

Master Thesis at FiBL

Title	How to reduce nitrate leaching in the Gäu region: scenario analysis using a modelling approach
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Background	Elevated nitrate concentrations in groundwater occur in agricultural regions throughout Switzerland and can impair drinking water quality. In the region Gäu-Olten since the year 2000, farmers manage their land according to management practices that are supposed to reduce nitrate leaching. In order to verify the effectiveness of these measures, FiBL together with several project partners has measured nitrate leaching under arable fields in the project NitroGäu for two years. The aim of this MSc thesis is to upscale the results from single fields to farms and possibly to the entire Gäu region, and to assess the effectiveness of potential additional measures in a modelling approach.
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Procedure	Two-year data on nitrogen input-output budgets and nitrate leaching for 11 fields under arable cropping will be made available from the project. Structural data of the eight involved farms (crop areas, animal density, fertilizer inputs) can be obtained. The so-called farm model, an Excel tool based on life cycle assessment (LCA) and the Ecoinvent database will be run both at the field and the farm level. Model outputs (nitrate leaching or N surplus) will be compared to measured values. In case of a large discrepancy, nitrate models should be screened and potentially run in order to improve the model output. Finally, scenarios for additional measures will be derived by the MSc student based on the literature and discussions with stakeholders. Potential scenarios could include reduced fertilizer input, reduced animal density, changes in crop proportions (e.g. less maize, more grass-clover leys) or 100% organic production.
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Requirements	We seek a student with a keen interest in environmental modelling and a high motivation to contribute to solving environmental problems. Basic knowledge in LCA is advantageous but not a prerequisite. Supervision will be shared between Else Bünemann (background information, project data, suggestions for scenarios, supervision of thesis writing) and Simon Moakes (modelling).
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Duration	6 months in 2020
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