



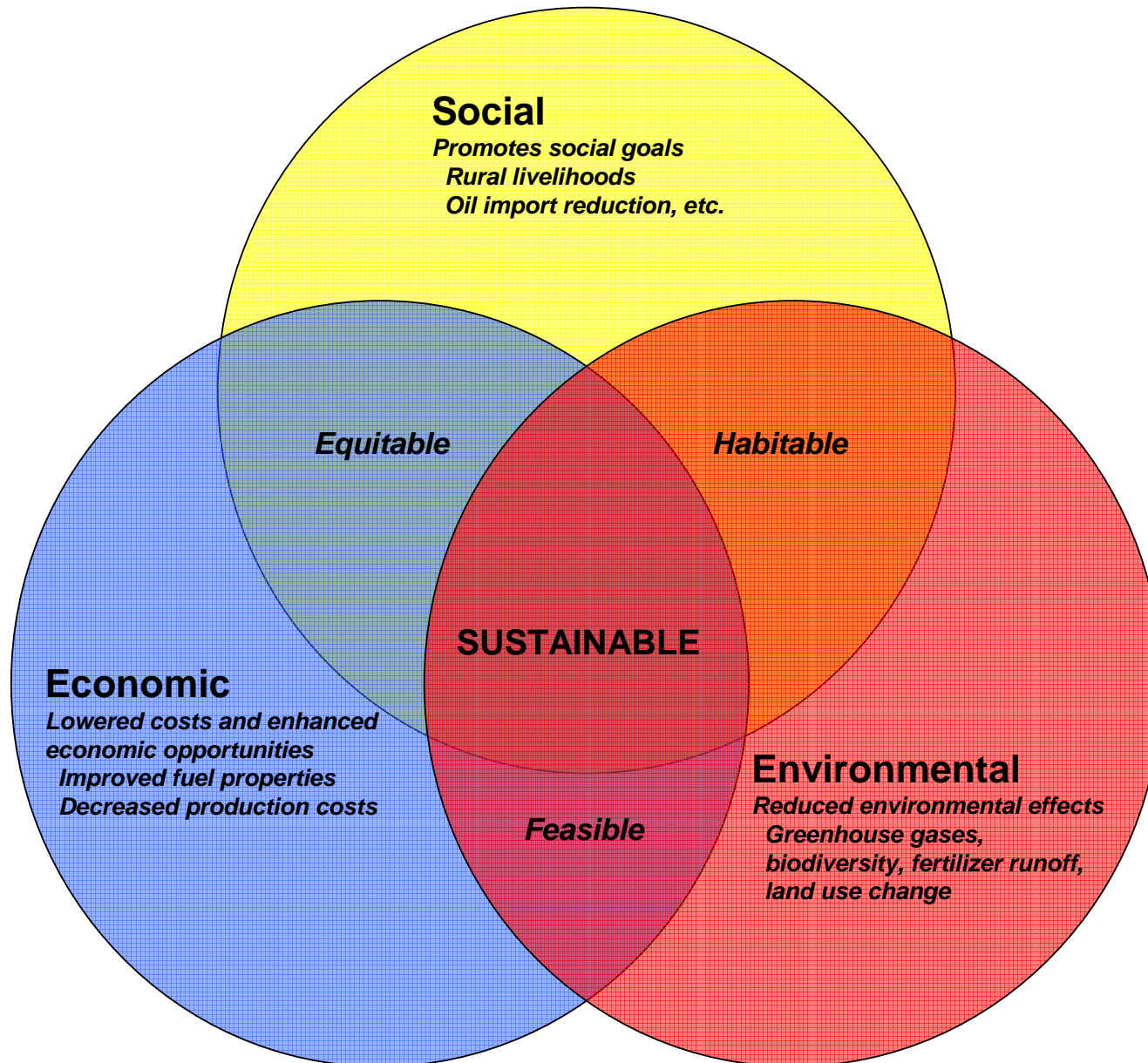
Sustainable Biofuel Production

A U.S. Department of Energy Perspective

Alison Goss Eng
Office of the Biomass Program

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A Sustainable Biofuels Industry



Our Vision



- A viable, sustainable domestic biomass industry that
 - Produces renewable biofuels, bioproducts and biopower,
 - Enhances U.S. energy security
 - Reduces our dependence on oil
 - Provides environmental benefits including reduced greenhouse gas emissions, and
 - Creates economic opportunities across the nation.



