Water-balance approach for assessing potential for smallholder groundwater irrigation in sub-Saharan Africa

P Pavelic[1]*, V Smakhtin[2], G Favreau[3] and KG Villholth[4]
[1]International Water Management Institute, Vientiane, Lao PDR
[2]International Water Management Institute, Colombo, Sri Lanka
[3]IRD, HydroSciences Montpellier, France
[4]International Water Management Institute, Pretoria, South Africa

Abstract

Strategies for increasing the development and use of groundwater for agriculture over much of sub-Saharan Africa (SSA) are urgently needed. Expansion of small-scale groundwater irrigation offers an attractive option to smallholder farmers to overcome unreliable wet-season rainfall and enhance dry-season production. This paper presents a simple, generic groundwater-balance-based methodology that uses a set of type-curves to assist with decision making on the scope for developing sustainable groundwater irrigation supplies, and to help understand how cropping choices influence the potential areal extent of irrigation. Guidance to avoid over-exploitation of the resource is also provided. The methodology is applied to 2 sites in West Africa with contrasting climatic and subsurface conditions. At both sites the analysis reveals that there is significant potential for further groundwater development for irrigation whilst allowing provisions for other sectoral uses, including basic human needs and the environment.

Keywords: groundwater irrigation, water balance, over-exploitation, sub-Saharan Africa