

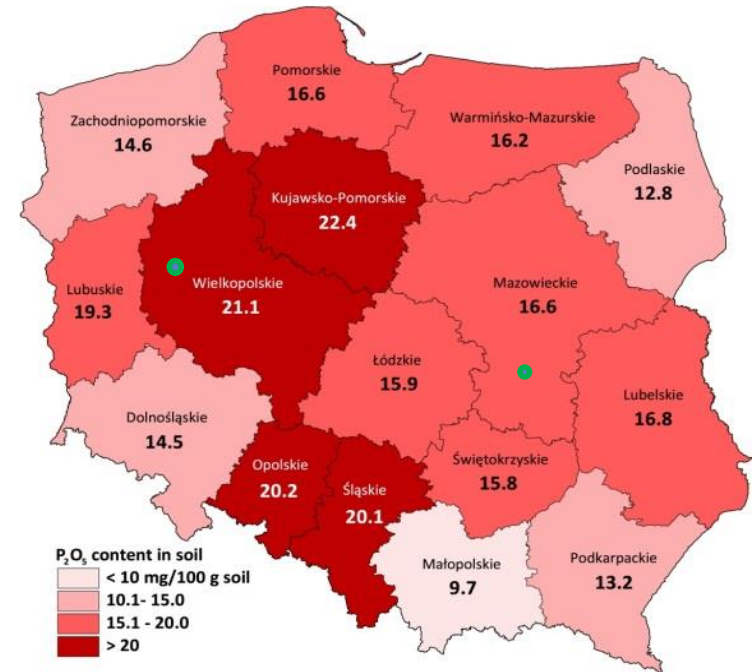
LONG TERM EFFECT OF UNBALANCED FERTILISATION WITH PHOSPHORUS AND NITROGEN – A CASE STUDY FOR POLAND



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PERSPECTIVES FOR REDUCING „LEGACY PHOSPHORUS”
IN AGRICULTURAL SOILS

2 February 2022



P fertilisers recommendations in Poland (by-crops don't removed from the field)

