

# Gypsum – a cost-efficient measure to boost water protection in agriculture



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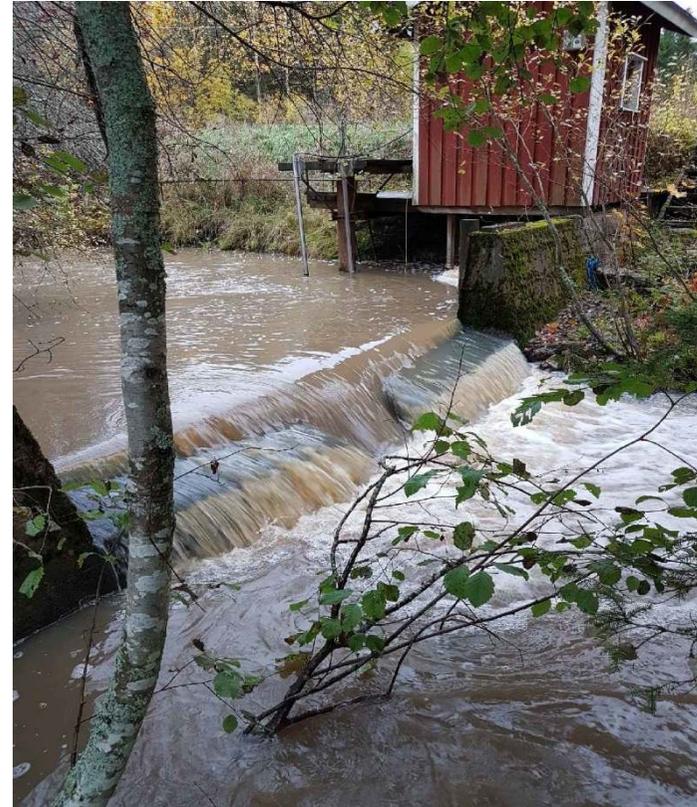
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# Content

- **Gypsum: cost-efficiency**
- **Farmers' experience from gypsum amendment**
- **Gypsum amendment and reduction in phosphorus loads to the Baltic Sea**

## Background: reducing P runoff from agriculture

- Phosphorus runoff from agriculture:
  - Erosion: PP
  - Soil phosphorus content: DRP
- Current measures
  - Buffer strips and zones
  - Winter-time plant cover
  - Catch crops
  - Tillage methods tillage
  - Wetlands
  - Reduced fertilizer intensity
- Weaknesses of the measures for P
  - Ineffective and uncertain
  - Efficient for N not for P
  - Trade-off between PP and DRP
  - Costly
- Any better alternative?



***Gypsum amendment of clay soil fields***

# Cost-efficiency of gypsum

## Experience from the Finnish pilots

- Reduction of PP 50% and DP 25%
- Soil P content varies over fields and areas
- Archipelago Sea catchment:
  - Average total P 1.3 kg/ha
- Costs of gypsum amendment:
  - average cost 220 €/ha
  - (Covers material, transport and spreading)



**Cost per reduced P kg: €/70**

For comparison:

