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“Can agroecological farming feed the world?  
Farmers’ and academia’s views”

## Agroecological practices and the water planetary boundary

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### Abstract

Rising demand for agricultural food production and at the same time rising crop water demand are putting a sustainable use of water resources for agricultural production increasingly at risk. A central question therefore is: how can agricultural production take place without transgressing crucial boundaries of sustainable water use?

The Planetary Boundary concept (Rockström et al. 2009; Steffen et al. 2015) offers a framework which quantifies such sustainability limits of fresh water use and land-system change and defines a so called “safe operating space” within sustainability limits. This safe operating space is transgressed, when a control variable (e.g. minimum river flow) triggers the destabilisation of a related response variable (e.g. aquatic biosphere integrity). Planetary Boundary assessments however, often focus on boundary transgressions at global scale and it is difficult to operationalize the framework for sustainable actions at local farm or agricultural system scale.

For this reason, our conceptual study focuses on defining and discussing sustainability boundaries on agricultural system scale. Here we concentrate particularly on the definition of local water boundaries. We discuss potential control and response variables, which could be used to decide whether an agricultural system is functioning within water boundaries or if it is at risk to transgress these and to destabilise a local or even global response variable. Acknowledging that the answer to this question can’t be universal and highly depends on the local environment, we propose local water related control and response variables for selected agricultural systems and environments (e.g. rainfed vs. irrigated systems).

In addition, we pose the question if agroecological measures can support farming within a safe operating space and which agroecological measures could help to prevent a transgression of local water boundaries?

Setting clear limits to water use in agriculture and highlighting the potential of agroecological measures to expand agricultural activities within these limits, can foster a more sustainable water management, which considers local as well as global impacts of agricultural water use.

**Keywords:** Agroecological practices, sustainability boundaries, water planetary boundary