2010

Northeast Sun Grant Regional Conference

Championing the Northeast's Participation in the National Bioenergy Agenda

Biographies and Abstracts

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United States
Department of Transportation

Northeast SunGrant INITIATIVE

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Speaker Biographies

Dr. Robin Brumfield, Deparment of Agricultural, Food and Resource Economics, Rutgers, The State University of New Jersey

Dr. Robin Brumfield has been the Farm Management Specialist at Cook College since 1988. Prior to joining the Rutgers University faculty, she was an Extension Specialist in Horticulture at Pennsylvania State University for five years. She received her Ph.D. and M.S. degrees in Horticulture with a minor in Economics and Business from North Carolina State University. She received her B.S. degree in Agriculture from Eastern Kentucky University. Dr. Brumfield is internationally known for her work in horticultural economics and has given over 100 talks in eleven countries. She has written extensively on horticultural economics in trade journals, books, and extension publications, as well as in professional journals. Dr. Brumfield has just released a new version of her computer program entitled "Greenhouse Cost Accounting" to help growers allocate costs to specific crops. This program determines the costs of producing each individual crop and helps growers make managerial decisions such as what crops to produce, how to price crops, and how to control costs," The latest version allows growers to look at outdoor as well as indoor production, includes options for detail on individual costs such as heating and labor.

Dr. James J. Corbett, Professor in the College of Earth Ocean and Environment, University of Delaware

James J. Corbett, P.E., Ph.D. conducts technology-policy research related to transportation, including groundbreaking research on air emissions from maritime transport, energy and environmental impacts of freight transportation, and assessment of technological and policy strategies for improving goods movement. Dr. Corbett is a Professor in the College of Earth Ocean and Environment with joint appointment in Civil and Environmental Engineering in the College of Engineering at the University of Delaware. He is a principal partner in Energy and Environmental Research Associates, L.L.C. (EERA), engaged in energy, environmental, and economic analysis for clients internationally. Dr. Corbett received his Ph.D. in Engineering and Public Policy (EPP) from Carnegie Mellon University, where he also earned M.S. degrees in the departments of EPP and Mechanical Engineering. He is a graduate of the California Maritime Academy and he worked as a licensed officer in the U.S. Merchant Marine, a Naval Reserve Engineering Duty Officer, and a consultant for industry and government in industrial operations, energy and environmental performance. Among more than 120 publications related to shipping and multimodal transportation, Dr. Corbett coauthored the 2000 *IMO Study on Greenhouse Gases from Ships*, the *Second IMO Greenhouse Gas Study 2009*, and wrote the *Marine Transportation and Energy Use* chapter in the 2004 Encyclopedia of Energy.

Dennis Hall, Assistant Director, Ohio BioProducts Innovation Center

Coordinates Ohio Third Frontier programs and projects including Wright Center of Innovation, The Ohio State University; Advanced Granule Technology, The Andersons, Inc.; Microchannel Hydroprocessing for Upgrading Biofuels, Petroleum Feedstock and Chemical Intermediates, Velocys; Advanced Natural Rubber, Ohio Agricultural Research and Development Center; Commercialization of Bio-based and Nano-tailored Composites for Industrial Applications; and Accelerating Commercialization of Anaerobic Digestion for Bioenergy Production, quasar energy group. Collectively, these programs represent over $100 million in leveraged support and funding.

Zia Haq, Senior Analyst, U.S. Department of Energy

Mr. Haq is a senior analyst with the U.S. Department of Energy, Office of the Biomass Program (OBP). He manages the analytical activities conducted by OBP. Prior to this position, he worked as an operations research analyst at the Energy Information Administration (EIA). He has worked for various energy consulting organizations and at Southern Company Services. He was a senior engineer in a coal gasification demonstration power plant, and has over 20 years of experience in energy and environmental areas. Mr. Haq has a Bachelor of Science degree in Chemical Engineering from Northwestern University and a Master of Science in Chemical Engineering from the Johns Hopkins University.

