DOE Bioenergy Technologies Office (BETO) 2015 Project Peer Review

Sun Grant/DOE Regional Biomass Feedstock Partnership (Award # GO85041; WBS 7.6.2.5

23-27 March 2015

Technology Area Review: Feedstock Supply and Logistics

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Goal Statement

- Development of more accurate cost supply information and improved communication with partners in the biomass feedstock supply chain
  - Replicated field trials across regions to determine the impact of residue removal on future grain yield
  - Replicated field trials to demonstrate the potential performance of energy crops within geographical regions
  - Regional assessment of feedstock resources which can be used to estimate supply curves

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Quad Chart Overview

Timeline

- Project start date: 1-15-2007
- Project end date: 12-31-2015
- Percent complete: 90%

Barriers

- Barriers addressed
  - Ft-A: Feedstock availability and cost
  - Ft-B: Sustainable production
  - Ft-C: Feedstock genetics and development

Budget

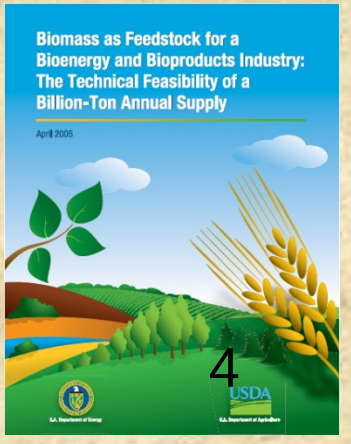
	Total Costs FY07 –FY12	FY 13 Costs	FY 14 Costs	Total Planned Funding (FY 15-Project End Date
DOE Funded	$13,939,834	$2,566,702	$1,797,386	$2,316,063
Cost Share (PI time)	$3,965,035	$417,752	$250,000	$0
Cost share (Monsanto)	$395,000	$150,000	$0	$0

Partners

- Sun Grant Initiative
- 28 Land-Grant Universities
- USDA-ARS
- Oak Ridge National Lab
- Idaho National Lab
- Monsanto
- Arborgen
- GreenWood Resources

1 - Project Overview

- Starting point
  - Sun Grant Mission
    - Enhance America's national energy security through development, distribution and implementation of biobased energy technologies.
    - Promote diversification and environmental sustainability of America's agriculture
    - Promote opportunities for biobased economic diversification in America's rural communities.
  - Initial Billion-Ton study (2005)
    - Estimated US annual sustainable biomass resource base at 1.3 billion tons



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1 - Project Overview

- Sun Grant Regional Biomass Feedstock Workshops
  - 2006 SE,NC
  - 2007 W, SC, & NE
  - Regional evaluation of Billion-ton study
    - Identified major feedstocks and projected potential sustainable supply within regions
- Sun Grant/DOE Regional Biomass Feedstock Partnership formed in 2007
  - Field trials initiated in 2008

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2 – Approach (Technical)

- Identified Near-Term Biomass Feedstocks
  - Herbaceous
    - Corn residue
    - Cereal crop residues (wheat straw primarily)
    - Switchgrass
    - Miscanthus x giganteus
    - Sorghum (sweet, high biomass, forage)
    - Energycane
    - Cool & warm season grass mixtures (on CRP land)
  - Woody
    - Short rotation hybrid poplar
    - Short rotation willow

2 – Approach (Technical)

- Established Key Tasks
  - Biomass Resource Assessment
    - Regional data bases on existing feedstock supply
  - Biomass Resource Development
    - Establish and maintain field trials of dedicated feedstocks
    - Impact of crop residue removal on sustainability
  - Education and Outreach
    - BioWeb (http://bioweb.sungrant.org/)
    - Regional Feedstock Partnership web site (http://www.sungrant.org/Feedstock+Partnerships/)

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2 – Approach (Management)

