

Integrated solutions to reduce nitrate losses from cropland – case studies in Northeast Italy

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Keyword: Nitrate loss, cropland, buffer strip, wetlands

The lowlands of the Eastern Alps and Po Valley basins in northern Italy are almost flat and are characterized by a shallow water table lying on a 1 – 3 m deep impervious layer. The area is one of the most fertile in the country and has a heavily fertilized intensive and highly productive, centuries-old agriculture. Nitrogen losses, particularly nitrates, are therefore a threat for the water quality of rivers and the nearby sea.

In this scenario, the control of N losses can be implemented with different approaches: a) reducing the source at field level, b) controlling the transport from field to water bodies and c) abating nitrates along the drainage channel network.

The control of nutrient transport from field to stream can be achieved by practicing the “controlled drainage”, in which excess water is only drained when water levels might damage crops or limit farm equipment movement. This technique uses appropriate structures easily managed at farm level. These practices have been developed and adopted in coastal area of North Carolina (USA). The abatement of nitrate concentration can be obtained with buffer strips and surface flow wetlands.

In this paper an overview on the results obtained from monitoring programmes carried out on controlled drainage, buffer strips and wetland at the Department of Environmental Agronomy and Crop Production of the University of Padova are presented.

During the period 1997-2003 the average N losses were close to 40 kg ha⁻¹ year⁻¹ under conventional drainage and were reduced by 66% with controlled drainage. During 2006-2008, performance by controlled drainage was even better and controlled drainage discharged only negligible amounts of nitrates.

Buffer strips reduced nitrates concentration in the shallow water table by 90% respect to the values measured within the field.

A surface flow wetland abated the incoming N load by 90% before discharging the water in a receiving stream.

The results highlight how a remarkable reduction of the amount of the nitrates reaching the final water body can be achieved by adopting one or more of these strategies in combination.