

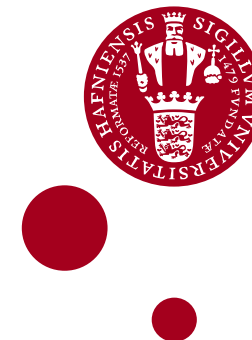
IMPROVE-P

IMproved Phosphorus Resource efficiency in Organic agriculture Via recycling and Enhanced biological mobilization

Stockholm, October 1, 2014



Nafferton Ecological
Farming Group



ETH

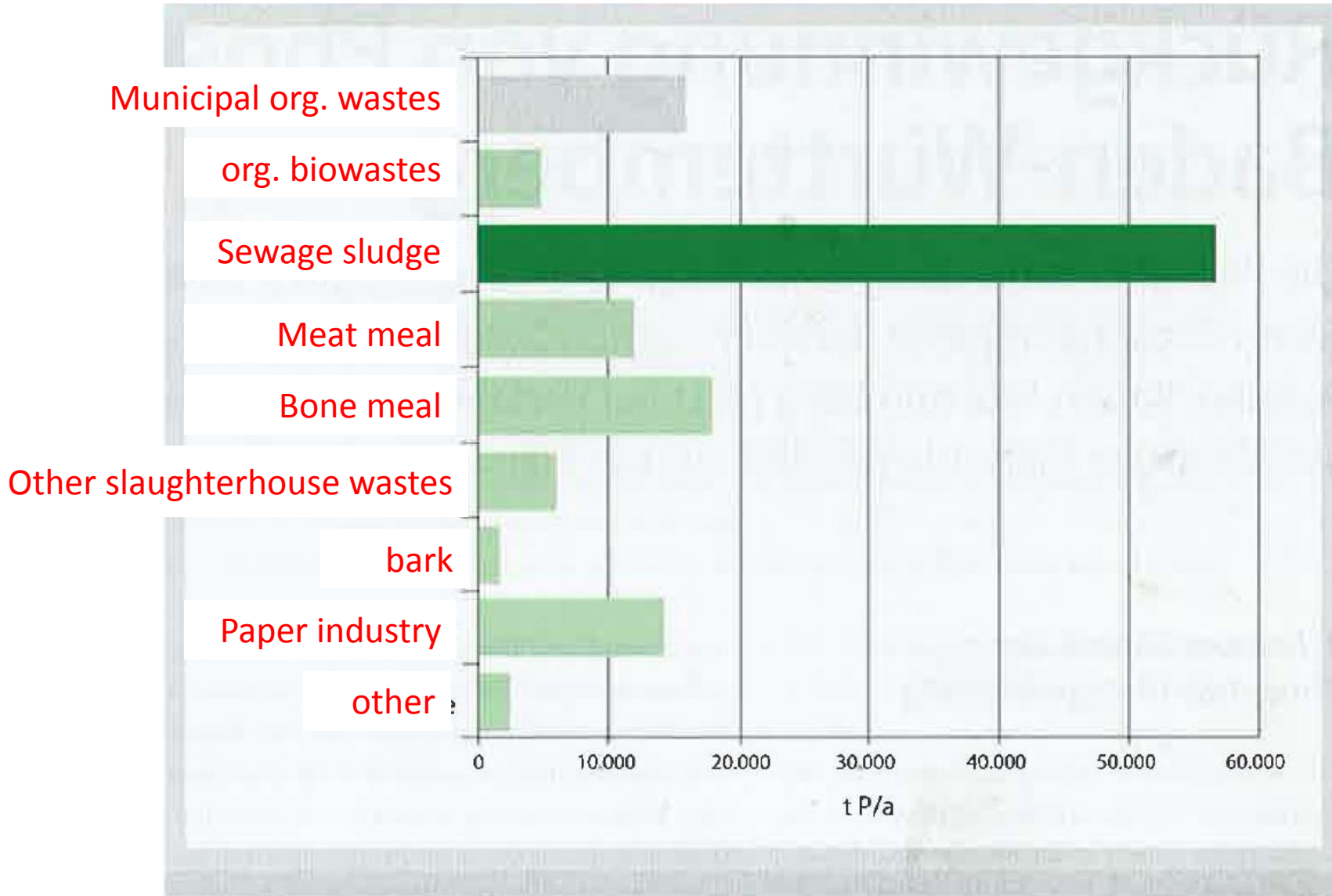
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich



