Mapping and managing nutrient flows in the food and farming system in Skåne – a multiscale integrated assessment of the potential for nutrient self-reliance

Background

Current global agricultural production relies heavily on synthetic fertilisers produced with nutrients mined from finite reserves. This is problematic both on the supply and the sink side. Concerns about nutrient pollution in water bodies and future fertiliser availability emphasise the need for better nutrient management along the entire food chain. This includes comprehensive recovery of nutrients from organic residuals such as food waste, human excreta, and wastewater. A wide range of treatment processes exist that facilitate recovery of nutrients from various organic residuals, rendering a variety of products potentially useful as fertilisers for the production of food and other biomass. But in regions with strong net imports of feed and food, the need for comprehensive nutrient recovery and reuse is not always obvious.

Scope and Approach

The proposed project builds on a novel methodological framework for mapping nutrient flows – multi-scale integrated assessment of nutrient flows in bioregional food systems. One of the key novelties of the framework is that it enables quantification of nutrient flows beyond those that lie within or cross the spatial boundaries of a given region. By following feed and food imports upstream all the way to fertilizer inputs and exports downstream all the way to organic residual management, it also considers nutrient flows that lie entirely outside of the spatial boundaries of the region but relate to the regional food system. Applying the framework and calculations to Skåne will require both data collection and adjustments to an existing model that was developed for a recent case study in BC Canada.
Ultimately, the goal with the thesis is for the student to explore and discuss various scenarios for managing nutrients in organic residuals in Skåne. In doing so, there is room for the student to investigate which food system, diet, and organic residual management scenarios to evaluate. Moreover, depending on the student's skills and preferences, the focus of the project can be on adapting the existing Excel model to discuss a broader suite of scenarios for Skåne, or on building a model in R, Julia or a similar programming language to more thoroughly investigate uncertainties for a smaller number of scenarios.

Expected Outcomes

This thesis will contribute to a broader understanding of nutrient flows related to food production and consumption in Skåne. While previous nutrient flow analyses have focused on flows within the region, this thesis project will go further and follow flows upstream to the point where fertilizers were used to produce imported feed and food, and downstream to the point where feed and food exports turn into organic residuals. This allows for instance to estimate the impact of internalization, that is, what it would mean for Skåne in terms of fertilizer needs, environmental pressures, and nutrient circularity if local consumption was to a larger extent met by local consumption. As such, the thesis should be able to make valuable contributions to the ongoing discussion in Skåne regarding how to manage nutrients in organic residuals.

Examiner

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The project is suitable for 1-2 students.