

Mitigation measures to reduce Phosphorus leakage from arable land, ditch dams and ditch filters; phase 1

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BACKGROUND

Leakage of nutrients from agricultural land is one of the main causes to eutrophication of the Baltic Sea. Despite implementation of mitigation measures such as protective zones, constructed wetlands and restrictions for spreading of manure, leakage of Phosphorus and Nitrogen is still much too high. To achieve rapid mitigation effects, the measures to be evaluated in this project are to be installed in ditches immediately downstream arable land, and have the potential to contribute significantly to reduction of Phosphorus leakage. Ditch dams and ditch filters can be installed in existing ditches so that the farmer does not have to use fertile field areas for the action.

IVL has recently in a desk study estimated the potential of using ditch dams and ditch filters to reduce leakage of Phosphorus from agricultural land to 30-40%. Earlier studies show that filters with different filter materials are effective to separate Phosphorus from sewage water. They should have good potential also with water from agricultural land, although the levels of Phosphorus are lower.

OBJECTIVE

This project will assess the potential and cost effectiveness for ditch dams and ditch filters to reduce phosphorus leakage from arable land. Conclusions from one year of measurements will be made regarding reduction capacity, installation design and management of filters. The large scale implementation potential in the other Baltic Sea countries will be estimated, specifically in Poland and Russia, as well as the total potential effect on the discharge of phosphorus to the Baltic Sea. The possibilities to re-use the exhausted filter material after use will be studied. Dissemination of results and implementation possibilities in the Baltic countries will be initiated.

METHOD

Field studies will be conducted on three sites with wheat or oat on common Swedish soils, silt, light clay and heavy clay, fertilized with commercial fertilizers and one site with heavy clay on sloping ground fertilized with pig manure, i.e. a site with high Phosphorus losses. The number of sites is planned to be expanded with another four sites in Phase 2, in order to cover a wider range of variations in the agricultural landscape.

The analyses of Phosphorus reduction capacity will be conducted using flow-proportional monitoring before and after the dam and filter installations. Water samples are taken automatically when a given amount of water has passed the sampler. The samples are stored and collected when the sampler is full. The flow is measured using a pressure logger or a Doppler instrument, depending on what type that is most suitable at the measurement station. One flow gauge controls all the samplers at one site.

The project period for Phase 1 is 18 months. The full project period is preliminarily four years. Dams, filters and monitoring equipment will be built and installed during the first months. The measurements in Phase 1 will continue for one year. The last months of Phase 1 includes evaluation,

synthesis, reporting and scientific publication. The evaluation of tests and measurements will provide analysis of the potential of the dam/filter action to reduce Phosphorus transport from arable land, including life span, optimal design, best material, practical implement ability over larger areas, as well as cost-effectiveness data. The sustainability of the filter action partly depends on the post-processing of the exhausted filter material. Experimental spreading of the material on small agricultural plots will be carried out, as well as acid washing which will separate phosphates from the material. Prior to these studies a literature review and analyses of the chemical composition of the used filter materials will be carried out.

An overview mapping of areas of arable land in these countries where the two actions are likely to be implementable with good efficiency will be carried out. In this process, agricultural experts from Russia, Poland and the Baltic States will be consulted. The assessment will be based on satellite imagery and regional agricultural knowledge. Building on the results from this study, as well as on the synthesis of the field studies, a first estimate of the total potential effect on the discharge of Phosphorus to the Baltic Sea will be made.