Advanced **Hardwood Biofuels** Northwest

Infosheet no. 4

Hardwood Biofuels Life Cycle Analysis

Assessing the Life Cycle of Poplar-based Biofuels

Advanced Hardwood Biofuels Northwest (AHB) is a consortium of university and industry partners developing a system to produce renewable liquid biofuels and bio-based chemicals from sustainably-grown hybrid poplar trees.

AHB researchers use a Life Cycle Analysis (LCA) to model environmental impacts over the entire life of poplar-based bio-products. An LCA is a "cradle-to-grave" appraisal tool that provides data on resource consumption and emissions at every stage of the biofuel's production process. The LCA for poplar-based jet fuel (bio-jet) identifies where greenhouse gasses (CH_4) and nitrous oxide (N_2O) are stored and emitted during the lifecycle of the biofuel. Each of the greenhouse gasses is converted into a CO_2 equivalence value and together measure the Global Warming Potential (GWP) of the biofuel.

The global warming potential of poplar jet fuel is 30-45% lower than petro-jet fuel

SYSTEM BOUNDARIES

The total GWP is calculated for bio-jet fuel through the defined system boundaries shown here and compared to conventional petroleum jet fuel.

Poplar Growth

Harvesting & Transportation

Fossil Fuel Substituted with Biomass Fuel

Fossil Fuel | Chemicals

Other Inputs

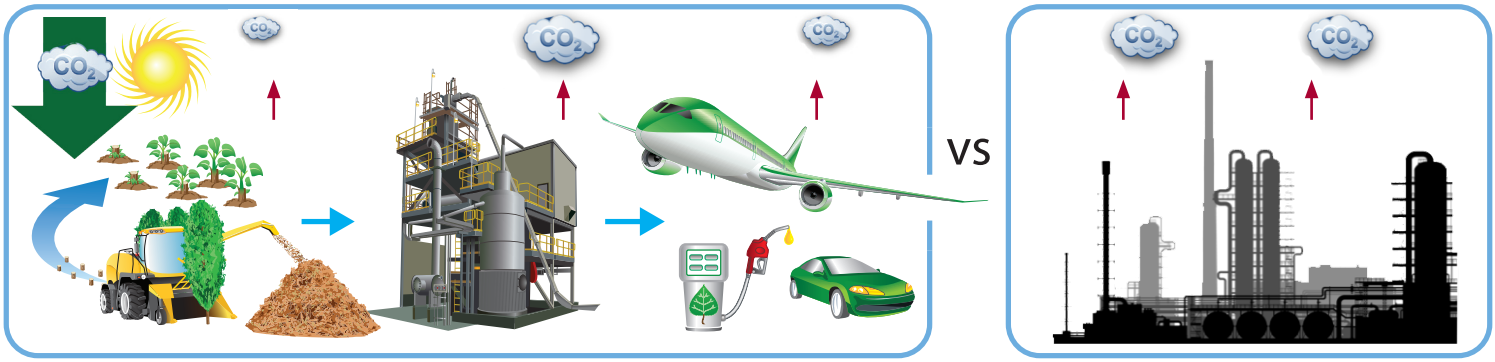
Bioconversion Process at Biorefinery

Outputs

Biofuels | Bio-Based Chemicals | Lignin

Fuel Distribution → Use

Poplar-Jet Fuel Reduces Global Warming Potential Compared to Petro-Jet Fuel



Poplar Based

Petroleum Fuel Based

Summary of the LCA

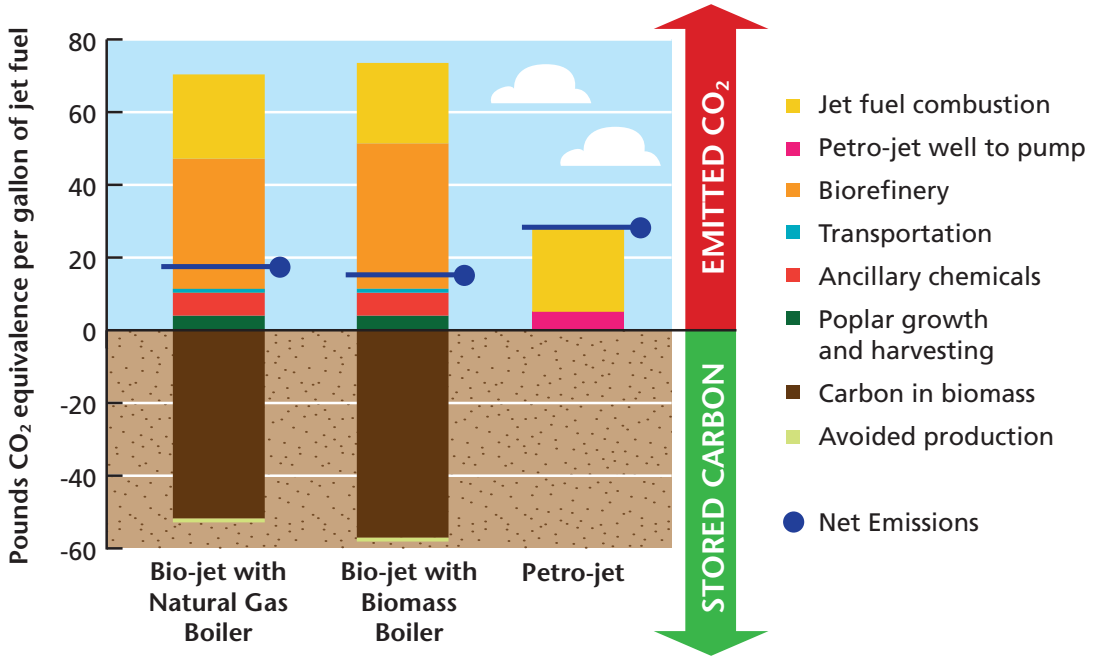
The LCA model shows that the production and use of poplar-based jet fuel could reduce GWP by 30 to 45% compared to petro-based jet fuel. Conversion technology improvements can lead to further emission reductions.

As poplar trees grow, they remove a significant amount of carbon dioxide from the atmosphere, storing carbon in their stems, branches, and roots represented by the green bar in the graph below. The process continues even after harvesting of the trees as they re-sprout from cut stems.

Harvesting and transporting the feedstock from the poplar fields requires some fossil fuel energy inputs resulting in CO_2 emissions. CO_2 is also emitted at the biorefinery as the poplar feedstock is converted into biofuels. This includes emissions from refining, producing and transporting chemicals, and disposing of waste. Finally, the distribution and use of bio-jet fuels by the aviation industry adds to the fuel's net carbon emissions.

Net greenhouse gas emissions of bio-jet fuel are influenced by the type of energy used for the conversion process. Net emissions can be reduced by burning biomass instead of natural gas.

JET FUEL GLOBAL WARMING POTENTIAL



For more information contact **WSU Extension**
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hardwoodbiofuels.org

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USDA United States Department of Agriculture National Institute of Food and Agriculture