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Enhancement of soil organic carbon storage and aggregation following cropland afforestation

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The cropland afforestation policy was initiated in 2002 in Taiwan and had been approaching the 20-year term. From the scientific perspective, it is a critical issue to understand the public welfare role and ecosystem services provided by the cropland afforestation. In this study, we investigated the changes of soil organic carbon (SOC) on plantations after 14 years conversion from the sugarcane fields. Soil samples were collected at 0-10 and 10-20 cm depth. Soil organic C concentration, bulk density, soil aggregation, and the stable isotopic ^{13}C of the SOC and aggregates were determined. The results indicated the SOC stocks on the afforested plots were between 1000 and 1500 g m^{-2} significantly higher than those under the sugarcane plots ($p < 0.05$). The analyses of stable ^{13}C indicated that the net increases in SOC stocks on the afforested plots were mainly attributed to the inputs of the forest-derived SOC that outweighed the loss of sugarcane-derived SOC. The afforestation also enhanced the aggregation with higher stability and SOC concentration. The comparatively depleted ^{13}C values in the stable macroaggregates further suggested the ecological function from this new SOC source. Combining with the stand development and aboveground biomass accumulation, we expected the cropland afforestation would provide ecosystem services and functions.