

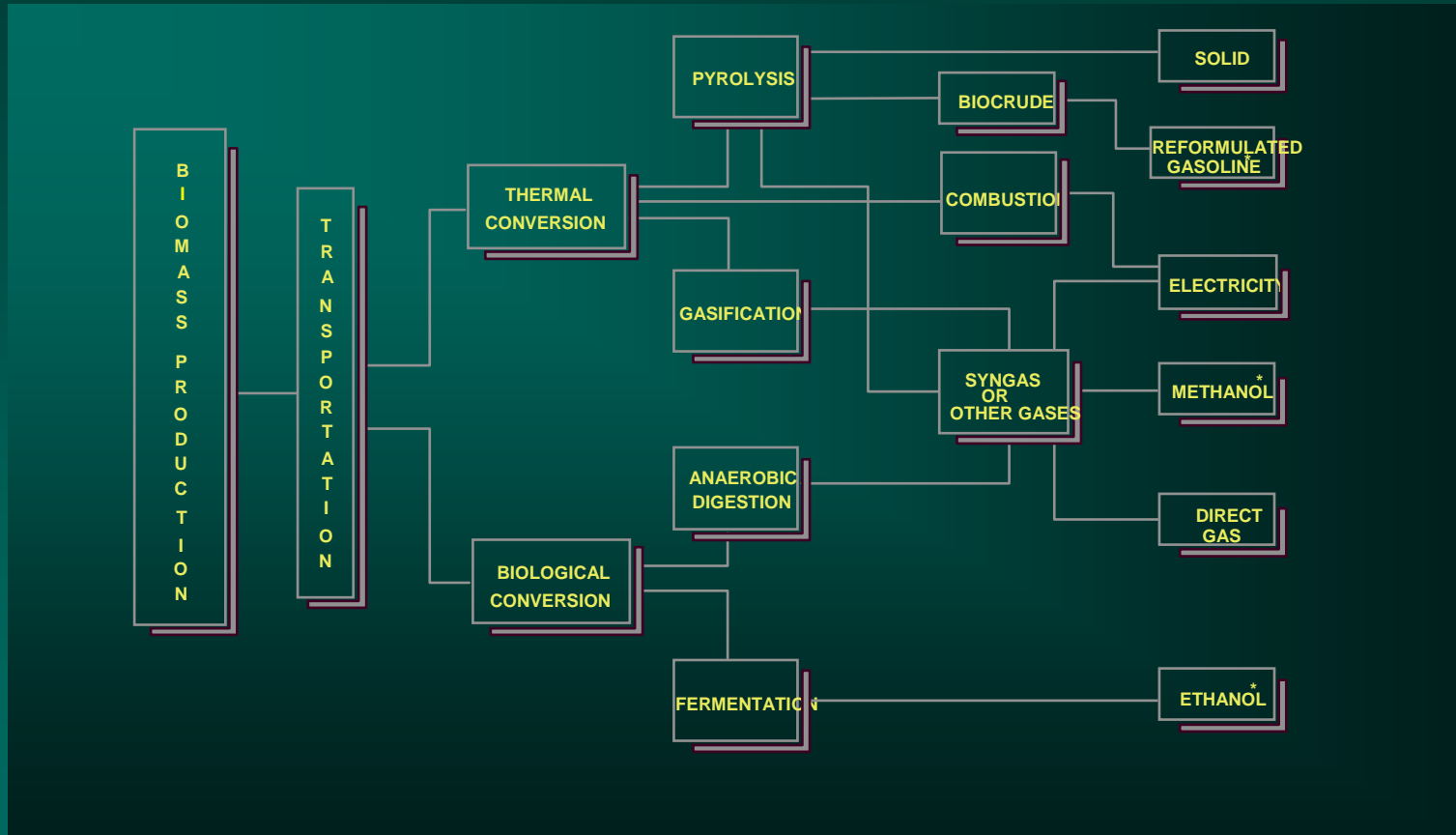


The Economics of Biomass: A Status Report

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Material Flow in the Production of Biofuels





