EU LIFE Programme project
"Demonstration of climate change mitigation potential of nutrients rich organic soils in Baltic States and Finland"

REPORT

ON IMPLEMENTATION OF THE PROJECT

DEMONSTRATION OF CLIMATE CHANGE MITIGATION MEASURES IN NUTRIENTS RICH DRAINED ORGANIC SOILS IN THE BALTIC STATES AND FINLAND

WORK PACKAGE

REPLICABILITY TOOLS

(C 5)

ACTIONS

Deliverable title	**Developed Simulation tool applied in real life conditions at least 5 times in partner countries (1 per country)**
Delivery No.	C5/8
Agreement No.	LIFE18 CCM/LV/001158
Report Nr.	2024 – C5/8
Type of the report	Final
Organization	Latvian State Forest Research Institute "Silava"

Report title	**Developed Simulation tool applied in real life conditions at least 5 times in partner countries (1 per country)**
Work package	**REPLICABILITY TOOLS** (C5/8)
Authors	I.Krūze, E.Konstantinova, K.Valujeva, A.Nipers, I.Līcīte, A.Lazdiņš, K.Sirmā, K. Puriņa, E.Lāce, E.Mednis, K.Soosar, T.Schindler, J.Jauhiainen, R.Laiho, A.Manchini, D.Čiuldienė, E.Vigricas, K.Armolaitis
Photos and drawings	
Report No.	2024- C5/8
Type of report	Final
Place	Salaspils
Organization	Latvia State Forest Research Institute "Silava"
Contact information	Riga street 111, Salaspils, LV-2169
	Phone: +37129183320
	E-mail: ieva.licite@silava.lv
	Web address: www.silava.lv
Date	2024
Number of pages	14

LIFE OrgBalt compiled the first regional Baltic/Finnish GHG emission factors for managed nutrient-rich organic soils (current and former peatlands), which have been made available for the customary scientific review and further verification for national GHG inventories in the hemiboreal region in Finland and the Baltic countries. While the project analysed selected CCM measures for drained organic soils in agriculture and forestry and developed spatial models and tools, it also identified remaining knowledge gaps. To bridge the remaining limitations and fill the gaps, it is essential to continue GHG measurements and model development, as well as to broaden and complete the scope of the evaluated CCM measures in the after-LIFE-project period, notably by including rewetting and restoration of peatlands that are currently considered to be among the most recommended CCM measures on drained peatlands in the EU. In addition, the developed Simulation and PPC models still include limited macroeconomic considerations and lack an assessment of all environmental impacts. For all these reasons, these models should be used carefully in CCM strategy development for the identification of gaps in climate neutrality transition policy and funding frameworks and need further optimization for broader applicability as decision-making tools.

Contents

List of Abbreviations and Acronyms

CAP	Common Agricultural Policy
CBA	Cost-benefit analysis
CCF	Continuous cover forestry
CCM	Climate Change Mitigation
CO_2	Carbon dioxide
EF	Emission factor
GHG	Greenhouse gas
MA	Ministry of Agriculture of Latvia
N2O	Nitrous oxide
PPC	Public-private cooperation
ROI	Return on investment
TCM	Temperate Cool and Moist (climate region)

INTRODUCTION

The main scope of C5 activity within the LIFE OrgBalt project is to ensure the replicability and transferability (R&T) of the project results in the Baltic States, Finland, Germany and the whole Temperate Cool and Moist (TCM) climate region in Europe. One of the main means to achieve this was intended by providing applicable support tools and enabling their application on regulatory, as well as end-user level. It was specified further in the project application that replicability and transferability was intended to be reached by development of the Simulation model of potential impact of the CCM measures and capacity building as the main approach to endorse the replicability of the Project results.

There were two models developed within the Project – Simulation tool and the Public-private cooperation (PPC) model (Functional land management model). Both models are described in more detail in project reports:

- Report No. 2004_C5/6 Simulation model with spreadsheet interface for a single parcel-based calculations of business as usual scenario and different management options;

- Report No. 2024-C4/1 Proposal for the PPC model and adopting of the Project results in Rural Development Plan (C4.1).

Project proposal envisioned that application of the developed model(s) will be done through enabling end users to put the developed tool(s) in practical use through specially targeted training sessions provided by consulting and advisory organisations. Two-level training was foreseen – first for the consultants, who will later pass on the skills and knowledge regarding the application of the developed tools to individual users. Therefore, a Framework for training sessions was developed and workshops organized in line with the Report No. 2024-C5/5 Final report on development of Framework for training sessions for individual stakeholders for application of the developed tool. There were also individual meetings concerning these models and their application with Latvian Forest Owners' Association, farmers' associations, Latvian Rural Advisory and Training Center, Forest Advisory Services Center, The institute of Agricultural Resources and Economics and other organizations.

WORKSHOP CONTENTS

Beside theoretical and practical presentations on both models, each National and training workshop in the second round of workshops that took place mainly in spring 2024 was introduced by general information about the LIFE OrgBalt project presented by SILAVA. This presentation included information about the project partners and countries involved, idea of the project and its aims, brief background information on organic soils and emissions, tools/models elaborated as well as the main results and demonstration sites.

