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Physicochemical properties and carbon accumulation as quality indicators of a volcanic soil under tillage, nitrogen fertilization and crop rotation

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Abstract

Conventional Tillage [CT] is a soil management system used by farmers in the Andean of Ecuador, however, this system, in the medium and long term, harms health and productive sustainability of the soil. These effects would be avoided if the no tillage system [NT] were implemented. Since 2016, the Central University of Ecuador, Faculty of Agricultural Sciences, at the La Tola Experimental Teaching Field [CADET], has implemented a study to evaluate the effects on soil chemical and physical properties, its organic matter content [SOM] and crop yields by comparing two tillage systems, four levels of nitrogen fertilization and two crop rotation schemes. The crops used in the rotations were bean-corn-beans [B-C-B] and bean-amaranth-beans [B-A-B]. The main results show that, after six years of research, NT improves the chemical and physical soil properties. Increases were 11, 17, 7, 11% of carbon, nitrogen, phosphorus, and potassium, respectively, when comparing NT and CT. On the other hand, the water storage capacity available to plants has also improved by 17%; furthermore, it has been determined that B-A-B rotation has been more beneficial for soil health, although, there were problems in the agronomic management of amaranth in NT. The cost benefit [C/B] study for yield of the B-C-B rotation was carried out and the results showed that the C/B ratio for beans were similar in the two tillage systems. On the other hand, NT surpassed CT by more of 50% for maize. In conclusion, the B-M-B rotation under NT is profitable and an excellent alternative for soil conservation under the soil and climatic conditions studied.

Keywords: No-till, Amaranth, Soil health.

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