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Impacts of Organic Farming on Soil Aggregate Stability

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Organic farming has expanded rapidly in the UK in recent years, amid increasing concerns for long term environmental and economic sustainability in agricultural systems. Much of the motivation for the shift away from conventional intensive agricultural practices has focused on soil nutrient management. Little attention has been directed toward the relative merits of organic farming for the physical structure of soils, despite aggregate structure and stability being of particular importance to soil erosion potential and sustainable soil quality. In this study, soil samples were collected from four arable sites within a small geographical area, in order to represent (1) an organic farm; (2) a conventional farm that only used artificial fertilizers; (3) a conventional farm that used artificial and cattle slurry fertilizers; and (4) a non-cultivated control site. Samples were analysed for living biomass and total organic content, bulk aggregate size and density distributions, bulk fragmentation fractal dimensions (which represent indices of soil erodibility), aggregate stability under simulated rainfall, and the stability of micro-aggregates that were mobilized in surface runoff generated by simulated rainfall. The relationships between the different soil properties were found to be complex. However, there were some significant differences between the samples, which were related to the different methods (or absence) of agriculture. The non-cultivated soil was determined to have the lowest erodibility and greatest aggregate stability. The conventional soil that was only fertilized by artificial means exhibited the lowest aggregate stability. There were few apparent differences between the organic soil and the conventional soil that received an input of organic fertilizer. The results of the physical analysis reflect the mining and replenishment of organic matter to each soil by the different management practices. This leads to the conclusion that the addition of organic matter to agricultural soils is of greater importance to aggregate stability than the type of farming system. This has significant implications for sustainable physical soil quality.