- Using current practices in the short-run: costs of 30% reduction are 220 €/kg

# Large-scale pilot in the river Savijoki

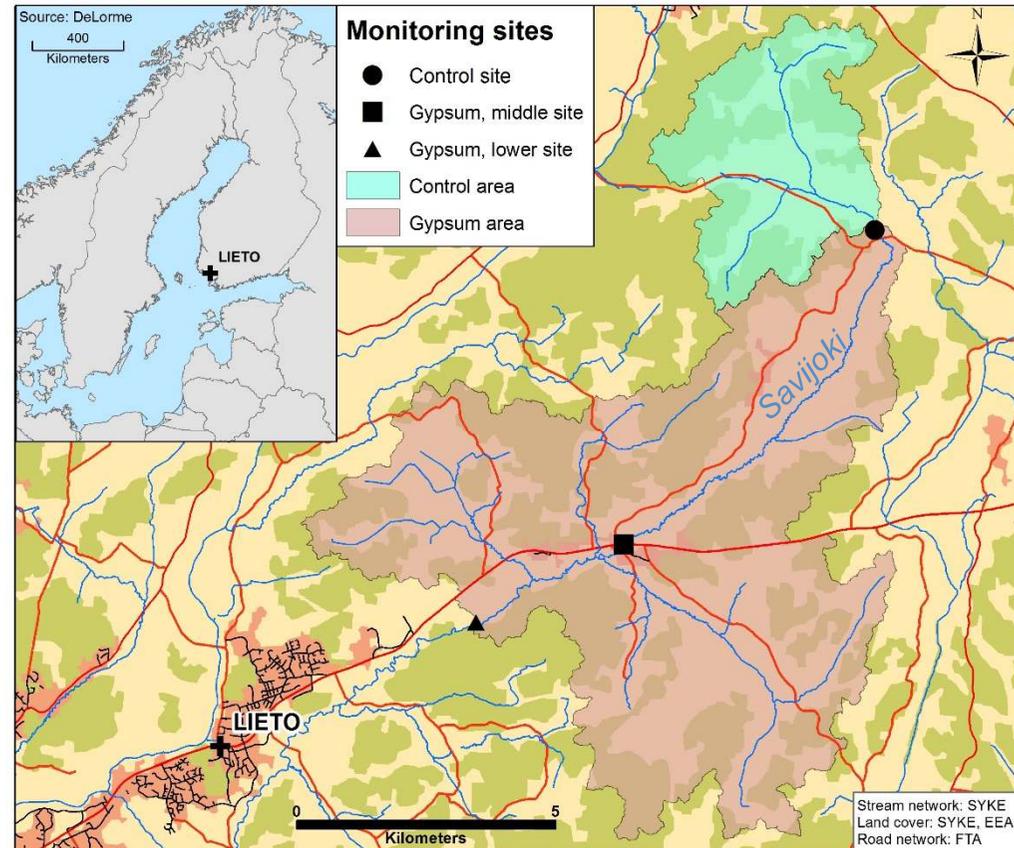
## **THE PILOT IN NUMBERS**

55 farms

1559 hectares

6270 tons of gypsum

144 truck loads



*The research was conducted by the University of Helsinki and the Finnish Environment Institute in the project SAVE (2016–2018), funded by the Ministry of the Environment. The monitoring of the impacts and the funding continues in the project SAVE2 (2019–2020). The pilot was implemented in collaboration with the NutriTrade project (2015–2018) funded by the EU Interreg Central Baltic programme.*

# Farmers' experience

- **Motives of participation**
  - To support research on new protection measures
  - To improve the reputation of agriculture
  - Curiosity on the use and impacts of gypsum amendment
  - To improve the quality of local waters
- **Gypsum application**
  - No special problems in spreading (favorable Fall)
  - Some farms (20%) had problems with the timing of delivery
- **Observations a year after application**
  - No yield penalty; higher yields for some fields
  - Soil quality improved on some farms: conventional and conservation tillage (30%)
- **Large scale application**
  - 70% recommends using gypsum to other farmers
  - 70% are willing to use gypsum again
  - Local people appreciated farmers' efforts

## Farmers' observations from fields

- **Impacts on soil structure and crop yields**
  - No observations on negative impacts on soil structure
  - Some farmers found that gypsum amendment improved soil structure (30% of conventional and conservation tilled fields)
  - A few report on improved yields
- **How spreading promoted soil compaction**
  - Two-thirds: no impacts
  - One third: a little bit has taken place
- **Tracks from spreading on fields**
  - Most (75%) no tracks
  - Some tracks 25%

# Farmers' worries on gypsum?

## Three main issues identified before the latest pilot

- Gypsum causes yield penalty
- Soil compaction is promoted

## Interview in 2016 and 2017

### Yield penalty

- 49% (2016) & 33% (2017)

### Soil compaction

- 51% (2016) & 30% (2017)

### Are you willing to recommend and use again

- 70% recommends
- 70% would use

# Gypsum and the Baltic Sea

## Countries of interest

- Clay soils dominant in Denmark, Finland and Sweden; also Poland (with more coarse soils) and Northern Estonia

## Rough estimates

- Agricultural P loads from these countries is 8 000 tons
- Gypsum could reduce about 1500 - 2 000 tons of loads
- Contribution to implementation of the BSAP P targets: 20 %



# GYPSUM - SOLUTION FOR THE BALTIC SEA REGION?

- Cost-efficient, immediate reductions to the agricultural phosphorus loads
- Should be supported by agri-environmental policy both at national and international level
- Should be studied in various local conditions in the Baltic Sea region