

DOE Bioenergy Technologies Office (BETO) 2015 Project Peer Review

South Dakota State University
SGI/DOE Regional Biomass Feedstock Partnership
Competitive Grants
(Award # GO88073; WBS 7.6.2.6)



23-27 March 2015

Technology Area Review: Feedstock Supply and Logistics

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Goal Statement

- Utilization of the congressionally directed DOE project at South Dakota State University and the North Central Regional Sun Grant's Competitive Grant program to address key issues and research gaps identified via the Sun Grant/DOE Regional Biomass Feedstock Partnership
- Identify and fund research projects relevant to the sustainable production, harvest, transport and delivery of cost-competitive, domestically grown biomass

Quad Chart Overview

Timeline

- Project start date: 1 June 2008
- Project end date: 30 Sep. 2015
- Percent complete: 90%

Budget (see next slide)

Barriers

- Barriers addressed
 - Ft-B Sustainable Production
 - Ft-C Feedstock Genetics and Deployment
 - Ft-H Biomass Storage Systems
 - Ft-K Biomass Physical State Alteration
 - Ft-L Biomass Material Handling and Transportation

Partners

- Land Grant Universities from 11 states (IA, IL, IN, KS, MN, MS, MT, ND, OH, TX, WI)
- Industry (see list on next slide)
- Non-profit (EcoSun Prairie Farm, Montana Wheat and Barley Committee)
- Idaho National Laboratory

Budget

	Total Costs FY08 –FY12	FY 13 Costs	FY 14 Costs	Total Planned Funding FY15- Project End Date
DOE Funded	\$5,883,694	\$2,187,322	\$1,440,376	\$980,608
<i>Cost Share</i>				
Awardee/sub-awardee time	\$1,725,951	\$320,602	Cost share met by FY14	
EcoSun Prairie Farm	\$74,278	\$18,555		
AGCO	\$75,000			
DuPont-Danisco Cellulosic Ethanol	\$47,970			
ConocoPhillips	\$107,653			
Archer Daniels Midland	\$28,064			
Hawkeye Renewables	\$28,064			
Alliant Energy	\$10,500			
John Deere	\$14,250			
Federal Machine Co.	\$133,332	\$2,530		
Mendel		\$11,550		
Applied Nanofilms		\$3,915		
SD Innovation Partners		\$7,585		
Thermo-Ag		\$13,201		

1 - Project Overview

- South Dakota State University agreed to employ the North Central Regional Sun Grant Center to administer a competitive grant program supporting the Regional Biomass Feedstock Partnership utilizing the Sun Grant's authorization as a guide.

2 – Approach (Technical)

- Sun Grant Authorization
 - Build local expertise and strength at the regional Sun Grant Centers (up to 25%)
 - Regional Competitive Grants (75%)
 - Integrate Federal and Regional Priorities
 - Regional Advisory Council and listening sessions
 - Federal Road Maps/Program Priorities
 - BETO Multi-Year Program Plan
 - At least 30% for
 - Technology development
 - Technology implementation

2 – Approach (Management)

- Three nationwide Request for Applications (RFA) completed (2008, 2009, and 2010)
- One internal (SDSU) Proof of Concept RFA completed in 2013
- Quarterly progress reports requested from each PI
- Final reports and follow up on completed projects to assess project outcomes and successes
- Annual reporting meetings held since 2009 for award recipients
- RFA Review Process: All proposals were reviewed for merit by a panel of scientific experts in the field and by the North Central Sun Grant Advisory Panel prior to selection

3 – Technical Accomplishments/Progress/Results

- 2008 Request for Applications (about \$3 million available)
 - Priority: Biomass feedstock logistics: biomass harvesting, handling (field operations), transportation, storage (including degradation & transformations), and densification.
 - 42 pre-proposals submitted
 - 20 invitations to submit full proposals
 - 8 selected for funding
- 3 internal projects selected for funding

3 – Technical Accomplishments/Progress/Results

- 2009 Request for Applications (about \$2.5 million available)
 - Priority: Sustainable biomass feedstock production systems for the North Central Sun Grant Region including biomass crop development, production, and systems/life-cycle analysis.
 - 77 pre-proposals submitted
 - 19 invitations to submit full proposals
 - 6 selected for funding
- 4 internal projects selected for funding

3 – Technical Accomplishments/Progress/Results

- 2010 Request for Applications (about \$2 million available)
 - Priority: Biomass production systems that optimize biomass feedstock yield and economic return across a diverse landscape in the North Central Sun Grant Region while minimizing negative effects on the environment and food/feed production.
 - 27 pre-proposals submitted
 - 14 invitations to submit full proposals
 - 4 selected for funding
- 2 internal projects selected for funding

3 – Technical Accomplishments/Progress/Results

- 2013 Internal Proof of Concept Request for Applications (about \$150,000 available)
- Project Requirements
 - 20% cash cost share from a source other than federal, state, or SDSU funds
 - Must advance economic development through commercialization of an invention discovered through SDSU research
 - Six month duration
 - Industry partner highly encouraged
- Three proposals funded—total cost around \$100k

3 – Technical Accomplishments/Progress/Results

- 2008 Funded Project: Evaluation of In-field Corn Stover Densification and Interaction with Storage Quality, Logistics, and Production Costs; Matthew Darr, Iowa State Univ. (DOE award: \$699,557; Status—completed)
 - In-field bale production costs of \$12 per ton.
 - Found a 20% improvement in bale collection efficiency when using an intelligent bale staging system.
 - Tarped stacks offered best balance of cost and quality.
 - Road quality a key criterion in selecting a satellite storage location
 - Tube wrapping a viable preservation option for early season, high moisture corn stover.
 - Dry matter loss the most influential economic driver to storage methods
 - Partners included DuPont-Danisco Cellulosic Ethanol, AGCO, ConocoPhillips, Archer Daniels Midland, Hawkeye Renewables, Alliant Energy, Idaho National Lab
 - Key project in DuPont siting decisions for cellulosic ethanol facility



3 – Technical Accomplishments/Progress/Results

- 2008 Funded Project: In-Field Cubing of Cellulosic Biomass; Kevin Shinnars, University of Wisconsin (DOE award: \$159,276; Status—completed)
 - Most important variables for successful formation of biomass (corn stover, switchgrass, reed canarygrass) cubes were, in order of importance
 - low moisture content (< 16% w.b.)
 - die block temperature at or below ~ 50°C
 - addition of lime at ~1% of DM as a binding amendment
 - steam conditioning
 - Cube density was often greater than 500 kg/m³ but fraction cubed and durability were often less than the desired targets of 90% and 75%, respectively



3 – Technical Accomplishments/Progress/Results

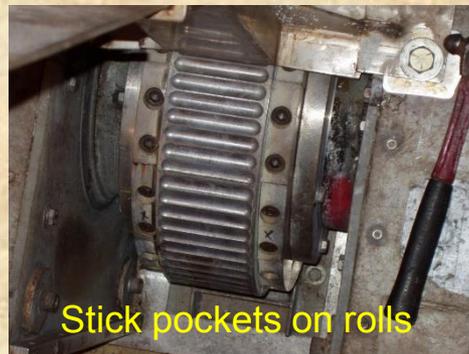
- 2008 Funded Project: The Logistics of Herbaceous Crop Residue-Based Ethanol Production under Uncertainty; David Lambert, Kansas State University (DOE award: \$116,063; Status—completed)
 - Results indicated HCR-based cellulosic ethanol production is profitable under the cost, price, and technical assumptions used to model plant investment decisions
 - Local cropping patterns influence likely locations of pretreatment and refinery operations
 - Potential crop residue-based ethanol plants favor the more productive agricultural areas of the three states (MN, SD, ND) modeled
 - In these models, Ammonium Fiber Expansion pretreatment (AFEX) yields feedstock for ethanol production yet also can provide high value cattle feed for local feedlots

3 – Technical Accomplishments/Progress/Results

- 2008 Funded Project: Strategies for Concurrent Wet Storage and Pretreatment of Corn Stover; Yebo Li, The Ohio State University (DOE award: \$79,688; Status—completed)
 - Adding NaOH (up to 50 g/kg DM) enhanced the enzymatic degradability of corn stover by 2-3 fold after 90-d wet storage
 - Treatment with white rot fungus (*Ceriporiopsis subvermispota*) also reduced recalcitrance of corn stover during storage

3 – Technical Accomplishments/Progress/Results

- 2008 Funded Project: Improving Handling Characteristics of Herbaceous Biomass; Vance Morey, University of Minnesota (DOE award: \$154,242: Status—completed)
 - Optimum tub-grinding and roll press compaction variables were obtained to produce compacted biomass materials with a bulk density of at least 240 kg/m³ (15 lb/ft³) for transport
 - Roll press compacts could be handled in belt conveyors without significant dust formation
 - Estimates show that as a fuel for heat and power applications, coarse ground/roll compacted corn stover reduced life-cycle GHG emissions by factors of approximately 7 and 11 compared to natural gas and coal, respectively
 - Industry partners: Kolbeck, Inc.; Bepex International LLC



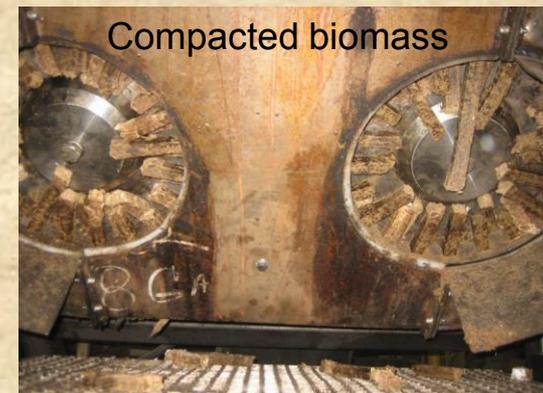
3 – Technical Accomplishments/Progress/Results

- 2008 Funded Project: Optimizing the Logistics of a Mobile Fast Pyrolysis System for Sustainable Bio-crude Oil Production; Sergio Capareda, Texas A&M University (DOE award: \$700,000; Status—completed)
 - A mobile fast pyrolysis system was developed and tested for biofuel production from corn stover, sorghum, and switchgrass
 - GIS analyses revealed that railroads and pipelines were generally not useful in optimizing feedstock logistics in the NC Region. Instead, roads and highways were the preferred means of transportation
 - Bio-char incorporation negatively affected major plant nutrient availability, and caused changes in soil pH and soil salinity
 - Proper incorporation of biochar critical to prevent derogatory soil environment
 - Company in Dallas, TX has licensed TAMU gasifier technology utilizing MSW for power generation
 - One provisional patent issued (see additional slides)



3 – Technical Accomplishments/Progress/Results

- 2008 Funded Project: Transforming and Densifying Biomass in Regional Biomass Processing Centers; K. Muthukumarappan, South Dakota State University (DOE award: \$689,553; Status—completed)
 - Optimized AFEX pretreatment conditions for bioethanol production from corn stover, switchgrass, and prairie cordgrass
 - AFEX pretreatment permitted effective pelletization at lower temperatures and pressures than is possible for untreated biomass using the ComPakco process



3 – Technical Accomplishments/Progress/Results

- 2008 Funded Project: Prioritizing Corn Harvest and Biomass Collection Activities; Cole Gustafson, North Dakota State University (DOE award: \$80,000; Status—completed)
 - Corn grain only option—Farmers are able to complete harvesting corn grain and achieve profit maximization in a fairly short amount of time with existing combine harvest capacity
 - Corn grain and cob one-pass option—grain harvest capacity diminishes due to the attachment of cob harvester to the back of combine which results in harvest slowdown
 - Corn grain and stover two-pass option—Time allocation will be the main challenge when farmers consider this system especially as farm size increases



3 – Technical Accomplishments/Progress/Results

- 2008 Internally Funded Project: Landscape Scale Biomass Production, Economics, and Environmental Quality; Carter Johnson, SDSU (DOE award: \$400,000; Status—completed)
 - Demonstrated effective methods of renovating CRP land to native grass/forb mixtures
 - Biomass production varied by species, mixture, and landscape position
 - Perennial grass production provided year round cover to all parts of the landscape thus minimizing erosion and sedimentation
 - Perennial grasses can slowly improve the soil over time; significant improvement was seen in wet aggregate stability, a key indicator of management impacts on soil quality
 - Improvements in soil quality can be made on cultivated land
 - Economics: Input costs of grass farming were about one-third the costs of conventional farms; however, grass farm income and profits were considerably lower than those of comparable corn-soybean farms



3 – Technical Accomplishments/Progress/Results

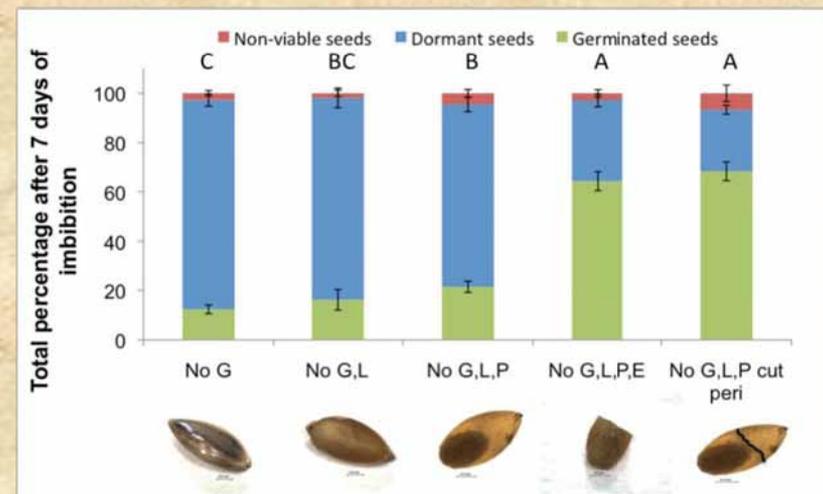
- 2008 Internally Funded Project: Interactions of Biochar/Bio-ash Source/Properties Impacts on Soil Properties, C Sequestration Potential, and Crop Management; Doug Malo, SDSU (DOE award: \$78,000; Status—completed)
 - Addition of biochar to the soil (10%) reduced plant available N and increased P and K
 - Biochar additions from the optimal production conditions significantly increased soil salinity
 - Biochar pH values varied greatly depending on processing temperature and residence time; highest pH at 650°C and >16 minute residence time, lowest pH at 550°C. These differences impact biochar suitability as a soil amendment.
- Led to USDA-NIFA successful grant application

