

Biological Management of Urban Waste and Organic Waste Imprint on Soil Quality

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Background

Amounts of urban organic waste and human excreta are increasing globally as a result of urbanization and our growing wealth. This waste contains valuable nutrients but can also contain unwanted substances like heavy metals, medicinal residues and unknown contaminants. The possibilities as well as unintended negative effects of utilizing waste resources need further investigation to promote sustainable and practical solutions for urban waste management.

Previous studies on the reuse of organic waste resources, e.g. as sewage sludge or after composting, focus on one or a few effects in the receiving soil, and often only a short time after application. If organic waste resources are to be an attractive supplement or alternative to other products in agriculture, the combined effects after long-term application need to be established. To achieve this we will investigate the effects of long-term application of human urine, compost and sewage sludge in agricultural soil from a Long Term Ecological research facility that has been developed over the past 6 years.

In addition to the examination of existing organic waste resources and their effects on soil quality, there are possibilities that waste products such as compost can be improved. According to literature it should be possible to favor biological control of certain plant pathogens and possibly increase nitrogen cycling rates by stimulating chitin decomposers in the compost before use on agricultural crops. The PhD study will contribute to the effort of elucidating the potential for enhancing the usefulness of compost and to investigate the underlying mechanisms, with special emphasis on Nitrogen cycling and microbial diversity studies.

Objective

The aim of this project is to increase our understanding of urban organic waste resources for agricultural purposes. This concerns the effects on soil quality after application of e.g. human urine, sludge or household waste compost, but also explores the possibilities of improving compost based on urban waste as a product. The project will combine the use of “classical” soil fertility and “modern” molecular biological methods.

Progress – 2007

- Research activities in the period include an incubation experiment with all the soils from the Long Term Ecological research facility. This has produced data on respiration, N mineralization and soil microbial biomass. Additionally, data on functional diversity of the

bacterial community and estimates of colony forming units has been obtained. Presently the organic waste resources from the 3 previous years are being analysed.

- Participated in the PhD courses: Real-Time RT-PCR Advanced (KU-course) and Scales and cross-scales in ecosystem services in agriculture and organic farming (SOAR Summerschool). Presently taking the master course Exploratory Data Analysis/Chemometrics (LIFE-KU-course, to be approved as a PhD course)
- Participated in SOAR Spring Seminar at RISØ

Plans – 2008

- Planned research activities include finishing the basic characterizing of the Long Term Ecological research facility at present after 6 years of organic waste application and producing a manuscript on these data
- To in more detail study the effects on the microbial communities in selected soils e.g. spread of multi-resistant or pathogenic organisms
- Participate in the PhD courses: Plant Nutrients in Terrestrial Ecosystems – acquisition and turnover and Microbial growth and activity in complex communities (both LIFE-KU-courses)
- Participate in Codis2008 International Congress on Compost and Digestate in Solothurn, Switzerland, 27.- 29. Feb. (submitted abstract)
- Participate in SOAR seminars and Summerschool

Time schedule

1. Feb. 2007 – 31. Jan. 2010