

Offering: Master theses in agroecology



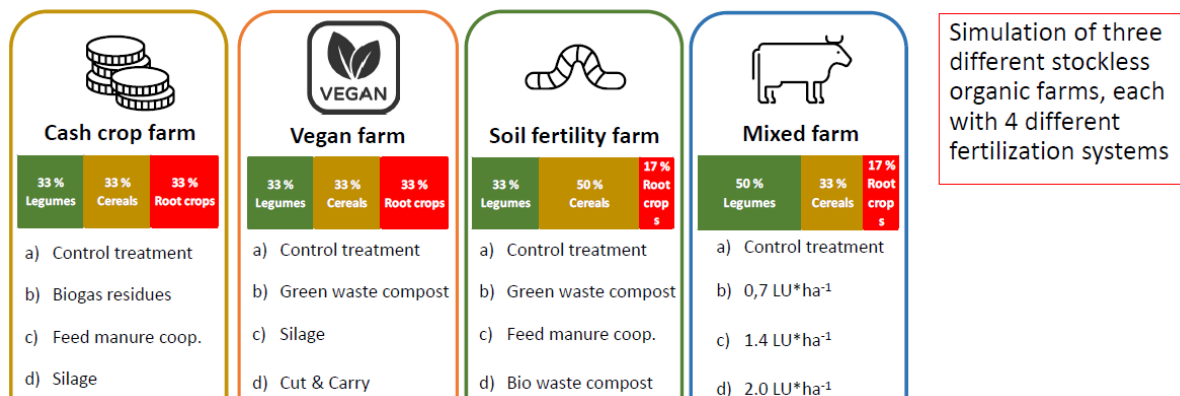
Priming effects in stockless and veganic farming systems (2x Master)

Preserving and increasing soil organic carbon (SOC) is of particular importance to meet the challenges associated with soil health, food security and climate change. SOC stocks result from the balance between C inputs (plants, fertilizers) and C outputs (mineralization by microorganisms) and are modified by stabilizing mechanisms. This sensitive balance between input and output fluxes depends, among other factors, on the priming effect (PE), defined as the change in the rate of SOC mineralization by microorganisms in response to fresh C inputs. The impact of agriculture on the PE is far less understood than for natural ecosystems, which hampers our understanding of how the development of more sustainable agroecosystems will influence C stocks on a large spatial scale. Therefore, we aim to study the impacts of different fertilization practices on SOC and PE in stockless and veganic farming systems (using soil samples from a long-term experiment at the University of Kassel). PE will be investigated in an incubation experiment (similar to Abdalla et al. 2022) after the addition of ^{13}C -labeled glucose to simulate the input of organic C that occurs in agroecosystems. The produced CO_2 and its ^{13}C will be measured continuously using a CO_2 stable isotope analyzer. After the incubation period the isotopic signature of bulk soil and microbial biomass, as well as net N mineralization will be determined. Additional analyses are possible. Each of the two Master theses will process two sample sets simulating two farm types.

Prerequisites: (basic) knowledge on stable isotopes (lecture "Isotope Biogeochemistry"), interest in the topic, willingness to work (accurately) in the lab

Project start: **April 2025** (thesis 1 / two sample sets) and **August 2025** (thesis 2 / two sample sets)

Further readings: Abdalla et al. (2022) Long-term continuous farmyard manure application increases soil carbon when combined with mineral fertilizers due to lower priming effects. *Geoderma* 428:116216; Bernard et al. (2022) Advancing the mechanistic understanding of the priming effect on soil organic matter mineralisation. *Functional Ecology* 36:1355–1377; Möller et al. (2024) How to maintain soil fertility in stockless organic farming: Research concepts and insights from the first crop rotation of a long-term field experiment. *Preprint* (online at papers.ssrn.com).



Both Master theses will be supervised by Dr. Ulrike Schwerdtner and Dr. Khatab Abdalla. If you're interested in writing your thesis with us, please contact: uli.schwerdtner@uni-bayreuth.de