



**Nutrients recycling and
pollution handling**



**Latvia University
of Life Sciences
and Technologies**

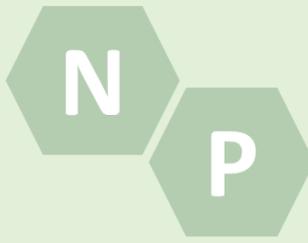
The Results of Monitoring Activities in the Demonstration Sites of the Lielupe River Basin - LATVIA

**The Community of members meeting
February 24, 2026
Rozmalas, Latvia**



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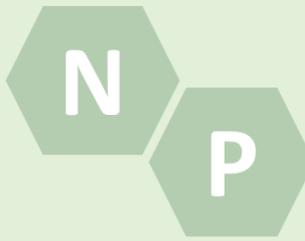


0 How the NENUPHAR project started?

The NENUPHAR project is a continuation of the collaboration and activities implemented within the LIFE GoodWater IP project - Implementation of River Basin Management Plans of Latvia towards good surface water status (<https://goodwater.lv/en/>).

In this project The Sewage Sludge Management Strategy 2022-2027 have been elaborated and approved by the government.





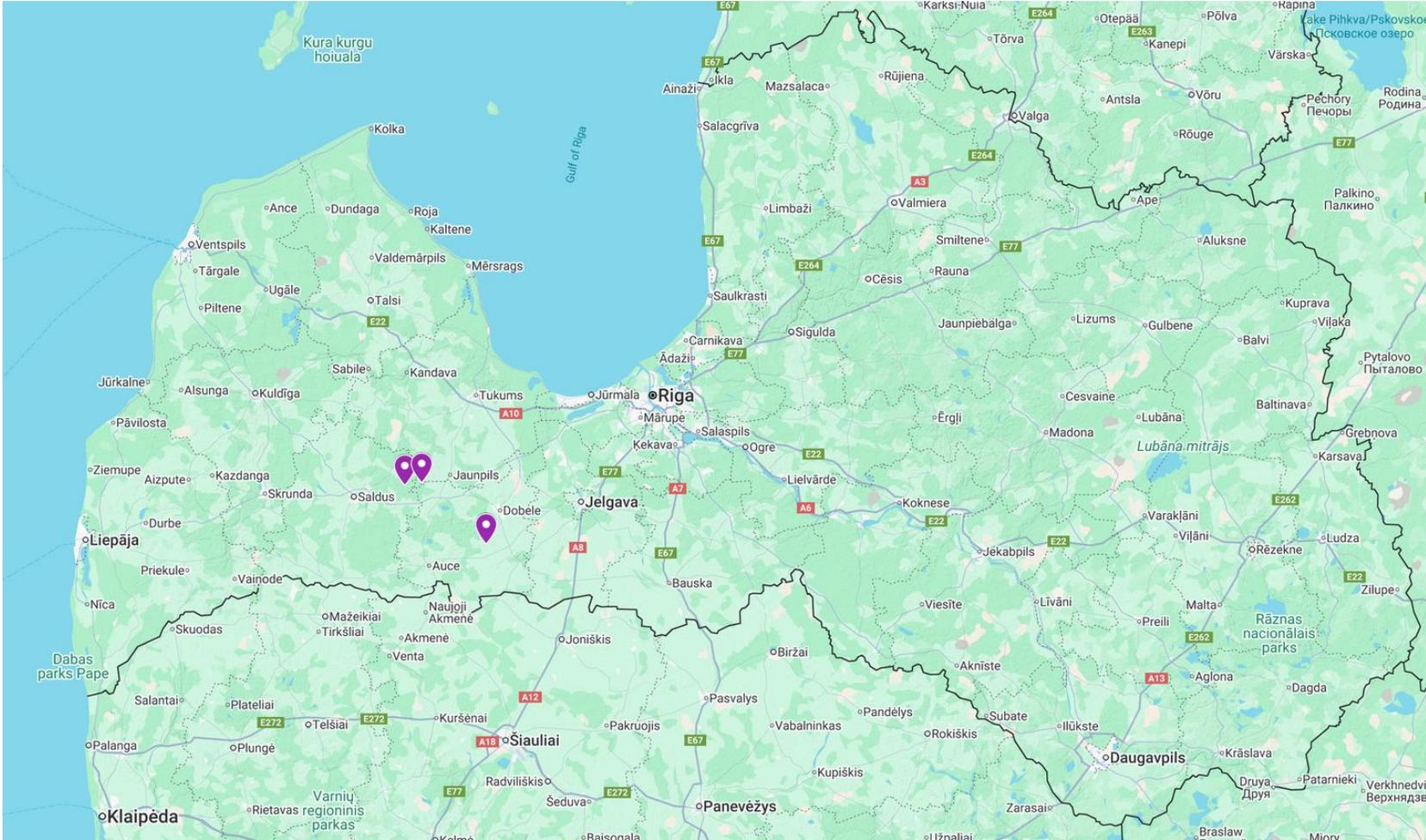
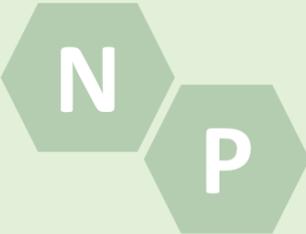
The criteria applied for selection of farms and demonstration sites:

