Long-term effects of phosphate fertilization on crop yields, soil and leaching: Phosphate trial Lelystad

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Research questions

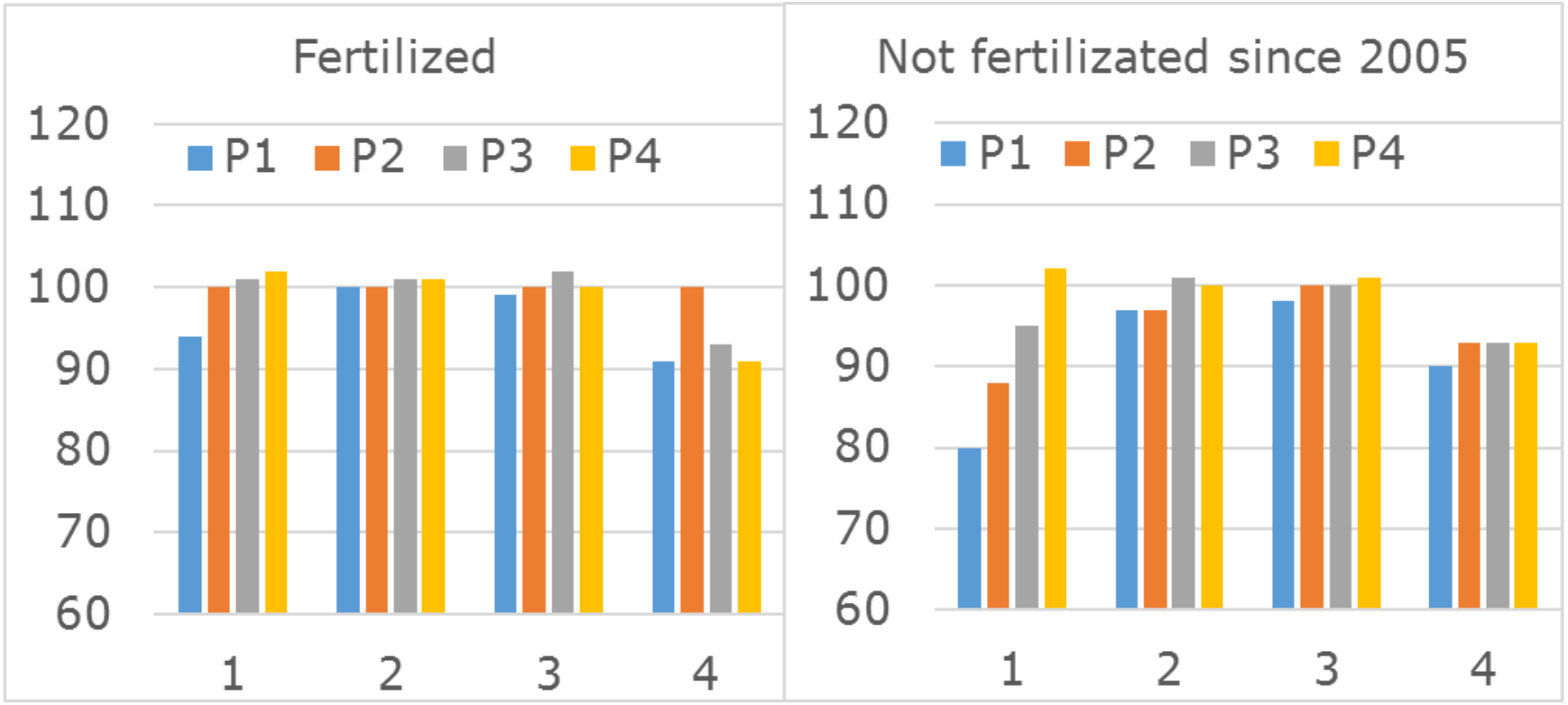
Does balance fertilization of phosphate lead to a decrease

1. in crop yield and quality?
2. in phosphate availability for crop growth?
3. in organic matter content of the soil?
4. in phosphate leaching?

