Waste to Fuels: Economic Feasibility of Biofuels Processing in the State of Washington

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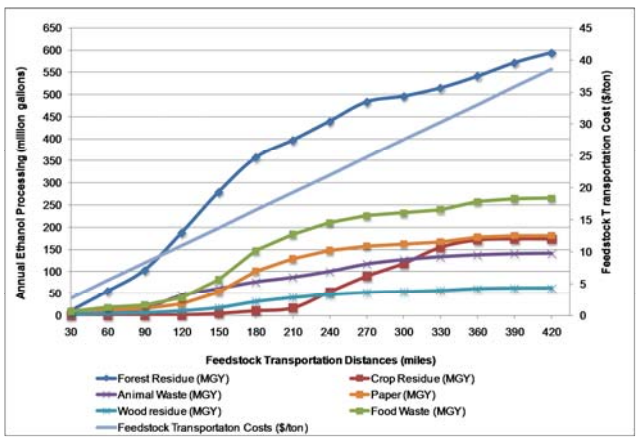
INTRODUCTION

Funded through the Washington State Department of Ecology, earlier part of this research project had geographically identified, characterized, and mapped potential bioresources in the state of Washington. In this part of the Biomass Inventory Technology and Economics Assessment project, the Transportation Research Group at Washington State University analyzed economic feasibility of cellulosic ethanol processing using Washington's bioresources. This study expands the previous work by spatially investigating types of available biomass in the state, incorporates geographically varying road infrastructure and hauling distances from fields to prospective biorefineries, as well as from biorefineries to consumption markets throughout the state.

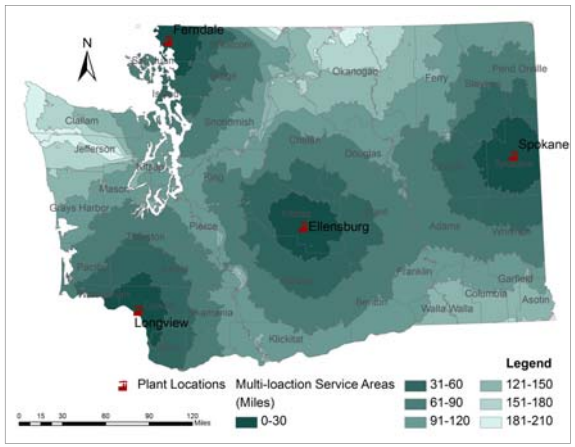
Figure 1: Feedstock Availability and Transportation Costs by Haul-Distances



Several types of feedstocks – agricultural crops residue, forest residue, animal waste, food waste, wood residue, and paper waste have spatially been analyzed with the use of Geographic Information Systems (GIS) Network Analyst toolset to derive the delivered costs (supply curves) of feedstocks to biorefineries in the state (Figure 1).

These supply curves were further combined with the biomass-to-biofuel processing costs. To determine distribution costs, GIS methodology similar to the feedstock transportation cost model was used by incorporating origin (processing plant/blending terminal) and destination (ethanol fueling stations in the state) data (Figure 3).

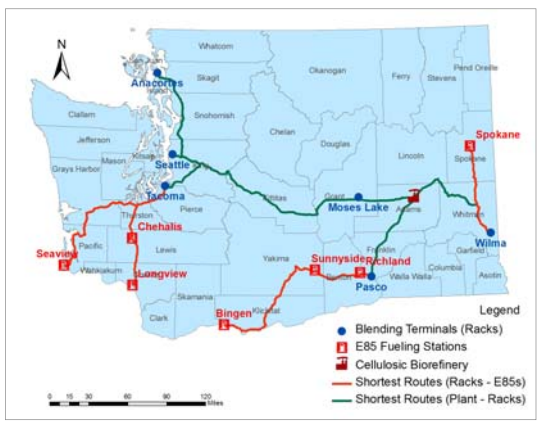
Figure 2: Feedstock Collection Areas for Potential Processing Plants in the state of Washington



METHODOLOGY

- Geographic Information Systems approach for feedstock collection and biofuel distribution costs
- Transportation rates derivation using an economic engineering approach
- GIS-based least-cost biomass conversion facility location identification model

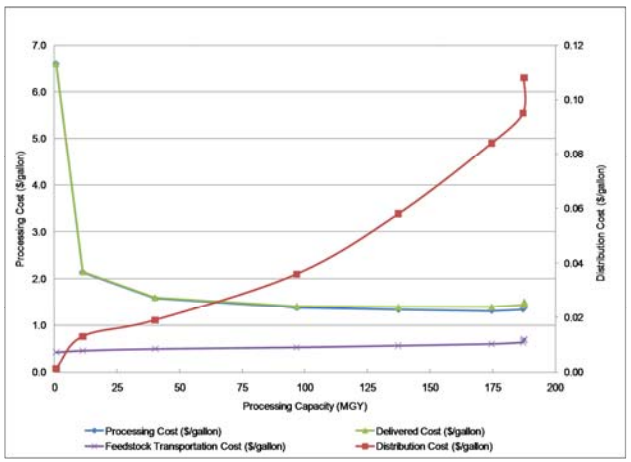
Figure 3: Shortest Routes from Processing Plant to Blending Terminals and E85 Fueling Stations



RESULTS

Study results show that in addition to biomass-to-biofuel conversion costs, the economic feasibility of biofuel processing in the state is influenced by feedstock transportation and distribution costs. Because of the geographic dispersion of the feedstock resources and increasing transportation costs for longer destinations, all of the feedstock deposits cannot be utilized at the same expense. Processing plant cost-minimizing location decisions are influenced by the type of the feedstock utilized, and vary depending on the processing plant capacities.

Figure 4: Ethanol Processing Costs by Plant Capacity



ACKNOWLEDGMENTS

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