

Farm Wastewater Treatment with Microalgae. A Living-lab Experimental Unit

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Abstract

Wastewaters from farms, agro-industrial activities and urban grey waters are residues that can be valued, through their reuse for several purposes within the farm, for example, irrigation or facilities washing. This practice saves conventional water and preserves the environment from contaminations, namely the water resources. This paper presents a research project planning an experimental study to be carry out in a wine farm aiming, through the settlement of a microalgae reactor, the wastewater treatment and the microalgae production. The farm has a vineyard, a winery and a rural tourism unit. Wastewaters are mainly generated from washing the equipment and the fermentation tanks and from the house (grey waters, with low organic loads). According to their characteristics a wastewaters pre-treatment might be required. The outdoor bioreactor uses those wastewaters, solar radiation and is supplied with CO₂ conducted from wine fermentation and from the composting unit, reducing the emission of this greenhouse gas. Prokaryotic cyanobacteria, as well as mono- and oligocellular species of eukaryotic algae species will be tested and applied. The performance of the outdoor cultivation systems will be assessed with respect to their light utilization (photosynthetic efficiency), growth yields (productivity), the economic aspects for the cultivation of phototrophs and the quality of treated wastewater. The biomass produced will be used as animal feed, for example for aquaculture, or as soil fertilizer. Treated wastewater will be temporarily stored, for later use, particularly for vineyard drip irrigation. The experimental unit of this project will be set in a living-laboratory to revitalise the environmental education, benefits for knowledge extension to other farmers of the Region. It will also provide deeper knowledge of this type of units to enable its optimization for a larger scale application and extension.

Keywords: algae, bioreactor, irrigation wastewater reuse, wastewater