

# Bioenergy Crops in the Regional Economy

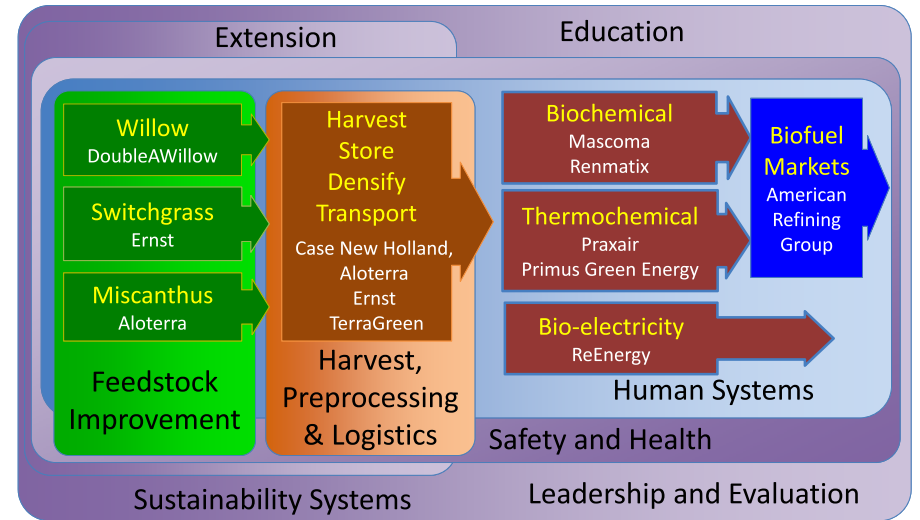


Tom Richard  
Penn State University

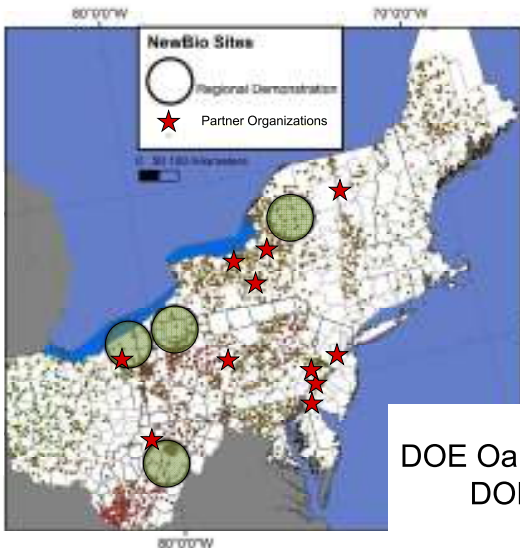


# NEWBio:

## Northeast Woody/Warm-season Biomass Consortium

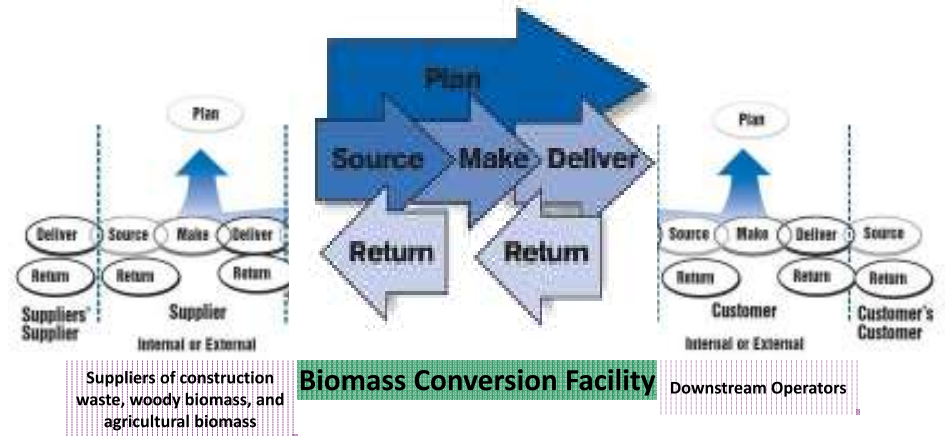