Social

Environmental

Economic



Sustainability and OBP



- Sustainability a focus of OBP
 - *Renewable* energy
 - Movement away from starch and toward cellulosic feedstocks
 - Enzyme development for cheaper, more efficient cellulose degradation
 - Integration of conversion platforms and focus on integrating products and high-efficiency heat and power production systems
 - Focus on high efficiency and low waste technologies

EERE/Biomass Program Priorities



Our Commitment to Sustainability



DOE's Biomass Program is committed to developing the resources, technologies, and systems needed for biofuels to grow in a way that enhances the health of our environment and protects our planet. To that end, we are working to...

- Develop diverse, non-food feedstocks that require little water or fertilizer
- Foster sustainable forestry practices to enhance forest health
- Selectively harvest biomass components while leaving adequate soil nutrients
- Assess life-cycle impacts of major scale-up in biofuels production, from feedstocks to vehicles, addressing:
 - land use and soil health
 - water use
 - air quality issues
 - impacts on greenhouse gas (GHG) emissions



DOE Biomass Program's Current Work on Sustainability



- **Indirect Land Use**

In response to Science articles and EISA Sec. 232, Argonne National Laboratory and Purdue University working jointly to refine models that can analytically address international land use change issues due to increasing growth of biofuels

- **Climate Change**

NREL is conducting a life cycle assessment (LCA) of the Advanced Energy Initiative performed for the 60 billion gallon 30x30 scenario (a scenario for supplying 30% of 2004 motor gasoline demands by 2030)

- **Biodiversity**

OBP is working with Conservation International to --

- Identify land that should not be developed into biofuel crops globally;
- Pilot studies to identify best land to locate biofuel crops (Indonesia and Brazil)
- Utilize standards for biofuel crop production to maintain biodiversity.

DOE Biomass Program's Current Work on Sustainability (continued)



- Water

Argonne and NREL are conducting LCA of water demand for biofuels production over the lifecycle in comparison to corn ethanol, sugar cane ethanol, and competing petroleum fuels

- Standards Development

Participating in the Council for Sustainable Biomass Production aimed at developing principles and standards for second generation bioenergy feedstocks

