

Feasibility and influence of urine use in agriculture in Danang City, Vietnam

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1. Introduction

Nutrients such as phosphorus (P) and nitrogen (N) are essential input in agriculture, which can possibly be pollutants when excessively discharged into water body. In this perspective, urine use in agriculture has been considered effective for plant nutrient recovery as well as reduction of pollutants. This practice can also be part of sustainable nutrient management in developing countries where dynamic change of nutrient flow is expected. This study aims to investigate feasibility and influence of urine use in Danang, a city with its goal set to becoming “Eco-City,” expecting the outcomes will be useful for a step forward to sustainable society.

2. Methodology

Two forms of urine, namely diluted urine and struvite were considered. The former achieves full utilization of nutrient recovery, while the latter was chosen for its high phosphorus recovery potential and usability.

(1) Feasibility

Acceptance toward urine/struvite use on crops was surveyed by interviewing local farmers in Danang. Meanwhile, economic values of urine and struvite were calculated based on their nutrient contents.

(2) Influence

Nutrient composition of human urine in Danang was determined by experiment. Based on the results and other statistical values, scenario study was performed to investigate: replacement of fertilizer by urine/struvite, change in P load on water body, and CO₂ emission during transportation of urine/struvite. Prepared scenarios are:

- Urinal scenario – Urine from male population is recycled
- UD scenario – Urine from all population is recycled by installing urine diversion (UD) toilets

3. Results and conclusion

Farmers’ acceptance was relatively good, for 48% and 73% of respondents showed positive attitude toward urine and struvite, respectively. Calculated economic values are in Table 1. The scenario study (Fig 1) revealed that:

- Among current nutrient input, 100% of N and 41% of P can be replaced by urine in the best scenario (UD scenario with urine use)
- P load on water body can be reduced by 44% in the best scenario
- Struvite shows great advantage emitting far less CO₂ than urine during transportation, and is also efficient for P transportation

In conclusion, urine use has many positive influences on nutrient management and water environment in Danang City, whereas problems such as cost performance still require further research.

Table 1 Calculated economic values of nutrients in urine/struvite

Description	Unit	Value
Value of urine	USD/m ³	12.1
Value of diluted urine	USD/m ³	1.2
Value of struvite	USD/kg	0.4
Cost of struvite	USD/kg	0.8

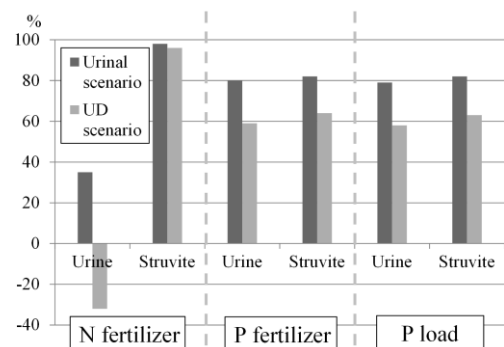


Fig 1 Change of fertilizer consumption and P load (current = 100%)