Phosphate trial Lelystad (since 1990)

- Part of larger project with other long-term grassland and arable experiments
- Marine light clay soil
- 4 P-levels with yearly fertilization (TSP)
    - 0, 70, 140 en 280 kg P_2O_5/ha/year
- Since 2005 plots split in two: one half no fertilization
- Measurements
    - Crop yields
    - Phosphate balances
    - Phosphate stocks and availability in soil
        - P-$CaCl_2$, P-water, P-Al, P-total...
    - Phosphate concentrations in soil moisture

Relative crop yields (P2 70 = 100%)



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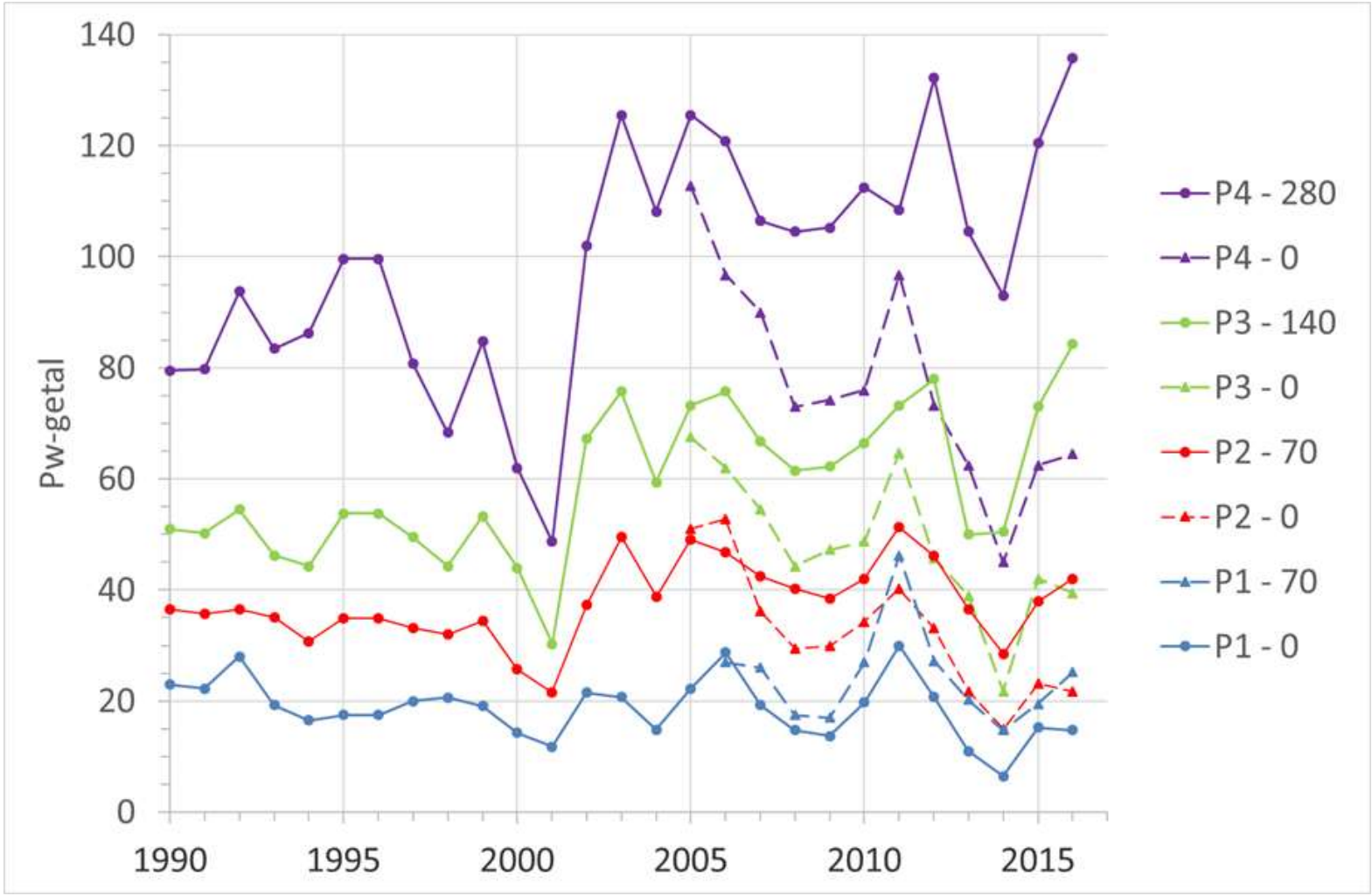
P-water 0-30 cm



