Integrated assessment of groundwater protection against nitrate pollution using environment-friendly agricultural practices

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Agricultural activities are among the major sources of nonpoint water pollution and agricultural best management practices (BMPs) are measures to reduce this problem. Groundwater pollution by nitrate diffusion is one issue of water contamination and on that an integrated study of assessing the implementation of BMPs using environmental, economic and acceptability aspects was carried out in a small Austrian watershed. As an example for the integration of these different aspects, three BMPs, which are mainly part of the Austrian agri-environmental programme ÖPUL 2000 (BMLFUW, 2000) were chosen. The study was part of the multidisciplinary project AgriBMPWater (Turpin et al., 2005) which aimed to compare BMPs in a three dimensional space defined by i) environmental effectiveness, ii) costs of their implementation and iii) social acceptance by farmers and land-users. Environmental effectiveness was assessed as the change of water quality resulting from BPM implementation and was calculated using a hydrological model, that had been calibrated with data derived from a local long term field experiment. Costs associated with implementation of the different BMPs were assessed at the farm level and at the watershed level using bio-economic modelling. Assessment of BMPs acceptance was based on a survey with focus on decision making at the farm level and farmers perceptions on the implementation of the Austrian agri-environmental policy. A clear order for environmental effectiveness of the investigated BMPs and the associated costs was identified. Results from costs assessment showed that for some BMPs, the level for compensation of additional expenditure caused by agri-environmental management should be tailored to the farm area implemented. The assessment of the acceptance of the tested BPMs also revealed that farmers have rather high expectations for compensation of the incurred expenses by the agri-environmental practices. The results gained from the integrative analysis showed that, depending on the BMP, rather many farms should contract to a BMP in order to contribute to improvement of the environmental conditions. The current agri-environmental policy in Austria, which is based on individual farm-level decision-making, does not seem contribute to effective allocation of the BMPs to areas where they are most essential from the environmental point of view.

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