



XVIIth World Congress of the International Commission of Agricultural and Biosystems Engineering (CIGR)



Hosted by the Canadian Society for Bioengineering (CSBE/SCGAB)
Québec City, Canada June 13-17, 2010

CREATING RENEWABLE ENERGY USING ECOLOGICAL ENGINEERING PRINCIPLES

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**CSBE101192 – Presented at the 10th American Ecological Engineering Society
Annual Meeting (AEES) Symposium**

ABSTRACT: Ecological engineering designs utilize natural energy sources as the predominant input to manipulate environmental systems and integrate society with its natural environment for the benefit of both. While there are many conservation methods that reduce our consumption of fossil fuels while incorporating ecological concepts into their design, there are very few ecological engineering designs that actually produce energy. In fact, many current renewable energy production methods can be harmful to the natural environment: hydroelectric dams, ethanol production using fertilizer-intensive corn, and deforestation for planting of biodiesel crops. Given the ecologically problematic nature of energy production, this presentation addresses the critical question of whether ecological engineering principles can be incorporated into renewable energy design. I will examine two renewable energy production designs: anaerobic digestion and algal turf scrubbers, and identify how these designs can incorporate ecological engineering principles by quantifying environmental inputs and ecological consequences. Anaerobic digestion utilizes microorganisms to breakdown organic material and produce methane-enriched biogas. The microbial process decreases water pollution from the waste materials, such as manure, reduces greenhouse gas emissions and odors, and enhances the fertilizer potential of the liquid effluent. Current applications in the US have focused on large-scale applications, but small-scale systems that incorporate more natural inputs have the ability to revolutionize renewable energy production potential in sustainable agriculture. Algal turf scrubbers capture nutrients from manure and wastewaters into their biomass. The algae can then be used in a variety of applications for energy production. Both of these technologies process waste from the environment and turn it into energy, while preserving the inherent benefits of the waste source.

Keywords: Anaerobic Digestion, Algal turf scrubbers, energy, self-design