Speaker Biographies

Dr. Zane Helsel, Professor and Agriculture Energy Specialist, Department of Plant Biology & Pathology, Rutgers, The State University of New Jersey

Dr Zane R. Helsel is Extension Specialist in Agriculture Energy with Rutgers Cooperative Extension and Rutgers University in New Brunswick, NJ. In addition to providing Extension programming on various aspects of energy use, conservation, and biomass energy production in agriculture in NJ, he has conducted research on production and energy potential of sweet sorghum, switchgrass, energycanes and similar crops for direct combustion and conversion to ethanol. He serves on the Steering Committee of the Northeast Sungrant program and has contributed to eXtension's community of practice on Farm Energy.

Dr. James F. Holden, Associate Professor of Microbiology, University of Massachusetts, Amherst

Dr. Holden is an Associate Professor of Microbiology at the University of Massachusetts Amherst where he began his appointment as an Assistant Professor in 2003. Prior to this, he was a post-doctoral research associate in the Department of Biochemistry and Molecular Biology at the University of Georgia with Dr. Michael W. W. Adams. He earned his Ph.D. in 1996 in Oceanography at the University of Washington with Dr. John A. Baross. His research is focused primarily on microorganisms that grow optimally above 80°C, or so-called 'hyperthermophiles', from geothermal environments in the deep sea and on land. He has made 11 dives in the research submarine to depths exceeding 2 km, and was the chief scientist of two oceanographic research cruises with in 2008 and 2009 at sites in the northeastern Pacific Ocean. Dr. Holden's field research examines microbial life in the subsurface biosphere, the distribution and abundances of specific types of microorganisms and their relation with environmental factors, numerical modeling of methane production, microbial responses to volcanic eruptions, and the upper temperature limit for life. His laboratory research is interested in physiological mechanisms of anaerobic respiration and CO2 assimilation in hyperthermophilic archaea. His biotechnology interests are related to high temperature bioreactors for biofuel production and bioprospecting for high-temperature sugar processing enzymes.

Patrick Hooker, New York State Agriculture Commissioner

Patrick Hooker became New York State's 26th Agriculture Commissioner on January 11, 2007. As Commissioner, Pat oversees the New York State Department of Agriculture and Markets, addressing agricultural economic development, environmental stewardship, and food safety issues to ensure agriculture remains a significant contributor to New York's economy and quality of life. Pat previously worked for New York Farm Bureau for 16 years as the farm advocacy organization's top lobbyist, serving as Director of the Public Policy Division. He has also worked in the State Legislature – first as the Rural Affairs Advisor for the State Assembly Minority Leader, and later as the Director of the New York State Senate Agriculture Committee. Pat grew up in rural Madison County, working on a neighbor's dairy farm. In school, he was active in the Junior Holstein Club, as well as FFA, which he served as State FFA President and received his American Farmer degree. Pat received his Associate's degree from Morrisville State College and his Bachelor of Science degree in Agricultural Education from Cornell University. Pat and his wife Karen have two children, Erika and Mitchell. Together, they own a 360-acre farm in southern Herkimer County, where they grow hay, keep horses and produce maple syrup.

Judy Jarnefeld, New York State Energy Research and Development Authority (NYSERDA)

Ms Jarnefeld holds a B.S. in Chemical Engineering from Rensselaer Polytechnic Institute. She oversees projects as diverse as: conversion of biomass into chemicals, fuels, or products; hybrid willow commercialization, School Power...Naturally™ (solar education), and helping incubators support renewable firms.

Shawn Johnson, Sun Grant Program Manager, United States Department of Transportation, Research and Innovative Technology Administration (RITA)

Ms. Shawn Johnson, a native Ohioan, started her career with the U.S. Department of Transportation working as a contractor. Most of her contracting tenure was spent working with the Pipeline and Hazardous Material Administration's Pipeline Safety State Grant Program. She started as a Program Specialist working with the state grants financial management process. She also participated on to various projects including working with the Pipeline Safety Technical Advisory Committee and the National Association of Pipeline Safety Representatives. In 2006 she joined the Department's Research Innovative and Technology Administration team to work with the Commercial Remote Sensing Technology program. She is a graduate from Ohio University were she earned a degree in Environmental Health Science and she has a paralegal certificate from The George Washington University.

