43. Repeated inputs of organic matter in the long term protect soils from global changes

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In the suburban area of Dakar (Senegal), family smallholdings produce market gardening sometimes for several decades. Dior soils (arenosol) and Deck soils (fluvisol, calcareous with high clay content) are intensely cultivated and required frequent applications of organic matter (OM). The objective of this study was to assess whether long-term changes in chemical and physical properties of these tropical soils increase or reduce the yields and the vulnerability of these family smallholdings to global changes. After field surveys, we collected Dior soil (Dr) and Deck soil (Dk), cultivated for fifty years (50), and named Dr50 and Dk50 respectively, and nearby, the same soils, but which have never been cultivated (0), and named Dr0 and Dk0 respectively. On these four soils, we cultivated three successive cycles of lettuce and compared an optimum mineral fertilization (T1) with two types of OM, a sewage sludge and a poultry droppings, with the amounts corresponding to 50% (T2) and 150% (T3) of the nitrogen equivalent of T1. Before the experimentation, the cation exchange capacities and the initial concentrations of organic carbon and total phosphorus were significantly higher between both pairs of soils, Dr50 and Dr0 soils and between Dk50 and Dk0 soils. The structural stability of the Dr50 and Dk50 soils were respectively better than Dr0 and Dk0 soils. After each crop cycle, yields were higher (i) for Dr50 and Dk50 soils, respectively than for Dr0 and Dk0 soils, (ii) with input of poultry droppings rather than sewage sludge and (iii) for doses T3 as T1 and T2 respectively. These results showed that these two types of tropical soils, even if they were intensively cultivated for a long time, have acquired some protective physical and chemical characteristics and were better adapted to global changes mainly due to OM inputs in the long term.