National workshops in all partner countries and also trainings workshops in Latvia included a presentation from the representative of the Ministry of Agriculture of Latvia. Within the framework of the LIFE OrgBalt project, the MA is working on the inclusion of climate change mitigation measures in national strategies and action plans with the aim of contributing to the achievement of the LULUCF and climate targets of the agriculture sector. MA, together with other relevant ministries, is working on the development of National Energy and Climate Plan, the proposals of The EU carbon removal certification framework, Nature restoration regulation and others.

Attendees to the National workshops were introduced to the main land resource challenges in the Baltic States, such as the simultaneous preservation of biodiversity, reduction of GHG emissions, and CO_2 sequestration, and the promotion of the bioeconomy. The dominant landscape in the Baltic States is forest land and agricultural land, with each of the Baltic States having a different proportion of these land uses. For example, in Lithuania, agricultural land accounts for more than 47% of the total area, while in Latvia it is 32%, and in Estonia 23% (**Error! Reference source not found.**).

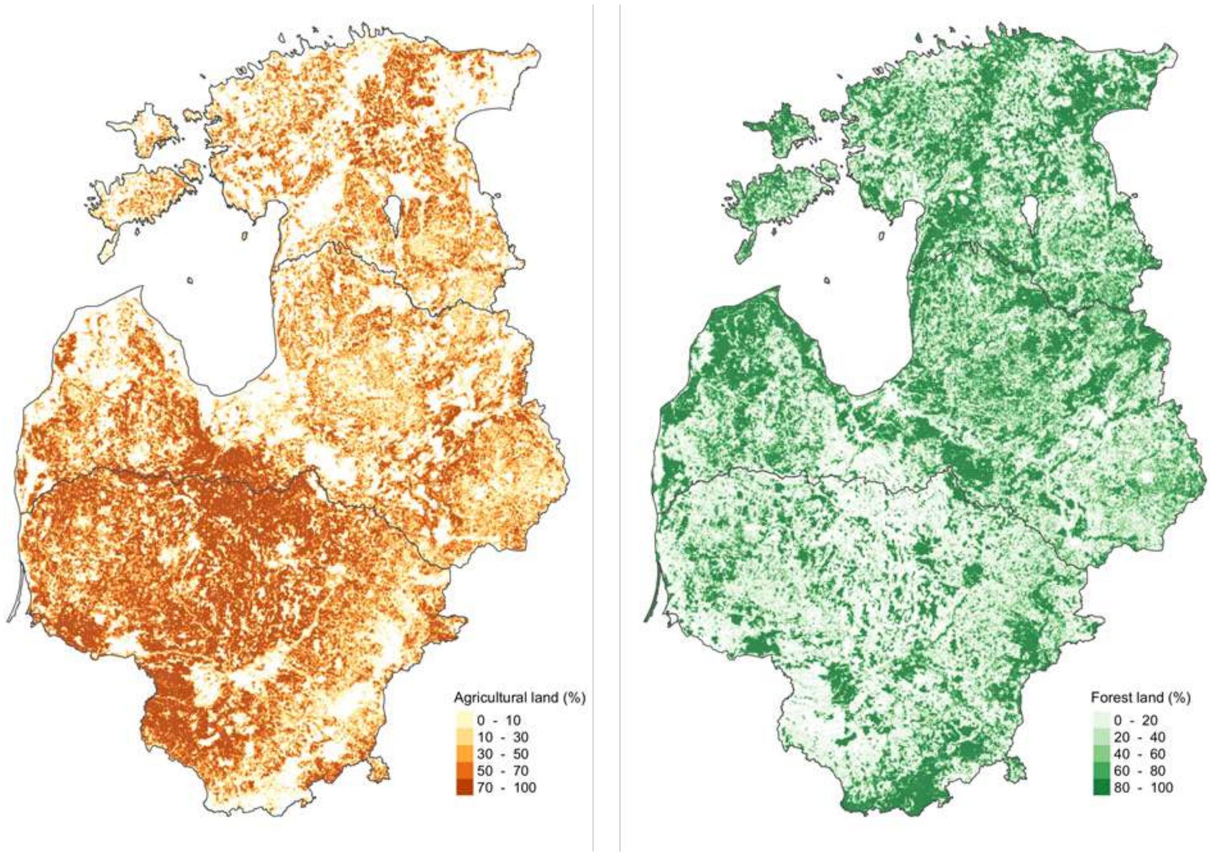

Figure 1. Agricultural and forest land areas in Baltic States.

Before taking any land management decisions, it is very important to acknowledge the existing land use and what kind of effect the changes will have on national economy and environmental commitments. Simulation tool and the PPC model were developed to be able to present these issues at different levels and for different target audiences.

DESCRIPTION OF THE MODELS

Both – Simulation tool and the PPC model – are briefly described below. More detailed information about the models as well as training framework is included in the project reports

(Reports No. 2004_C5/6, 2024-C4/1 and 2024-C5/5) mentioned in the Introduction part of this report.