Speaker Biographies

Dr. Peter Kahn, Professor, Department of Biochemistry and Microbiology, Rutgers, The State University of New Jersey

Dr. Peter Kahn is a Professor in the Dept. of Biochemistry and Microbiology at Rutgers University. He served as visiting Professor at the University of Helsinki, Biotechnology Institute and also at the Université René Descartes, Paris. Dr. Kahn has received the Academic and Professional Excellence award, Research Excellence Award, Teacher of the Year Award, President's Award for Public Service, Warren Susman Award for Excellence in Teaching, Academic and Professional Excellence Award, Research Fellowship, Finnish Academy of Sciences, and he was a Guest of Honor at the First Conference on the Bosnian Academic Diaspora, Sarajevo. Dr. Kahn received a BA in Biochemistry from Harvard College and a Ph.D. in Biochemistry from Columbia University.

Dr. Thomas Richard, Professor, Department of Agricultural and Biological Engineering, The Pennsylvania State University

Tom Richard is the Director of Penn State's Institutes for Energy and the Environment (PSIEE) and an Associate Professor in the Department of Agricultural and Biological Engineering. Dr. Richard's teaching and research applies microbial bioconversion technologies to agricultural crops and byproducts, industrial biomass, and manures for energy production and value-added manufacturing. His primary research thrust is the development of sustainable strategies for biomass feedstock supply. Dr. Richard is the author or co-author of over 100 research and technical publications and serves on the editorial boards of three scientific journals. He is active in several professional societies and a Fellow and Past President of the Institute of Biological Engineering. Dr. Richard has a B.S. from the University of California at Berkeley, and M.S. and PhD degrees from Cornell University.

Nathan L. Rudgers, Senior Vice President and Director, Business Development, Farm Credit East

Nathan L. Rudgers was named Senior Vice President for Farm Credit of Western New York (Now Farm Credit East) in December, 2005. In his capacity as Director of Business Development, Nathan is responsible for bringing resources to Farm Credit's clients who are planning or undergoing major business changes. He is a frequent speaker in state, national and international forums on such topics as renewable energy, food safety, international trade, agriculture policy and economic development. He also currently serves on the steering committee for 25 X 25, a group of industry leaders dedicated to fostering Agriculture and Forestry's role in US energy independence, and chairs their Carbon Work Group. Prior to joining Farm Credit, Nathan served as Commissioner of Agriculture and Markets for The State of New York. He was appointed Commissioner by Governor George E. Pataki in 1999. He began his tenure with the Department in 1995, serving as Deputy Commissioner, First Deputy Commissioner and then Acting Commissioner. Nathan also served as President of the National Association of State Departments of Agriculture in 2005. Preceding joining the Department, Nathan worked for several agri-business firms in the Northeast. Much of his experience in the private sector has involved the dairy industry and agricultural economics. Nathan was born and raised on a dairy and cash crop farm in Pavilion (Wyoming County), New York and is a 1982 graduate of Cornell University, receiving a bachelor's degree in agricultural economics. Nathan currently lives in Pavilion with his wife Eileen.

Dr. Chris Saffron, Assistant Professor, Department of Biosystems and Agricultural Engineering and Department of Forestry, Michigan State University

Dr. Christopher Saffron is an Assistant Professor in the Dept. of Biosystems and Agricultural Engineering at Michigan State University. His research interest is in the thermochemical conversion of biomass to fuels and chemicals. Current research projects include: Bio-oil tan reduction by selection amongst native warm-season grasses to promote biomass densification by pyrolysis; Woody biomass conversion to value-added chemicals using fast pyrolysis and catalysis; and Transforming and densifying biomass in the Regional Biomass Processing Center (RBPC).

Speaker Biographies

Matt Solomon, Mobile Source Analyst, NESCAUM

Matt Solomon is a Mobile Source Analyst at NESCAUM, focusing on emissions and energy impacts of transportation technologies and policies. He has nine years of experience working with advanced vehicles and emission control technologies. Among his current projects, he leads lifecycle and compliance scenario modeling efforts to support NESCAUM's low-carbon fuels research program and the development of a framework for a multi-state low-carbon fuels program in the Northeast and Mid-Atlantic regions. Prior to working at NESCAUM he was a Project Manager for Ford Motor Company at the California Fuel Cell Partnership in West Sacramento, CA. He holds a degree in Mechanical Engineering from the University of Massachusetts, Amherst and a Master's in Transportation Technology and Policy from the University of California, Davis.

