Economic Feasibility of Bio-Butanol on Marginal Agricultural Lands in Western Colorado

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Introduction

As is the case with most rural agricultural communities, western Colorado is dependent on fossil fuels transported from distant sources. This results in vulnerability to fuel supply disruptions and price shocks (Ederington et al., 2011; Yu, Wang, and Lai, 2008). A predictable and locally derived fuel source may provide stability to the agricultural production supply chain as well as to local commerce (Tareen, Wetzstein, and Duffield , 2000; Western Organization of Research Counsels, 2009). This research project evaluates the economic feasibility of bio-butanol as a locally grown biofuel in western Colorado as a means to encourage farm-level and regional energy sovereignty.

Objectives

The primary objective of this study is to develop a budgeting tool than can be used to determine the most economically advantageous feedstock for bio-butanol processing. Choosing the most economical feedstock is the first step in a regional feasibility study aimed towards answering the question, "Does it make sense economically to develop a bio-butanol industry in western Colorado?" This can be accomplished with the implementation of the budgeting tool.

Methods

The tool allows for cost comparisons between four feedstock scenarios in the establishment phase of a perennial cropping system. The scenarios include switchgrass, tall fescue, a "native mix scenario" (mainly wheatgrass species), and an "introduced mix (including alfalfa) scenario." Each production scenario is customizable and can be tuned to reflect fertilizer quantity, number of cuttings, and other variable costs.

STEP 1 ⬇ Choose Parameters

Fill in all white boxes from drop-down list.

Labor Rate (per hour)	$ 12.00
Diesel Fuel Price (per gallon)	$ 3.50
Irrigation Cost (per acre)	$ 75.00
Operating Interest Rate (based on 6 month annual loan repayment)	3%

STEP 2 ⬇ Choose Crop Mix Scenario to Further Examine

Fill in all white boxes from drop-down list. User can choose any or all scenarios to examine.

	Native Mix Scenario:	Introduced Mix Scenario:	Tall Fescue Scenario:	Switchgrass Scenario:
Yield in Tons:	2	2	2	2
Fertilizer Input:	High	High	High	High
Number of Cuttings:	Single	Single	Single	Single
Efficient Producer Cost Per Acre:	$ 191.37	$188.89	$ 186.20	$ 228.10
Efficient Producer Break Even Cost (per ton)	$ 95.68	$ 94.44	$ 93.10	$ 114.05
Inefficient Producer Cost Per Acre:	$ 192.62	$190.14	$ 187.46	$ 229.35
Inefficient Producer Break Even Cost (per ton):	$ 96.31	$ 95.07	$ 93.73	$ 114.68

Results

The native mix, introduced mix, and tall fescue crop scenarios are all cost competitive at various input parameters. Without factoring in variations in processing conversion rates, only switchgrass presents a significantly higher breakeven cost as a Colorado-grown feedstock. The performance of these species may change as additional years of production occur.

Conclusions

The evaluation tool is a step towards implementing a regional feasibility study. The tool is specific to western Colorado, but can be changed to match the agronomic needs of any region. Assuming constant yields, the tool identifies that switchgrass is more costly to grow than other bio-butanol feedstocks. Otherwise, there is little economic difference between the other scenarios.

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