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 BALTIC STATES AND FINLAND

MONITORING OF THE SOCIO-ECONOMIC IMPACT OF THE PROJECT ACTIONS (D2)

ACTIONS

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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.

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Abbreviations

CAP	-	EU Common Agricultural Policy
CCM	-	Climate change mitigation
EAFRD	-	European Agricultural Fund for Rural Development
EAFG	-	European agricultural guarantee fund
EBSA	-	Ecologically or biologically significant area
EIP	-	European Innovation Partnerships
LIFE OrgBalt	-	LIFE Programme Project "Demonstration of climate change mitigation potential of nutrients rich organic soils in Baltic States and Finland"
LULUCF	-	land use, land-use change and forestry
RDP	-	Rural Development Programme

SUMMARY

The implementation of the project "Demonstration of climate change mitigation potential of nutrient rich organic soils in Baltic States and Finland" (LIFE OrgBalt, LIFE18 CCM/LV/001158) (Project) includes analyse the achieved socio-economic development during the Project implementation.

The objectives of Action D2" Monitoring of the socioeconomic impact of the Project actions" aims to monitor and evaluate of the socio-economic impacts of the Project activities and also identifying risks in general for the project implementation. To achieve the monitoring goal two main socio-economic monitoring tasks are carried out: Evaluation of socio-economic effects of implemented CCM measures in demo sites and assessing socio-economic effects of the Project outcomes in policy planning. The Project will provide information on quantitative assessment of CCM effect, which is mandatory for implementation of the measures within the scope of RDP and LULUCF action plans.

All demonstration sites (13 in Latvia and 3 in Finland) and reference sites are established (in total 36 sites) with the aim to demonstrate the climate change mitigation potential of the specific mitigation practices to be implied in nutrient –rich organic soil management by considering cost-effectiveness.

This report provides the description of the demonstration sites in the context of the information that the project will gather to assess the impact of the project and outlines the methodology for the analysis of the socio-economic factors influenced by the project outcomes and their impact on the policy making processes.

Accordingly direct socio-economic effects of implemented CCM measures in demo sites will be measured by analysis of demo sites, for example: investment, expected returns, employment, costs for territory establishment; awareness and knowledge raising, behavioural changes, etc. But to assess socio-economic effects of the Project outcomes in policy planning several indicators has been set in based on Project results, as well as stakeholder and society involvement will be analysed, for example: stakeholder involvement, they expectation regarding Project results, etc.

The assessment will be carried out by a questionnaire for pilot site owners and operators developed to assess the criteria. Additionally, qualitative information will be provided by Project partners, who are responsible for the sites. The qualitative information will be the main source of assessment of the second group of criteria, the effect of the project on the policy planning.

Additionally, the socio-economic benefits model is developed and calculated during the Project. Within it the exact values of the mentioned indicators will be analysed and the feasibility of the investments will be calculated. The data collection process will be carried out to look at the changes over the Project timescale and thus come to conclusions regarding the sustainability of the pilot sites, their owners' and managers' motivation and capability to run the sites in the long run, and their dissemination potential towards other land owners.

The monitoring will be carried out continuously until the end of the Project. The monitoring of socio-economic benefits will be initially assessed till the end of 2021 and bi-annual monitoring meeting in the sites will be planned in 2022 and 2023. The monitoring of project effects on policy planning will take place continuously through the monitoring process. Stakeholders in all project partner countries will be interviewed within this process.

1. SOCIO-ECONOMIC MONITORING APPROACH

1.1 Indicators and criteria

According to the Project proposal and planned Project activities it is assumed that the Project impact will be direct and also indirect. The land use change and adopted management practices will provide alternative options for using the existing properties for different purposes, therefore resulting in different varieties of crops and varieties creating alternative/supplementary income opportunities. At the community level, climate-smart land use development can possibly increase farm productivity, reduce food deficits, increase food surplus and raise incomes. To achieve the monitoring goal of the LIFE OrgBalt project two main socio-economic monitoring tasks must been done:

- To evaluate socio-economic effects of implemented CCM measures in demo sites.
- To assess socio-economic effects of the Project outcomes in policy planning.

Direct socio-economic effects of implemented CCM measures in demo sites will be measured by analysis of demo sites, for example: investment, expected returns, employment, costs for territory establishment; awareness and knowledge raising, behavioural changes, etc. The following sub-chapters list and describe the indicators in both groups.

Socio-economic effects of implemented CCM measures in demo sites

Six main criterions have been identified to analyse direct Project socio-economic impacts (refer to Table 1). To gather data and to evaluate changes information will be obtained at least twice per year to analyse present situation and changes that will occur during Project implementation phase.

Table 1. Socio-economic effects of implemented CCM measures in demo sites (source: LIFE OrgBalt project proposal and Report No. 2019-A1|1-1).

Criteria	Indicators
Income	• Agriculture and forestry production • Gross value • Other income • Income from quota or other public funding
Territory establishment and investment costs	• Seeds and planting costs • Soil preparation • Ploughing • Levelling • Manuring • Harvesting costs
Maintenance costs	• Maintenance of established culture • Repair and maintenance costs
Other costs	• Lease/rental payments • Other payments (variable/non-variable costs) • Capital costs
Employment	• Engaged employee • Total hours worked per year • Personnel costs • Unpaid labour • Outsourcing services used, outfitting

Ecosystem services	• Availability of ecosystem services. • water quality, carbon sequestration, biodiversity maintenance in habitats, nutrient cycling • forest goods & wildlife management. • Landscape, experience.