David Specca, Assistant Director for Bioenergy Technologies, Rutgers EcoComplex, Rutgers, The State University of New Jersey

David Specca has worked for the past twelve years on small and large scale bioenergy projects at the Rutgers EcoComplex. His activities include identifying, demonstrating and promoting appropriate renewable energy technologies. Currently, his projects include working on technologies in landfill gas cleanup and utilization, microturbine co-generation, anaerobic digestion, ethanol production, biodiesel, and biomass pyrolysis. As part of the environmental business development activities of the EcoComplex, Dave is a member of the NJ Business Incubator Network, Board member of the Rutgers Energy Institute, and Co-chair of the Clean Energy Alliance, a nationwide network of clean energy incubator facilities. He also directs the activities of a one-acre hydroponic vegetable and aquaculture greenhouse facility powered by two landfill gas to energy technologies. He was part of the NJAES team that produced the "Assessment of Biomass Energy Potential in NJ" and has written a paper looking at crop based bioenergy in NJ, "Opportunities for Agricultural-based Bioenergy in New Jersey, a case study of switchgrass and field corn."

David Swenson, Associate Scientist, Department of Economics, College of Agriculture, Iowa State University

David Swenson is a specialist in community economics research and education. His work centers on community and statewide economic analysis and affiliated projects in support of the College of Agriculture's efforts in community development and in extending economics education services to the public. Areas of research and specialization include community and regional industrial studies and evaluations, economic development research and technical assistance, input-output (economic impact) studies, fiscal impact research, public finance and tax policy analysis, community change and worker mobility issues, and public program and project evaluation. Specific topics or research in recent years include the economic impacts of biofuels development, understanding local foods potentials and values, and evaluations of local and state government support of economic development. He have received several awards as a scientist and researcher. Of the more recent: 2006 Award for Excellence in Economic Development Research, University Economic Development Association annual meeting, Savannah, Georgia, 2006; Iowa State University Foundation Award for Outstanding Achievement in Extension or Professional Practice, Ames, Iowa. 2002; and the RUPRI/CPAN Outstanding Award for Modeling Innovation for 2000 Community Policy Analysis Network, North American Regional Science Association Meeting, Chicago, 2001. He has an MA in Urban and Regional Planning from The University of Iowa (1985), and an MA and BA in Political Science from the University of South Dakota (1981, 1979).

Dr. Mario Teisl, Professor, School of Economics, Director, School of Policy and International Affairs, University of Maine

Dr. Mario Teisl is a Professor in the School of Economics at the University of Maine. His research focuses on how health and environmental information affects demand behavior and measuring the effects of information on consumer welfare. Mario has designed and administered on-site, phone and mail surveys, designed and analyzed sampling procedures appropriate to on-site and mail surveying, has experience designing focus group research and has years of experience conducting market and non-market studies that utilize stated-preference, experimental, quasi-experimental and market data methods. Mario has over 50 papers focusing on consumer reactions to information, and been invited by state, federal and international organizations to present his findings. Mario's research has been used by numerous Federal agencies, including: the U.S. Centers for Disease Control and Prevention, The U.S. Food and Drug Administration, the International Association of Fish and Wildlife Agencies, and the U.S. Environmental Protection Agency. Mario received his PhD in Agricultural and Resource Economics from the University of Maryland, and M.S. from the former Agricultural and Resource Economics Department at the University of Maine.

Speaker Biographies

Dr. Timothy Volk, Senior Research Associate, State University of New York, College of Environmental Science and Forestry

