LABORATOIRE INTERDISCIPLINAIRE
DES ENVIRONNEMENTS CONTINENTAUX

PVC-free, recyclable, ecoposter

Mitigation of water contamination from drained fields using constructed wetlands in grass strips

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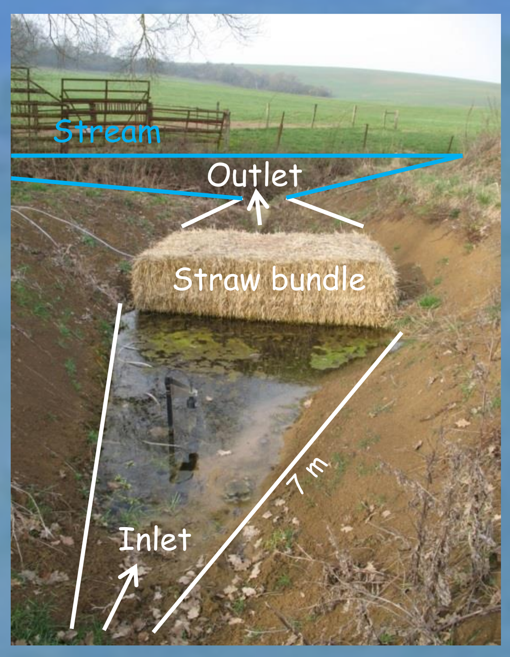
INTRODUCTION

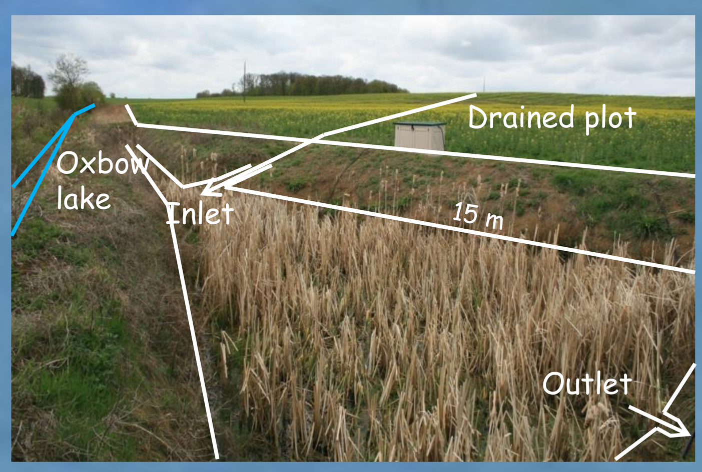
¤ In Lorraine, the drainage of clay soils contributes to transfer of pesticides towards surface waters.
¤ In this case, the regulatory grass strips installed along rivers are bypassed and no longer effective in purifying surface water.
¤ Constructed wetlands (CWs) are often recommended for decreasing non-point source pollution by pesticides.
¤ The aim of this study was (i) to evaluate the effectiveness of two CWS for reducing pesticide concentrations in drainage water and (ii) to understand the processes involved.

Field constructed wetlands

Jallaucourt ditch (54)



Ollainville vegetated pond (88)



Field monitoring

In CW inlet and outlet:
- Flow rate measurement
- Analysis of 80 pesticides/metabolites by the LHN

