

Soil organic matter management in agriculture

Assessing the potential of the 4per1000 initiative



Book of abstracts

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Biofunctool[®]: a new framework to assess the impact of land management on soil quality

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The assessment of soil quality is a scientific issue that has been widely debated in the literature for the last twenty years. We developed the Biofunctool[®] framework to assess soil quality based on an integrative approach that accounts for the link between the physico-chemical properties and the biological activity of soils. Biofunctool[®] consists of a set of twelve in-field, time- and cost- effective indicators to assess three main soil functions: carbon transformation, nutrient cycling and structure maintenance. Firstly, a reliability, redundancy and sensitivity analysis was performed to validate the capacity of the set of indicators to assess the impact of land management on soil quality. The results showed the relevance and consistence of each of the twelve indicators to assess the soil functioning. Secondly, we applied Biofunctool[®] to assess the impact of various land use contexts and agricultural practices on soil quality. In order to consolidate the information gathered by all the indicators, we aggregated it through a Soil Quality Index. The Biofunctool[®] index was applied in rubber tree plantations along three study sites in Thailand, as well as in forests and intensive cash crops to cover various land use changes and management practices in various pedo-climatic contexts. The results were analyzed site by site to investigate the impact of land use change, management practices and rubber stand ages on soil quality. The results proved that Biofunctool[®] index can provide an aggregated synthetic soil functioning score that is sensitive to land management and is robust in various pedo-climatic contexts. First, the index revealed the impact of the conversion from annual crop to rubber plantations and order rubber plantation regarding to a natural forest reference. Then, it showed the positive effect of legume cover-crop on the soil functioning. Finally, it highlighted a similar improvement of the soil quality with the age of rubber plantations in contrasted pedo-climatic contexts. Therefore, the Biofunctool[®] index is a reliable and relevant descriptor of the soil integrated functioning, i.e., soil quality, and could be included in more global approaches of environmental impact assessment.