

# CONNECTING THE DOTS FOR A CIRCULAR BLUE BIOECONOMY

From science to policy and regulatory solutions

30 JANUARY 2024



## MARIGREEN

Sustainable utilization of MARine resources  
to foster GREEN plant production in Europe

## Barriers in the valorization of BLUE residues for the production of fertilizers and biostimulants



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## OUTLINE

- GENERAL OBJECTIVE
- OBTAINED RESULTS
- BARRIERS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817992.





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❑ Upgrading **poorly used residual materials** from the BLUE value chain (i.e., from fish capture, organic aquaculture, and seaweed industry)



**fish heads and backbones from clipfish industry**



**sludge from organic fish farming**



**seaweed residues from extraction processes**

by treating them using appropriate technologies to produce **fertilizers and biostimulants** for GREEN agriculture



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**GENERAL OBJECTIVE**



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- Selected **BLUE** residual materials based on their chemical composition, especially the content of macro- and micronutrients, fatty acids, amino acids:



- **fish** (cod, common ling, cusk) **heads and backbones**



- **rockweed** (*Ascophyllum nodosum*) **residues** from extraction processes

Maroulis, M., Matsia, S., Lazopoulos, G., Pârvulescu, O.C., Ion, V.A., Bujor, O.-C., Cabell, J., Løes, A.-K., Salifoglou, A. (2023) *Chemical and biological profiling of fish and seaweed residues to be applied for plant fertilization*. *Agronomy*, 13(9), 2258, 1–32.



- **fish sludge** from recirculating aquaculture systems (RAS)

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**OBTAINED RESULTS**





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## Selected methods/technologies for treating BLUE residues:

- drying
- grinding
- pelletizing
- composting
- extraction
- compost fermentation to obtain compost tea (CT)
- impregnation of biochar with CT



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**OBTAINED  
RESULTS**



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RESULTS

## ❑ Selected BLUE residue-derived fertilizers/biostimulants:

- **dried and ground fish** (cod, common ling, cusk) **heads and backbones**
- **pellets** obtained by mixing **cod bone powder** and **rockweed** (*Ascophyllum nodosum*) **residues**
- **BLUE residue-based compost (BRC)** obtained by thermophilic composting of marine residual materials (**fish bones and rockweed residues**) with **LECA** (lightweight expanded clay aggregate) **or woodchips**
- **compost tea (CT)** obtained by fermentation of **BRC**
- **biochar** (obtained by pyrolysis of wood residues) **impregnated with CT**
- **filter cake** from **fish sludge** resulting from recirculating aquaculture systems (RAS)
- **rockweed residue-based biostimulant**





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## Testing BLUE residue-derived fertilizers and biostimulants for plant cultivation

Moloșag, A., Pârvulescu, O.C., Ion, V.A., Asănică, A.C., Soane, R., Moț, A., Dobrin, A., Frîncu, M., Løes, A.K., Cabell, J., Salifoglou, A., Maroulis, M., et al. (2023) *Effects of marine residue-derived fertilizers on strawberry growth, nutrient content, fruit yield and quality*. *Agronomy*, 13(5), 1221, 1–19.



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OBTAINED  
RESULTS



- cod and common ling bone powder
  - pellets obtained by mixing cod bone powder and rockweed residues
  - compost based on fish and rockweed residues
  - rockweed residue-based biostimulant
- had positive effects on plant growth/development and can be more efficient and eco-friendly options



Moloșag, A., Ion, V.A., Pârvulescu, O.C., Dobrin, A., Bujor, O.C., Moț, A., Lagunovschi-Luchian, V. (2023) *Preliminary results of fish fertilizer effects on lettuce*. *Sci. Papers Ser. B Hortic.*, LXVII(2), 372–378.

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## BARRIERS

Material	EU Fertilising Products Regulation (FPR) 2019/1009	EU Organic Farming Regulation 2021/1165 (Annex II)
Fish meal	Can be used as inputs to <b>CMC3</b> (compost), <b>CMC5</b> (digestate), <b>CMC13</b> (ashes), subject to the composting/digestion/combustion processes	Authorised
Fish product aquaculture sludge	Can be used as such under the conditions of <b>CMC2</b> (plants and plant parts) and as inputs to <b>CMC3</b> (compost), <b>CMC5</b> (digestate), <b>CMC13</b> (ashes), <b>CMC14</b> (pyrolysis or gasification materials), subject to the composting/digestion/combustion/pyrolysis/gasification processes, if the processing of the seaweed was performed only by the means specified in these CMCs	Use as input to composts is authorised
Seaweed waste	Can be used as such under the conditions of <b>CMC2</b> (plants and plant parts) and as inputs to <b>CMC3</b> (compost), <b>CMC5</b> (digestate), <b>CMC13</b> (ashes), <b>CMC14</b> (pyrolysis or gasification materials), subject to the composting/digestion/combustion/pyrolysis/gasification processes, if the processing of the seaweed was performed only by the means specified in these CMCs	Authorised as far as are directly obtained by: (i) physical processes including dehydration, freezing and grinding (ii) extraction with water or aqueous acid and/or alkaline solution (iii) fermentation only from organic or collected in a sustainable way

### Component material categories (CMCs)

- CMC2.** Non-processed or mechanically processed plants, plant parts or plant extracts
- CMC3.** Compost
- CMC5.** Other digestate than energy crop digestate
- CMC13.** Thermal oxidation materials or derivatives (including ashes)
- CMC14.** Pyrolysis or gasification materials

### REGULATORY BARRIERS

- for fertilizers to be applied in **organic growing** - there is no regulation on acceptable additives and processing methods
- **dead fish** and **manure** from aquaculture and **filter cake** from **fish sludge** resulting from RAS - represent significant sources of nutrients, but are currently not allowed in **organic production** (except for **fish sludge based-compost**)

Collaboration between decision-makers and research and industry units is essential to develop/implement appropriate strategies to support the adoption of these new organic fertilizers and biostimulants



# THANK YOU FOR YOUR TIME AND ATTENTION!



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