# University and Federal Partners

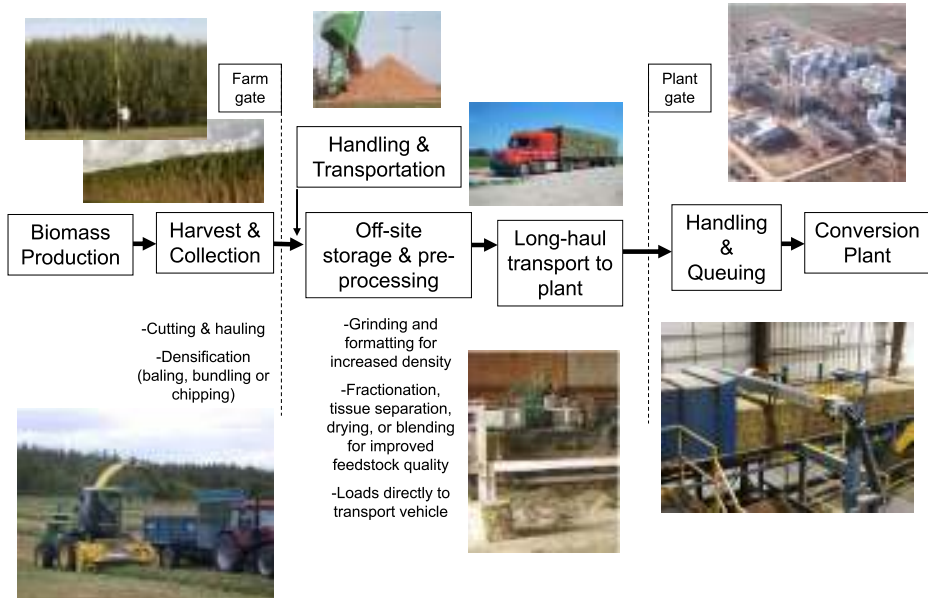


- Penn State University
- Cornell University
- SUNY ESF
- West Virginia University
- Delaware State University
- Ohio State University
- Rutgers University
- Drexel University
- USDA ARS ERRC
- DOE Oak Ridge National Laboratory
- DOE Idaho National Laboratory

