



Evaluation of soil indicators for agriculture in The Netherlands

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Since soil health is considered important for both agriculture production and climate change, there is growing consensus on the selection of relevant soil indicators. However, reference and/or target values to evaluate the indicators are poorly defined. We designed a system for a uniform and integral evaluation of soil quality. The system (named BLN) supports the Dutch aims for sustainable management of agricultural soils by 2030 and annual sequestration of 0.5×10^6 kg carbon. BLN consists of a set of soil health indicators and corresponding reference values for assessing ecosystem services, e.g. carbon sequestration, bulk density, and microbial biomass. Pre-selected features of BLN are: *i*) give a reliable representation of integral soil quality, *ii*) able to detect changes in soil quality in time and space, *iii*) applicable for national and/or regional regulatory monitoring purposes as well as field and/or farm management. Indicators and analytical methods were selected on the basis of accuracy, reliability, rapidity, and cost-effectiveness. Initial reference and/or target values were taken from a national survey and from literature. The system distinguishes reference and target values for four different soil type / land use combinations. BLN Version 1.1 comprises 18 indicators for soil organic matter, chemical, physical and/or biological aspects of soil health, many of which are from routine soil analysis. To test its use, BLN was applied within a network of arable farms covering the major arable regions in The Netherlands. Soil samples were taken in autumn 2019, 2021 and 2022 and analysed for BLN and other soil parameters e.g. disease suppressiveness. Also, details of annual soil and farm management since 2010 were registered, as well as regional climate statistics. Data-analyses include change over time for individual indicators, PCA-analysis with all measured indicators, and, for soil carbon, modelling with the RothC-model. Results will be discussed viz. a multi-criteria approach for further development of the BLN system, including possible improvement of reference / target values as well as extension of the system with other soil type / land use combinations.