The economic criteria are derived from the cost-benefit analysis approach of investment projects. The data obtained will also serve as an input for the cost-benefit assessment carried out within the LIFE OrgBalt activity on development of private-public partnership model. Ecosystem services is another important group of indicators and include a wider array of components. Such ecosystem services, as food or goods from the direct produce, are already included in the Income criterion, which assesses all potential income sources from the pilot territory. We define outfitting as the co-operation with other entities in land management, a typical example in the LIFE OrgBalt territory would be the long-term rent of a fraction of the land to another entity which takes up the management of the rented land plot together with all income generated from it.

Socio-economic effects of the Project outcomes in policy planning

Current Rural Development Plans (RDPs, Common Agriculture Policy strategic plans after 2021) and CCM action plans are selected in the Project as catalysts of the process of integration of the Project results, approaches and proposed measures in the decision and policy planning. The Project will provide information on quantitative assessment of CCM effect, which is mandatory for implementation of the measures within the scope of RDP and LULUCF action plans. To assess socio-economic effects of the Project outcomes in policy planning several indicators has been set in Table 2 – recommendations developed based on Project results, as well as stakeholder and society involvement will be analysed, for example: stakeholder involvement, they expectation regarding Project results, etc.

Table 2. Socio-economic effects of the project outcomes on communities and policy planning (source: LIFE OrgBalt project proposal and Report No. 2019-A1|1-1)

Criteria	Indicators
Policy planning	• Recommendations developed based on Project results • Developed documents related with the Project • Advisory for policy planning
Stakeholder and society involvement	• Involvement of private farmers and formation of cooperatives, outfitting, • Networks, groups of interest • Involved stakeholders • Transfer of knowledge • Awareness rising • Alternative land management and use practices • Behavioural changes • Social context: community and family life, health and security • Local and regional resources used, community infrastructure and services • Tourism potential, outdoor recreation resources, • Cultural heritage resources used

As can be seen in Table 2, the two main groups of criteria for assessment are Policy planning and Stakeholder and society involvement further than the direct involvement of the pilot site owners and managers.

1.2 Methodology

The objectives of the Action D2 – Monitoring of the socio-economic impact of the Project Actions are:

- to monitor the socio-economic impacts of the Project Actions for assessment of the success of the Project implementation.
- to evaluate the identified socio-economic impacts of the Project Actions in order to determine how their implementation has contributed to the Project objective to provide timely identification of the risks related to separate Actions or Project in general.

Within this Action two deliverables will be prepared:

1. Initial monitoring report on socio-economic impact of Project Actions.
2. Final monitoring report on socio-economic impact of Project Actions.

To achieve the goal several socio-economic monitoring tasks have to been done:

- To evaluate socio-economic effects of implemented CCM measures in demo sites.
- To assess socio-economic effects of the Project outcomes in policy planning.

According to the Project proposal the analysis of direct and indirect socio-economic effects will be performed within socio-economic monitoring assessment. Project-related direct socio-economic effects will be assessed to measure effects on people and communities that are directly related with Project activities and indirect socioeconomic monitoring indicators will measure overall effects on people and communities.

The assessment will be carried out by a questionnaire for pilot site owners and operators developed to assess the criteria in Table 1 (refer to Annex II). Additionally, qualitative information will provided by project partners, who are responsible for the sites. The qualitative information will be the main source of assessment of the second group of criteria, the effect of the project on the policy planning. The open-ended survey questions for the stakeholders in all LIFE OrgBalt partner countries are listed in Annex III.

Baseline values for the selected socio-economic indicators will be established during the inception phase, to ensure the possibility to compare the final indicator levels to the baseline by the end of the monitoring. As a result, the achieved socio-economic effect of the project will be analysed. The particular questions, which will define the baseline and the end result are listed in Annex II.

A survey is carried out at the beginning and at the end of the project focusing on exploring Project partners' and stakeholders' awareness, behaviour, and benefits, as well as the LIFE OrgBalt project results and impacts. The survey is semi-quantitative; thus a sample is chosen to cover the whole stakeholder group. It is planned to apply the compass method grounding on the study of stakeholder satisfaction. In addition to the survey the analysis of policy planning documents will be carried out in all project partner countries.

Additionally, the socio-economic benefits model is developed and calculated during the LIFE OrgBalt project. Within it the exact values of the mentioned indicators will be analysed and the feasibility of the investments will be calculated. The monitoring report will collect these data to look at the changes over the project timescale and thus come to conclusions regarding the sustainability of the pilot sites, their owners' and managers' motivation and capability to run the sites in the long run, and their dissemination potential towards other land owners.

The monitoring will be carried out continuously until the end of the LIFE OrgBalt project, i.e. July 2023. The monitoring of socio-economic benefits will be initially assessed till the end of

2021 and bi-annual monitoring meeting in the sites will be planned in 2022 and 2023. The monitoring of project effects on policy planning will take place continuously through the monitoring process. Stakeholders in all project partner countries will be interviewed within this process.

1.3 Data collection methods

The data collection will be handled in all Project countries where demo sites and direct implementation activities will be organised. To gather the data, several data collection methods will be used and both qualitative and quantitative data will be obtained. By analysing quantitative data, insights that can help better understand the audience can be uncovered. Qualitative data is descriptive, rather than numeric, data is less concrete and less easily measurable than quantitative data. But at the same time qualitative data helps explains the "why" behind the information quantitative data reveals.

The LIFE OrgBalt project scenarios can be divided in two groups. Part of the scenarios are implemented in forest land and the other part in agricultural land. Scenarios in each of the two groups share similar characteristics, therefore the indicator performance of the scenarios will be analysed based on this classification. The following chapter on Initial assessment provides more information of the pilot sites, which underlines the similarities within the two groups of the pilot sites.

To collect data, surveys will be prepared with standardised questions to gather quantitative and also qualitative data, that results could be compared between countries. If necessary, focus group discussion or interviews will be organised to gather more detailed results.

Data and information will be gathered also through desk research, especially regarding policy planning. This method represents an efficient and cost-effective way to capitalise on already existing knowledge, with no need to invest time and resources on designing new primary data collection surveys.

