Long-term effects of phosphorus mining on grassland soils

ESPP Webinar – Legacy P

02 February, Inge Regelink, Jantine van Middelkoop

Inge.Regelink@wur.nl

Wageningen UR





Field trials on permanent grasland

Sand (2 locations), peat and clay

Initial P status: 'neutral' due to historical P fertilisation

Treatments:

- Mining → No P fertilization (mowing)
- P-equilibrium fertilization → dairy manure (grazing and mowing)

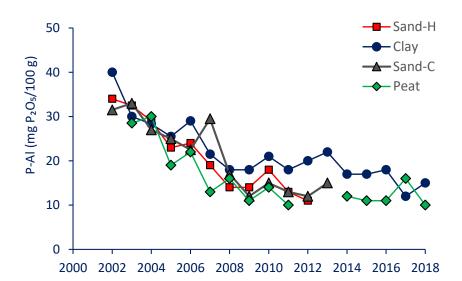




Decline in soil P status in mining plots

0-5 cm soil layer

■ Steady decrease in P-Al from \approx 30 to 10-20 mg P₂O₅/100 g on all fields



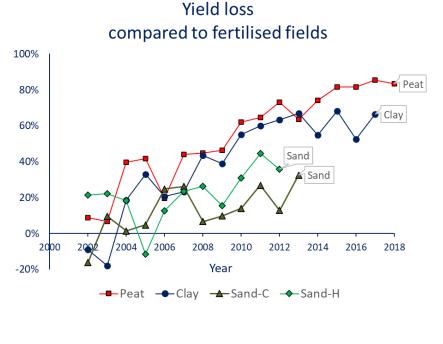
*field trials on the sand soils ended in 2011 and 2012. Clay and peat are still being monitored





Yield reduction (P uptake)

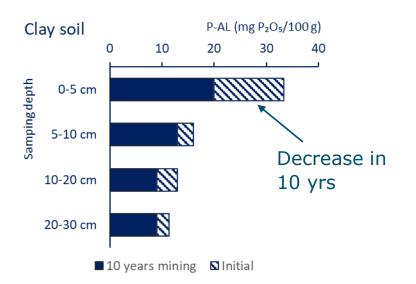
- Lower P uptake as compared to fertilized fields
- Higher yield reduction on peat and clay as compared to the sandy soils
- which was not expected based on soil P tests



• Yield reduction = $1 - \left(\frac{P - uptake_{mining}}{P - uptake_{P - equilbrium fertilisation}}\right) * 100\%$



Differences in soil P depth profiles



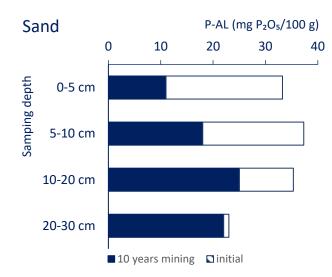
- Permanent grassland, no tillage;
- P accumulated in 0-5 cm soil layer
- Mining lowers P-Al in 0-5 cm soil layer

P-leaching from rooting zone:

Ortho-P in soil porewater<0.05 mg/L</p>



Differences in soil P depth profiles



- Tillage led to uniform P profile at the start
- Strongest decrease in P-AL in 0-10 cm
- Reversal of P profile, explaining lower yield reduction
- P-leaching from rooting zone:
- Ortho-P in soil porewater ≈0.3 mg/L



Phosphorus mining **effectively decrease P content** of grassland soil but effects are most pronounced in the **upper 10 cm** of the soil meaning that **P leaching from deeper soil layers** could still continue. It the latter case, tillage/inversion of soil could be advised.

Contact: Inge.Regelink@wur.nl



