A Great Challenge to Solve Nitrogen Pollution from Intensive Agriculture

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The huge population and the small arable land area per person determine that intensive agriculture, which is characterized by high ratio of cultivated land to territory, high multiple cropping indices, and large input of agro-chemicals, is an inevitable choice for food security in China. Although the researches were continuously strenthened for good management practices for raising nitrogen use efficiency (NUE), minimizing N losses from croplands, and thus mitigating adverse impacts of N application on environment and the knowledge on rational application of N fertilizers was improved greatly in China in the last three decades, the total consumption of N fertilizers continuously increased and NUE, on the national average, decreased from about 30-35% in 1980s to around 20-30% in 2000s. This is because the top priority for food security drove the increase in consumption of N fertilizers, thus leading to the decrease in NUE. The driving force for producing food as much as possible will continue and potential is available for enhancing crop production through raising multiple cropping indices and increasing N application in China, while, the NUE is unlikely to reach the levels achieved in some developed countries because it decreases with the increases in multiple cropping indices and nitrogen application rate. All of these factors determines that the N consumption will increase in China in future. Therefore, while we should continue to struggling for higher NUE, we have to realize that nitrogen pollution from crop production could not be controlled by raising NUE alone under intensive agriculture. In order to protect our environment and sustain development, we have to face a challenge to solve nitrogen pollution under the condition of high nitrogen application rate. Research should be strengthened for the control of nitrogen pollution through establishedment of theories, principles, technologies, and policies under the intensive agriculture.

Integrated Greenhouse gas emission from paddy fields in China

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Rice is the crop with the biggest production in China, but the sowing area of rice showed a declining trend since middle 1970s and was outweighed by maize in 2007. The current sowing area is about 29 million ha, with half being single rice, one quarter being early rice and remaining being late rice. Methane (CH_4) emission has been measured on over 30 sites, with varying duration since late 1980s. Measured seasonal emissions were extremely variable, ranging from 3.4 to 1274 kg CH_4 ha^{-1}. Except the widely acknowledged influencing factors such as organic amendment, water regime during rice growing season, it was found that seasonal emission from late rice is higher than that from early rice, and the latter is higher than that from single rice, likely due to the difference in the water regimes before these rice seasons. A number of estimations have been made for the total CH_4 emission from Chinese rice fields, with more recent ones being around 7.6 Tg CH_4 $year^{-1}$.

Nitrous oxide (N_2O) emission from paddy fields in China has been measured on over 20 sites, with seasonal emissions ranging from 0.02 to 12.6 kg N ha^{-1}. Estimated annual emission ranged from 29 to 37 Gg N.

While emitting CH_4, paddy fields in China acted as a sink of atmospheric carbon dioxide (CO_2). Average soil