All Project partners will contribute to data collection by conducting data about situation in each country. The obtained data will be stored in the project management system of the partner in charge of the monitoring actions. Data sets will be stored in spreadsheet format. Open-ended interview transcripts and indicator assessment reports will be stored and available as documents.

2. INITIAL ASSESSMENT OF THE PROPOSED APPROACH

2.1 Stakeholders and ownership

Demonstration sites

In total 17 demonstration sites are included in the LIFE OrgBalt project. They are listed in Annex I. The forest management sites in Latvia are owned by the Public agency "Forest Research Centre", which is co-owned by the Project partners Latvian State Forest Research Institute "Silava" and Latvian University of Life Sciences and Technologies. The agricultural land sites in Latvia are owned by Latvian University of Life Sciences and Technologies. Additionally forest soil pilot projects are implemented in private farm "Andrupēni". Growing of legumes in the integrated cropping system is implemented in site owned by SIA "Latvijas grauds" and SIA "Jaunkaudzītes".

The forest land sites in Finland are owned by the private company UPM Forest and by the state forest company Metsähallitus Forestry Ltd. The project partner LUKE has an agreement with both companies on using the sites for research and demonstration until December, 2026, with an option to prolongation.

According to the report "Demonstration of climate change mitigation measures in nutrients rich drained organic soils in Baltic States and Finland", No. 2020-C.1.1-1. the scientific environmental results in demonstration objects are in most cases compared to the reference objects for GHG reduction actions. However, the performance of the reference objects is outside the scope of this report.

The direct stakeholders will be questioned on socio-economic effects of the implemented CCM measures on the demonstration sites.

Other stakeholders

Apart from the demonstration site owners, the other relevant stakeholders include the project partners: Baltic Coasts, Lithuanian Research Centre for Agriculture and Forestry, Ministry of Agriculture of the Republic of Latvia, Michael Succow Foundation, Germany and University of Tartu.

These stakeholders will be questioned on the socio-economic effects of the project outcomes of the project and the policy planning.

2.2 Geography and Characteristics of the Sites

The demonstration sites in Latvia are located in central, north – eastern and south – western parts of the country. The location of the demonstration sites is depicted in Figure 1. The description provides information about the planned activities in the sites, which characterises the main costs necessary for implementing and maintaining the scenarios. Therefore, this chapter provides insight in what cost items will be taken into account during the assessment. The description of the sites is taken from the LIFE OrgBalt report "Report on implementation of CCM measures in demo sites in Latvia", C3/2 (2021).

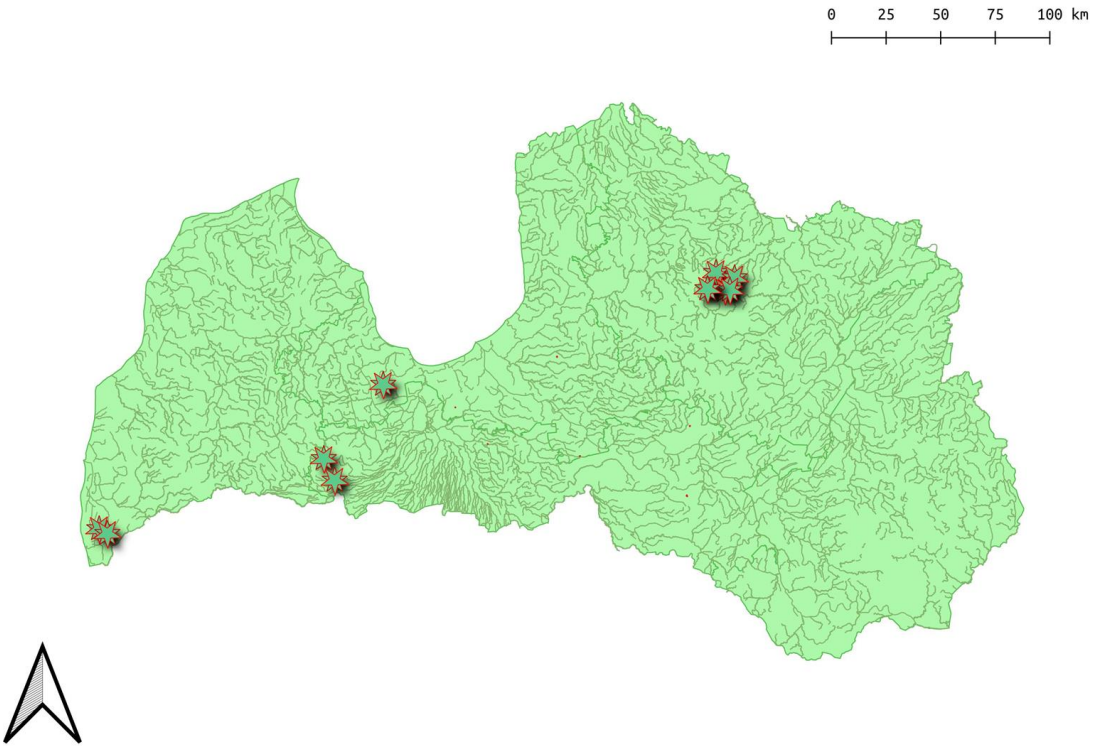
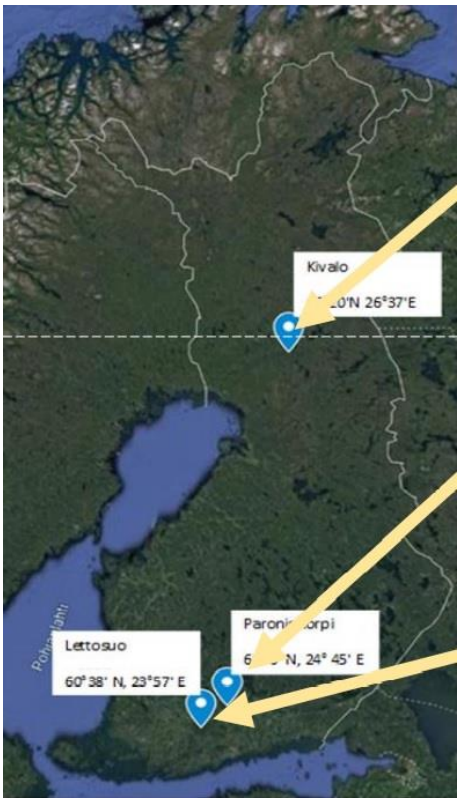


Figure 1. Location of the demonstration sites in Latvia (Source: LIFE OrgBalt project materials).

