Selection and Use of Native Grasses for Biomass Feedstocks

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The Plant Materials Program

- We are a network of Plant Materials Centers and Plant Materials Specialists strategically located throughout the United States.
- We select plants and develop plant technology for the successful conservation of our nation’s natural resources.
- We provide information to private landowners who need assistance in addressing critical land management problems.
Biofeedstock Characteristics

- Fast growing
- Perennial
- Efficient use of inputs
- Highly productive
- High quality
- Agronomically viable
- Environmentally compatible
Candidate Biofeedstocks

- Sorghum & Sudangrass
- Arundo donax (giant cane)
- Bahiagrass & Bermudagrass
- Giant Miscanthus
- Switchgrass
- Indiangrass, Big Bluestem, Little Bluestem
- Prairie Cordgrass
Bermudagrass

- Multi-use, existing production
- Conventional equipment
- High inputs required
- Difficult to harvest
- Low productivity as a biomass crop
- Poor quality
Giant Miscanthus

- High productivity, sterile
- Low input production
- Low mineral content
- Vegetatively propagated
- Low wildlife value
- Current breeding work to eliminate sterility
- Potential weediness
Switchgrass

- Easy to seed and harvest
- Long lived, perennial
- Low input production
- Multiple uses
- Very adaptable
- May be slow to establish
Other Native WSGs

Indiangrass, Big Bluestem, Little Bluestem
Similar qualities to Switchgrass

- Many different cultivars and selections
- Seeding may require specialized equipment
Average Yields

<table>
<thead>
<tr>
<th>Crop</th>
<th>Tons/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switchgrass</td>
<td>10</td>
</tr>
<tr>
<td>Indiangrass</td>
<td>3</td>
</tr>
<tr>
<td>Big Bluestem</td>
<td>3</td>
</tr>
<tr>
<td>Little Bluestem</td>
<td>3</td>
</tr>
<tr>
<td>Giant Miscanthus</td>
<td>22</td>
</tr>
</tbody>
</table>
Switchgrass Cultivars

- ‘Dacotah’
- ‘Forestburg’
- ‘Pathfinder’
- ‘Sunburst’
- ‘Summer’
- ‘Cave-In-Rock’
- ‘Kanlow’
- ‘Carthage’
- ‘Alamo’
- Timber Germplasm
Switchgrass Cultivar Performance

From Wullschleger, et.al., 2010, Agronomy Journal 102(4).
Harvest Frequency of Switchgrass

Knoxville, TN

Adapted from Fike et al., 2006
Advantages of Single Harvest

- Lowland cultivars produce well
- Late fall or early winter harvest requires less energy
- Maximizes biomass production
- Allows for translocation of nutrients to crown and roots
- N and other nutrient conservation strategy
- Improve biomass quality for direct combustion
Feedstock for Direct Combustion

- Requires specific feedstock quality
- Low nutrients (N, K, Ca, S, Cl), moisture, and ash required to reduce direct combustion system failure
Effect of Environment on Harvestable Biomass of Switchgrass

![Graph showing the effect of environment on harvestable biomass of switchgrass. The graph compares the yields in 2008-2009 and 2009-2010 across different weeks after seed maturity. The yields are measured in pounds per acre (lb/acre). The graph shows that the yields are consistently higher in 2008-2009 compared to 2009-2010 across all weeks.]
Effective of Harvest Timing on Biofuel Quality of Alamo Switchgrass

Critical levels from Lewandowski, 2007
Guidance for the Producer

- Field Preparation
- Cultivar selection
- Planting rates, dates and methods
- Weed Control
- Fertilization
- Harvest Management

Questions?