- Location: Lielupe River Basin
- Number of farms: 3 farms in Latvia and Lithuania
- Field size: 10-30 ha
- Drainage systems: presence of a subsurface drainage system draining water from a specific field or part of a specific field with option to install measurement well
- No risk of flooding: the interactive map of flood hazard and flood risk developed by State Limited Liability Company "Latvian Environment, Geology and Meteorology Centre"



1

Selection of the farms and demonstration sites



Co-funded by the European Union

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Selection of the farms and demonstration sites

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	Farm 1	Farm 2	Farm 3
2024			
Application of compost – field size (ha)	8.4	8.7	6.2
Control – field size (ha)	12.3	8.6	9.4
2025			
Application of compost – field size (ha)	14.5	9.7	9.2
Control – field size (ha)	6.5	7.7	3.3



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The requirements are defined by the regulations of the Cabinet of Ministers No. 362 "Regulations Regarding Utilisation, Monitoring and Control of Sewage Sludge and the Compost thereof" for an average sample of the series of sewage sludge or compost:

- The mass concentration (mg/kg) of heavy metals - cadmium (Cd), chrome (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb) and zinc (Zn)
- Environment reactions (pH), organic matter (%), mass concentration (g/kg) of total nitrogen, ammonium nitrogen, total phosphorus in the dry matter, dry matter (%).



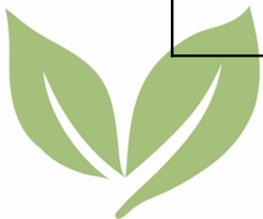


No requirements only the interest of the project partners:

- Agrochemical parameters –potassium, potassium oxide;
- Microbiological parameters – protozoan oocysts and helminth eggs, Clostridium perfringens count, Beta-glucuronidase positive Escherichia coli count, Enterococcus spp. count, Salmonella spp. presence, Salmonella serotype.



Heavy metals	Mass concentration limit for soil fertilisation in sludge and compost - mass concentration in dry matter (mg/kg)	Compost indicator established within the project - mass concentration in dry matter (mg/kg)	Compost indicator created within the project - mass concentration in dry matter (mg/kg)
		2024	2025
Cadmium (Cd)	10	1.00	1.08
Chromium (Cr)	600	141	86.5
Copper (Cu)	800	107	104
Mercury (Hg)	10	0.24	0.82
Nickel (Ni)	20	14.5	15.0
Lead (Pb)	50	58.5	49.1
Zinc (Zn)	250	469	447



Indicator	2024	2025	Unit of measurement
Dry matter	57.11	83.8	%
pH	7.95	8.19	
Ammonia nitrogen (N-NH ₄)	0.58	1.0	mass concentration in dry matter, g/kg
Total nitrogen (N)	21.2	22.6	mass concentration in dry matter, g/kg
Phosphorus (P)	15.0	7.19	mass concentration in dry matter, g/kg
Organic matter	51.6	47.5	% in dry matter





