CLIMATE CHANGE MITIGATION SCENARIOS INVOLVING CHANGE OF CROPS IN AGRICULTURAL LANDS WITH NUTRIENT-RICH ORGANIC SOILS TESTED IN LIFE ORGBALT

Changing the type of crop cultivated on agricultural land can be beneficial for soil quality, which has been proven by the success of the crop rotation method, practiced by farmers around the world for centuries. A study on crop rotation with legumes in Finland found lower nitrogen runoff and greenhouse gas (GHG) emissions in lands where crop rotation with legumes was practiced, compared to cereal crop monocultures (1). Moreover, a comprehensive meta-analysis on agricultural crop diversity impacts on soil microbial biomass and organic matter dynamics revealed that crop rotations are beneficial to enhancing soil carbon, nitrogen, and microbial biomass, resulting in improvements in soil quality and productivity (2).

LIFE OrgBalt takes on the task of measuring whether switching of crops is helpful for soil quality improvement and climate change mitigation (CCM) in nutrient-rich organic soils used in agriculture. The degradation of these soils poses both a serious environmental and economic concern, which is why scenarios with the potential of nutrient-rich organic soil restoration and maintenance were developed within the project. By testing, demonstrating, and measuring the impact crop change has on nutrient-rich organic soils, LIFE OrgBalt aims to reduce the GHG flows from these lands and inspire land owners to implement similar practices.

There are two CCM scenarios within LIFE OrgBalt in which the change of crops is practiced to monitor the effect on GHG emissions and other environmental factors. Demonstration site LVC301 in Vecauce was prepared for testing the impacts of conversion of cropland used for cereal production into grassland considering periodic ploughing. During the demonstration period, grass is sown in the whole site area; soil improvement is done in

*Crop rotation – "the successive cultivation of different crops in a specified order on the same fields, in contrast to a one-crop system or to haphazard crop successions."(3)

accordance with the best management practice for integrated farms – by using optimal sowing standard and mineral fertilization dose; grassland is mown regularly (2-3 times/year) for hay or forage production. Potential benefits of the scenario expected in this plot are reduced GHG emissions from soil, increased carbon stock in soil and belowground biomass, as well as reduced risks of nutrient leaching and soil erosion.

In the demonstration sites LVC304a and LVC304b in Lazdiņi and Slampe, introduction of legumes in conventional farm crop rotation is tested. In these areas, good practice guidelines for integrated farms which use legumes in crop rotation are followed. Management cycle here is 5 years with legumes sown in the first year, followed by winter rapeseed and remaining three years, before restart of the cycle, winter wheat is cultivated. Potential benefits of introducing legumes in conventional crop rotation include reduced N2O emissions from soil reported in agriculture sector because of avoided mineral fertiliser application and gradual nitrogen input by symbiotic organisms, as well as increased carbon input with plants ensuring increased soil carbon stock.

It is expected that besides potential benefits of these climate change mitigation scenarios they will also be profitable for landowners and are also beneficial from the socio-economic perspective, including provision of ecosystem services. Soil fertility and agricultural productivity will be maintained which is essential for addressing the challenges posed by climate change while ensuring the long-term sustainability of agricultural sector.

Achieving a balance between productivity and climate change mitigation in organic soil management requires a comprehensive understanding of the trade-offs involved. There are models elaborated within the LIFE OrgBalt project that will help researchers, landowners, and policymakers better understand these trade-offs. That can lead to development of sustainable land management practices that optimize both productivity and carbon storage while maintaining ecosystem health and resilience.

LIFE ORGBALT TEAM

References:

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