Biomass Feedstock

Bottlenecks

Approach

Expertise

S1007

The Science and Engineering for a Biobased Industry and Economy

“Multistate Research Committee”

A.R. Womac, The University of Tennessee

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“Feedstock”

- Biologically Based – Recent Solar Capture
- Many sources – Much potential
- Typically Voluminous
- Typically Cultivated/ Cultured
- Feedstock Supply/ Engineering
  - Growth
  - Harvest
  - Handle
  - Store
  - Transport
  - Processe
  - “Supply and Prep of Plant Material for Conversion”
Feedstock Integration

• Feedstock Supply Can’t Function in a Knowledge Vacuum
  – Optimizing Biological production versus ease of Harvesting?
  – Knowledge of Feedstock value versus Over-investment?
  – What are feedstock requirements and tolerances for the conversion?
  – What do feedstock quality compromises do to conversion efficiency?
  – Does large-scale conversion perform like bench-top experiments?
  – Standards for At-the-Door Feedstock Characteristics
Feedstock Bottlenecks

• Growth
  – Impact of system design on biomass yield and quality
  – Impact of system operation on ecosystem and environment
• Harvest
  – Terrestrial and Aquatic cutting and gathering equipment
  – Ag machinery not robust for many feedstock sources
• Storage
  – Wet versus Dry
  – Supply Management versus Fermentation versus Drying Energy
• Transport
  – Handling Discrete versus Continuous Units
  – Transport Density versus Densification Energy
• Processing
  – Size Reduction Energy versus Conversion Process Efficiency
  – Physical Separation versus Benefits
• Standardization
  – Few standards to ensure consistent feedstock supply to processing plants
Feedstock Approach

• Growth
  – Optimization of Genetic and Agronomic Factors
  – Harvest frequency on Yield, Quality, Wildlife Habitat, CRP grasslands

• Harvest
  – Take advantage of Biomass Weakest Mode of Failure
  – In-Field processing, Size Reduction, Dry Flowable Product, Densification

• Storage
  – Centralized storage – methods, deterioration, Dry Matter Losses
  – In-field “storage”

• Transport
  – Availability - Use - Moisture - Deterioration Strategies
  – GPS – GIS – Shortest Distance Management

• Processing
  – Size Reduction Optimization
  – Separation Benefits

• Standardization
  – ASAE and other – Uniform terminology, system integration
Feedstock Expertise

• Growth
  – Paul Adler   Agronomist   USDA-ARS
  – Lewis Liu    Molecular Biologist   USDA-ARS
  – David Brune  Engineer   Clemson University

• Harvest
  – Raymond Huhnke  Engineer   Oklahoma State University
  – Shahab Sokhansanj  Engineer   ORNL
  – Alvin Womac  Engineer   University of Tennessee

• Storage
  – Carl Bern  Engineer   Iowa State University

• Transport
  – Michael Montross  Engineer   University of Kentucky

• Processing
  – Lonnie Ingram  Microbiologist   University of Florida