

North Wyke Farm Platform

Case study no. 13

Spatial variation of Olsen-P in soils on the North Wyke Farm Platform

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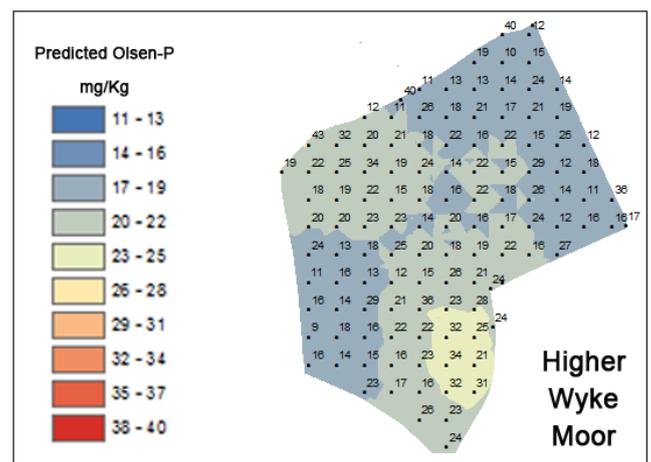
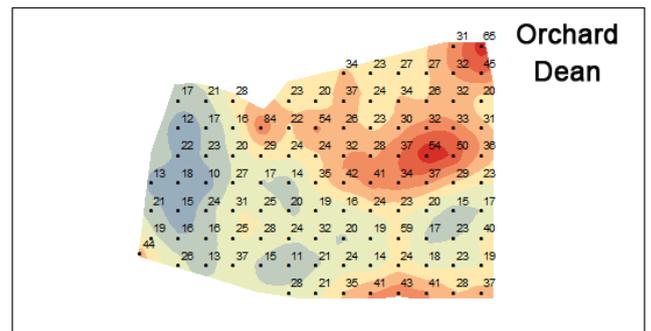
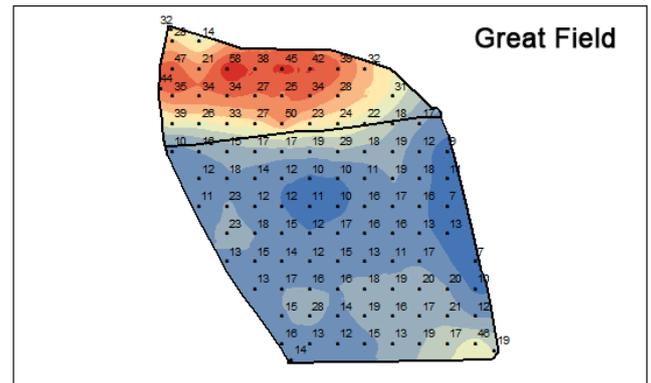
Phosphorus (P) is a critical element for plant growth, while excessive phosphorus in soil can lead to environmental problems; therefore, appropriate P management is crucial. This study investigated the spatial variation of soil Olsen-P (plant available P) in three different fields on the North Wyke Farm Platform.

A total of 327 soil samples were collected (0-10cm depth) on a regular 25 x 25 m grid and their Olsen-P concentrations determined. Classical and geospatial statistical analyses were undertaken on the data.

Summary statistics of Olsen-P values from the three fields

Field Name	Mean mg kg ⁻¹	Minimum mg kg ⁻¹	Maximum mg kg ⁻¹	Std dev mg kg ⁻¹
Great Field	20.3	6.8	57.8	10.3
Orchard Dean	27.5	10.4	83.7	12.0
Higher Wyke Moor	20.2	8.5	43.2	6.8

There was no significant difference in the mean Olsen P concentration in each of the three fields, where the mean concentrations in Great Field (20.3 mg kg⁻¹) and Higher Wyke Moor (20.2 mg kg⁻¹) were relatively low, whilst in Orchard Dean it was considerably higher (27.5 mg kg⁻¹). The coefficient of variation of Olsen-P was highest in Great Field (51%), less in Orchard Dean (44%), and was lowest in Higher Wyke Moor (34%), reflecting the more even distribution of Olsen P in the latter. Hotspots of Olsen P were apparent in the other two fields. High concentrations in the northern part of Great Field reflect the legacy of different management historically; the line across the field in the figure represents an old fence boundary and it is likely the northern part of the field was either fertilized or grazed more intensively than the southern part. Two hotspots in the north-eastern part of Orchard Dean were associated with the presence of a feeding ring and a water trough, which would have attracted intense livestock activity and associated faecal deposits resulting in higher Olsen P concentrations than elsewhere in the field. Olsen-P at different elevations was analyzed by classic statistics and ArcGIS maps, and in general Olsen-P concentration declined with increasing elevation. Soil type had no relationship to Olsen P concentration.



Key points

- Olsen P concentrations in the three fields were highly variable, with soil P indices ranging from index 0 to index 5.
- Hotspots of Olsen P occurred in association with areas of intense animal activity and associated defecation (water troughs and feeding rings)
- Other hotspots were associated with different historical land management
- Management generally overrides environmental factors with regard to the spatial distribution of Olsen P concentrations