

Kemira

Where water meets chemistry™

LUCKILY ENOUGH, GREEN PLANTS HAVEN'T STUDIED PHOSPHORUS CHEMISTRY

PURIFY WATER AND CLOSE THE NUTRIENT CYCLE

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PURIFY

- Reliably reach the lowest levels of phosphorous in effluents of wastewater treatment plants to avoid eutrophication by inorganic coagulants
- Remove organic particles and other impurities from wastewater and instead use them to increase the biogas yield and optimize your energy costs

CLOSE THE NUTRIENT CYCLE

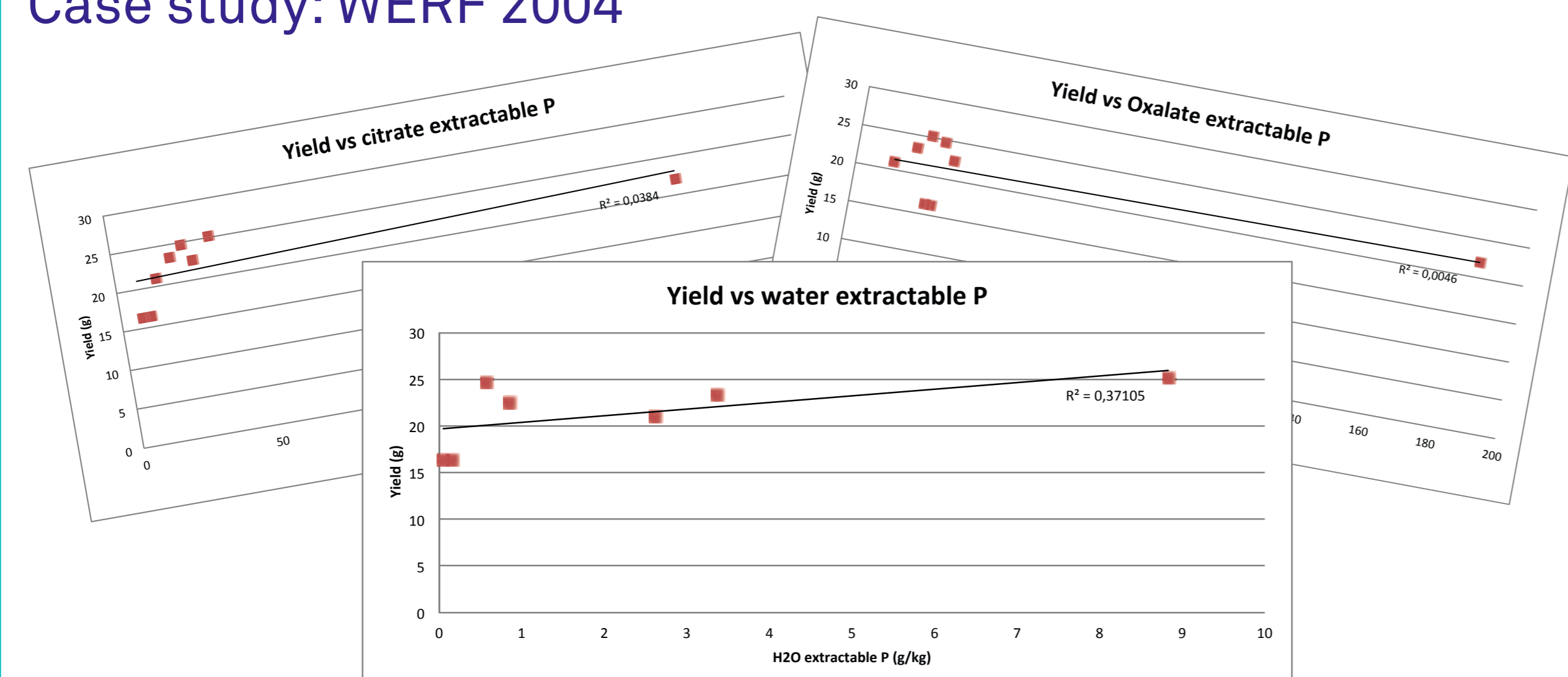
- Maximize your P-recovery rate to get the highest outcome for nutrient re-use
- Precipitated phosphorus is available for plants though the chemical solubility does not correlate with the actual plant-uptake of phosphorus
- Precipitated sludge improves soil quality and reduce erosion of phosphorus

THE CONCLUSIONS – DISCUSS WITH US!

