CYANOTECH: A SUSTAINABLE AND INNOVATIVE MANAGEMENT SYSTEM FOR TOXIC CYANOBACTERIA BLOOMING OF SURFACE WATERS WITH COMBINED ENERGY PRODUCTION, SUSTAINABLE AGRICULTURE, AND FOOD SAFETY.

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ABSTRACT

The persistent and widespread blooming of toxic cyanobacteria in surface waters is a global concern with complex impacts [1]. Beyond the aesthetic and environmental consequences, various economic sectors, including tourism, fishery, food, health, and water industries, endure substantial annual losses, often reaching millions of USD annually [2]. This prevalent issue demands the development and implementation of innovative and sustainable management systems specifically tailored to mitigate the effects of toxic cyanobacteria. Yet, the challenge lies in addressing the environmental and economic implications and integrating solutions into existing infrastructures. CYanoTech is a two-year project that proposes a novel, sustainable, and innovative management system for mitigating the effects of toxic cyanobacteria blooming in surface waters while combining energy production and promoting sustainable agriculture and food safety. The CYanoTech system comprises the removal of the excess aquatic biomass (cyanobacteria cells and algae) from water with a low-energy non-mechanical separation technology, the application of ozonation for the removal of cyanobacterial cells and their toxic metabolites (aka cyanotoxins), the treatment of the aquatic biomass for the production of energy and marketable products (fertilizers), and the application of treated and untreated surface water in hydroponic cultures that produces safe for consumption crops (cyanotoxins-free crops). Herein, the major outcomes of each treatment step will be presented. In brief, tangential-flow separator (TFS) has been used to separate the excessive biomass, four ozone doses were applied to different cyanobacteria and green algae cultures, and various pretreated cyanobacteria cells were used in anaerobic batch experiments as a source to produce struvite. Finally, the treated streams were evaluated for their effects on lettuce and rocket growth in two hydroponic systems: deep flow technique (DFT) and inert substrate (such as perlite).

KEYWORDS: freshwater cyanobacteria, ozonation, anaerobic digestion, hydroponics, food safety

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