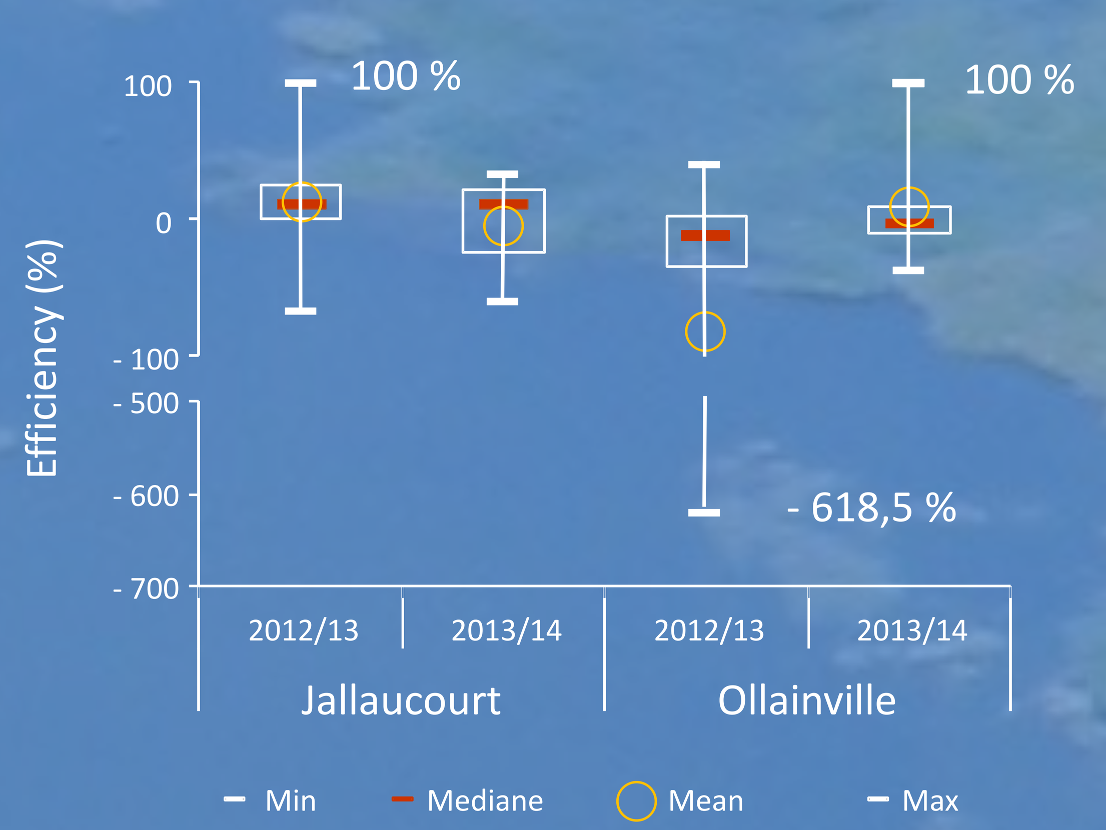
⇒ Calculation of pollutant amounts in inlet and outlet
⇒ CW efficiency (%)

