Lowering the Cost of Bio-energy Feedstocks while Providing Environmental Services: A Win-Win Opportunity

Contract Number: RD3-1

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Goal, Research Areas, and Objectives

Project Goal

- To develop an efficient system for the production, pre-processing and delivery of biomass feedstocks for energy production that minimizes feedstock cost for energy facilities while maximizing landowner income and the environmental benefits of biomass production.

Major Research Areas

- Biomass crop production field to farm gate
- Moving biomass from road/farm gate to facility
- Measure and value environmental benefits
- An integrated assessment of multiple environmental commodity market options
- Life cycle assessment of biomass to energy system

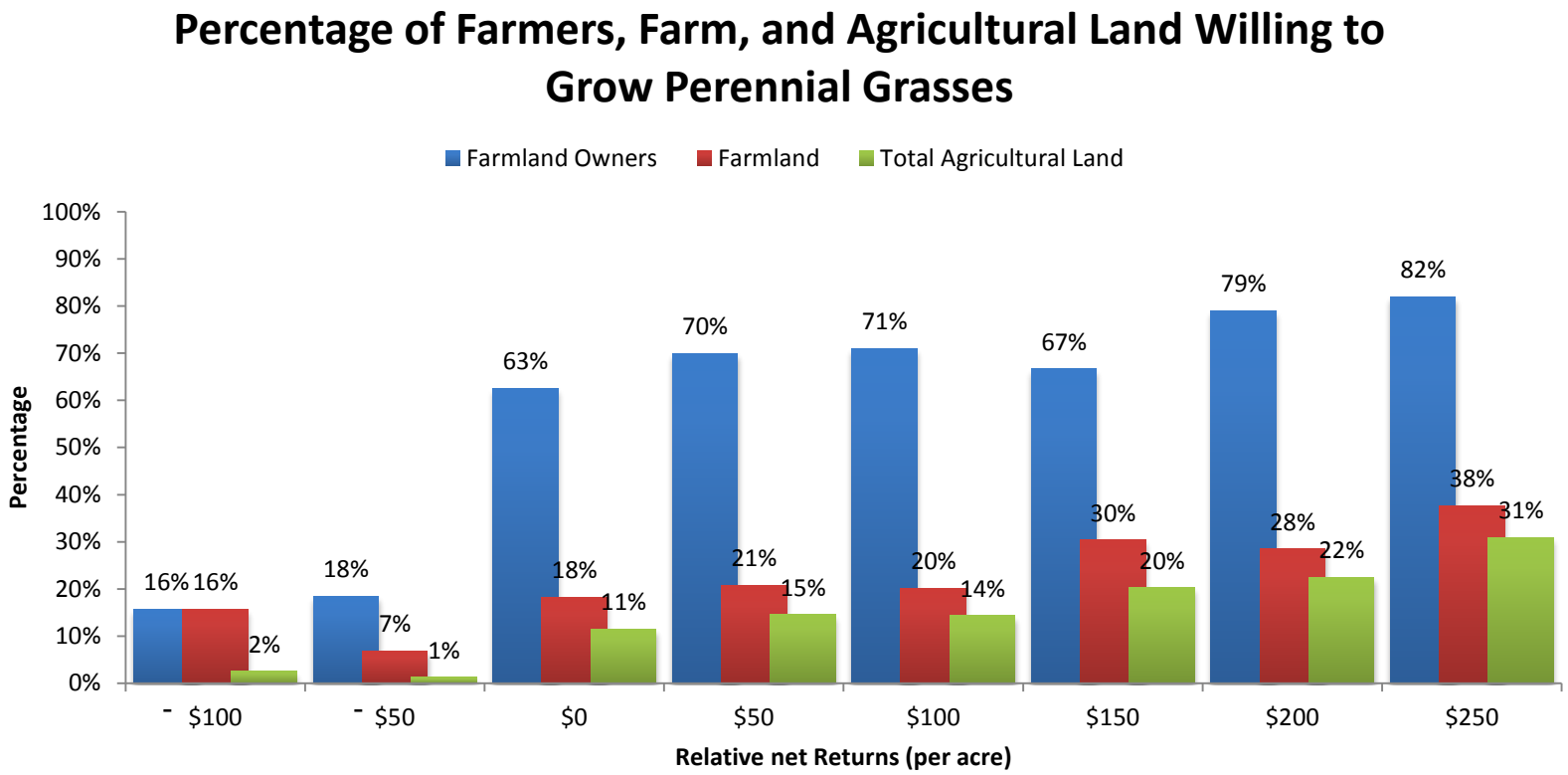
What was Accomplished

- Biomass crop production field to farm gate
  - Biomass establishment, weed control, productivity
  - Harvest timing
  - Impact of ash as fertilizer (based on lab scale study)
  - Landowner willingness to supply biomass to a facility
  - Guidelines for biomass production and harvest
- Measure and value environmental benefits
  - Impacts of biomass production on birds and small mammals
  - Impacts of biomass on water quality and quantity
- An integrated assessment of multiple environmental commodity market options
  - Completed review of for ecosystem/environmental services payments
  - Completed survey of consumer interest in environmental services

