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"Solidarity in a competing world — fair use of resources"

Effects of Water Management on the Performance of NERICA 4 in Semi-Arid Areas, Tanzania

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Abstract

In semi-arid areas in Africa soil degradation and droughts are reducing agricultural productivity. In order to counteract the yield reduction soil and water conservation methods need to be applied. The aim of this study is to analyse the potential of growing upland rice, one of the most important stable crops, in seasonal drought prone areas in Tanzania. Three water management techniques are identified and evaluated: modifying the soil surface to collect and save water, adding a minimum amount of water in case of drought events and to decrease evaporation by adapted weeding management.

Experiments were conducted near Dodoma, Tanzania during the wet season from January until May in which an average precipitation of 430 mm is recorded. The upland rice variety NERICA 4, which is well adapted to the African environment, was used for investigating the potential for growing NERICA 4 upland rice under following management practices: i) rainfed, ii) rainfed in combination with tied-ridging, iii) tied-ridging with additional irrigation to keep soil moisture above the permanent wilting point of the soil (life saving irrigation), iv) life saving irrigation without tied ridges and v) under irrigation (full crop water requirements). Those options were combined with time based weeding strategies. This study explores the effects of these water management methods on the soil water status and the performance of the crop in terms of leaf area, specific leaf area (SLA), biomasspartitioning, yield determining components like number of productive tillers and spikelets, grain yield, harvest index (HI), yield loss and water use efficiency (WUE) were investigated. Tied ridges did not improve irrigated cropping systems. The competitiveness of weeds led to changed soil moisture values and microclimate within the canopy, caused development delay and reduced grain yields up to 45 %. The poor rainfall distribution in the growing season 2015 provoked total crop failure of all rainfed treatments without irrigation and caused yield loss and thus low water use efficiencies for the treatments with life saving irrigation. In that context possibilities for growing upland rice successfully under rainfall limited conditions will be discussed.

Keywords: Deficit irrigation, tied ridges, upland rice variety NERICA 4

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