The 2 demonstration sites in Finland are located in the south and one site is located in the Northern part of the country. The location of the demonstration sites is depicted in Figure 2.



FIC303

FIC301

FIC302

Figure 2. Location of the demonstration sites in Latvia (Source: LIFE OrgBalt project materials).

Sites LVC302, LVC303, LVC307, LVC308, LVC309 and LVC311 are located on the land managed by Public agency "Forest Research Centre". Sites LVC306, LVC310, and LVC301 are located in private farm "Andrupēni". LVC305 will be implemented in the experimental education site "Vecauce", owned by Latvian University of Life Sciences and Technologies, and demonstration of LVC304 will be carried out in two farms, SIA "Latvijas grauds" & SIA "Jaunkaudzītes". Finally the scenarios LVC312 and LVC313 will be carried out in the sites owned by Public agency "Forest Research Centre".

In Finland the demonstration of FIC301 and FIC302 will be carried out in the sites owned by private company UPM Forest. FIC303 will be implemented in the site of State forest company Metsähallitus Forestry Ltd.

The existing land use of **LVC 302** is a game animal feeding glade, planned land use – forest stand. Two compartments will be afforested. Total area of the compartment 024-4-1 is 4,21 ha and of the compartment 024-3-7 7,76 ha including already afforested area. Area to be afforested within the project activities in the compartment 024-4-1 is 1,5 ha, but in the compartment 024-3-7 4,5 ha.

The costs of implementation are related to planting and agro-technical cleaning activities, when all equipment installed in the site must be maintained (groundwater level measuring wells, photosynthetically active radiation measuring sensors, gas exchange measuring rings, footbridges, etc.).

The existing land use of **LVC 303** is a game animal feeding glade, planned land use – forest stand. total area of the compartment 031-1-1 is 1,8 ha, in the framework of the research the whole compartment is to be afforested.

The costs of implementation are related to planting and agro-technical cleaning activities, when all equipment installed in the site must be maintained (groundwater level measuring wells, photosynthetically active radiation measuring sensors, gas exchange measuring rings, footbridges, etc.).

The existing land use of **LVC 308** is forest stand, which will be cut in selective felling. The total area of the forest compartment is 2,97 ha, selective felling will be performed in the whole forest compartment.

The costs of implementation are related to the planned activities:

- cleaning of drainage diches along the demonstration site during the winter 2020.-2021 to ensure (if needed) optimal water runoff from the forest stand;
- marking of technological corridors (with 20 m distance) for selective felling during winter season 2020.-2021 to ensure preconditions for establishing of GHG exchange equipment;
- selective felling during winter period 2021.-2022. Felling residues should be placed into technological corridors;
- maintenance of drainage system in good technical condition.

The existing land use of **LVC 313** is forest stand, which will be cut in strip harvesting. The total area of the forest compartment is 2,1 ha, strip felling to be performed in 1,1 ha.

The costs of implementation are related to the planned activities:

- marking of technological corridors (with 20 m distance) for strip felling during winter season 2020.-2021 to ensure preconditions for establishing of GHG exchange equipment;

- strip felling in 1.1 ha during winter period 2021.-2022. Felled strip width 20 m, unfelled strip width 20m. Clear felling in winter season 2021.-2022. In 1,0 ha;
- Soil preparation (mounding method) in spring 2022 (clear felled and strip felled area). At least 1200 planting places ha-1. Dimensions of planting places – 60cmx60cm.
- planting of pine seedlings with qualified root system in spring 2022 by using plant protection products if needed;
- help-planting if needed and agro-technical (grass) cleaning during the first 3-5 years after planting by choosing the cleaning frequency by need.

In **LVC 309** the existing and planned land use is forest stand. The total area of the forest compartment is 0,74 ha, forest regeneration is planned in the whole area. The cost of the establishment of the pilot are related to the planned activities:

- mapping of technological corridors during winter season 2020.-2021 to ensure preconditions for establishing of GHG exchange equipment outside of technological roads. Distance between technological roads in clear felling area - 20 m;
- clear felling during winter period 2021.-2022. Felling residues to be put in technological roads;
- soil preparation (mounding method) in spring 2022. At least 1600 planting places ha-1. Dimensions of planting places – 100 cm x 100 cm;
- planting of black alder seedlings with improved root system or at least 50 cm long container plants in spring 2022;
- help-planting if needed and agro-technical (grass) cleaning during the first 3-5 years after planting by choosing the cleaning frequency by need.

In **LVC 307** the existing and planned land use is forest stand. The total area of the forest compartment is 2,48 ha. The cost of the establishment of the pilot are related to the planned activities:

- mapping of technological corridors during winter season 2020.-2021 to ensure preconditions for establishing of GHG exchange equipment outside of the technological roads. Distance between technological roads - 20 m (if there are no already established technological roads);
- thinning during winter period 2022.-2021. Felling residues to be put in technological roads. Stand basal area after thinning – in accordance to allowed minimal basal area after thinning;
- wood ash spreading in May –June 2021, the dose - 5 t/ha. Wood ash material – retained ash that is already carbonized (hardened). Wood ash spreading is to be coordinated with LSFRI “Silava” and spreading has to be done by LSFRI “Silava” assistance ensuring possibility to take ash samples.

