Environmental benefit of biofuels is overestimated, new study reveals

EurekAlert!

Two scientists are challenging the currently accepted norms of biofuel production. A commentary published today in *GCB Bioenergy* reveals that calculations of greenhouse gas (GHGs) emissions from bioenergy production are neglecting crucial information that has led to the overestimation of the benefits of biofuels compared to fossil fuels.

The critique extends to the Life Cycle Analysis models of bioenergy production. Life Cycle Analysis (LCA) is a technique used to measure and compile all factors relating to the production, usage, and disposal of a fuel or product. The authors conclude that LCAs are overestimating the positive aspects of biofuel use versus fossil fuel use by omitting the emission of CO2 by vehicles that use ethanol and biodiesel even when there is no valid justification.

Proponents of bioenergy argue that analyses should always ignore this CO2 because plants grown for biofuel absorb and therefore offset the same amount of carbon that is emitted by refining and combusting the fuel. The commentary critiques this method by arguing that doing so double counts the carbon absorbed by plants when the bioenergy crops are grown on land already used for crop production or already growing other plants because the bioenergy does not necessarily result in additional carbon absorption. Biofuels can only reduce greenhouse gases if they result in additional plant growth, or if they in effect generate additional useable biomass by capturing waste material that would otherwise decompose anyway.

The overestimation of bioenergy LCAs becomes increasingly magnified when the omission of CO2 is combined with the underestimation of nitrogen emissions from fertilizer application. According to lead author Dr. Keith Smith, from the University of Edinburgh, "Emissions of N2O from the soil make a large contribution to the global warming associated with crop production because each kilogram of N2O emitted to the atmosphere has about the same effect as 300kg of CO2." He notes that several current LCAs underestimate the percentage of nitrogen fertilizer application that is actually emitted to the atmosphere as a GHG. The authors claim that the observed increase in atmospheric N2O shows that this percentage is in reality nearly double the values used in the LCAs, which greatly changes their outcome.

Since results of the LCAs have been widely utilized, Searchinger and Smith conclude that the overall development and research of alternative fuels has been heading in the wrong direction. "The best opportunity to make beneficial biofuels is to use waste material or to focus on relatively wet but highly degraded land," notes Dr. Smith. If bioenergy crops are produced on degraded land, less GHGs will be emitted

and more will be stored. There are additional benefits: this method will not compete with crop production for food, textiles, and other products.

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