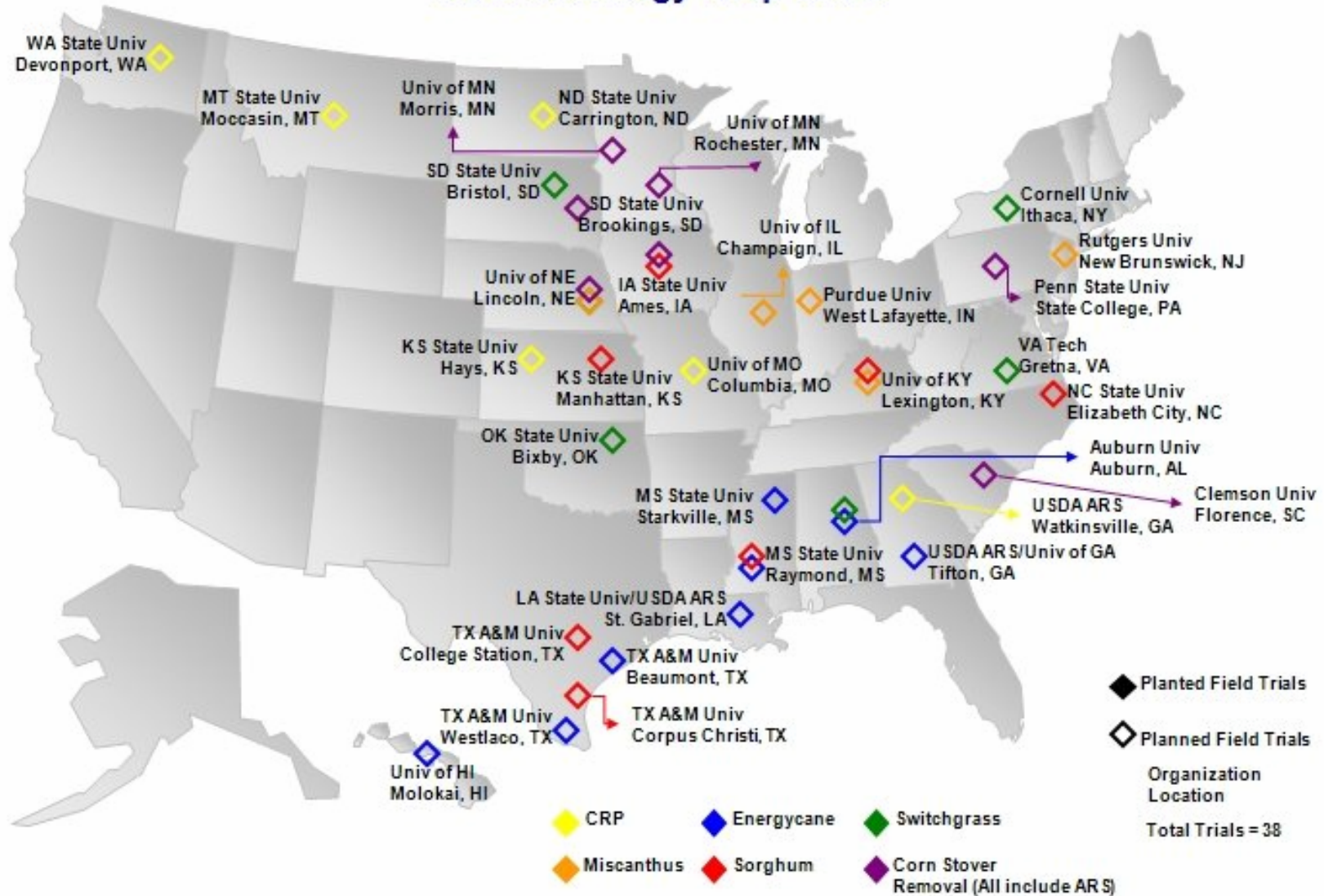
- Feedstock Production

- Conducting in-field studies to determine best location for energy crops; done in collaboration with USDA, the Sun Grant Initiative universities, and other regional partners
- Developing a tool to identify the amount of corn stover that should be left on the field to maintain soil carbon and biomass yields

Sustainable Feedstock Production



Regional Biomass Energy Feedstock Partnership 2008 Bioenergy Crop Trials



Current Cross-Cutting Efforts



- **National Bioenergy GIS**
 - ORNL, ANL, INL, UC-Davis and others are developing a national scale GIS-based framework to assist in the analyzing the economic and environmental impacts of feedstock, biorefinery, and infrastructure development options.
- **Great Lakes Bioenergy Research Center Sustainability Efforts**
 - Field-based research on novel feedstock production systems
 - Lab-based research on microbial-plant interactions
 - Evaluation of biogeochemical, biodiversity, and socioeconomic responses to expansion and intensification of agriculture
 - Analysis of biomass cropping in reference to land use requirements, environmental consequences and competing energy technologies

Major DOE Biofuels Project Locations

Geographic, Feedstock, and Technology Diversity



Key
 Company
 Process
 Feedstock
 (Location)



- Six Commercial-Scale Biorefinery Projects: up to \$385 million
- Four Small-Scale (10%) Biorefinery Projects: up to \$114 million (first round)
- Three Bioenergy Centers: up to \$405 million
- Four Thermochemical Biofuels Projects: up to \$7.7 million
- Four Improved Enzyme Projects: up to \$33.8 million
- Five Projects for Advanced Ethanol Conversion Organisms: up to \$23 million

- Regional Partnerships**
- South Dakota State Univ., Brookings, SD
 - Cornell University, Ithaca, NY
 - Univ. of Tennessee, Knoxville, TN
 - Oklahoma State Univ., Stillwater, OK
 - Oregon State Univ., Corvallis, OR



We Need Balanced Analysis, Constructive Dialogue, and Smart Policies



- DOE and the recently passed *Energy Independence and Security Act of 2007* call for sustainable biofuels.
 - EISA requires GHG reductions and periodic reevaluation.
- The US can encourage land use policies that restrict development of ecologically-sensitive and carbon-rich lands.
- DOE and the State Department are working to address global sustainability issues with international partners, including environmental organizations, industry, and others.
 - Sustainability requires careful assessment of all environmental impacts, including water, land use, GHG, fertilizer use, and socio-economic issues.
 - Global standards for sustainable development, if well crafted, could promote adherence to best practices in developing biofuels industries,
- We welcome open discourse on all topics of concern and encourage broad dissemination of plans and ideas.

