Environmental assessments of woody biomass feedstock for bio-jet fuel production

Indroneil Ganguly
Assistant Professor, Research

Ivan Eastin
Professor/Director, CINTRAFOR

Tait Bowers
Graduate Student

Cindy X. Chen
Graduate Student

Cody Sifford
Graduate Student

School of Environmental and Forest Sciences
University of Washington
Seattle, Washington

Francesca Pierobon
Department of Land, Environment, Agriculture and Forestry (LEAF)
University of Padua
35020 Legnaro (PD), Italy

Typical forest harvest operations in the Pacific Northwest (PNW) leave a considerable volume of unused woody biomass in the forest in the form of treetops and branches. Despite the environmental benefits, the economic feasibility of extracting these residuals from the forest is limited due to low market demand and high collection and transportation costs. Most of the unused woody biomass is collected, piled and burned in the forest or it is simply left on the forest floor to decompose. To address the market failure of more fully utilizing woody residues, new technologies are being developed to utilize forest residuals for conversion into high value advanced bio-fuels.

The Northwest Advanced Renewables Alliance (NARA) research project is exploring the potential of converting woody biomass into bio-jet fuel within the PNW region. This paper assesses the environmental implications of producing woody biomass based bio-fuel within the Western Washington/Oregon region. In order to document the environmental benefits of substituting biofuel for fossil fuel, a detailed Life Cycle Assessment (LCA) is being conducted to evaluate the environmental impacts of using woody biomass as a feedstock for conversion into bio-jet fuel.

This paper presents the results of a ‘cradle-to-gate’ life-cycle of woody biomass feedstock to be used for bio-jet fuel production. In this paper ‘cradle’ is defined as beginning with the natural regeneration of young trees within the forest and ‘gate’ is defined as residual woody feedstock delivered to the pre-treatment facility. To evaluate the various logistical/procedural pathways, this paper explores a range of biomass transportation scenarios and incorporates the avoided environmental costs associated with piling and burning the woody biomass within the forest into the LCA calculations. The environmental burdens for each of these scenarios are assessed in terms of global warming, acidification, smog, and ozone depleting potentials.