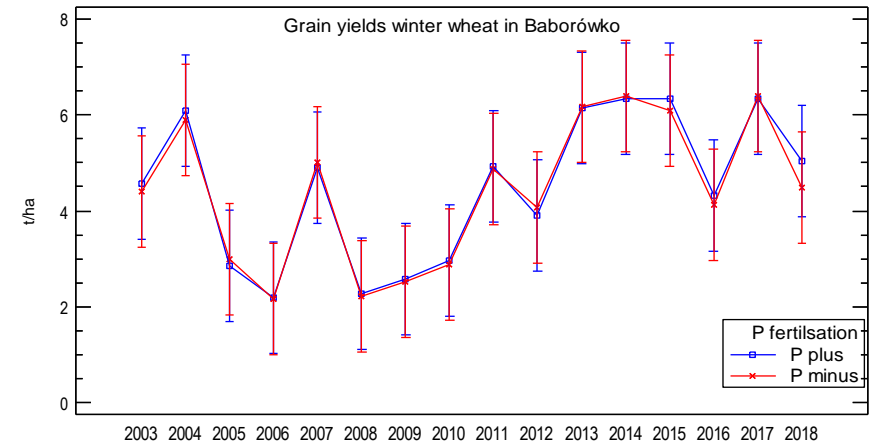
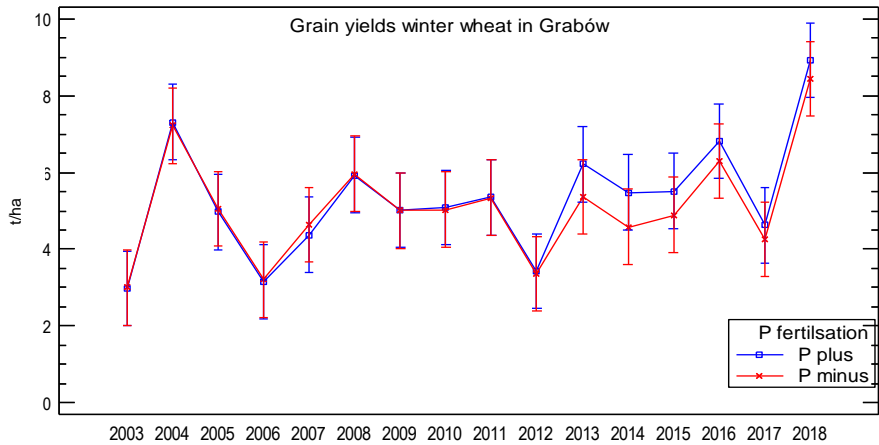
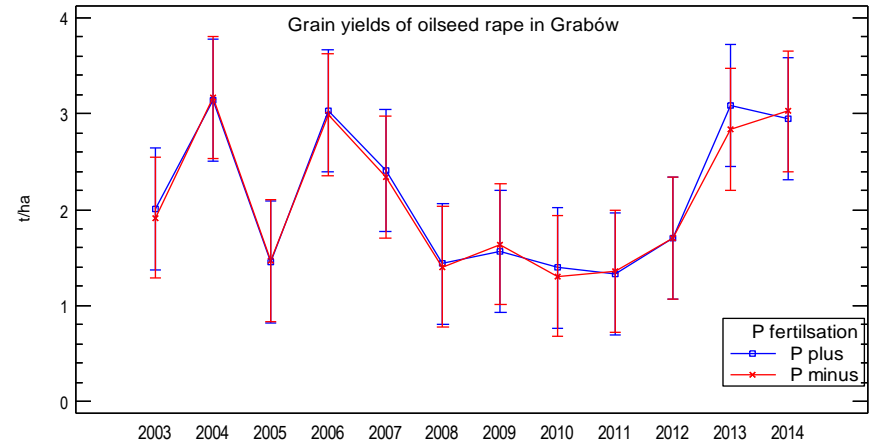
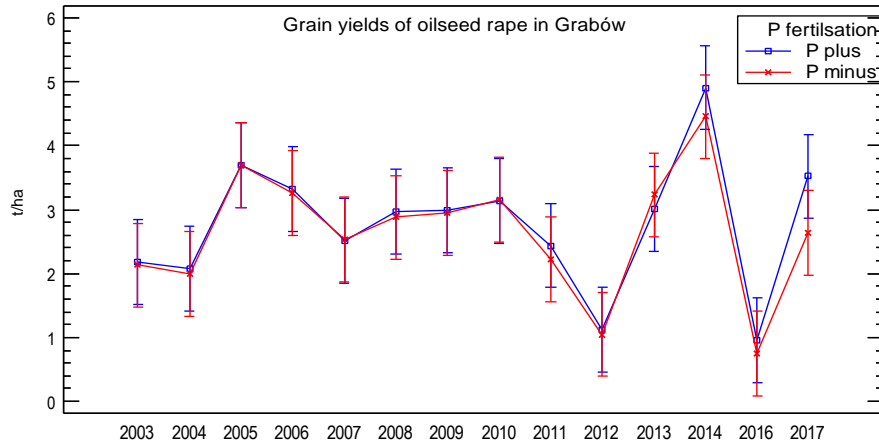
- > 40 mg P₂O₅/100 g soil **do not fertilise!**
- 20,1 - 40 mg P₂O₅/100 g soil - reduce by 20 kg P₂O₅/ha
- 10,1-20,0 mg P₂O₅/100 g soil – according to P- plants requirements
- 5,1 - 10 mg P₂O₅/100 g soil - increase by 30 kg P₂O₅/ha
- < 5,0 mg P₂O₅/100 g soil – increase by 40-60 kg P₂O₅/ha

