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Assessing the Scope for Resilient Crop Yields through Rainwater Management in Sub-Saharan Africa

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Abstract

Rainfed cropping systems continue to be a major provider of food, fodder and fibre, particularly in sub-Saharan Africa where these systems cover more than 90 % of the cultivated area. However, yields are often far below potential levels. In areas with highly variable rainfall, such as semi-arid and sub-humid zones, crops are strongly affected by soil moisture constraints. This unpredictability in rainfall and soil moisture greatly increases the risks for farmers and holds back necessary investments that could enable a sustainable intensification contributing to increased harvests yields and contribute towards food security and nutrition goals.

Measures and investments in rainwater management (RWM) can overcome inter- and intra-seasonal soil moisture constraints and build resilient rainfed crop systems. This study maps where, and to what degree, rainwater management adaptation strategies can increase the resilience of rainfed crop systems to cope with rainfall variability under current rainfall regimes. The analysis uses daily precipitation data from TRMM, combined with AFSIS soil data, and a water balance modelling approach to provide daily estimates on soil moisture variability and yield impact under three different management scenarios at 0.25-degree resolution.

Results show that on 136 Mha (about 60 %) of current rainfed cropland in sub-Saharan Africa, the chance to achieve a full yield without rainwater management is less than 75 %. On about one fourth of this land (35 Mha), the risk for a total crop failure is at least 25 %. With moderate and ambitious RWM, the chances of reaching the full yield potential can be improved above the 75 % level on 35 Mha and 46 Mha, respectively. On 12 Mha, the risk for a total crop failure is reduced below 25 % under both RWM scenarios. However, even on most lands where full yields can be achieved with relatively high certainty, the implementation of RMW can help to substantially prolong the growing period and improve yields.

Keywords: Rainfed cropping systems, rainwater management, resilience

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