Simulation tool

The Simulation model is a data-based tool for policy planning and decision making at regional and national level. It allows to evaluate the impact of climate change mitigation measures selected within LIFE OrgBalt project on socio-economic indicators and GHG emission reduction at national level for three Baltic States. The results of the model is not only an impact assessment of GHG emissions reduction measures at the national and regional level, but also spatial location of the GHG emission reduction measures.

PPC model

PPC model or "Functional land management model – a tool for sustainable and climate friendly management of nutrient rich organic soils" is designed to allow the user to assess the performance of organic soils depending on the planned land use type (scenario), based on land use performance criteria. Based on the findings and using the developed model, it is possible to implement deliberative management decisions of managed nutrient rich organic soils, to evaluate potential management costs, plan the expected financial return, assess the benefits of climate mitigation and consider nature values.

The model is a microeconomic model, to be used at farm level as business planning tool. At the same time, its calculations provide information on economic benefits and optimal public funding amount and its results may serve as a basis for further discussion among wide range of stakeholders.

PRESENTATION OF MODELS AND THEIR RESULTS IN THE WORKSHOPS

Before going into detail about both models and their results it should be noted that not only the target audiences and functionality of both models differ, but also results are provided in different forms and for different periods. Therefore, both models should rather be considered as complementary than overlapping. Additionally, results particularly for the scenarios on forest lands (and to a certain degree also those scenarios in agricultural lands involving afforestation) are heavily dependent on the particular moment within the rotation cycle the results are generated for. For example, the site has accumulated significant amount of carbon showing considerable reduction of GHG emissions right before timber harvesting in main felling, but the site becomes source of GHG emissions right after harvesting. On the other hand, the data on income is better right after that.

Simulation tool

Results show that the reduction in GHG emissions resulting from implementation of scenarios on agricultural land is attributed to increase in biomass of the surface, subsurface, and ground cover resulting from the afforestation. By 2050, an additional increase in wood volume is expected, resulting in a significant reduction in GHG emissions due to the increase in biomass. In scenarios LVC308 and LVC313, where selective logging is performed, a more moderate reduction is expected, while in scenario LVC312, a consistent reduction throughout the rotation cycle is expected (Figure 2).

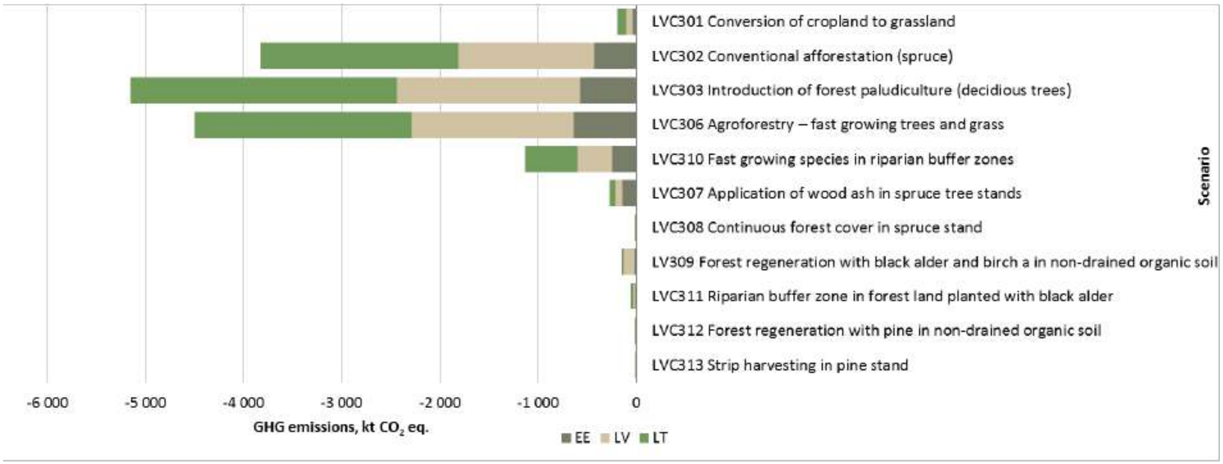

Figure 2. Impact on GHG emissions in 2050.

By 2050, profits are expected to decline in all scenarios except for LVC306. In the LVC306 scenario, profits increase in 2050 because the fast-growing trees have reached cutting age (Figure 3). In scenarios where losses occur in 2050, thinning of young stands is performed, and profit is anticipated in later stages of the rotation cycle. This expectation is based on the forest age in these areas, which is projected to be between 15 and 25 years by 2050.

