Meeting biofuel production targets could change agricultural landscape

February 29 2012

Almost 80 percent of current farmland in the U.S. would have to be devoted to raising corn for ethanol production in order to meet current biofuel production targets with existing technology, a new study has found. An alternative, according to a study in ACS' journal *Environmental Science & Technology*, would be to convert 60 percent of existing rangeland to biofuels.

W. Kolby Smith and colleagues explain that the 2007 Energy Independence and Security Act (EISA) set a goal of increasing U.S. biofuel production from 40 to 136 billion gallons of ethanol per year by 2022. They point out, however, that gaps exist in the ability to establish realistic targets for biofuel production, which the law fills with assumptions about technological developments and the availability and productivity of farmland. In an effort to establish more accurate estimates, they used satellite data about climate, plant cover and usable land to determine how much biofuel the U.S. could produce.

The satellite analysis found that to meet the EISA goals under current technology, farmers would either need to plant biofuel crops on 80 percent of their farmed land or plant biofuel crops on 60 percent of the land currently used to raise livestock. The authors reported that both options would significantly reduce the amount of food U.S. farmers produce. They also noted that research shows that increased farming could lead to more polluted freshwater and accelerate global climate change.

More information: Bioenergy potential of the United States constrained by satellite observations of existing productivity, *Environ. Sci. Technol.*, Just Accepted Manuscript. DOI: 10.1021/es203935d

Abstract

United States (U.S.) energy policy includes an expectation that bioenergy will be a substantial future energy source. In particular, the Energy Independence and Security Act of 2007 (EISA) aims to increase annual U.S. biofuel (secondary bioenergy) production by more than three-fold, from 40 to 136 billion liters ethanol, which implies an even larger increase in biomass demand (primary energy), from roughly 2.9 to 7.4 EJ yr^{-1}. However, our understanding of many of the factors used to establish such energy targets is far from complete, introducing significant uncertainty into the feasibility of current estimates of bioenergy potential. Here, we utilized satellite-derived net primary productivity (NPP) data – measured for every 1 km^2 of the 7.2 million km^2 of vegetated land in the conterminous U.S. – to estimate primary bioenergy potential (PBP). Our results indicate that PBP of the conterminous U.S. ranges from roughly 5.9 to 22.1 EJ yr^{-1}, depending on land use. The low end of this range represents the potential when harvesting residues only, while the high end would require an annual biomass harvest over an area more than three times current U.S. agricultural extent. While EISA energy targets are theoretically achievable, we show that meeting these targets utilizing current technology would require either an 80% displacement of current crop harvest or the conversion of 60% of rangeland productivity. Accordingly, energy planning should include iteratively and realistically constrained bioenergy estimates for effective incorporation of bioenergy potential into the national energy portfolio.

Provided by American Chemical Society