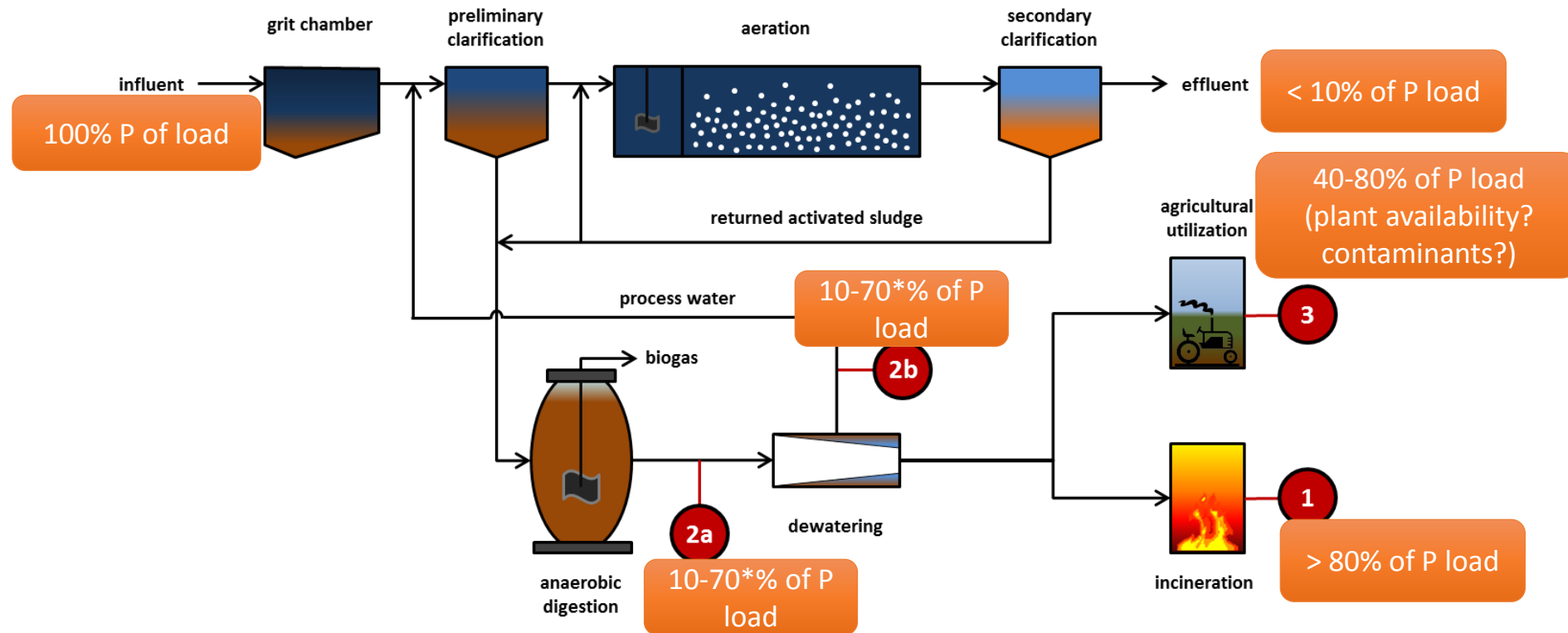
Work packages

- WP 0: Coordination and dissemination
- WP 1: Compilation of existing knowledge and synthesis
- WP 2: Evaluation of efficacy and potential environmental impacts of alternative P fertilizers
- WP 3 : Improved P mobilization by adapted agronomic strategies and addition of P mobilizing PGPR
- WP 4 : Discussions with stakeholder about APF applicability, mainly by workshops in each of the participating countries