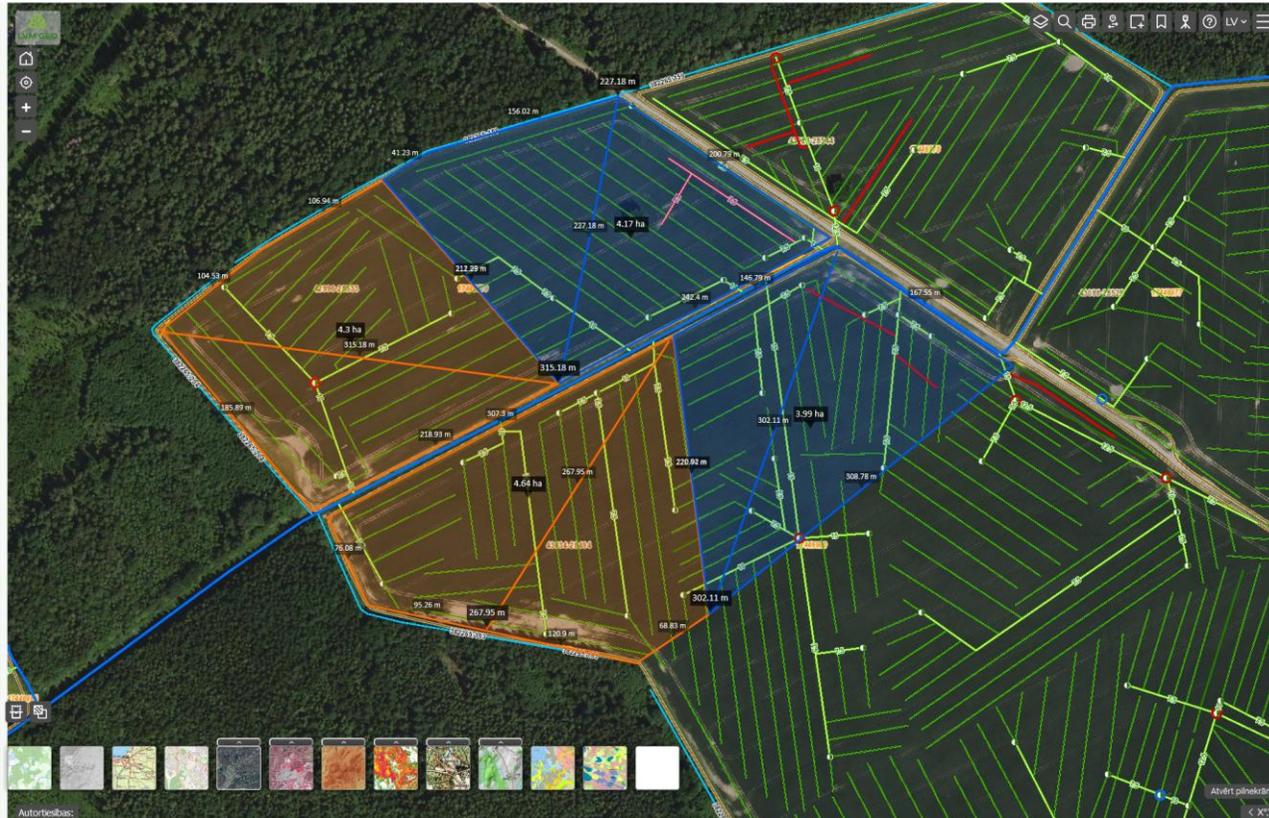
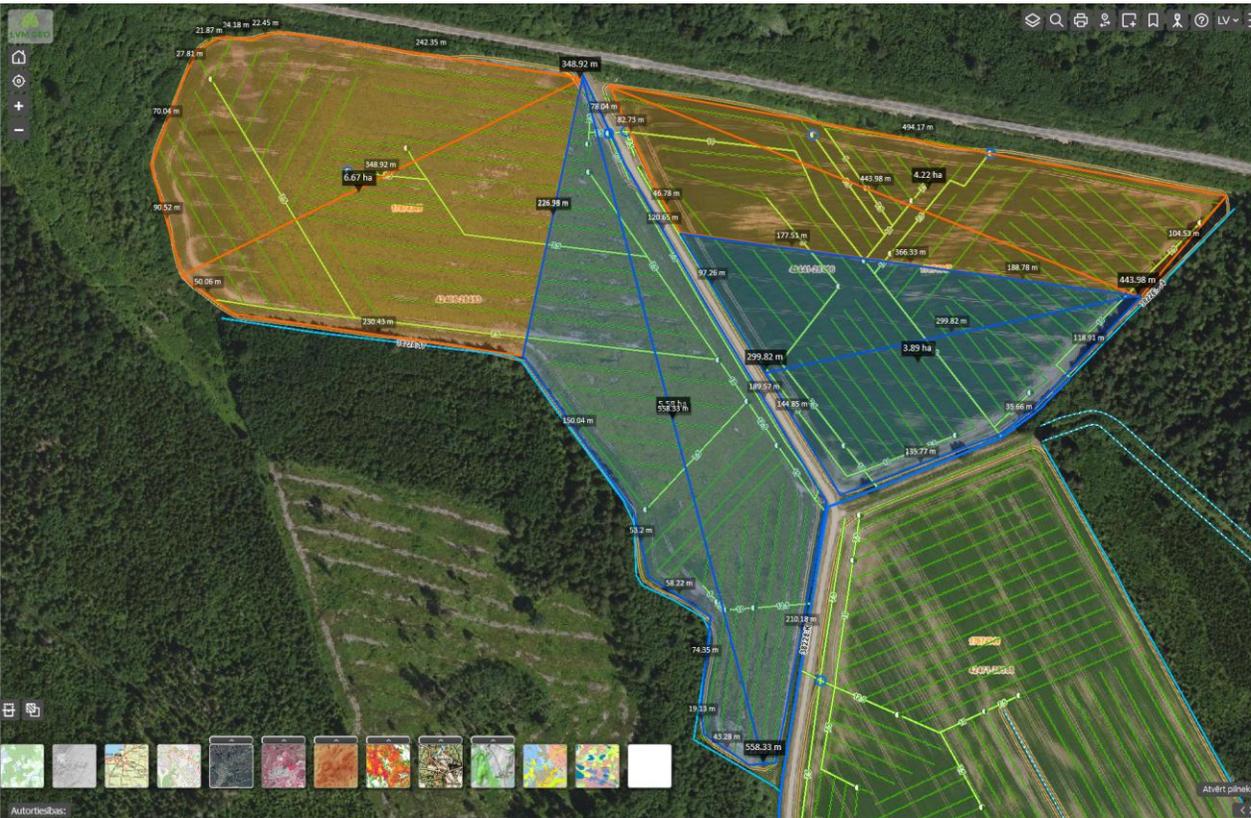
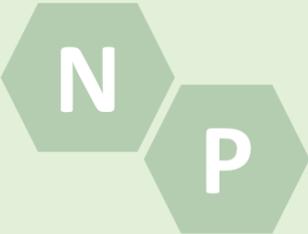
The requirements are defined by the regulations of the Cabinet of Ministers No. 362 "Regulations Regarding Utilisation, Monitoring and Control of Sewage Sludge and the Compost thereof":

- An average sample of the surface layer of soil shall be formed by mixing at least 25 individual samples taken from an area that does not exceed 5 ha
- The mass concentration (mg/kg) of heavy metals - cadmium (Cd), chrome (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb) and zinc (Zn)
- Environment reactions (pH).



