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Gdynia – Łeba 27-30.09.2021

LIFE17 ENV/LT/000407

Algae - economy-based ecological service of aquatic ecosystems

https://algaeservice.gamtostyrimai.lt/background-information/

Harvesting of wild algal biomass from Lithuanian freshwaters and testing for bioproducts within the framework of the project AlgaeService for LIFE

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Harvesting of wild algal biomass - WHAY?

HOW to harvest wild algal biomass?

WHERE / WHEN to harvest wild algal biomass?

WHAT are environmental benefits of wild algal biomass harvest?

WHERE to use harvested wild algal biomass?



Harvesting of wild algal biomass **WHAY**?



https://www.eea.europa.eu/highlights/eutrophication-remains-a-major-problem

According to the EEA assessment, **due to excessive availability of nitrogen and phosphorus** about 563 000 km² (~23 %) of sea and ocean areas have a eutrophication problem.

The situation is worst in the Baltic Sea where 99 % areas suffer from eutrophication.



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Harvesting of wild algal biomass WHAY? Stockholm U



One boom unit has the potential to harvest up to 700 kg dry weight of N. spumigena per hour.





Gröndahl, 2009 Pechsiri et al., 2014, 2021



Nodularia spumigena © Nordic microalgae and aquatic protozoa



Cyanobacterial bloom in the Baltic Sea, July 11, 2005. Satellite mage from NASA' s Terra satellite, MODIS instrument.



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Harvesting of wild algal biomass - WHAY?

Total load of nutrients into the Baltic Sea (2014)









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Daugpilis







Harvesting of wild algal biomass **WHAY**?



Declaration of the Ministers of Environment, Maritime Economy, Agriculture and Fisheries of Baltic Sea Member States and of the Commissioner for 'Environment, Oceans and Fisheries'

We AGREE that, without further steps and efforts to tackle those pressures immediately and effectively, we will not witness further improvement in the state of the Baltic Sea and of its coastal areas.

RECOGNISING that the legal objective to reach Good Environmental Status by 2020 as required by the Marine Strategy Framework Directive will not be achieved for the whole Baltic Sea and therefore **urgent additional efforts are needed**.

14. We COMMIT to continue to **address all nutrient inputs** at source with a **priority** on nutrients coming **from agriculture** but also taking into account domestic and industrial sources. RECOGNISE THE NEED to finalise the HELCOM Baltic Sea regional **nutrient recycling strategy** by 2021, and, ... to develop ... an integrated nutrient management action plan **promoting recyclability and ensuring sustainability of nutrients**,... **reducing the losses** of nutrients into the environment according **to the Baltic Sea** Action Plan ...



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Harvesting of wild algal biomass - WHAY?

Cyanobacteria and algae - BIOLOGICAL FILTERS





Declining water transparency and species diversity
Intensified sedimentation of organic matter
The decomposition of biomass consumes oxygen
Produces dangerous cyanotoxins

Kaunas Reservoir, Sestember 2020



Destroys aquatic vegetation,
Reduces habitat heterogeneity,
Reduces flow rate
Covering the bottom - negatively affects fish populations

River Jūra, August 2019



Harvesting of wild algal biomass - WHAY?



Immediate emergency actions are necessary!





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HOW to harvest wild algal biomass?



AS-S prototype-harvester











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HOW to harvest wild algal biomass?

AS-S prototype-harvester: macroalgae harvesting







Cladophora packed in a roll Video: A. Gedvilas, J. Drazdas





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HOW to harvest wild algal biomass?

AS-S prototype-harvester: cyanobacteria harvesting

Baltic GEnvironment







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HOW to harvest wild algal biomass?

AS-L prototype-harvester

– cyanobacteria harvesting in large aquatic eqosystems



Recent state of manufacturing



Technical information	Value	
Platform length	8500 mm	
Platform width	3440 mm	Ĵ Î
Height with pontoons	3250 mm	
Pontoons height	1050 mm	
Maximum draft	50 cm]
Weight	3500 kg	
Carrying capacity	3000 kg	
Pontoons type	M+	
Platform adapted to which categor	y C-D ¹	
waves and wind strength		
Platform type	Trimaran	
Number of pontoons	3]



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WHERE to harvest wild algal biomass?



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WHERE to harvest of wild algal biomass?



Conterence of the Polish and the Pol

Contemporary taxonomy of algae

WHERE to harvest wild algal biomass?





Nature Research Centre

in cooperation with external experts R. Skorupskas, A. Gedvilas





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WHERE to harvest wild algal biomass?





WHERE to harvest wild algal biomass?







in cooperation with Klaipėda University (Horizon 2020 project EOMORES)

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WHERE/WHEN to harvest of wild algal biomass?





from end of July

till October

WHERE? 5-6 zones

Critterence of the Policin Harding Call Society

Contemporary taxonomy of algae

WHAT are environmental benefits of wild algal biomass harvest?









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WHERE to use harvested wild algal biomass?

Macroalgal biomass



FERTILISERS





Macroalgal biomass shredded and mixed with cattle manure







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MACROALGAL BIOMASS TESTING AS FERTILIZER

WHERE to use harvested wild algal biomass?



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Nutrients (g/kg DW)

	Cyanobacteria	Macroalgae
Nitrogen	79.2 – 95.6 (av. 87.3)	14.6 – 41.5 (av. 26.9)
Phosphorus	4.5 – 6.6 (av. 3.3)	1.6 – 4.9 (av. 3.3)
Potasium	4.8 – 7.8 (av. 6.0)	32.5 - 60.0 (av. 49.6)

Heavy metals (mg/kg DW)

	Cyanobacteria	Macroalgae
Cd	0.012-0.022	0.055-0.170
Pb	<0.1-1.33	0.22-1.06
Cr	3.05-3.55	6.70-15.00
Zn	7.35-15.90	6.95-23.3
Cu	2.10-4.50	3.70-7.15
Ni	2.25-5.40	1.40-4.75

Testing in laboratory and greenhouse



Testing in experimental fields





WHERE to use harvested wild algal biomass?



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Antanina Ušinskienė et al. – POSTER No 31

LAB SCALE: testing of seed germination





GREENHOUSE testings





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WHERE to use harvested wild algal biomass?



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Dmitrij Morudov et al. - POSTER No 22



Testing in 4 m² experimental fields

- Two sets of testing fields
- Three sampling periods
- Growth and yield
- Soil quality

Experimental fields: Testing macroalgal biomass as slow-release organic fertilizers for barley





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WHERE to use harvested wild algal biomass?



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Phycocyanin extraction

Cyanobacteria biomass











ENERGETIC TREE PLANTATIONS



Control





Sewagesludge





Cyanobacteria biomass

+ Sewagesludge

INGRADIENT FOR ANIMALS FUNCTIONAL FOOD





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The project seeks to promote best practices in ecological service and the circular economics approach by implementing innovative complex system





August, 2021, Krakow

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LIFE17 ENV/LT/000407 A circular economy EU Life project: Algae - economy-based ecological service of aquatic ecosystems https://algaeservice.gamtostyrimai.lt/background-information/

Many thanks for colleagues from all partners teams

Alqae

for Lıfe

Service

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The content of this publication does not reflect the official opinion of the European Union. Responsibility for the information and view expressed therein lies entirely with the authors.

Thank you very much for the attention

Kaunas Reservoir, August 12, 2021