

An Integrated System for Wastewater Scrubbing and Bioenergy Production

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Passage of municipal wastewater effluent (MWE) through constructed wetlands can lower levels of residual contaminants and nutrients in the water. As a demonstration project, two 37 m² Channelized Aquatic Scrubbers (CAS), each composed of three channels ranging in depth from 12 to 46 cm, were constructed at the City of Santa Rosa Laguna Treatment Plant and stocked with native floating aquatic vegetation and algae. Flows of MWE through the CAS ranged from 1 to 20 mm sec⁻¹. From June 2008 to April 2009 nitrate removal efficiencies of the CAS averaged from 318 to 1775 mg N m⁻² d⁻¹. Denitrification constituted the primary mechanism of nitrate removal. Additionally, preliminary results from juvenile trout bioassays show that the CAS substantially decrease levels of estrogen-mimicking compounds in the water. Net productivity of the CAS, estimated from regular harvests, averaged from 1.3 to 13.7 g dry weight m⁻² d⁻¹. Anaerobic digestion of harvested biomass at 35 °C yielded 145 ± 22 ml biogas g⁻¹ dry weight (mean ± SE); an approximate 40% synergistic enhancement of biogas production from the biomass was attained by co-digesting with a mix of winery and dairy waste. On a larger scale, energy generation from digester biogas could increase the feasibility of constructed wetlands for wastewater polishing.