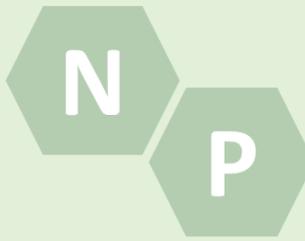
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Soil quality



Date	Site	Field	Sample	pH	Organic matter (%)	P ₂ O ₅ (mg/kg)	K ₂ O (mg/kg)	N-NH ₄ (mg/kg)	N-NO ₃ (mg/kg)
04.09.2024	Farm 1	control	1	6.8	4.6	52	262	2.2	10.9
28.03.2025	Farm 1	control	1	6.7	5.4	48	232	19.8	14.5
12.08.2025	Farm 1	control	1	6.7	4.7	73	190	27.0	9.0
04.09.2024	Farm 1	control	2	7.2	5.1	87	308	2.5	13.4
28.03.2025	Farm 1	control	2	7	5.7	61	229	8.1	17
12.08.2025	Farm 1	control	2	7.0	4.8	67	198	7.5	9.7
04.09.2024	Farm 1	compost	1	7.3	4.7	156	321	1.9	8.9
28.03.2025	Farm 1	compost	1	7.4	5.2	134	275	11.5	17.2
12.08.2025	Farm 1	compost	1	7.4	4.3	72	202	5.3	9.5
04.09.2024	Farm 1	compost	2	7.2	4.2	80	287	1.9	8.3
28.03.2025	Farm 1	compost	2	7.1	5.9	94	274	16.1	19.3
12.08.2025	Farm 1	compost	2	7.1	4.1	73	189	4.7	9.1





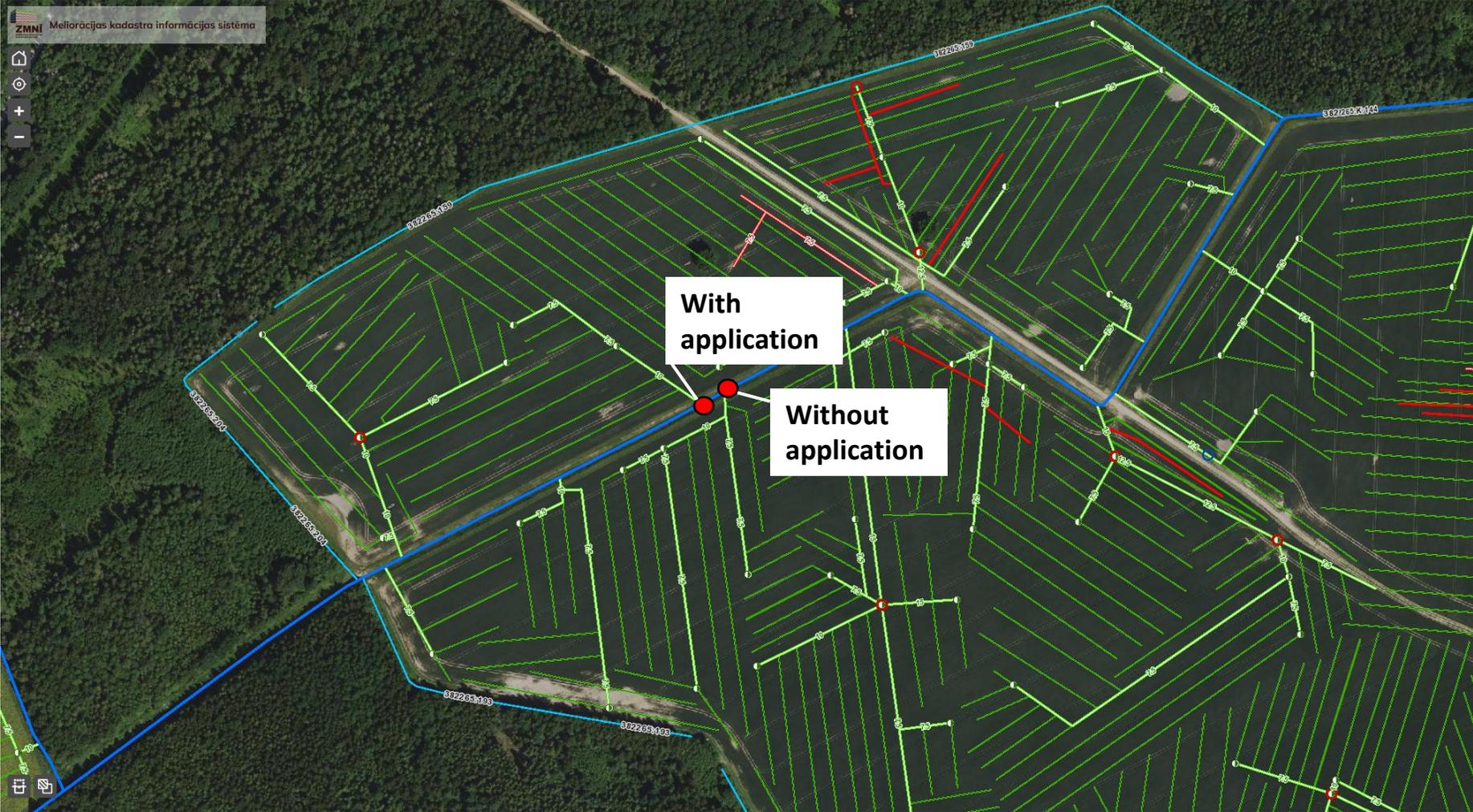
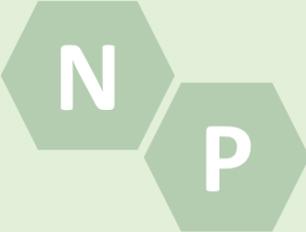
No requirements only the interest of the project partners:

- Water samples are collected at the outlets of subsurface drainage systems in the fields where composted sewage sludge is applied and adjacent fields without application (business as usual)
- Water samples are tested for pH and concentrations (mg/l) of total nitrogen (TN), nitrate nitrogen ($\text{NO}_3\text{-N}$), ammonium nitrogen ($\text{NH}_4\text{-N}$), total phosphorus (TP), and phosphate phosphorus ($\text{PO}_4\text{-P}$) at an accredited laboratory



