

Modelling of soil mineral nitrogen in leachate using APSIM

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Methods

This study aims to quantify nitrate leaching from a wheat, barley and rapeseed crop rotation with different fertilization and irrigation practices. The APSIM model is used to quantify percolation and nitrate leaching. Soil, weather, and management data as well as soil water content, Nmin and crop growth variables from a field trial on a sandy soil at Braunschweig, Germany, are used to calibrate and validate the model. In the experiment, **two irrigation levels (none, 100 mm) and three fertilization levels (none, 75%, 100% N demand)** are tested. With the R package CROPTIMIZE parameters for wheat (11 parameters), barley (6), rapeseed (14), Soil Water (2 per layer) models were calibrated.

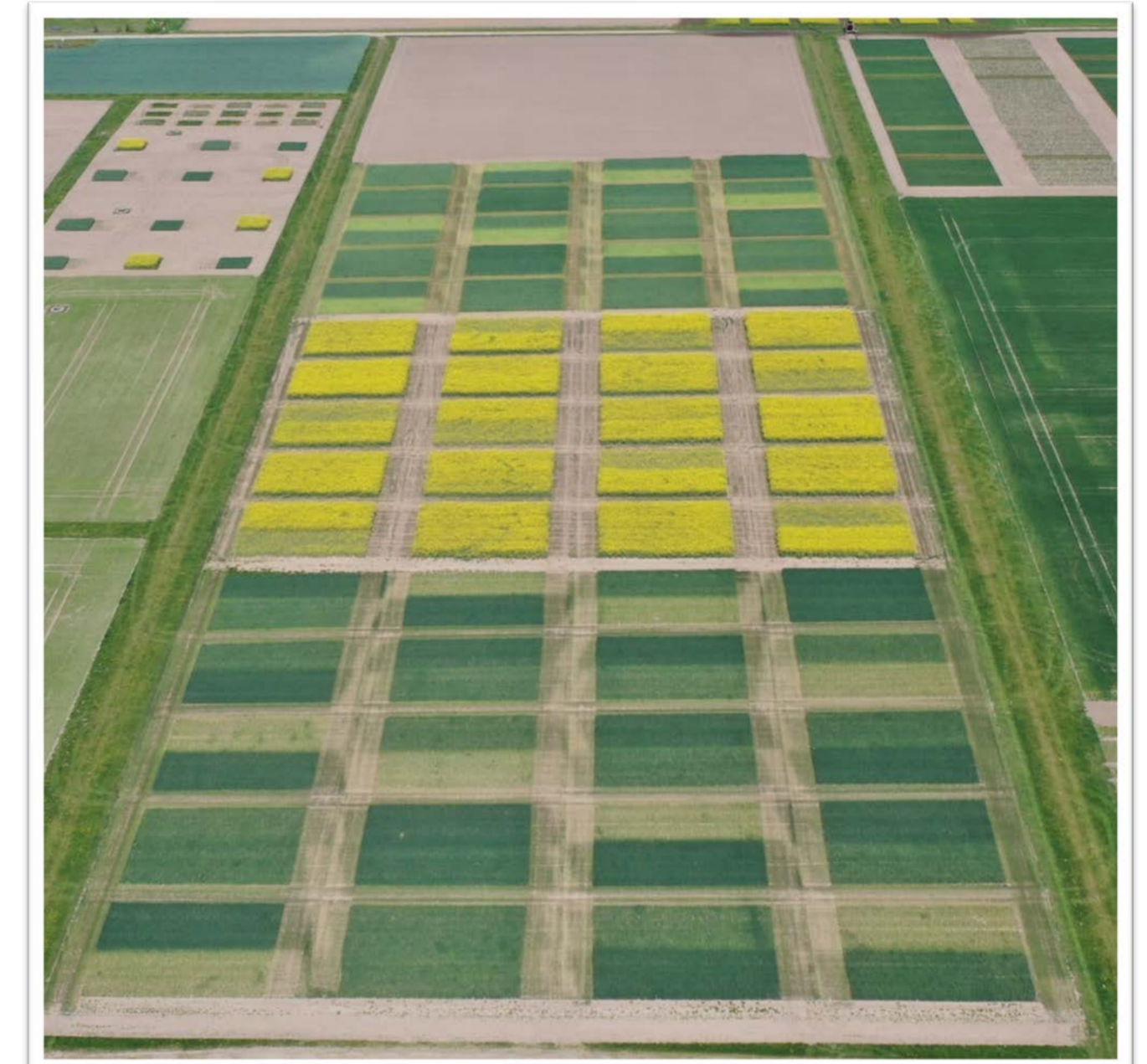
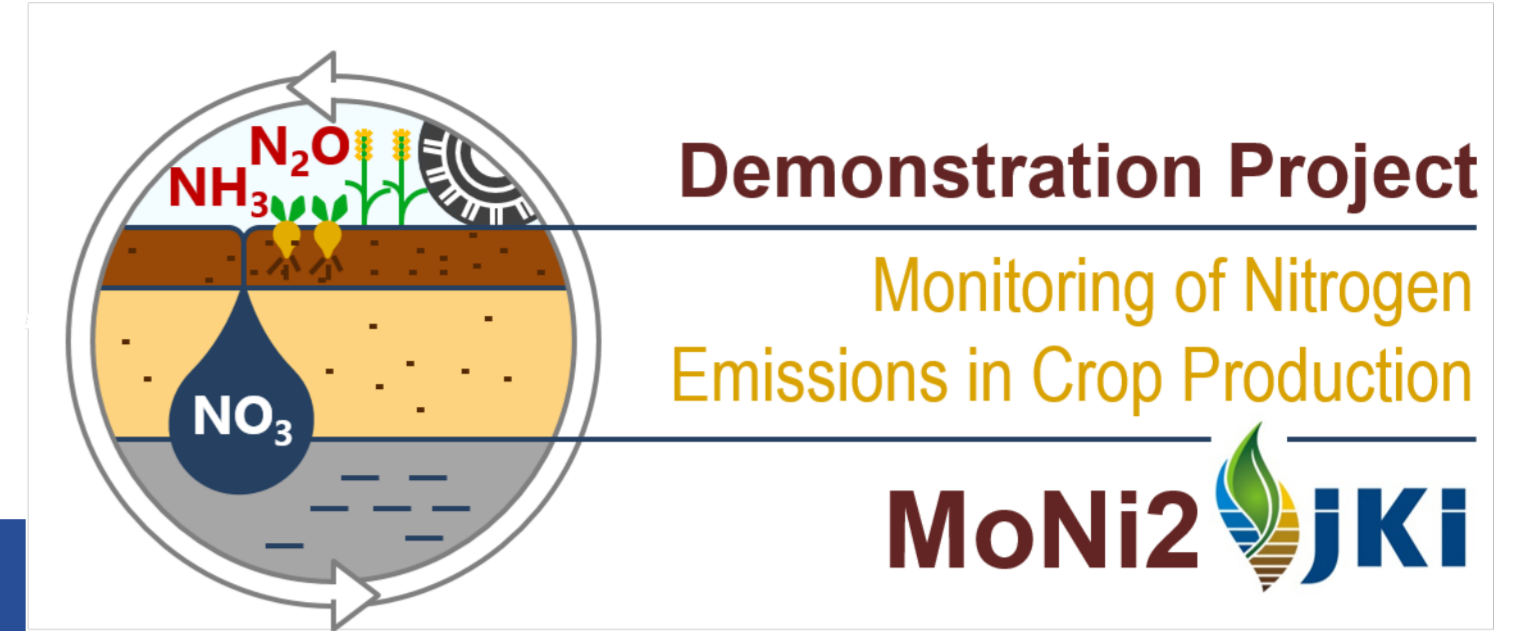