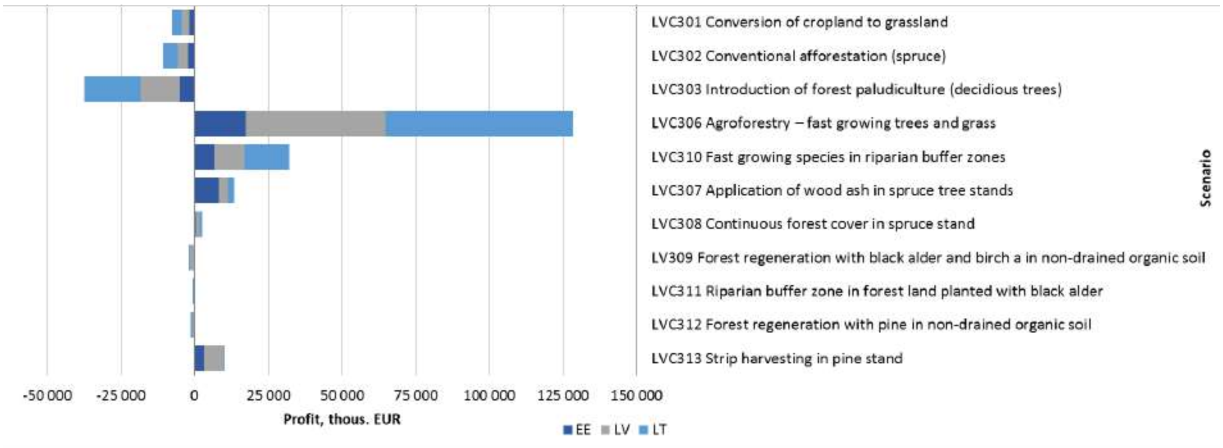

Figure 3. Impact on profits in 2050.

The implementation of scenarios LVC301, LVC302, and LVC303 results in a reduction in employment by 2050 (Figure 4). This is because employment prior to the implementation of these scenarios on agricultural land depends on specific land use and management activities. Greater employment opportunities arise in 2050 when thinning or regeneration cuts are carried out in areas that have reached the specified age.

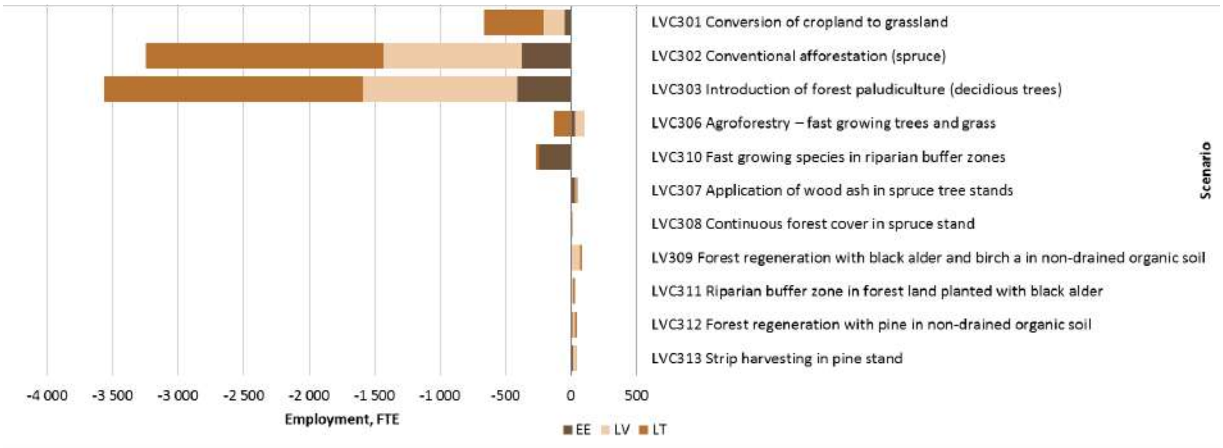

Figure 4. Impact on employment in 2050.

An interactive application has been created to display the results of Simulation tool, providing both summary and detailed spatial information for each scenario and country (Figure 5). The left panel visualizes all areas where a scenario's measures are applied. Users can switch scenarios using the "Select scenario" block. The spatial data for visualization purposes is aggregated into a grid of 100 hectares (1 km²).

