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Organic amendments enhance microbial diversity and abundance of functional genes in Australian Soils

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Food and cash crops play important roles in Australia's economy with black, grey and red clay soil, widely use for growing cotton, wheat, corn and other crops in rotation. While the majority of cotton growers use nitrogen and phosphate fertilizers only in the form of agrochemicals, a few experiment with the addition of manure or composted plant material before planting. We hypothesized that the use of such organic amendments would enhance the soil microbial function through increased microbial diversity and abundance, thus contribute to improved soil sustainability. To test the hypothesis we collected soil samples from two cotton-growing farms in close geographical proximity and with mostly similar production practices other than one grower has been using composted plants as organic amendment and the second farmer uses only agrochemicals. We applied the Biolog Ecoplate system to study the metabolic signature of microbial communities and used qPCR to estimate the abundance of functional genes in the soil. The soil treated with organic amendments clearly showed higher metabolic activity of a more diverse range of carbon sources as well as higher abundance of genes involved in the nitrogen and phosphorous cycles. Since microbes undertake a large number of soil functions, the use of organic amendments can contribute to the sustainability of agricultural soils.