
Improving nutrient cycling in Chinese dairy systems

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Milk production in China has greatly increased over the last few years. This has led to intensification and specialization of dairy farms in many regions of China, an increased reliance on the import of feed, and decoupling of previously linked crop and animal production. As dairy farmers face difficulties to return the animal manure to fields, and the efficiency of used manure is low, significant amounts of valuable elements such as nitrogen (N), phosphorus (P), and carbon (C) are lost to the environment. These losses contribute to environmental issues like eutrophication and global warming. To develop a sustainable dairy system in China, crop and animal production need to be recoupled and nutrients need to be restored. The aim of this study, therefore, is to improve the circularity of N, P and C flows in the Chinese dairy sector, and efficiently recouple dairy farming and crop production. To reach that goal a four-step study will be conducted based on a concrete regional case. These four steps include: (i) assess the performance of different dairy farming systems in terms of nutrient cycling and their role to improve nutrient cycling within the region (ii) quantify nutrient flows of the dairy sector at regional level, evaluate the potential to improve nutrient cycling through optimizing the use of local resources (e.g. land, manure, co-products, food waste) (iii) analyse the effect of technological and system changes (re-design) to improve nutrient cycling on milk output, resource use, and nutrient losses in the region, using scenario analysis (iv) explore economic-environmental trade-offs for restoring nutrient flows through proposed improvement options, and farmers' willingness to adopt those options. Following this framework, the most promising, environmental-friendly and feasible options that improve nutrient cycling will be identified in the selected region, with potential for broader application in North China. Results can contribute to a self-sustaining, circular Chinese dairy sector, that needs less import of feed and reduces the impact of dairy farming on various environmental aspects to a minimum.