3 – Technical Accomplishments/Progress/Results

- 2009 Funded Project: Seed Technologies to Secure Rapid and Complete Switchgrass Establishment; Brian Baldwin, Mississippi State University (DOE award: \$378,049; Status—completed)
 - Seed dormancy in these switchgrass cultivars lies primarily with permeability of the pericarp, and to a lesser extent the inner glumes
 - Seed safeners (to protect against metolachlor) improved switchgrass seedling establishment and resulted in greater crop yields
 - The use of the herbicide metolachlor in controlling weeds for the first months of establishment may enable a harvest in the establishment year

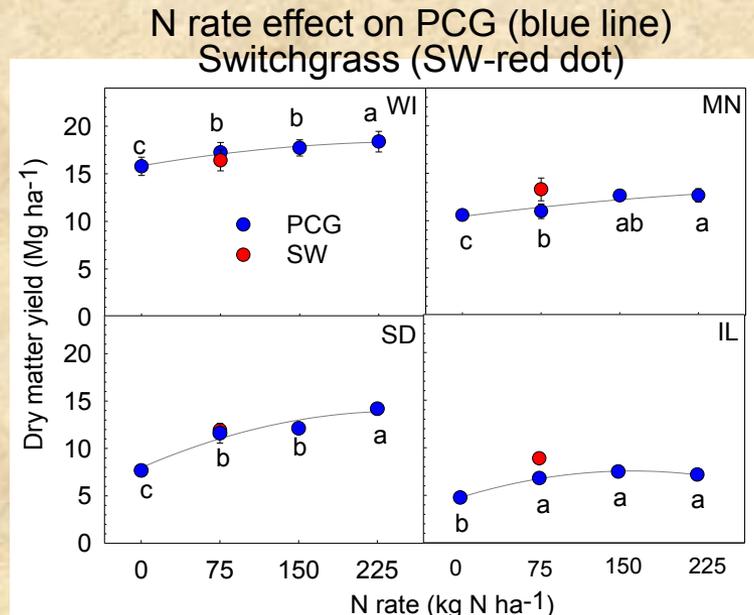


Switchgrass seed dormancy



3 – Technical Accomplishments/Progress/Results

- 2009 Funded Project: Sustainable Biomass Production on Marginal Lands using a Novel Legume/Grass Mixture; Vance Owens, South Dakota State University (DOE award: \$644,021; Status—Completed)
 - Cultivar adaptation: Prairie cordgrass (PCG) yields increased with N application up to 225 kg/ha in WI, SD and MN and with urea application up to 75 kg/ha in IL
 - By year three (2013) there was a N value associated with PCG grown with KC
 - N was important in increasing theoretical ethanol yield because of biomass yield

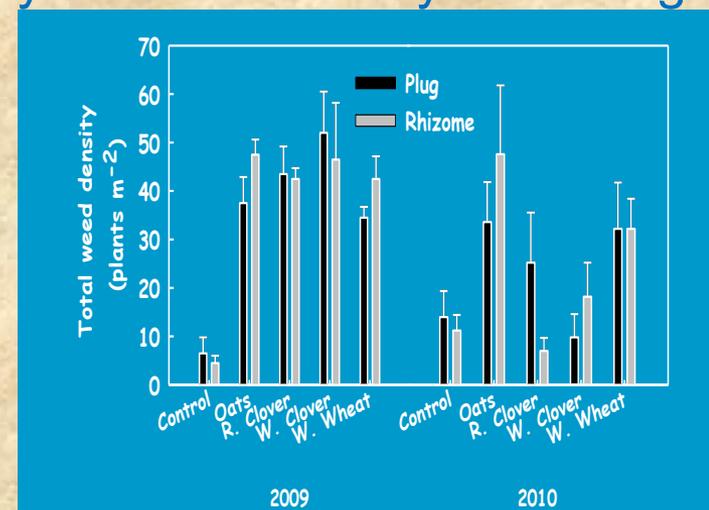
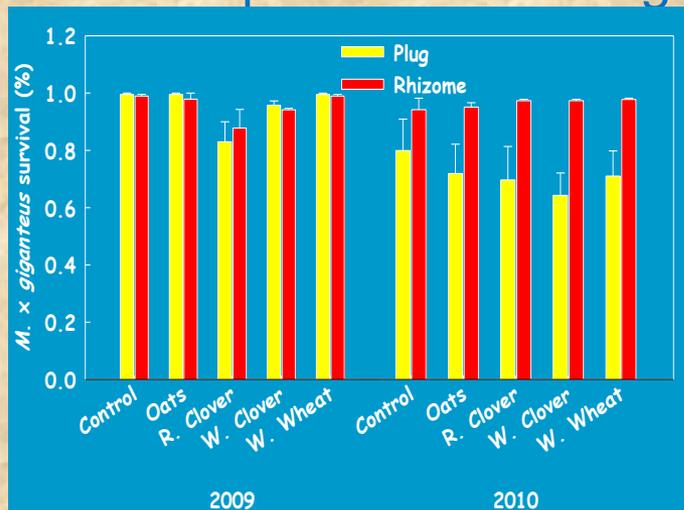


State	FNRV* kg/ha
WI	25
SD	60
MN	82
IL	44

*FNRV: fertilizer N replacement value

3 – Technical Accomplishments/Progress/Results

- 2009 Funded Project: Do Nurse Crops Make *Miscanthus x giganteus* Establishment More Sustainable?; Emily Heaton, Iowa State University (DOE award: \$180,969; Status—completed)
 - Nurse crops had no clear effect on *M. x giganteus* winter survival. Survival was near 100%, except in 2010, when ~30 % of plugs were lost due to severe heat-stress during shipping
 - Nurse crops suppressed weeds, especially when combined with timely herbicide application, allowing fewer applications and/or less mechanical weed control.
 - Nurse crops reduced *M. x giganteus* yields in the first year after growth.

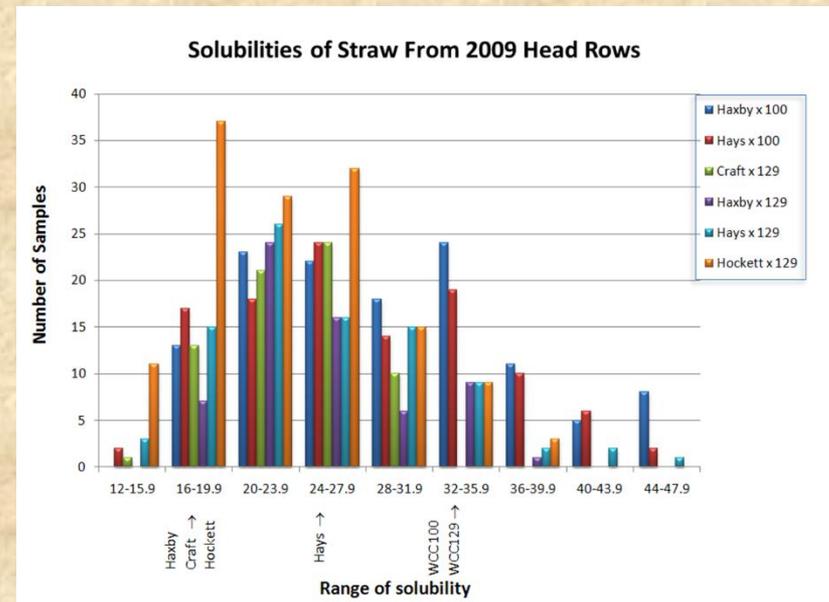


3 – Technical Accomplishments/Progress/Results

- 2009 Funded Project: Optimization of biomass productivity and environmental sustainability for cellulosic feedstocks: Land capability and life cycle analysis; Sylvie Brouder, Purdue University (DOE award: \$700,000; Status—completed, awaiting final report)
 - Average yields of sweet and photoperiod sensitive sorghums were higher than corn
 - Yields of the perennial crops (*Miscanthus x giganteus*, switchgrass, and low diversity prairie mix) were variable depending on location and establishment success (up to 3 years)
 - Once established, *Miscanthus x giganteus* produced the greatest biomass across all locations followed by switchgrass, then the low diversity prairie
 - Switchgrass and prairie mix less variable across locations
 - LCAs to evaluate environmental sustainability of bioenergy crops as compared to liquid petroleum
 - Led to successful grant applications to DOE, USDA, and IPNI (International Plant Nutrition Institute)

3 – Technical Accomplishments/Progress/Results

- 2009 Funded Project: Barley Straw Fructanosec Ethanol for On-Farm Biofuel Production; Victoria Blake, Montana State University (DOE award: \$77,868; Status—completed)
 - Evaluation of straw yield and composition from high-fructan barley lines
 - Utilization of recombinant inbred barley lines to improve grain and straw yield characteristics in high straw fructan barley lines
 - Found 22 lines with 35% straw solubles and competitive grain and straw yield

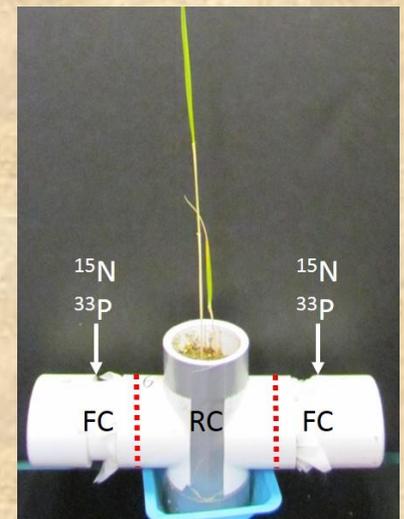


3 – Technical Accomplishments/Progress/Results

- 2009 Funded Project: Evaluation of Bioenergy Crop Production on Marginal Land in Wisconsin; Stephen Ventura, University of Wisconsin-Madison (DOE award: \$667,299; Status—completed)
 - Cropping scenarios that converted sensitive lands currently in row crop production to perennial crops such as switchgrass generated greater ecosystem benefits in terms of water quality, soil erosion, greenhouse gas sequestration, and wildlife (pollinator) habitat.
 - Mail surveys: Getting farmers to switch to bioenergy crops would require a substantial subsidy or increase in current market prices, particularly farmers with integrated crop-livestock systems. Fewer than one-third of farmers would even consider including bioenergy crops in their cropping systems.
 - Mail surveys: Identified characteristics of farms and farmers associated with likelihood of adopting bioenergy crops including amount of marginal land (slight positive association), type of cropping system (negative for integrated crop-livestock systems), age (younger is more likely) and education of farmer (more educated is more likely), familiarity with bioenergy crops (more familiar is more likely), and non-farm family income (more non-farm income is more likely).
 - Farm gate price was the main determinant of willingness to adopt bioenergy crops.
 - Developed a manual on safe and sustainable production of bioenergy crops on sensitive landscapes, now distributed by the Wisconsin Bioenergy Council.

3 – Technical Accomplishments/Progress/Results

- 2009 Internally Funded Project: Beneficial Plant Microbe Interactions and Their Potential Application to Increase Biomass Production and Environmental Sustainability of Prairie Cordgrass; Heike Bucking, SDSU (DOE award: \$143,763; Status—On-going)
 - Natural communities of prairie cordgrass (PCG) are primarily dominated by *Glomus* sp.
 - *Glomus intraradices* is able to increase biomass production under low input conditions and transfers P and N to its host
 - PCG genotypes differ in their biomass potential under low input conditions, and their mycorrhizal responsiveness
 - P and N taken up by fungal hyphae in the fungal compartment (FC) and transferred to roots and shoots of mycorrhizal PCG plants



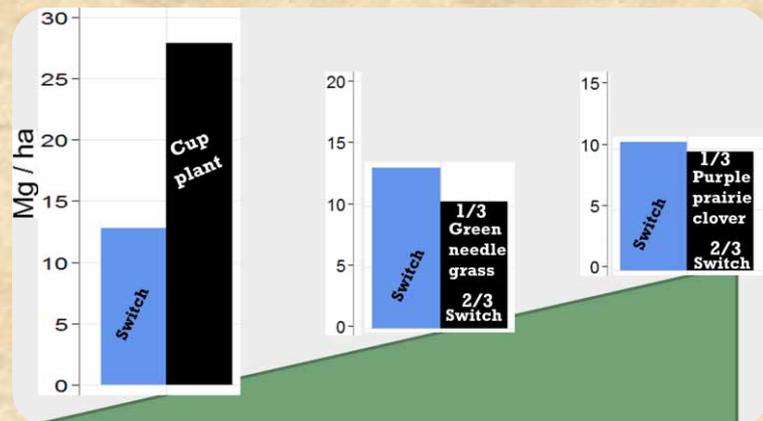
3 – Technical Accomplishments/Progress/Results

