Grassland reseeding - improving grassland productivity and reducing soil surface phosphorus accumulations

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Introduction

Long-term phosphorus (P) accumulation within agricultural soils is a challenge for water quality improvement schemes such as the EU WFD. Research has demonstrated the potential for reseeding and tillage to reduce soil surface nutrient accumulations.

Research Aim

Research aims to explore the usage of grassland reseeding and tillage to reduce soil surface P accumulations by using high-resolution gridded soil sampling at the sub-field scale to monitor changes before and after reseeding and tillage

Reducing Soil Nutrient Accumulations

Reducing soil legacy is a slow process taking up to 20 years to draw down surplus soil P to more agronomically optimum levels. As such, it may be several years before any associated improvements in water quality are seen[1–3]

Grassland Reseeding and Tillage

Reseeding and tillage inversion can reduce soil nutrient accumulations by causing a vertical stratification in soil P and increasing nutrient uptake[4–6]. Few studies have explored changes in sub-field scale nutrient content before and after reseeding with tillage inversion

Study Area

Blackwater catchment in NI and ROI, has issues of legacy P . Study site underwent reseeding in spring-summer 2020. Used to research sub-field scale nutrient variability

Fig 1. Location of Blackwater Catchment

Methods

- 35 m gridded soil sampling and kriging used to quantify sub-field scale nutrient variability and associated laboratory analysis
- Sampling in Jan 2020 (before reseeding) and Feb 2021(after reseeding)

Study Site

Results and Discussion

- Table 1 shows that after reseeding, largely decreases occurred in soil nutrient content (mgl^{-1}).
- Fig 2a shows a soil P Index 3 hotspot present before reseeding in 2020 and Fig 2b shows that this hotspot was removed following reseeding and tillage with increased nutrient deficiency

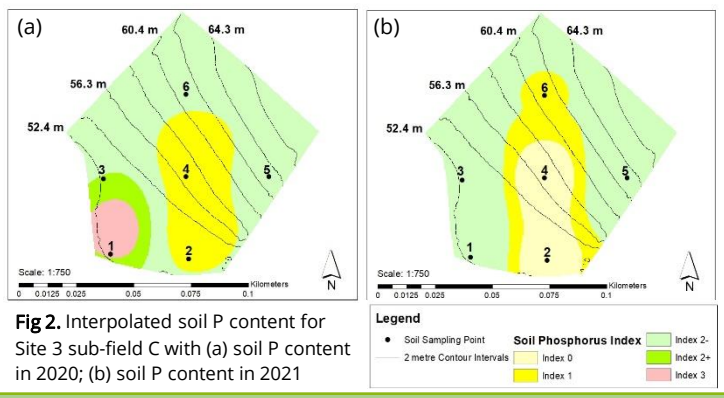

Fig 2. Interpolated soil P content for Site 3 sub-field C with (a) soil P content in 2020; (b) soil P content in 2021

Sampling Point	Soil P Content	Soil K Content	Soil Mg Content	Soil S Content
1	36.7% decrease	2.9% decrease	0.9% increase	8.9% increase
2	30.0% decrease	7.7% decrease	6.6% decrease	4.9% decrease
3	11.9% decrease	32.3% decrease	17.3% decrease	9.1% decrease
4	52.0% decrease	37.5% decrease	14.2% decrease	18.9% decrease
5	5.1% increase	4.6% increase	6.9% decrease	0.8% decrease
6	47.7% decrease	24.1% decrease	14.9% increase	25.7% decrease

Table 1. Calculated percentage change in soil nutrient content (mgl^{-1}) from 2020 to 2021 per gridded sample point for Site 3 sub-field C.

Conclusions

Reseeding is an effective method of reducing surface soil nutrient accumulations. However, it is unclear whether the associated soil disturbance will increase overall soil nutrient and sediment loss which would be detrimental to local water quality

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