



Nitrogen Budget on Township Scale in North China Plain



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Introduction and objective

Many studies on Nr flows, fluxes and transfers on national scale (Cui *et al.*, 2013; Gu *et al.*, 2015) or on province-scale (Ma *et al.*, 2014) have been documented recently. They revealed Nr transfers and fluxes to provide administrators with good information for better managing Nr from a larger scale in order to increase nitrogen utilization efficiency and decrease impacts on environment. However, we think that research into Nr flows at a fine scale, such as in representative typical townships in rural areas may be better suited to understanding Nr flows where management decisions are made. So our objective was to reveal the Nr fluxes and transfers through typical region on finer scale in North China Plain using the method of tracing farmer's performances on food production and consuming and waste treatments.

Method

We carried out research from 2014 to 2015 on the scale of rural township, a basic administrative unit in China. We used the method of daily recording on agricultural practices and food consumption of typical and representative households. We randomly selected 40 households in Disituan township (DST) (36° 20'N, 114° 00'E, 37 m of altitude), a cropland-dominated region with a rural population of nearly 40,000 and cropland extent of 5.142×10^3 ha accounted of 74% for administrative land of 73.3 km² in Quzhou county, Hebei province in NCP. In addition, 30 households were chosen in Gaoshanbu township (GSB) (41° 46'N, 115° 41'E, 1380 m of altitude) located in agro-pasturing interlocked area with administrative land of 177 km² and a population of approximately 10,000 and land use was as follows: cropland 2.584×10^3 ha accounted for 15% administrative land, grazing land 2.225×10^3 ha, and forest land of 2.199×10^3 ha. Therefore GSB is relatively a scarcely populated area versus DST. A livestock-dominated farming system is major character among its agriculture production in GSB. According to the specific conditions in two townships a calculation model using Excel table of Microsoft was developed to simply calculate the Nr flows through the major sections within the township. Nr flows in different households were ascertained based on mass flow and the law of conservation of matter.

Results and discussions

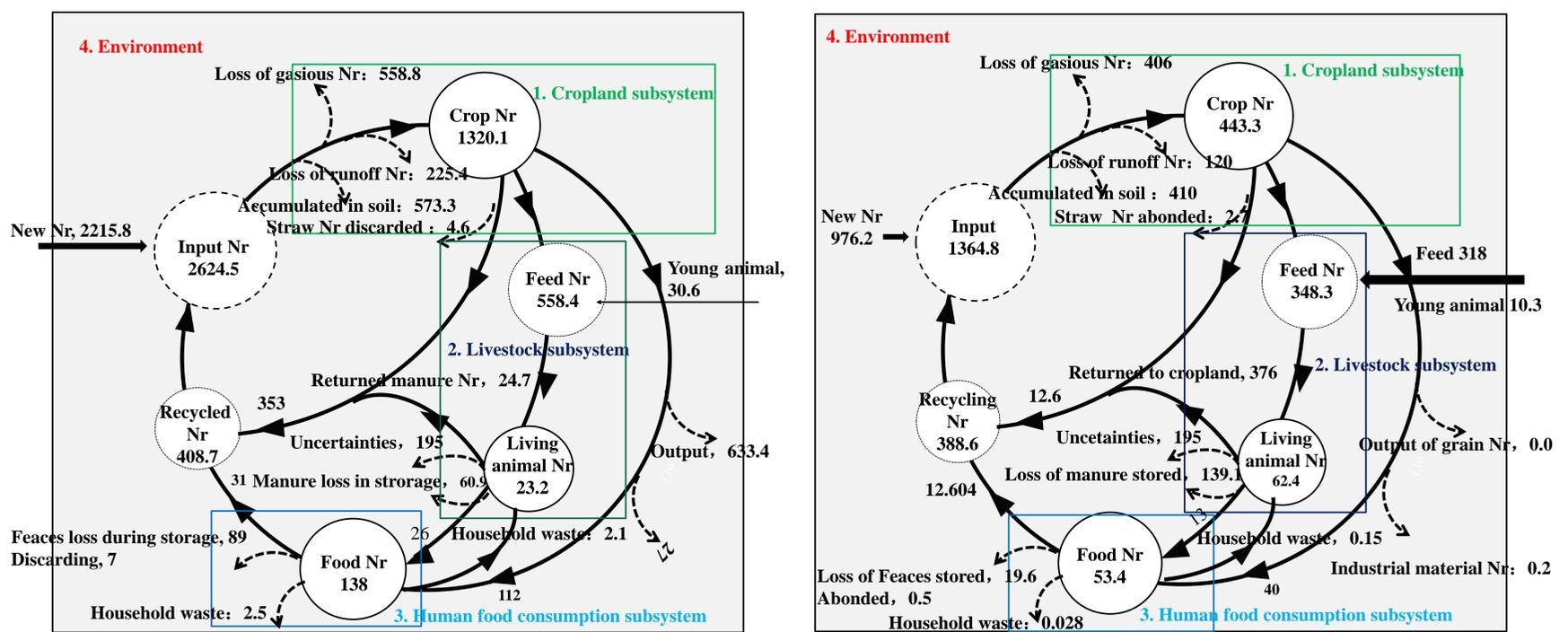


Fig. 1 Flows and transfers of Nr in two different townships. The right fig. is for Nr flows in DST and the left for GSB. The edge and background in gray of the biggest rectangles means boundary and environment respectively of township system, and the other 3 rectangles in different edge colors indicate 3 subsystems. The sagittal curves indicate different Nr flows and the directions of sagittal arrows mean directions of Nr flows in system. The words and figures (in t/yr of unit) near the sagittal arrows mean Nr behaviors and corresponded fluxes respectively of the Nr flows meant by sagittal curves.

Conclusions and suggestions

Nr imported into township were mainly from mineral fertilizer especially in plant-dominated DST. More organic fertilizer would be used and improve recycling use ratio of agricultural waste was urgently essential for decreasing environment pressure. The environmental Nr loads mainly come from cropland subsystem which concern with excessive nitrogen fertilizer application and irrational applying such as surface application of fertilizer universally used in NCP, so decreasing application rates of nitrogen fertilizer and alternatives of scientific and advanced application methods were needed. The results highlight the huge losses of Nr during storage of human feces and animal manure involved with lack of treating facilities and ignoring the rational management of the wastes, accordingly sewage treatment in rural new countryside construction and developing of flush toilets in dry region in NCP should given a priority consideration henceforth and extension of new extensive technologies of livestock husbandry for achieving higher converting ratio of feed and provided with facilities of treating manure with great efforts are all necessity especially in agro-pasturing interlocked area.

Reference

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