Phosphorus potential of alternative P sources in Germany (Fricke & Bidlingmaier 2003)



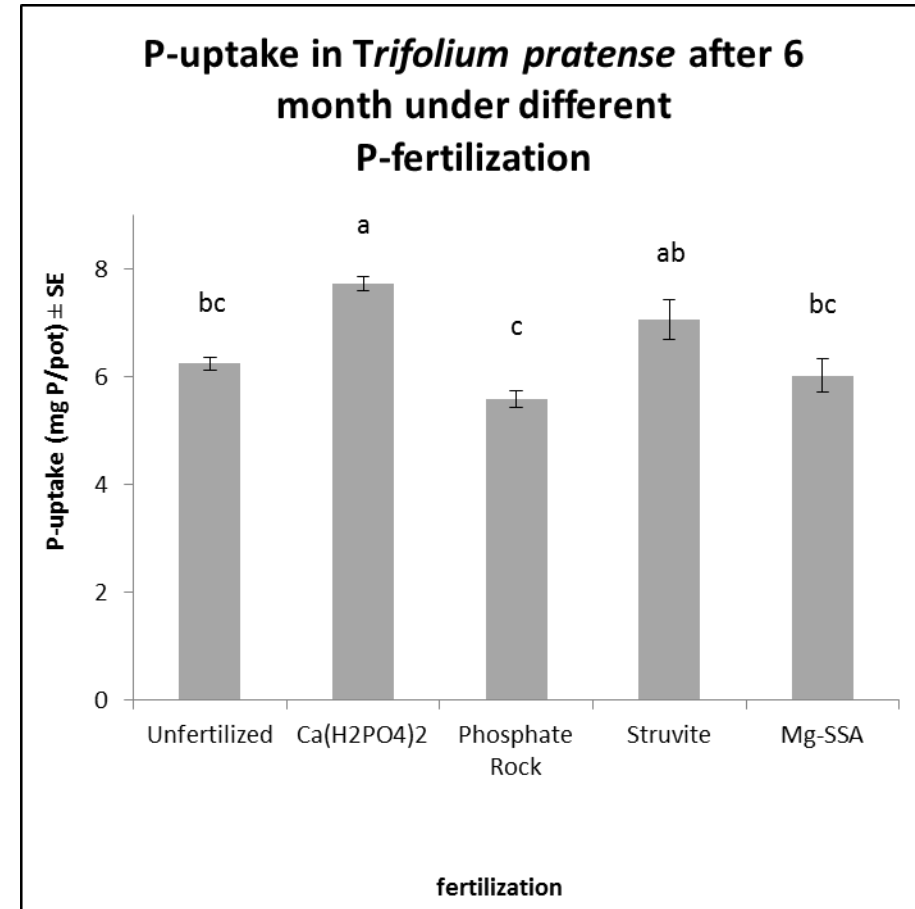