Dr. Timothy Volk has over 20 years of experience working in the fields of forestry, agroforestry, short-rotation woody crops, bioenergy and phytoremediation in the Northeastern United States and Africa. He holds degrees from the University of Guelph (BS (Agr.), Guelph, Ontario) in Natural Resources Management, Cornell University (MS, Ithaca, NY) in Forest Science and SUNY – ESF (PhD, Syracuse, NY) in Forest and Natural Resources Management. He is currently a senior research associate at the State University of New York College of Environmental Science and Forestry (SUNY-ESF) in Syracuse, NY. In that capacity he is responsible for a series of research projects focused on the development of willow biomass cropping systems as a feedstock for bioproducts and bioenergy and the use of willow as an alternative cover for industrial waste sites. He is also actively involved in research and development of sustainability assessments of bioenergy systems, life cycle assessments of willow biomass crops and woody biomass from forests, assessments of woody biomass availability from natural forests, economic modeling of short rotation woody crops, living snowfences, regional woody biomass resource supplies, and harvesting systems for short rotation woody crops. He chaired the ad hoc committee at SUNY-ESF that developed and is now implementing the curriculum for a minor in Renewable Energy and is currently teaching courses on Energy Systems and Biomass Energy.

Tiffany Westendorf, Chemical Engineer, GE Global Research

Tiffany Westendorf is a chemical engineer at GE Global Research, where she works in biofuels and bioenergy technology development under GE's Sustainable Energy Advanced Technology Program. She is currently focusing on algal biofuels process design, and has extensive experience in techno-economic analysis of various biofuels production methods. Tiffany is also the PI for a coal/biomass solids handling program for high-pressure gasification, sponsored by DOE/NETL. These activities allow her to present a broad technical perspective on biofuels. Tiffany holds a BSChE from Rensselaer Polytechnic Institute and is working toward an MSChE from Columbia University.

Dr. Peter Woodbury, Senior Research Associate, Department of Crop and Soil Science, Cornell University

Peter Woodbury is an environmental researcher who seeks to improve our understanding of natural and managed ecosystems. Peter develops and uses different kinds of computer models including geospatial analysis to quantify the sustainability of agricultural and forest ecosystems and to improve agricultural and environmental management and policy. He is keenly interested in the effects of changing land use on agricultural productivity, air, soil, and water quality, and ecosystem services. With multi-disciplinary teams, he is investigating the strengths, weaknesses, opportunities and challenges for sustainable bioenergy systems at farm, landscape, state, national and international scales and addressing important bioenergy questions. Which types of bioenergy crops are best for different soil types, farms, and regions? How will different bioenergy systems affect soil, air, and water quality? How will increased bioenergy feedstock production affect agricultural and forest enterprises and other rural land uses?

Moderator Biographies

Dr. Carolyn Branch Brooks, Executive Director of Association of 1890 Research Directors

Dr. Carolyn Branch Brooks received her B.S. degree and the M. S. Degree in Biology from Tuskegee University and a Ph.D. in Microbiology from The Ohio State University. Dr. Brooks joined the University of Maryland Eastern Shore (UMES) in 1981until 2007 and rose through academic and administrative ranks through the years to become a full professor and to serve in the positions of Director, Coordinator, Department Chair, Executive Assistant to the President, Chief of Staff, Research Director of 1890 Land Grant Programs and Dean of the School of Agricultural and Natural Sciences. Since July, 2007 she has served as the Executive Director of the Association of 1890 Research Directors (ARD). Dr. Brooks was honored with the prestigious William A. Hinton Award from the American Society for Microbiology at its annual meeting in May, 2007. This award recognized her for her many years of devotion to increasing the enrollment of under-represented minority students in microbiology and mentoring them to success. A few months earlier she was recognized as one of Maryland's Top 100 Women. Other awards include being featured as one of the 100 Distinguished African American Scientists in "*Distinguished African American Scientists of the 20th Century".* She was the recipient of the UMES National Alumni Association's Faculty Award for Excellence and Achievement, Outstanding Educator Award from the Maryland Association for Higher Education, the First Annual White House Initiative for Historically Black Colleges and Universities - Faculty Award for "Excellence in Science and Technology," the "Woman of the Year Award" from the Maryland Eastern Shore Branch of the National Association of University Women, recipient of the "Chancellor's Research Scholar Award", and the School of Agricultural Sciences' "Outstanding Faculty Award for Research." Invited to serve on numerous panels, councils, boards, etc. has allowed Dr. Brooks to serve as a consultant or review team member for research program evaluations in California, Michigan, Oregon, Idaho, South Dakota, New Jersey, New York, Puerto Rico, Washington State, South Africa, Costa Rica, Honduras, the Dominican Republic, Tanzania, and Malawi. Her funded research projects allowed her to conduct research in Egypt, Cameroon, Togo, Nigeria and Senegal.

