

Extended Spade Diagnosis for a complex evaluation of soil conditions

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Problem

Flood, a decreasing quality of groundwater and drinking water and soil loss caused by erosion are under debate. These problems are closely related to soil health as a basic issue. Soil science and agricultural soil management have primarily focused on the production function of soil and in doing so have been successful in increasing the output of biomass in the decades of the rise of modern agriculture. As a consequence the humus content and the activity of soil biota were reduced at the same time. This is at the core of an imbalance of the basic soil functions and results in a tendency to soil compaction and erosion in industrialized agriculture. In contrast, agricultural land use management systems should maintain or restore the balance between all major ecological functions of soils in the long term (habitat function, production function as well as regulation function). According to that, the basic objective is a *high rate of activity of soil life* and a *good soil structure*.

The result of such a diagnosis can be actually derived and applied on the ground. It is an advantage to have an overall, "holistic" result which may not be based on isolated samples and data from laboratory tests. Further improvements of the method were presented in a study with some modifications and supplements (BESTE 2003). This "Extended Spade Diagnosis" (ESD) has some advantages:

- The ESD allows to document the ecological effects of different management systems on the soil vitality without an expensive high-tech equipment.
- The ESD combines exact and quantitative data information on soil parameters with the qualitative evaluation of soils in the field.
- Information and results are helpful for agricultural advisers in demonstrating soil quality to farmers because they are close to the experiences of farmers with soil. Therefore, communication between scientific expertise and agricultural work is facilitated.



Left: Crumbly, loose and porous soil. Regular intercropping and organic manuring.

Right: Heavily compacted soil. Maize cropping without intercrops. Both soils: Sandy loam. 2004, Germany. Photos: A. Beste

Objectives

A sustainable management system should protect and stimulate the capability of the soil structure to maintain stability under a broad range of agricultural practices. Water erosion should be minimized. Water cycles, the activity of soil life, the transformation capacity and the tendency to erode are closely linked with the quality of the soil structure.

Complex evaluation of soil conditions

GÖRBING developed a method in the early 1930ies to analyze the relevant aspects in the field labeled "Spade diagnosis". With this method, the soil structure, size, shape and arrangement of soil particles and aggregates as well as the density, root growth and soil moisture may be easily examined. The overall result of this method is helpful to judge the quality of the management practice of farmers and its effects on the major aspects of our objectives in previous years. Crop rotations, tillage systems and alike are relevant factors determining the result of a spade diagnosis.

Benefits of the ESD for a sustainable land use management

To conclude, the *Extended Spade Diagnosis ESD* may facilitate a sustainable soil management. Information for decisions on tillage and intercropping can be provided in detail to support the soil structure. The ESD is a tool which allows combined information on an aggregated indicator of soil stability as well as the evaluation of the soil structure. This provides *knowledge on the actual tendency of soil to erosion and compaction*. The ESD is also helpful to evaluate the infiltration capacity and the capability of a soil to filter water for a high-quality groundwater. ■

Publications and links to the Extended Spade Diagnosis (ESD) see www.gesunde-erde.net

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