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Water quality

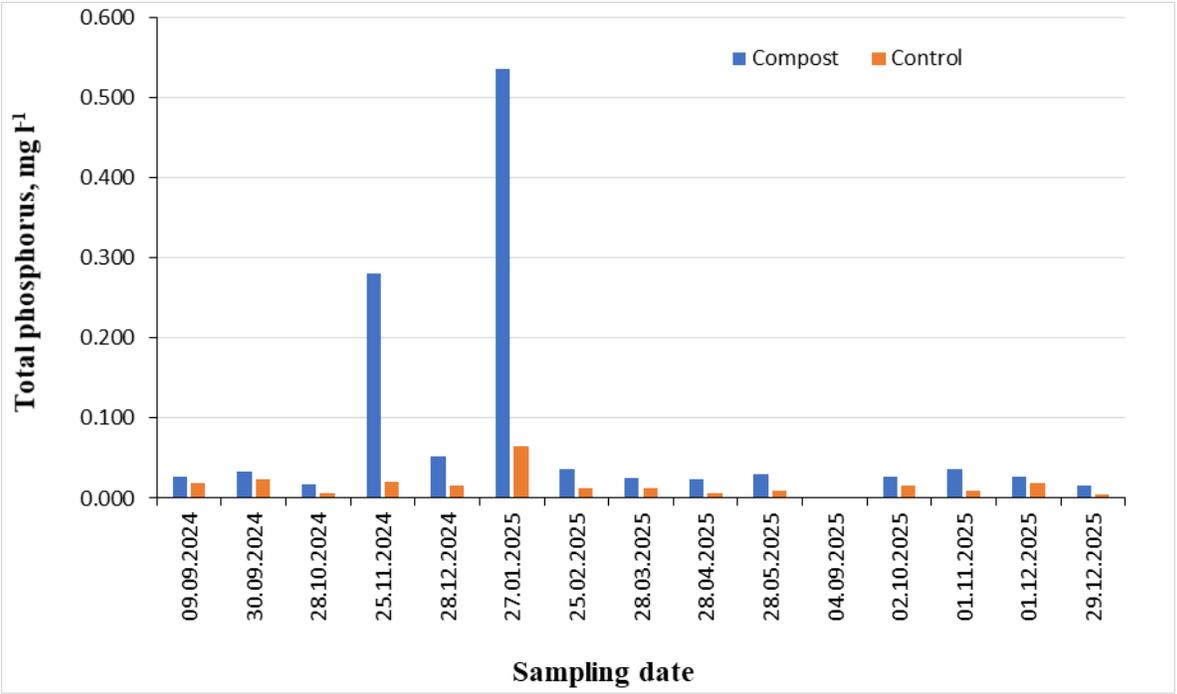
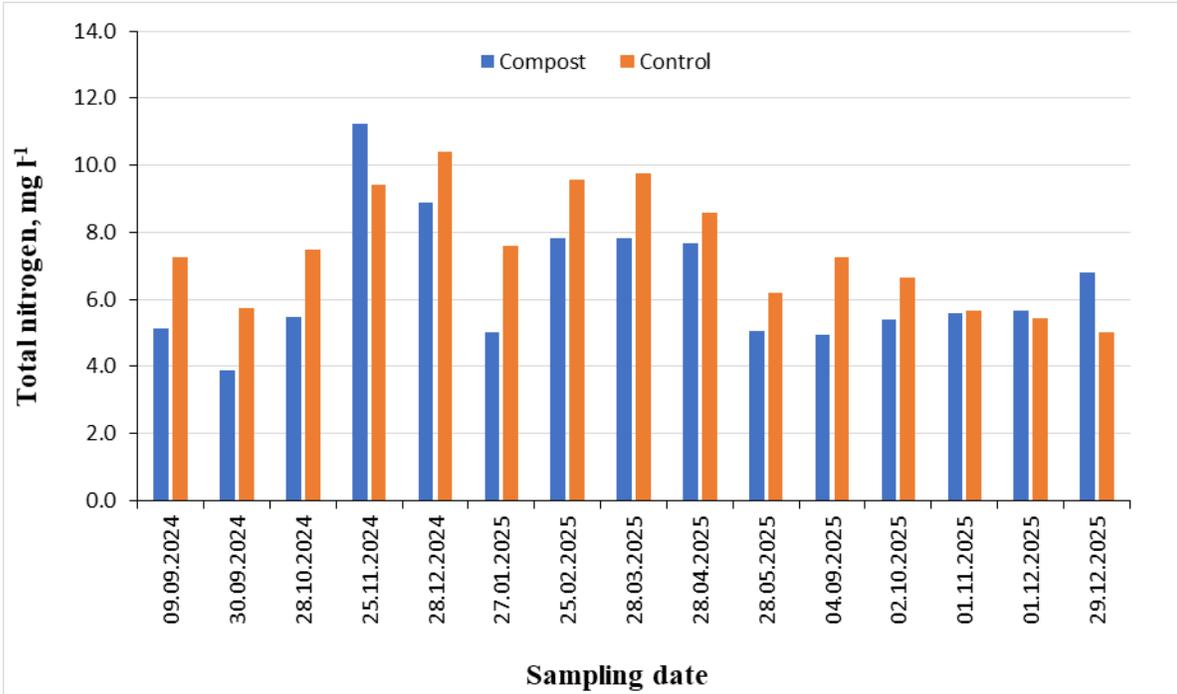
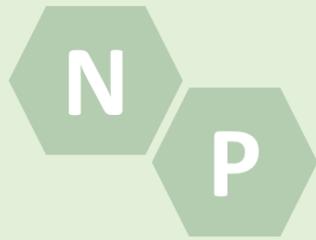


