ECOSYSTEM APPROACH IN SOIL PROTECTION AND LAND MANAGEMENT

Raimo Kõlli[1] & Arno Kanal[2]
[1]*Estonian University of Life Sciences,*[2]*University of Tartu*

Introduction

Preserving soil productivity is a key factor in sustaining the soil resources of the terrestrial ecosystems. The soil cover as a whole and its soils distribution patterns play an essential role in the development of regional land use peculiarities or in the spreading of arable, semi-natural grasslands and forest areas. On forested and semi-natural areas, the leading role in forming and developing ecosystems, as well as their proper functioning, belongs to the soils. The mutual causal relationships between soil and plant covers are under the influence of local meteorological (climatic) conditions; however, these relationships are in a site specific state.

On arable areas, due to soil management and temporally quickly rotating agroecosystems, the fluxes of organic matter into and out of soil may be quite variable and, besides that, there are big differences between low input and high input management conditions.

The main task of our work is to analyze the functioning regularities of soils in composition of different types of ecosystems, elucidating not only optimized levels of their functioning, but also finding possibilities for step by step improvement of their productivity and environment protection ability (EPA).

Material and Methods

The present work is based on available researches on mutual relationships of plant associations with soil cover in *frigid-udic* & *frigid-aquic* pedoclimatic conditions. In the treatment of the problem, the ecosystem approach was used. In the quantitative characterization of soil functioning, the annual fluxes of organic carbon and phytoproductivity of ecosystems, as well as the soil's EPA were considered.

Results and Discussion

The work presents the main constraints of Estonian soils and in addition, their occurrence is assessed. The soil degradation features and their causes are very variegated, depending on soil properties, local ecological conditions, land use, external influences and societal activity. The measures to prevent soil degradation are as numerous and various as the factors that cause the problem.

The matching of soil cover with suitable plant cover and with crops on arable lands is considered a key problem. Critical activity for sustainable land use. In arable soil management, the tools of conservation agriculture (equilibrated and exactly timed fertilization, establishment of suitable soil crop rotations, taking into account the soil's humus status and biological activity etc.) and those of others should be used.

The EPA of the soil is an integrated capability of the soil cover to sustain or stabilize the functioning of the soil's ecosystem in the discharging of environmentally harmful influxes into the soil. The biological aspect of the EPA of the soil reflects the soil's capability to form productive plant association with sufficient litter inflow into or onto the soil surface, thus facilitating the process of mineralization and humification and thereby sustaining the soil's organisms. The influence of soil cover on the environmental conditions of an area depends very much on soil type peculiarityies. Soils with a low EPA are highly vulnerable to degradation, but those with high EPA are more resistant to negative influences and may be used more intensively for agricultural purposes.

Conclusions

A knowledge-based and expedient activity in the management of ecosystems will give the best results in the soil cover protection. The disharmonies between geodiversity, pedodiversity and biodiversity should be overcome by pedoecologically proved management. Soil cover may be taken as a medium through which it is possible to improve the environmental status of the area. Soil management strategies, which lead to higher inherent soil productivity, generally also enhance the soil's ability to protect environment.

Raimo Kõlli, *DSc, Professor of Soil Science, Professor-emeritus of EMÜ; Estonian University of Life Sciences, Institute of Agricultural and Environmental Sciences; Kreutzwaldi Str. 1A, 51014 Tartu; Phone. 7425288; raimo.kolli@emu.ee*
Arno Kanal, *PhD, Docent; University of Tartu; Institute of Ecology and Earth Sciences; Vanemuise Str. 46, 51014 Tartu; Phone. 7375824;* arno.kanal@ut.ee