Pollubac and ultra-sound flowmeter

Automatic sampler

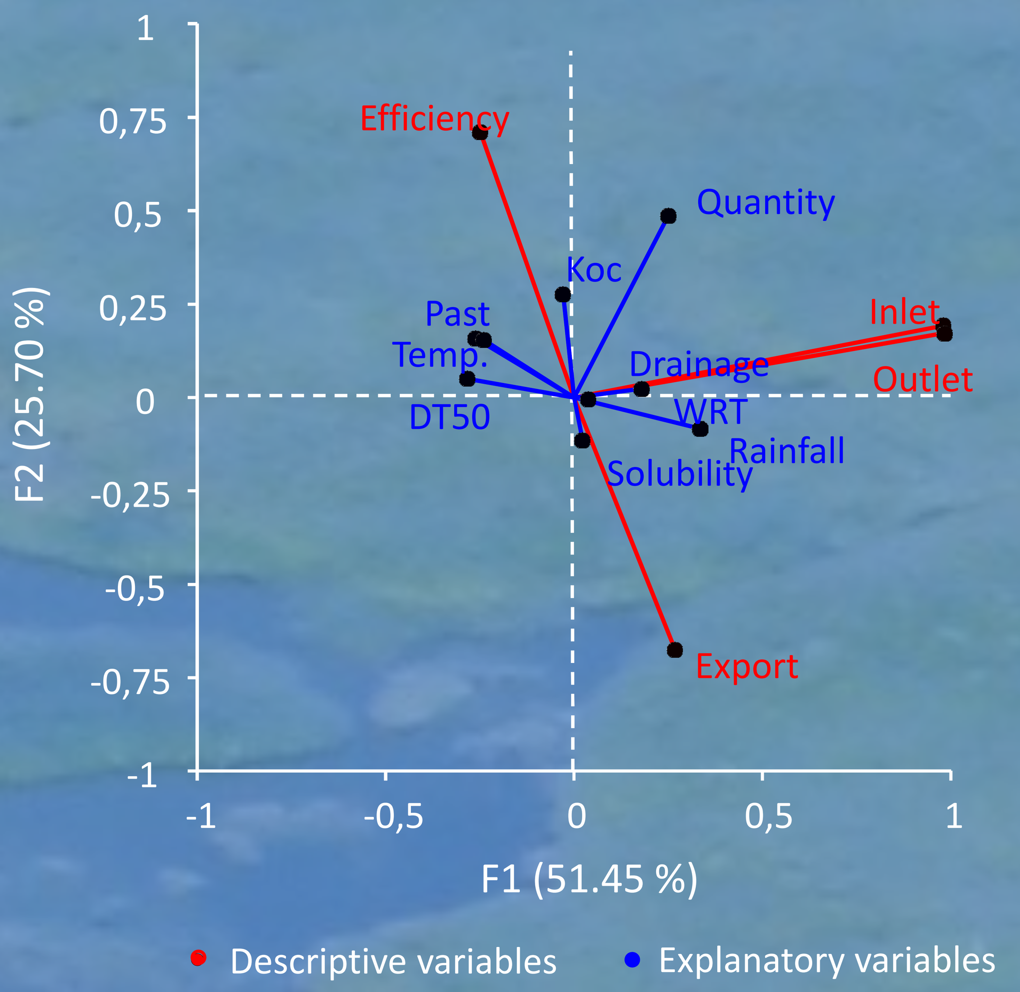
Venturi flume and ultra-sound flowmeter

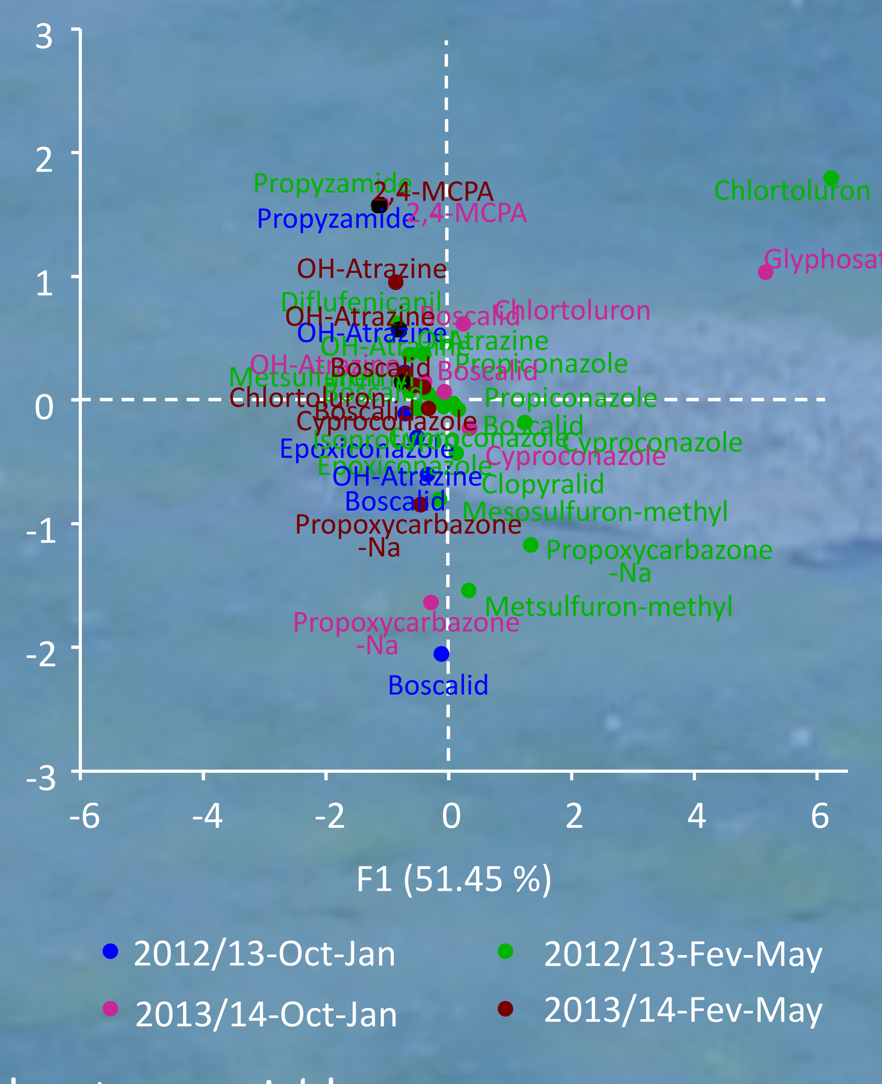
Wide range of efficiency: - 618 % to 100 % !



