Local Bioenergy: Benefits and Challenges

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EESI Biomass Crops Briefing
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Innovative stakeholder-led projects are demonstrating how to combine biomass production & conservation

- In some cases, existing Farm Bill programs support these projects.
- With modest tweaks, USDA could do more to advance multifunctional agriculture.
Native Grasslands in Pennsylvania for Food, Fiber, Fuel and Wildlife Habitat
Environmental Quality Incentive Program (EQIP)

- Assists farmers by providing incentives for seeding native grasslands for multiple uses
- Additional incentives for grass management benefiting wildlife
- Has assisted many farmers in the Benton PA area to start growing native grassland biomass

Slide credit: Scott Singer
In the Summer:
Harvested as hay or grazed as a late summer forage
In the Fall:
Harvested at “peak biomass” as feedstock for ethanol and/or next generation liquid bio-fuels
In the Late Winter or Early Spring:
Harvested after overwintering to be densified into solid fuels (pellets or briquettes) for heat and power.
Made in the USA

Pocono Northeast RC&D Pelletizer

Buskirk Engineering (IN)

Bob Thomas
Biomass grower with briquetter at the 2011 Farm Progress Show

BHS Energy (PA)
Made in the USA

Benton Schools Biomass Boiler
Advanced Recycling Equipment (PA)
The Local Bioenergy Initiative

A collaborative project to begin growing and using perennial energy crops in Central Illinois
Lake Decatur Watershed

- 925 square miles
- 87% row crops
- Tile drainage
- Sediment & nitrates addressed by:
  - Dredging
  - IX Treatment
  - Watershed management
The Local Bioenergy Initiative

Outreach & assistance to early adopters

Some landowners like the “GYOF” idea – Grow your own fuel!
The Local Bioenergy Initiative

Develop/demonstrate landscape design concepts:

Optimize co-production of biomass & environmental benefits

- Water Quality
- Biodiversity
- Wildlife habitat
- Recreation

Prairie grass buffer separates an organic field from the adjacent conventionally-farmed field.
The Local Bioenergy Initiative

Market development

Markets for biomass

~ and ~

Markets for ecosystem services … aka

Conservation incentives

Eastern Illinois University’s Renewable Energy Center burns wood chips during start-up period. May shift to a grass—wood blend.
Community Supported Energy

• Grow energy grasses
• Make pellets or briquettes
• Deliver biomass fuel to participating property owners
• Collect ash and return nutrients to the soil
Caterpillar – AWI Prairie for Bioenergy Demonstration Plots

Planted Spring 2011

- Wildflower/Grass Border (3 Grasses/11 Flowers)

Plot #1
Warm Season Grass Mix (Big Bluestem, Indiangrass, Switchgrass)
30 Acres
FDC

Plot #2
Switchgrass (Blade EG1102)
10 acres

Plot #3
Quail Unlimited Illinois Moist Soil #1 Blend (4 Grasses/6 Forbs) + 2 lbs/A Indiangrass
10 Acres

Plot #4
CP 25 Diversity Mix (11 Grasses/22 Forbs)
5 Acres
Prairie cordgrass (*Spartina pectinata*):
- High yielding warm season native
- Thrives in wet conditions
- Starts growing in early spring
- Promising candidate for nitrate removal.

Future site of AWI—Cat—U of I
Prairie cordgrass research plot
Made in the USA

Outdoor pellet boiler – heat a home

Central Boiler (MN)
Indoor pellet furnace – heat a farm shed

Big M Mfg (IL)
Madelia Model: Perennial Feedstocks to Advanced Biofuel

Goal:
Utilize Local Grown Renewable Energy as a Catalyst for Increasing Perennials on the Landscape to Reduce Pollution from Production Agriculture

Madelia Slides: Linda Meschke, Rural Advantage
• Multiple Feedstocks Grown Locally
• Perennials Targeted to Priority Sites

Feedstocks

Torrefaction
• Produces an Advanced Biofuel
• Similar to Wyoming Coal in BTU's [8,600/lb]
Targeting Acres

Crop Equivalent Ratings for the Madelia Fuelshed

CER
- Not tilled
- 0.1 - 20.0
- 20.1 - 40.0
- 40.1 - 60.0
- 60.1 - 80.0
- 80.1 - 100.0

Cities and Roads:
- Madelia
- New Ulm
- Sleepy Eye
- Mankato
- Saint James
- Winnebago

Scale: 0, 2.5, 5, 10, 15, 20, 25 Miles
Potential Ecological Uplifts:
- Sediment, N & P Reduction
- Water Storage Increased
- Wildlife & Pollinator Habitat
- Carbon Sequestered
- GHG Reduced

* Compare economics of corn production on *marginal lands* to dedicated energy crop economics.
Cordgrass grown to reduce nitrates in Chesapeake Bay & provide biomass

U of Maryland, Wye Research Center
Made in the UK
(But US-Made “bale burners” are now available)

Dr. Ken Staver with hydronic boiler at Wye Research Center
Potential Environmental benefits and crop yields in bioenergy buffers

Model Results:
• Nitrate leached reduced by 60-70% in buffer zones
• Nitrous oxide emissions reduced in buffer zones by 65% - 93%.
• Yields of energy crops comparable to yields with fertilizer application.
• → supports Biomass program goals and RFSII mandates

Argonne National Laboratory’s Fairbury project is funded by the U.S. DOE, Office of the Biomass Program
Contact: M. Cristina Negri negri@anl.gov
Testing Biomass production and Nitrate recovery in the Indian Creek MRBI watershed, Fairbury IL

- Producing bioenergy crops without competing with food and feed crops
- Woody crops would be productive where corn is not
- This approach could save on crop insurance and provide clean water, reduce greenhouse gas emissions.

Short rotation willows will be planted and harvested with modified farming implements

Argonne National Laboratory’s Fairbury project is funded by the U.S. DOE, Office of the Biomass Program
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Final thoughts ...

Biomass crops can be used for thermal energy without waiting for large biorefineries.

Hay producers, including small farms, can be “multifunctional agriculture” pioneers.

Small U.S. manufacturers are finding a niche in the emerging Green Energy industry.

Stakeholder-led projects can be laboratories for R&D on biomass—conservation synergies.