Biomass Energy Opportunities from Hybrid Poplars In Minnesota

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Short Rotation Woody Crops for Biomass
A “Poplar” topic for Minnesota

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Making Things Happen!

WesMin RC&D Council acknowledges the many partners that we work with who support and carry out hybrid poplar project activities

- MN DNR
- US DOE-Biofuels Feedstock Development Program
- CINRAM
- U of M
- AURI
- NRRI
- U of Nebraska
- National Agro-Forestry Center
- McKnight Foundation
- MN State Legislature
- USDA - Rural Development
- EPS/Beck Power
- International Paper
- SWCD’s
- County Commissioners
- RC&D Councils
- US Forest Service
- NRCS
- MN Dept. of Ag
- MN Agro-Forestry Cooperative
- Cooperative Services
- Center for Rural Policy
- Private Landowners
- FSA
- MN State Energy Office
- CERTS and Renewable nrg
- Central MN Comm. Found.
Hybrid Poplar Trees

- Short Rotation Woody Crop (SRWC)
- Fast Growing "Cottonwood trees"
- Site preparation
- Plant "sticks"
- Spacing (8’x8’ or now 10x10’ or variation)
- Maintenance Critical (cultivation and weed control) first 3 years
- Reduced fertilizer and chemicals
- Insect and Disease Control
- Harvest at age 5 years (energy) or age 10-15 years (pulp/paper)
- Uses: Whole Tree Burning, steam and electric energy from heat, windbreaks, pulp for paper, OSB; wood products (fiber is similar to aspen)
- Future: Ethanol?

Benefits to Minnesota Citizens and Landowners

- Perennial Crop—doesn't need to be planted every spring (i.e. NW MN)
- Soil and Water Conservation—because of perennial crop, less tillage, less plowing over rotation
- Water Quality—sediment filters, phytoremediation,
- Environmental Protection—less overall use of fertilizer and chemicals
- Alternative Agriculture—new crop for farmers to diversify income
- Produce forest products from crop land
- Locally produced renewable energy (Now 2005 energy crunch—high gas prices, natural gas, etc.) Reduce dependence on fossil fuels and less environmentally friendly nonrenewable energy, coal, nuclear power, etc)

Wood Energy Scale Up Project

- WesMin RC&D Project - Nonprofit Fiscal Agent
- Funded by D.O.E.- Biofuels Feedstock Development Program- Oakridge
- Technical Assistance from DNR Forestry
- Many Partnerships - Stated Earlier
- Collects Hybrid Poplar Costs and Growth/Production
- On Farm Demonstration- Real Life

Wood Energy Scale Up Project

- 17 Landowners within 50 miles of Alexandria, MN- West Central MN
- 6 Ac. To 300 Ac fields, Approx. 1750 Ac.
- Mostly on CRP (CRP 5 year extensions)
- Wide Variety of Soils, Topography, Management
- More typical of real life farms in MN?
Wood Energy Scale Up Project (continued)

- Started in 1994, 2006 would be 12th year
- Technical Assistance from DNR- Forestry
- Producers allow access by Project Participants for on farm research, data collection
- Cost Share from DOE with WesMin as Fiscal Agent to encourage best management and data collection from receipts

Next Slides/Overlays compiled by University of Minnesota

Thanks to Steve Taff and others at U of M for compiling our data so it can be shared with the public!!!

Yield of 1 to 6 dry tons/ac/yr

- Average of 17.11 tons over 6 years
- Approx. 3 tons/ac/yr
- Some better clones and soils and management yielding nearly 6 tons/ac/yr
- Most experts agree 3.0 to 3.5 tons/ac/yr with new clones, improved management and experience from what we have learned from pilot projects
- Lower yields: poorer clones, maintenance not as should be, CRP program cover crop competition, weather, etc

Site average hybrid poplar production (cumulative)

Dry tons per acre

Stand Age
Acreage, location of hybrid poplar plantations

- 3000 acres in Oklee Tree Project in NW MN
- 1750 acres in WesMin Wood Energy Scale Up Project near Alexandria
- 16,000 owned or rented by International Paper for Sartell Paper Plant (West Central MN, Todd, Douglas Counties)
- 4000-6000 more in other locations, private
- Estimate 25,000 – 30,000 acres (28,000) total growing in MN (DNR and other sources)

Hybrid Poplar in Minnesota - 2004

Hybrid Poplar has been found to be an excellent substitute for aspen fiber in papermaking and Oriented Strand Board (OSB) production.

- Hybrid Poplar can reach merchantable size in 7 to 12 years.
- Intensive culture is required for the first 3 years in order to grow hybrid poplar.
- It is commonly grown on marginal agricultural fields.

Real Data Comparisons from three actual harvests in MN

- Douglas County- west of Alexandria
- Harvest 2003 - 26 acres @27 cords acre = 700 cords
- 15 years old
- $24/cord = $648/ac
- Comments: Cherry Picked best trees, excessive wood waste (30% +)
- Site for Timberjack Harvester demo.
Timberjack Slash Bundler Demo
2003 - Douglas County

Lots of slash and biomass left over

A method for biomass collection and storage??
Harvest Site #2

- NW Becker county
- Harvested 2003
- 12 years old – 25 cords per acre
- $25/cord
- $625/ac
- Comments: Old clones, poor soils, maintenance not the best

Harvest Site #3 (2006- Most recent)

- 7.5 Acres
- 15 years old
- 260 cords
- $11,000 sale price
- $42.30/cord
- Thinned once- don’t know what was removed
- Comments: good maintenance
Some harvest pictures of site 3
The slash and residue left site 3 in Todd county

So what’s the average yield per acre per year on harvested sites
- Site 1 = 1.8 cords/ac/yr (excess slash)
- Site 2 = 2.1
- Site 3 = 2.3
- This is ONLY the logs or 100” bolts removed for pulp or OSB Board
- We have improved clonal varieties of trees and better management than when we first experimented with Poplar trees.

