A New Lease on Life for Marginal Farmland: Convergence of prairie restoration with biofuel production

Borsari, B.[1] , and Onwueme, I.[2]

Abstract

The prairie ecosystem that occupied most of the North American continent has been mostly converted into agricultural farmland. The looming global scarcity of fossil fuels has spurred interest in renewable energy, especially ethanol from corn (Zea mays). However, legitimate objections remain to the idea of diverting significant quantities of corn into ethanol as this conversion may result in substantial increases in food prices, use of the best land for fuel, and increasing amounts of inputs. Finally, there are still doubts being expressed about the energy efficiency of ethanol production from corn, with some claiming that the process indeed uses more energy than it produces. Simultaneously, ongoing ecological interest in reverting the prairies to grassland could generate substantial grass biomass suitable for biofuel production. Recent studies have indicated that low-input high-diversity (LIHD) mixtures of native grassland perennials possess higher potential for the Midwest region of the United States to produce renewable energy. The purpose of this study was to initiate a prairie restoration on marginal soil of a 16.2-hectare farm in southeastern Minnesota, and to determine which restoration procedure (only native grass species, versus a mixture of grasses and forbs) was most effective for the establishment of prairie on the land that may yield biomass for biofuels. We planted 11.4 kg./ha of grasses on 4.7 ha and 0.70 kg/ha of forbs on 3.2 ha in June 2007. An evaluation analysis of the vegetation in the five restored plots was conducted after 90 days (August 2007). Species richness was evaluated by considering the Margalef's index of diversity. All five plots were uniformly covered by herbaceous vegetation and this included primarily unwanted weeds. The mean percent cover in the grass plots was 0.935, whereas the one in the grass-and-forbs plots was 0.944. In the grass-only samples we identified two prairie species (S. scoparium and P. virgatum). The mixed samples had a total of four prairie species (S. scoparium, P. virgatum, C. fasciculata, R. hirta). A number of annual, early succession species were also found in all the samples. A count of the prairie plant species was done along each transect, for each plot. Preliminary data indicated that diversity (species richness) in the grass-and-forbs plots was slightly higher than in the grass-only plots. A t-test with two independent samples complemented the computation of the diversity index and indicated that there was not a statistically significant difference in species diversity between the grass-only and the grass-and-forbs plots at 90 days since the onset of the restoration. This paper postulates a model of prairie rehabilitation in synergy with renewable energy production from native prairies. This could inspire agriculture in the Midwest of the United States to a vision of ecological farming and sustainability.

[1] Department of Biology, Winona State University, 137 Mark Street, Winona, MN 55987 USA, e-mail: bborsari@winona.edu

[2] College of Natural and Applied Sciences, Missouri State University, Springfield, MO 65897, e-mail: InnoOnwueme@MissouriState.edu