



Water productivity analysis of sand dams irrigation farming in northern Ethiopia

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Water scarcity is the main problem to be tackled to meet regional food security in drylands. A large number of studies is calling to focus efforts to enhance Water Productivity (WP), and one of the most promising option is represented by water harvesting, the collection and storage of runoff water to be used for beneficially uses. Among the available technologies, sand dams are experiencing a renovated interest because of their relative simplicity and their potential. This research aims to deepen the knowledge about WP of water harvesting systems studying a sand dam irrigation system in Tigray, north Ethiopia, where farmers are getting used to this new technology. The research was carried out in the period March-April 2017, when farmers use sand dams water to irrigate maize, during the Ethiopian dry season. We analysed a representative plot irrigated through a shallow well drilled in the sand dam aquifer, in terms of yield, Crop Water Productivity (CWP), Crop Water Productivity based on Evapotranspiration (CWP(ET)) and Economic Water Productivity (EWP), through field data analysis and a validated Aquacrop model. CWP(ET) was found to be low (1.12 kg of grain per m³ of water), due to both inefficient water application and low soil fertility. Aquacrop model results showed that changing the irrigation schedule can increase CWP(ET) up to 1.35 kg/m³ and EWP up to 3.94 birr/m³, but yield gap is mainly due to the low soil fertility. Interventions on soil fertility can raise yields from the observed 3.3 kg/ha up to 8.5 kg/ha, and thus CWP(ET) and EWP up to 2.94 kg/m³ and 9.54 birr/m³ respectively. To enhance the effect of sand dams in northern Ethiopia, a set of measures, including conservation agriculture, is then proposed.