First let me acknowledge those funding this initiative

- Department of Agricultural Economics and Rural Sociology, University of Tennessee
- Soil Conservation Service, United States Department of Agriculture
- Biomass Sciences Division, Oak Ridge National Laboratory
- Department of Energy
- Tennessee Valley Authority



Several Projects are Underway at the University of Tennessee

- Farm Level Analysis
- A Regional Analysis
- An Eastern United States Analysis
- Corn to Ethanol Analysis



Farm Level Analysis

- ❑ Examines biomass in a farm situation
- ❑ Assumes existing policies
 - ❑ Commodity programs
 - ❑ Conservation Reserve Programs
 - ❑ Conservation Compliance
- ❑ Conclusions include areas with highly erodible lands and limited crop selection will prefer a low eroding biomass crop to alternatives that exist with traditional crops



Farm Level Analysis

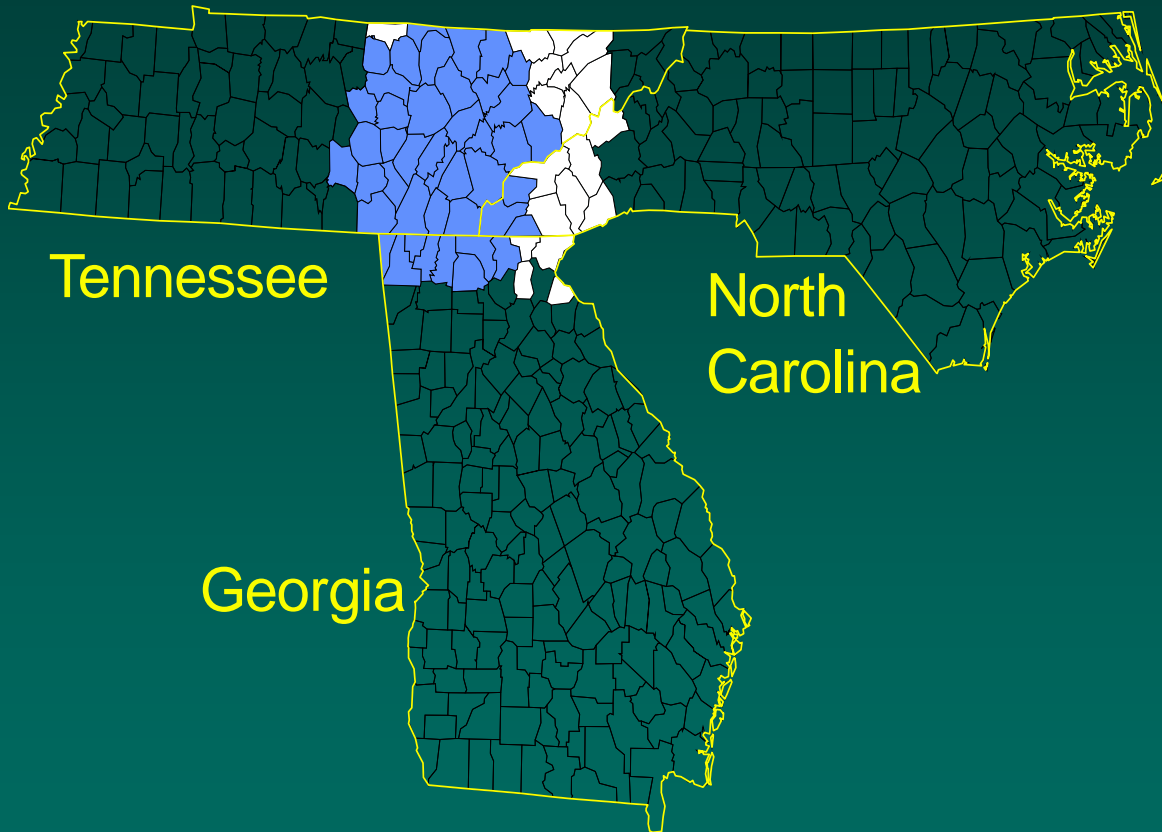
- However, at a biomass price of \$34/ton the farmer does loss money. He/she simply loses less money by staying in compliance and partaking in government programs on the rest of his/her lands.



