

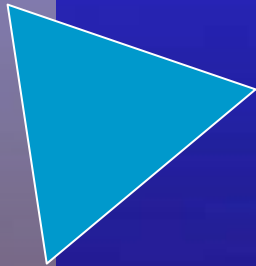
Integrating Small Scale Technology into Local Systems

- **Sustainability Challenge**
- **Multiple Resource Assessments and Need for Problem Solving – Some Regional Examples**
- **Introducing New Technology – A Value-Added Approach**



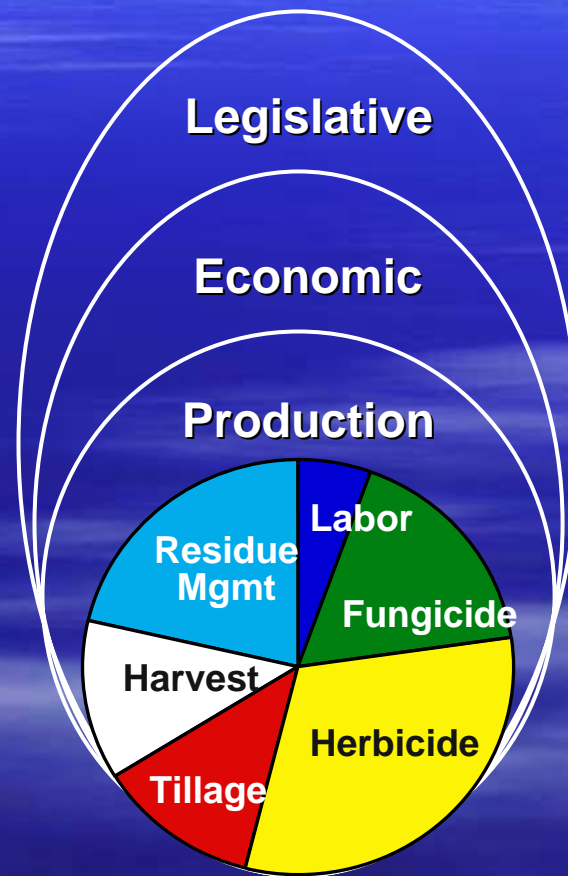
Sustainability Challenge

Economic



Social

Environmental



Decreasing
control

Farmer ability to influence

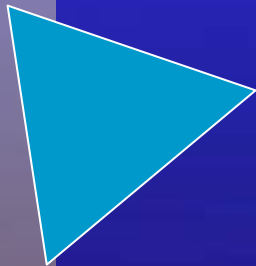
Increasing
control



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Sustainability Challenge

Economic



Social

Environmental

How to best balance the economic, environmental, and social demands of American farmers and ranchers by providing options that increase productivity and profitability across geographically diverse locations.

Soil Water Air Plant Animal +Human Effects

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Sustainability Challenge



How to best balance the economic, environmental, and social demands of American farmers and ranchers by providing options that increase productivity and profitability across geographically diverse locations.

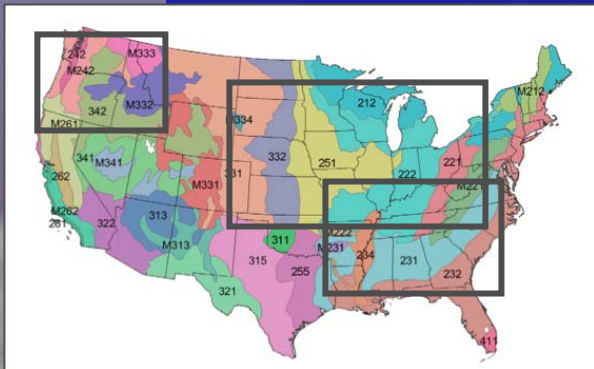
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One Size Does Not Fit All

*A Diversity of
Commodities, Production
Environments, and
Problems*



Corn Grain



Cereals and Grasses



Crop-Livestock



Confined Feeding

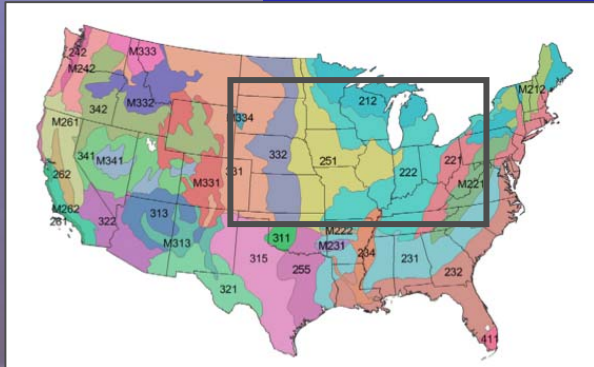
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The Energy Crop Belt

