



Soil health indicators: A case study with smallholder coffee farmers in Uganda

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The study aims to determine soil health indicators of 46 coffee smallholder farmers in the area of Mbale, Mount Elgon region (1200m ~ 1900m) in the southeast of Uganda. Forty of these farmers are working under an organic farmers association and are certified. They are compared to six conventional coffee production systems. The organic farms are agroforestry systems, whereas the conventional coffee farms have nearly no shading trees. Topsoil and subsoil samples, in a depth of 0-20 and 20-40 cm were collected from each farm and analyzed. The following parameters were determined: pH (H₂O), electric conductivity (EC), organic matter (OM), dissolved organic carbon (DOC), nitrate (NO₃), phosphate (PO₄), sulfate (SO₄), carbonate, dissolved total nitrogen (TN), plant available phosphorus (PO₄ CAL), plant available potassium (K CAL) and cation exchange capacity (CEC). These parameters were used as indicators for soil health.

A set of 33 quantitative and qualitative indicators was exclusively developed for coffee farmers to best describe a functioning ecosystem through social, economic and ecological indicators. These ecosystem-indicators were assessed through a questionnaire, carried out parallel to the soil sampling and further transformed into a scoring matrix where a scoring system from 0 to 100 points was used to normalize the collected data.

There is a significant difference between the soil health indicators of organic and conventional coffee producers. The soil samples of conventional farms show higher pH values than those of organic farming systems referring to high turnover rates of the organic material. DOC release is on average higher in organic production systems.

A major difference in the system is the higher plant available phosphate content, as well as a higher CEC in organic systems, which is due to the high organic matter input.

The soil health indicator systems allowed to differentiate and to evaluate organic farms.

Outlook

Through the different management system of organic farmers they are able to create an ecofriendly environment and benefit through higher biological biodiversity in the farm ecosystem. The approach of agro-ecosystem health and soil health highlights the challenges of farmers in certain regions and can support certification schemes and therefore assist as a planning tool for regional development.