



Phosphate fertiliser requirements of Scottish soils

Key contacts

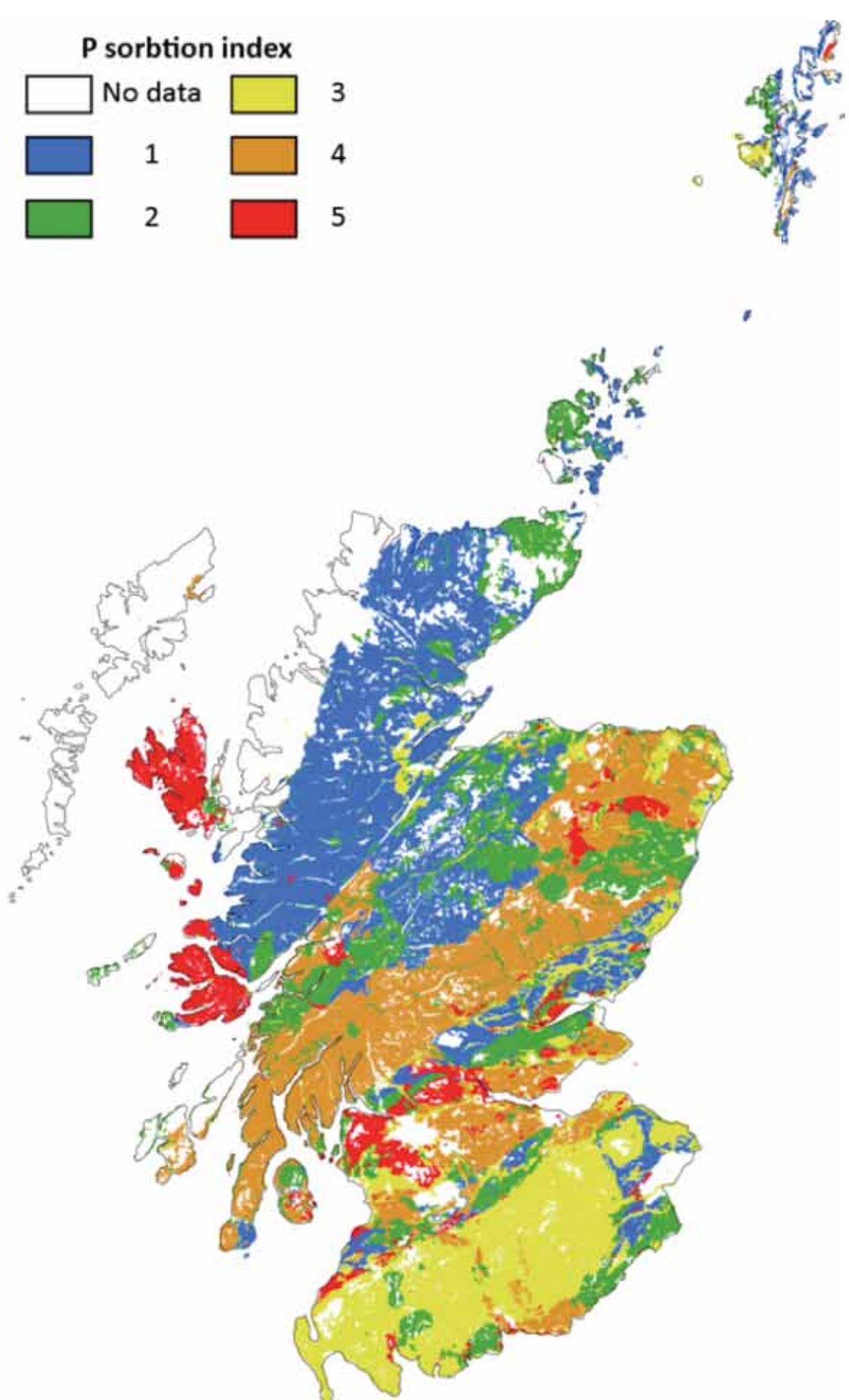
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Background

- Modern agriculture relies on phosphate fertiliser additions to maintain high crop productivity
- Phosphate fertilisers are added to soil to build phosphate and maintain a reserve sufficient to meet crop demand
- Over-fertilisation is wasteful and may adversely affect water quality, whereas under-fertilisation may reduce crop yields
- In Scotland, soil testing for phosphate fertiliser requirement usually involves laboratory extraction of the soil with reagents such as solutions of acid ammonium acetate or acetic acid, but the resultant advice usually takes no account of soil type and its individual P sorption capacity. A more refined procedure has been developed

