

LANDSCAPE LABORATORY FOR INNOVATIVE AND DIVERSE CROPPING SYSTEMS

KATHRIN GRAHMANN



Drone top view of the patchCROP landscape laboratory.



In 2020, ZALF established the on-farm experimental platform PATCHCROP aiming to balance crop production with a simultaneous increase in ecosystem services and maintenance of biodiversity by minimizing resource and nutrient loss and gradually reducing the application of chemical pesticides. To this end, PATCHCROP combines different spatial and temporal diversification measures at the field and landscape scale. We test digital tools, artificial intelligence and other new technologies like autonomous field robots regarding their potential for implementing landscape diversification and changing the size and the patch geometry of future agricultural fields.

First, a large 70 ha field under conventional sole cropping was analyzed for its heterogeneity and divided into zones of high and low yield potential. Then, 30 smaller patches of 0.5 ha each were spatially arranged in consideration of small-scale soil heterogeneity. For each yield potential zone, two five-year, legume-supported crop rotations were designed, featuring a total of nine different arable crops and three cropping intensities: (1) conventional pesticide application, (2) situation-specific pesticide application, and (3) situation-specific pesticide use with adjacent flower strips. The collaborating Julius Kühn-Institute (JKI) investigates the potential of reduced pesticide use in this small-scale diversified landscape based on Integrated Pest Management principles.

The surrounding sole-cropped fields are monitored as reference areas to quantify the effects of spatial (field size) and

In the context of sustainable intensification, there is a rising demand for agricultural crop diversification by replacing sole-cropped large fields with new cropping system approaches that increase the temporal, spatial and genetic dimension of diversity at the field and landscape level. Spot farming, pixel cropping and patch cropping conceptually address diversified cropping systems with small-scale and site-specific diverse crop mosaics at different spatial scales.

temporal (crop heterogeneity) diversification. Numerous parameters are measured and assessed at different temporal and spatial scales by working groups from different Research Areas, thus providing a multi-dimensional, data-driven and integrated perspective on agricultural landscape dynamics following diversification measures.

The re-design of agricultural landscapes calls for the inclusion of on-farm research and agricultural living labs to investigate the above-mentioned issues using evidence-driven and systemic approaches. This ensures a comprehensive practicability assessment of the proposed solutions by applying a strategic co-design approach between scientists and farmers, where much effort is aimed at strengthening the farmer-centric perspective. All field operations are planned and conducted by our practice partner, the »Komturei Lietzen GmbH«, whose farm manager is consulted for pivotal decisions.

The DFG Cluster of Excellence PhenoRob uses PATCHCROP in core project 5 on new field arrangements to assess digital technologies under a wide range of different crops and soil conditions.

Project: patchCROP – A living lab for more diversity in agricultural landscapes **Term:** 2020–2030 **Funding agency:** ZALF **Lead at ZALF:** K. Grahmann (kathrin.grahmann@zalf.de) **Partners:** University of Bonn, JKI, UP GmbH, PhenoRob, DAKIS, ATB, TU Dresden
www.landschaftslabor-patchcrop.de