


**LIFE+ TL-BIOFER - NUTRIENTS AND REGENERATED WATER  
RECYCLING IN WWTPs THROUGH TWIN-LAYER MICROALGAE CULTURE  
FOR BIOFERTILIZERS PRODUCTION**

**LIFE13 ENV/ES/000800**



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#### PROJECT DESCRIPTION:

##### BACKGROUND

Human activities can have a significant negative impact on the environment, particularly by affecting the global biogeochemical cycles of carbon, nitrogen and phosphorus. Water supplies to urban areas and subsequent sanitation and wastewater systems – even when conventional treatment occurs – produce enormous punctual loadings (point sources pollution) of nitrogen and phosphorus. Such water pollution leads to eutrophication, resulting in a loss of plant and animal species, along with negative impacts on water for human consumption and other purposes. Furthermore, marine ecosystems are similarly affected by excess nutrients and thus the impact of eutrophication extends beyond inland waters to coastal and oceanic regions, too. Advanced wastewater treatment facilities are thus vital to remove these nutrients and meet the main objective of the Urban Waste Water Treatment Directive (91/271/EEC). This directive established minimum requirements for waste water collection and treatment depending on the size of the agglomeration and the characteristics of the discharge area. Water pollution caused by wastewater persists despite three decades of attempts to address the problem and despite the requirements of the abovementioned directive. Current concentrations of orthophosphate and nitrate are still above 'background' natural levels.

##### OBJECTIVES

The LIFE + TL-BIOFER project aims to address the environmental problem of wastewater produced by small- and medium-size urban agglomerations. To meet this aim, the project plans to implement two actions. First, it will develop and demonstrate a wastewater treatment plant using a Twin-Layer (TL) system: an advanced nutrient removal technology based on immobilised cultivation of microalgae. In this technology, microalgae are immobilised by self-adhesion on a wet, microporous ultrathin substrate (the substrate layer). A second layer, which consists of a macroporous fibrous structure (the source layer), will provide and distribute the growth medium.

Secondly, the project also plans to address the shortage of P by developing produced and testing biofertilisers derived from the remaining microalgae. The fertiliser will meet high agronomical standards of sustainable farming as well as the requirements of current and future EU regulations. The trials will be conducted in microplots for two different crops in northern Italy and four different crops in Spain.

Expected results:

- Demonstration of the TWIN LAYER (TL) prototype for treatment of 12 m<sup>3</sup>/day wastewater from the secondary treatment along the two years of planned operation to produce a quality final effluent compliant with stringent requirements for discharge in sensitive zones (estuaries, reservoirs, protected areas etc.) according to the Urban Waste Water Treatment Directive, the general guidelines of the World Health Organization on water reuse and the Spanish Decree R.D. 1620/2007 on water reuse;
  - Total treated wastewater 7 300 m<sup>3</sup> during the project
- Uptake of 90-100% of nutrients (N and P) from wastewater (previous analytical shows total nitrogen content 38.33 mg/l, and total phosphorus content of 5.07 mg/l in treated wastewater from secondary treatment):
  - 248 to 276 Kg of N captured by microalgae during the project
  - 32.9 to 36.5 Kg of P captured by microalgae during the project;
- Development of a concept for transformation of TL microalgae harvested into a biofertiliser marketable product;
- Formulation and production of biofertilisers from microalgae:
  - Total amount of biofertilisers produced during the project: 20 000 kg; and
- At least three new products formulated from three biofertiliser lines with at least one product at commercial stage for each:
  - 300 l for suspensions/foliar product
  - 100 Kg for powdered product
  - 50 Kg for micro-granulated product.

## RESULTS

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## THEMES

Environmental management - Eco-products design  
 Waste - Waste use  
 Water - Waste water treatment

## KEYWORDS

fertiliser, eutrophication, waste water treatment, water reuse, sludge treatment

## NATURA 2000 SITES

Not applicable

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COORDINATOR	Biomasa Peninsular S.A.
TYPE OF ORGANISATION	SME Small and medium sized enterprise
DESCRIPTION	BIOMASA PENINSULAR is a Spanish company specialised in the treatment and recycling of biowaste and organic by-products, the production of compost and organic fertilisers, and the production of solid and recovered biofuels.
PARTNERS	UoC(UNIVERSITY OF COLOGNE), Germany EMPROACSA(EMPRESA PROVINCIAL DE AGUAS DE CORDOBA S.A), Spain BIO-LOGIC(BIO-LOGICAL SOLUTIONS S.L.), Spain

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PROJECT REFERENCE	LIFE13 ENV/ES/000800
DURATION	01-JUL-2014 to 30-JUN -2017
TOTAL BUDGET	1,097,092.00 €
EU CONTRIBUTION	548,546.00 €
PROJECT LOCATION	Nordrhein-Westfalen,Andalucía

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