In **LVC 312** the existing and planned land use is forest stand. The total area of the forest compartment is 4,05 ha. The regeneration is planned in the whole area. The cost of the establishment of the pilot are related to the planned activities:

- mapping of technological corridors during winter season 2020.-2021 to ensure preconditions for establishing of GHG exchange equipment outside of the technological roads. Distance between the technological roads - 20 m;
- clear cutting during winter period 2022.-2021. Felling residues to be put in technological roads;

- deep furrows establishment during spring 2022 to drain excess surface water and soil preparation with mounding method. Mounds – with large dimensions (100x100 m) and must be pressed with excavator bucket. At least 1200 planting places/ha.
- Planting of spruce seedlings with qualified root system or container plants in the whole site area during spring 2022, except the wet part of the site in the West direction where black alder seedlings with qualified root system or container plants should be planted.
- help-planting and agrotechnical (grass) cleaning during the first 3-5 years after planting – with frequency by need.

In **LVC 311** the existing and planned land use is forest stand. The total area of the forest compartment is 0,88 ha. The regeneration is planned in the whole area. The cost of the establishment of the pilot are related to the planned activities:

- mapping of technological corridors during winter season 2020.-2021 to ensure preconditions for establishing of GHG exchange equipment outside of the technological roads. Distance between the technological roads - 20 m;
- clear cutting during winter period 2021.-2022 in the whole site area or in 20 m wide stripe along the protecting zone of the Melnupīte river. Felling residues to be put in technological roads;
- deep furrows establishment during spring 2022 to drain excess surface water and soil preparation with mounding method. Mounds – with large dimensions (100x100 m) and must be pressed with excavator bucket. At least 1200 planting places/ha.
- Planting of black alder seedlings with qualified root system or container plants in the 20 m wide stripe along the river during the spring 2022. Spruce seedlings with enhanced root system or container plants to be planted in the rest of the site area;
- help-planting and agro-technical (grass) cleaning during the first 3-5 years after planting – with frequency by need.

The remaining the demonstration sites in Latvia are located in agricultural land.

Scenario **LVC 306** is planned in existing cropland, which will be converted into forest. The total area of the forest compartment is 2,7 ha, tree planting in 1,5 ha, including buffer zone along drainage diches. The costs of implementation are related to the planned activities:

- poplar hybrid planting and perennial grassland sowing and maintenance 1 year after establishing in 1,5 ha area;
- tree planting in lines in perpendicular to the diches in North-South direction. Distance to the diches from 1st and last plant in the row – 3,5 m, distance from the last line to the edge of the field or dich – 3,5 m. In these lines willows are planted in two rows. Distance between poplar lines – 3,5 m, distance between trees in line – 2 m.
- planting with poplar planting material adapted to the climatic conditions of Latvia and appropriate for organic soils. The length of cuttings – 150-200 cm, diameter of the thickest part – 2 cm, cuttings to be planted in the soil in the depth that corresponds to 1/3 of the cutting length;
- agro-technical (grass) cleaning once per vegetation season and help-planting at the beginning of 2nd vegetation season to ensure at least 90% success of the planting at the beginning of the 2nd vegetation season (end of June 2022);
- sowing of Festuca rubra or equivalent before poplar planting (at least 20 kg of seeds per ha).

In scenario **LVC 301** it is planned to turn existing cropland into grassland. The total area of the

site is 2,5 ha, grassland will be established in the whole area. The implementation costs arise from the planned activities:

- grass sowing in the whole site area;
- soil improvement in accordance with the best management practice for integrated farms – by using optimal sowing standard and mineral fertilization dose;
- regular (2-3 times/year) mowing of the grassland for hay or forage production.

In scenario **LVC 310** it is planned to turn existing cropland into tree plantation. The total area of the site is 2,7 ha, tree plantation – established in 0,4 ha including protection zone along the drainage diches. The implementation costs arise from the planned activities:

- establishment of poplar and willow plantation and maintenance 1 year after establishing in 0,5 +/- 0,2 ha (band of poplar hybrids and willows - 680 +/- 50 m and 110 +/- 50 m long willow band along poplar plantation perimeter) along drainage ditches;
- tree rows in parallel to drainage diches. Poplar plantations have to be established in a distance of 3,5 m from the edges of the drainage diches. Poplars should be planted in 3 rows with the distance of 2 m, plants placed in the form of chess boxes – meaning plant from the row no. 3 in front of the plant from row no. 1. Willows should be planted in 2 rows in the dich side looking from the plantation of hybrid poplar – distance among plants in the row – 0,5 m, distance among rows – 0,7 m. Distance between the center of two row willow plantation to row of poplar hybrids – 2,5 m. Willow plantation should be established along the whole perimeter of the site and in addition two row plantation to the West from the plantation of hybrid poplars;
- planting with poplar hybrid planting material adapted to the climatic conditions of Latvia and appropriate for organic soils. Length of the cuttings – 150-200 cm, diameter of the thickest part – at least 2 cm, cuttings to be planted in the soil in the depth that corresponds to 1/3 of the cutting length. Willow hybrid cuttings are suitable for Latvian climatic conditions and peat soils (Salix spp. male clones with scientifically proven suitability for cultivation in organic soils), the length of the cuttings – 20-25 cm, the diameter of the thinnest part – at least 0,8 cm, at least 3 dormant buds are present on the cutting, cuttings planted in a way that at least 3-5 long shoots are left above the soil level;
- removing of tree and bushed overgrowth in drainage diches, agro-technical (grass) cleaning during the first vegetation season and help-planting at the beginning of 2nd vegetation season to ensure at least 90% success of the poplar and willow planting at the beginning of the 2nd vegetation season.

