Geophysical Research Abstracts
Vol. 19, EGU2017-4086, 2017
EGU General Assembly 2017

Soil Tillage Conservation and its Effect on Soil Properties Bioremediation and Sustained Production of Crops

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Soil Tillage Conservation (STC) is considered major components of agricultural technology for soil conservation strategies and part of Sustainable Agriculture (SA). Human action upon soil by tillage determines important morphological, physical-chemical and biological changes, with different intensities and evaluative directions.

Nowadays, internationally is unanimous accepted the fact that global climatic changes are the results of human intervention in the bio-geo-chemical water and material cycle, and the sequestration of carbon in soil is considered an important intervention to limit these changes. STC involves reducing the number of tillage's (minimum tillage) to direct sowing (no-tillage) and plant debris remains at the soil surface in the ratio of at least 30%. Plant debris left on the soil surface or superficial incorporated contributes to increased biological activity and is an important source of carbon sequestration. STC restore soil structure and improve overall soil drainage, allowing more rapid infiltration of water into soil. The result is a soil bioremediation, more productive, better protected against wind and water erosion and requires less fuel for preparing the germinative bed. Carbon sequestration in soil is net advantageous, improving the productivity and sustainability.

We present the influence of conventional plough tillage system on soil, water and organic matter conservation in comparison with an alternative minimum tillage (paraplow, chisel plow and rotary harrow) and no-tillage system. The application of STC increased the organic matter content 0.8 to 22.1% and water stabile aggregate content from 1.3 to 13.6%, in the 0-30 cm depth, as compared to the conventional system. For the organic matter content and the wet aggregate stability, the statistical analysis of the data showed, increasing positive significance of STC. While the soil fertility and the wet aggregate stability were initially low, the effect of conservation practices on the soil features resulted in a positive impact on the water permeability of the soil. Availability of soil moisture during the crop growth resulted in better plant water status. Subsequent release of conserved soil water regulated proper plant water status, soil structure, and lowered soil penetrometer resistance. Productions obtained at STC did not have significant differences for the wheat and maize crop but were higher for soybean.

The advantages of minimum soil tillage systems for Romanian pedo-climatic conditions can be used to improve methods in low producing soils with reduced structural stability on sloped fields, as well as measures of water and soil conservation on the whole agroecosystem.

Presently, it is necessary to make a change concerning the concept of conservation practices and to consider a new approach regarding the good agricultural practice. We need to focus on an upper level concerning conservation by focusing on soil quality. Carbon management is necessary for a complexity of matters including soil, water management, field productivity, biological fuel and climatic change.

In conclusion a Sustainable Agriculture includes a range of complementary agricultural practices: (i) minimum soil tillage (through a system of reduced tillage or no-tillage) to preserve the structure, fauna and soil organic matter; (ii) permanent soil cover (cover crops, residues and mulches) to protect the soil and help to remove and control weeds; (iii) various combinations and rotations of the crops which stimulate the micro-organisms in the soil and controls pests, weeds and plant diseases.

Acknowledgements: This paper was performed under the frame of the Partnership in priority domains - PNII, developed with the support of MEN-UEFISCDI, project no. PN-II-PT-PCCA-2013-4-0015: Expert System for Risk Monitoring in Agriculture and Adaptation of Conservative Agricultural Technologies to Climate Change, and International Cooperation Program - Sub-3.1. Bilateral AGROCEO c. no. 21BM/2016, PN-III-P3-3.1-PM-RO-MD-2016-0034: The comparative evaluation of conventional and conservative tillage systems regarding carbon sequestration and foundation of sustainable agroecosystems.