MATERIAL AND METHODS

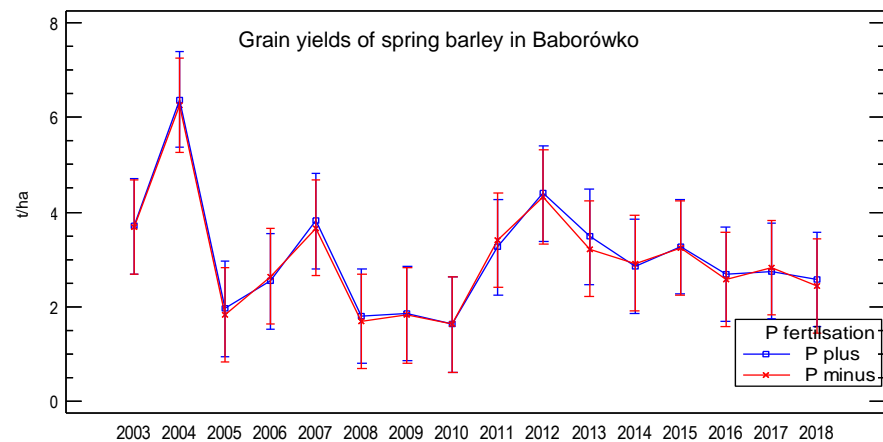
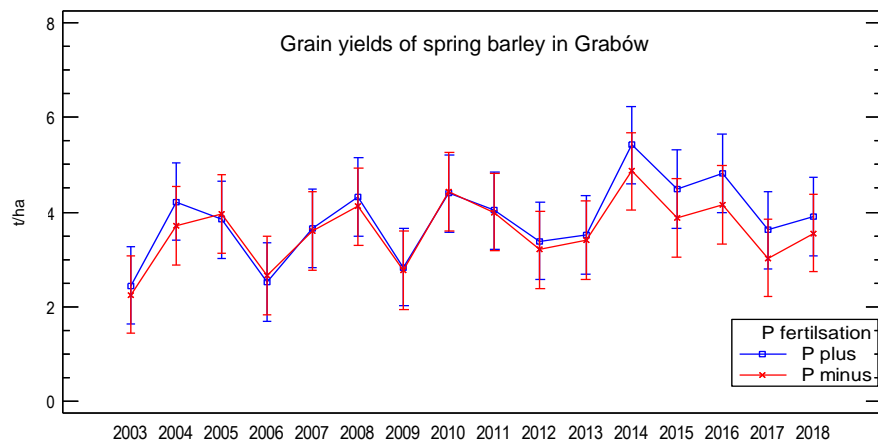
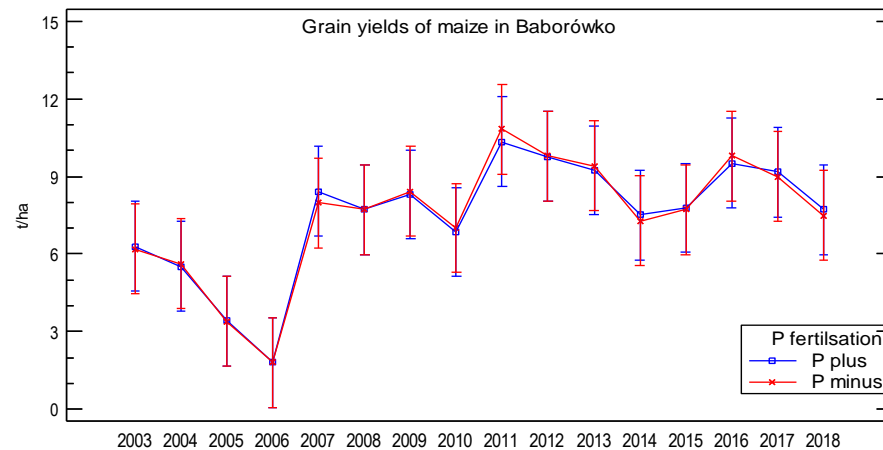
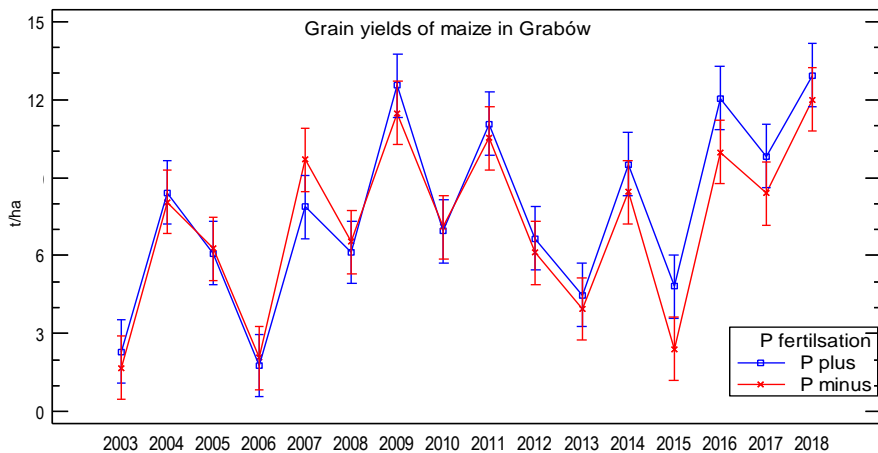
- Long-term field experiments
- Location: East Poland (Grabów), West Poland (Baborówko)
- Soil: sandy soils
- Years: 2003-2018
- Crop rotation: winter oilseed rape - winter wheat – maize - spring barley
- Factors: P fertilisation – P plus, P minus
N fertilisation – N0, N1, N2, N3, N4, N5
- pH_{KCl} : Grabów 6.2, Baborówko 6.8 (1M KCl 1:5, soil solution)
- **Initial P content in soil: Grabów 69.8 mg P/kg soil, Baborówko 116 mg P/kg soil (Egner-Riehm DL)**
- **P rates: oilseed rape 39 kg P/ha, maize 35 kg P/ha, wheat and barley 31 kg P/ha**
- P fertilizer: superphosphate
- N fertilizer: ammonium nitrate
- N rates: rape and maize 50-250 kg N/ha, wheat 40-200 kg N/ha, barley 30-150 kg N/ha



