LAND AND CLIMATE CHANGE: HOW DO THEY RELATE TO ONE ANOTHER? AN AGRICULTURAL SECTOR PERSPECTIVE.

Agriculture is highly exposed to climate change, as farming activities directly depend on climatic conditions. However, it represents also a unique sector since not only contributes to climate change through the release of greenhouse gases into the atmosphere, but can also contribute to climate change mitigation by reducing greenhouse gas emissions and by sequestering carbon[1].

We explored the opportunities and challenges related to these aspects with the help of experts from all partner countries of the LIFE OrgBalt project. “Greenhouse gas emissions from soils is a key topic in global change issues, in climate research, and for agricultural and forestry management”, claims Dr. Cornelius Oertel and his colleagues[2]. Undrained organic soils remove carbon dioxide from the atmosphere and store it as soil carbon matter. At the same time, “according to internationally recognized greenhouse gas calculation methodology (from the Intergovernmental Panel on Climate Change IPCC guidelines)”, added the research team of the Latvian State Forest Research Institute "Silava", leading partner in the LIFE OrgBalt project, “drained nutrient-rich organic soils can be a significant source of greenhouse gas emissions especially if managed for agriculture purposes (croplands and grasslands) because the decomposition of soil organic material leads to an increase in carbon dioxide and nitrous oxide emissions. Scientific hypothesis suggests that the amount of greenhouse gas emissions can be decreased by introducing management changes that shift organic soils more towards a sink state. The LIFE OrgBalt project researchers and experts are working to find the most effective “sink” measures to be suggested to policy makers as effective climate change mitigation measures.”

If sustainably managed, in fact agricultural soils can contribute to the reduction of greenhouse gas emissions. On the other hand, mismanagement of these soils can decrease their greenhouse gas reduction and removal potential.

“The potential of mitigating climate change with organic soils is in reducing the carbon dioxide and nitrous oxide emissions from drained organic soils. As these emissions are the higher the deeper the water table is, they can be efficiently reduced by raising the water table”, according to Dr. Paavo Ojanen, researcher at the Department of Forest Sciences of the University of Helsinki. “This could be achieved by rewetting drained soils or by keeping the water table as high as possible at soils drained for agriculture and forestry. As emissions are much higher from agricultural than forest soils, allocating drained organic soils to forestry instead of agriculture could also be an efficient climate change mitigation”. “Example of mitigation measures in the agricultural sector”, in Dr. Olgirda Belova opinion, member of the Department of Forest Protection and Game Management, Institute of Forestry LAMMC, partner in the LIFE OrgBalt project, “can be represented by reduced tillage which could reduce soil disturbance and improve soil structure, and extended rotations a farming practice that requires the alternation of different types of crops in recurrent succession on the same land.“ According to Dr. Bärbel Tiemeyer, research-group-leader at the Thünen Institute, the following climate mitigation measures can reduce the greenhouse gas emissions in the context of peatlands. “Mitigation measures can comprise changes in management (less intensive land-use, less fertilisation,

higher groundwater levels), but such measures can only reduce carbon dioxide and nitrous oxide emissions, but not stop them. To do so, restoring the natural hydrological conditions as much as possible is necessary. Depending on the legal, socio-economical and natural context, re-wetted peatlands can either, in the long-term, be restored towards their natural state or used for biomass production ("paludiculture"). Furthermore, replacing horticultural peat with truly renewable substrates is an important mitigation approach. The mitigation potential strongly depends on the extent of drained peatlands - in a country like Germany, the potential is very large, and it will not be possible to reach climate goals without seriously addressing peatlands. In other countries, it is also important to remember that there are huge amounts of carbon stored in natural peatlands. In this case, it is crucial to protect these peatlands and also to avoid disturbance from the surrounding".

What do we need to identify the most effective climate mitigation measures and to implement them?

The LIFE OrgBalt project aims to identify and to demonstrate sustainable, resilient, and cost-effective climate change mitigation measures applicable in drained nutrient-rich organic soils and to provide tools and guidance for the elaboration, implementation, and verification of the results of climate change mitigation policies. To do so the project in the first place aims to improve greenhouse gas calculations for drained nutrient-rich organic soils by including project territory specific activity data and emission factors. "The lack of consistent long term monitoring programs allowing in depth investigation and acquiring long term data series characterizing organic soils situation in our region, is indeed one of the main challenges researchers have faced for quite a long period", stresses the SILAVA research team. "Historical soil maps are often really historical and need to be updated as well as continuous soil monitoring data are needed to help farmers and foresters to project the greenhouse gas emission from drained nutrient-rich organic soils under different management and climatic scenarios".

Climate change in fact is not just a theoretical debate, but a concrete challenge that has a deep impact on farmers' activity.

