

UNIVERSITY OF MINNESOTA

**EXTENSION**

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Fueling the Future:

The Role of Woody and Agriculture Biomass for Energy Workshop

February 18, 2009

Roosevelt

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EXTENSION CENTER FOR  
**Food, Agricultural and  
Natural Resource Sciences**

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UNIVERSITY OF MINNESOTA  
**Driven to Discover**<sup>SM</sup>

# Biomass Basics

Fueling the Future:  
Roosevelt, MN

2/18/09

# Biomass

- Any organic matter that is available on a renewable or recurring basis.....
- Stuff that grows
- Capturing the suns energy that comes to earth and turning that energy into products

# Biomass

Increasing the efficiency of that system or range of products you can derive from that energy will have great value.

# Key Issues

- 1) What species to focus on?**
- 2) Starch or Cellulose?**
- 3) What technologies will be used in the future?**
- 4) Are we ready for renewable energy?**
- 5) What does the future hold?**

# Biomass

The biomass industry is in its infancy.

# Starch or Cellulose?

- **Starch processing much further at this time.**
- **Starch is ultimately food source and cellulose can add value in food production (corn stalks, switchgrass).**
- **Cellulose gives greater breadth of environments.**

# Species

**Monocultures or  
Polycultures (mixed)**

# Species

- **Monocultures – Corn, wheat, switchgrass, willows, poplars, etc.**
- **Multiple species (Polycultures) – Prairie, CRP, etc.**
- **Regionality**

# Monocultures

**Corn and wheat, switchgrass, willows, poplars, etc.**

## **Strengths**

- **Ease of management**
- **Simpler systems**
- **biorefining**

## **Weakness'**

- **Risk – Supply, system design**
- **Inputs**

# Polycultures

**Mixed species – Prairie, CRP, etc.**

## **Strengths**

- Perenniality
- Water quality

## **Weakness'**

- Logistics
- Biorefining
- System design to meet changing fuel type

# Biorefining

- **Processing materials from plants to make products.**
- **Biomass is young oil**
- **In this instance with the end product ultimately being fuel or energy.**

# Technologies?

**Fermentation or Gasification?**

# Technologies?

**Fermentation – Making sugars and then alcohols from plant material.**

**Strengths – Further developed than gasification**

**Weakness – Enzyme specific**

**- Access to fiber**

**- Contamination can be a problem**

# Technologies?

**Gasification – heating with low oxygen to make gas (instead of burning).**

## **Strengths**

- Uses little water
- Fuel flexible
- Tolerant of contamination

## **Weakness'**

- Technologies not as advanced as fermentation
- Clean-up issues for further processing

# Technologies

**Logistical issues are just as important as technologies....  
harvesting, storing,  
transportation, preprocessing,  
time of growth, etc.**

# Are We Ready?

- Social as well as Technical Issues
- Infrastructure
- Policy

# Drivers:

- Oil and natural gas prices are rising
- Fossil fuels for energy emit things into the air that would not otherwise be there.
- We import much of our energy
- Renewable energy can keep energy dollars local.

# Challenges of Renewable Energy

- Dispatchability of wind and solar
- Storage – energy and biomass
- Transmission
- Technology
- Food vs Fuel
- Sustainability
- Biomass production logistics
- Short-term economic viability

# Renewable Energy

If we are going to reap the potential economic, environment, and energy security benefits that are the promise of renewable energy, integrated energy systems must be developed.