- Established Task Teams
  - Biomass Resource Assessment
    - Laurence Eaton; ORNL
      - NE – Peter Woodbury; Cornell
      - SE – Sam Jackson; Univ. Tennessee
      - SC – Michael Dicks; OK State Univ.
      - NC -Mike Wimberly; SD State Univ.
      - W – Chris Daly; OR State Univ.
      - USDA ARS Coordinator; Vince Breneman
  - Sustainable Corn Residue Removal
    - Doug Karlen; USDA ARS (Last harvest—2012; completed—2013)

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2 – Approach (Management)

- Established Task Teams
  - Herbaceous Biomass Feedstock Development—Vance Owens, SDSU
    - CRP—DK Lee; Univ. of IL (Last harvest—2013; completed 2014)
      - USDA ARS Coordinator; Paul Adler
    - Energycane – Brian Baldwin; MS State Univ. (continuing through 2015)
      - USDA ARS Coordinator; Ed Richard (retired)
    - Miscanthus – Tom Voigt; Univ. IL (continuing through 2015)
      - USDA ARS Coordinator; Adam Davis
    - Sorghum – William Rooney; TX A&M Univ. (Last harvest—2012; completed 2013)
      - USDA ARS Coordinator; Jeff Pederson (retired)
    - Switchgrass – Vance Owens, SDSU; John Fike, Virginia Tech (continuing through 2015)
      - USDA ARS Coordinator; Rob Mitchell

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2 – Approach (Management)

- Established Task Teams
  - Sustainable Cereal Crop Residue Removal (completed 2011)
    - Russ Karow; OR State Univ.
    - USDA ARS Coordinator; Hal Collins
  - Woody Biomass Feedstock Development (continuing through 2015)
    - Tim Rials; Univ. of TN
    - Poplar – Bill Berguson; Univ. of MN-Duluth
    - Willow – Tim Volk; State Univ. NY (SUNY)
    - USDA FS Coordinator; Marilyn Buford
  - Education and Outreach
    - Jessica McCord; Univ. TN

3 - Technical Accomplishments/ Progress/Results

- Effective Task Teams in place
  - Reports from selected Team or Species Leads are next presentations
  - Completed 7 crop-years of field trials (2008 – 2014); number of years varies by species and location
  - Field plot yield data and treatment information uploaded to the Knowledge Discovery Framework (KDF) each year
  - Soil samples collected for sustainability analysis (e.g. soil C) at multiple locations
  - Biomass samples collected and sent to INL for composition analysis and archiving in the Biomass Library

