Geophysical Research Abstracts
Vol. 14, EGU2012-13790, 2012
EGU General Assembly 2012

Soil management system for water conservation and mitigation of global change effect

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One of the main constraints in rained agriculture is the water availability for plant growth which depends largely on the ability of the soil to allow water flow, infiltration and its storage. In Venezuela, the interaction between aggressive climatic conditions, highly susceptible soils and inadequate management systems have caused soil degradation which together with global change threatened the food production sustainability. To address this problem, we need to implement conservationist management strategies that improve infiltration rate, permeability and water holding capacity in soil and reduce water loss by protecting the soil surface. In order to study the impact of different management systems on soil water balance in a Fluventic Haplustept, the effects of 11 years of tillage and crops rotation management were evaluated in a long term field experiment located in Turén (Portuguesa state). The evaluated tillage systems were no tillage (NT) and conventional tillage (CT) and crop rotation treatments were maize (Zea mays)-cotton (Gossypium hirsutum) and maize–bean (Vigna unguiculata). Treatments were established in plots arranged in a randomized block design with three replicates. The gravimetric moisture content was determined in the upper 20 cm of soil, at eight different sampling dates. Results showed increased in time of the water availability with the use of tillage and corn-cotton rotation and, better protection of the soil against raindrop impact with crop residues. Water retention capacity also increased and improved structural condition on soil surface such as infiltration, storage and water flow distribution in the rooting zone. We conclude that these strategies of land use and management would contribute to mitigate the climate change effects on food production in this region of Venezuela.

Key words: Soil quality; rained agriculture; plant water availability