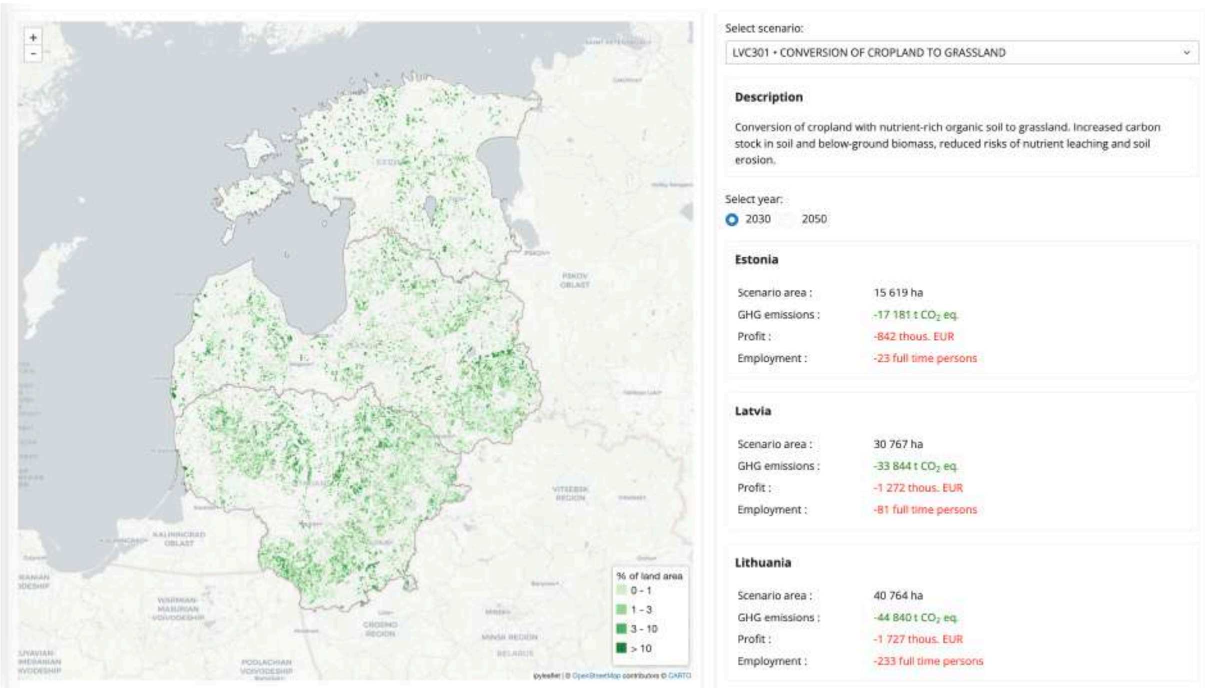

Figure 5. Application of Simulation tool.

PPC model

The model provides financial, economic, and socio-economic indicators for different types of land management (agricultural land and forest land) based on two levels of input data. First level data are necessary to understand which CCM measure can be implemented on a given territory, for instance for agricultural land: type of agricultural land, soil type, land use assessment, management system, drainage system, restrictions on economic activity. For first level data there are several restrictive criteria, since the CCM measures included in the model can be implemented only on lands with certain given characteristics. Once first level input data are entered all possible implementable CCM measures are shown for user in a separate window. For each implementable CCM measures second level data must be entered so to obtain financial and socio-economic indicators. There are no restrictive criteria for second level data.

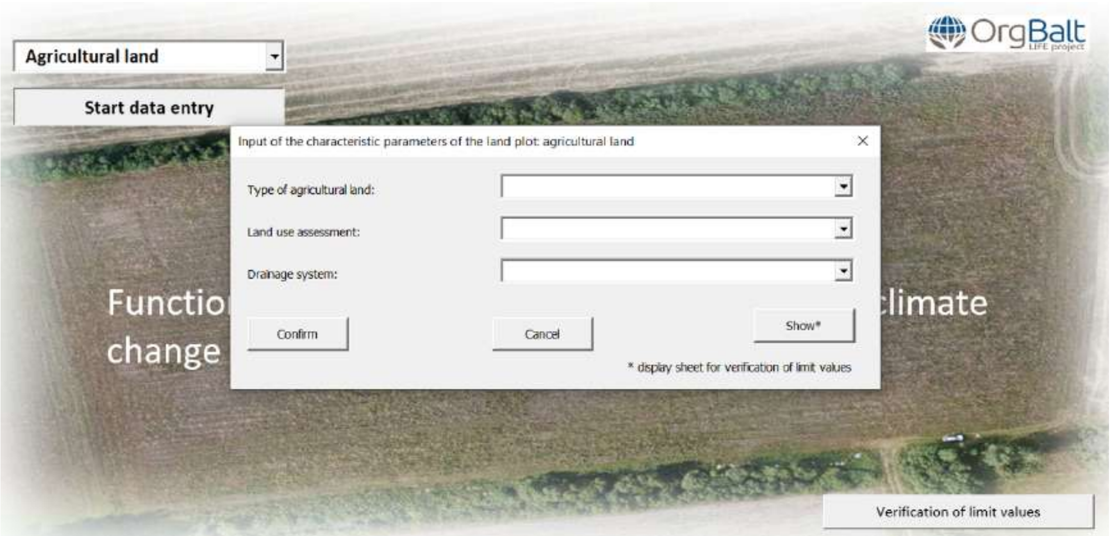

Figure 7. First level input data form for agricultural land.

