Implementation of Fast-Growing Trees for Municipal Wastewater Treatment - Municipalities Find Waste Management Solutions and Wood Biomass Production Opportunities

Richard Krygier, M.Sc.Forestry, RPF
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Presentation Outline

• What are fast growing trees/shrubs?
• Plantation Establishment and Management
• Technology Adoption
• Research
What are fast growing trees/shrubs?

- In Canada two genera *Populus* and *Salix*
- Much faster than native forests

Data and photos courtesy of Derek Sidders
What are fast growing trees/shrubs?

- *Populus* spp. as high yield afforestation

5-7.4 Odt/ha/yr

2 weeks

1 yr

3 yr

5 yr

14 yr

Data and photos courtesy of Derek Sidders

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What are fast growing trees/shrubs?

- Our focus is *Salix* spp. (willow) short rotation intensive culture dedicated biomass plantations.

Photo from www.jprwillow.co.uk
Plantation Establishment

- Good agronomic practices are critical to success
- Site preparation
Plantation Establishment

- Planting Pattern

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Plantation Establishment - Early Growth
Plantation Establishment - Growth Cycle
Plantation Establishment-Growth Cycle

- Site preparation
- Harvest
- Early spring after coppicing
- One year after coppicing
- Three years after coppicing
- First year growth
- Coppice
- Planting

From T.A. Volk
State University of New York
Irrigation System - Subsurface Drip
Irrigation System - Surface

- Drip emitter
- Point Source Controlled Flood

* www.laqua.se
Harvesting Methods and Scale
Material Handling
Material Handling
Harvesting Methods and Scale
Harvesting Methods and Scale

Gyro-Trac Bio-Energy Baler
Technology Adoption - Community Perspective

• Our driver additional wood fibre production
• Primary community driver water and/or biosolids
• Beaverlodge- alternative to discharge
• Camrose County- defer expansion of lagoon system
• City of Calgary and Edmonton- biosolids application location
• Indigenous communities- lagoon expansion/renovation and biomass for energy (remote and rural)
Technology Adoption- Camrose County

Wastewater
Technology Adoption - Camrose County
Technology Adoption - City of Calgary

Willow Demonstration Project

Who: The City of Calgary and SYLVIS.

What: Work on this site demonstrates the ability of Alberta's agricultural land to produce a willow tree crop, increasing diversity.

How: Biosolids are applied to this land to improve productivity by increasing soil fertility and soil organic matter content while ensuring the sustainable growth of willow trees.

This application is approved by Alberta Environment and Sustainable Resource Development and is in accordance with applicable Wheatland County bylaws.

Why: Biosolids are nutrient-rich organic materials generated by municipal wastewater treatment.

Land application is the most common use of biosolids in Alberta and ensures that essential plant nutrients such as nitrogen and phosphorus remain part of the nutrient cycle.

For more information, please visit www.calgary.ca or contact The City of Calgary by phone at 311 (403.268.2489) or SYLVIS at 1.800.778.1377.

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Technology Adoption - City of Calgary

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Technology Adoption - Others

SE Saskatchewan - new subdivision wastewater 9 ha

Red Deer AB - 2 ha clonal trial

Photos courtesy of Bionera
Technology Adoption - Others

- Coal mine reclamation
  - 500 ha’s
  - Use of biosolids
  - Research component
    - Clonal trials
    - Insect and disease assessment
    - Certification of carbon sequestration
    - Socio-economic- transitioning from coal to biomass
Technology Adoption - Others

• First Nations
  • Address infrastructure issues
  • Biomass energy

• Rural and Remote communities
  • Part of biomass feedstock for bioenergy

• End users looking for consistent high quality biomass feedstock
Research

- CBIN – pilot research and demo site in Wtcrt. Additional funding secured through AIBio and ARDN
- Fortunate to partner with progressive municipalities and organizations in Alberta
Research - Phytoremediation

• Aircraft De-icing Agent
  – Greenhouse trial
  – Clones tested tolerant to ethylene glycol
  – Assessed impact on growth, soil chemistry, soil biota and leachate
Research- End Uses

• Biochemicals and other higher value end products
  – Collaboration with Université de Montréal
    • Chemical and physical analysis
    • Conversion options
    • Wastewater irrigation found to increase lignocellulosic bioenergy potential
    • Potential to improve sustainable biofuel economic feasibility while providing a environmental service

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Research- Models & Economics

• WISDOM decision support model
  – Hue Nguyen, McGill University and Dr. Evan Davies, University of Alberta
    • System dynamics model

• Techno-Economic Analysis
  – CFS GLFC and AFC researchers
  – Module for Wisdom model