Economic Incentives for Achieving Conservation and Renewable Energy Goals with the Conservation Reserve Program

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Project Goals: The goal of this project is to examine the economic and ecological benefits from producing harvestable dedicated energy crops on land enrolled in the Conservation Reserve Program (CRP). Specifically, we examine the economic incentives for growing miscanthus and switchgrass for cellulosic biofuels on land enrolled in the CRP at various biomass prices and the extent to which this can displace oil while also lowering the costs of maintaining the CRP for the government. We also assess the potential for additional carbon mitigation by growing harvestable miscanthus and switchgrass produced on CRP acres and the change in soil nitrate levels as compared to leaving CRP with unharvested permanent cover.

The objectives of reducing dependence on fossil fuels, increasing energy independence and mitigating greenhouse gas (GHG) emissions has led to ambitious policies in the US, such as the Renewable Fuel Standard (RFS), to encourage the use of renewable fuels in the US. At least 16 billion gallons of cellulosic ethanol out of a total 36 billion gallons of biofuels was mandated by the RFS to be blended annually with gasoline by 2022. However, the production of biofuels has raised concerns about the competition for land they pose for food and feed production, resulting in higher global crop prices that lead to indirect land use change by creating incentives for the conversion of non-cropland to crop production and releasing carbon stored in soils and vegetation.

These concerns are mitigated in the case of high-yielding dedicated energy crops, such as, miscanthus and switchgrass, that can be grown productively on low-quality land. This has led to an interest in the potential to use land already enrolled in the CRP in the United States for producing harvestable bioenergy crops like miscanthus and switchgrass. This is appealing for both economic and ecological reasons. It can provide a source of revenue for landowners that could reduce the rising annual rental payments for enrolling land in CRP. Using CRP acres to produce harvestable biomass can enhance soil carbon sequestration, produce low carbon biofuels and reduce soil nitrate levels as compared to leaving CRP with unharvested permanent cover.

In this study, we assess the extent to which the conversion of CRP land to produce harvestable bioenergy crops can contribute to biomass production and displace foreign oil while maintaining or enhancing the ecosystem services and lowering maintaining cost of the government using an integrated model, which combines the a biogeochemical model (Daycent) with an economic model (BEPAM).

We simulate a Business-as-Usual Scenario (BAU) in which no CRP acres are converted to energy crops, and we examine the optimal land allocation for energy crops, biomass prices, GHG and nitrate effects while meeting the 16 billion-gallon goal. Then we consider four other alternative policy scenarios in which CRP can be used for energy crops with varying levels of reduction in land rental payment by the government to assess the incentives to convert CRP acres in the rainfed region to energy crops and its effect on biomass prices, GHG and nitrate effects. We also consider four additional policy scenarios in which the government provides a cost-share subsidy that covers 50 percent of the cost of establishing harvestable energy crops. We conduct this research by compiling a comprehensive county-specific dataset on acres enrolled in the CRP and their soil attributes. We also compile information on the land rental payment and dominant cover practices adopted as well as expiring CRP acres in each county over the next 15 years, and we overlay various soil attributes data layers on CRP parcels, including, soil texture, bulk density, and PH, that are available from the SSURGO database. Our analysis shows that very limited CRP land will be converted to produce harvestable biomass if farmers are expected to forgo the full rental payments they currently receive for keeping land in CRP. In our results, given the government payment for enrolling in CRP program remains at the full level, 1.6 million ha (66.4%) of CRP acres in the rainfed region will convert to energy crops and produce 60 Million megatons of biomass. If the government payment is reduced by 25 percent, little CRP acres will convert to energy crops, and an additional 0.4 million croplands and 1.2 million marginal lands are required to harvest energy crops to meet the RFS mandate. We also find the cost-share assistance program contributes to the conversion of CRP acres to harvestable energy crops, but the incentive is very limited.

However, harvesting miscanthus and switchgrass in CRP lands would be accompanied by a significant increase in soil carbon stocks and a reduction in nitrate runoff relative to the status quo use of CRP acres. The GHG analysis shows the conversion of CRP acres to harvestable energy crops can increase accumulative soil carbon sequestration of the U.S. by 63.2% over 2017-2030, compared to the BAU scenario. In our simulation of 2030, we found that nitrate leaching can also be reduced by 17% compared to the BAU scenario.

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