

Important Source of Greenhouse Gas Emissions from Agricultural Soil Underestimated

Changes in agricultural practices could reduce soil emissions of nitrous oxide (N₂O) and nitric oxide (NO), according to a new study by scientists at the Chengdu Institute of Biology, Chinese Academy of Sciences and the University of California, Davis.

As a greenhouse gas, nitrous oxide destroys the ozone layer that shields Earth from ultraviolet light high in the atmosphere, and nitric oxide plays a very important role in atmospheric photochemistry and air quality. Agriculture practice such as the use of nitrogen-based fertilizer are a major source of atmospheric N₂O and NO, which are produced through microbial and abiotic chemical reactions.

Prof. WU Ning and Dr. ZHU Xia from the Chengdu Institute of Biology studied N₂O and NO production from three different soil types fertilized with urea or ammonium sulfate under different oxygen concentrations. By labeling ¹⁵N in ammonium (NH₄⁺) and nitrate (NO₃⁻), ¹⁸O in H₂O and NO₃⁻, they distinguished N₂O produced from different pathways, and found that low oxygen concentrations yielded more N₂O from ammonia oxidation pathways.

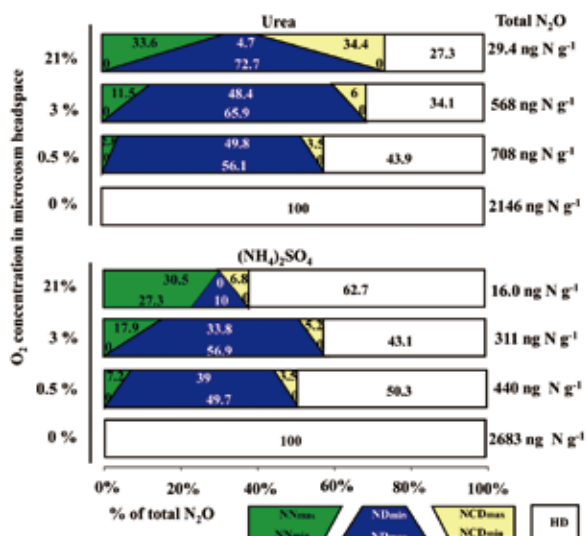
In this process, the opposite of what researchers



Dr. ZHU Xia.



Dr. ZHU and her colleagues setting up oxygen sensor in different soil layers. (Photo courtesy Dr. ZHU)



previously believed based on indirect measures of oxygen was proved availability. Urea fertilizer also produced more N₂O. The results indicated that fertilizer choice and agricultural practices to promote soil aeration can reduce emissions.

The study's other co-authors include UC Davis Department of Land, Air and Water Resources Professor William R. Horwath, researchers Martin Burger and Timothy Doane. Funding for the study was provided through the J.G. Boswell Endowed Chair in Soil Science at UC Davis.