

Date of poster presentation: 11 April 2022

The N flows in the agro-food system and options to close N cycle in Quzhou, China

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Increased N losses from the linear agro-food system cause severe environmental problems and harm human well-being in China. Here, we aim to quantify N flows and study options to close N cycle of the agro-food system in Quzhou, a typical county in China which is the most appropriate spatial unit for N management recommendations. N flows at village level were firstly quantified and then upscaled to county level. The N import rate was 624 kg ha⁻¹ in Quzhou, among which 22% was emitted to air and 32% was discharged to water. A considerable amount of N was accumulated in cropland soil (76, 145, 102 and 172 kg N ha⁻¹ for cereal, cash crop, livestock, and land limited village, separately). N recycling rate of animal and human manure was less than 30% due to inappropriate management. The amount of kitchen residue and food loss was less than 1 kg N per person. The food system could be reshaped by a set of options: 1) improving nitrogen use efficiency – best management practices for the crop production compartment, better feed conversion ratio for the animal feeding compartment, dietary change to less animal products for the household compartment; 2) increasing organic resource recycling rate – manure management and substitution for chemical fertilizer; 3) adjusting planting structure – involving soybean and other legumes to reduce fertilizer application and to provide plant protein for human consumption. Such integrated options demonstrate the scenario with drastically less N losses and circular N use.

Keywords: N flows, N cycle, Agro-food system, NUE, Manure recycling