FiBL

Master/bachelor thesis at FiBL, Soil sciences

Title	The more, the better? Potential effects of bio-based fertilizers on carbon sequestration and soil quality – Literature review and synopsis
Background	Soil organic carbon (SOC) is in the focus of climate change mitigation and adaptation measures. Increasing SOC stocks through improved land management is discussed to remove large amounts of atmospheric CO_2 thus mitigating climate change, improving soil quality and increasing the resilience of soils against drought and heavy precipitation events. World food production heavily relies on soil quality and the accelerating increase in world population requires increasing yields without compromising environmental protection. In recent decades, crop yield increases have been mainly achieved with mineral fertilisers, especially N and P, in turn causing vast environmental problems. Because of the anticipated scarcity of P, and the N fertilization industry's large CO_2 footprint, nutrient rich side-streams (such as manure, anaerobic digestate, sewage sludge, municipal biowaste and food industry by-products) need to be utilised more efficiently as bio-based fertilisers (BBFs) to increase soil quality. The current EU H2020 project Lex4Bio will target the most promising technologies for BBF production and evaluate their fertilisation potential against national and EU fertilisation requirements. This will provide essential tools for closing European nutrient cycles, contribute to ameliorating the impact of fertilisation on the environment, and open new avenues for a more sustainable land management considering soil quality and SOC especially. Within this master thesis, the current knowledge on long-term effects of BBF on soil quality and especially SOC will be compiled and analysed. In combination with the most recent (scientific) concepts on soil quality and soil organic matter dynamics a conceptual framework on the potential effects of BBFs will be developed aiming for policy, advisory services and farmers.
Methods	• Literature review and qualitative meta-analyses of existing long-term trials; • Development of a conceptual framework on the effects of BBFs on soil quality and carbon sequestration
Contact	Markus Steffens (markus.steffens@fibl.org) Else Bünemann-König (else.buenemann@fibl.org)
Starting date	Right now!
Literature	Homepage of the EU H2020 project Lex4Bio: https://www.lex4bio.eu/ Dynarski, K.A., Bossio, D.A., Scow, K.M., 2020. Dynamic Stability of Soil Carbon: Reassessing the "Permanence" of Soil Carbon Sequestration. Frontiers in Environmental Science 8. Lehmann, J., Bossio, D.A., Kögel-Knabner, I., Rillig, M.C., 2020a. The concept and future prospects of soil health. Nature Reviews Earth & Environment 1, 544-553. Lehmann, J., Hansel, C.M., Kaiser, C., Kleber, M., Maher, K., Manzoni, S., Nunan, N., Reichstein, M., Schimel, J.P., Torn, M.S., Wieder, W.R., Kogel-Knabner, I., 2020b. Persistence of soil organic carbon caused by functional complexity. Nature Geoscience 13, 529-534.