

Soil Carbon Sequestration Offset N₂O and CH₄ emissions in China's Croplands

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Cropland soils have been shown to emit nitrous oxide (N₂O) and methane (CH₄) into the atmosphere and to sequester carbon when field management is improved. However, the extent to which soil organic carbon (SOC) sequestration can help to offset N₂O and CH₄ emissions in China's croplands remains unclear. On the basis of model simulations from 1980 to 2009, we estimated SOC change rates, and N₂O and CH₄ emissions in China's croplands. Our estimates showed that SOC sequestration offset 21.4% in the 1980s and 29.4% of the N₂O and CH₄ emissions in the 2000s. The offset is more pronounced in upland cropping systems (28.5%–49.5%) than in rice-based cropping systems (16.2%–19.0%). This disproportionate offset is due not only to a large amount of CH₄ emissions during the rice growing season but also to N₂O emissions in both rice and off-rice upland crop seasons. Increasing carbon input in the upland cropping systems is expected to further offset N₂O and CH₄ emissions in China's croplands.