Biofuels Come a Cropper

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As American farmers reap the corn-ethanol bonanza and new ventures chase more efficient ethanol feedstocks, two troubling studies reported in “Science” magazine say that all forms of biofuels will result in higher CO2 emissions than petroleum.

      Earlier analyses based comparative ratings on the full production cycle -- from growing a crop to its ethanol conversion to its final burning -- and concluded that, while corn-ethanol might emit somewhat less than gasoline, other plants such as sugar cane and switchgrass might cut emissions by as much as 85%. But the “Science” studies factor in the carbon cost of land conversion to raise those crops, and come up with the disturbing conclusion that vastly more CO2 will be released into the atmosphere than were we to continue to use gasoline.

     The problem is this: the accelerating demand for raising crops for both food and fuel worldwide will lead to millions of acres to be cleared, ranging from grasses to mature forests. Whether suddenly from burning or gradually from decomposition, the biomass on that land will release the stored CO2 that funded its growth. Then comes the lost opportunity of how much CO2 that biomass would have absorbed thereafter by its continued existence, especially woodlands that are still growing.

The combined release of CO2 at the outset and the sacrificed “carbon uptake” thereafter creates what the studies call a “carbon debt”. For a biofuel crop to make sense, it must repay that debt in the course of its repeated plantings by the CO2 emissions it saves compared to oil. Until that payback, a biofuel will have led to the emission of more CO2 than the fossil fuel it replaced.

Long Term Debt

     The question: how long do different feedstocks on different types of converted land take to cancel their debt?

The answer: the carbon debts incurred are enormous. The studies say that scores of years and even centuries are needed to break even, depending on the crop and the type of land put to the plow. When land use change is added on the debit side of the ledger, most crops result in much higher emissions than oil, especially across the next 30 years, the span during which the studies assume we will be using biofuels before moving on to a non-agricultural-based fuel.

     One study found, for example, that even if it only displaced central U.S. grassland, corn grown for ethanol would take 93 years before it overcame the carbon debt of land use change with its lower carbon emissions compared to gasoline.

The other study, which used globe-spanning agricultural models to assign crops to land to meet projected demands, calculated that were corn to replace

forest, the sequestered carbon loss is about 330 to 630 times the amount the field will pay back each year, the variance depending on the type of forest and whether it is still growing.

Most findings are much worse when natural land cover is replaced by the much reduced CO2 take-up of field crops. An insurmountable 319 year debt is left behind when Brazil's rain forests are leveled to produce soybeans for biodiesel. The rain forests slashed in Indonesia in the race to produce palm oil as fuel leave behind an astonishing 423 year debt.

     There are few bright spots. One is Ethanol from Brazilian sugarcane. Its extraordinary productivity could pay back its land use debt in only four years, if tropical grazing land is used. Elsewhere, as in the United States, the studies strongly advise that (1) only abandoned agricultural lands, or land retired under U.S. programs, be planted, and with perennials, and (2) otherwise, biofuels must be produced only from waste that would yield its CO2 anyway, and to no purpose, such as municipal waste, wood chips, and agricultural discard.

     - Stephen Wilson, PlanetWatch Editor

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