Site	Field	pH	PO ₄ -P, mg/l	TP, mg/l	NH ₄ -N, mg/l	NO ₃ -N, mg/l	TN, mg/l
Farm 1	control	7.8	0.018	0.024	0.006	8.1	8.4
Farm 1	compost	7.7	0.064	0.073	0.006	6.6	7.0
Farm 2	control	7.8	0.011	0.017	0.004	7.1	7.5
Farm 2	compost	7.7	0.074	0.084	0.006	5.9	6.4
Farm 3	control	7.2	0.040	0.050	0.003	13.0	14.3
Farm 3	compost	7.1	0.002	0.012	0.004	25.9	28.3



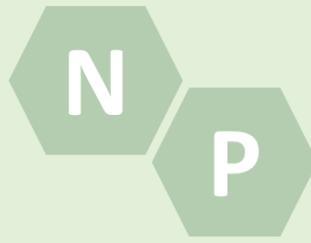
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Water quality – 2024 – Farm 2



Site	Field	pH	PO ₄ -P, mg/l	TP, mg/l	NH ₄ -N, mg/l	NO ₃ -N, mg/l	TN, mg/l
Farm 1	control	7.6	0.017	0.028	0.002	7.5	7.8
Farm 1	compost	7.6	0.009	0.012	0.001	13.8	14.6
Farm 2	control	7.3	0.012	0.023	0.008	7.1	7.9
Farm 2	compost	7.4	0.006	0.010	0.001	8.7	9.1
Farm 3	control	7.5	0.005	0.011	0.002	9.1	9.5
Farm 3	compost	7.6	0.006	0.012	0.004	11.5	12.0





No requirements only the interest of the project partners:

- Measurements of nitrous oxide (N_2O), methane (CH_4), carbon dioxide (CO_2) and ammonia (NH_3) are carried out using the Picarro G2508 gas analyzer in the fields where composted sewage sludge is applied and adjacent fields without application (business as usual)
- The measurements were carried out before, directly after, 1 h after and 21 days after application of composted sewage sludge at three locations in each field, as well as at three locations in fields without application



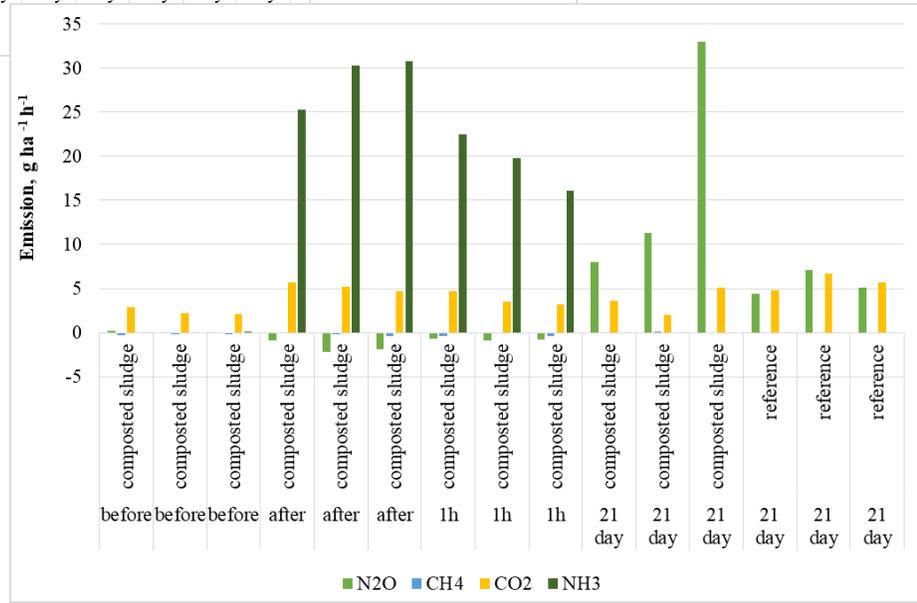
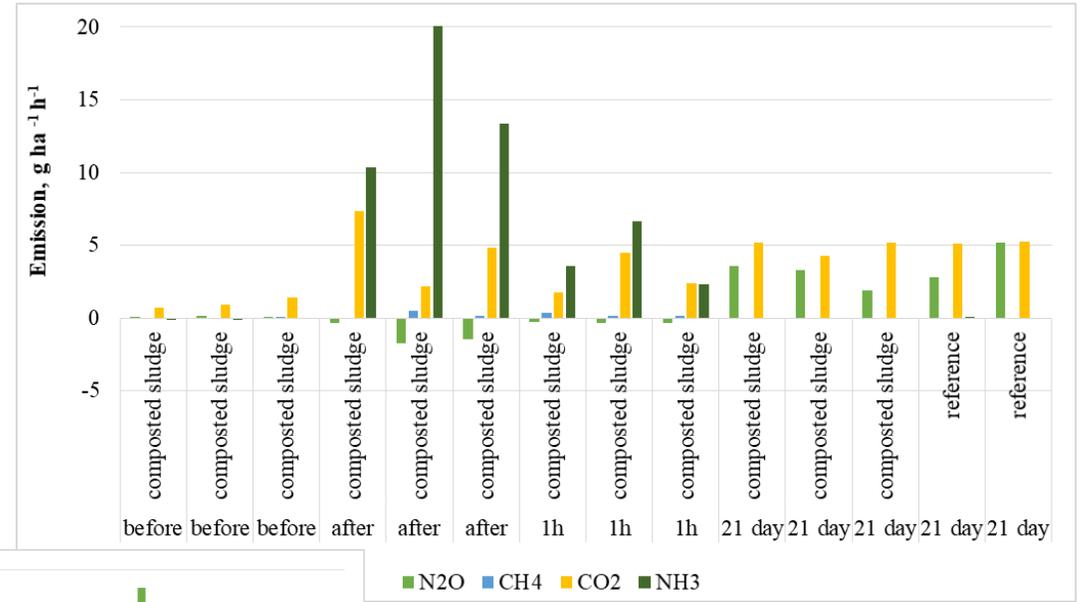
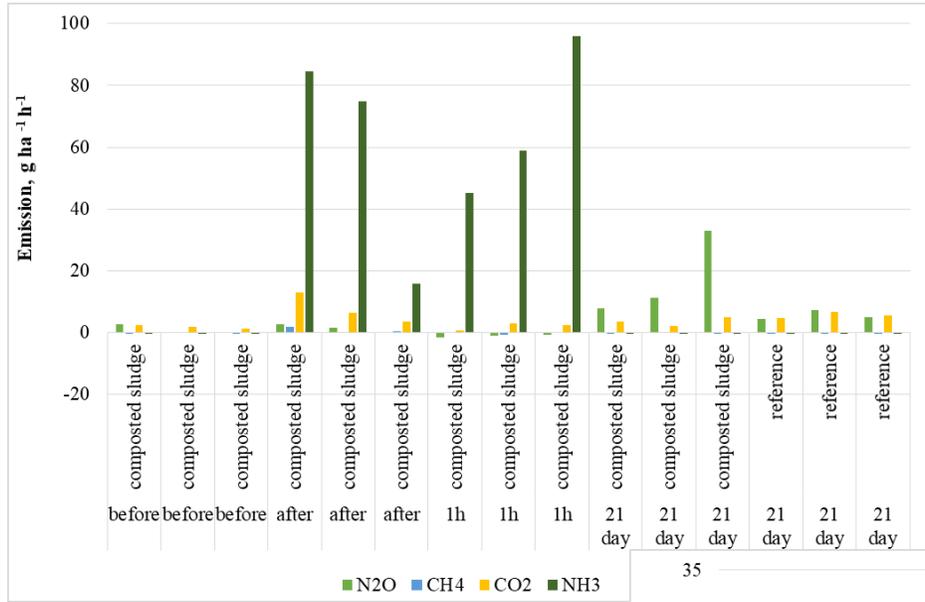
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Measurements of GHG



