

Taking biofuel from forest to highway

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The world is moving from a hydrocarbon economy to a carbohydrate economy, according to University of British Columbia biofuel expert Jack Saddler. He is presenting his work at the 2012 Annual Meeting of the American Association for the Advancement of Science (AAAS) in Vancouver on Feb. 17.

With the [global demand](#) for energy continuing to grow, the biofuels industry will emerge as an economically and environmentally sustainable solution, he says.

Saddler, a professor in UBC's Faculty of Forestry, says: "we will become less dependent on fossil fuels and will become more dependent on fuels made from the sugars and chemicals found in plants."

For more than 30 years, Saddler studied converting biomass, like trees and agricultural residues, into ethanol to be used as a [biofuel](#). He and his colleagues have studied every step of the process from the physical breakdown of [plant matter](#) to the industry's socioeconomic impacts.

"Biomass has another attractive characteristic in that it is very democratically distributed," says Saddler, who also serves as Canada's representative on the International Energy Agency's (IEA) [Bioenergy Task 39 Network](#).

"While some countries may be rich in oil, coal or natural gas, many poorer countries tend to have the land and climatic conditions that may allow them to grow lots of biomass. A fully developed biorefinery

strategy would offer these countries both [energy security](#), [economic opportunities](#) and a way to develop a more sustainable society."

The International Energy Agency's "Biofuel Road Map" predicts that biofuels will become increasingly important and will become a commercial reality during the 2020's.

Today, biofuels are blended with gasoline to satisfy government-mandated targets to include renewable content in [transportation fuel](#). The 2007 [Energy Independence](#) and Security Act in the United States requires that 117 billion litres (31 billion gallons) of ethanol be added to gasoline annually by 2022. In Canada, the federal government mandates that gasoline must include five per cent renewable fuel content. In Brazil, all new cars are flex-fuel vehicles that can use various blends of ethanol made from sugar cane and gasoline.

The biomass-based biofuel industry is not currently commercially and economically viable, largely because of the time and cost associated with breaking down plant matter, says Saddler.

"In nature, trees breakdown and decompose over many years and decades. Our research is trying to find ways to make it happen in a few minutes or hours. In other words, speeding up the process that Mother Nature designed."

Currently, biofuels such as ethanol is made by either fermenting the sugar obtained from crops like sugar cane or sugar beet, or by using enzymes to break down the starch found in corn and wheat to make the sugars.

The goal of the work at UBC is to make biomass derived sugars as cheaply as those obtained from food crops while also using the other high value chemicals found in trees.

Similar to an oil refinery that processes crude oil to make thousands of supplementary products like plastics, dyes, paints, etc., the biorefinery would use leftover agricultural and forest material to make many of the same products, but from a sustainable and renewable resource.

Biodegradable plastic soda bottles, now used by some of the major manufacturers, are made from bioplastics. Other by-products that can be made from biomass include medications to help lower cholesterol, rayon for textiles and clothing, cosmetics, carpeting and building materials.

"There are so many opportunities for breakthroughs in this field from reducing the cost of producing and transporting the biomass to building on nature's already excellent mechanisms for recycling and using the stored energy in biomass that was put there by the sun."

Provided by University of British Columbia

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