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Stock change of soil moisture under crop cultivation: A relevant and low cost indicator to assess hydrological performance of agricultural land use systems in Tigray, northern Ethiopia.

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In the highlands of Tigray both crop yield and soil erosion are important concerns. At the same time the impact of climate change is felt in the form of delayed and more erratic rains. Different adaptation strategies are proposed to increase resilience. The successful implementation of most of these strategies, like for example, agroforestry, conservation tillage and water harvesting, heavily relies on improved infiltration and the amount of water stored in the root zone. In this presentation the water storage in the root zone is discussed in relation to crop productivity and hydrological performance of the local (agricultural) land use system. For this purpose measurements of (gravimetric) soil moisture content, taken at different depths in the root zone and at regular time intervals during four growing seasons in the period 2010-2013, were considered. In total 43 sites were involved, which were measured for one up to three years. In addition to soil moisture content, at selected sites also bulk density, saturation, field capacity and wilting point were determined. On the basis of the data collected, site-specific changes in soil moisture budgets were analyzed and trends observed were related to crop productivity and hydrological parameters (like rainfall and evapotranspiration). First outcomes pointed to a relatively rapid increase of soil moisture stock at the start of the growing season, followed by a more or less stable level, and ending at crop maturation with a very rapid decrease. Typical figures for gravimetric moisture content at the stable level were between 25 and 30 %. Soil depth was in most cases shallow (around 40 cm) and likely limiting moisture storage capacity. Assuming that at the start of the stable phase rainfall still is exceeding evapotranspiration, this then will point to a relatively high risk for run off at this stage. Stock change of soil moisture as such appears a relevant and low cost indicator to assess hydrological performance of land use systems in terms of infiltration capacity and soil moisture availability. In line with that, analysis of stock change of soil moisture might provide relevant clues for designing and optimizing effective land management strategies that successfully deal with erosion hazard and result in a more resilient and sustainable production of food crops.