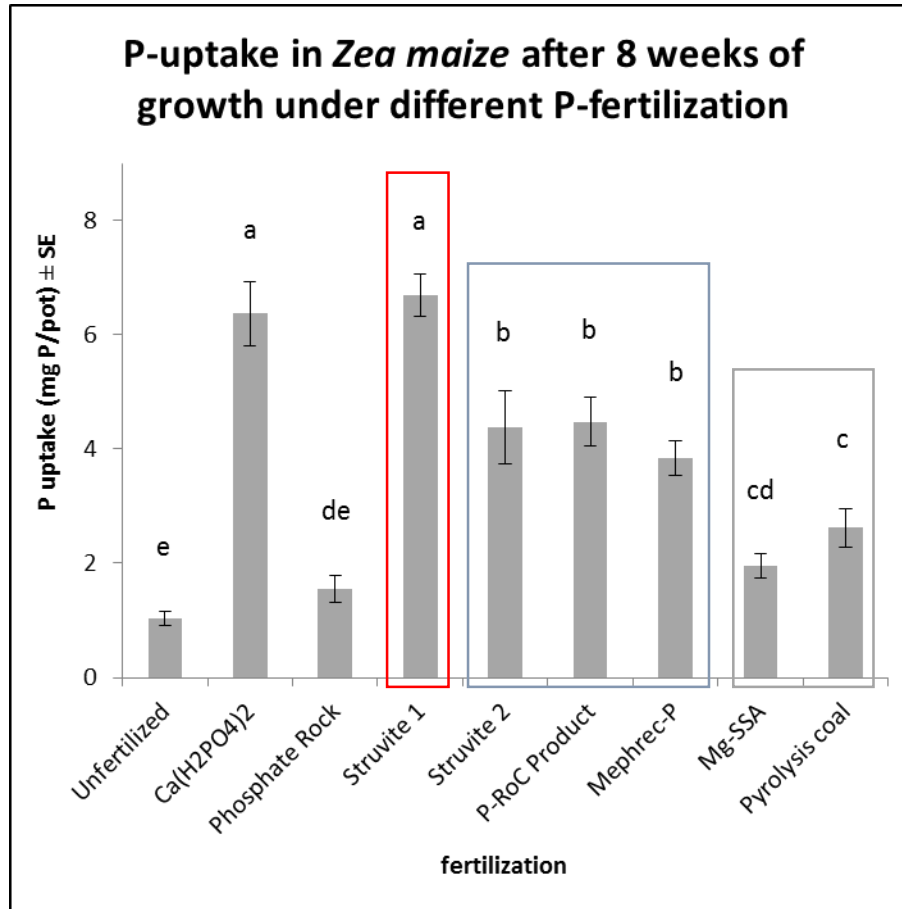
Hot spots for P recovery in wastewater treatment plants (Kabbe 2014)



