

Master Thesis at FiBL and HAFL

Title	Assessment of measures reducing nitrate leaching in the Gäu region 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 is measuring nitrate leaching under arable and vegetable fields in the project NitroGäu. The aim of this MSc thesis is to upscale the results from single fields to the entire Gäu region and to assess the effectiveness of 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. Data on farm sizes, animal density and area of crops is available through the canton of Solothurn. In a first step, a dynamic complex process-oriented simulation model will be used to predict nitrate leaching to groundwater for the entire Gäu region calibrated with the empiric data from NitroGäu. In a second step, the dynamic nitrate leaching model will be combined with the FiBL farm model, which is a model to assess the environmental impact of farming systems based on a life cycle assessment (LCA). The two models will then be used to assess the environmental impact of different measures within agricultural production to reduce nitrate leaching in the Gäu region with a focus on changes in eutrophication potential.
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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 Matthias Meier (modelling, support during thesis writing).
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Duration The topic is available throughout the year 2020. An early start is preferable.

Literature Roelsma, J.; Hendriks, R.F.A. (2014): Comparative study of nitrate leaching models on a regional scale. In *Science of The Total Environment* 499, pp. 481–496. DOI: 10.1016/j.scitotenv.2014.07.030.