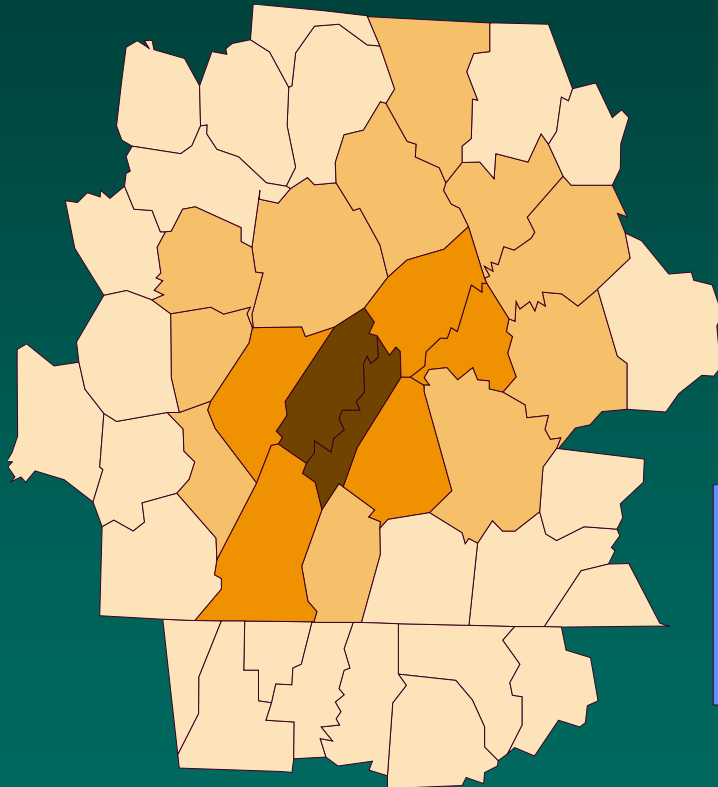
Regional Analysis

- Analysis is currently being conducted over three sites including areas around
 - Wattsbar, Tennessee
 - Orange County , Indiana
 - Cass County , North Dakota
 - Olmstead County, Minnesota
- The initial analysis is completed for the Wattsbar power plant.

