



OKLAHOMA'S BIOENERGY FUTURE

Presented to:
Biomass South 2008
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Presented by:
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The Noble Foundation

THE SAMUEL ROBERTS
NOBLE
FOUNDATION

- Founded 1945.
- Headquartered in Ardmore, Okla.
- Research campus and 12,000 acres of research and demonstration land.
- Conducts fundamental and translational plant science research.
- Assists regional farmers and ranchers through consultation, education and demonstration.

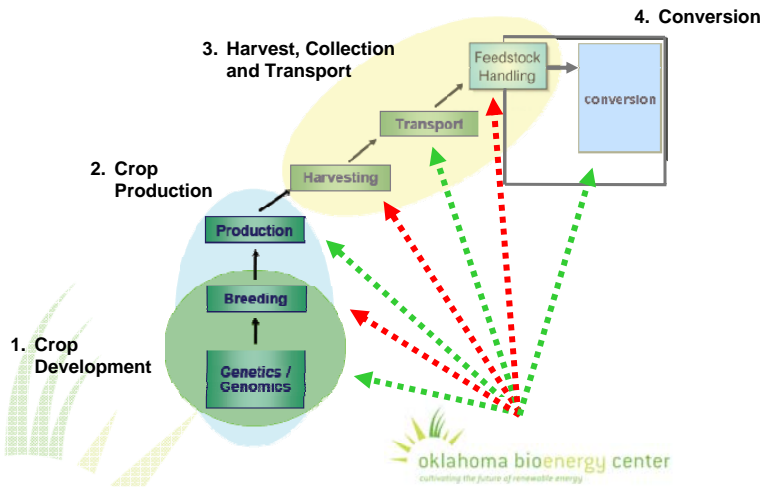
Oklahoma Bioenergy Center

- Enable the **competitive and sustainable production of liquid biofuels** in Oklahoma, and
- **Contribute to the national research effort** to enable the United States to achieve prescribed levels of foreign petroleum independence.
- Contributing Institutions:
 - Oklahoma State University
 - University of Oklahoma
 - The Noble Foundation

Oklahoma Bioenergy Center

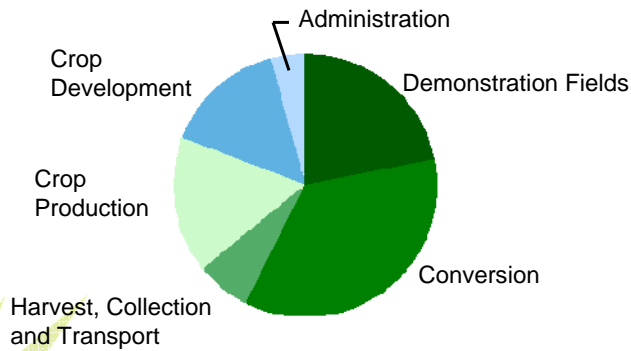
- **Board of Directors:** (7 members)
 - Vice Presidents of Research
 - Vice Presidents/Deans
- **Steering Committee:** (9 members)
 - Key researchers from Contributing Institutions
- **Scientific and Industrial Advisory Committees**
 - Leaders from academia, national laboratories, research institutions and industry

Oklahoma Bioenergy Center



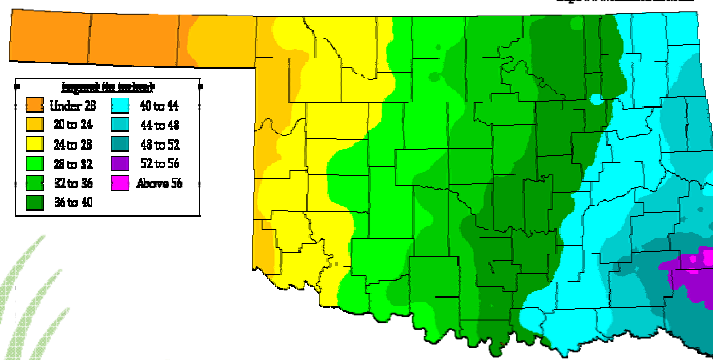
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Allocation of Oklahoma Bioenergy Center Resources: 2007-2009
(based on allocated research dollars)



Oklahoma: a complex environment

Average Annual Precipitation



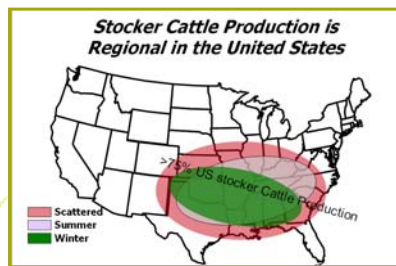
- **33,700,000** million farm acres (2005)
- Agricultural products (total): **\$4.5 billion** (2002)
- Value of crops (total): **\$900 million** (2002)

Crop development: appropriate to the geography

- New varieties
- Improved traits: establishment and yield
- Biotechnology solutions: next-generation, “designer” feedstocks
 - **High-lignin** (thermochemical processing)
 - **Low-lignin** (biological processing)

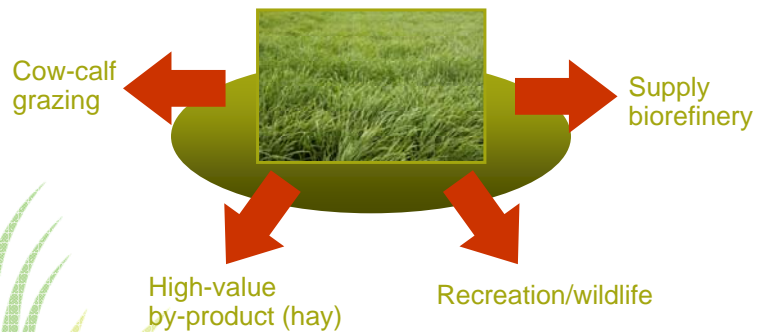
Crop production

- Creating **best management practices** for biomass cropping systems
- Developing plans to enable the **integration of livestock operations and dedicated energy crops**



