

Hedgerows and non point source pollution: field test and landscape planning

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Abstract

Venetian Municipality is developing several actions to control lagoon pollution, including hedgerow network planting. The hedgerow network is reintroduced by means of a GIS supported planning system that takes into account for the need of local agriculture and the non point source pollution (NPSP) control effect on the farm and landscape scale. To implement the GIS decision support system, a complex multi-years field test was established. The influence of the hedgerow on crop production is negative in the first year and becomes more and more positive in the second and third year, and the same is for the crop quality. Some results in NPSP abatement were expected, given the hydrogeologic settings, and others are somewhat new: very narrow agroforestry multi-functional plantations have a strong effect on NPSP; the abatement capacity quickly grows in few years; the measured abatement efficiency ranged from 75 (first year) to 99% (last year) and mean annual abatement of nitrate loading passed from 37% (1st year) to 62% (3rd year); the runoff control was strongly effective and the average annual control capacity was of 85% for suspended solids, 73% for total N, 70% for total P. NO₃ abatement was extremely patchy on fine scale, low predictable and depending on NO₃ availability; on coarser scale predictability of the process grew up and other variables were selected: water table, flow rate and temperature.

Introduction

Hedgerow and woodlots perform positive functions on agriculture and environment at landscape level if correctly planned and planted. Afforestation planning should consider all the interactions that characterise such a complex system as landscape: the same afforested surface has very different agricultural, environmental, hydrological, economical effects in a rural landscape according to the distribution, localisation and structure of plantations. Landscape ecology is a necessary approach for rural agroforestry network planning because it allows to consider the hierarchical characteristics and scale problems (that are inherent in landscape processes and structures). Venetian Municipality is developing several actions to control lagoon pollution, including hedgerow network planting. The hedgerow network is reintroduced by means of a GIS supported landscape planning system (PLANLAND[®]), that takes into account for the need of local agriculture (Franco, 1997) and the non point source pollution (NPSP) control effect on farm and landscape scale. To implement the non-point source pollution functionality in the GIS decision support system, a three years field test was established. This test was a part of a more complex experimentation on non-point pollution in the area of Venice Lagoon, including control of manure utilisation and the implementation of the "Dafne® 1" approach to animal manure utilisation (Perelli & Franco, 1994).

Methods

Grain corn (*Zea mais* L.) was cultivated between 1995 and 1997 on a calcareous clay-loam soil. The hydrogeologic settings (Hill, 1996) restrict groundwater to shallow and strong seasonal water table fluctuation. A multistoried one-line windbreak was planted on half length of a field edge (Figure 1), using grown plant material (e.g. 2-3 m trees, 1.5 m shrubs).

