



Reducing phosphorus (P) losses from drained agricultural fields with iron coated sand (ICS) filters

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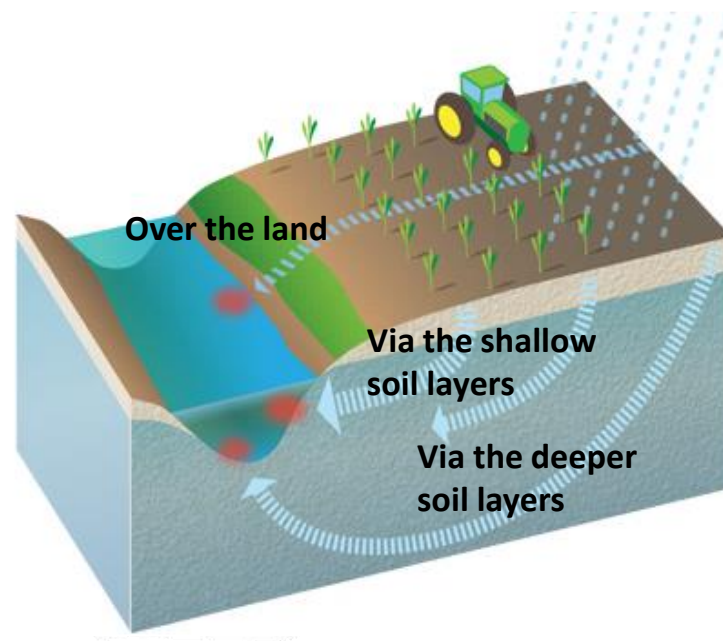
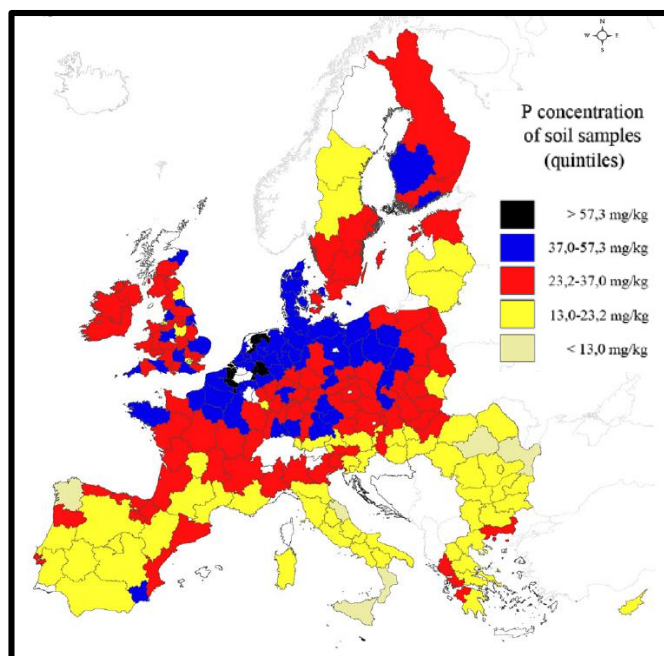
Ghent University

Why is it important?

In Northwest Europe, agricultural P losses
→ eutrophication problems in surface water

High to very high soil P test values

17—40 % is drained in NW Europe



What do farmers need?

- Reduce P loads as much as possible
(< 0.1 ppm, Water Framework Directive)
- For individual drainage pipe with water flow of
6-8 m³ per day
- Process discontinuous flows
- Low cost and easy to install

- Phosphorus sorbing materials (PSM) & Principle
- Lab-scale evaluation
- Field-scale evaluation
- Development of prototype
- Performance of prototype

PSM: Phosphorus Sorbing Materials

Iron coated sand (ICS)



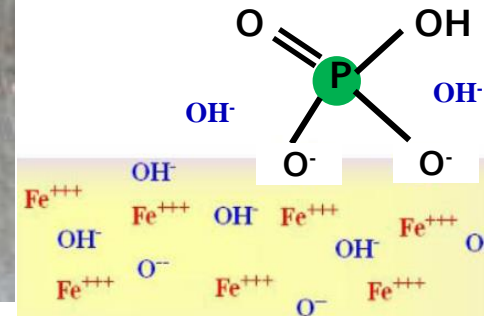
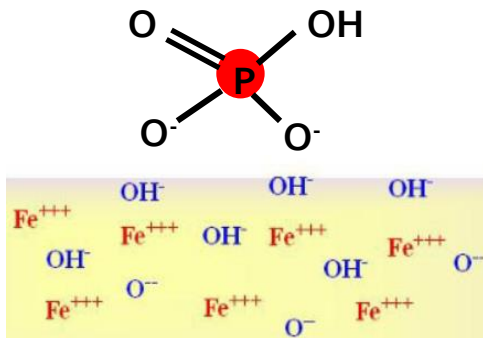
By-product from drinking-water industry

