INVESTMENT DECISIONS AND POLICY ANALYSIS

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BACKGROUND

This project will inform investment decisions and policy development by integrating economic modelling – designed for decision making under uncertainty – into the biomass energy supply chains.

A major impediment to the growth of the bioenergy sector is the current uncertainty with respect to the reliable supply of sufficiently large quantities of feedstocks to feed processing facilities of sufficient scale. Reducing this uncertainty would help inform future bioenergy policies and private investment decisions.

The overall goal of this research is to construct three models: *(i)* a feedstock supply model, *(ii)* a product options model, and *(iii)* a supply chain model. These models will estimate the amount, location, and costs of cellulosic bioenergy feedstocks available over time, which are sensitive to changes in market prices and yield variability. The information will be valuable to bioenergy producers considering new investments, as well as to policy makers interested in attracting such investments.

SHORT-TERM OBJECTIVES

(i) Feedstock Supply Model

- Estimate market fluctuations that influence the supply of agricultural and forest products, and therefore the resulting amounts of residues
- Estimate amounts and locations of biomass available at various cost levels
- Simulate impacts of forest and agricultural policies (e.g., allowing fast-growing exotic tree species to be grown on public land; subsidies to energy plantations) and constraints that influence available biomass supply

(ii) Product Options Model

- Analyze historic prices of bioenergy products as the basis for future projections
- Predict the spillover effects of other sector price series on bioenergy product prices
- Explore optimal options (in terms of maximum expected profitability) with respect to which bioenergy products to pursue, and when to invest in them
- Predict the price/policy conditions that trigger switching in optimal choices of options (e.g., agriculture to biomass)
- Estimate profitability levels (or gaps in profits) and option values for alternative policy/investment choices

(iii) Supply Chain Model

- Integrate the feedstock supply and product options models to explore factors affecting the profitability of biomass and bioenergy investments

PROJECT OVERVIEW

FEEDSTOCK SUPPLY MODEL

- We will develop a spatial and dynamic model to estimate the costs of agricultural and forest biomass supplies (purpose grown and residues) that could be available for bioenergy production

PRODUCT OPTIONS MODEL

- We will develop a model to simulate the effect of different policy/investment options within biomass energy supply chains, and thereby estimate the impacts of these options on the production of various bioenergy products

SUPPLY CHAIN MODEL

- We will integrate biomass feedstock supply with product options into a supply chain model to better understand the technical, ecological, and economic factors that might limit or enable profitability of these biomass/bioenergy options

THEME OVERVIEW

Biomass

We already know how to create fuels from certain types of biomass, but many other feedstocks can potentially be transformed in a similar manner. In order to identify new viable sources, we must develop more a sophisticated understanding of the technological processes that might be used to convert biomass to fuel, and assess the potential business cases for adopting certain sources that might have other economic uses, or compete with established cash crops. We can also explore the potential for tailor-made fuels for the transportation sector, developed from biological sources.

EXPECTED OUTCOMES

This research will generate information regarding supply (amount and location), demand, and profitability of various forms of bioenergy production under changing market, technology, and policy environments. The supply chain model will aid decision-makers in predicting and simulating future commercial-scale biomass production in Alberta. Investors and policy makers will thereby have improved information upon which to make investment and policy decisions.

Biomass supply is likely to change over time in response to changing agricultural yields per hectare, and changes in markets for agricultural and forest products. For example, on agricultural lands weather variability causes significant differences in yields per hectare over time. Likewise, if the price of wheat increases relative to other crops, then wheat production will likely increase, along with the wheat straw available for bioenergy. Similarly, if the price of forest products increases, harvesting activity on public forest land will likely increase, and thereby lead to an increase in forest residues.

Our models will allow the simultaneous consideration of the supply of cellulosic bioenergy feedstocks from residues and dedicated crops, within the context of different spatial market structures, and how these supplies could change in response to stochastic future prices and changes in government policies.

EXTERNAL PARTNERS

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BRIMS

Some of the data for the biomass modelling will be obtained from the Bio-Resource Information Management System (BRIMS) database developed by Silvacom with funding from Alberta Innovates. Contact Scott Wilson at scott.wilson@silvacom.com for more information on BRIMS.

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