

The effects on the structure, stability and functioning of soil food webs and soil ecosystem processes

Throughout The Netherlands there are many areas where soil quality is severely affected by persistent chemical pollution in addition to other stress factors, such as eutrofication, acidification and impacted water balances. The recent policy regarding soil sanitation proclaims a user-oriented approach, with as central criterion that relatively low concentrations of contaminants are tolerated as long as they will not cause serious damage to human health and the natural environment. As a consequence, serious impacts of relatively low levels of soil pollution on the long-term functioning of soil ecosystems cannot be excluded, especially in combination with other environmental stress factors. The objective of this project is to develop a quantitative guide for soil quality and ecotoxicological risk assessment. This guide will be based on a set of soil ecosystem quality indicators that can be observed and quantified, are consistent, refer to important social needs (life support systems) and have a sound scientific basis. Central attention is given to soil ecosystem stability, as a measure of resistance against long term and multiple stress events.

The project consists of field and laboratory experimentation and mathematical and simulation modelling. We will adopt a system approach, analyzing the following cause-effect chain: First we analyze in-situ effects of long term multistressors on populations of soil organisms. This takes place along a pH gradient on a copper-contaminated field plot, near Wageningen. By means of modelling, the observed population effects are used to analyse effects on community structure and stability and soil ecosystem processes. Effects on the stability of community and ecosystem processes will also be empirically analysed in stress on stress experiments. Finally the outcome of the various kinds of models will be integrated into an Ecosystem Network Analysis, as to establish the effects on overall soil ecosystem properties, i.e. overall system activity, trophic efficiency, nutrient retention times, ecological complexity and diversity. These properties are known to be indicative for ecosystem stability and are connected to the life support function of the soil. It is envisaged that the outcome of this network analysis can be used for designing an adequate and meaningful soil sanitation management guide.

This project is divided in three subprojects and is part of the NWO programme TRIAS. One of these projects is carried out at the Vrije Universiteit, and will focus on the food web. Experimental work within this project concentrates on soil arthropods and enchytraeids. The other two projects are being carried out at Wageningen University (population level effects and focus on nematodes) and University Utrecht & ALTERRA (ecosystem stability analysis and focus on microorganisms and protozoans).

Duration:

4 years (September 2001 - September 2005)

Participants:

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