We tried to investigate the difficulties faced by the agricultural sector, such as the impact of climate changes, the role played by sustainable management from a farmers' perspective and mitigation potential to reduce greenhouse gas emissions and increase soils productivity, by collecting some voices from the field thanks to representatives of the agricultural sector from all partner countries. "Adapting to the changing weather conditions, caused by climate change, is among the biggest challenges that farmers have to face nowadays", said Riina Maruštšak, Head of Environmental Policy at the Estonian Chamber of Agriculture and Commerce. "We all have fresh memories of the heavy precipitation of 2017 and the drought of 2018, whereas both years had great impact on the crop yield. And we cannot forget about the challenges in plant protection due to new plant diseases and pests, all living organisms such as insects, animals, bacteria, fungi, detrimental to the agriculture health". "Farmers need to adapt to climate, indeed", claims Agita Hauka, Chairman of the Board of the Latvian Farmers' Federation. "The past winters have not been as cold as they used to be and this led to an increase in the number of insects which were normally killed by very low temperatures. In addition, soils are not moisture enough due to the lack of snow. Heavy precipitation causing floods alternates with droughts finding farmers unprepared to both".

More information, researches at the service of the agricultural sector and training sessions for farmers are needed.

Lack of information, need to conduct further research to provide concrete solutions at the service of the agricultural sector, and the urgency of informative and training sessions for farmers were highlighted by all interviewee, as a potential key to increase the knowledge on mitigation measures potential to reduce greenhouse gas emissions and increase soils productivity, within the agricultural sector. In Agita Hauka opinion, “it’s important to obtain constant information from policy makers and to inform farmers on the importance to take preventive measures and adapt their management to protect nature and reduce climate change impact on the agricultural sector, to understand the challenges in front of us even if they didn’t heat directly a business yet”. “Objective scientific assessment of the economic and environmental impact of climate mitigation measures is of fundamental importance to increase their attractiveness” according to Zigmas Medingis, Deputy director at the Economics Department of Ministry of Agriculture of the Republic of Lithuania. “Without clear economic and environmental assessments of the potential of climate change mitigation measures”, continued Zigmas Medingis, “it is difficult in fact to convince not only farmers, but also agricultural policy makers of the role played by agriculture in reducing greenhouse gas emissions and on the great economic and managerial potentiality connected to it. This assessment would highlight not only the economic benefits of mitigation, but would also provide long-term risk management solutions. Most of the public”, concluded Zigmas Medingis, “is already aware of the risks of climate change and the agricultural sector is aware of the need to contribute to climate mitigation. However, there is still a serious lack of knowledge and qualified professionals able to inform and train farmers on climate-friendly management and the necessary actions to put in place to sustainably increase soil productivity”.

The need of informing and training farmers has been stressed also by Agita Hauka, which highlighted in particular the need to provide them with concrete tools, such as data, maps, models and opportunities for discussion, including the possibility to hear about the experiences of other countries.

Along with training, the need of support mechanism, such as incentives, to support farmers and increase their willingness to pursue measures with long-term goals has been highlighted.

According to Riina Maruštšak, “a major challenge is farmers ability to invest, as well as the provision of fair transition period to implement new technologies for the swift to more sustainable production.

In addition, there is a lack of climate friendly management alternatives for sustainable plant protection and where available subjected to high costs". In Netta Leppäranta opinion, Management Consulting from the Finnish agricultural expert organisation ProAgraria, additional challenges are faced by the agricultural sector in implementing sustainable management practices. Among them the need to develop sustainable cultivation techniques able to make the agricultural sector resilient to climate change. More information, in her opinion, is needed also on how to practically implement climate changemitigation measures once identified. Zigmas Medingis, concluded our round of interviews with a reflection on the role that the Common Agricultural Policy (CAP) should play. According to Zigmas Medingis, there's also a need to implement systemic incentives like taxation system "polluter pays", CO2 emission accountancy at farm level, direct payments linked with climate and environmental targets that will reward farmers in a long-term perspective. We have to change unsustainable farming practices that are causing increasingly higher economical losses for farms and that are still compensated by society. Unsustainable practices have a negative impact on the environment, on the health of society, and stimulating biodiversity loss. Training and systemic instruments has a key role in changing agriculture attitude to global challenges (like climate change mitigation, enhancement of biodiversity, pollution reduction) according to the Lithuanian representative.

"We need to focus taxation system, direct support, investment support, training and agricultural advice services on sustainable production, which means retraining consultants to provide advisory service for sustainable management practices and technologies within farms.

The public funds should be planned so to encourage farmers in implementing climate mitigation practices".

LIFE OrgBalt team

[1] https://ec.europa.eu/info/food-farming-fisheries/sustainability/environmental-sustainability/climate-change_en
[2] Oertel, C. et al. (2016). Greenhouse gas emissions from soils—A review. Geochemistry 76: 327–352.

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info@baltijaskrasti.lv

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