Ball-milled and acid pretreated glauconite

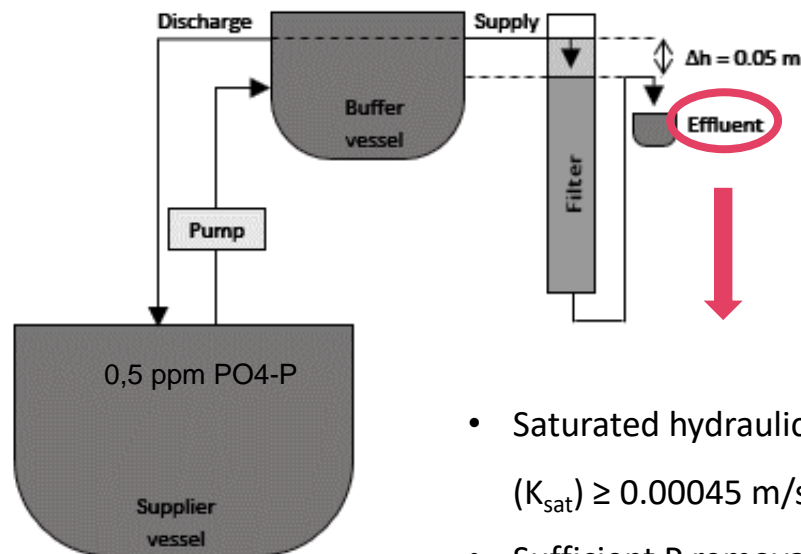


Abundantly available natural mineral

Principle: P is removed from water by absorbing into iron coated sand (ICS)



Prepare and test filters at lab scale



- Saturated hydraulic conductivity ($K_{\text{sat}} \geq 0.00045 \text{ m/s}$)
- Sufficient P removal



Three experimental sites



Zedelgem

- three individual drains
- max water flow 8 m³/day

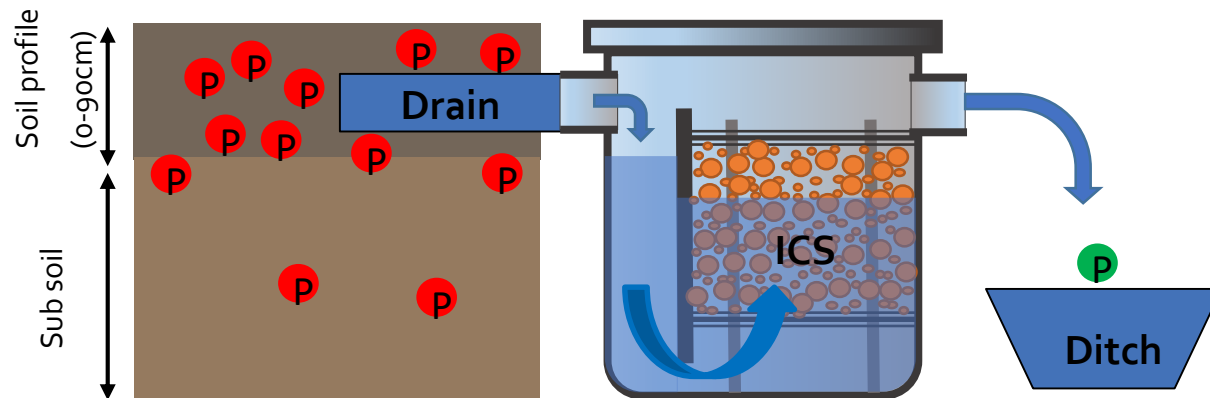


Simple bucket filter



flow
outlet

Prototype development



Key features:



