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Statement of Jason Hill
before the
U.S. Senate Committee on
Agriculture, Nutrition and Forestry

Mr. Chairman and Members of the Committee:

Thank you for the opportunity to speak with you today about the research on biofuels my colleagues and I conducted at the University of Minnesota. There I am part of a diverse team of economists, agronomists, engineers, ecologists, and policy experts who are collaborating to better understand the various facets of renewable energy production.

The rapidly expanding biofuels industry in this nation has been led by corn ethanol and soybean biodiesel. Together they have offset a portion of our gasoline and diesel use while boosting farm profits and reducing greenhouse gas emissions. Although both corn ethanol and soybean biodiesel are, and will continue to be, integral parts of our transportation energy portfolio, we need to expand and diversify our biofuel supplies. We need to develop biofuels produced from feedstocks grown on land other than our most fertile farmland. We need to do this in ways that benefit both farmers and the environment.

Our work has identified one such system that is ideally suited to production on our marginal and degraded lands. We found that biofuels with tremendous energy, economic, and environmental advantages can be produced from mixtures of native prairie plants including grasses, legumes, and other wildflowers. Allow me to briefly describe the experiments we conducted.

We wanted to learn which mixtures of prairie plants were best suited for producing biofuels such as ethanol. Which mixtures, for example, would produce the most energy, and which mixtures would reduce greenhouse gases the most? Also, how much new energy and greenhouse gas reduction would a mixture of species provide compared to a single species such as switchgrass? To answer these questions, we planted 168 plots with either 1, 2, 4, 8, or 16 different native prairie species on agriculturally-degraded farmland. For over a decade we measured the total biomass each plot yielded annually and the total amount of carbon dioxide each plot removed from the air and stored in the soil.

We found at our study site that mixtures of 16 native prairie species produced 238% more energy on average than single prairie species such as switchgrass. We also found that highly diverse mixtures removed large amounts of carbon dioxide from the air and stored it in the soil, but that single species did not. Why did we see these trends? Essentially, highly diverse mixtures use available resources such as light, water, and nutrients more efficiently than less

diverse mixtures do. Also, in the highly-productive mixtures, legumes such as purple prairie clover and wild lupine were able to pull nitrogen from the air and make this important nutrient available to grasses such as big bluestem and little bluestem, which grew much larger as a result.

The environmental benefits of producing biofuels from diverse prairie biomass are striking. Most amazingly, producing and using ethanol from diverse prairie biomass can actually reduce the amount of carbon dioxide in the atmosphere. This is because a diverse prairie removes more carbon dioxide from the air and stores it in the soil than is released into the air when fossil fuels are burned to farm prairie biomass and convert it into ethanol. The carbon dioxide prairie plants remove from the atmosphere is stored as soil organic matter. This, along with the nitrogen added to the soil by native legumes, actually restores fertility to degraded farmlands. A prairie also provides wildlife habitat and reduces soil erosion and pollution of waterways with pesticides, herbicides, and fertilizers.

The advantages to farmers and the biofuels industry of producing diverse prairie biomass are equally remarkable. Diverse prairie biomass can be grown on marginal and highly-erodible lands, such as those often put into CRP and CSP. This spares our most fertile farmland for traditional crop production. Also, an acre of prairie biomass grown on marginal land can yield as much or more net energy in biofuels as an acre of corn ethanol produced on fertile cropland. This is because the fossil fuel energy requirements for growing prairie biomass and converting it into ethanol are so low relative to the amounts of energy needed to grow corn and convert it into ethanol. Once a prairie is established, biomass can be grown at considerably less expense to farmers than either corn or switchgrass. This is because a prairie needs to be planted only once, and maintaining it requires no pesticides or herbicides, and only trace amounts of fertilizer in certain cases.

The advantages for both farmers and our nation of this upcoming generation of biofuel feedstocks are clear. How can we best promote cellulosic biofuels, such as ethanol from diverse prairie biomass, as valuable complements to our existing crop-based biofuels? This question has taken on particular importance now that high corn prices are inducing farmers to take marginal lands out of conservation programs and place them back into corn production. This acreage shift has negative consequences not only for erosion and wildlife habitat, but also for the carbon cycle. This is because land taken from conservation programs and returned back to production loses its ability to sequester carbon, even if no-till or reduced-till cultivation practices are followed.

Making diverse prairie biomass ethanol or any other next generation biofuel a reality hinges upon recognizing that land can provide valuable ecosystem services such as carbon sequestration and soil restoration. We must reward those who treat the land in ways that provide these services to society. Incentive support may flow either to the farmers who manage the land or to the biofuel producers who purchase biomass grown in environmentally-beneficial ways. Such incentives may be in the form of direct support for farmers who grow diverse prairie biomass, as is being proposed by Sen. Klobuchar. I have seen a draft version of her legislation, and I am pleased that she is taking a lead on turning this opportunity into a reality. These incentives may also be credits provided to blenders who purchase the forms of ethanol

that have the greatest net greenhouse gas reductions, such as ethanol produced from prairie biomass. A tangible example of such legislation is California's Global Warming Solutions Act (AB 32) mandating low carbon fuels.

We are now at a time when the rapidly expanding biofuel industry has effectively wed together three of our fundamental needs - energy, food, and a healthy environment. Our challenge is to find and promote solutions that mutually benefit our nation on all three fronts. Biofuels from diverse prairie biomass provide us with an opportunity to do this.

Thank you, Mr. Chairman. I look forward to answering your questions.