- 1 ash after incineration
- 2a undrained sludge after anaerobic digestion
- 2b sludge liquor after dewatering
- 3 direct agricultural utilisation of dewatered sludge

*High recovery rate only after forced P extraction from solid phase (acidification)

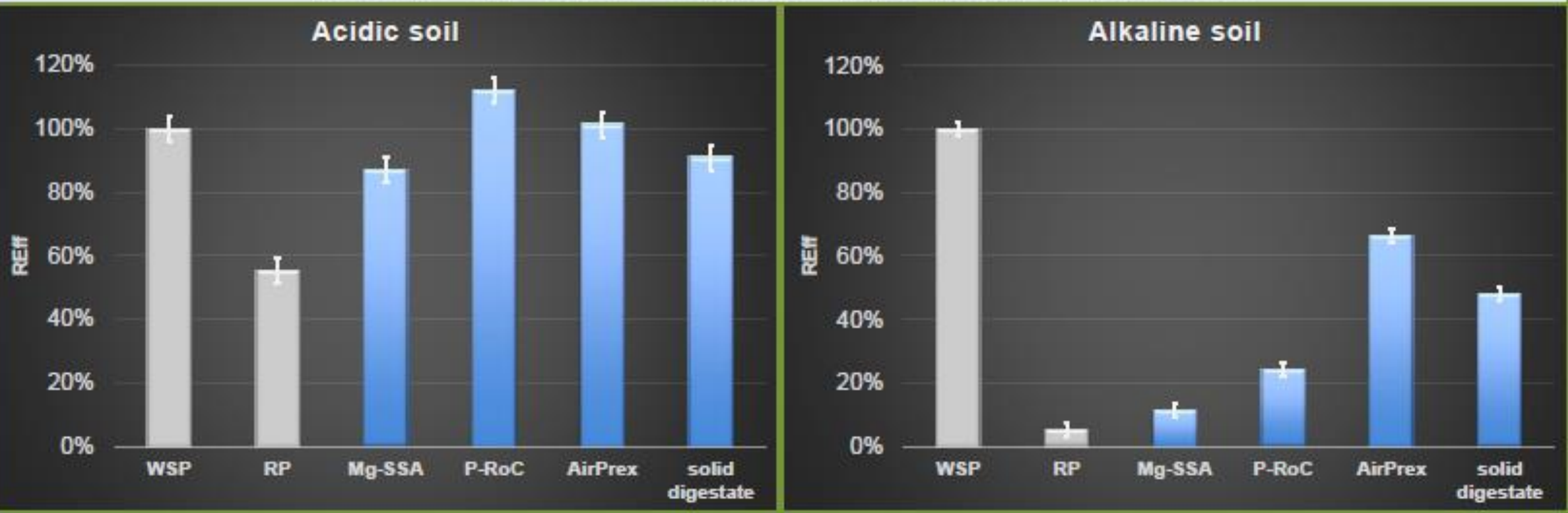
P uptake alternative P fertilizer (Hohenheim)



