Production of Short-Rotation Woody Biomass With and Without Irrigation With Treated Municipal Sewage Wastewater

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Purpose

Demonstration and research technologies incorporating the treatment of wastewater and biosolids from municipalities and pulpmills into short rotation woody crop production on agricultural land.

Objectives

- To integrate and investigate wastewater and biosolids application methods and management systems into short rotation woody crop production
- To demonstrate to communities and other organizations the potential for waste treatment and wood fibre production;
- To determine the environmental and growth implications of waste application;
- To assess the costs and the economics of various application methods
- To provide provincial and federal regulators with defensible data to set policy and regulations
- To provide growers and waste treatment managers credible cost and yield data on which to base investment decisions

Past

- Established first research/demonstration site at Whitecourt, AB in spring of 2006- harvested winter 2008-09

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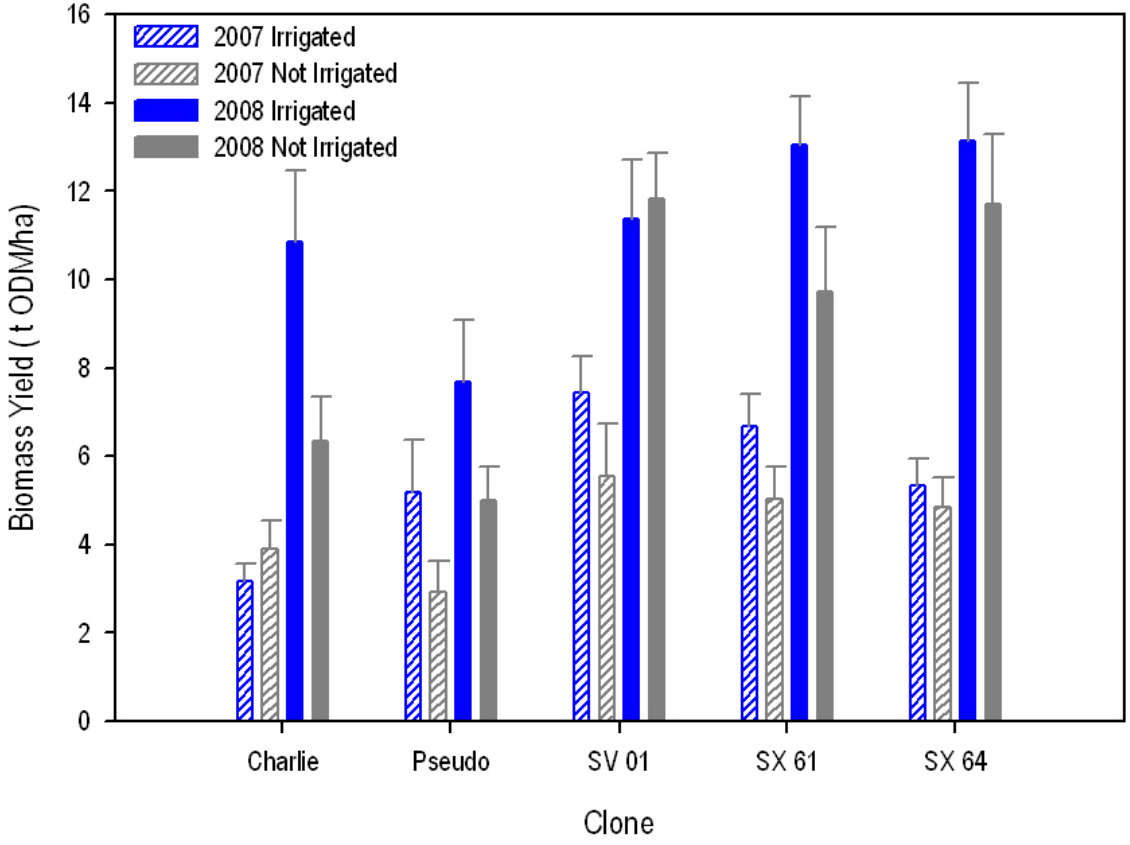
2007 Irrigated
2007 Not Irrigated
2008 Irrigated
2008 Not Irrigated
Biomass Yield (t ODM/ha)
0
2
4
6
8
10
12
14
16
Charlie
Pseudo
SV 01
SX 61
SX 64
Clone

