EGU21-11026
https://doi.org/10.5194/egusphere-egu21-11026
EGU General Assembly 2021

Water Productivity; a Sustainable Pathway to Agricultural Extensification and Climate Adaptation?

Amali A. Amali, Muhammad Khalifa, and Lars Ribbe
Institute for Technology and Resources Management in the Tropics and Subtropics, TH-Köln University of Applied Sciences, Cologne, Germany (aa.amali@outlook.com)

Water Productivity (WP), a pointer to crop performance vis-à-vis consumptive water use, has fevered debates around agricultural water use, away from scheme-based efficiency to field-scale productive value of water, that can be optimised in localities of increasing absolute and relative scarcity. Research on WP sprung from such debates to become a growth industry, that measures irrigation inefficiencies, poised towards developing economies and “low” value uses of water, to justify its reallocation across sectors, sometimes away from agriculture. While water allocation decisions increasingly prioritise sectoral productivity of freshwater resources, burgeoning food security measures to water scarcity adaptation is shifting management decisions from the purview of scheme managers to individual farming units, underscoring the need to parallel WP initiatives with the resilience of local livelihoods. In this study, we analyse the potential contribution of WP as an agricultural extensification mechanism for a water-scarce irrigated region. The Surface Energy Balance Algorithm for Land (SEBAL), is used to estimate evapotranspiration as a proxy for irrigated water consumption. An automated derivative, the pySEBAL model, is used to compute crop biomass combined with satellite-based evapotranspiration to estimate WP across 1680 heterogeneous groundwater irrigated fields in the eastern Azraq basin of Jordan. WP gap was hereafter estimated as the difference between the current field WP, to a selected productivity range, attainable within infrastructural and agroclimatic limits. By investigating the possibility of closing WP gaps, we show that a careful selection of WP thresholds to benchmark localised irrigated water consumption offers the potential to reduce seasonal irrigation water use within a range of 18 to 29% of the current consumption, without adversely affecting crop yield and related livelihoods. Such range (5 – 9 MCM[†]) for a water-scarce Azraq basin, offers substantial relief to groundwater resources, related ecosystems, and long-term catchment sustainability. We additionally demonstrate that this provides a window for agricultural extensification by leveraging farm management practices across irrigated fields. We finally propose entrepreneurial and capacity building opportunities from analysing dynamics in farmers' individual water use behaviour. WP, as a useful indicator for water reallocation under water-scarce conditions, would need to consider equitable utilisation of water resources and the resilience of local livelihoods.

[†] Million Cubic Meters