Compare to Wood Energy Scale Up Project Predictions
- We had said 3 to 3.5 tons/ac/yr was reasonable
- That was for entire biomass
- If you remove 25% for slash we are close to our predictions
- (3.0 -.75 t/a/yr = 2.25 tons/ac/yr)
- We are using cords and dry tons interchangeably as they are approximately the same.

So what is potential biomass tonnage from HP in MN-"Back of the napkin calculations"
- In my opinion the best use of HP for biomass will be from slash as the trees bring a higher price for pulp than energy.
- Added value energy product or in some cases the stands are not a quality product for paper and pulp (twisted and multiple trunks)
- So for slash or added value figure at present 28,000 acres x (3.0 x .25) = 28,000 x .75 x 15 years = 315,000 cords or dry tons of wood for the stands if harvested at 15 years of age
Tonnage if all were used for biomass

- 28,000 x 3.0 t/ac/yr x 15 years = 1,260,000 cords or dry tons of wood.

- Since they are various ages it is not likely all would be harvested in one year, many are nearing 12 to 15 years of age

Conclusions and estimates of biomass harvest as added value

- Pulp prices bringing $30 to over $100/cord stumpage price, offers of $50 + easily today
- Slash not used for pulp bringing $0 (give it away for free and I'll take it away off your land) to $15-25.
- Using 1 cord/acre as slash, that's $15/yr per acre of added value for energy
- $60 to $200 per acre per year for pulp
- Summer wood, easy access, private lands avoids environmental and public concerns

Other Economic Factors to Consider

- Distance to markets
- Trucking and fuel prices
- Biomass energy prices
- Wood similar to aspen, some industry desires HP wood, some may not be compatible for wood processes
- International Paper highly desires and has planted approx. 16,000 ac
- Ainsworth Engineered for OSB interested
- Pulp market—DNR sales $20 to $120 + (aspen)

My biggest concerns about hybrid poplar slash for biomass

- If not utilized for biomass, it is on field in way of planting so most likely will just be burned on the field
- Wasted biomass and CO2 in the air
- Added value is nice, any farmer could use more $ rather than waste it
- There is still a tremendous amount of leaf litter and small twigs, branches so am not concerned about erosion from what I've observed
Other thoughts about use of Hybrid poplars for biomass

- Many have been planted too close and a thinning operation could be used to improve stand and use thinned tress for biomass. Were 8x8, now most 10x10, some thinking 12x12.
- Coppicing of trees, resprouting from trunks after harvest are many stems, most landowners will not prune out main leaders, extensive hand labor required, multistem bush-like coppicing could be a great way to save root system and not replant and use these for biomass crops, every 4 to 5 years? Great Potential!

Will farmers/growers get a fair price??

- Are we moving from food production to energy production on midwest farms?
- If so, will farmers get paid for what their biomass is worth to grow or for energy or will they be expected to “give it away for free”???
- Farmers are not getting costs of production for corn, soybeans, wheat, hence LDP’s, etc. Will we repeat this cycle for energy crops??? Just a thought for the future.

Why Minnesota’s leading the way for Hybrid Poplar Demonstration Projects, Research, and Programs

- MN Wood Energy Scale-up Project
- Oklee Tree Project-UM Crookston
- MN Agro-Forestry Cooperative
- Information and Educational Activities – Tours, handouts, workshops, Farmfest, event booths, newsletters, etc.
- Agro-Forestry Loan and Grant Program from MN State Legislature
- St. Peter CRP Biomass Pilot Project
- Center for Rural Policy and Development (Panel and Paper regarding MN role for SRWC)

What will drive SRWC in the future? #1 opinion, energy needs

- Federal and State Supported Biomass/ Closed Loop Renewable energy Projects
- Wood Energy (Burning)
- Gasification
- Plasmapification
- Ethanol from wood
- Need for locally produced, renewable energy, national and state mandates, energy shortages and prices
- Jobs and local economic development-from energy projects and businesses
For instance

- Central MN Ethanol Coop. (Little Falls) Biomass Burning addition-$17 million-Wood Chips, sawdust, gasification to make steam and electricity for plant-Replace natural gas
- Fibrominn -Turkey Litter – Benson -20% wood
- District Energy- St. Paul-Waste wood
- Laurentian Energy Authority- Hibbing and Virginia-closed loop wood
- RECAP- Plasma Torch concept at International Falls (Laurentian RC&D)

New Projects for environment

- Phytoremediation
  - Wellhead protection (Glenwood)
  - Sanitary landfills (Clay county)
- Watershed protection and buffers
  - Chippewa Watershed
  - Hypoxia in gulf?
  - MN and Mississippi river Basin

Conclusion about HP in MN

- Alternative agriculture and diversity
- Minnesota's pulp prices and wood industry needs fiber, possibly highest prices for pulp in nation?
- Renewable energy
- Energy conversion specialists vs. Food producers
- "Productive Conservation" vs "Idle Conservation"
  - Environment & Soil and Water Conserv.
  - Water quality protection
  - Perennial cover
  - Phytoremediation
  - Carbon Sequestration
- Programs and challenges
- Minnesota is a leader in SRWC

Photos by:

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• Making things happen!!