Switchgrass as an energy crop



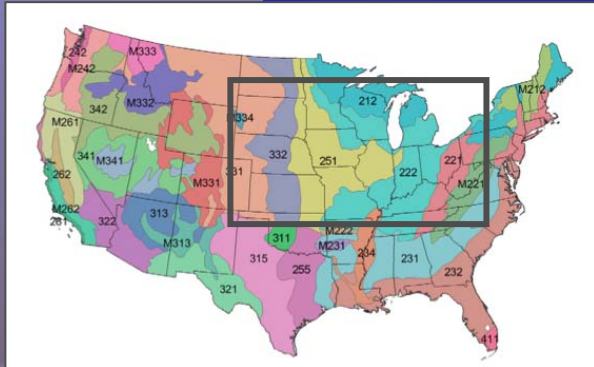
Characteristics:

- Response to static prices.
- Complimentary crop to corn.
- Uniform crop production culture.
- Established transportation system.
- Replaces food or feed crop.
- Centralized conversion model.



The Energy Crop Belt

Switchgrass as an energy crop



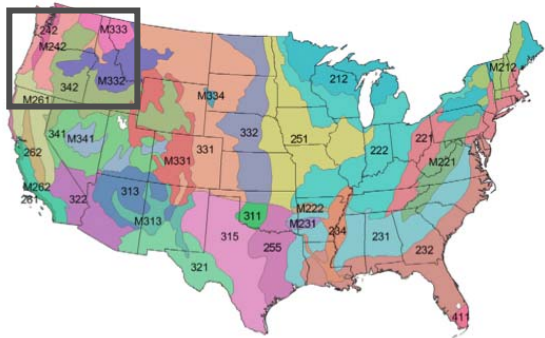
Challenges:

- Effects of production on soil erosion.
- Mining nutrient phosphorus.
- Impact on corn and bean market.
- Central conversion facility impacts.
- Residues utilization after conversion.



Pacific Northwest Cereal and Grass Seed Systems

Challenges to Sustainable Production



Highly erodable soils,
wildlife, & clean water



Excess straw residues
after harvest



Health and safety
concerns with
burning



Southeastern Integrated Crop-Livestock Systems

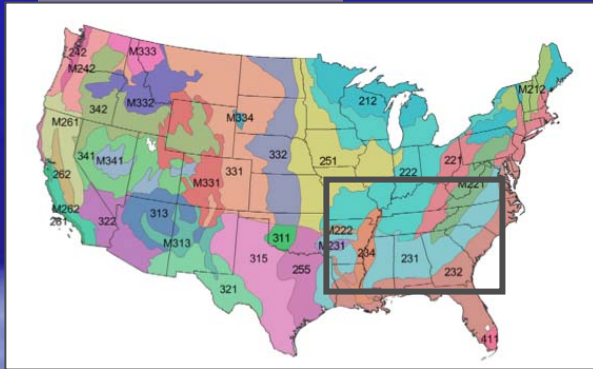
Challenges to Sustainable Production



Grazing livestock



Confined livestock

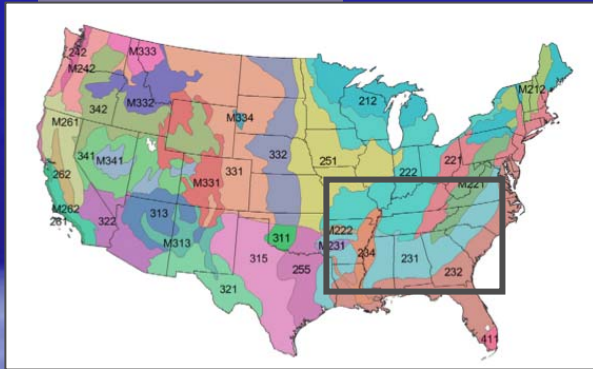


Crop production



Southeastern Integrated Crop-Livestock Systems

Challenges to Sustainable Production



- Excess poor quality hay.
- Removal from field needed.



