

INCREASE DEPTH OF ARTIFICIAL DRAINAGE IN COMBINATION WITH CONTROLLED DRAINAGE

First DRAFT

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Description

Phosphorus is mainly transported to surface water by water transport. The pathway of the water flow can be changed in such a way that phosphorus rich components in solution will be reduced. Depending of the main pathway of P losses (e.g. overland, subsurface, artificial drains etc) and the main P component in soil solution (particle P material, colloids, inorganic soluble P, organic soluble P) specific measures will reduce the P losses. In this specific fact sheet the impact of subsurface flow (without artificial drains) will be discussed in more detail.

Rationale, mechanism of action

In areas where P losses are also, or mainly, caused by subsurface drainage water, management measures are also possible by changing or blocking the pathway of the water flow in such a way that

- the travel time of the water from a part of the field through the soil to surface water is increased
- and/or the flow rate is reduced

This will reduce the amount P loss to surface water.

A measure that realize this effect is to allow only water discharges of groundwater at greater depth. This can be arranged by increasing the depth of artificial drains in combination with controlled drainages. This option is visualized in figure XX

Peilgestuurde drainage

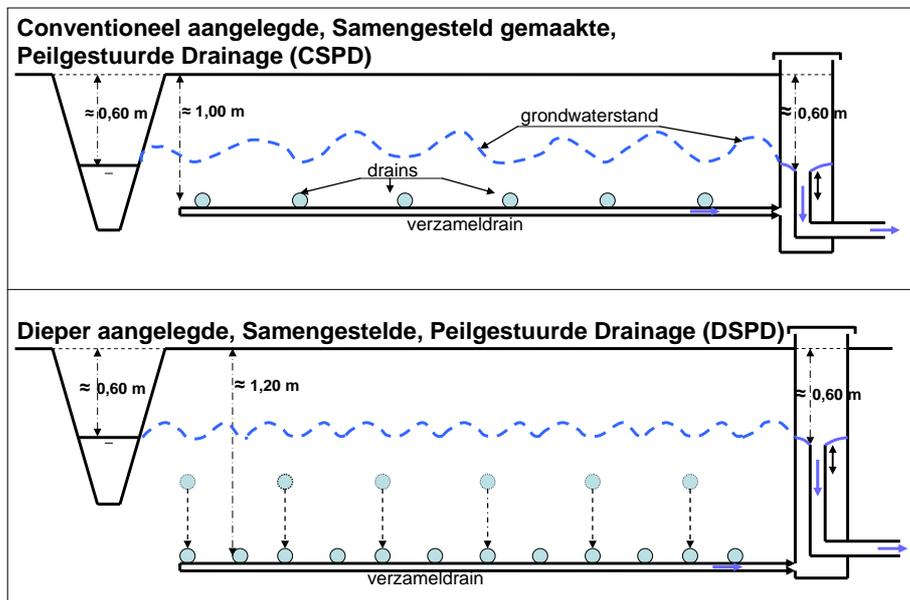


Figure XX. Schematic visualization of the impact of measure “implementing deeper artificial drains in combination with controlled drainage” on the water flow

a) soluble P components

The impact of such measures on the P losses caused by inorganic and organic P components in soil solution is much better known for inorganic phosphorus than for

organic P. Soluble components are defined as material that is still in solution after filtering by 0.45 µm.

The general idea of this measure is to reduce discharge the water from the field at greater depth in order to use the greater capacity of the soil to adsorb and absorb phosphorus components. This can be achieved by putting the drains at greater depths and collect the water in a storage tank (vat?) where the groundwater level is regulated as shown in figure XX. Since phosphorus are lower at greater depth also the concentrations in the storage tank will be lower and consequently the P losses.

b) particulate P / colloidal P

The P losses caused by transport of detached soil particles components in soil solution through the soil is not well known. Particle components in soil solution are defined as material that is filtered by a 0.45 µm filter. By increasing the pathway of water transport through the soil also the amount of detached material will be probably decreased. However, experiments are not yet available, but will be carried out soon in the Netherlands.

Applicability

The measure will be most effective when applied under field conditions where water high soluble P components are transported to the surface water via artificial drainage. This can be the case in artificial drained areas with high P accumulation in the soil at greater depth.

Effectiveness, including certainty

The effectiveness of increasing the depth of artificial drains in combination with controlled groundwater levels will have the most impact in situations with high P content of the soil and a rather shallow artificial drainage system. In flat areas of the Netherlands reductions of ...% have been calculated for sandy areas (Noij et al??). Such evaluations have not been done for peat areas and clays areas. In literature such practical experiments have not been found yet.

Time frame

Increasing the length of the pathway of P transport through the soil to deeper layers will have an impact on the travel time and therefore on the timeframe. However, the impact of the measure will turn out at the short term (within a year).

Environmental side-effects / pollution swapping

It is not expected that there will be negative side effects of this measure.

Relevance, potential for targeting, administrative handling, control

The option can be relevant for those fields that mainly cause the diffuse P losses by subsurface transport at local scale. Selection of such fields by modeling approaches or by local experiences are highly recommended.

Costs: investment, labor

The main costs are caused by labor and the installation of deeper the artificial drains. In most cases also more drains have to be placed compared to shallow drainage systems. The costs are about euro / ha. No special investments are necessary.

References [1] To be filled in.