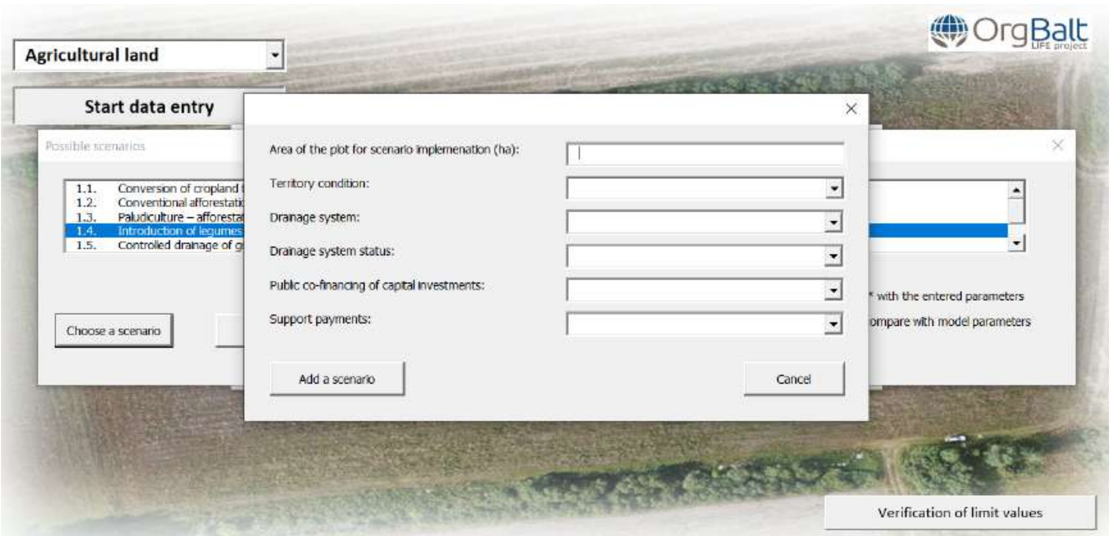

Figure 8. Second level input data form for scenario LVC304 (in agricultural land).

The PPC model generates output data that differs based on the different circumstances included in second level input data. Those results are applicable in a field or forest stand level. Therefore, in order to enable better understanding of the results, presentation of the model was more focused on demonstration of usability the model and interpretation of the output data, not on results of any particular case.

Results are generated for 6 periods of time: 5, 10, 25, 50, 100 and 200 years. Below is a table with some of the output data for the forestry scenarios for 200-year period as an example.

Table 1. Model output data for CCM measures on forest lands

CCM measures	Application of wood ash in spruce stand (LVC307)	Continuous forest cover as a forest regeneration method in spruce stand (LVC308)	Semi-natural regeneration with black alder without reconstruction of drainage systems (LVC309)	Riparian buffer zone in forest land planted with black alder (LVC311)	Forest regeneration (coniferous trees) without reconstruction of drainage systems (LVC312)	Strip harvesting in pine stand (LVC313)
Average investment costs (EUR)	2102,14	2102,14	1352,14	1352,14	1352,14	2102,14
Return on investment (years)	60,25	60,37	70,53	70,37	80,11	78,87
Reduction of GHG emissions (tons / year)	1,19	1,28	-1,02	0,73	1,05	0,12
FNPV (EUR) (real discount rate: 4%)	-848,83	-797,18	-2502,1	-1813,15	-1527,44	-939,34
ENPV: total value (EUR) (real discount rate 5%)	63214,03	77398,36	84250,76	65280,36	64404,13	78309,39
Revenue from sales of products (EUR)	1984,06	2664,84	1273,32	539,07	940,37	1998,84
Financing gap rate (%)	143%	93%	382%	259%	207%	101%

CCM measures	Application of wood ash in spruce stand (LVC307)	Continuous forest cover as a forest regeneration method in spruce stand (LVC308)	Semi-natural regeneration with black alder without reconstruction of drainage systems (LVC309)	Riparian buffer zone in forest land planted with black alder (LVC311)	Forest regeneration (coniferous trees) without reconstruction of drainage systems (LVC312)	Strip harvesting in pine stand (LVC313)
Decision amount (EUR) (Relative amount * funding gap rate)	2102,14	1955,77	1352,14	1352,14	1352,14	2102,14
GHG reduction costs (EUR / tons)	25,08	25,83	0	24,98	19,48	243,86

APPLICATION OF MODELS

Wide range of stakeholders were invited to evaluate emission reduction potential of different CCM measures using the tools elaborated by the project during the meetings, dissemination events, training and national workshops. There were two rounds of National workshops with 5 workshops in the first round and additional 9 workshops in the second round of workshops. Those were held in all project partners' countries, namely – Estonia, Finland, Germany, Latvia and Lithuania.

The second round of National workshops was done mainly in spring of 2024 and in some cases these events were combined with training workshops as described in the Project report No. 2024-C5/5. In total more than 500 participants have participated in these events. Those were stakeholders from ministries, municipalities, agencies and other governmental institutions, universities and other research institutions, different kinds of NGOs (including forest owners' and farmers' organizations) as well as companies.

Within the second round of workshops around 68% of participants were institutional representatives either from different ministries, universities, research institutions or other governmental entities (including government controlled or funded consultancy organisations). Second and third largest group of stakeholders were forest related NGOs (~8%) and agriculture related NGOs (~5,5%). All other groups of stakeholders, namely – forest owners, agricultural land owners, private sector, local communities and other stakeholders – were represented with 2,3-4,6% from the total number of participants. It should also be noted that significant number of participants would simultaneously fit in several groups of stakeholders. For example, many NGO representatives, especially forest owners' or agricultural land owners' union representatives, and also many representatives of different institutions, especially consultants, are simultaneously forest or agricultural land owners. Though each workshop had quite different composition of stakeholders.