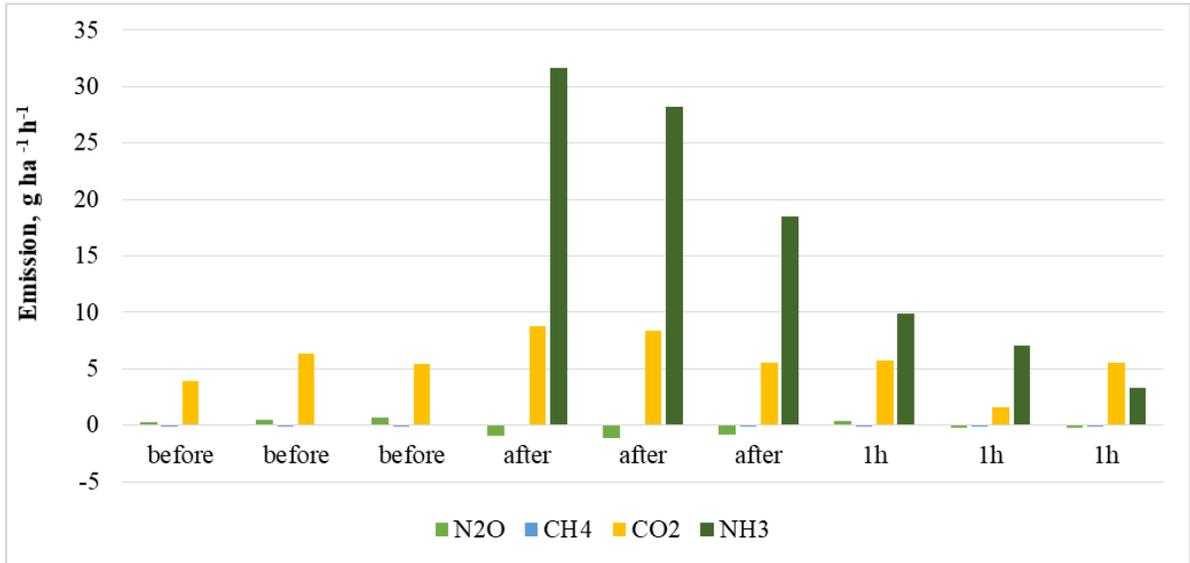
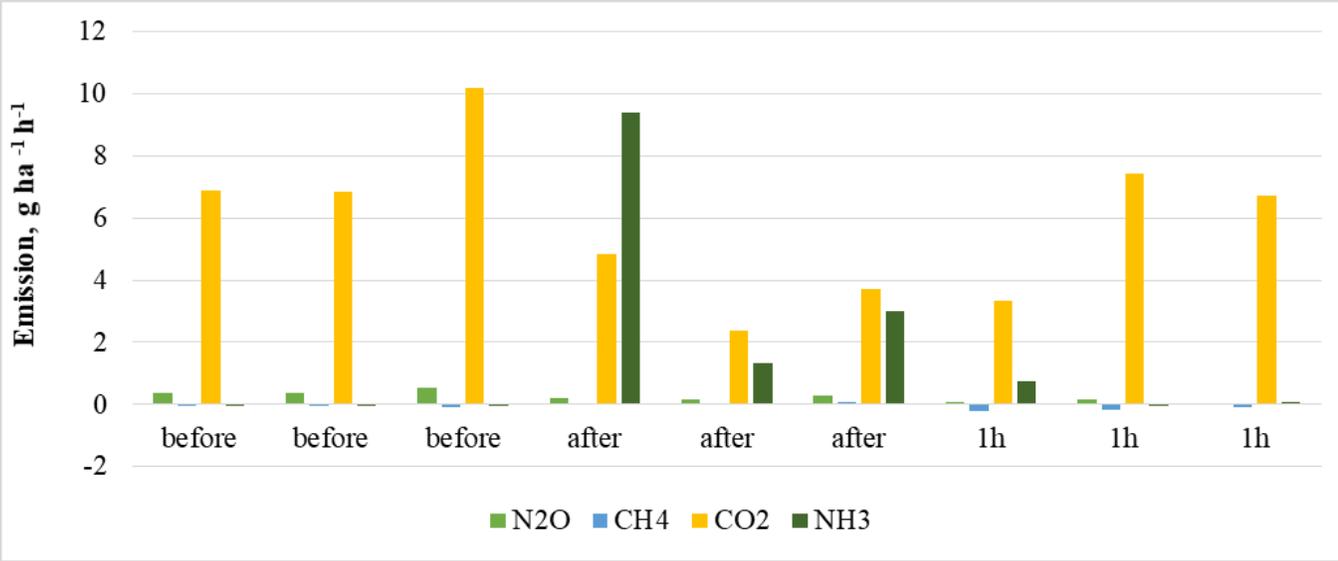
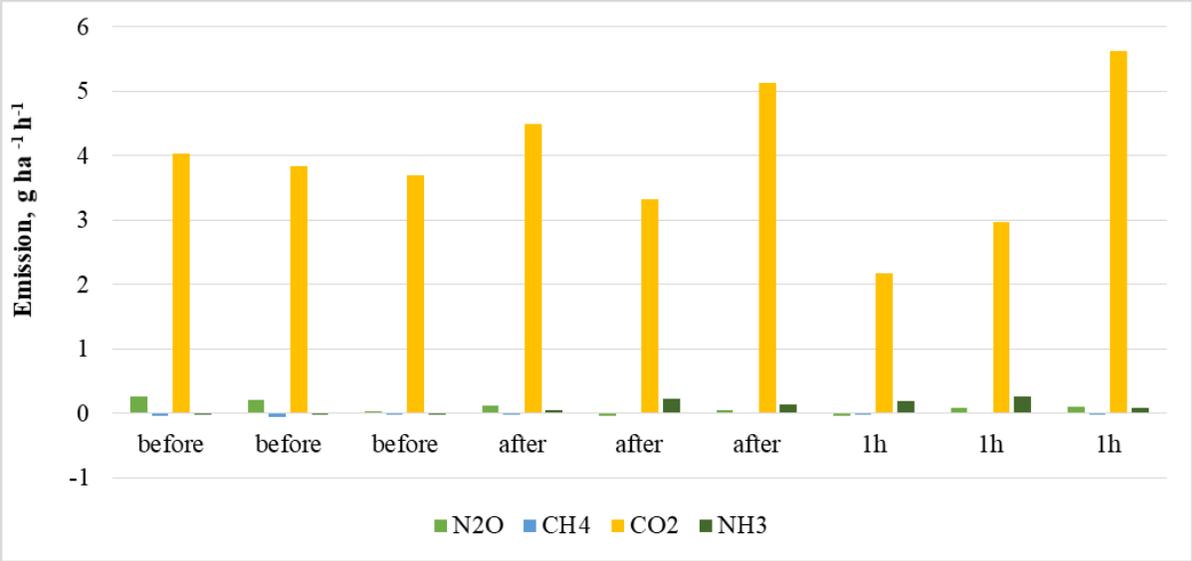
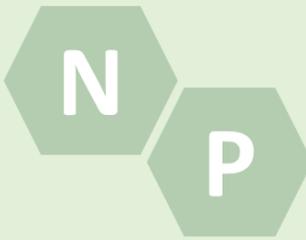
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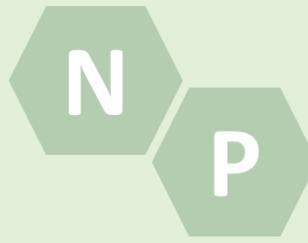
Measurements of GHG - 2024



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Measurements of GHG – 2025





- Install measurement wells at the outlets of subsurface drainage systems at six demonstration fields
- Continue water sampling and measurements of GHG and ammonia
- Collect and analyze soil samples in the spring (start of vegetation) and autumn (post-harvest) including heavy metals and agrochemical parameters
- Collect and analyze crop yield, straw and root samples heavy metals and chemical parameters





Thank you for your attention!

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