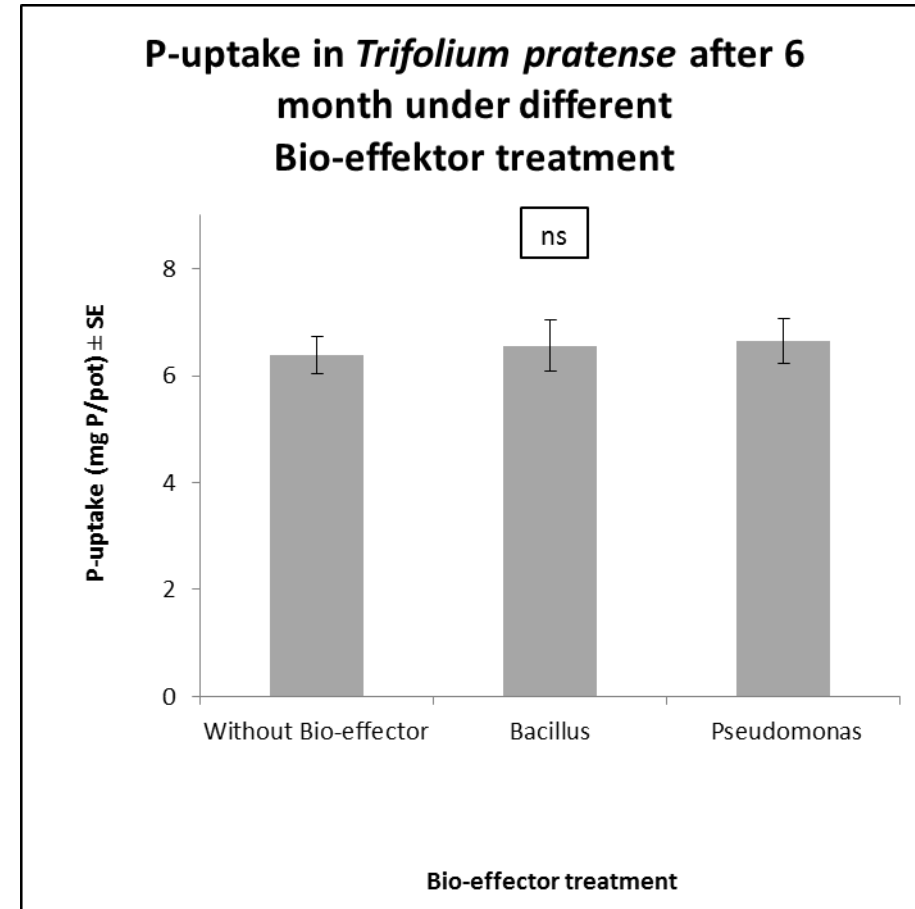
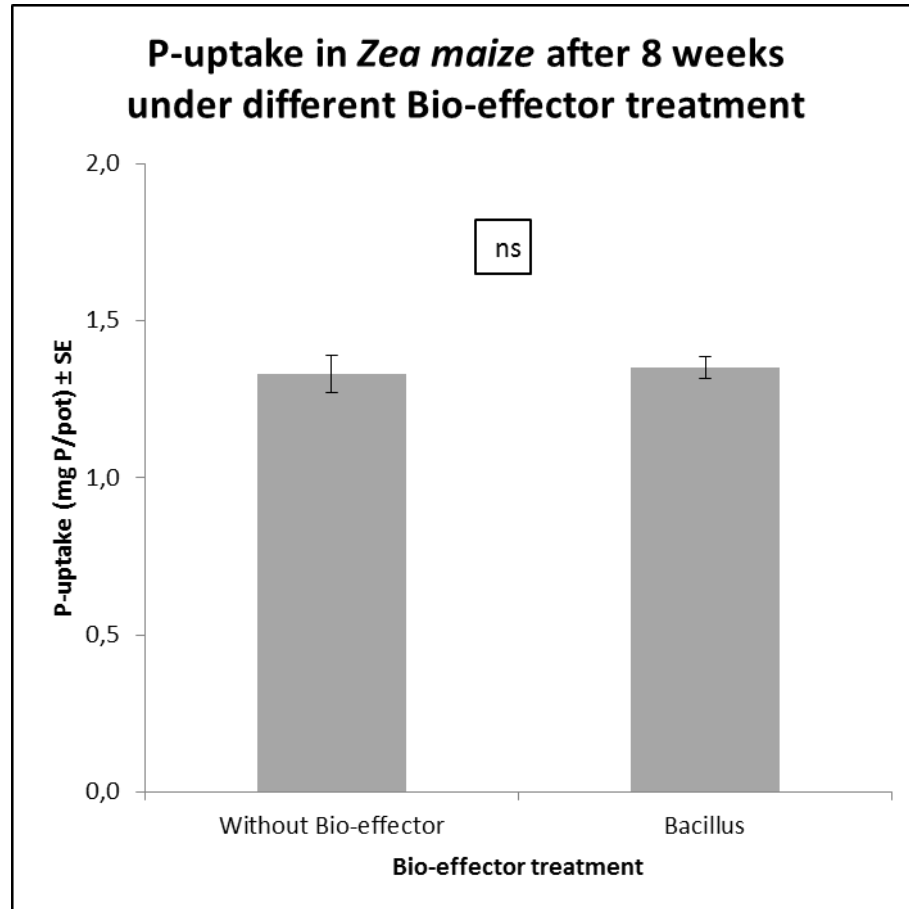
Relative P effectiveness of alternative P fertilizers in alkaline and acidic soils (Zürich) (Meyer et al.)

