AGROCOMPOSIT (ID 71)

Biochar-compost composites for supporting site-specific soil agro-ecosystem functions and climate change mitigation

Coordinator

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Project partners

Country	Organization
Hungary	Centre for Agricultural Research
Norway	Jordpro Tiller AS
Switzerland	University of Applied Sciences and Arts Northwestern Switzerland
Switzerland	Agroscope
Norway	Norwegian Institute of Bioeconomy Research (NIBIO)

Summary

The main objective of the proposed project is the development of site-specific soil improvement technologies applying composite soil amendments (co-composted biochar and organic wastes) produced from region-specific organic wastes and by-products. The biochar-compost composites will be suitable for the effective improvement of low-quality soils and their productivity focusing on the enhancement of nutrient availability, water use efficiency under drought stress, carbon sequestration and improving biodiversity. Primarily, we plan to co-compost biochar and various organic wastes (e.g. seaweed, aquaculture waste streams, sewage sludge, organic fraction of municipal solid waste) that are typical of the participant countries and are produced in large quantities, while their utilisation has not been resolved yet. Biochar will also be produced from organic wastes or by-products typical of that country or region.

The addition of biochar to the raw composting resources and its further impact on the composting process will be evaluated, as well as the final co-composted product and its application to agricultural soils as organic fertilizer. Co-composting these wastes is expected to produce value-added products compared to biochar and compost. The composite products will be tested on the long-term in scale-up experiments (from pot to field) on particular degraded soils and various cropping systems characteristic of specific climatic zones. This technology is expected to serve as an innovative multifunctional tool in land management practices to improve soil structure, health and fertility, plant growth and productivity, as well as mitigate climate change. The priority objective is to maintain cropping systems' environmental sustainability, supporting their essential functions such as nutrient cycling, water retention, habitat, biodiversity, buffering and filtering. Applying specific soil amendments paired with typical crop varieties of each region will ensure the improved compatibility with soil biota to restore soil health.

The plant-microbe-soil complex, the biochemical mechanisms responsible for soil health and the effects on biodiversity will be given particular importance by applying a complex monitoring methodology that contains soil physical (e.g. water holding capacity, aggregate stability, porosity), chemical (e.g. SOM stability, nutrient cycling, GHG emissions), microbiological (e.g. activities and diversity) and ecological (e.g. habitat) assessment and plant studies (e.g. biomass, enzyme levels).

Based on the results of the microcosms, pot and pilot field experiments, the efficiency and feasibility of co-composted soil amendments and technologies will be evaluated from the technological and environmental points of view. The innovative technology using the specific co-composted products will be compared with the traditional organic and inorganic fertilisers to evaluate their pros and cons. Finally, we will apply substance flow analysis, Life Cycle Assessment and Cost Effectiveness Analysis plus Environmental Risk Assessment to assess the benefits (and drawbacks) of the technologies over a

range of feedstock and specific application scenarios. Based on the collaboration, a database will be established aimed at matching certain biochars with organic wastes, with specific low-quality soils and cropping systems to find a technology for efficiently improving soil health and utilising the wastes in a sustainable and eco-efficient manner.

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