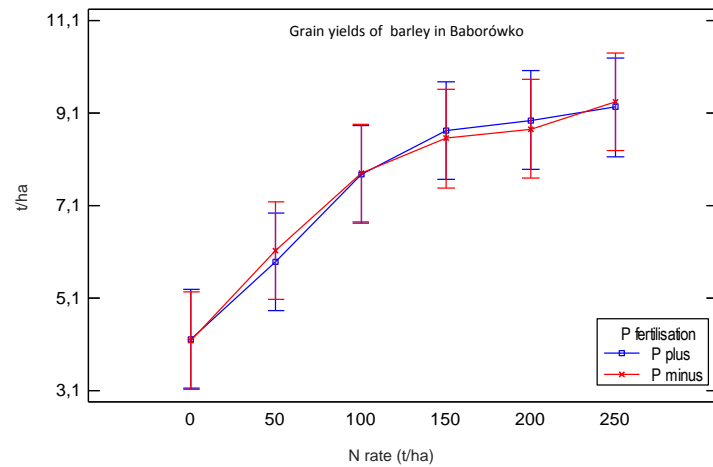
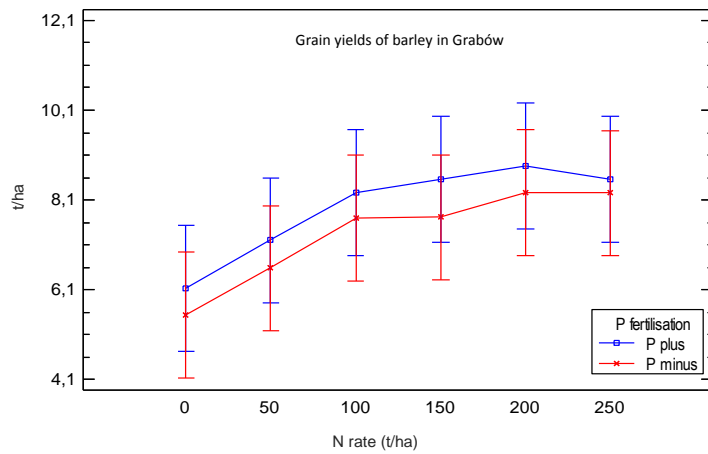
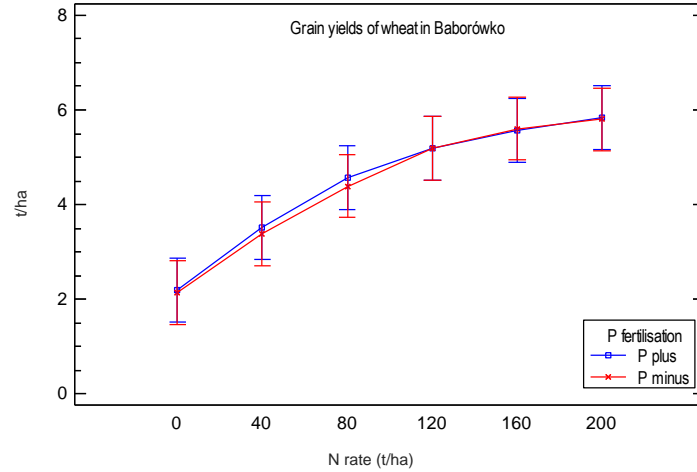
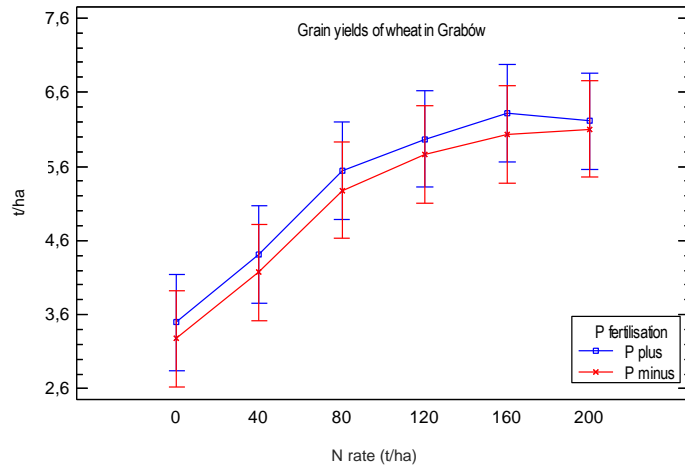
THE AVERAGE FOR CROP YIELDS (N0-N5)