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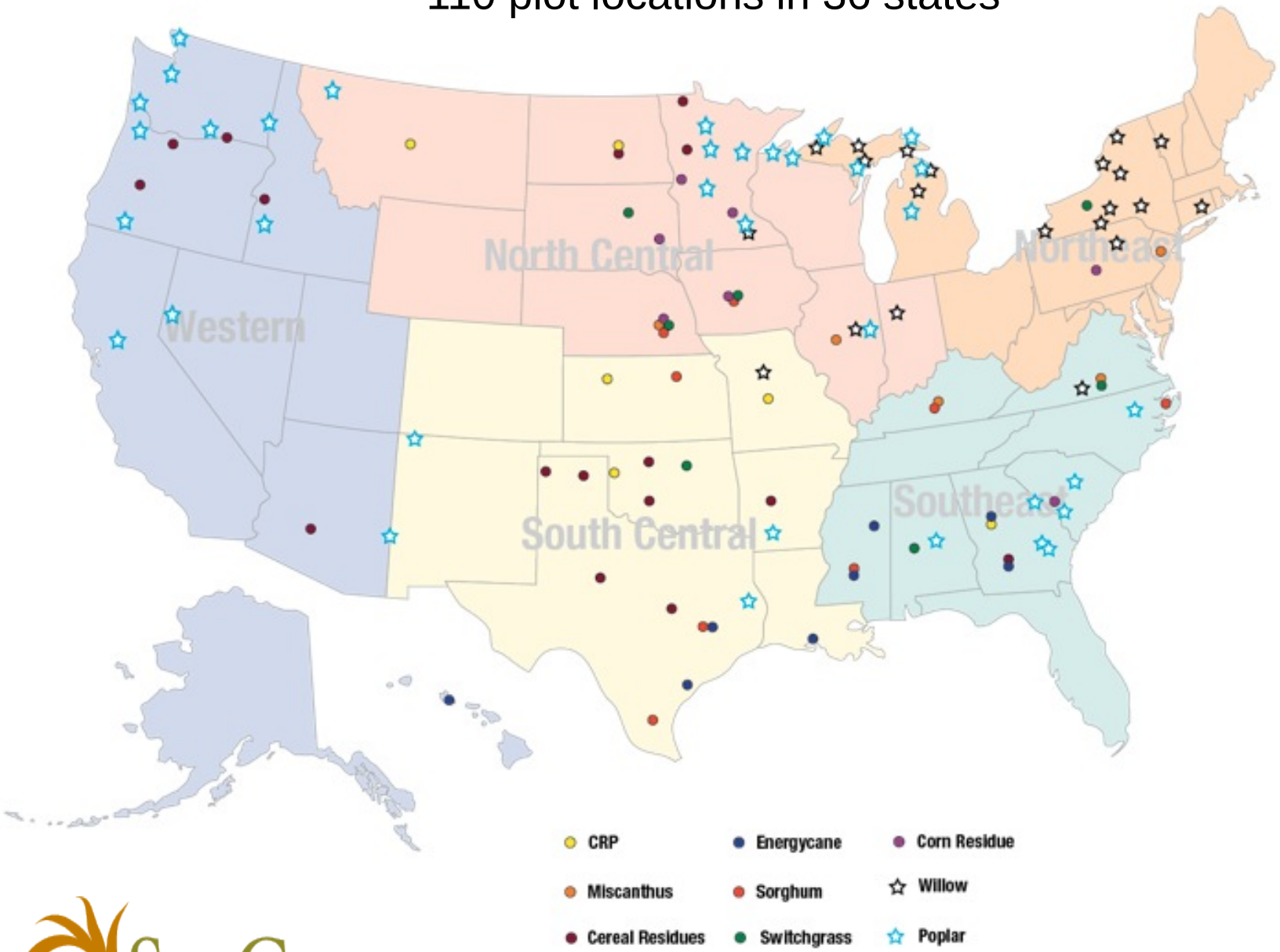
110 plot locations in 36 states



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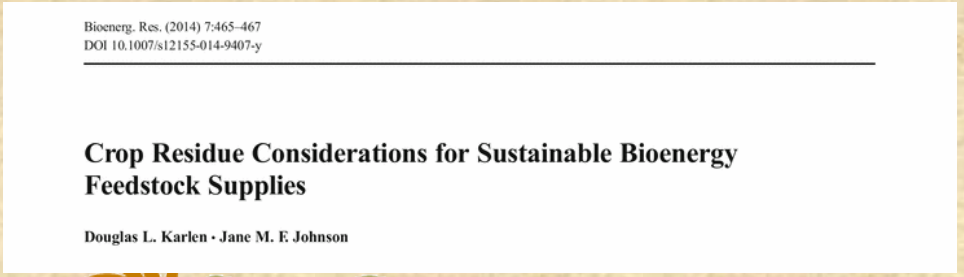
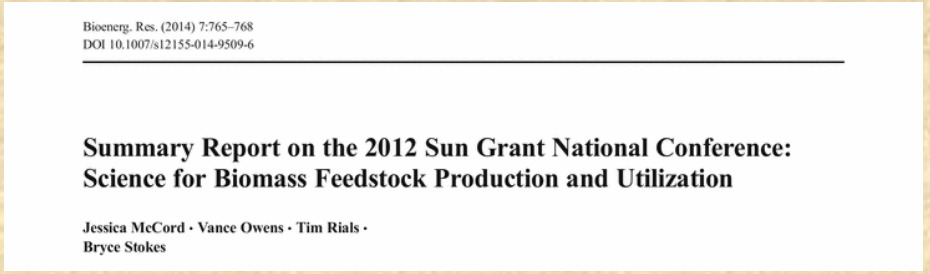
3 - Technical Accomplishments/ Progress/Results (cont'd)