- Biomass from field/farm gate to facility
  - Analysis of costs and benefits of biomass production
  - Costs of transport and environmental impacts
  - Impact of a staging area for KODA Energy
- Valuation of ecosystem/environmental services
  - Based on current and potential markets
  - Included in analysis of biomass production options
- Leveraged funding
  - LCCMR funding for impacts of biomass harvest on wildlife
  - EPA 319 funding for Decision Support Tool
  - Met Council/Natn'l Agroforestry Center/UMN (IREE) funding for study of biomass crops

Results

Landowner Willingness to Supply



Lowering the cost of grassland biomass production - agronomics

- Plant materials
  - Selection of plant materials with high yield, adaptability, & pest resistance
  - Maximize returns, reduce cost per unit of production
- Landscape targeting
  - Many perennial crops are better suited to floodplain or depositional positions than annual crops such as corn.
  - Targeting perennial bioenergy crops to these landscape positions results in a reduced opportunity cost for the landowner

Lowering the cost of grassland biomass production – (continued)

- Companion crops
  - Establishing perennial herbaceous biomass crops with companion crops such as barley can increase establishment year income by providing grain and additional harvestable biomass
- Biomass ash fertilizer
  - Excellent source of P & K (supplemental N required)
  - Diversion of waste stream
  - Could reduce production costs depending on delivery cost

Lowering the cost of grassland biomass production – (continued)

- Delaying harvest until spring
  - Increased flexibility for producers
  - Better wildlife habitat
  - Reduced nutrient export
  - Better product quality, especially for gasification