- 2010 Funded Project: Using Second-Generation Biofuel Feedstocks to Improve the Carbon Economy of US Agriculture; Evan DeLucia, Univ. of Illinois (DOE award: \$644,517; Status—On-going)
 - Improved DayCENT modeling through data collection, and projected yields for the central and eastern US.
 - Calculated GHG emissions for potential bioethanol crop scenarios.
 - Calculated abatement costs and associated GHG balance for the least-cost land allocation scenario.
 - Project ending 31 March 2015

3 – Technical Accomplishments/Progress/Results

- 2010 Funded Project: Improving production, resilience, and biodiversity of perennial grass mixtures and monocultures as biofuel feedstocks across environmentally heterogeneous landscapes; Carter Johnson, South Dakota State Univ. (DOE award: \$671,506; Status—On-going)
 - Determine biomass production and species performance in fields of warm-season grasses and forbs planted 1-3 years ago
 - Determine, by pairing numerous combinations of native prairie species, which grow best together and benefit switchgrass plantings the most across a range of soils and topography
 - Project ending 31 July 2015

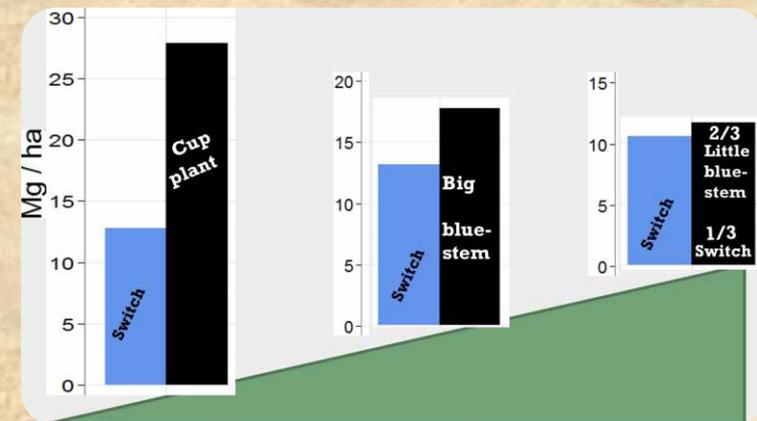
Maximize biomass



Species mixtures across the landscape

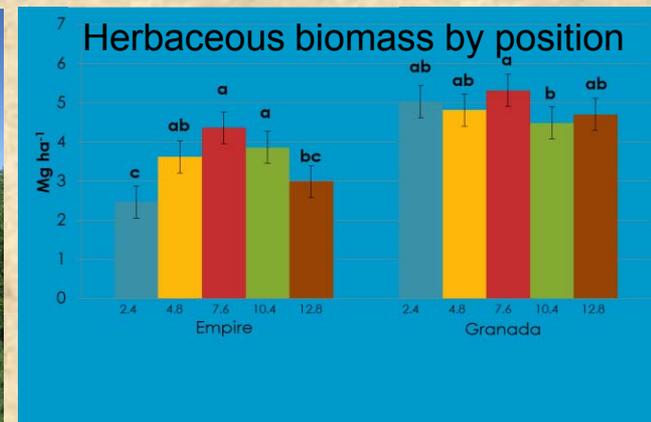
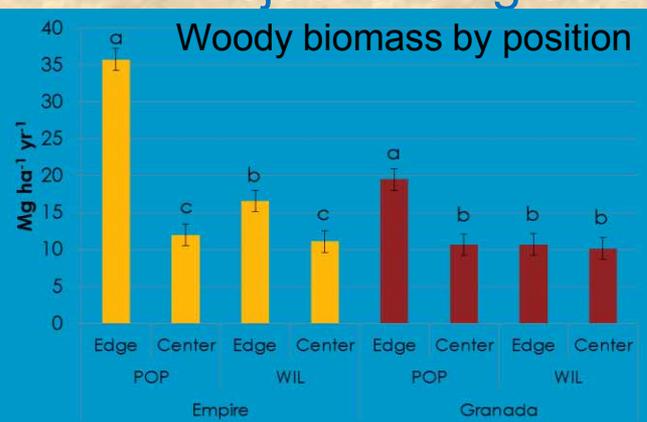


Biomass and Diversity



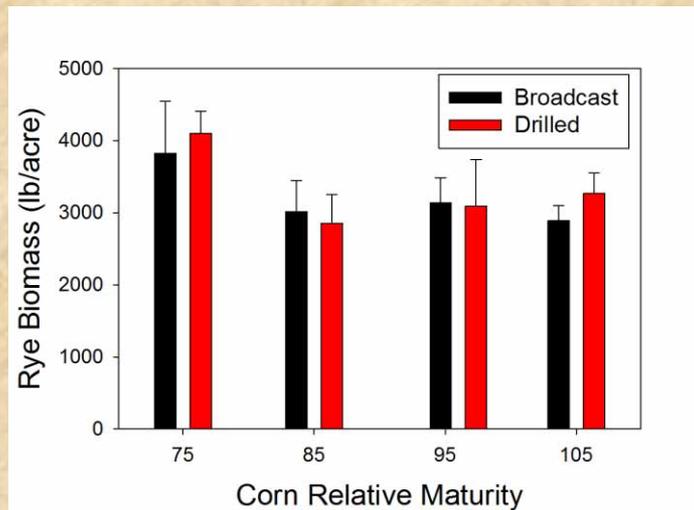
3 – Technical Accomplishments/Progress/Results

- 2010 Funded Project: Production and Economics of Perennial-based Woody and Herbaceous Biomass Crops under Alley-Cropping Systems; Gregg Johnson, University of Minnesota (DOE award: \$515,025; Status—On-going)
 - Determine productivity of woody and herbaceous biomass species in an alley cropping configuration as well as evaluate cover crops to control erosion and improve diversity
 - Aggregate production data and refine enterprise budgets for alley-cropping and other perennial-based biomass cropping systems
 - Developing a decision support tool for producers or other to use
 - Project ending 31 July 2015



3 – Technical Accomplishments/Progress/Results

- 2010 Funded Project: Intensifying the corn-soybean rotation with the use of winter rye grown for biomass energy production; Peter Sexton, South Dakota State Univ. (DOE award: \$248,697; Status—On-going)
 - Evaluate potential of winter rye as a biomass crop established after corn varying in maturity and followed by soybean
 - Use of earlier-maturing corn lines significantly lowered corn grain yield, but did not improve rye biomass yield in 2013.
 - Rye did not affect soybean yields in the 2013 season. However, in a drought year (2012) the rye adversely impacted soybean yields.
 - Cost of rye biomass production estimated at \$62 per ton in this study.



3 – Technical Accomplishments/Progress/Results

- 2013 Proof of Concept Internally Funded Project: Developing Gas Stripping - Adsorption/Desorption Separation Processes based on Porous Carbon Adsorbents for Biofuel Purification from Bioreactors; Z. Gu, SDSU (DOE award: \$30,338; Status—Completed)
 - Bio-char adsorbent can achieve adsorption of volatile chemicals
 - Desorption energy decreases with loading dosages, also depends on surface area, pore volume, and surface conditions
 - Intellectual property: talking with several companies about this process

3 – Technical Accomplishments/Progress/Results

- 2013 Proof of Concept Internally Funded Project: Catalytic Fast Pyrolysis (CFP) Conversion of Corn Stover to Drop-In Quality Hydrocarbon; L. Wei, SDSU (DOE award: \$52,805; Status—Completed)
 - Various catalysts were developed and combined with the CFP reactor to effectively convert lignocellulosic biomass to drop-in fuels.
 - Intellectual property: one license; exploring other collaborations to commercialize the CFP technology.

3 – Technical Accomplishments/Progress/Results

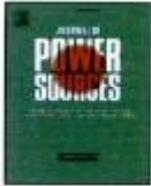
- 2013 Proof of Concept Internally Funded Project: Electrophoretic Deposition of Biochar Nanomaterial Films for Energy Storage; Q. Fan, SDSU (DOE award: \$23,878; Status—Completed)
 - Supercapacitor made of activated carbon from pyrolysis of yellow pine using electrophoretic deposition demonstrated specific capacitance comparable to traditional, more expensive methods.
 - Intellectual property: one disclosure, one patent, one license agreement (working on another one)

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Biochar activated by oxygen plasma for supercapacitors

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4 - Relevance

- A portfolio of projects supporting the Sun Grant/DOE Regional Biomass Feedstock Partnership and addressing four technical barriers to producing a sustainable, cost-competitive supply of biomass feedstock
 - Ft-B Sustainable Production
 - Ft-C Feedstock Genetics and Deployment
 - Ft-H Biomass Storage Systems
 - Ft-K Biomass Physical State Alteration
 - Ft-L Biomass Material Handling and Transportation

5 - Future Work

- Continue to monitor progress on funded projects.
 - Quarterly reports
 - Final reports
 - Annual progress presentation at North Central Annual Meeting
 - Facilitate research/outreach publications

Summary

- Funding from a congressionally directed project at South Dakota State University is being utilized to support a complete grant program through the North Central Sun Grant Center to address technical barriers identified through the Regional Feedstock partnership.
- Key barriers addressed:
 - Sustainable feedstock production systems on marginal land
 - Technologies to densify biomass to improve transportation and storage

Additional Slides

Responses to Previous Reviewers' Comments

- Wide range of project topics resulted in a diverse set of conclusions. One was indicated as resulting in further funding. Some projects are completed and others are just underway, so accomplishments are still occurring.
 - Answer: We will continue to monitor and document accomplishments of the diverse projects associated with these funds. The breadth of projects has led to some very interesting and informative results across the bioenergy value chain.
- No tech transfer presentation made.
 - Some tech transfer has been included in the current presentation, especially for the Proof of Concept projects. See also Additional Slides.

Publications, Patents, Presentations, Awards, and Commercialization

Peer reviewed publications (2014)

- Zilverberg, C.J., W.C. Johnson, A. Boe, V. Owens, D.W. Archer, C. Novotny, M. Volke, and B. Werner. 2014. Growing *Spartina pectinata* in previously farmed prairie wetlands for economic and ecological benefits. *Wetlands* DOI 10.1007/s13157-014-0548-8.
- Zilverberg, C.J., W.C. Johnson, V. Owens, A. Boe, T. Schumacher, K. Reitsma, C.O. Hong, C. Novotny, M. Volke, and B. Werner. 2014. Biomass yield from planted mixtures and monocultures of native prairie vegetation across a heterogeneous farm landscape. *Agric., Ecosyst. and Environ.* 186:148-159.

Peer reviewed publications (2013)

- Karunanithy, C., K. Muthukumarappan and A. Donepudi. 2013. Moisture sorption characteristics of corn stover and big bluestem. *Journal of Renewable Energy*. <http://dx.doi.org/10.1155/2013/939504>.
- Karunanithy, C., K. Muthukumarappan and A. Donepudi. 2013. Moisture sorption characteristics of switchgrass and prairie cord grass. *Fuel* 103: 171-178.
- Karunanithy, C., Y. Wang, K. Muthukumarappan, and S. Pugalendhi. 2013. Physio-chemical characterization of briquettes made from different feedstocks. *Biotechnology Research International: Bioenergy and Biorefinery (Special issue)* – DOI:10.1155/2013/165202.
- Eckard, A. D, K. Muthukumarappan and W. Gibbons. 2013. Enhanced Bioethanol Production from Pretreated Corn Stover via Multi-Positive Effect of Casein Micelles. *Bioresource Technology* 135(5): 93-102.
- Wangda Qu, Lin Wei, James Julson. An exploration of improving the properties of heavy bio-oil. *Energy & Fuels*, 2013, 27 (8), pp 4717–4722.
- Field-scale potassium and phosphorus fluxes in the bioenergy crop switchgrass: Theoretical energy yields and management implications. 2013. *J. Plant Nutr. Soil Sci.* 176:387-399.
- Farmers' Supply Response, Price of Corn Residue, and Its Economic Viability as an Energy Feedstock. *Bioenergy Research*. 6(2):797-807, 2013. <http://dx.doi.org/10.1007/s12155-013-9300-0>
- Environmental and economic tradeoffs in a watershed when using corn stover for bioenergy. *Environmental Science & Technology*. 47(4):1787-1791, 2013. <http://dx.doi.org/10.1021/es303459h>
- Wangda Qu, Lin Wei, James Julson. An exploration of improving the properties of heavy bio-oil. *Energy & Fuels*, 2013, 27 (8), pp 4717–4722.
- Zhongyi Ma, Lin Wei, Wangda Qu, James Julson, Qingwei Zhu, Xunzhang Wang, 2013. The effect of support on the catalytic performance for bio-oil upgrading. *Advanced Materials Research*. Vols. 608-609, pp 350-355.

Publications, Patents, Presentations, Awards, and Commercialization

Peer reviewed publications (2013 cont'd)

- Meehan, T.D., C. Gratton, E. Diehl, N.D. Hunt, D.F. Mooney, S.J. Ventura, B.L. Barham, and R.D. Jackson. 2013. Ecosystem-service tradeoffs associated with switching from annual to perennial energy crops in riparian zones of the US Midwest. PLOS ONE 8:e80093. PDF.
- Rushing, J.B., B.S. Baldwin, A.G. Taylor, V.N. Owens, J.H. Fike, and K.J. Moore. 2013. Seed safening from herbicidal injury in switchgrass establishment. Crop Sci. 53:1-8.