The existing and planned land use of **LVC 305** scenario is grassland in total area of 2,26 ha. The costs related to implementation of the scenario arise from the planned activities:

- grass at the area of interest has been sowed 1 year prior to establishment of the controlled drainage demonstration site, therefore, no additional implementation activities related to vegetation cover are needed. If density and quality of the grass will decrease over time, repeated sowing of grass might be considered;
- installation of two water level control structures at the outlets of existing subsurface drainage systems. One water level control structure represents conventional (free) drainage conditions, in this case adjustable boards are removed to ensure discharge of excess water from the agricultural field. Another structure represents controlled drainage conditions, in this case adjustable boards are used to raise the groundwater level in the field and increase water retention and storage within the soil profile. Installation of water level control structures consist of digging a trench, levelling and preparation of a foundation, filling with supporting materials, establishment of

connection between structure and existing subsurface drainage system, retrofitting existing outlet;

- autonomous sensors for water pressure and temperature measurements, along with a sensor for measurements of atmospheric pressure are used at both water level control structures in order to quantify the amount of water leaving the fields.

Scenario **LVC 304** will be implemented in two sites. Both are cropland currently used for cereal growing, but legumes will be introduced in the crop rotation within the pilot. LVC 304a is 2,5ha and LVC 304b is 18ha. The costs of implementation are associated with the foreseen activities:

- area is managed in accordance with good practice guidelines for integrated farms, that uses legumes in crop rotation;
- legumes should be sawn at least once within the period of 24 months while measurements are performed (species and variety chosen by land manager). Legumes should be sawn in the part of area in 2021 and 2022;
- gas exchange measurement equipment is installed in the part of the area where legumes are grown in 2021. Equipment is placed in parallel to the technological roads to avoid disturbing of the site management. Another similar measurement plot is established in area where cereals (species and variety chosen by land manager) are grown in 2021;
- Measurements will be continued in 2021 and 2022. In area where in 2021 legumes are grown in 2022 cereals (species and variety chosen by land manager) should be sown, but in area where in 2021 cereals are grown – legumes (species and variety chosen by land manager) should be sown.

In Finland **FIC 303** is a forest of mixed stands, **FIC 301** is a spruce forest and **FIC 302** is a pine-dominated forest. FIC 301 is 3,5 ha, with planned clear-cut of 0,6 ha. FIC 302 is 16 ha and FIC 303 is 2 ha. In all pilots planned harvesting will be implemented, as well as the greenhouse gas measurement subplots established.

2.3 Income, Costs and Employment

The previous chapter identified the type of costs that the LIFE OrgBalt pilot sites will incur. These costs can be divided into scientific experiment costs and the costs of the establishment and maintenance of the. It is important to make a distinction between these types of costs, because only the latter type will be relevant to the land owners, who want to replicate the pilots in their own land plots. The particular amount of the costs will be assessed, as the pilots are being implemented. The questionnaire annexed to the report will be used for this purpose, refer to Annex II. Finally, it can be concluded that none of the scenarios will need extensive outsourcing or outfitting costs during the management process. The set-up of the site is not analysed for this purpose. All of the site owners will use their own workforce, tools, and technology to maintain the sites.

The income of the pilot sites is much more complicated, as most of the sites actually are not expected to generate direct and quickly measurable income. The forest sites will mostly add value through increased quality and thus value of the trees in the site. Such benefits will be monetised only decades after the implementation of the project. Calculations of the future income will be done based on the area and the species introduced in each of the sites. The felling and harvesting activities during the project are not expected to generate income, as the produce will not be sold, but rather consumed within the organisation of the respective land owners. Furthermore, those will be small amounts of produce compared to the long term produce of an established site.

However, most of the pilot sites are eligible to public funding subsidies both on forest and agricultural lands. The subsidies may reach up to 1085 EUR / ha according to the study carried out within LIFE OrgBalt project, “Proposal for PPC model and adopting of the Project results

in Rural Development Plan". The report provides detailed subsidy assessment for each scenario, which also will be used, when modelling the costs and economic benefits of each of the scenarios during the project.

Scenario LVL 304 with two sub-scenarios will have the most straightforward income data, as currently the land is used for growing cereals. After the pilot it will be used for growing legumes and cereals in rotation. Consequently income will be generated every year after the project. Scenario LVL 301 will require particular attention as the cropland will be used into forest land, reducing the annual income potential, but creating the potentially higher long-term value. Exact numbers will be gathered after the questionnaire will be filled by the site owners.

Finally, the pilot sites generate additional employment during the site preparation, however the sustainability of these positions depends on the nature of the pilot. More intensive job creation potential will be in those pilots, where the outcome is on agricultural land, as it usually needs annual intensive maintenance. If the land use does not change or the pilot foresees less intensive way of managing the land, new employment will not be caused by the project directly. However, it can be said with high certainty that the replication of the project results will cause new employment in other farms and organisations, which will take up the replication. To assess these numbers, a respective question will be included in the open-ended questionnaire of the policy makers and stakeholders.

2.4 Ecosystem services

Each of the pilot sites will clearly provide ecosystem services as a result of the project. The ecosystem services considered within this project are:

- water quality, carbon sequestration, biodiversity formation of habitats, nutrient cycling;
- forest goods & wildlife management;
- landscape, experience.

Given the framework of the project, all pilot sites will contribute to the reduction of the greenhouse gases and thus the carbon omission from the atmosphere. Apart from this straightforward achievement, it is expected that all sites will contribute the improved landscape. In many cases, especially when it involves felling and consequent afforestation it will be a lengthy process, which will take decades.

