REESTABLISHMENT OF INUNDATED RIPARIAN WETLANDS

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Description

In the past, most lowland rives were accompanied by riparian wetlands that were inundated during periods with high water levels. However, many of these wetlands were transferred into agricultural soils. Reestablishment of the wetlands, by stopping their agricultural use and removing dikes will restore the natural nutrient purification potential of the low-lying often organic soils.

Rationale, mechanism of action

Intensive agricultural production and artificial drainage of floodplains increase the risk for losses of nutrients as distance to surface water is shortest. Moreover, the drainage of floodplain soils increases the turnover of organic carbon which releases nutrients and the natural self purification potential of lowland riparian areas is lost.

Reestablishment of riparian wetlands on such lowland floodplains will, therefore, both decrease nutrient losses from leaching on former drained agricultural fields and increase the nutrient retention potential of such areas. At high stages in river the floodplains will be inundated with river water having high concentrations of nitrate-N, suspended sediments and particulate P. Flood risk will be reduced [1], denitrification of nitrate-N will take place in floodplain soils [2,3] and suspended sediment and particulate P will be deposited on the floodplain [4,5,6]. Moreover, the groundwater table in the floodplains will be lifted and nitrate-N transported through the floodplain soils from adjacent fields may be denitrified [7]. The measure will be most effective if biomass is removed from the riparian wetland (phytoremediation) as ‘old’ agricultural P may be released from wet riparian soils [7].

Applicability

The measure can only be used along lowland rivers having low energy environments and where there are no risk for flooding of towns, cities, rail roads, high ways, etc. It is possible to create controlled flooded areas on e.g. very wide floodplains where the wetlands can be surrounded by dikes. Former agricultural low-lying soils being very saturated in ‘old’ agricultural P and low in iron content should be avoided as they can release dissolved P for years or decades to surface waters when becoming rewetted.

Effectiveness, including certainty

The effectiveness is high for reduction in leaching of N and P from riparian soils when agricultural production is abandoned. This effect will take place within a few years. The effectiveness is also high for the denitrification of nitrate-N and deposition of particulate P during days with flooding from the onset of the new restored wetland [1,2,3,4,5,6]. However, desorption of ‘old’ agricultural and iron bound P from the wetted soils may for some years lower the effectiveness of the measure [7]. Experiences from reestablished and natural riparian wetlands in Denmark shows that the denitrification potential of recreated wetlands can be between 1.0-1.5 kg N per hectare flooded riparian area per day and the potential for deposition of particulate P between 0.2-1.2 kg P per hectare flooded riparian area per day.

Time frame

Effects of abandoning agriculture on lowland floodplains will appear within a short time frame (years). Effects of the temporal inundation of riparian wetlands will appear during the first flooding incident. Biomass should be harvested from the floodplain to remove soil pool released nutrients during summer.

Environmental side effect
Risk of flooding further downstream will be reduced and greenhouse gas emissions will be reduced when manure and fertilizer are no longer applied. The wetted areas can be transformed to a net carbon sink depending on the length of year the riparian areas are wetted and level of the groundwater table. An increase may, however, take place in methane emissions from the wetted soils again depending on the local conditions. The use of pesticides in recreated riparian wetlands will cease.

Relevance, potential for targeting, administrative handling, control
The option is only relevant for low-lying riparian areas along lowland rivers being larger than of 3rd to 4th order (*Sensu Strahler*). Each site will have to be handled as a project and negotiation with local stakeholders on the project details will have to take place. Farmland is often bought or changed for nearby farmland bought by the local administrative level, regional authority or state. A pre-project survey of the riparian soils for P and iron content will be necessary in order to evaluate the risk for P-releases following rewetting of the area. Post monitoring of the efficiency of the wetland for nutrient retention can be recommended following a standardised guidelines.

Costs: investments, labor
The costs of this option relates to the costs of establishing the project proposal, the costs getting hold of the riparian land eventually through buying the land from farmers, costs of restoring the river and riparian area through e.g. remeandering the river channel, cutting of drainage installations in the riparian areas (ditches, tile drains, pumps) and costs of making surveys and post monitoring.

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