The Wattsbar Region



Wattsbar Hauling Regions

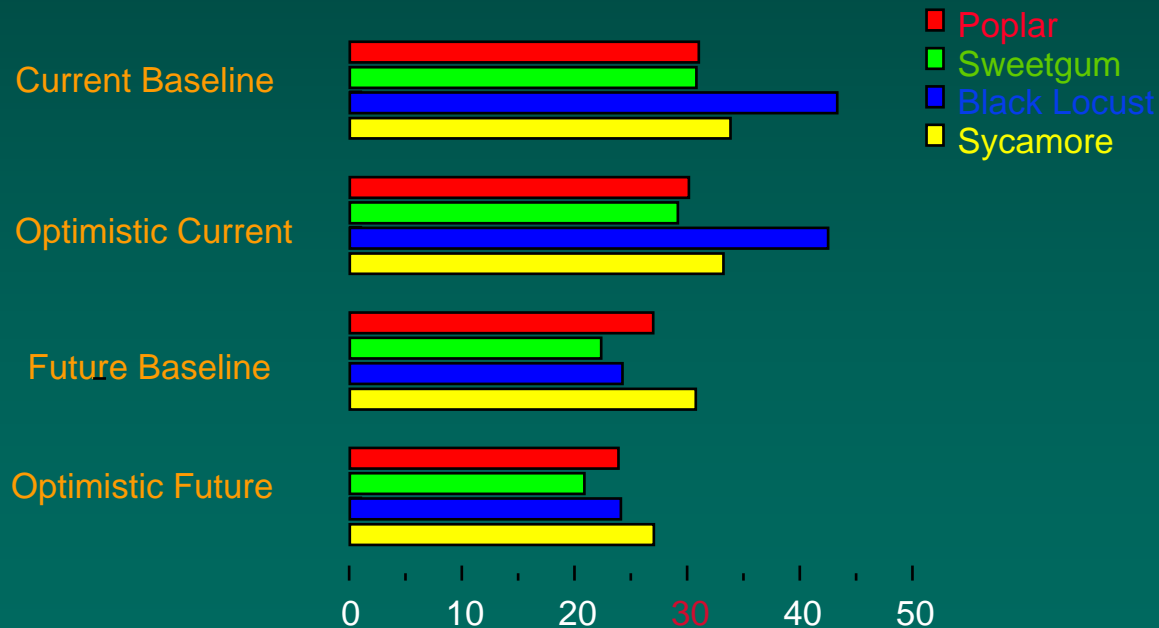


- Region 1 <30 miles
- Region 2 30 to 60 miles
- Region 3 60 to 90 miles
- Region 4 >90 miles

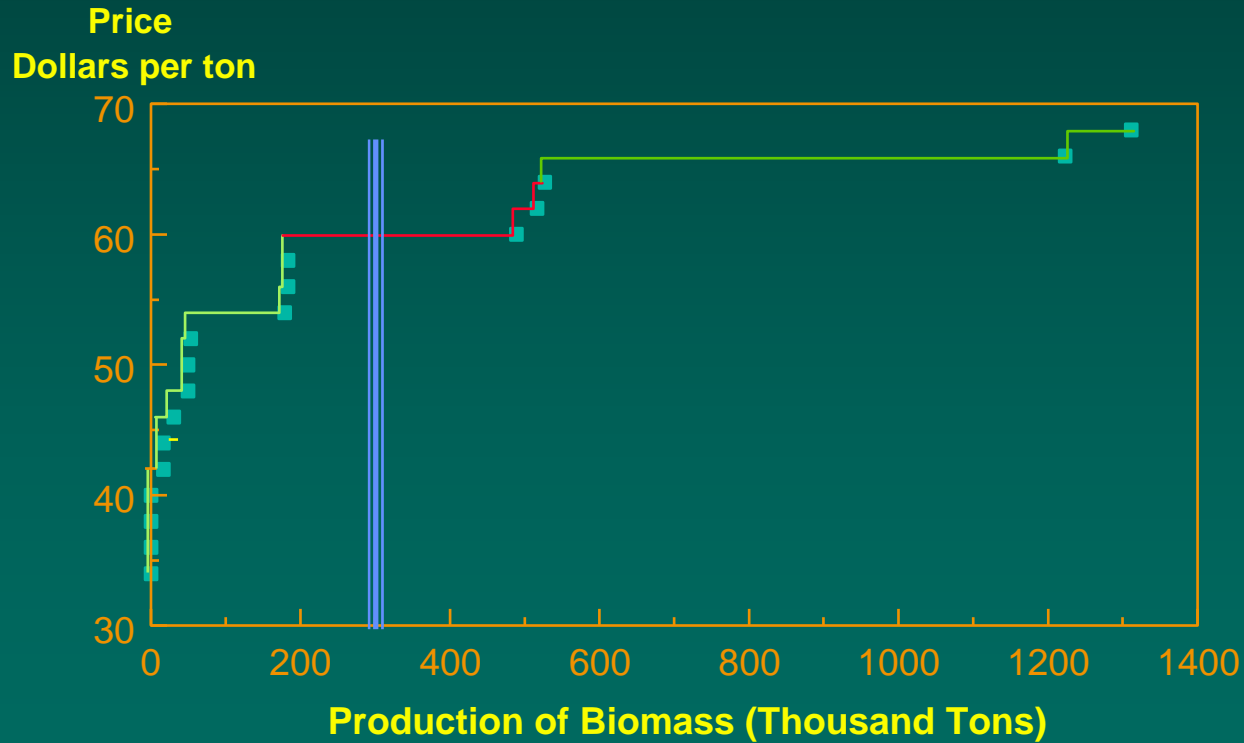
Regional Analysis (Continued)