Restoration of wetlands, grasslands and planting of new forest stands will contribute positively to formation of biodiversity and habitats. Additionally, forests are supposed to produce forest goods, however it cannot be expected in substantial amounts in the nearest years in the new forest sites.

Finally, it can be mentioned that the landscape, in which scientific work is being carried out, is also an appealing landscape, and creates the feeling of trust and safety.

ANNEX I DEMONSTRATION SITES

#	Country Code	Owner / main stakeholder	CCM measure	CCM benefits
1	Latvia LVC303	Public agency "Forest Research Centre"	Paludiculture - afforestation of grassland with black alder and birch	Potential benefits of establishment of forest paludiculture in rewetted grassland: ✓ Reduced GHG emissions from soil due to improvement of water regime by mounding and establishment of network of shallow furrows to drain exceeding surface water ✓ Reduction of risks associated with natural disturbances in forests with wet organic soils ✓ Accumulation of CO_2 in living and dead biomass, soil and litter and replacement effect of forest biofuel and harvested wood products
2	Latvia LVC302	Public agency "Forest Research Centre"	Conventional afforestation considering shorter rotation	Potential benefits of afforestation: ✓ Reduced GHG emissions from soil ✓ Accumulation of CO_2 in living and dead biomass, soil and litter and replacement effect of forest biofuel and harvested wood products ✓ Shorter rotation and more intensified management ensure higher yield and replacement effect, as well as reduces carbon losses due to root rot and other disturbances
3	Latvia LVC308	Public agency "Forest Research Centre"	Selective harvest as alternative to clear-felling in spruce forest	Potential benefits of selective felling: ✓ Reduced CH_4 and N_2O emissions from soil due to avoiding of increase of the groundwater level after harvesting
4	Latvia LVC307	Public agency "Forest Research Centre"	Application of wood ash after commercial thinning in spruce stands	Potential benefits of wood ash application in forest on organic soils: ✓ Increased CO_2 removals in living biomass, dead wood, soil, litter and harvested wood products due to improved growth conditions and additional increment in living biomass
5	Latvia LVC311	Public agency "Forest Research Centre"	Planting of black alder on mounds nearby buffer zones of natural streams – forest paludiculture	Potential benefits of improved planting of black alder in riparian buffer zone: ✓ Reduced GHG emissions from soil due to improvement of water regime by mounding and establishment of network of shallow furrows to drain exceeding surface water ✓ Reduction of risks associated with natural disturbances in forests with wet organic soils

				✓ Accumulation of CO_2 in living and dead biomass, soil and litter and replacement effect of forest biofuel and harvested wood products
6	Latvia LVC309	Public agency "Forest Research Centre"	Regeneration of forest stand with wet organic soil by mounding and planting of black alder – forest paludiculture	Potential benefits of forest stand regeneration without reconstruction of drainage systems (from naturally wet or rewetted organic soils): ✓ Reduced GHG emissions from soil due to improvement of water regime by mounding and establishment of network of shallow furrows to drain exceeding surface water ✓ Reduction of risks associated with natural disturbances in forests with wet organic soils ✓ Accumulation of CO_2 in living and dead biomass, soil and litter and replacement effect of forest biofuel and harvested wood products
7	Latvia LVC306	Private, farm "Andrupēni"	Agroforestry - fast growing trees and grass	Potential benefits of agroforestry: ✓ Increased CO_2 removals in living biomass and soil ✓ Reduced GHG emissions from soil and replacement effect of woody and herbaceous biofuel and harvested wood products
8	Latvia LVC310	Private, farm "Andrupēni"	Fast growing species in riparian buffer zones	Potential benefits of fast-growing species in riparian buffer zones: ✓ Increased CO_2 removals in living biomass and soil ✓ Replacement effect of woody and herbaceous biofuel and harvested wood products ✓ Avoided nutrients leakage from farmlands
9	Latvia LVC301	Private, farm "Andrupēni"	Conversion of cropland used for cereal production into grassland considering periodic ploughing	Potential benefits of cropland conversion to grassland: ✓ Reduced GHG emissions from soil ✓ Increased carbon stock in soil and below-ground biomass ✓ Reduced risks of nutrient leaching and soil erosion
10	Latvia LVC305	Latvian University of Life Sciences and Technologies	Controlled drainage of grassland considering even groundwater level during the whole vegetation period	Potential benefits of controlled drainage: ✓ Reduced GHG emissions from organic soils due to reduced fluctuations of groundwater level ✓ Reduced leaching of nutrients to surface water bodies ✓ In summer drought additional water is available to meet crop demand ensuring higher carbon inputs into soil
11	Latvia LVC304	SIA "Latvijas grauds" & SIA "Jaunka	Growing of legumes in the integrated cropping system to increase carbon input and reduce N_2O emissions	Potential benefits of legumes in conventional crop rotation: ✓ Reduced N_2O emissions from soil reported in agriculture sector because of avoided mineral fertilizer application and gradual nitrogen input by symbiotic organisms ✓ Increased carbon input with plants ensuring