Principal Component Analysis

Descriptive variables: CW parameters (inlet, oulet concentrations, efficiency…)
& Explanatory variables: agronomic parameters, climatic data and pesticides properties





⇒ No correlation between CW parameters and explanatory variables

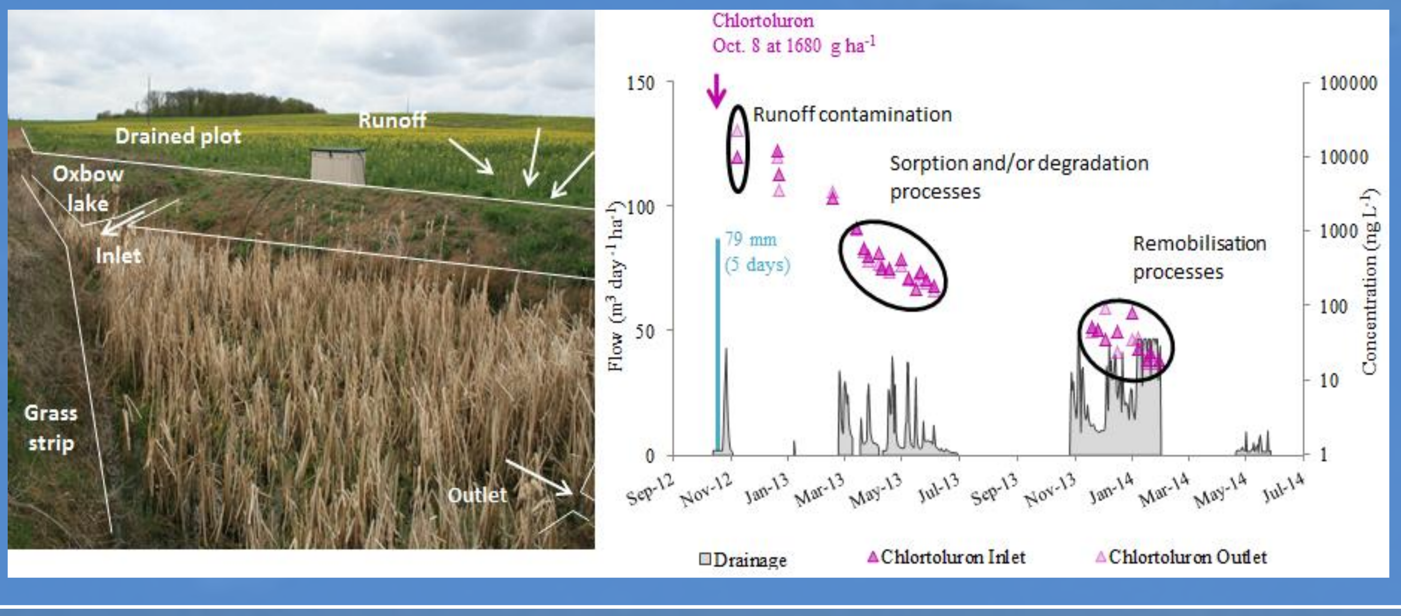
Nevertheless, three pesticide behaviors may be highlighted:

❖ **High negative efficiency** (for example, isoproturon & Mesosulfuron-méthyl – *high solubility*) : probably due to side input runoff and remobilisation from sediments towards water *(pesticides measured in sediments)*.

❖ **Low negative efficiency** (for example, boscalid, cyproconazole) : remobilisation from sediments towards water *(stable concentration measured over time in the water and pesticides detected in sediments)*.

❖ **High positive efficiency** (for example, diflufenicanil, propyzamide - *low solubility and high K_f*) : sorption by CW substrates *(high concentration measured in sediments)*

Efficiency and processes involved inside the CW



CONCLUSION

¤ These small wetlands (100-400 m^2) installed in grass strips are effective in minimizing pesticide concentrations in surface waters.
¤ The CW's effectiveness is promoted by the high sorption and short half-lives of pesticides. In addition, a longer water residence time improves the effectiveness of a CW by allowing pesticides to achieve the equilibrium time necessary for pesticide adsorption.
¤ However, the effectiveness of these wetlands is limited for pesticides with low K_{OC} and long DT_{50} values; thus, their installation must not call into question reductions in the use of pesticides.

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