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Comparison of net GHG emissions between separated system and crop-swine integrated system in the North China plain

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Agriculture causes 10–12% of global GHG (CO_2, CH_4 and N_2O) emissions. GHG emissions from Chinese agriculture have been estimated at 819.97 Mt CO_2-equivalence (CO_2-eq); among them, total annual GHG emissions from the production of grain and livestock have been estimated at 374 Mt CO_2-eq and 445 Mt CO_2-eq, respectively. Because of food demand, food production has intensified, resulting in the separation of crop production and livestock rearing. This separation has increased the application of outside resources and agricultural waste, aggravating GHG emissions and other ecological and environmental problems. This research attempts to mitigate GHG emissions by improving soil carbon sequestration of crop production and decreasing emissions from swine-rearing waste. Net GHG emissions (NGHGE) between an integrated system and a separated system are compared in this study from a life-cycle perspective. The causes of different GHG emissions between these two systems are analyzed and mitigation strategies are proposed. The results show that the NGHGE of crop-swine integrated and separated systems were 24917.95 kg CO_2-eq/ha/yr and 27732.70 kg CO_2-eq/ha/yr, respectively, for 215 head of pigs. The integrated system reduced GHG by 1381.33 kg CO_2-eq/yr mainly due to the recycling and reuse of pig manure in croplands. Meanwhile, the integrated system increased soil carbon storage by 35.92% compared with the separated system, although it increased soil CH_4 and N_2O emissions. In conclusion, these results indicate that through a series of methods, such as recycling agricultural waste, the integrated system can reduce net GHG emissions by 10.15% compared with separated systems. Although much work remains to adopt the integrated system to reduce GHG emissions, the crop-swine integrated system should be given priority to mitigate anthropogenic net GHG emissions.

Biography

Zhejin Li is a student of China Agricultural University pursuing Doctoral degree. Her major is Agricultural Wastes Managements and Ecological Agriculture.

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