THE AVERAGE FOR N0-N5 CROP YIELDS

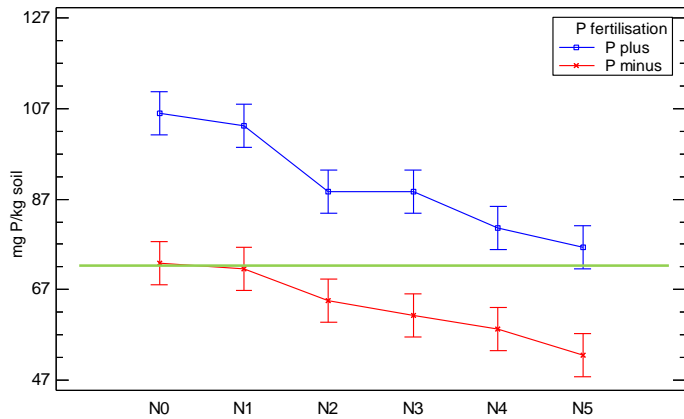


THE AVERAGE FOR 2003-2018 CROP YIELDS

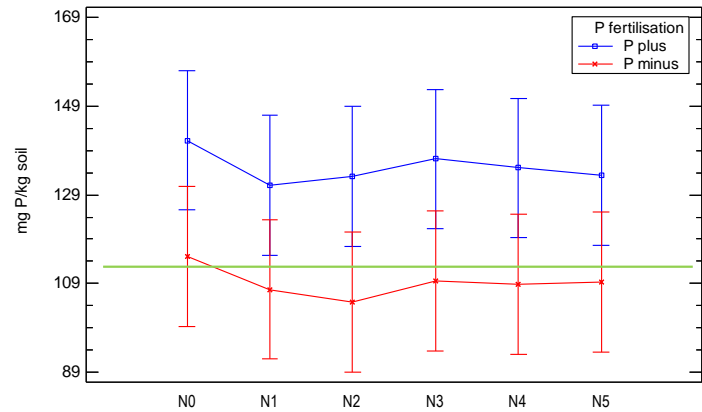


CHANGES IN P CONTENT IN THE PLOUG LAYER OF SOILS BETWEEN 2003-2018

Grabów



Baborówko



CONCLUSIONS

- Long-term N and P fertiliser experiments over 16 years with winter oilseed rape, winter wheat, maize and spring barley revealed the presence of significant soil P mining causing a reduction in the content of available forms of P but without negative impacts on crop productivity.
- In the Grabów region where the initial value of available P (Egner-Riehm DL) was classified as high, 69.8 mg P/kg soil, the sixteen years of P soil mining led to a decrease in available topsoil P to an average of 63.2 mg P/ kg soil.
- There was a close relation between the intensity of soil P depletion and the range of applied N fertiliser rates which points to the need for monitoring P levels in soil, especially when intensified N fertiliser applications are considered.
- In contrast, in the Baborówko region, where soil P content was very high, the added N fertiliser did not affect the changes in soil P over the long term. Moreover, the year-to-year addition of P fertiliser resulted in an unnecessary accumulation of available P in the soil.



THANK YOU FOR YOUR ATTENTION !

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