Lowering Per Acre Costs

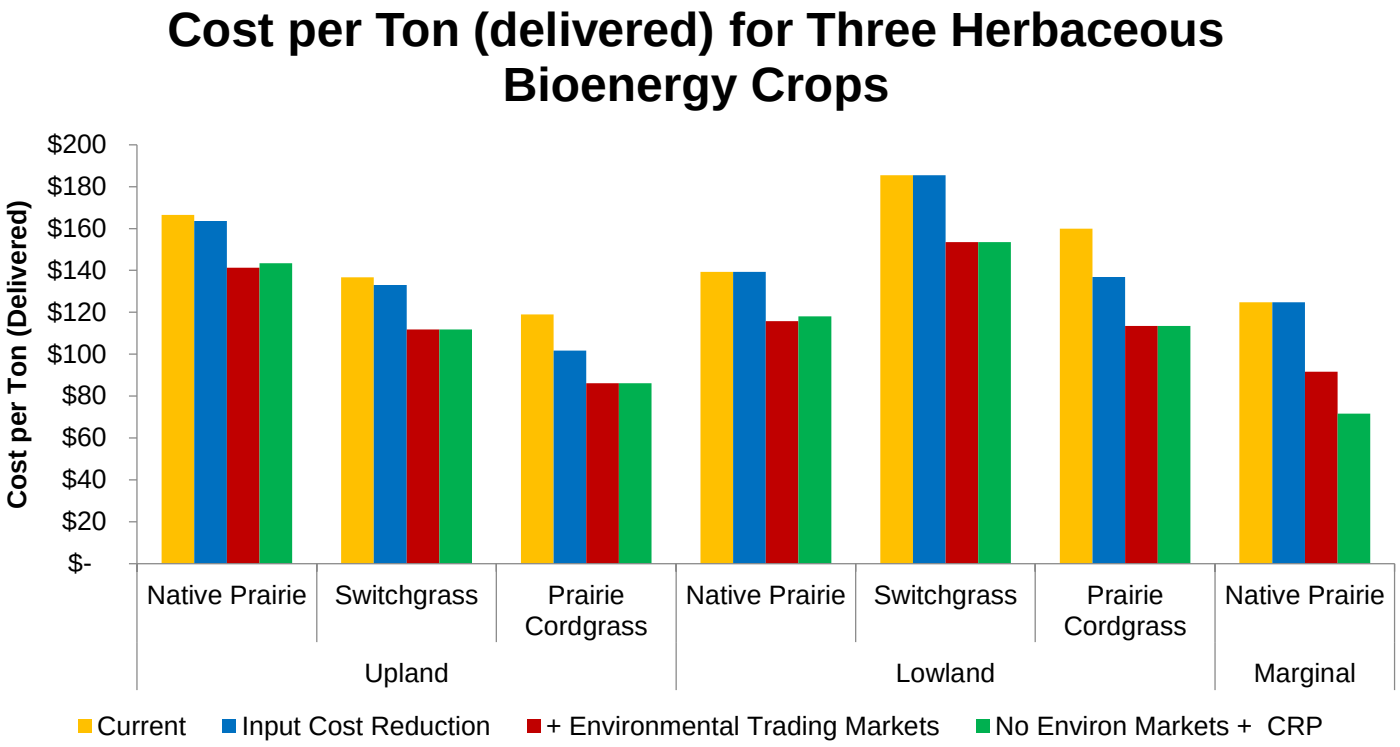
Input Cost Reduction

- Companion Crop (barley)
- Ash Credit
- Seed Costs (prairie cord grass)
- Transportation

Environmental Payments

- Water Quality
  - Nitrogen
  - Phosphorus
  - Sediment
  - Volume
- Carbon
  - Sequestration
  - Nitrous Oxide
- Pollination

Lowering the Cost per Ton of Biomass



Environmental Scores of Biomass - LCA

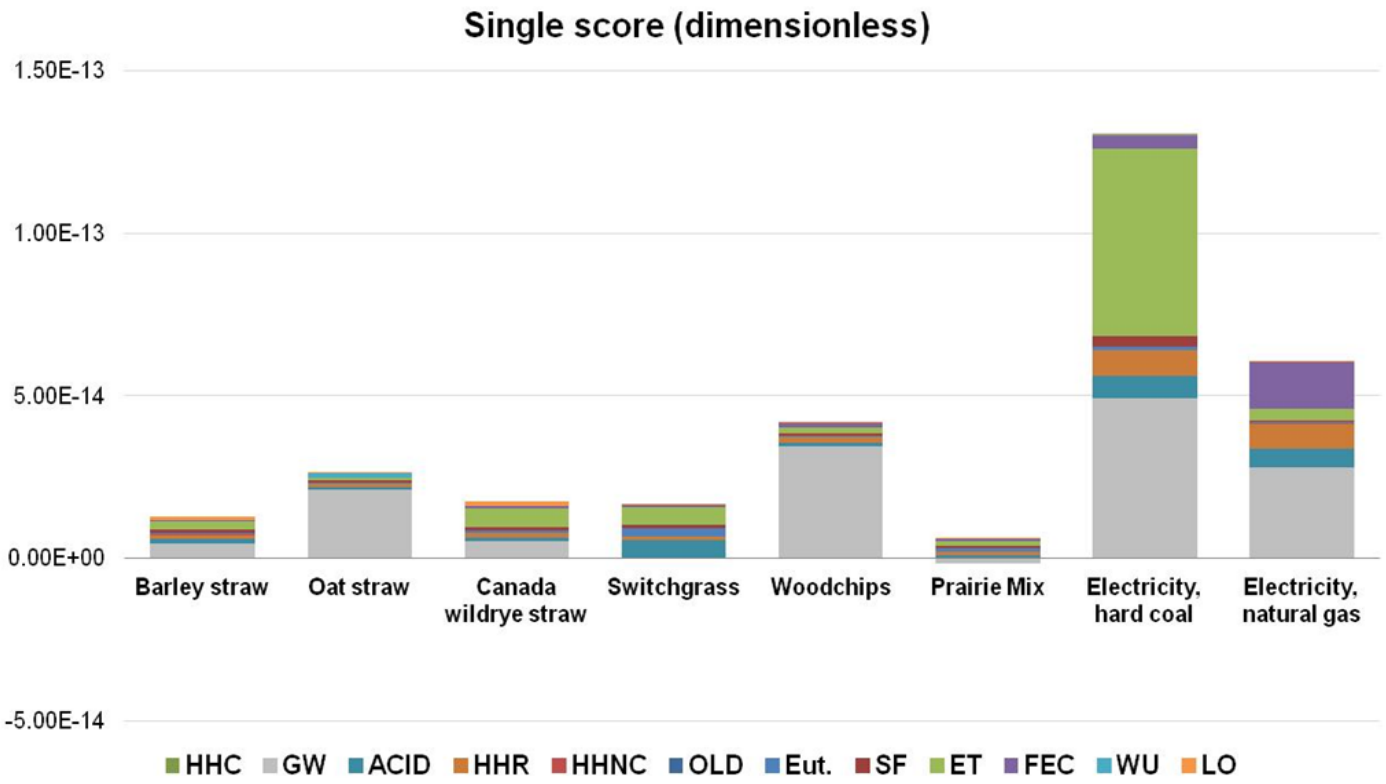


Figure 2. Overall environmental scores of biomass electricity pathways and conventional (hard coal and natural gas) electricity generation

Note: shorter bars indicate fewer impacts
(prairie mixes had the lowest level of impacts)

Questions?