Peer reviewed publications (2012)

- Medic, D., M. Darr, A. Shah and S. Rahn. 2012. Effect of Torrefaction on Water Vapor Adsorption Properties and Resistance to Microbial Degradation of Corn Stover. Energy & Fuels 26:2386-2393.
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- Cui, Z. F., Wan, C. X., Sykes, R., Li, Y. B. 2012. Enzymatic digestibility of corn stover fractions in response to fungal pretreatment. Industrial & Engineering Chemistry Research. Under revision.
- Cui, Z.F, Shi, J., Wan, C. X., Li, Y. B. 2012. Comparison of alkaline- and fungi- assisted wet-Storage of corn Stover. Bioresource Technology. 109:98-104.
- Kaliyan, N., D.R. Schmidt, R.V. Morey, and D.G. Tiffany. 2012. Commercial scale tub grinding of corn stover and perennial grasses. Applied Engineering in Agriculture 28(1): 79-85.
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- Schnell R.W., D.M. Vietor, T.L. Provin, C.L. Munster and S.C. Capareda. 2012. Capacity of Biochar Application to Maintain Energy Crop Productivity: Soil Chemistry, Sorghum Growth, and Runoff Water Quality Effects. J. Environ. Qual. 41: 1044-1051.56
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Publications, Patents, Presentations, Awards, and Commercialization

Peer reviewed publications (2012 cont'd)

- Ventura, S., S. Hull, R. Jackson, G. Radloff, D. Sample, S. Walling, and C. Williams (2012) "Guidelines for Sustainable Planting and Harvest of Nonforest Biomass in Wisconsin." *Journal of Soil and Water Conservation* 67(1):17A-20A
- Shah, A., M. Darr, K. Webster and C. Hoffman. 2011. Outdoor storage characteristics of single-pass large square corn stover bales in Iowa. *Energies*. 4: 1687-1695.
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- Wan, C. X., Li, Y. B. 2011. Effect of hot water extraction and liquid hot water pretreatment on the fungal degradation of biomass feedstocks. *Bioresource Technology* 102: 9788-9793.
- Wan, C. X., Li, Y. B. 2011. Effectiveness of microbial pretreatment by *Ceriporiopsis subvermispora* on different biomass feedstocks. *Bioresource Technology*. 102: 7507–7512
- Wan, C. X., Zhou. Y. G. , Li, Y. B. 2011. Liquid hot water and alkaline pretreatment of soybean straw for improving cellulose digestibility. *Bioresource Technology* 102:6254-6259.
- Wise, J.T., D. Vietor, T. Provin, S. Capareda, C. Munster, and A. Boateng. 2012. Mineral nutrient recovery from pyrolysis systems. *Environ. Progress & Sustain. Energy*. Vol 31-2. pg. 251-255.

Peer reviewed publications (2011)

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- Clay, S.A. and D.D. Malo. 2011. The Influence of Biochar Production on Herbicide Sorption Characteristics. Chapter in *Herbicides/Book 3*. ed. M.N. Hasaneen. Intech Rijeka, Croatia. ISBN 9790953-307-729-0 (accepted for publication/in press).
- Zambare, V. P, Zambare, A. V, Muthukumarappan, K. and L. P. Christopher. 2011. Biochemical characterization of thermophilic lignocellulose degrading enzymes and their potential for biomass bioprocessing. *International Journal of Energy and Environment* 2(1): 99-112.

Publications, Patents, Presentations, Awards, and Commercialization

Peer reviewed publications (2011 cont'd)

- Zambare, V. P, Zambare, A. V, Muthukumarappan, K. and L. P. Christopher. 2011. Potential of thermostable cellulases in the bioprocessing of switchgrass to ethanol. *Journal of BioResources* 6(2): 2004-2020.

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- Nguyen, B. T., Lehmann, J., Hockaday, W. C., Joseph, S., & Masiello, C. A. 2010. Temperature Sensitivity of Black Carbon Decomposition and Oxidation. *Environmental Science and Technology*, 44(9), 3324–3331. doi:10.1021/es903016y
- Lambert, David K. and Jason Middleton. “Logistical Design of a Regional Herbaceous Crop Residue-Based Ethanol Production Complex,” *Biomass and Bioenergy* 34(2010): 91-100.
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Book Chapters (all years)

- Muthukumarappan, K., and C. Karunanithy. 2014. Chapter 23 on 'Lignocellulosic Feedstock Preparation by Size Reduction and Pretreatment' in *Biofuel Crops: Production, Physiology and Genetics* Edited by B. P. Singh.
- Karunanithy, C., K. Muthukumarappan, and W. R. Gibbons. 2014. Chapter on 'Advances in Pretreatment Strategies of Biochemical Conversion of Biomass' *Bioprocess Engineering of 'Recent Developments in Biotechnology'* STUDIUM PRESS LLC, TX.
- Karunanithy, C. and K. Muthukumarappan. 2013. Thermo-mechanical pretreatment of feedstocks: In *Green Biomass Pretreatment for Biofuels Production* edited by Dr. Tingyue Gu, Springer-Verlag London Limited., ISBN 978-94-007-6051-6, 31-65.

Publications, Patents, Presentations, Awards, and Commercialization

Book Chapters (all years cont'd)

- Muthukumarappan, K. 2012. Novel Integration of Preprocessing and Densification of Different Biomass Feedstocks. In: Advanced Biofuels in a Biorefinery Approach. ISBN: 978-87-7903-574-4: 23.
- Karunanithy, C. and K. Muthukumarappan.2012. Extrusion Pretreatment of Biomass Towards Bioethanol Production. Eds., Lambert Academic Publishing. ISBN: 978-3-8473-4262-5.

Patents

- Capareda, S. C., C. B. Parnell, Jr., D. Carney and W. A. LePori. Pyrolysis and Gasification System for Biomass Feedstock. Provisional Patent with Serial No. 61/302,001 (Issued February 5, 2010)

Disclosures

- Wei L. T-00238, “A Novel rotating fluidized bed catalytic pyrolysis reactor” 12.15.2011.
- Fan, Q. T-00313, “Plasma induced microporous structures in biocarbon materials” 4.8.2014
- Gu, Z. T-00254, “Biochar adsorption of chemicals form drain tile water, fracking water, and other polluted waters” 5.30.2012.
- Gu, Z. T-00252, “Biochar or activated biochar adsorption of long alcohols and hydrocarbons from process fluids” 5.16.2012.
- Muthukumarappan, K. T-00254, “Biochar adsorption of chemicals form drain tile water, fracking water, and other polluted waters” 5.30.2012.
- Muthukumarappan, K. T-00252, “Biochar or activated biochar adsorption of long alcohols and hydrocarbons from process fluids” 5.16.2012.
- Bucking, H. T-00350, “Nitrogen fixing bacterial endophytes” 1.30.2015

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2014)

- Dierking, R., J. Volenec, S. Brouder, and D. Allen. 2014. Miscanthus Yields and Tissue N Concentrations during Establishment with Various N-Rates Grown on Marginal Soils. ASA-CSSA-SSSA International Meetings, Long Beach, CA. Nov. 2-5, 2014.
- M.K. Long, J.J. Volenec, and S.M. Brouder. 2014. Lignocellulosic theoretical ethanol production of potential bioenergy sorghum genotypes. Poster 284-9. <https://scisoc.confex.com/scisoc/2014am/webprogram/Paper87703.html>. ASA-CSSA-SSSA International Meetings, Long Beach, CA. Nov. 2-5, 2014.
- Orr, M.-J., M. Bischoff Gray, S.M. Cunningham, N. DeArmond, J.J. Volenec, S.M. Brouder, and R.F. Turco. 2014. Comparative analysis of soil properties and greenhouse gas flux responses to nitrogen fertilization in bioenergy production systems. Poster 100-12. ASA-CSSA-SSSA International Meetings, Long Beach, CA. Nov. 2-5, 2014.
- Barham, B., D. Mooney, D. Prager, S. Swinton, T. Skevas, and S. Tanner. 2014. Economic “Availability of Private Lands for Bioenergy Crop Production: Looking Towards the Northern Tier”. Poster presented at the 8th Annual GLBRC Science Retreat. South Bend IN. May 20-22, 2014.
- Sundaram, V., and Muthukumarappan, K. 2014. Effects of biomass blending on sugar yield and pellet hardness of afex treated corn stover and switch grass. To be presented at the 2014 ASABE and CSBE/SCGAB Annual International Meeting, July 13-16, Montreal QC, Canada.
- Sundaram, V., and Muthukumarappan, K. 2014. Effect of densification and biomass parameters on sugar yield of AFEX pretreated corn stover, prairie cord grass and switch grass. To be presented at the 2014 ASABE and CSBE/SCGAB Annual International Meeting, July 13-16, Montreal QC, Canada.
- Sundaram, V., and Muthukumarappan, K. 2014. Influence of AFEX pretreated corn stover and switchgrass ratio levels on the compaction characteristics of pellets. Presented at the 2014 ASABE/CSBE North-Central Intersectional Conference, March 28-29, Brookings, SD.
- R. Gupta, J. Hong, M. Dubey, X. Wang, V. Neto, J. Gracio, Z. Gu, Q. Fan, “Biochar Nanomaterials Activated by Oxygen Plasma for Energy Storage”, Proceedings 5th International Conf. on Advanced Nanomaterials, 2-4 July 2014, Aveiro, Portugal.

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2014 cont'd)

- R. Gupta, M. Dubey, Z. Gu, Q. Fan, “Comparison of Argon and Oxygen Plasma Activation of Biochar for Supercapacitors”, Oral presentation, accepted for oral presentation at AIChE Annual Meeting, Nov. 20, 2014 Atlanta, GA
- R. Gupta, Z. Gu, Q. Fan, “High performance plasma treated biochar for supercapacitors”, Oral presentation, 2014 ASABE Intersectional Meeting, Mar. 28 – 29, 2014, Brookings, SD
- R. Gupta, Z. Gu, Q. Fan, “Biochar for Energy Storage”, GreenWeek poster presentation, May 1, 2014. This is a public education and outreach activity organized by SDSU
- Han Vu, Yuhe Cao, Zhengrong Gu, “Recovery of Butanol from Fermentation Using Chemically Modified Activated Carbon as Adsorbent”, REU Students Competition and South Dakota Science Symposium (Funded by NSF-EpsCor), August 1 and 5th, 2014, Sioux Falls and Brookings SD
- Yuhe Cao, Xiaomin Wang, Han Vu, Hong Jin, Zhengrong Gu, and Gibbons William, “Gas stripping and Adsorption/desorption separation of volatile alcohol from model solution”, NSF-EpsCor Track II DakotaBiocons annual meeting (Funded by NSF-EpsCor), July 21, Fargo, ND 2014.
- J. Polin, X. Wang, J. Bassett, Z. Gu, K. Muthu, and W. Gibbons, Recovery of Butanol and Ethanol From a Photobioreactor Using Bio-Char Based Activated Carbon As Adsorbent, 2014 ASABE Intersectional Meeting, Mar 28-29, 2014, Brookings SD.
- L. Wei, J. Julson. 2014. Catalytic Fast Pyrolysis of Corn Stover to Hydrocarbon drop-in fuels. NC Sun Grant annual meeting, Mar. 27, Minneapolis, MN.
- L. Wei, Y. Huang, Y. Gao, X. Zhao, and J. Julson. Upgrading pyrolysis bio-oil over ZSM-5 catalyst for advanced biofuel development. July 16 – 21, 2014 ASABE annual meeting, Montreal, Canada
- Y. Huang, L. Wei, J. Julson, Y. Gao, and X. Zhao. 2014, Upgrading of bio-oil into advanced bio-fuel over Mo/ZSM5 catalysts. ASABE intersection meeting, Mar. 29, Brookings, SD.
- L. Wei, J. Julson. 2014. Catalytic Fast Pyrolysis of Corn Stover to Hydrocarbon drop-in fuels. NC Sun Grant annual meeting, Mar. 27, Minneapolis, MN.
- L. Wei, Y. Huang, Y. Gao, X. Zhao, and J. Julson. Upgrading pyrolysis bio-oil over ZSM-5 catalyst for advanced biofuel development. July 16 – 21, 2014 ASABE annual meeting, Montreal, Canada
- Y. Huang, L. Wei, J. Julson, Y. Gao, and X. Zhao. 2014, Upgrading of bio-oil into advanced bio-fuel over Mo/ZSM5 catalysts. ASABE intersection meeting, Mar. 29, Brookings, SD.
- Li W, Yen Y. Develop solid-stem triticale as feedstock for biofuel production. North Central Regional Sun Grant Annual conference. March 25-27, 2014. Minneapolis, MN

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2014 cont'd)

- Li W, Zhu H, Wang W, Wei W, Chen F, Paudel D, Yen Y. Developing solid-stem Triticale as a feedstock for biofuel production. Sept. 22-23, 2014. Brookings, SD
- Mooney, D. E. Barham, B. Barham, T. Meehan, R. Jackson, S. Ventura, N. Hunt. "Economic Responses of Non-Farm Rural Landowners to Bioenergy Cropping Opportunities." Poster presented at the 2014 GLBRC Sustainability Retreat. Kellogg Biological Station, Michigan State University, Hickory Corners, MI, February 3-5, 2014.