Cost of production for Short Rotation Woody Crop

Wattsbar Region



Current Baseline Scenario, Wattsbar region





An Eastern United States Analysis

□ Objective

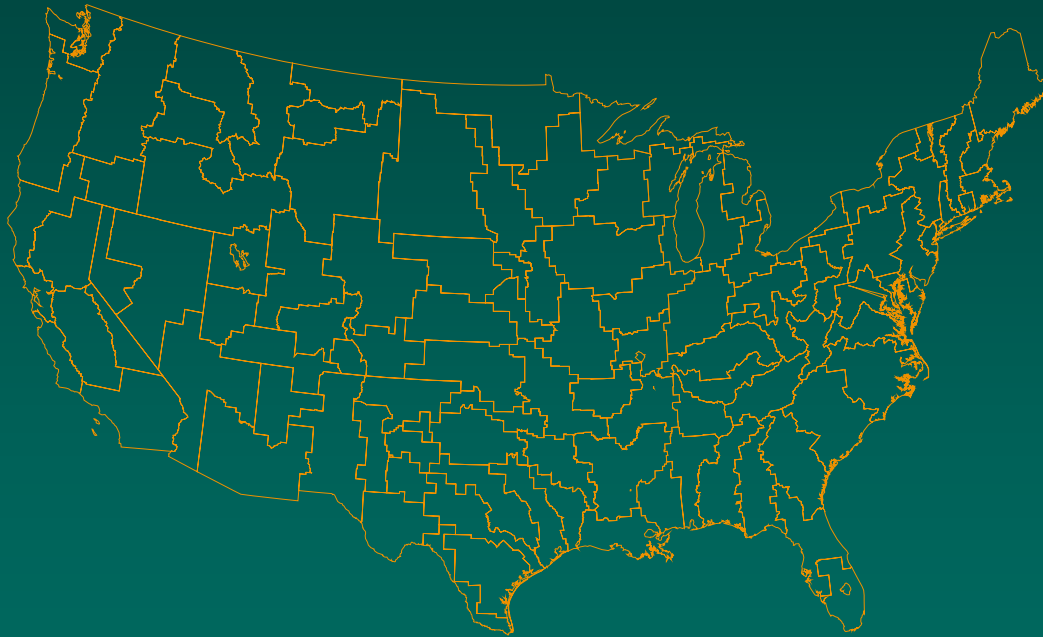
The primary objective of this project is to evaluate herbaceous biomass potential in the United States with regards to the agricultural sector. This appraisal will include estimates on environmental impacts as well as estimates on economic feasibility on a regional basis.



An Eastern United States Analysis

- Agricultural Resource Interregional Modelling System has been identified as the Analytical System to use
- This model, used in the 1985 RCA, contains crop and livestock production activities.
- The model has been updated to incorporate 1990 costs of production data.
- The model's livestock sector is being redesigned so that concerns that surfaced in the 1985 RCA are addressed.
- A set of Biomass production activities are being incorporated into the model.

Crop Production Regions used in ARIMS





An Eastern United States Analysis

A set of Biomass production activities are being incorporated into the model.

- The DOE screening program has been used for crop selection and crop production information
- Two types of biomass crops are being included :
 - Herbaceous
 - Short Rotation Woody Crops
- In the process of developing biomass production systems and estimating the costs
- In addition, using EPIC, yields are being developed for the herbaceous crops
- Finally, the demand currently is stated in tons of biomass.



Use of the DOE Screening program

- **Current crop selections for the eastern United States include:**
 - **Herbaceous**
 - **Switchgrass**
 - **Sorghum**
 - **Energy Cane**
 - **Short Rotation Woody Crops**
 - **Hybrid poplar (cottonwood)**
 - **Sycamore**
 - **Sweetgum**
 - **Black Locust**
- **Production data reviewed and summarized from experimental plots**



Develop the Biomass Production System

Aspects of Crop Production Considered

- Rotational Effects
- Machinery Requirements
- Chemical and Other Input Requirements
- Yield Responses to changes in inputs
- Environmental parameters measured including
 - Soil erosion
 - Nitrogen cycle
 - Phosphorous cycle



Solving ARIMS

- Cost minimization with no government policies
- Cost minimization with CRP, Conservation Compliance, and Commodity program setasides
- Demand level for Biomass
 - Simply a demand for biomass
 - or a demand for energy generated from biomass?
- Environmental Constraints????