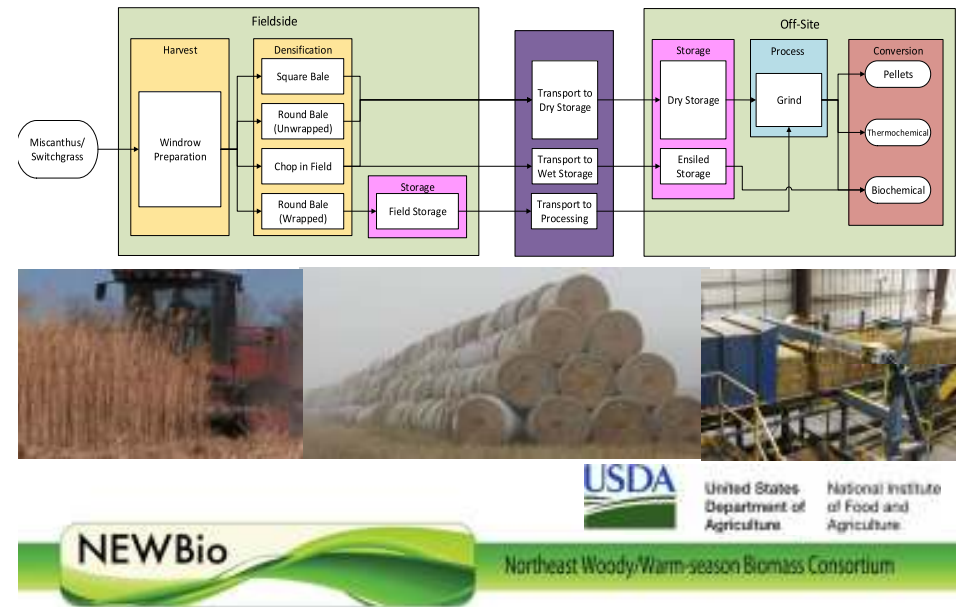
# Supply Chain Business Functions



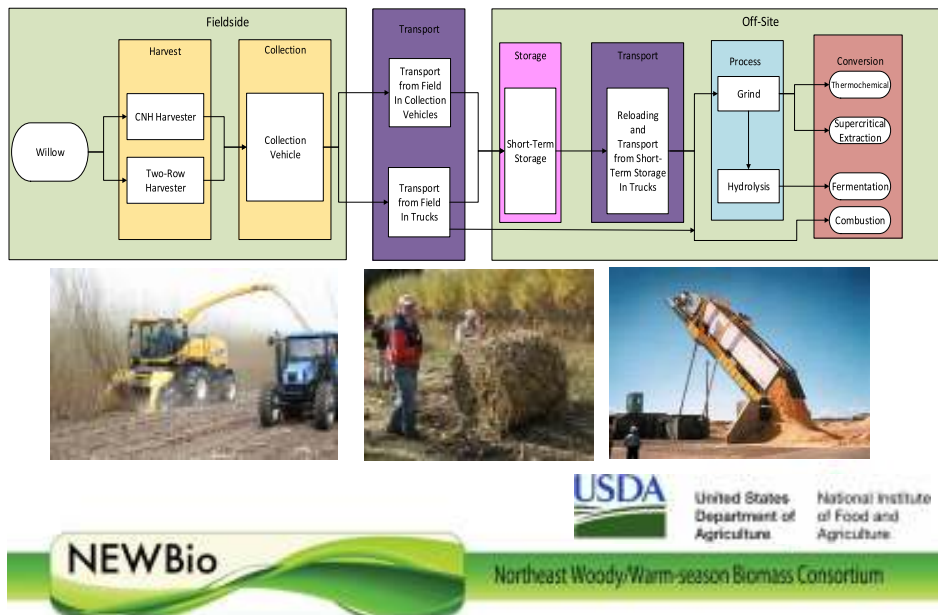
# Commodity Supply Chains



# Perennial Grass Supply Chains



# Willow Supply Chains



# Northeast Perennial Grass and Woody Crop Supply



## Willow Biomass Production Cycle

### Site preparation



### Planting



First-year growth  
Winter coppice



Regrowth after coppice

Three years old  
after coppice



One year old  
after coppice

## Willow Biomass Production Cycle

### Winter harvest



Fertilizer: ~100 lbs N  
per acre after every  
harvest (every 3 years)



Three years old  
after coppice



One year old  
after coppice

At least 7  
harvests



Regrowth after coppice



Diversity Group	Species	Variety
1	<i>Salix x dasyclados</i>	SV1
2	<i>S. sachalinensis</i>	SX61
3	<i>S. caprea hybrid</i>	S385
4	<i>S. erioccephala</i>	S25
5	<i>S. miyabeana</i>	SX64 SX67
6	<i>S. purpurea</i>	Fish Creek Onondaga Allegany
7	<i>S. sachalinensis x S. miyabeana</i>	Sherburne Canastota
8	<i>S. viminalis x S. miyabeana</i>	Tully Champion Fabius Owasco Otisco
9	<i>S. purpurea x S. miyabeana</i>	Oneida Millbrook