Both of the developed models were sent to the following institutions, organizations, farmers and foresters for testing of these models: ZS Andrupēni, ZS Lazdiņi, Ltd Arosa – R, ZS Pūpoli, ZS Ozoliņi, Ltd Laflora, Ltd ASB Fabrika, Vaasan Oy, The Forest Research Station, Training and research farm "Vecauce", Latvian Rural Advisory and Training Center, Forest Advisory Services Center, The institute of Agricultural Resources and Economics, Estonian Environmental Agency, Estonian State Forest Management Centre RMK, Estonian Ministry of Regional Affairs and Agriculture, Estonian Peat Association, Tallin University, Estonian Chamber of Agriculture and Commerce, Ministry of Environment of the Republic of Lithuania, Chamber of Agriculture of the Republic of Lithuania, Lithuanian Soil Association, Ministry of Agriculture and Forestry of Finland, Vytautas Magnus University, Lithuanian Geological Survey under Ministry of Environment, State Forest Service of Lithuania, Lithuanian Agricultural Advisory Service, The Nature and Biodiversity Conservation Union (Germany), Halle-Leibzig integrative Biodiversity research centre, State Authority for Mining, Energy and Geology (Germany), Humbold University Berlin, Federal State Forestry MV Forestry office Neustrelitz, Thunen Institute Eberswalde, Grefswald Iniversity partner in Greifswald Mire Centre, AECO – private funded collaborative developer of European peatland restoration projects, Federal State Forestry MV Forestry office Poggendorf, Thunen Institute Braunschweig, Federal state department of Bavaria for the environment, Federal state department of Baden-Wurttemberg for the Environment, Federal state department of Brandenburg for the environment, Centre of Estonian Rural Research and Knowledge, Latvian Forest Owners' Association, Nature Conservancy Agency (Latvia).

Models are available online (Simulation tool - https://bioekonomika.lbtu.lv/orgbalt/; The PPC model - https://www.orgbalt.eu/?page_id=2761) to grant accessibility to wide range of stakeholders interested in sustainable use of organic soils and mitigation of GHG emissions from such soils. After the project they will be available in websites of LBTU, LLKC, Silava and the Project website for continuous testing and application. Partners that were in charge of developing the PPC model undertake to update the model data, as well as continue to advise users for at least in the Project after-life period.

FEEDBACK FROM PARTICIPANTS

There were surveys done to receive feedback from the workshops' audience on the CCM measures on organic soils and tools developed. Surveys were done at the end of most of the National and training workshops during the second round of workshops. It should be considered that situation in each country differs as well as audiences in each workshop were quite different.

Evaluation was done through a simple survey where participants were asked to evaluate the suitability of the measure for the drained peatland used for grassland/cropland/pasture and also rank the “Protection” measure appropriately according to their opinions. It was asked to do the evaluation for the period of 20 years and also take into account the establishment and maintenance costs of the listed measures.

Table 2. Summary of the survey results from workshops

Listed measures	Summarized results
Protection of intact peatland	16,22%
Conversion of annual crops to permanent grasslands	12,76%
Restoration of degraded peatlands	11,51%
Afforestation of former grassland/peatland	11,29%
No-till farming on grassland/cropland	10,16%
Paludiculture on former grassland/cropland	9,72%
Cover crops on cropland	9,57%
Wet grassland (water table 30 cm below surface)	9,53%
Adjustable drainage on grassland/cropland	9,24%

Although mainly results were quite consistent, there were several differences among countries. For example, Cover crops on cropland placed second in Finland with 15,1% and Wet grassland (water table 30 cm below surface) received around 12,1% in Germany placing third there. On the opposite, Restoration of degraded peatlands shared 7th and 8th position in Latvia with 9% and Conversion of annual crops to permanent grasslands was not considered as suitable in Estonia where it scored only 10,5% but still ranked 4th.

Additional survey was done in Germany where participants were invited to rate suitability of CCM measures for drained peatland from suitable (5) to not suitable (0).