Presentations (2013)

- R.M. Dierking, J. Volenec and P. Murphy. Forage yield and quality of Miscanthus x giganteus subjected to simulated haying/grazing conditions. ASA-CSSA-SSSA International Meetings, Tampa, FL. Nov. 2 to 6, 2013.
- Long, M.K., J.J. Volenec, and S.M. Brouder. Theoretical ethanol yield for potential bioenergy sorghum genotypes of differing compositions. Abstract 373-9. ASA-CSSA-SSSA International Meetings, Tampa, FL. Nov. 2 to 6, 2013. <https://scisoc.confex.com/crops/2013am/webprogram/Paper80060.html>
- Mooney, D.F. and B.L. Barham. "What Drives the Adoption of Clean Agricultural Technologies? An Ex Ante Assessment of Sustainable Biofuel Production in Southwestern Wisconsin." Annual Meeting of the Agricultural and Applied Economics Association (AAEA). Washington, DC, August 4-6, 2013.
- Mooney, D.F., B.L. Barham and C. Lian. "Sustainable Biofuels, Marginal Agricultural Lands, and Farm Supply Response: Micro-Evidence for Southwest Wisconsin." Annual Meeting of the Agricultural and Applied Economics Association (AAEA). Washington, DC, August 4-6, 2013.
- Heaton E.A., Boersma N.N.* Schulte L.A. & Wilson D.* (March 19, 2013) Perennial energy crops in Iowa. 3rd Annual Biomass Workshop. Iowa City, IA. 30 participants. (2013)
- Heaton E.A., Schulte L.A. & Wilson D.* (March 12, 2013) Managing for bioenergy – integrating food and fuel production. Ag Education Day, Emmetsburg, IA, 130 participants. (2013)
- Heaton E.A. (February 28, 2013) Perennial bioenergy crops benefit soil and water. University of Illinois Soil and Water Workshop, Taylorville, IL, 75 participants. (2013)
- Heaton E.A. & Bonin C. (February 20, 2013) Perennials to the rescue! The Dirt on Dirt Soil Health Workshop, Lenox, IA, 78 participants. (2013)
- Heaton E.A., Schulte L.A. & Milster F. 2013. Integrating food and fuel production in the Corn Belt. Kohn Lecture Series, University of Iowa, Iowa City, IA. (2013)
- Field Tour of the EcoSun Prairie Farm on July 26, 2013. Research conducted on the farm funded by the Sun Grant Center program was reviewed. This was a focused field tour open to invited stakeholders.

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2013 cont'd)

- Field Tour of the EcoSun Prairie Farm on July 26, 2013. Research conducted on the farm funded by the Sun Grant Center program was reviewed. This was a focused field tour open to invited stakeholders.
- Archer, D.W., W.C. Johnson, C.J. Zilverberg, C. Novotny, T. Schumacher, A. Boe, and S. Kronberg. 2013. Economic Performance of a Corn Belt Grass Farm. Poster presented at the 68th International Annual Conference of the Soil and Water Conservation Society, Reno, Nevada, July 21-24, 2013.
- Zilverberg, C.J. *, W.C. Johnson, and D. Archer. Restoring prairie for agricultural production and profit. America's Grasslands Conference, 2013.
- Zilverberg, C.J., W.C. Johnson, A. Boe, V. Owens, and D. Archer. 2013. Improving production, resilience, and biodiversity of perennial grass mixtures and monocultures as biofuel feedstocks across environmentally heterogeneous landscapes. Presented at the 2013 North Central Regional Sun Grant Center Annual Meeting. 26-27 Mar., 2013. Chicago, IL.
- "Johnson, W.C., A. Boe, V. Owens, C. Zilverberg, and C. Novotny. 2013. Biofuel feedstock crops in sub-irrigated lowlands. Presented at the 2013 North Central Regional Sun Grant Center Annual Meeting. 26-27 Mar., 2013. Chicago, IL. Presentation by W. Carter Johnson on the progress being made at the EcoSun Prairie Farm, "Green Drinks" seminar series, Sioux Falls, SD (July 25, 2011)."
- Muthukumarappan, K. 2013. Advanced Biofuels: Challenges and Opportunities. Invited plenary session speaker at the 4th World Gene Convention 2013, November 13-16, Haikou, China, Conference Proceedings: 139.
- Muthukumarappan, K. 2013. Bioenergy Research at CBRD. Invited Keynote Address at the 2013 International Conference on Energy and Sustainability, October 18-20, Beijing, China, Conference Proceedings: 19.
- Karki, B., Muthukumarappan, K., Sundaram, V., and Gibbons, W. 2013. Effects of storage conditions on the properties of control, AFEX, and AFEX-PAKed prairie cord grass samples. Presented at the 2013 ASABE Annual International Meeting, Kansas City, MO.
- Sundaram, V., and Muthukumarappan, K. 2013. Effect of AFEX treatment on compaction characteristics of biomass. Presented at the 2013 ASABE Annual International Meeting, Kansas City, MO.
- Pryor, S.W. 2013 Synergies of Biomass Densification and Pretreatment for Biofuel Production, NDSU Agricultural and Biosystems Engineering Seminar. Fargo, ND Jan 25, 2013
- Muthukumarappan, K. 2013. Novel Integration of Preprocessing and Densification of Different Biomass Feedstocks. Presented at the 3rd International Conference on Lignocellulosic Ethanol, April 3-6, Madrid, Spain.
- Muthukumarappan, K. 2012. Novel Characteristics of Pretreated and Densified Biomasses. Invited plenary session speaker at the 2nd Annual World Congress of Bioenergy 2012, April 25-28, Xi'an, China, Conference Proceedings: 126.

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2013 cont'd)

- Gu ZR, Polin J, Muthu R, et al. 2013 "Volatile Product Recovery From a Photobioreactor Using Modified Blue Green Algae Strains and Bio-Char Based Activated Carbon As Adsorbent" AICHE (2013 annual meeting), San Francisco CA, November 6, 2013: 9:35 AM
- Jacob Bassett, Joseph Polin, Xiaoming Wang, Hong Jin, Zhengrong Gu, "Desorption Thermodynamics of Volatile Organic Compounds from Activated Carbon", REU Students Competition 1st Award Poster (in 20 REU students), August 1, 2013, SDSU Brookings
- L. Wei, K. Muthukumarappan, Z. Gu, and J. Julson. 2013. Catalyst development for biomass conversion to jet fuels. North Dakota/South Dakota Engineering Research Summit, South Dakota State University, April 23, Brookings, SD.
- L. Wei, K. Muthukumarappan, Z. Gu, and J. Julson. 2013. Catalyst development for biomass conversion to jet fuels. North Dakota/South Dakota Engineering Research Summit, South Dakota State University, April 23, Brookings, SD.
- L. Wei, W. Qu, J. Julson, C. Shi, X. Zhao. 2013. "Experimental study on torrefaction of corn stover, switchgrass, and prairie grass", Paper No. 131585924. ASABE Annual International Meeting, Kansas City, Missouri, July 21 – 24, 2013.
- Barham, B.L., D.F. Mooney, C. Lian, T. Meehan, R. Jackson, S. Ventura, and N. Hunt. "Supply Prospects for Bioenergy Crop Production on Marginal Land in Southwest Wisconsin." 6th Annual Retreat of the Great Lakes Bioenergy Research Center. Chicago IL. May 21-23, 2013.
- Mooney, D., B. L. Barham, and L. Chang, S. Ventura, N. Hunt, T. Meehan, R. Jackson. (2013). Current Prospects for Bioenergy Crop Production on Marginal Lands: Results from a Farm Survey in Southwestern Wisconsin. University of Wisconsin- Madison, Department of Agricultural and Applied Economics, Staff Paper No. 569, July 2013, 11p.
- Mooney, D.F., and B.L. Barham. Economic Thresholds, Environmental Stewardship, and Land Use Change: An Empirical Assessment of Farmer Bioenergy Crop Adoption in Wisconsin. 6th Annual Sustainability Conference. Great Lakes Bioenergy Research Center. Kellogg Biological Station, Hickory Corners, MI, February 17-19, 2013.

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2012)

- Selected Paper for the 2012 Agricultural and Applied Economics Association Annual Meeting in Seattle, WA. Sajeev, E.M., T. Ji, W.E. Tyner, and B.M. Gramig. "Economic Costs and Environmental Performance for Three Cellulosic Biofuel Pathways."
- Dierking, R., J. Volenec, and S. Brouder. The Potential of Maize and Sorghum Biomass Grown On Marginal Sites. ASA-CSSA-SSSA International Meetings, Cincinnati, OH Nov. 3 to 6, 2012.
- Trybula, E., I. Chaubey, J. Frankenberger, S.M. Brouder, and J.J. Volenec. Quantifying Ecohydrologic Impacts of perennial rhizomatous grasses on tile discharge, a plot level comparison of continuous corn, mixed prairie, upland switchgrass, and *Miscanthus x giganteus*. Abstract 297-9. <http://scisoc.confex.com/scisoc/2012am/webprogram/Paper75175.html>, ASA-CSSA-SSSA International Meetings, Cincinnati, OH, Oct. 21 to 24, 2012.
- Long, M., J.J. Volenec, and S. M. Brouder. 2012. Nitrogen impacts on the yield and cell wall composition of contrasting sorghum lines used for biomass. Abstract 383-8. ASA-CSSA-SSSA International Meetings, Cincinnati, OH, Oct. 21 to 24, 2012.
- Burks, J., S.M. Brouder, and J.J. Volenec. 2012. Seasonal accumulation and partitioning of carbon- and nitrogen-containing compounds in perennial bioenergy crops. Abstract 99-4. ASA-CSSA-SSSA International Meetings, Cincinnati, OH, Oct. 21 to 24, 2012.
- Turco, R.F., P. Chivenge, J.J. Volenec, and S.M. Brouder. Opening our file cabinets and field notes with meta-analysis: An approach to overcome the soil C sequestration data void. Abstract 179-3. ASA-CSSA-SSSA International Meetings, Cincinnati, OH, Oct. 21 to 24, 2012.
- Volenec J.J. and S.M. Brouder. Plant Growth, Nutrition and Environment Interactions Conf., University of Veterinary Medicine, Vienna, Austria. Feb 18 to 21, 2012. Nutrient Use in Bioenergy Cropping Systems.
- Morey, R.V. 2012. Improving handling characteristics of herbaceous biomass. Presentation at North Central Region Sun Grant Annual Meeting. Indianapolis, Indiana, January 10-11, 2012.
- Cook, W., A. Van Orshoven, C.L. Munster, T. Provin, and K. McInnes. 2012. Soil property changes as a result of pyrolysis biochar applications. ASABE International Meeting, Dallas, TX, July.
- Review of annual trends of atmospheric thermal inversions in South Dakota utilizing NWS radiosonde and WRAN data. South Dakota Academy of Science Annual Meeting, Vermillion, SD 14 April 2012, South Dakota Academy of Science.
- Program Review Presentation (C. Johnson), "Landscape-Scale Biomass Production, Economics, and Environmental Quality," North Central Sun Grant Research Center, Indianapolis, IN (2012)

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2012 cont'd)

- Heaton E.A. (Oct. 9, 2012) Perennial biomass scavenger hunt. AGA 114 lab, Southwest Iowa Community College, Creston, IA. (2012)
- Heaton E.A. (Oct. 9, 2012) Introduction to biomass crops. AGA 114 lab, Southwest Iowa Community College, Creston, IA. (2012)
- Boersma N. N.* & Heaton E.A. (June 27, 2012) Giant Miscanthus performance in Iowa, Northwest Iowa Research Farm Field Day, Sutherland, IA, 150 participants. (2012)
- Heaton E.A., Berns B.* & Culp, C.* (June 20, 2012) Biomass crops for Iowa overview, Hay and Forage Expo, Boone, IA, 1000 participants. (2012)
- Heaton E.A. (June 18, 2012) Iowa State University Early Outreach Program Intensive Program, Hinds Farm, Ames, IA, 60 participants. (2012)
- Heaton E.A. (June 13, 2012) Ag Energy Workshop, BioCentury Farm, Ames, IA, 75 participants. (2012)
- Heaton E.A. (April 5, 2012) Miscanthus propagation demonstration. In cooperation with Northwest Missouri State University, Hinds Farm, Ames, IA, 25 participants. (2012)
- Public field Tour of the EcoSun Prairie Farm on August 3, 2012. Research conducted on the farm funded by the Sun Grant Center program was reviewed.
- Tours of the EcoSun Prairie Farm by a grassland ecology class (OLLI organization) led by Dr. Larry Tieszen (EROS and Augustana College) on September 20, 2012 and an agricultural economics class from SDSU (Dr. Mike Miller) on October 20, 2013. Sun Grant funded research shown and discussed.
- Program Review Presentation (C. Johnson), "Landscape-Scale Biomass Production, Economics, and Environmental Quality," North Central Sun Grant Research Center, Indianapolis, IN (2012)
- Muthukumarappan, K. 2012. Novel Integration of Preprocessing and Densification of Different Biomass Feedstocks. Presented at the Advanced Biofuels in a Biorefinery Approach Conference, Feb 28-March 1, Copenhagen, Denmark.
- Muthukumarappan, K. 2012. Novel Characteristics of Pretreated and Densified Biomasses. Invited plenary session speaker at the 2nd Annual World Congress of Bioenergy 2012, April 25-28, Xi'an, China.
- Wang, Y., and K. Muthukumarappan. 2012. Moisture adsorption characteristics of control, AFEX and PAKed Corn stover. Presented at the 2012 ASABE Annual International Meeting, July 29-Aug 1, Dallas, TX.
- Wang, Y., K. Muthukumarappan and C. Karunanithy. 2012. Moisture adsorption characteristics of control, AFEX and PAKed Switchgrass. Presented at the 2012 ASABE Annual International Meeting, July 29-Aug 1, Dallas, TX.