<http://www.doubleawillow.com>

## Switchgrass



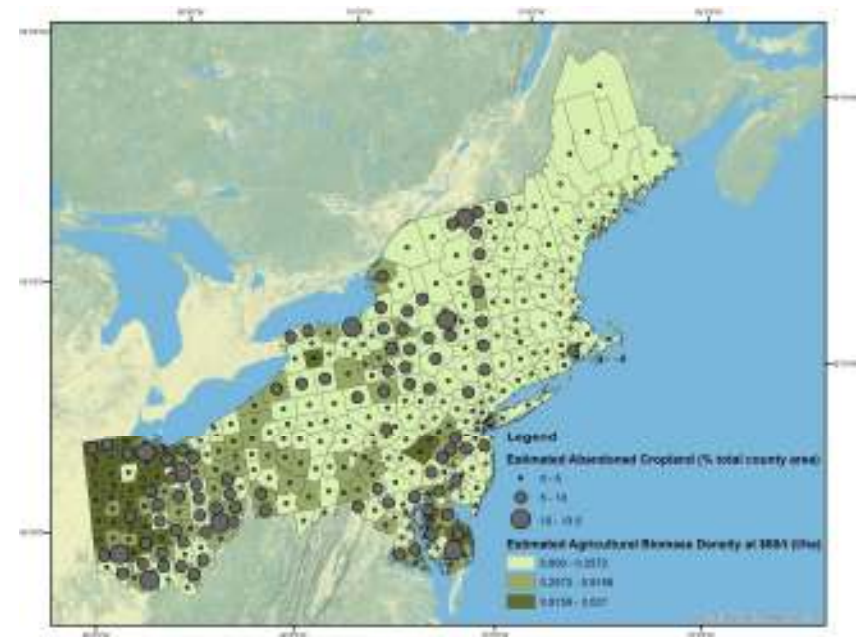
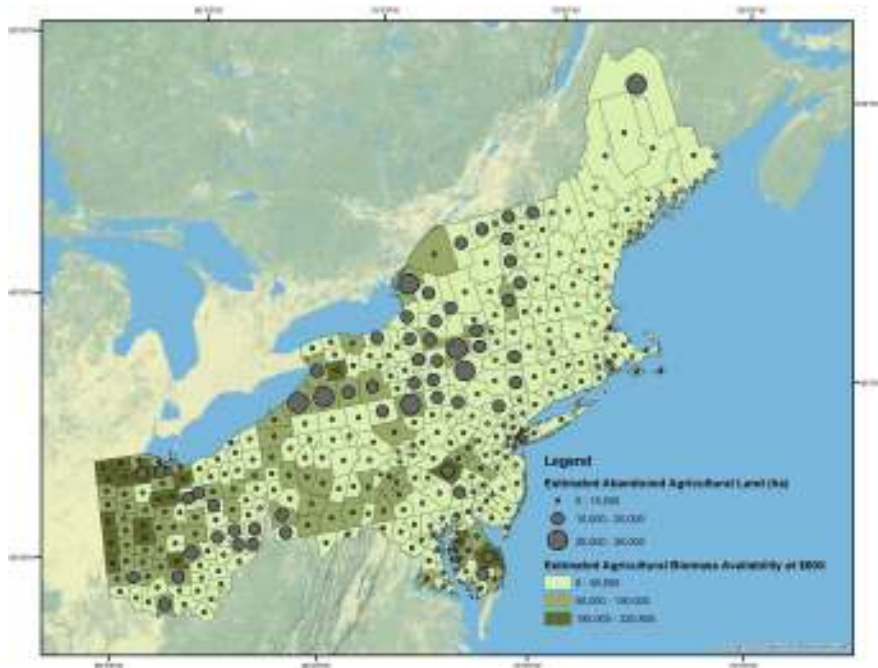
# Switchgrass

