

Urbanization and Wastewater Reuse in Peri-Urban Areas: A Case Study in Thanh Tri District, Hanoi City

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Objective

The aim of this study was to better understand the impact of urbanization on agriculture in peri-urban areas. The following research questions were addressed:

1. What is the impact of loss of cultivable land on flooding?
2. How does urbanization affect the transformation of the agricultural system?
3. What role does wastewater reuse play in these developments?

Methods

The study was carried out in Thanh Tri, a lowland area on the outskirts of Hanoi, which has undergone rapid urbanization. Most of the wastewater of the capital flows via natural rivers to Thanh Tri district, where it is reused for agriculture and aquaculture. Secondary data were collected on population and cultivable land over the period 1960–1993. Water samples were taken at 6 locations along the rivers that convey the wastewater and from three wastewater-fed fishponds. Additional information was collected through interviews with experienced agronomists and through rapid assessments of the situation in communes in the area.

Results

1. *Loss of cultivable land and flooding*
 - Over the period 1960–1993, the area of cultivable land per inhabitant decreased by 2.8 percent per year.
 - Flooding events and duration have increased between 1984 and 1994.
2. *Transformation of the agricultural system*

Urbanization causes the loss of cultivable land and increases flooding. However, it also creates a larger consumer market, which stimulates the development and diversification of the agricultural systems. Important is the change to crops such as vegetables that are more profitable than rice and expansion of aquaculture.
3. *Urbanization and wastewater reuse*
 - 3.1 Characteristics of wastewater from Hanoi to Thanh Tri district

Upstream river water samples contained elevated levels of copper and lead. Levels of cadmium, mercury, chromium, nickel, and arsenic were all below permissible standards. Suspended solids, pH, BOD, COD, and hydrogen sulphide concentration in the fishponds were below permissible standards.

3.2 *Wastewater reuse for fishery*

Over the last 30 years farmers have gained a lot of experience in wastewater-fed aquaculture. Different fish species are cultured and the yield is increasing. Compared with non-wastewater-fed fishponds, the fishing under wastewater gives yields that are 2-2.5 times higher with financial benefits that are 2-3 times higher.

3.3 *Wastewater reuse for rice and vegetable cultivation*

Compared with non-wastewater fields, the yield of rice under wastewater gives 10-15 percent higher yields and 10-20 percent higher financial benefits. Farmers have found that vegetables grow better when wastewater is diluted with fresh water or when the effluent from fishponds is used, instead of the raw wastewater.

3.4 *Pollution and human health*

The survey and data from hospitals show very high incidence and prevalence of eye and skin diseases in Thanh Tri.

Conclusion

Thanh Tri receives most of its wastewater from Hanoi. It is an area undergoing urbanization and this leads to a loss of cultivable land and increase in flooding. The agricultural system is changing with reuse of the wastewater for high value crops such as vegetables and aquaculture. Wastewater reuse for rice and vegetable cultivation and aquaculture leads to increased yields and financial benefits. However, the quality of the products is uncertain. Of concern is the high burden of disease among the population, which could, to some extent, be related to the reuse of wastewater in agriculture and aquaculture.

Bibliography

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