

Alternative Fuels from Biomass

Rebecca Lankey and Lester Lave

Introduction:

Concerns over fossil fuel consumption, associated vehicle emissions, urban air quality, and the U.S.' dependence on foreign oil have been increasing. As a result, the availability of alternative fuels has become more important. Some of the alternatives to gasoline still consume non-renewable resources or involve greenhouse gas emissions. Ideally, alternatives to liquid petroleum fuels would be manufactured from renewable sources of biomass. This study considers the production of alcohol fuels and biodiesel from biomass.

Problem Statement:

Biomass fuels offer several advantages, including the production of oxygen from growing biomass crops, the capture of carbon dioxide by growing plants, and geographical flexibility. Biomass can be continuously produced as a renewable resource. Energy crops can filter runoff and reduce erosion, and biomass from agricultural wastes may be a secondary product that adds value to an agricultural crop. In addition, if waste materials are used, this can reduce landfill disposal volume and pollution.

However, biomass fuels have disadvantages, such as the need to develop new harvesting methods and high costs of production. Some liquid fuels have a lower energy density than liquid petroleum fuels. Land used for energy crops may be in demand for other purposes, and agricultural wastes used for fuel will not be available if the basic crop is no longer grown. The total cost of production is an important factor in the ability of biomass fuels to compete with petroleum fuels. Fuel taxes and credits can help to make biomass fuels economically viable options. To determine the actual environmental benefits of these fuels, a life-cycle assessment of the associated energy

use and emissions through all stages of production and use is necessary.



Approach:

This work uses conventional life-cycle assessment to assess resource flows and environmental impacts through the various stages of a fuel's life, including production of biomass, conversion of the biomass to the liquid fuels, transportation and infrastructure, and fuel combustion.

Conclusions:

Two of the most promising candidates for biomass crops to produce alcohol fuels include switchgrass and hybrid poplars. Sugarcane and bagasse, a by-product, are possible sources, but their growth is limited geographically. Other waste sources, including paper from municipal solid waste, are future possibilities. Possible sources of biodiesel include microalgae, soybean oil, and rapeseed oil. Currently, biodiesel is primarily produced from soybeans in the U.S. and rapeseed in Europe. Microalgae is primarily experimental, but could be an efficient use of low-quality land and water resources.

For more information contact:

Noellette Conway-Schempf

Phone: (412) 268-2299

Email: nc0y+@andrew.cmu.edu