- Coagulants are essential for a stable and efficient capture of phosphorus in wastewater
- Precipitated phosphorus, using Al or Fe coagulants, is available for green plants
- The established phosphorus extraction methods give no, or very little correlation, with the growth yield of the plant
- A combination of chemical and biological wastewater treatment ensures that the treatment process is more efficient and stable and hence the safest option

THE PROOFS

Case study: WERF 2004

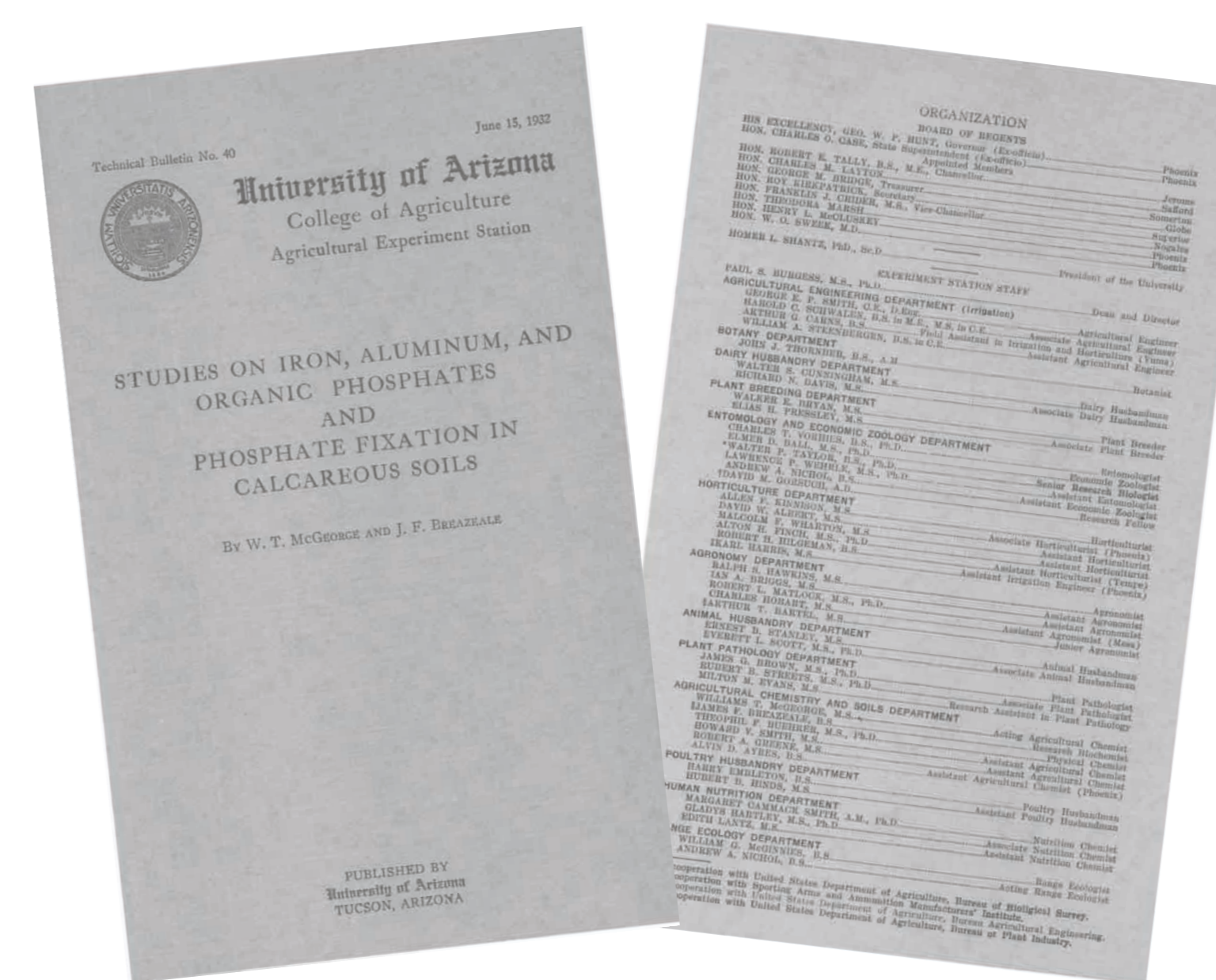


- No significant correlation between solubility analysis and plant yield
- Clearly lower phosphorus solubility in dried and pelletized sludge
- Phosphorus availability almost zero at high calcium content
- Significant reduction of erosion of phosphorus from soil by high content of iron and aluminum in sludge

O'Connor, G.A.; Sarkar, D.; Brinton, S.R.; Elliott, H.A.; Martin F.G., Phytoavailability of Biosolids Phosphorus, Journal of Environmental Quality 2004, 33, 703-712.

