### Abstract

This study created geo-referenced maps of harvestable Conservation Reserve Program (CRP) land in Ohio in order to identify where attention should be focused on cellulosic energy in Ohio. It also creates a methodology for an optimization model that will evaluate the value of biomass to be harvested from CRP land based on biological and economic factors.

### Introduction

In order for Ohio to invest in its energy future, all inputs to the energy market must first be evaluated. The Ohio Biomass Inventory has used an extensive database to assess the availability and potential of many biomass feedstocks for energy including crop residues, wood residues and bioenergy processing wastes (Jeanty et al. 2004). One input this study didn’t include is the availability and potential of CRP land, which has the ability to provide significant biomass (Epplin 1996, Mulkey et al. 2006, Mapenga et al. 2007). With the proper technology and policies in place, the state of Ohio could potentially use biomass harvested from these areas for energy production including co-combustion with coal and cellulosic ethanol.

**Objective 1:** To create a geo-referenced map of harvestable CRP land in Ohio and evaluate its composition and value.

**Objective 2:** To develop a dynamic bioeconomic model that optimizes the value of biomass to be harvested.

### Materials and Methods

County level data was collected from the Farm Service Agency (FSA), which collects information on the acres enrolled for each CRP classification by year and contract. Data was collected on potentially harvestable CRP classifications. The term “potentially harvestable” refers to acres that can currently be harvested under the emergency and prescribed harvesting management program (USDA 2007).

When determining the dry biomass available for acres the harvesting restrictions for the current program were assumed. Native stands established before 2002 and all non-native stands were evaluated at 3.5 dry tons per acre and native stands established in 2002 and after were evaluated at 2 dry tons per acre. All mapping was done on ArcGIS version 9.2.

The bioeconomic optimization model was developed by drawing upon biological, environmental and economic literature as well as communication with professionals in these fields and those familiar with CRP lands at the state and farm level.

### Results

**Figure 1.** This figure shows the distribution of potential ethanol from harvestable CRP acres in Ohio. Regions with the highest potential include South, North East, and North Central.

- As of September 2007 there are 363,908 acres enrolled as CRP land for the state of Ohio, of which 63.3% are currently available for managed or prescribed haying in the state.
- This translates to an estimated 707,981 dry tons of available biomass on CRP lands.
- Using the Department of Energy’s conversion factor of 67 gallons of ethanol for one dry ton of biomass, Ohio holds an estimated 47,434,694 gallons of potential ethanol in its CRP lands.
- The average rental rate paid harvestable CRP land in Ohio in 2007 was $102.80.

**Figure 2.** A diagram of the bioeconomic optimization model which will optimize the harvest of biomass while considering both biological and economic factors. The orange circles represent the state variables and the green diamond represents the decision variable. The arrows show how both the economic and biological factors will be considered in the harvesting decision.

### Conclusions

This study gives policy makers and those interested in investing in the energy future of Ohio one more piece to consider for an energy portfolio. This study shows that ethanol from CRP lands in Ohio has the potential to displace .75% of Ohio’s current gasoline use.

The geo-referenced map created from this study, along with previous biomass inventory data, can help to reveal a clearer picture on where attention should be focused on cellulosic energy in Ohio. The optimization model will show how biological factors can alter the economic market for CRP biomass and vice versa. This model will also be able to show what the price paid to farmers for biomass for cellulose will have to be before they will be willing to enter the market under private costs and benefits. It will also be able to show how much of an affect environmental costs could on the market.

In addition to this, the model may be able to show how likely farmers will be willing to forfeit the benefits of CRP and reenter their acres into crop production. This is an important issue with the additional demand for corn based ethanol increasing the financial returns to corn and soybeans.

### Literature Cited


Indian grass: 80% switch grass, 20% big bluestem, 20% little bluestem and switch grass.

**Table 1.** Harvestable categories of CRP land in Ohio and their relative abundance.

<table>
<thead>
<tr>
<th>Category</th>
<th>Name</th>
<th>Acres</th>
<th>Species Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP1</td>
<td>Native Grasses</td>
<td>20,717</td>
<td>60% tall fescue, 20% orchard grass</td>
</tr>
<tr>
<td>CP2</td>
<td>Native Grasses</td>
<td>52,322</td>
<td>20% before 2002, 60% switch grass, 20% big bluestem and Indian grass</td>
</tr>
<tr>
<td>CP45</td>
<td>Native Grasses</td>
<td>231</td>
<td>Since 2002: 40% Indian grass, 40% big bluestem, 20% little bluestem and switch grass</td>
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<tr>
<td>CP40</td>
<td>Native Grasses</td>
<td>48,579</td>
<td>20%</td>
</tr>
<tr>
<td>CP10</td>
<td>Native Grasses</td>
<td>25,238</td>
<td>60% switch grass, 20% big bluestem and Indian grass</td>
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<tr>
<td>Total</td>
<td>Native Grasses</td>
<td>230,276</td>
<td></td>
</tr>
</tbody>
</table>

### Acknowledgments

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