Fig. 1: Aerial photo of the experimental fields in April 2025 ▶

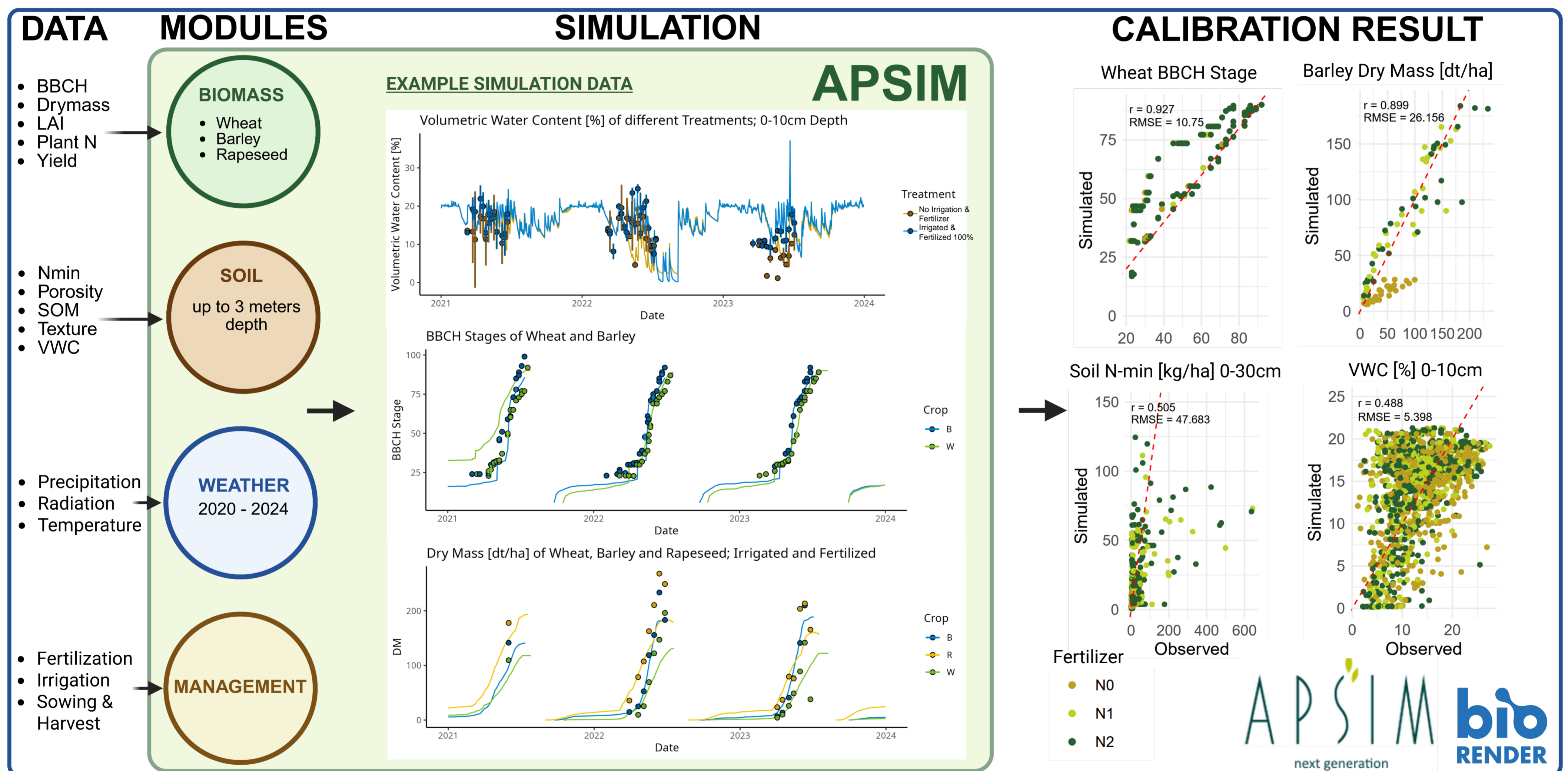


Fig. 2: Working procedure for using APSIM simulations to explain measured soil nitrate values. Experimental data are used to set up the APSIM model and to calibrate it against soil and crop data. Simulated outputs can address research questions, such as identifying the nitrogen transport and plausibilisation of high values in depth profiles.

Conclusion & Outlook

- First validation results for biomass production, yield and qualities are promising
- First insights into water drainage speed are possible
- The current challenge is to quantify mineral nitrogen dynamics more precisely to demonstrate differences between crops. For this, parameters determining nitrogen dynamics need to be optimized.