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Testing crop models to predict climate change effects

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Lysimeter extraction at the original site in Dedelow, Germany. Photo by Wilfried Hierold/Leibniz Centre for Agricultural Landscape Research (ZALF).

Process-based crop growth models assess the impact of climate change on future ecosystems. However, their predictive capability may be limited because model tests do not account for changes in climatic conditions outside the range of the natural variation at the calibration sites.

A new *Vadose Zone Journal* crop model intercomparison study looks at 11 models that used data from high-precision soil monolith lysimeters to predict crop growth and soil water flux. Using a "space-for-time substitution" approach, soil monoliths were translocated from the original site to regions with warmer and drier (WD) and warmer and wetter (WW) climates. Crop models were first calibrated using data at the original site and then validated at the other sites.

The models predicted crop and soil variables similarly well at the WD site but failed to predict crop yield at the WW site where the climatic conditions were outside the range of naturally occurring variability.

The study demonstrates that when agronomic and environmental variables are considered simultaneously, more soil-related observations are key for improving the predictive capability of crop models. Innovative climate change experiments are required to test models for a wider range of crops and soils in scenarios with assumed changes in climatic conditions.

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Groh, J., Diamantopoulos, E., Duan, X., Ewert, F., Heinlein, F., Herbst, M., ... & Gerke, H.H. (2022). Same soil, different climate: Crop model intercomparison on

translocated lysimeters. *Vadose Zone Journal*, *21*, e20202.

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