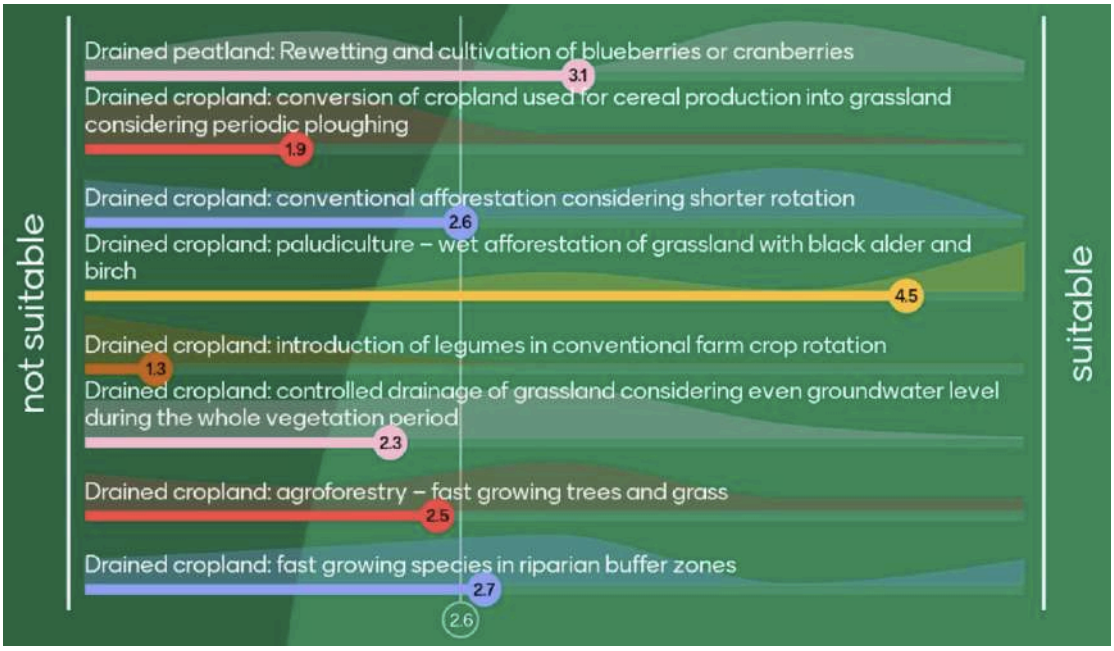

Figure 9. Results of the additional survey for drained arable peatland in Germany

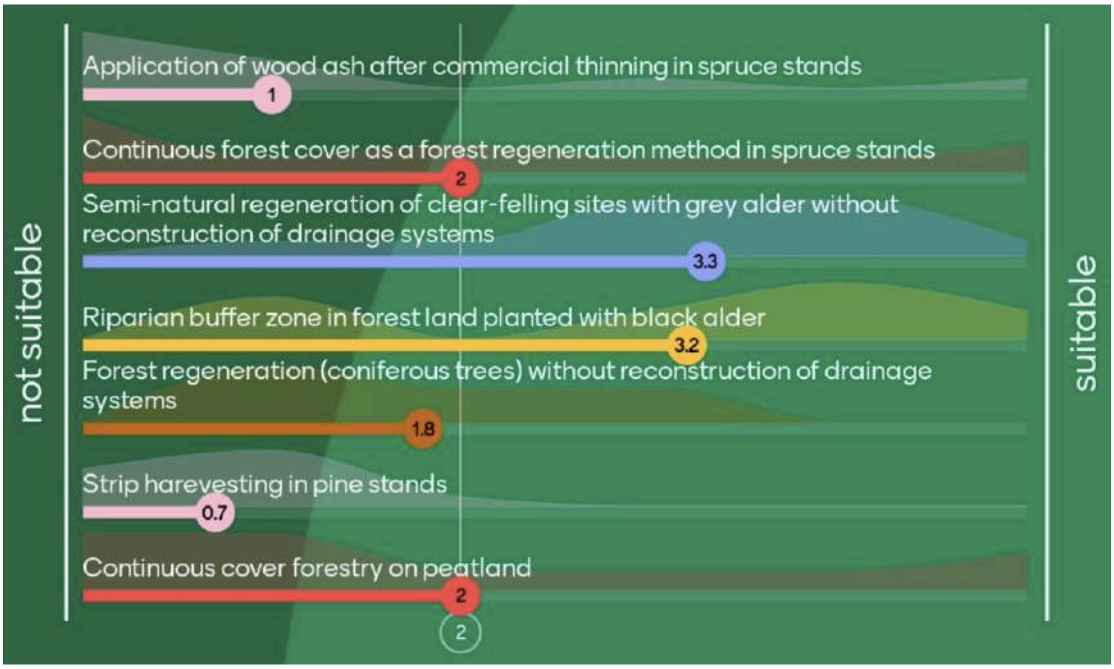

Figure 10. Results of the additional survey for forested drained peatland in Germany

Both these figures include information about the average score which is rather low and as communicated in many stakeholder events, including the project's Final Conference, the project was in its planning phase quite a long time ago. At that time understanding of different measures and their possible suitability for organic soils and GHG emission reduction was still in its developing phase.

CONCLUSION

The developed models were extensively tested across two rounds of workshops. In total 13 workshops were conducted, including 5 in the first round and 9 in the second round. These workshops took place in all partner countries – Estonia, Finland, Germany, Latvia and Lithuania – with participation from over 500 stakeholders representing various sectors such as ministries, municipalities, agencies, universities, NGOs, and private companies.

Both models were disseminated to a wide array of organisations for testing and application. Specifically, the models were sent to stakeholders from numerous organizations including governmental agencies, research institutions, advisory or consultation services, and universities across all partner countries. Additionally, models were made accessible online to broaden their reach and ensure their availability for wide range of stakeholders interested in sustainable land management and climate change mitigation.

The models provide a good insight and evaluation of the measures included in them both at the farm and national level. Though these models should be only considered as complementary tools providing indicative guidance on the costs and benefits of organic soil management choices under the assumptions and input data used in the algorithms (see model descriptive section and report on the models). They are not designed to be the only decision-support tools used.