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2012 cont'd)

- Rijal, B., B. Karki, C. Igathinathane, M. Yu, and S.W. Pryor 2012 Interaction of Densification and Pretreatment for the Enzymatic Hydrolysis and Fermentation of Biomass, Paper No. 121338124. ASABE International Meeting. Dallas, TX Jul 29 Aug 1, 2012.
- Wangda Qu, Zhongyi Ma, Lin Wei, James Julson, 2012. Fast pyrolysis of corn stover and sawdust in a novel reactor, Paper #: 121337678. The 2012 ASABE annual international meeting, July 29, Dallas, TX.
- Zhongyi Ma, Lin Wei, Wangda Qu, James Julson, 2012. Fast pyrolysis bio-oil upgrading over noble metal catalysts. Paper #: 12134519. The 2012 ASABE annual international meeting, July 29, Dallas, TX.
- Li W, Yen Y. Develop solid-stem triticale as feedstock for biofuel production. North Central Regional Sun Grant Annual conference. Jan 9-11, 2012. Indianapolis, IN.
- Li W, Yen Y. Develop solid-stem triticale as feedstock for biofuel production. North Central Regional Sun Grant Annual conference. March 21-23, 2013. Chicago, IL.
- Ventura, S. (2012). "Evaluation of Bioenergy Crop Production on Marginal Land in Wisconsin." Northcentral SunGrant Annual Meeting, January 10-11, 2012, Indianapolis, IN.

Presentations (2011)

- Woodson, P., S.M. Cunningham, P. Murphy, S.M. Brouder, and J.J. Volenec. Production and quality of switchgrass grown on marginal land. Amer. Soc. Agron. Annu Meeting, San Antonio TX. Oct. 16 to 20, 2011.
- Brouder, S.M., P. Woodson, L. Bowling, R. Turco and J. Volenec. Water for Food Global Conference: Path to Solutions, Lincoln, NE. May 1 – 4, 2011. Yield potential, water and N requirements of non-food biofuels.
- Brouder, S.M., P. Woodson, L. Bowling, R. Turco and J. Volenec. Water for Food Global Conference: Path to Solutions, Lincoln, NE. May 1 – 4, 2011. Yield potential, water and N requirements of non-food biofuels.
- Brouder, S.M., R. Turco and J.J. Volenec. Purdue Extended Campus Senior Programs, "All-You-Can-Learn Buffet" Elderhostel Program. West Lafayette, IN. June 14th. 2011. Demystifying the promise of bioenergy crops: Environmental impacts and ecological accounting.
- Brouder, S.M. Global sustainability issues in energy, climate, water, and environment. West Lafayette, Sept. 25 to 28, 2011. IN China-US 2011 Joint Symposium. Comparative agro-ecological performance of perennial and annual biomass systems: metrics and data workflows.
- Sajeev E.M., B.M. Gramig and W.E. Tyner. Global sustainability issues in energy, climate, water, and environment. West Lafayette, IN, Sept. 25 to 28, 2011. China-US 2011 Joint Symposium. "Validation of the DayCent Model for Bioenergy Feedstocks"

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2011 cont'd)

- Burks, J.L., J.J. Volenec and S.M. Brouder. 2011. Seasonal cycling and partitioning of C and N in perennial bioenergy crops. Abstract ID# 64585.ASA-CSSA-SSSA International Meetings, San Antonio, TX. Oct. 16 to 19, 2011.
- Smith, D.R., D. Bucholtz, S.M. Brouder, J.J. Volenec, R.F. Turco, and G. Ejeta. 2011. Greenhouse gas emissions from traditional and biofuels cropping systems. Abstract # 64779.ASA-CSSA-SSSA International Meetings, San Antonio, TX. Oct. 16 to 19, 2011.
- Brouder, S.M., R. Turco, J. Volenec, G. Ejeta, D.R. Smith, L. Bowling, I. Chaubey, B. Gramig. 2011. Nitrogen partitioning and utilization in bioenergy cropping systems. In Proceedings of the 6th Frontiers in Bioenergy Conference & US-Brazil Symp. on Sustainable Bioenergy. West Lafayette, IN, May 15 -18 2011.
- Woodson, P., S. Cunningham, P. Murphy, S. Brouder, J. Volenec. 2011. Influence of potassium and phosphorus on yield and composition of switchgrass. <http://a-c-s.confex.com/crops/2011am/webprogram/Paper65191.html>.ASA-CSSA-SSSA International Meetings, San Antonio, TX, Oct. 16 to 19, 2011.
- Smith, D.R., D. Bucholtz, S. Brouder, J. Volenec, R. Turco, G. Ejeta. 2011. Greenhouse gas emissions from traditional and biofuel cropping systems. <http://a-c-s.confex.com/crops/2011am/webprogram/Paper64779.html>.ASA-CSSA-SSSA International Meetings, San Antonio, TX, Oct. 16 to 19, 2011.
- Lambert, David K. "The Logistics of Herbaceous Crop Residue-Based Ethanol Production under Uncertainty." Project update. 2011 North Central Sun Grant Regional research conference. Orlando, FL. January, 2011.
- Cui, Z. F., Wan, C. X., Fu, G. M., Li, Y. B, 2011. Concurrent NaOH pretreatment and ensilage of corn stover. Presented at 2011 ASABE Annual International Meeting. Louisville, KY. (August 7 - 11)
- Morey, R.V. 2011. Improving handling characteristics of herbaceous biomass. Presentation at North Central Region Sun Grant Annual Meeting. Orlando, Florida, January 11-12, 2011.
- Ha, M., C. Munster, S. Capareda, D. Vietor, T. Provin, and M. Palma. 2011. GIS program to optimize feedstock utilization for mobile pyrolysis units. Presented at the 2011 ASABE Annual International Meeting, Louisville, KY, 7 – 10 August.
- Husmoen, D., D. Vietor, C. Munster, and T. Provin. 2011 ASA-CSSA-SSSA Annual Meetings in San Antonio, TX, Title of Presentation: "Biochar Effects On Switchgrass Establishment and Runoff Loss of Nutrients"
- Husmoen, D., T. Provin, C. Munster, J. Wise, and M. Keough. 2011. Biochar effects on switchgrass establishment and runoff loss of nutrients. ASA-CSSA-SSSA Int. Ann. Meetings. Oct. 16-19, 2011. 205-20.
- Keough, M., T. Provin, D. Vietor, C. Munster, and S. Capareda. 2011. Post removal of oil/tar materials from biochar and subsequent impact on weathering. ASA-CSSA-SSSA Int. Ann. Meetings. Oct. 16-19, 2011. 137-13.57.

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2011 cont'd)

- Palma, M.A., Richardson, J., Roberson, B., Ribera, L., Outlaw, J., and C. Munster. 2011. "Economic Feasibility of a Mobile Fast Pyrolysis System for Sustainable Bio-crude Oil Production" Paper presented at the International Food and Agribusiness Management Association meeting. June 14, 2011. Frankfurt, Germany.
- Wise J, Provin T, Vietor D, Munster C, Capareda S, Boateng A. 2011. Nutrient Recovery from Pyrolysis Systems. Presented at the TC Biomass 2011 International Conference on Thermochemical Conversion Sciences. Chicago, Illinois. September 29. (Placed 2nd in the graduate student competition).
- Wise J, Provin T, Vietor D, Munster C, Capareda S, Boateng A. 2011. Nutrient Recovery from Pyrolysis Systems. Presented at the 2011 ASA-CSSA-SSSA Annual Meetings. San Antonio, Texas. October 16-19.
- Wise, J., D. Vietor, T. Provin, D. Husmoen, M. Keough, S. Capareda, C. Munster, and A. Boateng. 2011. Mineral nutrient recovery from pyrolysis systems. ASACSSA- SSSA Int. Ann. Meetings. Oct. 16-19, 2011. 127-30.58
- Wise, J., T. Provin, D. Vietor, D. Husmoen*, C. Munster, M. Keough, S. Capareda, A. Boateng. Nutrient Recovery from Pyrolysis Systems. Poster presented at: TC Biomass 2011. The International Conference on Thermochemical Conversion Science; 2011 Sept 27; Chicago, Illinois.
- Bumguardner, M., M. Ha, and C. Munster. 2011. Result of a GIS model developed to optimize feedstock logistics for production of bio-oil using mobile pyrolysis units. Poster presentation at the Energy Forum 2011: Energy Security and Sustainability –Global Challenges. Feb. 1 – 2, 2011. College Station, TX.
- Wise J, Provin T, Vietor D, Munster C, Capareda S, Husmoen D, Schnell R. Mineral Nutrient Recovery in Pyrolysis Systems for Varied Feedstocks. Presented at the 2011 Hispanic Leaders in Agriculture and the Environment (HLAE) South Texas Symposium. Corpus Christi, TX. March 16.
- Taylor, A. G. 2011. Challenges in seed germination and dormancy for new industrial crops. 23rd Annual meeting of the Association for the Advancement of Industrial Crops. Fargo, ND, September 12, 2011. p 22.
- Malo D.D. and Clay, S.A. (project leaders), Schumacher, T.E., Woodard, H.J., Clay, D.E., Gelderman, R.H., Julson, J.L., and Wei, L. 2011. Interactions of Biochar Source/Properties Impacts on Soil Properties, C Sequestration Potential, and Crop Management (annual report). Sun Grant Initiative – North Central Center at South Dakota State University Annual Meeting. Jan 2011. Orlando, Florida (verified Jan 24, 2011).
- Contributed Paper (C. Johnson), "South Dakota's Prairie Farm: An Experiment in Ecological and Economic Sustainability," Conference on America's Grasslands: Status, Threats, and Opportunities, Sioux Falls, SD (2011)
- Invited Keynote Address (C. Johnson), "Dakota Grasslands, Wetlands, and Climate Change: Last Nail or Silver Lining?" Annual Meeting of the South Dakota Academy of Science, Oacoma, SD (2011)

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2011 cont'd)

- Invited Lecture (C. Johnson), "South Dakota's Prairie Farm, An Experiment in Ecological and Economic Sustainability," Inaugural Civitas (Honors) Lecture Series, Augustana College, Sioux Falls, SD (2011)
- Program Review Presentation (C. Johnson), "Production of Biomass Across Heterogeneous Landscapes," North Central Sun Grant Research Center, Orlando, FL (2011)
- Seminar (C. Johnson), "Biofuel Feedstock Production at the Prairie Farm," NRCS Plant Materials Center, Bismarck, ND (2011)
- Invited Lecture (A. Boe), "South Dakota's Prairie Farm Project—An Experiment in Grassland Farming," Brookings, SD (2011)
- Heaton E.A., Singer J., Cruse R.M., Boersma N. & Davenport D. 2011. Miscanthus Production Practices: A New Missouri Bioenergy Crop. Special workshop, Columbia, MO. (2011)
- Heaton E.A., Singer J., Cruse R.M., Boersma N. & Davenport D. 2011. Agronomic Issues for Giant Miscanthus. University of Missouri, Special seminar, Columbia, MO. (2011)
- Heaton E.A., Singer J., Cruse R.M. & Davenport D. 2011. Under Cover: Secrets to Using Companion Crops in Establishment of Miscanthus × giganteus. Biomass & Energy Crops IV, Champaign, IL. (2011)
- Heaton E.A., Singer J., Cruse R.M. & Davenport D. 2011. Under Cover: Secrets to Using Companion Crops in Establishment of Miscanthus × giganteus. Conservation Districts of Iowa Annual Meeting, Des Moines, IA. (2011)
- Showings of the documentary film by W. Carter Johnson, "Grass Roots: The Prairie Farm Story," McCrory Gardens Visitor and Education Center, Brookings, SD, September 15, 2011 (research sponsored by the Sun Grant Center is reviewed in this film) and to a food and nutrition class at SDSU (Dr. Shelly Brandenburger) on November 27, 2011.
- Public field Tour of the EcoSun Prairie Farm on August 3, 2011. Research conducted on the farm funded by the Sun Grant Center program was reviewed.
- Contributed Paper (C. Johnson), "South Dakota's Prairie Farm: An Experiment in Ecological and Economic Sustainability," Conference on America's Grasslands: Status, Threats, and Opportunities, Sioux Falls, SD (2011)
- Invited Keynote Address (C. Johnson), "Dakota Grasslands, Wetlands, and Climate Change: Last Nail or Silver Lining?" Annual Meeting of the South Dakota Academy of Science, Oacoma, SD (2011)
- Invited Lecture (C. Johnson), "South Dakota's Prairie Farm, An Experiment in Ecological and Economic Sustainability," Inaugural Civitas (Honors) Lecture Series, Augustana College, Sioux Falls, SD (2011)
- Program Review Presentation (C. Johnson), "Production of Biomass Across Heterogeneous Landscapes," North Central Sun Grant Research Center, Orlando, FL (2011)

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2011 cont'd)

- Seminar (C. Johnson), "Biofuel Feedstock Production at the Prairie Farm," NRCS Plant Materials Center, Bismarck, ND (2011)
- Invited Lecture (A. Boe), "South Dakota's Prairie Farm Project—An Experiment in Grassland Farming," Brookings, SD (2011)
- Rijal, B., B. Karki and S.W. Pryor 2011. Impact of AFEX Pretreatment and Biomass Densification on Cellulosic Ethanol Production, Paper No. 1111208. ASABE International Meeting. Louisville, KY Aug 7-9, 2011.
- Muthukumarappan, K. 2011. Novel Integration of Biomass Pretreatment and Densification for Effective Bioethanol Production. Invited plenary session speaker at the 1st Annual World Congress of Bioenergy 2011, April 25-29, Dalian, China.
- Christopher, L.P., V.P. Zambare, A. Bhalla, K. Muthukumarappan, R.K. Sani. 2011. High-solids extrusion, hydrolysis and fermentation of corn stover to ethanol using a thermophilic *Geobacillus* strain. Presented at the 33rd Symposium on Biotechnology for fuels and chemicals, May 2-5, Seattle, WA.
- Wang, Y., C. Karunanithy, K. Muthukumarappan, and S. Pugalendhi. 2011. Physio-chemical characterization of briquettes made from different feedstocks. Presented at 2011 ASABE Annual International Meeting, August 7-10, Louisville, KY.
- Wang, Y., K. Muthukumarappan, and C. Karunanithy. 2011. Physical and chemical characterization of AFEX-PAKS densified corn stover. Presented at 2011 ASABE Annual International Meeting, August 7-10, Louisville, KY.
- Wang, Y., K. Muthukumarappan, and C. Karunanithy. 2011. Physical and chemical characterization of AFEX-PAKS densified prairie cord grass. Presented at 2011 ASABE Annual International Meeting, August 7-10, Louisville, KY.
- Muthukumarappan, K. 2011. Transforming and densifying feedstocks in regional biomass processing center. Presented at the Where there's smoke, there's fuel – A symposium on the thermochemical conversion of biomass to fuels, Aug 2, Oklahoma State University, Stillwater, OK.
- Muthukumarappan, K and W. Gibbons. 2011. Novel Integration of Biomass Pretreatment and Compaction for Effective Bioethanol Production. Presented at the 2011 Pacific Rim Summit on Industrial Biotechnology and Bioenergy, November 21-23, Kuala Lumpur, Malaysia.
- Hu, J., F. Yu, Y. Lv, Q. Yuan, J. Wooten, E. P. Columbus, Lin Wei. 2011. Catalytic Conversion of Biomass-derived Syngas to Gasoline Range Hydrocarbons. Paper No. 1110878. Louisville, Kentucky: ASAE Annual International Meeting.
- Hoffman, T. J. 2011. Design and Performance Evaluation of an In-Field Cuber. Master of Science Thesis – Department of Biological Systems Engineering – University of Wisconsin.

