Advanced **Hardwood Biofuels** Northwest

Infosheet no. 3

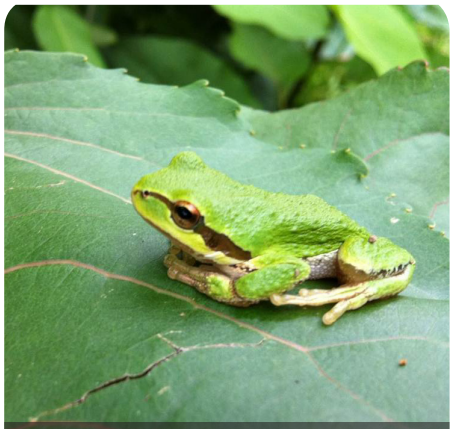
Environmental Sustainability

The Importance of a Sustainable System

Hybrid poplar trees are a promising feedstock for renewable, locally-produced biofuels and biochemicals in the Pacific Northwest (PNW). Advanced Hardwood Biofuels Northwest (AHB) is a research initiative analyzing the feasibility of industries that will use non-genetically modified hybrid poplars trees to produce jet fuel, diesel, and gasoline, as well as chemicals that are used to make a variety of products including paint, solvents, glue, and road salts. While these biofuels and biochemical are expected to have a much lower carbon footprint and fewer environmental impacts compared to their petroleum-based counterparts, the production system will have impacts on the region's landscape. To understand and minimize environmental impacts of poplar production, a key research focus of the AHB initiative is environmental sustainability.

Soil and water quality are a key concern in a sustainable biofuels production system.

At AHB's poplar demonstration tree farms, researchers are establishing protocols for the sustainable production of biofuel feedstocks that growers can transfer to larger-scale tree farms. To measure sustainability, AHB researchers are comparing agriculture land converted to hybrid poplar to adjacent agriculture fields growing crops such as wheat and hay. This research seeks to understand the impacts of the change in land use to ensure the sustainable production of renewable fuels.



Biodiversity in poplar fields is expected to increase compared to traditional agricultural fields.

Greenhouse Gas Emissions

Emissions of greenhouse gases (GHG) such as carbon dioxide, methane, and nitrous oxide from poplar farms are an environmental concern. AHB researchers want to understand how GHG emissions change when agriculture land is converted to poplar bioenergy farms and how poplar cultivation techniques can be altered to reduce GHG production. Early results indicate that poplar fields consume methane and produce nitrous oxide, while agriculture fields tend

In row-tilling techniques minimize soil disturbances and helps reduce site prepreation costs.

Air samples are taken to measure the flux of GHGs off the soil's surface in newly estabiished bioenegy farms.

to be consumers of both methane and nitrous oxide. Comparing the levels of each in terms of carbon dioxide equivalents indicates that the net levels of GHG emissions from the poplar fields are similar to those of the adjacent agriculture fields. These results are incorporated into a larger Life Cycle Assessment (LCA) analysis to assess the total "cradle-to-grave" carbon footprint of poplar-based fuels and chemicals compared to petroleum-based products.

Water Quality

Soil erosion and nutrient leaching from poplar fields could also affect the sustainability of poplar production. These are being measured at the demonstration sites to assess the environmental impacts caused by water runoff. Preliminary results indicate that soil deposition is taking place, meaning that, rather than causing erosion, the soil in the poplar fields is actually collecting material. Researchers are also looking at changes in groundwater quality at the poplar fields by analyzing the water runoff from each site. Results show that nutrient leaching rates from the poplar fields are generally low and are similar to those occurring in the adjacent agriculture fields.

Soil Quality

Soil quality is determined by the soil's physical, chemical, and biological structure. To determine changes to soil quality, soil samples taken from poplar bioenergy farms are analyzed to examine microorganism activity, soil chemistry, and soil density. Through this research, AHB hopes to determine if hybrid poplar cropping systems improve or degrade the quality of the soil. Because poplars are fast growing and contribute significant carbon to the soil, researchers expect soil quality to improve.

Wildlife Abundance

Wildlife monitoring is occurring at AHB demonstration sites and adjacent agriculture fields. Determining songbird and small mammal abundance helps researchers understand impacts to wildlife, as these populations often respond quickly to changing environments. Pollinating insects are also being studied to understand how they are impacted by changes in land use and shifts in crop cultivation. In the past, deer, elk, and bird populations dramatically increased in areas where large poplar tree farms were established for the pulp and paper industry. As the demonstration sites are further developed, wildlife abundance in the poplar fields is expected to be greater than in adjacent agriculture fields.

Researchers study songbird abundance as a measure of wildlife biodiversity at bioenergy farms in the PNW.

Looking Forward

Preliminary results indicate that, overall, poplar farms do not have greater environmental impacts compared to traditional food, forage, or fiber production systems. This research will continue to analyze impacts over longer periods to ensure that hybrid poplars can be grown as biofuel and biochemical feedstock with minimal environmental impacts.

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

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