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Long-term effect of organic amendments, mineral fertilizers and combinations thereof, on plant yield, soil physic-chemical and microbiological properties

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The aim of this study was to investigate the influence of mineral fertilizer, different composts and combinations of compost/fertilizer as soil amendments on a loamy silt Cambisol after a 27-year field trial. Four different composts were used: urban organic waste (OWC), green waste (GC), farmyard manure (MC) and sewage sludge compost (SSC). In addition to plant growth, (physico-)chemical and microbiological changes in soil properties following amendment were analysed: total organic carbon (TOC) and nitrogen (N), soil pH, water holding capacity (WHC), basal respiration (BR), microbial biomass (C_{mic}) and microbial community composition. Fertilization promoted plant growth, when SSC or GC in addition with mineral fertilizer were applied compared to control. Concerning the (physico-) chemical properties only minor differences among the treatments were found. Phosphorus concentrations were three times higher in plots receiving SSC and SSC + N than control or mineral N fertilizer alone and magnesium concentrations in plots treated with SSC were lower compared to soils treated with GC and MC, respectively. The bacterial community exceeded the fungal one in terms of both richness and diversity. Further, bacterial richness, diversity and community composition differed significantly among the treatments, whereas differences in fungal richness, diversity and composition seemed negligible. Our conclusion is that composts produced from various source materials serve as a valuable source for plant nutrients and can partially substitute mineral fertilizers, modulate soil microbial community and increase fertility. This way, they contribute to the mitigation of climate change.