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2011 cont'd)

- Ventura, S. (2011). "Mapping Bioenergy Resources at Multiple Scales." Midwest Biomass Conference, November 2-3, 2011, Dubuque, IA.

Presentations (2010)

- Volenec, J.J. and S.M. Brouder. 2010. Water-use efficiency in biomass cropping systems. pp. 18-19. In: Proc. 2nd China-US Workshop on Biotechnology of Bioenergy Plants. Beijing, China. September 19-21.
- Brouder, S.M., R.F. Turco, and J.J. Volenec. 2010. Nitrogen use efficiency in bioenergy cropping systems. pp. 27-29. In: Proc. 2nd China-US Workshop on Biotechnology of Bioenergy Plants. Beijing, China. September 19-21.
- Burks, J., J.J. Volenec, and S.M. Brouder. 2010. Nutrient cycling dynamics in perennial bioenergy crops. pp. 24. In: Proc. China-US 2010 Joint Symp. on Energy, Ecosystem, and Environmental Change. Beijing, China. September 22-24.
- Brouder, S.M., and J.J. Volenec. 2010. Greenhouse gas emissions and pelicans: Ecological accounting in bioenergy cropping systems. pp. 27-29. In: Proc. China-US 2010 Joint Symp. on Energy, Ecosystem, and Environmental Change. Beijing, China. September 22-24.
- Volenec, J.J., S.M. Brouder, and R.F. Turco. 2010. Agroecological considerations when growing biomass. pp. 39-40. In: Proc. China-US 2010 Joint Symp. on Energy, Ecosystem, and Environmental Change. Beijing, China. September 22-24
- Krack, K., Clay, S., Hansen, S., Clay, D., and Olson, M. 2009. Switchgrass biochar influence on soil properties and atrazine sorption (published abstract). Weed Science Society of American Annual Meetings. Denver, CO (Feb 2010). <https://srm.conference-services.net/reports/template/onetextabstract.xml?xsl=template/onetextabstract.xsl&conferenceID=1756&abstractID=344140> (verified Jan 24. 2010).
- Canales, Elizabeth, David K. Lambert, and Jason Bergtold. "Ecosystem Costs in a Logistical Model of Cellulosic Ethanol Production." INFORMS Annual Meeting, Austin, TX. November 10, 2010.
- Lambert, David K. "Ethanol Markets and the Development of a Cellulosic Ethanol Industry." Presentation at 2010 Risk & Profit Conference. Manhattan, KS. August 20, 2010.
- Lambert, David K. "The Logistics of Herbaceous Crop Residue-Based Ethanol Production under Uncertainty." Project update. 2010 North Central Sun Grant Regional research conference. Reno, NV. January, 2010.
- Li, Y. B., Wan, C. X., Racharaks, S. 2010. The selection of microbial-pretreated lignocellulosic feedstocks for ethanol production. 2010 Annual ASABE Meeting, Pittsburgh, PA, June 21-23, 2010. ASABE Paper No. 1009438.
- Wan, C. X., Li, Y. B. 2010. In-storage Microbial Pretreatment of Corn Stover for Improving Sugar Yields. 2010 Annual ASABE Meeting, Pittsburgh, PA, June 21-23, 2010. ASABE Paper No. 1009435.

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2010 cont'd)

- Morey, R.V. 2010. Improving handling characteristics of herbaceous biomass. Presentation at North Central Region Sun Grant Annual Meeting. Reno, Nevada, January 12-13, 2010.
- Capunitan, J.A. and S.C.Capareda. 2010. Corn Stover Pyrolysis in a High- Pressure/High-Temperature Batch Reactor: Evaluation of Product Yields and Conversion Efficiencies. Paper presented at the 2010 American Society of Agricultural and Biological Engineering (ASABE) Annual Meeting. ASABE Paper #100-9881. ASABE, St. Joseph, MI.
- Hockaday W.C., S. Kim, P.G. Hatcher, and C.A. Masiello. 2010. Comparing the Molecular Structures of Black Carbon in Soil and Water to Constrain Processes of Formation and Decomposition. American Chemical Society National Meeting, San Francisco, March 21-25, 2010.
- Husmoen, D., S. Capareda, T.L. Provin, C.L. Munster, R.W. Schnell, J. Wise, and E.M. Vietor. 2010. Biochar effects on switchgrass establishment and water quality. Paper 169-6, Poster 614, Div. A05, Annual ASA Meeting, Long Beach, CA.
- Masiello C.A., W.C. Hockaday, K. Zygourakis, B. Dugan, J.A. Rudgers, P.J.J. Alvarez, T.W. Boutton, L.A. Pyle, T.J. Kinney, H. Sun, and D. Li. 2010. Biochar Research at Rice University: An Overview. Geological Society of America, Denver, CO, 2010.
- Pyle L.A., W.C. Hockaday, C.A. Masiello, T.W. Boutton, and C. LeCroy. 2010. Production and Isotopic Composition of Black Nitrogen Following Experimental Charring of Plant Materials. Fall American Geophysical Union Meeting, San Francisco, Dec. 13-18, 2010.
- Schnell, R.W., S. Capareda, T.L. Provin, C.L. Munster, D. Husmoen, J. Wise, and D.M. Vietor. 2010. Cycling biochar affects crop production and water quality. Paper 166-1, Division A05, Annual ASA Meeting, Long Beach, CA.
- Sun H., W.C. Hockaday, C.A. Masiello, K. Zygourakis. 2010. Physical and Chemical Structure Analysis of Biochars Produced from Different Feedstocks and Under a Variety of Pyrolysis Conditions. American Institute of Chemical Engineers Annual Meeting (AiChE), Salt Lake City, Nov 7-12, 2010.
- Vietor, D.M., S. Capareda, J. Wise, D. Husmoen, R. Schnell, B. Santos, J. Capunitan, T. Provin, C. Munster, and W. Rooney. 2010. Biochar yield and composition from sorghum pyrolysis at varied temperature. Annual Meeting of Northeastern Branch of Agronomy, Crop, and Soil Societies. Ithaca, NY, June 28-30.
- Wise J, Provin T, Vietor D, Munster C, Capareda S, Husmoen D, Schnell R. 2010. Mineral Nutrient Recovery in Pyrolysis Systems for Varied Feedstocks. Presented at the 2010 ASA-CSSA-SSSA Annual Meetings. Long Beach, California. October 31-November 3.

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2010 cont'd)

- Wise J, Provin T, Vietor D, Munster C, Capareda S, Rooney B. Relationship of Feedstock Composition and Pyrolysis Temperature to Bio-Char Yield. Presented at the 2010 AgriLife Conference. College Station, Texas. January 11-15.
- Wise J, Provin T, Vietor D, Munster C, Capareda S, Rooney B. Relationship of Feedstock Composition and Pyrolysis Temperature to Bio-Char Yield. Presented at the 2010 Hispanic Leaders in Agriculture and the Environment (HLAE) Orientation. College Station, Texas. August 26.
- Rushing, J.B., B. Baldwin and A. Taylor. 2010. Seed safening for use in switchgrass establishment. Seventh Eastern Native Grass Symp. Knoxville, TN. Oct 5-8.
- Rushing, B., B. Baldwin, A. Taylor. 2010. Seed safening for use in switchgrass establishment. MSU Biofuels Conference. Jackson, MS. 11-13 Aug.
- South Dakota WRAN Update, South Dakota Wind Energy Association Annual Meeting, Mitchell, SD, 30 November 2010. South Dakota Wind Energy Association.
- Malo D.D. and Clay, S.A. (project leaders), Schumacher, T.E., Woodard, H.J., Clay, D.E., Gelderman, R.H., Lei, H. and Julson, J.L. 2010. Interactions of Biochar Source/Properties Impacts on Soil Properties, C Sequestration Potential, and Crop Management (annual report). Sun Grant Initiative – North Central Center at South Dakota State University Annual Meeting. Jan 2010. Reno, Nevada. http://ncsungrant.sdstate.org/upload/Microsoft-PowerPoint-SDSU-biochar-projects-Presentation-reno_2010-Compatibility-Mode.pdf (verified Jan 24, 2010).
- Invited seminar (C. Johnson), “South Dakota’s Prairie Farm: An Experiment in Economic and Ecological Sustainability,” University of Northern Iowa (sponsored by UNI Tallgrass Prairie Center and the College of Natural Sciences/Humanities and Fine Arts. (2010)
- Invited speaker (C. Johnson), “The Prairie Farm Concept and South Dakota’s Alternative Energy Future,” Annual Conference of the SD Association of Conservation Districts, Pierre, SD (Alternative Energies Session). (2010)
- Invited banquet speaker (C. Johnson), “Prairie Farm Research,” Annual Meeting of the Eastern Dakota Water Districts, Brookings, SD (2010)
- Presenter (C. Johnson), “Research Progress in Biofuel Feedstocks,” North Central Sun Grant Research Center 5 X 10 meeting, Brookings, SD (2010)
- Program Review Presentation (C. Johnson), Landscape Scale Lignocellulosic Biomass Production, Economics and Environmental Quality,” North Central Sun Grant Research Center, Reno, NV (2010)

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2010 cont'd)

- Heaton E.A., Singer J., Cruse R., Davenport D. 2010 Under Cover: Secrets to Using Companion Crops in Establishment of *M. x giganteus*. In Abstracts of the 2010 International Meetings [CD-ROM] ASA-CSSA-SSSA, Madison, WI. ASA/CSSA/SSSA Annual Meeting, Long Beach, CA. (2010)
- Heaton E.A. , Singer J., Dohleman F., Long S.P. 2010. Managing Perennial Monocultures for Ecosystem Services. Ecological Society of America Annual Meeting, Pittsburgh PA, p. 117. (2010)
- Invited seminar (C. Johnson), "South Dakota's Prairie Farm: An Experiment in Economic and Ecological Sustainability," University of Northern Iowa (sponsored by UNI Tallgrass Prairie Center and the College of Natural Sciences/Humanities and Fine Arts. (2010)
- Invited speaker (C. Johnson), "The Prairie Farm Concept and South Dakota's Alternative Energy Future," Annual Conference of the SD Association of Conservation Districts, Pierre, SD (Alternative Energies Session). (2010)
- Invited banquet speaker (C. Johnson), "Prairie Farm Research," Annual Meeting of the Eastern Dakota Water Districts, Brookings, SD (2010)
- Presenter (C. Johnson), "Research Progress in Biofuel Feedstocks," North Central Sun Grant Research Center 5 X 10 meeting, Brookings, SD (2010)
- Muthukumarappan. 2010. Novel integration of pretreatment and comPAKtion of biomass for bioethanol production. Invited plenary session speaker at 3rd World Congress of Industrial Biotechnology 2010, July 25-27, Dalian, China
- Muthukumarappan. 2010. Combination of Novel Pretreatments for Effective Bioethanol Production. Invited plenary session speaker at the 2010 International Fuel Ethanol Workshop & Expo, June 14-16, St. Louis, MO.
- Muthukumarappan. 2010. Integration of Novel Pretreatments for Effective Bioethanol Production. Invited plenary session speaker at the 2010 International Conference on Biomass and Energy Technologies, Aug 20-22, Beijing, China.
- Muthukumarappan. 2010. Novel Integration of Biomass Pretreatment and Densification for Effective Bioethanol Production. Invited Keynote session speaker at the 2010 International Conference on Biomass and Energy Technologies, Aug 20-22, Beijing, China.
- Wang, Y., K. Muthukumarappan, and C. Karunanithy. 2010. Physical and chemical characterization of AFEX-PAKS densified switchgrass. Presented at the Pacific Rim Summit on Industrial Biotechnology & Bioenergy, Dec 11-14, Honolulu, HI.
- Yu, F., Q. Yan, J. Hu, Y. Lu, Lin Wei, J. Wooten, E. Columbus and W. Batchelor. 2010. Mixed Hydrocarbons from Biomass-derived Syngas over Mo/HZSM-5 Catalyst. 9th International Conference on Sustainable Energy Technologies (SET). Shanghai, China. August 24-27.