upward-oriented outlet



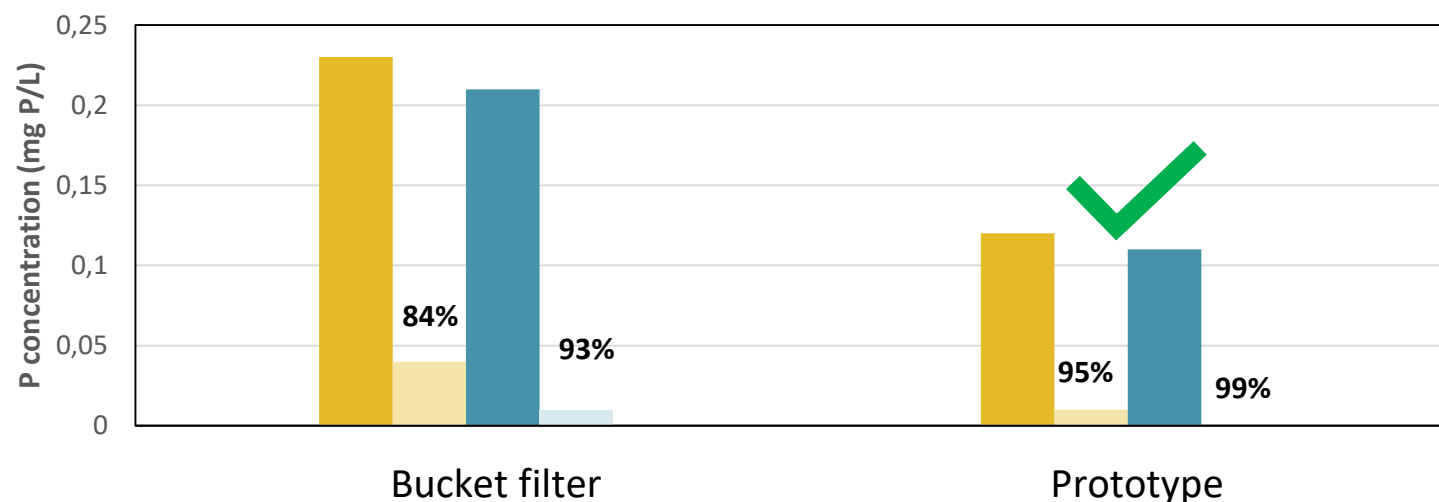
mesh netting at bottom & top



Prototype performance

P removal efficiency

- Volume weighted average TP concentration inlet
- Volume weighted average TP concentration outlet
- Volume weighted average DRP concentration inlet
- Volume weighted average DRP concentration outlet

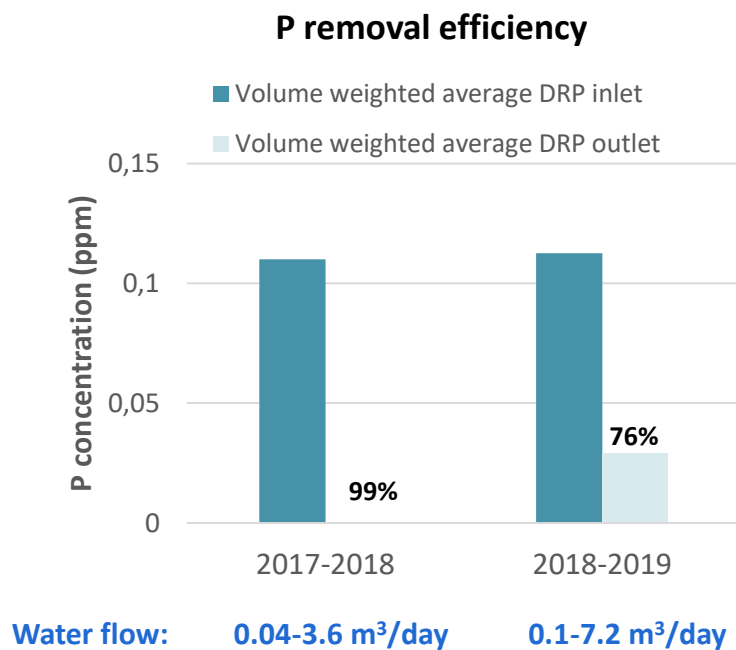


Water flow: 0.04-4.3 m³/day

0.04-3.6 m³/day

TP: total phosphorus
DRP: dissolved reactive phosphorus

-Seasonal variation



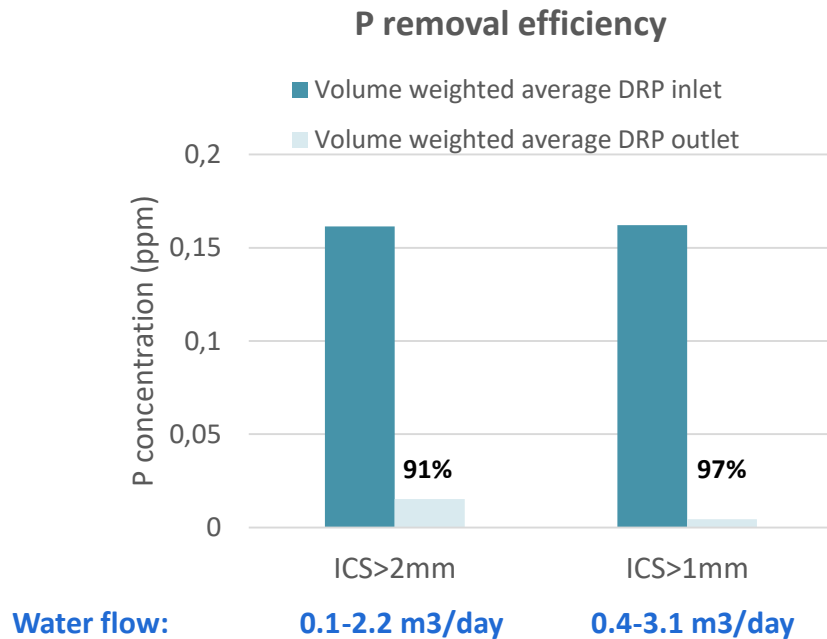
2017-2018



2018-2019



-Effect of particle size



Evaluation of the filter

- Only applicable for individual drains
- Mostly remove dissolved reactive P
- + Low-tech solution: easy installation and operation
- + High P removal efficiency
- + Low cost of filter materials: ICS is industrial by-product
- + Causes no other contaminations
- + No impact on accessibility and landscape

Q & A