Title: Assessing the Environmental Impact of Biofertilizers and Biostimulants on Climate Change in Europe

Presenting: Sahar Azarkamand

Affiliation details of Presenting author UNESCO Chair in Life Cycle and Climate Change ESCI-UPF, Passeig Pujades 1, 08003 Barcelona, Spain

Co-authors' details

Ibtissam Bouhzam [1], Rita Puig [1], Pere Fullana-i-Palmer [3], Alba Bala [2], Ilija Sazdovski [2]

Affiliation details of Co-authors

[1]*Department of Industrial and building Engineering, University of Lleida (UdL), Pla de la Massa, 8, 08700 Igualada, Spain*
[2]*UNESCO Chair in Life Cycle and Climate Change ESCI-UPF, Pg. Pujades 1, 08003 Barcelona, Spain*

Abstract:

Biobased fertilizers (BFs) and biostimulants (BSs) are increasingly recognized as sustainable options in agriculture, contributing to circularity. This paper aims to evaluate and compare the environmental impacts of eight biofertilizers and biostimulants produced in Ukraine, Denmark, and Sweden using a life cycle assessment (LCA) approach on climate change. The analyzed products include various compost types, insect frass, digestate, biochar, and fish hydrolysate. The environmental impacts are assessed from production to the point of farm gate delivery. In this study, the functional unit (FU) is based on nutrient content, considering the three primary nutrients essential for plants: nitrogen (N), phosphorus (P), and potassium (K). In this study, system expansion is employed to manage co-products and account for avoided burdens from mineral fertilizers. To estimate the reduction in mineral fertilizer usage, a comprehensive literature review was conducted to establish the equivalents of nitrogen, potassium, and phosphorus from mineral fertilizers. The findings of LCA indicate that digestate is the most environmentally favorable option for mitigating climate change impacts when considering 1 tonne of N and 1 tonne of K, while vermicompost emerges as the best choice for 1 tonne of P due to its high phosphorus content. Conversely, biochar performs poorly in terms of phosphorus content. Selecting appropriate BF and BS can profoundly enhance circularity and waste reduction initiatives through minimized environmental impacts.

Biography

I am a postdoctoral researcher at the UNESCO Chair in Life Cycle and Climate Change (ESCIUPF). My primary research interests lie in Environmental Impact Assessment, Life Cycle Assessment, Green Supply Chain Management, and Carbon Footprint. During my Master's degree, I evaluated the green management system of Iran Aseman Airline, and

throughout my Ph.D., I focused on green supply chain management at a petrochemical site in Iran, where I developed a conceptual model for evaluating the environmental impacts of the site. In my second Ph.D., I developed an Excel-based tool for calculating the three scopes of greenhouse gas emissions in ports, earning recognition as one of the top ten theses in the 'Thesis in 4 Minutes' competition that year. I have an academic background, having served as a researcher at the Waste Biotechnology Research Group at Alzahra University and supervised master's theses at Islamic Azad University (Najaf Abad) in Iran. Additionally, I worked at the BETA Research Center at the University of Vic for a year. In 2014, I co-authored a book titled 'Urban Environmental Management Strategies,' and in 2016, I translated and published a book titled 'Green Supply Chain Management. Since 2023 I am also giving classes at ESCI-UPF. Furthermore, I bring over a decade of experience from consultancy firms in Iran, where I worked on assessing the environmental impacts of various projects, particularly in the oil and gas and road construction sectors in Iran