WAGENINGEN UR
For quality of life

Constructed wetlands for agricultural drainwater

Francisca P. Sival[1], I.G.A.M. Noij[1], J. de Haan[2] and JR van der Schoot[2]

Introduction

In the Netherlands agricultural practices have led to a number of environmental problems such as eutrophication and desiccation Nutrient concentrations in agricultural drainwater are still too high to meet the ecological quality goals for surface waters from the EU-WFD. Constructed wetlands may serve for water treatment. The retention efficiency for N and P is insufficiently known for policy making and planning purposes. Several systems are being compared since 2005.

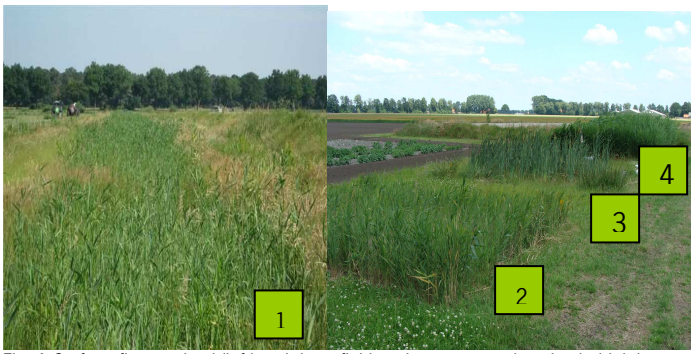

Fig. 1 Surface flow wetland (left) and three field scale constructed wetlands (right). Numbers refer to table 1

Material & method

A surface flow wetland was constructed in 2006 parallel to a stream for P-retention (nr 1 in Tab.1 and Fig.1). On an experimental farm three field scale N-retention systems were installed in 2005 (nr 2-4). Stored drainwater during winter is gradually supplied to the wetlands to meet the retention capacity. In- and output to the systems has been sampled discharge proportionally for the determination of N and P loads, and –retention. Vegetation, soil and sediment are measured yearly to complete the N and P-balance.

Table 1 The four different wetlands for agricultural drainage water purification

year	type	nutrient	cover	length (m)	surface (m2)
2006	1: surface flow system	P	reed	290	1305
2005	2: SF:surface flow system	N	reed	10	64
2005	3: SSF-reed: subsurface flow	N	reed	5	32
2005	4: SFF-straw: subsurface flow with straw	N	tall fescue	5	32

Results

N and P retention surface flow wetland

Reed establishment was very poor during the first two years, but significantly improved in 2008 (Fig.2). Retention of P was primarily due to adsorption of P to the wetland soil whereas removal of N was due to denitrification and uptake.

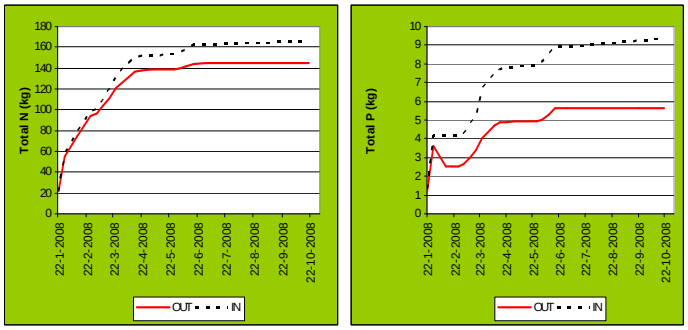

Fig. 2 Measured in- and output of N and P (kg) between January and december 2008 in the surface flow wetland parallel to the stream

N retention field scale systems

The SF and SSF-straw systems functioned very well with a retention of about 60%. SSF-reed did not do well. Reed grew badly in the pure sand and probably the amount of carbon produced in the system was too limited for effective denitrification.

Due to mineralization of P in the straw, SSF-straw produced a higher P-output.

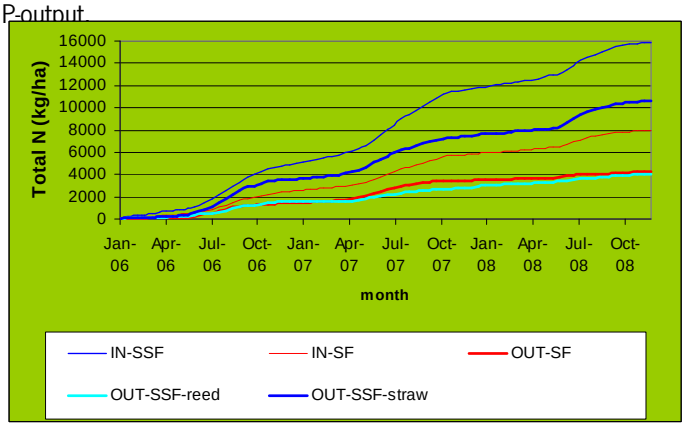

Fig. 3 Measured N-retention of the field scale systems

Conclusion

We conclude that constructed wetlands with reed offer opportunities to comply with the European Water Framework. Integration of the wetland into the farm is however necessary and the required land is an important draw back for the farmer.

Acknowlegements

We like to thank Province of Limburg and the Dutch Ministery of Agricultural, Nature and Food Quality for their financial support

[1]Alterra, Dept. Water and Climate, Alterra-WUR
P.O. Box 47. 6700 AA Wageningen, The Netherlands
Tel: +31 317 – 486463 - Fax: +31 317 – 41 80 94
E-mail: francisca.sival@wur.nl

[2] Applied Plant Research, Wageningen UR
P.O. Box 430, 8200 AK Lelystad, The Netherlands