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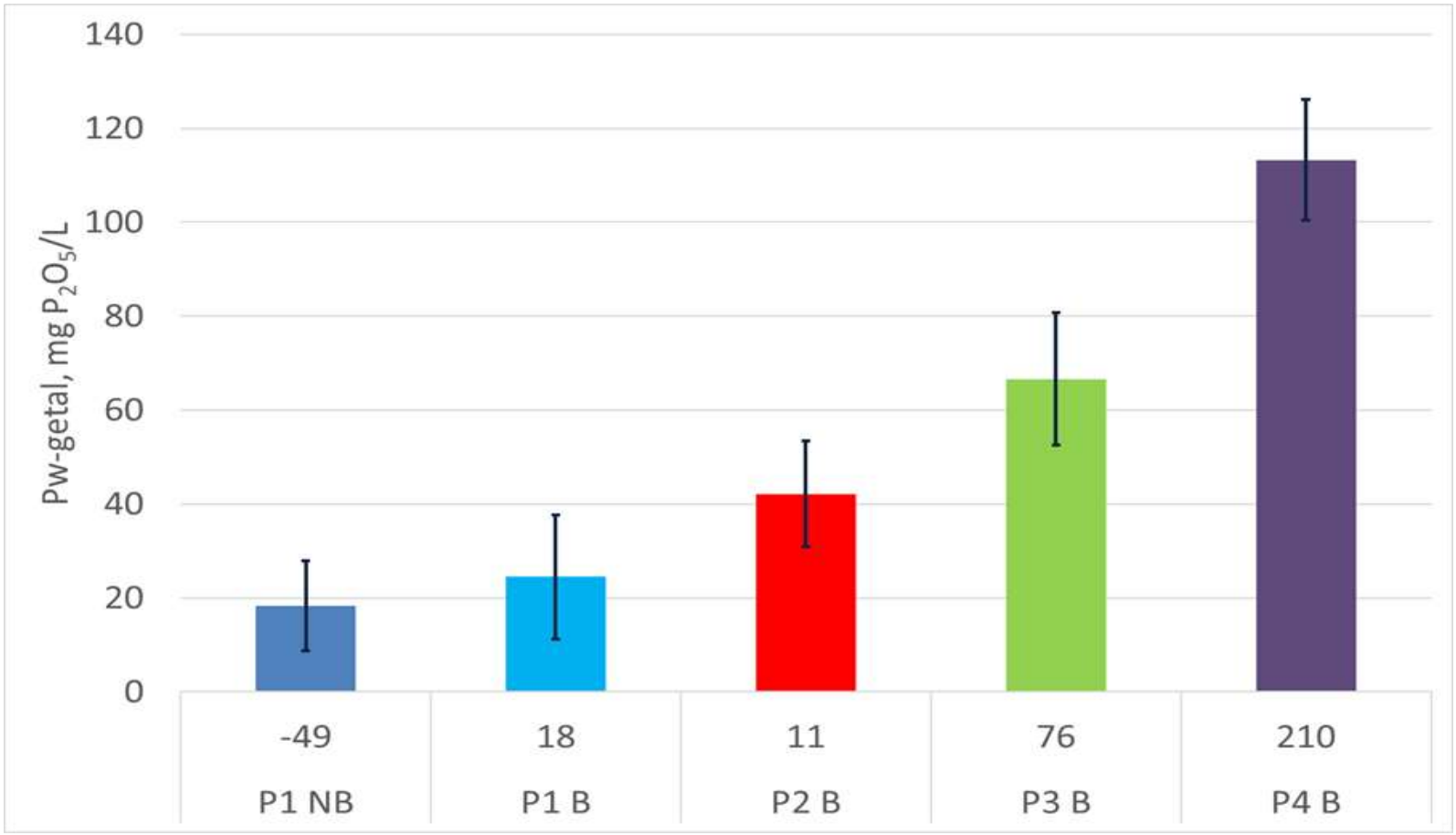