Case study: University of Arizona, College of Agriculture 1932

„This experiment, which is in accord with those of other investigators, shows an excellent assimilation of phosphate from these two salts*“

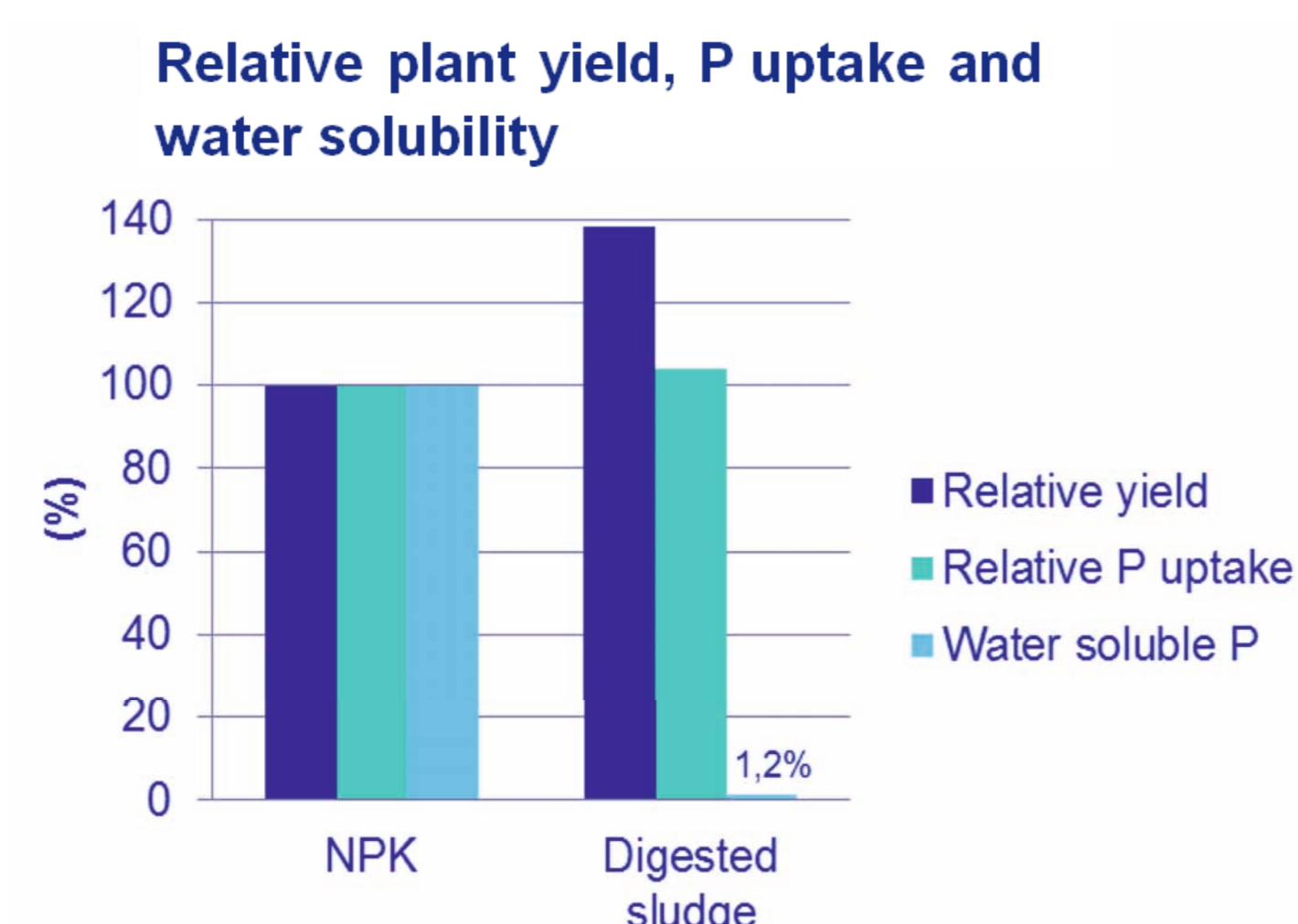


*Aluminum and ferric phosphate

McGeorge, W.T.; Breazeale, J.F.; Studies on iron, aluminum, and organic phosphates and phosphate fixation in calcareous soils. Technical Bulletin No. 40, University of Arizona, Tucson, Arizona 1932, 59-111.