4. Results

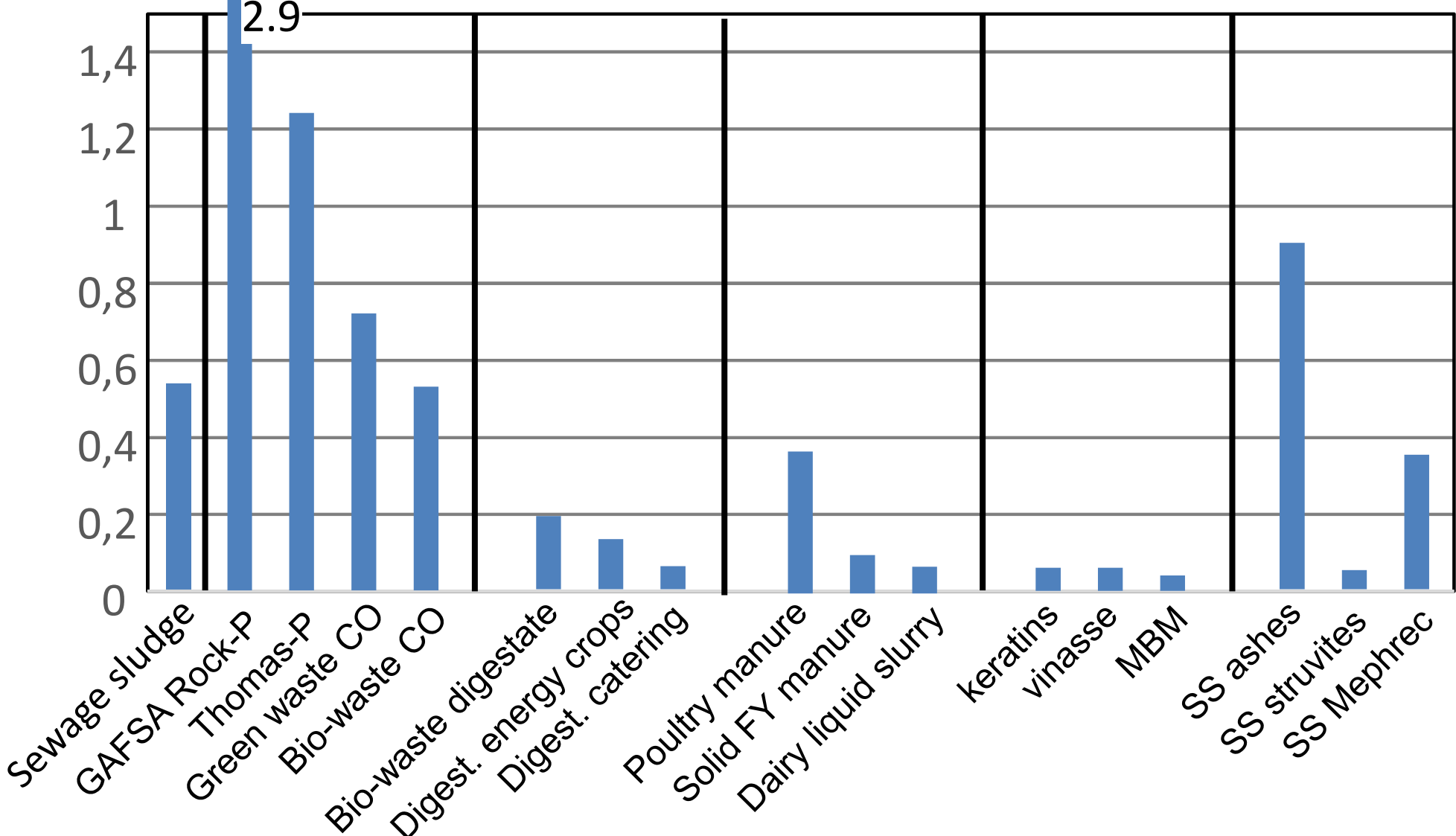
Relative effectiveness (REff) of alternative P fertilizers



P uptake bio-effector treatment (Hohenheim)



Heavy metal-nutrient index of recycling fertilizers



Conclusions

- P status in OF differs strongly depending on the system:
 - Low/declining P status on (stockless) arable systems
 - Moderate imbalances in mixed systems
 - Strong surpluses in vegetable systems/organic orchards
- Large differences in P-fertilizer efficiency of alternative P fertilizers:
 - Very high for crystallization products (struvite)
 - Low for incineration products
 - Differences depend on soil pH and crop species
- The relative heavy metal load of some currently not allowed APFs is sometimes (much) lower than in allowed recycling fertilizer
 - Sewage sludge vs. green waste composts
 - Catering waste digestates vs. source separated composts
 - Crystallization or incineration fertilizers from sewage sludge vs. thomas-P or Gafsa rock-P
- No significant effect of Bio-effectors
- Stakeholder meetings in each country with a questionnaire