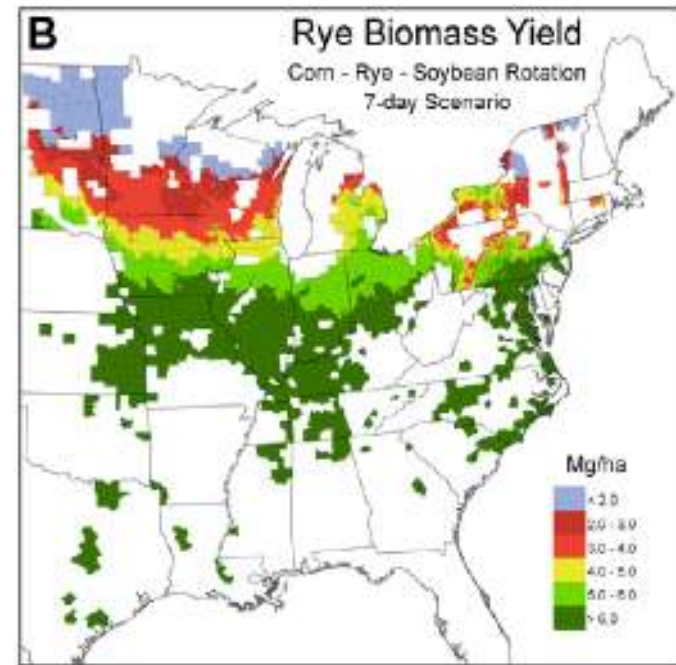
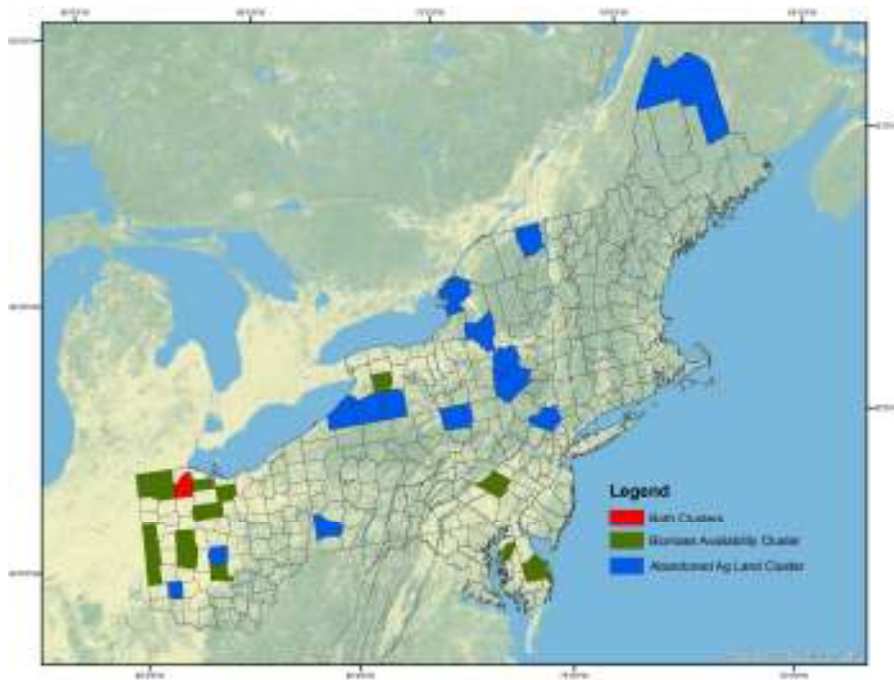


## Feedstock Development

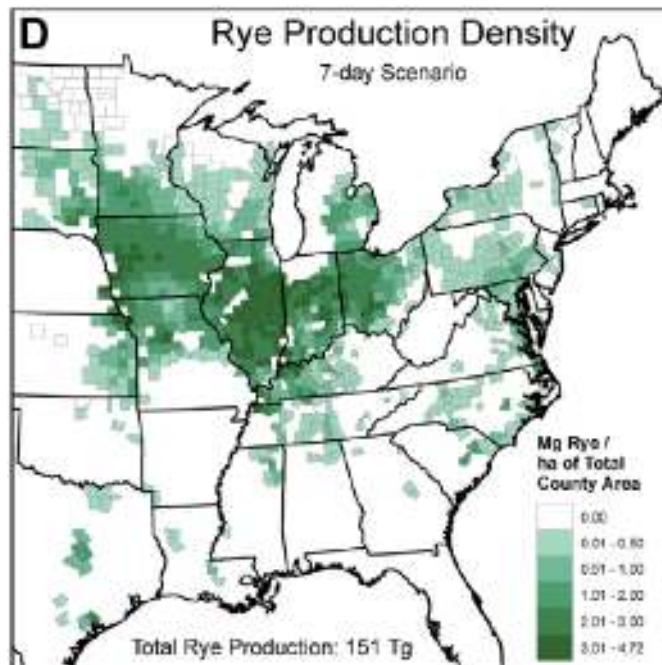
- Developing high yielding biofuel cultivars for the Northeast and Mid-Atlantic US
- Identify superior germplasm adapted to the temperate region of the US
- Increase biomass & biofuel yield
- Modified/lower lignin content
- Improve tolerance to drought, disease, and lodging
- Improve germination and establishment
- High yields on marginal land

# Miscanthus x giganteus





Feyereisen et al. 2011



Feyereisen et al. 2011

**USDA** United States Department of Agriculture National Institute of Food and Agriculture

**NEWBio** Northeast Woody/Warm-season Biomass Consortium



[www.newbio.psu.edu](http://www.newbio.psu.edu)

PENN STATE, Cornell University, Delaware State University, ESF, INL, OAK RIDGE, OHIO STATE, RUTGERS, UNIVERSITY OF MARYLAND EXTENSION, West Virginia University, NSF