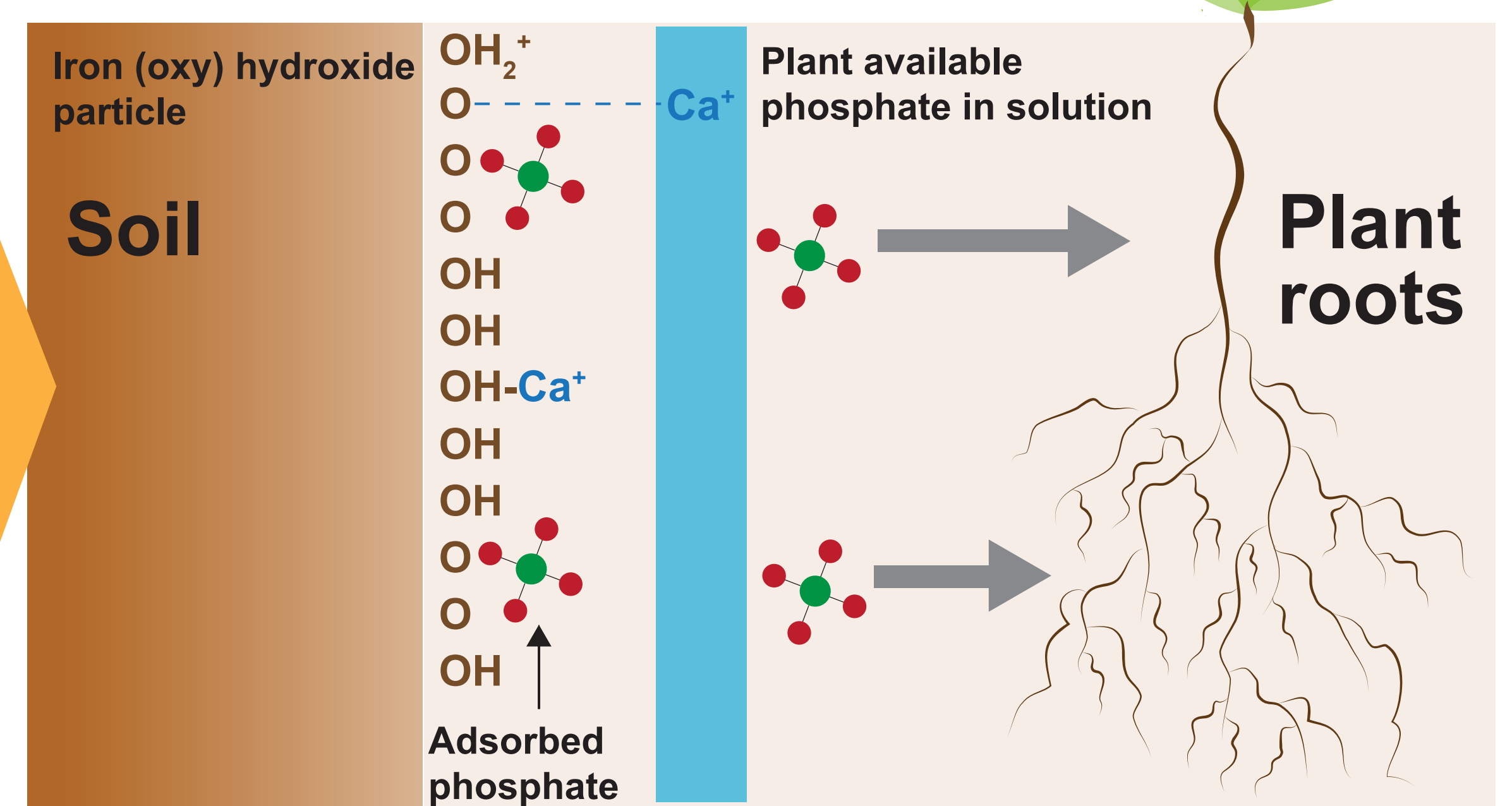
Approaches



Soil data

- % Iron and aluminium oxides
- % Clay
- pH
- Calcium (Ca)

Chemical model



Using data from the National Soil Inventory of Scotland (NSIS) and an advanced chemical model we have produced a phosphate sorption map for Scotland.

The sorption of phosphate is influenced by soil pH, and calcium which forms inner- and outer- sphere complexes.

When phosphate is added to soils a large proportion becomes fixed to reactive surfaces such as iron (oxy)hydroxides.

A high phosphate fixing capacity soils means that more phosphate is required compared to those with a low phosphate fixing capacity where less is required.

Outcomes and benefits

- By providing rates of application of phosphate fertiliser tuned to intrinsic soil properties there will be a better match to crop demand. Soil with a low P fixing capacity will be less likely to become over-fertilised, whereas soils with a high P fixing capacity will be less likely to be under-fertilised
- The model will help understand the complexities of phosphate loss by leaching and aquatic process involving desorption of phosphate from soil eroded into water bodies
- Additional work is required to complete the picture for the blank areas in the west and to provide information at the field scale

Advice in Practice

Know your soil and its phosphate sorption capacity and apply fertiliser accordingly to increase P use efficiency, reduce losses and maintain yields.