

Nitrogen balance between animal wastes production, crops and fish ponds demand at commune level in Thai Binh province, Northern Vietnam

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Summary

The agronomical balance in nitrogen at the commune level has been calculated between livestock-produced manure and the total demand in nutrients by crops and fish ponds, in the district of Vu Thu, Thai Binh province (Vietnam). Based on a conceptual Vietnamese-adapted model, calculations have underlined N surpluses in 50% of the studied communes during winter and the importance of waste waters that are expected to be the most important issue for environment regarding the 2010 provincial pig development plans.

Keywords: Tran Duc Toan, animal wastes production, pollution, area-wide integration, fertility transfer, Vietnam

Introduction

The Red River Delta is the hub of all economic activity in Northern Vietnam, where the majority of the region's population is concentrated. Fuelled by a growing demand for pig products, the pork meat sector is one of the major priorities for rural development; In Thai Binh province, an ambitious provincial project has foreseen the creation of 1000 animal husbandry units, with 10-200 sows and 100-1000 fattened pigs in each, by the year 2010. The province is turning from its low-income rice production to fish ponds and increased maize and vegetable protein production for animal feeding. Decision makers have undertaken to increase the number of large-scale pig units in specialized areas far from villages, and to provide subsidies to small-scale pig producers to upgrade their existing pig farms, mainly based on livestock-fish-crops integration. Numerous questions are raised about water pollution due to animal wastes, in the rapidly-developing Vietnamese situation. In front of this situation, we have to know the capacity of the environment to cope with this future animal effluent production to avoid soil and water pollution and environmental harmful effects (Hillion, 2005). Among several activities, the E3P¹ project has focused on the adequacy between livestock production and crops and fish ponds demand in nitrogen (N). This study was lead at the Vu Thu district scale for 2004 and 2010 in order to implement a decision making tool to support Vietnamese agricultural stakeholders.

Materials and Methods

The communes have been modelled as one farming unit with several compartments: crops, gardens, livestock units, and fish ponds (figure 1). Compost and waste waters are considering used on annual and perennial crops respectively. For fish ponds, all the effluents are considering applied. Equations have been formulated to calculate N balances at the district and commune level. For this calculation based on the reasoned fertilization principle, we

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considered local statistics, animal husbandry strategies, local effluents management practices and, and available references for animal manure composition and efficiency. Two scenarios are built to simulate the situation in 2010, considering local livestock and crops development plans. The geo-referenced data have been managed with the help of spreadsheet software (MS Excel©) and a geographic information system (MapInfo©).

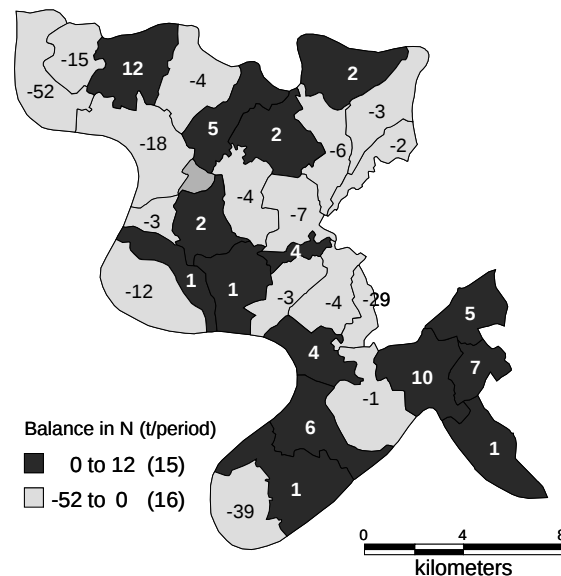
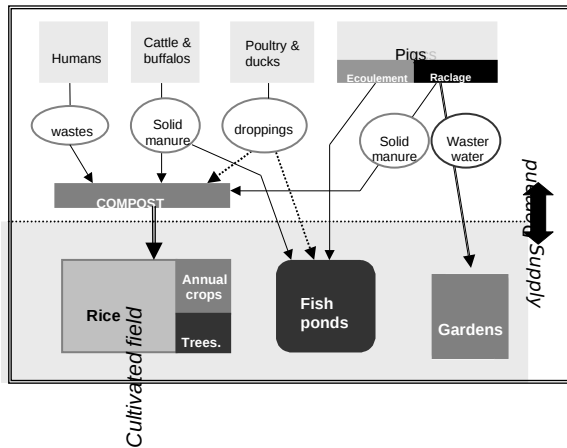


Figure 1. Conceptual model of effluents transfers at commune level in Thai Binh province (Vietnam)

Figure 2. N balance during 2004 winter, at commune level in the district of Vu Thu in Thai Binh province (Vietnam)

Results and Discussion

Preliminary results have established a statistical and agronomic baseline for animal wastes production, crops surfaces, and fish production. Pig units provided the most important quantity of wastes to manage, with 70% of the total N produced in 2004; this rate is expected to increase more than 35% in 2010. In 2004, 45% of total N was used to fertilize fish ponds in the district. 40% is expected in 2010. Gardens could only use 15% of the liquid wastes, and 9% in 2010. Waste waters are thus in large surpluses in every communes. Annual calculations have highlighted the current demand in N for crops in every commune. Seasonal calculations show possible inadequacy between effluents supply & demand in winter. Figure 2 displays N balances calculated in winter 2004 (when only winter crops are cultivated) where surpluses are identified in 50% of the communes. During spring and summer, important negative balance in N (i.e. lack in organic fertilizers) is observed. This balances calculation will be lead on the 7 districts of Thai Binh province. The scenarios for 2010 defined according official policies and expected land-use changes would face mainly two challenges: first, the management of the waste waters that gardens and fish ponds can not absorb efficiently; then the lack for available surfaces to spread solid wastes during winter season.

References

1. Hillion B., Adéquation entre la production d'effluents d'élevage et leur utilisation potentielle pour fertiliser les cultures et les étangs aquacoles dans un district du nord Vietnam. Etude menée sur le district de Vu Thu, province de Thai Binh, delta du Fleuve Rouge. Agronomist engineer level report. INA-PG, Cirad, 2005, 69 p.