Crop production

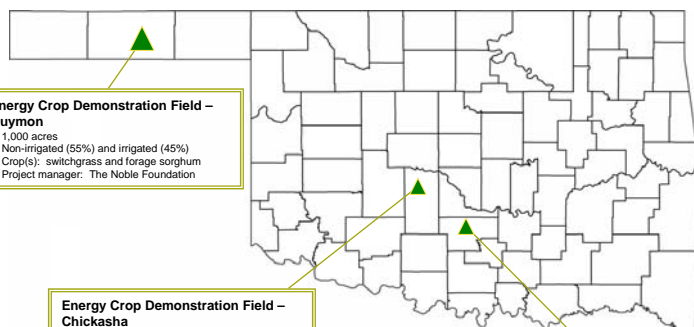
Creating **new production alternatives** for regional agricultural producers –



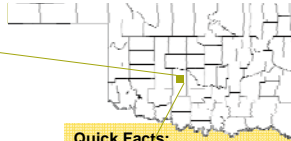
Deliverables: feedstock and liquid fuel

- Harvest and transportation
 - Collection
 - In-field processing opportunities
 - Economic factors
- Conversion: emerging technologies
 - Fast pyrolysis with catalytic conversion
 - Gasification with fermentation

Demonstration fields



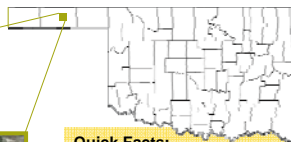
Demonstration fields – Chickasha



Quick Facts:

- 200 acres
- Oklahoma State University Experiment Station
- Planted early May
- Forage sorghum (three varieties)
- Row spacing and planting evaluations
- Agronomic studies (fertilizer and land treatments)
- Harvest studies
- Storage studies

Demonstration fields – Guymon



Quick Facts:

- World's largest stand of switchgrass dedicated to cellulosic ethanol production
- 1,000 acres
- Non-irrigated: 550 acres
- Irrigated: 450 acres
- Switchgrass
 - Alamo
 - Trailblazer
 - Blackwell
 - Kanlow
- Forage sorghum
 - ES5140 (Ceres, Inc.)
 - ES5150 (Ceres, Inc.)

■ Non-irrigated acres

■ Irrigated acres

Scale: 1 mile

Demonstration fields - Guymon

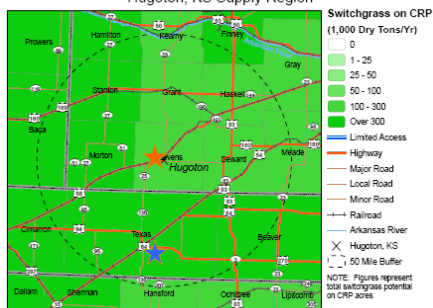


Photos:

1. Planting of Guymon demonstration fields, Jun 2008.
2. Non-irrigated Blackwell, Aug 8, 2008.
3. Irrigated Kanlow, Aug 8, 2008.

Demonstration fields - Guymon

2005 Estimated Switchgrass Potential on CRP Lands
Hugoton, KS Supply Region



★ Future Abengoa Bioenergy (Hybrid) Biorefinery

★ OBC Demonstration Field - Guymon

ABENGOA BIOENERGY

- Section 923-award recipient from the U.S. Department of Energy
- Planned "hybrid" facility:
 - 12 million gallons cellulosic ethanol (154,000 dry tons of biomass)
 - 88 million gallons of non-cellulosic ethanol (32 million bushels of grain)
 - Synthesis gas to replace facility natural gas needs (245,000 dry tons of biomass)
- Cellulosic feedstocks: stovers, wheat straw and switchgrass
- Biomass supply contracts, 2009
- Construction start, 2009 (24-months)

Source: Abengoa Bioenergy Hybrid of Kansas, LLC.

Demonstration fields - Guymon

ABENGOA BIOENERGY

The proposed Hugoton biorefinery will occupy about 400 acres west of Hugoton. The Noble Foundation, on behalf of the OBC, will enter into a supply contract with the Hugoton facility to supply cellulosic feedstock material to the facility from at least the Guymon demonstration field. Additionally, the OBC will make the Guymon demonstration fields available for purposes of targeted harvest, collection and storage research.



A leading developer of high-yielding, dedicated energy crops that can be planted as feedstocks for cellulosic ethanol production. Ceres' role was critical in supplying seed for both the Guymon and Maysville demonstration fields.



The lead feedstock supply and logistics laboratory for the Department of Energy's Office of Biomass Programs, INL has conducted considerable work in the area of feedstock gathering and processing for crop residues (wheat straw). Building on these strengths in large-scale engineering demonstrations, the INL is well-equipped to demonstrate the viability of an integrated feedstock supply system for dedicated energy crops.



Hitch Enterprises, founded more than 110 years ago, is a family owned and managed agricultural company. It is one of the region's most renowned agriculture operations. Hitch Enterprises conducts extensive cattle feeding, cattle production, pork production and agricultural operations near Guymon.

Public education



www.okbioenergycenter.org



switchgrass.okstate.edu