- Expanded data collection at select locations for improved sustainability analysis
- BioWeb
  - http://bioweb.sungrant.org
- Development of yield potential maps
- BioEnergy Research Special Issues
  - Crop residues (June 2014)
  - Sun Grant National Conference (September 2014)


Bioenerg. Res. (2014) 7:465–467
DOI 10.1007/s12155-014-9407-y

Crop Residue Considerations for Sustainable Bioenergy Feedstock Supplies

Douglas L. Karlen · Jane M. F. Johnson


Bioenerg. Res. (2014) 7:765–768
DOI 10.1007/s12155-014-9509-6

Summary Report on the 2012 Sun Grant National Conference: Science for Biomass Feedstock Production and Utilization

Jessica McCord · Vance Owens · Tim Rials · Bryce Stokes

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4 - Relevance

- This partnership project is crucial to DOE/EERE's Biomass Multi-year Program Plan mission to "develop and transform our renewable biomass resources into commercially viable, high performance, biofuels, bioproducts, and biopower through targeted research, development, demonstration, and deployment supported through public and private partnerships".
  - Collection of field-scale and small-plot yield data of promising energy crops provides critical information to determine viability of a commercial-scale supply system
  - Long(er)-term biomass yields important for all species/mixtures, particularly to identify sustainable, high quality feedstock supplies and the risks associated with their production
  - Synergies created through the partnership will help quantify the range of feedstock properties across regions and growing conditions

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5 - Future Work

- Complete crop year 2015 for perennial (herbaceous and woody) species
- Complete analysis of multi-year data set and final reports for perennial species
- Soil sample collection for pertinent locations and species to assess whether crops build or deplete soil C and N stores
- Continue sustainability measurements at select locations
- Continue to submit all data to KDF; eventually make all data publicly available
- Modify/improve national yield potential maps
- Global Change Biology—Bioenergy Special Issue
  - Several manuscripts
  - Data sets

Summary

- The Regional Biomass Feedstock Partnership has completed 7 years of field trials for dedicated biomass crops and crop residue removal.
- Data from the field trials and resource assessment activities have been and will continue to be uploaded to the KDF and made available for public access.
- We will continue with perennial species through 2015 (and beyond if additional funding can be identified).
- Long-term yield trials critical in increasing our understanding of temporal variability (drought, flood, cold, etc.) in changing climatic conditions and varying soil types.
- Final reports for annual crops (corn, sorghum, cereals) presented at 2013 Project Peer Review.
- Reports for Woody Crops (hybrid poplar, willow), Herbaceous Crops (energycane, mixtures on CRP land, *M*. x *giganteus*, switchgrass), Biomass Resource Assessment (GIS, yield mapping) with greater details on activity and output/outcomes, follow this introduction.

Additional Slides

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Responses to Previous Reviewers' Comments

- "Sustainablity data collection should have started earliered."
  - No funds were provided to this project to begin gathering sustainability data when the project started. This is why these measurements began approximately one year later.
- "With the project ending Sept. 2013, the estimate of 80% completion raises concerns over the ability of the teams to achieve the needed analysis and synthesis of the complete dataset for each crop."
  - The 80% completion figure was an estimate based on the continuation of harvesting of these trials in 2013; thus the end date would be 30 Sep. 2014 rather than 2013. The new end date had not been officially approved at the time of the Platform Review, but we anticipate that it will.
- "With such a large project, KDF data entry will be a real challenge as time goes on. It is listed as a critical success factor, but I didn't see a plan or schedule for this."
  - We have worked with ORNL to establish a deadline for submission of KDF reports to them by 1 August after harvest has been taken. Hopefully this will enable us to closely monitor upload of data to KDF.

Publications and Presentations

- Listed with Team Presentations