ers, CFS

Present

CBIN Funded Willow Demonstration/Research Sites Across Canada

From Derek Sidders, CFS

Present

Clairmont Irrigation Site
Afforestation
Ainsworth Lumber, Grande Prairie County
Aquatera, Grande Prairie Regional College
4 ha's irrigation 2010
Grande Prairie
Beaverlodge Irrigation Site
Concentrated Biomass Plantation
Town of Beaverlodge, ConocoPhillips Petroleum, PRT Inc
4 ha's irrigation 2010
Whitecourt Biosolids Site
Concentrated Biomass Plantation
Millar Western Forest Products, Town of Whitecourt
6 ha's biosolids/pulpmill sludge applicaiton
Athabasca
Edmonton Biosolids Site
Concentrated Biomass Plantation
City of Edmonton, EWMCE
6 ha's biosolids/compost application 2010
Bonnyville
Whitecourt
Whitecourt Irrigation Site
Concentrated Biomass Plantation
Town of Whitecourt, Alberta Environment
University of Alberta
2 ha's irrigation 2005
Fort Saskatchewan
St Albert
Edson
Villeneuve Irrigation Site
Concentrated Biomass Plantation
Sturgeon County, University of Alberta
4 ha's irrigation 2010
Spruce Grove
Edmonton
Hinton
Leduc
Ohaton Irrigation Site
Concentrated Biomass Plantation
Camrose County, University of Alberta
4 ha's irrigation 2010
Camrose
Wainwright
Red Deer

Project Collaborators/Drivers

Municipal

1. Town of Whitecourt
2. Town of Beaverlodge
3. City of Edmonton
4. Camrose County
5. County of Grande Prairie
6. Sturgeon County

Irrigation

1. Ion Irrigation Management Inc.
2. Geoflow Inc.
3. Aquatera Ltd.
4. Southern Drip Irrigation Ltd.
5. Laqua Treatment AB
6. Design Irrigation Ltd.

Academic

1. University of Alberta
2. Grande Prairie Regional College
3. University of Calgary

Industrial

1. Millar Western Forest Products
2. Ainsworth Lumber
3. ConocoPhillips Petroleum
4. Pacific Regeneration Technologies
5. Benchmark Laboratories Group Ltd.

Other Government

1. Alberta Innovates Bio Solutions
2. Alberta Agriculture and Rural Development
3. Alberta Environment
4. Alberta Municipal Affairs
5. NRCan- Canadian Forest Service
6. Edmonton Waste Management Centre of Excellence
7. Alberta Innovates Technology Futures

Non-Government Organizations

1. Poplar Council of Canada

Present

- Four additional irrigation sites in Alberta with water sourced from sewage lagoons- Ohaton (Camrose County), Beaverlodge, Clairmont (Grande Prairie), Villeneuve (Sturgeon County)
- Developing 2 biosolids application sites- Whitecourt, Edmonton

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- Developing 2 biosolids application sites- Whitecourt, Edmonton
- 4 clones per site- willow and poplar depending on location and collaborators, using subsurface drip irrigation
- Will test four rates of biosolids application
- Treatments include a control with no irrigation or biosolids
- Assisting other communities with feasibility and providing technical support to CANMET-Mining and Mineral Sciences Laboratories

Present

- With contractors and suppliers sourcing/developing operational scale subsurface drip irrigation installation and control technology (e.g. multi-row dripline insertion)

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- Investigating willow and poplar growth, soil chemistry (micro- and macro-nutrients, heavy metals, salts) and biology (pathogens), ground water chemistry/biology, subsurface movement of water and solutes, carbon balance (soil CO2, methane, NOx)

Future

- Investigating the potential of using a surface flood system- possibly 50% cheaper than subsurface systems (must address with regulators the issues of human contact, surface flow and odours)
- Will perform a costs/benefits analysis using operational scale scenarios

Expected Outcomes/Impact

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- Provide growers and waste treatment plant managers with a decision support tool for waste application and crop production
- Local energy/heat self sufficiency
- New local or regional employment and business opportunities
- Provide regulators with scientifically defensible results on which to base policy and regulation
- Quantify the carbon footprint of the crop-production/waste treatment system
- Reduced environmental impact of waste treatment (alternative to surface waters discharge)

Challenges

- High plantation establishment costs
  - $10,000-12,000 C (7,600-9,200 Euro) per hectare
    - Planting cuttings
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Photo by Derek Sidders

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  - Hybrids from abroad
- Receptivity of regulators
  - Variable
- Chicken and egg
  - Opportunity for bioremediation

Thank You

This area is
subsurface irrigated
with treated sewage
waste water.