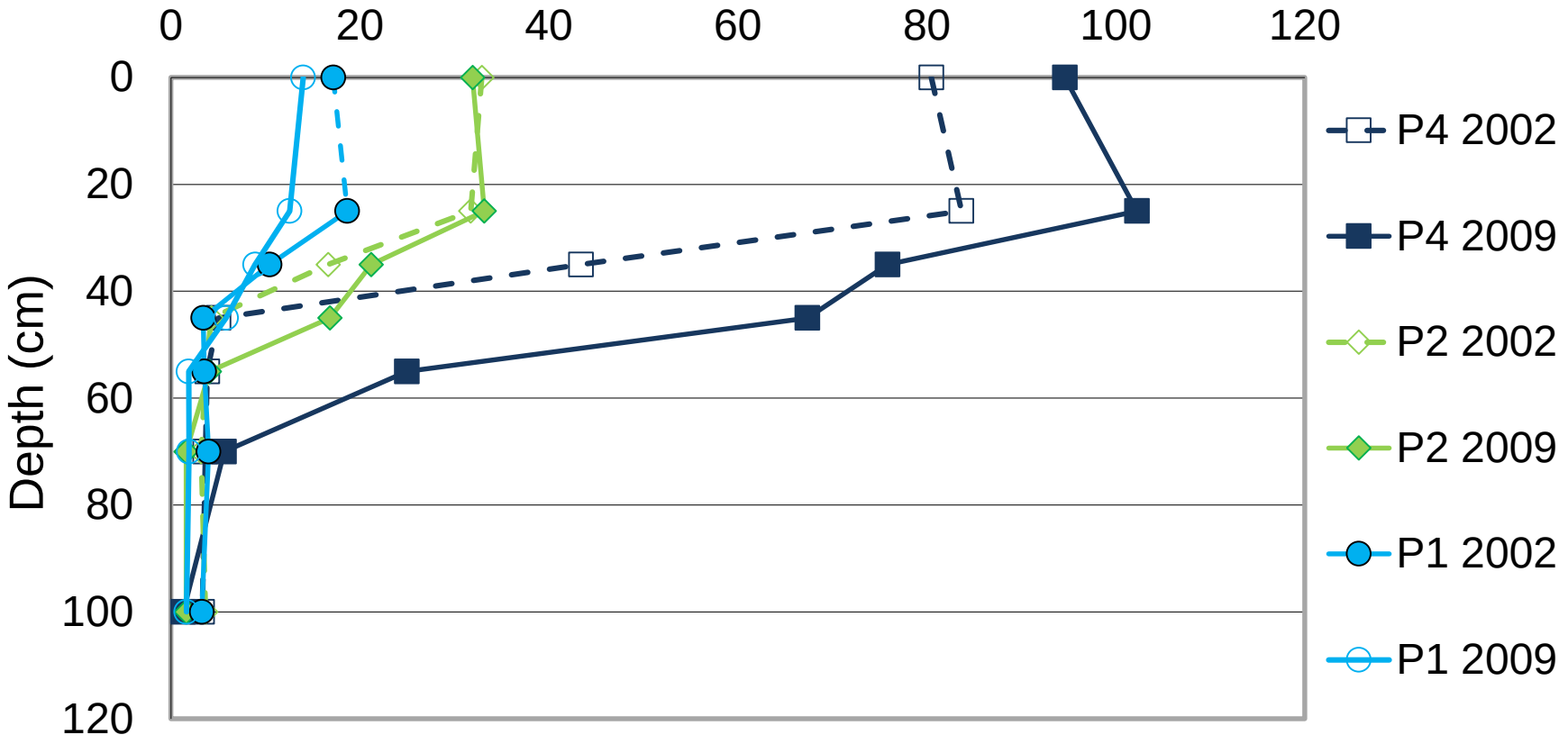
Average stabilized P-water and phosphorus surplus (kg P_2O_5/ha/year)



