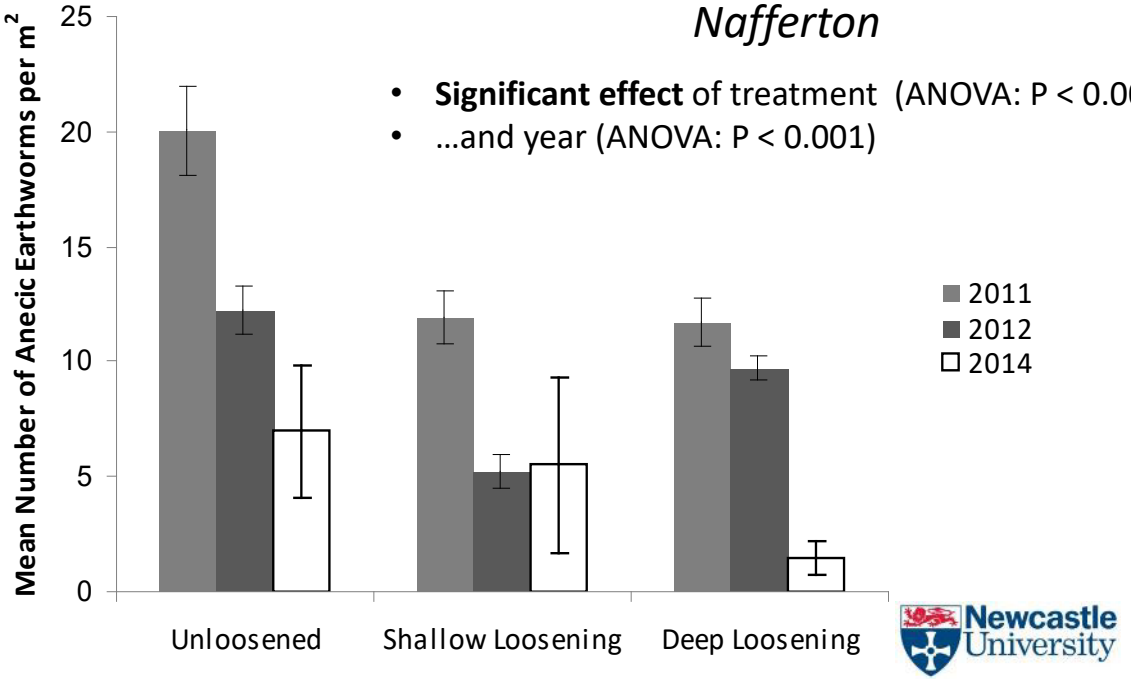
…on saturated infiltration rates at medium soil sites



Effect of mechanical loosening

…on deep burrowing earthworms





- **Significant effect** of treatment (ANOVA: $P < 0.001$)
- …and year (ANOVA: $P < 0.001$)

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Conclusions

- Mechanical loosening can result in significant increases in **water infiltration rates** on mineral grassland soils that can last for **three years or more**
  - Improves **soil drainage**
  - Enables **early and late season grazing** that can benefit the farm economy
  - Reduces need for conserved or imported forage and manure management
- However, effects on **grass yield** are **inconsistent** and it is highly likely that soil **macrofauna** are **negatively impacted**
- The focus of grassland soil management should therefore be on **compaction avoidance**
- Mechanical loosening should only be carried out when **clear signs** of soil compaction have been identified

Thankyou!

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