- Confined animal waste.
- Land area needed for disposal.



- Energy required to condition seed cotton for ginning.



Common to Agricultural Wastes



Characteristics:

- Disposal options are limited.
- Relatively low density so cannot be shipped great distances and produce value to the producer.
- Limited direct market options.
- Few economic options for use in manufactured value-added products.
- Viewed as a liability by the producer.



Potential Conversion to Energy

Previous Hurdles to Utilizing Agricultural Wastes for Energy:



- Cost of transporting low-density materials to a central conversion facility.
- Apparent unsuitability of using air blown gasification reactors with materials high in silica.
- Technology not available for farm-scale use.



Potential Conversion to Energy



An Alternative Conversion Model for Distributed Energy Production:

- New technologies available for local-scale use.
- Convert agricultural wastes and produce value-added energy products.
- New source of income, behind the farm gate.



New Technology Introduction

Western Research Institute – Dual-phase gasification reactor



Characteristics:

- Suited for diverse agricultural feed stocks.
- Produces medium BTU synthesis gas in an air-blown configuration.
- Can convert 2 to 10 tons of biomass per day.
- Operates at temperatures below those that cause slagging.



New Technology Introduction

DOE Pacific Northwest National Laboratory – Microchannel Fischer-Trope reactor



Characteristics:

- Liquid fuel production from synthesis gas.
- Suited to convert synthesis gas from 6 to 1,000 tons of biomass per day.
- Microchannel catalytic process, custom product selection.



Potential Conversion to Energy

Pacific Northwest Straw Potential:

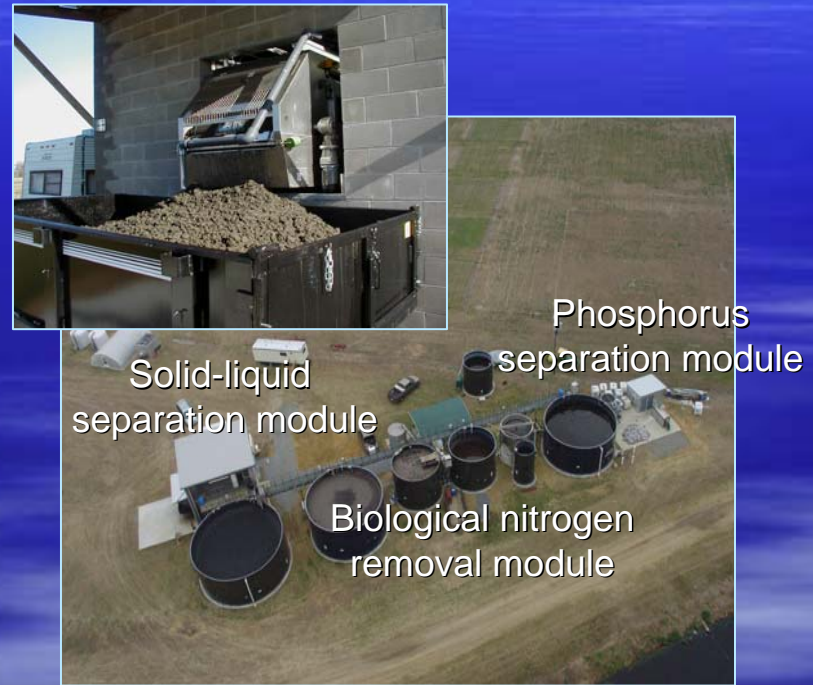
- Already profitable cereal and grass seed production systems on 5.3-million acres in the region.
- Over 7-million tons of straw available beyond the conservation requirement.
- Conversion equivalent 60-80 gallon per ton at \$1.90 per gallon equals \$800-million; 8.8% of the 4.8-billion gallons of fuel used in the region.



Potential Conversion to Energy

Southeastern Crop-Livestock System Potential:

- Suited to integrate with waste solids and gin operations.
- Provide producers a means to reduce land requirements for waste management.



ARS Swine lagoon replacement system



Potential Conversion to Energy

Southeastern Crop-Livestock System Potential:

- Conversion of biomass to energy, utilizing herbage produced beyond grazing livestock requirements.
- Direct conversion of poultry manure and cotton gin wastes.
- Source of energy for seed cotton conditioning before ginning and gin waste disposal.