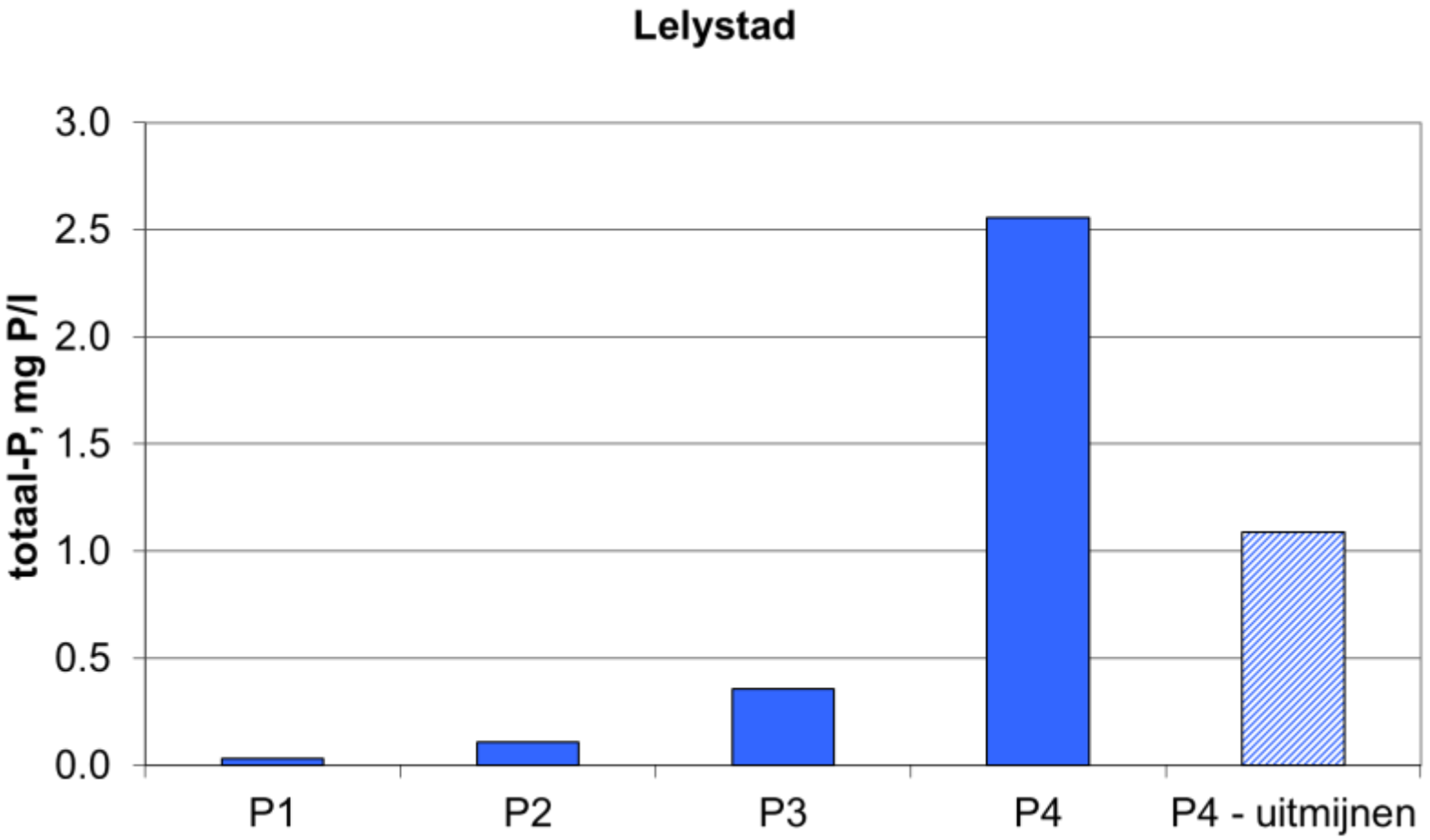
Phosphate removal P2 70 in a standard crop rotation

Crop	% in crop rotation	Phosphate removal at P2 70 (kg P_2O_5/ha/year)
Potato	25	52
Sugar beet	30	66
Spring barley	30	55
Onion	12,5	50
Carrot	12,5	82
Total	**100**	**66**

Profile sampling P-water



Phosphorus in soil moisture (2004-2010)



Conclusions

1. Balance fertilization leads to lower yields for phosphate demanding crops, especially when status is low.
2. Fertilization with small surplus leads to phosphate status neutral on this soil. In general risk for lower available phosphate with balance fertilization.
3. Organic matter content of the soil is not decreasing
4. Phosphate leaching is low at balance fertilization

Thank you for your attention

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