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2010 cont'd)

- Yu, F., Q. Yan, J. Hu, Lin Wei, E. Columbus and J. Wooten. 2010. Mixed Hydrocarbon Production from Biomass-derived Syngas over a Bi-functional Catalyst. International Symposium on Renewable Feedstock for Biofuel and Bio-based Products. Austin, TX, August 11-13.
- Hu, J., Yu, F., Lin Wei, Columbus, E., and Batchelor, W. 2010. Preliminary Study of the Conversion of Biomass-derived Syngas to Gasoline-range Hydrocarbons over Mo/HZSM-5. Paper 1008573, ASABE 2010 Annual International Meeting, Pittsburgh, Pennsylvania, June 20-23.
- Ventura, S. (2010). "Biomass Supply: Mapping WI Biofuel Potential." Wisconsin Bioenergy Summit, October 14 2010, Madison WI.
- Ventura, S. (2010). "The Vulnerable Landscapes of Wisconsin." Soil and Water Conservation Society, Wisconsin Chapter, March 11, 2010. Madison WI.
- Ventura, S. (2010). "Beyond 'Food vs. Fuels:' Spatial Analysis to Guide Bioenergy Crop Production." Western Michigan University, January 21, 2010. Kalamazoo, MI.
- Ventura, S. (2010). "Guidelines and Standards for Bioenergy Crop Production in WI." North Dakota GIS Users Conference, November 2-4, 2009, Grand Forks, ND.

Presentations (2009)

- Lambert, David K. and Jason Middleton. "The Logistics of Herbaceous Crop Residue-Based Ethanol Production under Uncertainty." Selected Paper for presentation at the Western Agricultural Economics Association 2009 Annual Meeting, Lihue, HI, June 24-26.
- Wan, C. X., Li, Y. B. 2009. Microbial pretreatment of corn stover for improved enzymatic saccharification and ethanol production. 31th Symposium of Biotechnology for Fuels and Chemicals, San Francisco, CA, May 3-6, 2009.
- Zhou, Y. G., Li, Y. B., Wan, C. X., Li, D., Mao, Z. H. 2009. Application of hot water and homogenization treatment for ethanol production from corn stover. 2009 Annual ASABE Meeting, Reno, NV. June 21-23, 2009.
- Wan, C. X., Li, Y. B. 2009. Microbial Pretreatment of Corn Stover by Solid State Fermentation for Bioethanol Production. 2009 Annual ASABE Meeting, Reno, NV. June 21-23, 2009
- Rushing, J. Brett. Techniques to aid in establishing switchgrass from seed. M.Sc. Mississippi State Univ. Plant and Soil Sci. Dec. 2009.
- Duclos V.D., D. T. Ray, A. G. Taylor. 2009. Understanding the physiology and mechanisms of seed dormancy in Switchgrass (*Panicum virgatum* L.). Association of the Advancement for Industrial Crops 21st Annual Meeting, Chillán, Chile. p 30.

Publications, Patents, Presentations, Awards, and Commercialization

Presentations (2009 cont'd)

- Invited seminar (C. Johnson), "South Dakota's Prairie Farm," Iowa State University Sustainable Agriculture Colloquium, Ames. (2009)
- Invited seminar (C. Johnson), "South Dakota's Prairie Farm," Ecology and Environmental Biology Seminar Series, SDSU, Brookings. (2009)
- "Program Review Presentation (C. Johnson), Landscape Scale Lignocellulosic Biomass Production, Economics and Environmental Quality," North Central Sun Grant Research Center, Reno, NV (2010) Invited seminar (C. Johnson), "South Dakota's Prairie Farm," Iowa State University Sustainable Agriculture Colloquium, Ames. (2009)"
- Invited seminar (C. Johnson), "South Dakota's Prairie Farm," Ecology and Environmental Biology Seminar Series, SDSU, Brookings. (2009)
- Invited seminar (C. Johnson), "South Dakota's Prairie Farm," Plant Science/NCARL Seminar Series, Brookings, SD (2008)
- Invited seminar (C. Johnson), "South Dakota's Prairie Farm," Plant Science/NCARL Seminar Series, Brookings, SD (2008)

The logo features a stylized orange sun with three rays on the left, followed by the text "SunGrant" in a large, green, serif font. Below "SunGrant" is the word "INITIATIVE" in a smaller, green, all-caps, serif font.

SunGrant *INITIATIVE*

Grow renewable energy and biobased industries that revitalize rural communities by harnessing science and technological capacities of Land-Grant University research, education, and Extension programs

**Vance Owens, Director
North Central Sun Grant Center
South Dakota State University**



Concept...

- A national network of land-grant universities and federal agencies partnering to build a biobased economy.
- Land-grant institutions will broaden their responsibilities beyond traditional agriculture & forestry issues.
- SGI Centers will be charged with making significant advances in biobased industries for the benefit of America's independent farmers, rural communities, and public at large.



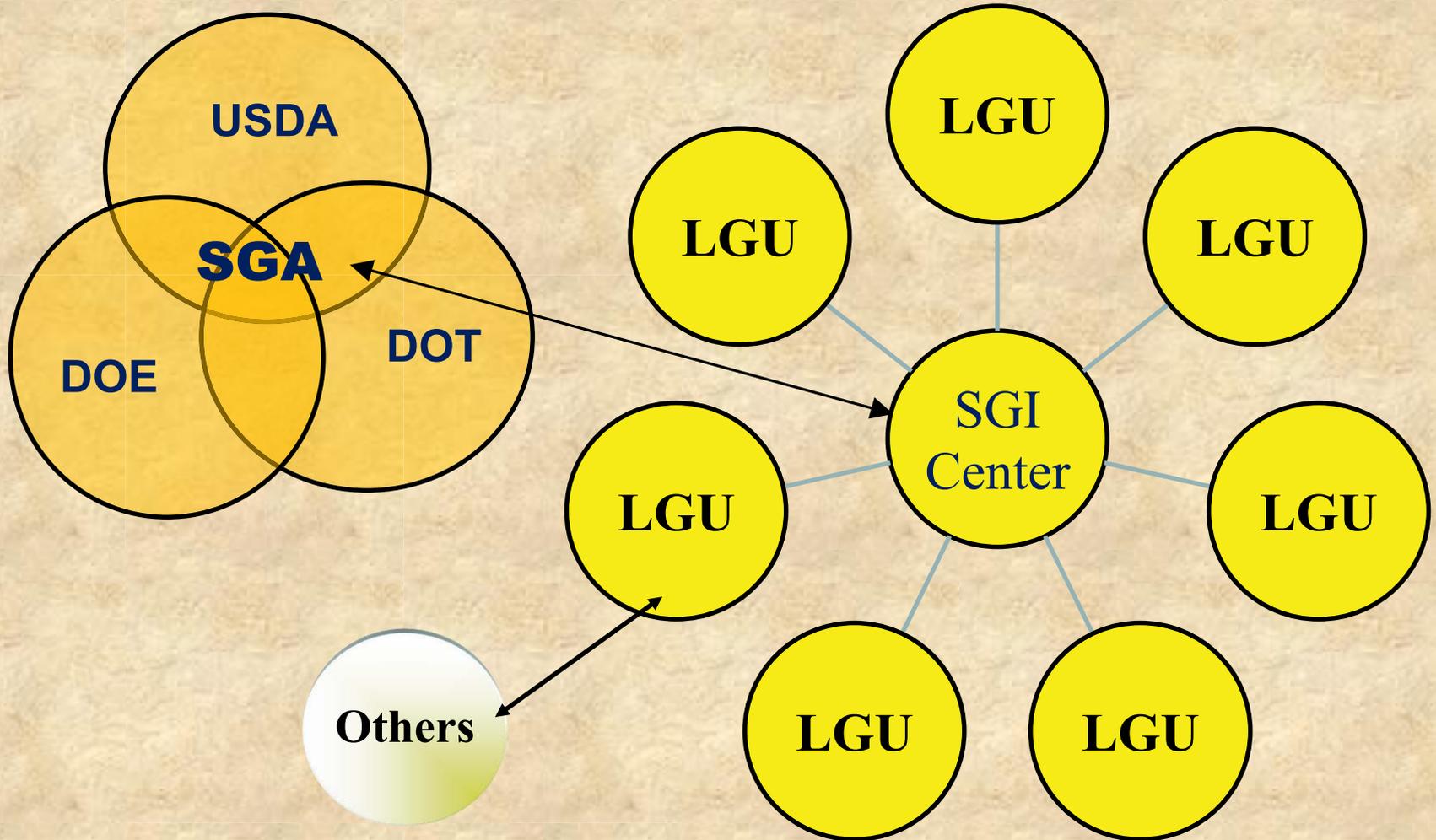
- Mission

- 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.



- Five Regional University Centers
 - South Dakota State, U of Tennessee, Oregon State, Oklahoma State, Penn State University
 - Coordinate activities within SGI Region and SGA
 - Administer Regional grant program
- Sun Grant Association (SGA)
 - Non-profit entity
 - Membership from Regional SGI Centers
 - Facilitates/Integrates activities of 5 SGI regions
 - Facilitates coordination and communication with agency and private partners

- **Interaction of SGA with SGI Centers,**
- **federal agencies and others**

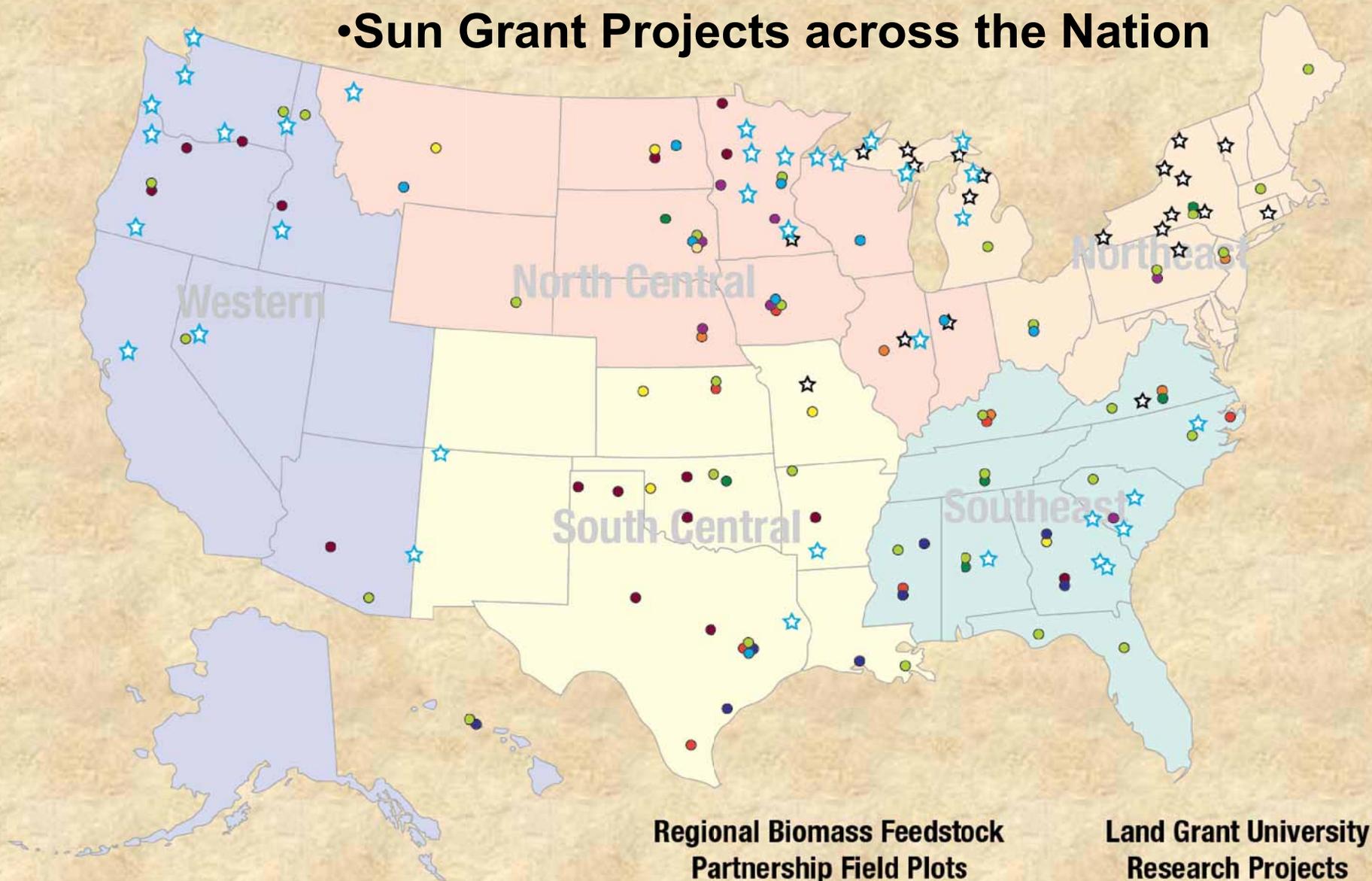




Authorized and Funded

- USDA
 - Authorized in the 2008 Farm Bill at \$75M
 - \$5.5 M
- DOE
 - Biomass Program project funding
 - \$11.2 M
 - Regional Feedstock Partnership
 - \$18.9 M
- DOT
 - Authorized and funded in the 2005 Highway Bill (SAFETEA-LU)
 - \$43.9 M
- Total = \$75.6 M \$92.7 with cost-share

•Sun Grant Projects across the Nation



Regional Biomass Feedstock Partnership Field Plots

- CRP
- Energycane
- Corn Residue
- Miscanthus
- Sorghum
- ☆ Willow
- Cereal Residues
- Switchgrass
- ☆ Poplar

Land Grant University Research Projects

- DOT Funded
- DOE Funded
- USDA Funded