Case study: Natural Resources Institute Finland 2015

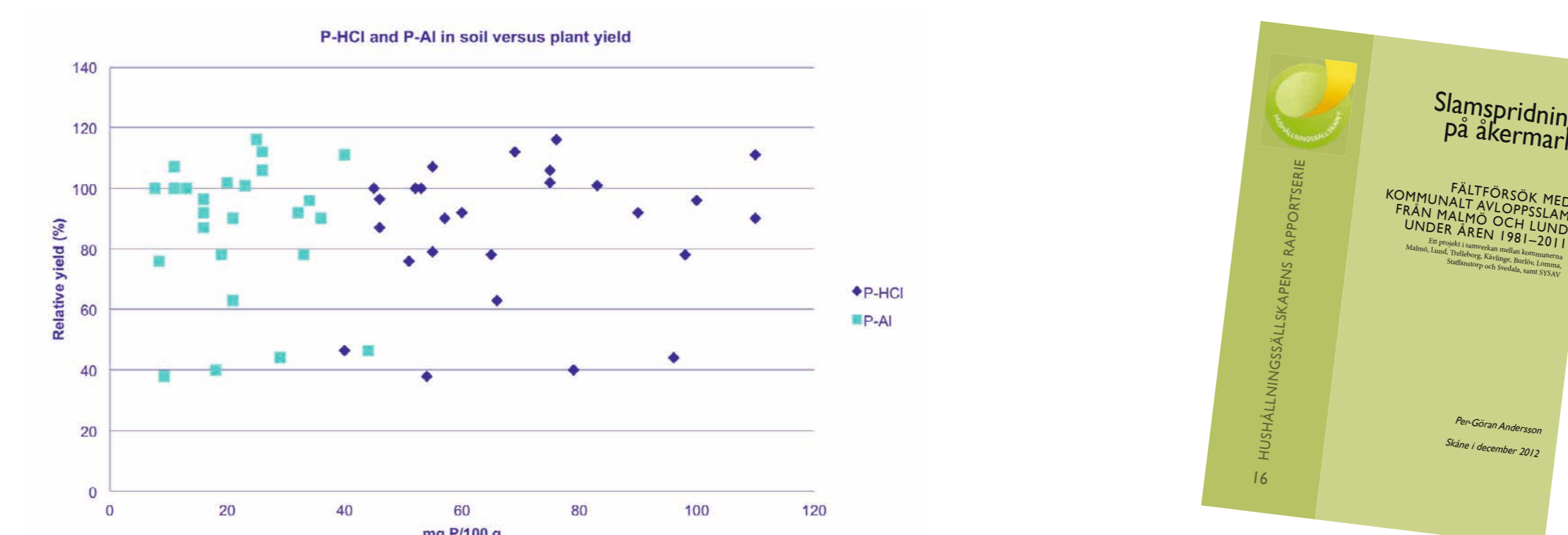
Even though the sludge has very low levels of water soluble P, still the plant yield and P uptake is higher than with 100 % soluble NPK.*



* Tests using digested sludge, with medium/high dosage of iron coagulant used for P removal, at the same P-tot application rate. Other sludge tested indicated similar results.

Kahiluoto, H.; Kuisma, M.; Ketoja, E.; Salo, T.; Heikkinen, J., Phosphorus in manure and sewage sludge more recyclable than in soluble inorganic fertilizer. Environmental Science and Technology (2015)DOI:10.1021/es503387y

Case study: Hushållningssällskapet – Swedish Rural Economy and Agricultural Societies 2012 Expertise of 30 years on sludge to agriculture



- On fields where only sludge have been used, yield increased by 16%
- The combination of fertilizer and sludge gave 7% higher yield than fertilizer only
- Increased value of productivity of 50-100 €/ha*year
- No correlation between P-AL, P-HCl and yield (author's conclusion)

Andersson P-G, Slamspridning på åkermark. Hushållningssällskapens rapportserie 2012, ISBN 91-88668-74-6