		udzītes".		increased soil carbon stock
13	Latvia LVC313	Public agency "Forest Research Centre"	Strip harvesting as alternative to clear-felling in pine forest	Potential benefits of strip harvesting: ✓ Reduced CH_4 and N_2O emissions from soil due to avoiding of increase of the groundwater level after harvesting in comparison to clear-felling
14	Latvia LVC312	Public agency "Forest Research Centre"	Forest regeneration (coniferous trees) without reconstruction of drainage systems	Potential benefits of forest regeneration with coniferous trees without reconstruction of drainage systems: ✓ Reduced GHG emissions from soil due to improvement of water regime by mounding and establishment of network of shallow furrows to drain exceeding surface water ✓ Reduction of risks associated with natural disturbances in forests with wet organic soils ✓ Accumulation of CO_2 in living and dead biomass, soil and litter and replacement effect of forest biofuel and harvested wood products
15	Finland FIC301	Private company UPM Forest.	Continuous cover forestry on peatland. Selective felling without full ditch network maintenance is implemented for studying forest regeneration and greenhouse gas fluxes in nutrient rich peatland spruce forest. Conventional clear cut and uncut plots are used as comparison.	Potential benefits of continuous forest cover forestry practices: ✓ Lower impact to environment conditions in forest stand ✓ Remaining tree stand evapotranspiration controls soil water-table ✓ Reduced/no need for ditch network maintenance ✓ Reduced change in soil CO2 emission after harvesting ✓ Reduced inputs of water and plant nutrients to surface water bodies
16	Finland FIC302	Private company UPM Forest.	Shifting to continuous cover forestry on peatland. Forest regeneration, soil greenhouse gas fluxes, and site water balance are studied following harvesting of overstorey pine and release of spruce-birch understorey. Conventional clearcut + ditch mounding + planting of spruce seedlings, as well as uncut forest, are used as control treatments.	Potential benefits of continuous forest cover forestry practices: ✓ Lower impact to environment conditions in forest stand ✓ Remaining tree stand evapotranspiration controls soil water-table ✓ Reduced/no need for ditch network maintenance ✓ Reduced change in soil CO2 emission after harvesting ✓ Reduced inputs of water and plant nutrients to surface water bodies

17	Finland FIC303	State forest company Metsähallitus Forestry Ltd.	Shifting to continuous cover forestry on peatland. Forest regeneration and soil greenhouse gas fluxes are studied following small gap harvesting and natural regeneration. Spruce shelter tree stand with advanced natural regeneration is used as comparison. Ditch network maintenance has not been applied in the study area.	Potential benefits of continuous forest cover forestry practices: ✓ Lower impact to environment conditions in forest stand ✓ Remaining tree stand evapotranspiration controls soil water-table ✓ Reduced/no need for ditch network maintenance ✓ Reduced change in soil CO2 emission after harvesting ✓ Reduced inputs of water and plant nutrients to surface water bodies

ANNEX II. QUESTIONNAIRE OUTLINE (DEMO SITES)

Criteria, Indicators, Questions
Income Questions at the beginning and at the end of the project for comparison: **1. What is the current amount of annual agriculture / forestry produce from the site? Specify by type.** **2. Are there any other parties apart from the site owner, who receive income from the operations within the site. Please, specify.** **3. What is the amount of external annual income of selling the produce?** **4. What is the amount of the subsidy income for the site?** **5. If there is any other income of the site, what is its annual amount?**
Territory establishment and investment costs Questions at the beginning and at the end of the project for comparison: **6. What are the annual seed and planting costs** **7. What are the annual soil preparation** **8. What are the annual ploughing costs** **9. What are the annual levelling costs** **10. What are the annual manuring costs** **11. What are the annual harvesting costs**
Maintenance costs Questions at the beginning and at the end of the project for comparison: **12. What are the annual maintenance costs of the established culture, if not covered in questions 5.-10.** 13. **What are the annual repair and maintenance costs of the site.**
Other costs Questions at the beginning and at the end of the project for comparison **14. What are the annual lease/rental payments associated with the site** **15. What are any other payments (variable/non-variable costs)** **16. What is the cost of capital, i.e. costs of bank financing, if applicable.**
Employment and outsourcing Questions at the beginning and at the end of the project for comparison **17. What is the average number of employees on the site, please, specify, if it varies by season. The answer may also be a fraction, in case no full work load is needed to establish and maintain the site.** **18. What are the total hours worked per year of the associated employees.** **19. What are the annual total personnel costs of the associated employees.** **20. How many unpaid labour hours are associated with the site annually.** 21. **What kind of outsourcing services are used to maintain the site, please identify the main contracts and prices.**
Ecosystem services Questions at the beginning and at the end of the project for comparison **22. Is the water quality currently assessed in the site? What are the last results?** **23. Has the carbon sequestration been assessed in the site? What are the last results?** **24. What is the degree of biodiversity in the site, describe the main habitats?**

25. **What are the agriculture or forest goods available in the site, not only for commercial use, but also for individual consumption. Can you estimate the amount?**
26. **Does the site include remarkable landscape and / or remarkable wildlife experience? Please, give examples.**

ANNEX III. OPEN-ENDED INTERVIEW OUTLINE (POLICY MAKERS)

Criteria	Indicators, questions
Policy planning	• Recommendations developed based on Project results • Developed documents related with the Project • Advisory for policy planning
Stakeholder and society involvement	Questions at the beginning and at the end of the project • Involvement of private farmers and formation of cooperatives, outfitting, • Networks, groups of interest • Involved stakeholders • Transfer of knowledge • Awareness rising • Behavioural changes **1. Mention the main 3rd parties, i.e. farmers, associations that might adapt the project scenarios in their land management practices. Characterise them, provide direct contact for follow-up at the end of the project. Mention synergising transfer of knowledge and awareness rising activities, which these parties would benefit from. Specify the 3rd parties which are expected to change their behaviour in the effect of the LIFE OrgBalt project.** • Alternative land management and use practices • Social context: community and family life, health and security **2. Mention alternative land uses for organic soils in respective territory. Explain the rationale of any mentioned use. i.e. economic, cultural, habit, lack of knowledge, other,** **3. Characterise qualitatively the monetary, health and other benefits, that the organic soil landowners gain.** • Local and regional resources used, community infrastructure and services • Tourism potential, outdoor recreation resources, • Cultural heritage resources used. 4. **After getting acquainted with the proposed scenarios, describe the potential socio-economic benefits for the region, i.e. exploitation of local resources, tourism, recreation, and cultural heritage related.**