Dr. Thomas Fretz, Dean Emeritus, University of Maryland, Northeast Sun Grant Steering Committee Chair

Dr. Fretz retired from the University of Maryland and the position of Executive Director of the Northeastern Regional Association of State Agricultural Experiment Station Directors (NERA) in March 2007, after having served from September 1994 to September 2003 as Dean of the College of Agriculture and Natural Resources, and Director of both the Maryland Agricultural Experiment Station and Maryland Cooperative Extension. He previously served as Associate Dean and Director of the Iowa Agriculture & Home Economics Experiment Station at Iowa State University, 1989-1994, Chair of the Department of Horticulture at Virginia Tech and Professor of Horticulture at Ohio State University. Dr. Fretz currently serves as a member of the U.S. Secretary of Agriculture's National Agricultural Research, Extension, Education and Economics (NAREEE) Advisory Board representing the interests of the 1862 land grant colleges of agriculture. Dr. Fretz received his undergraduate degree from the University of Maryland in 1964, and M.S. and Ph.D. degrees in 1966 and 1970 from the University of Delaware in horticulture and plant science.

Dr. Zane Helsel, Professor and Agriculture Energy Specialist, Department of Plant Biology & Pathology

Dr Zane R. Helsel is Extension Specialist in Agriculture Energy with Rutgers Cooperative Extension and Rutgers University in New Brunswick, NJ. In addition to providing Extension programming on various aspects of energy use, conservation, and biomass energy production in agriculture in NJ, he has conducted research on production and energy potential of sweet sorghum, switchgrass, energycanes and similar crops for direct combustion and conversion to ethanol. He serves on the Steering Committee of the Northeast Sungrant program and has contributed to eXtension's community of practice on Farm Energy.

Moderator Biographies

Dr. Tim Phipps, Professor, Interim Associate Dean and Associate Director Agricultural and Forestry Experiment Station, West Virginia University

Tim Phipps is a professor and interim Associate Dean for research and outreach in the Davis College and Associate Director of the WV Agricultural and Forestry Experiment Station. He is a former Director of the Division of Resource Management and the former chair of the agricultural and resource economics program at West Virginia University. His areas of research areas include economic policy analysis; spatial analysis; energy markets; technology assessment; non-market benefit assessment and benefit transfer; watershed modeling and restoration; the relationships among agricultural policy, agricultural production and environmental quality; agricultural land-use policy; resource and environmental economics; and, applied econometrics. Phipps received his B.A. in Economics from the University of California, Berkeley in 1973 and his M.S. and Ph.D. degrees in Agricultural Economics from the University of California, Davis in 1977 and 1981, respectively. Prior to joining West Virginia University in 1989 he was a fellow at the National Center for Food and Agricultural Policy, Resources for the Future, Washington D.C. From 1981 until 1985 he was an assistant professor with the Department of Agricultural and Resource Economics at the University of Maryland. Dr. Phipps is an author of 20 articles in refereed journals, 22 chapters in books and proceedings, and over 50 professional works including co-author of one book. He has served as principal investigator or co-principal investigator for research projects with the Economic Research Service, Environmental Protection Agency, the Natural Resource Conservation Service, the Fish and Wildlife Service, the Department of Energy, the National Research Center for Coal and Energy, Minelands Reclamation Center, the Regional Research Institute, the Environmental Policy Institute, Resources for the Future, the Advanced Power and Energy Research Center, and Earth Satellite Corporation. He has also twice chaired the Markets and Trade panel of the National Research Initiative and served on a National Academy of Sciences committee. He has received the AAEA Quality of Communication Award (1991).

Dr. Steven Pueppke, Associate Vice-President for Research and Graduate Studies, Director of the Michigan Agricultural Experiment Station, Michigan State University

Dr. Pueppke is Chair of the Board of Advisors of the MSU BioEconomy Network and has university-based responsibility for a portfolio of research focused on land use, water, climate change, food and agriculture, and renewable energy. Pueppke was awarded a B.S. degree from MSU in 1968 and received his Ph.D. in plant pathology from Cornell University in 1975. He came to MSU from the University of Illinois, where he served as Associate Dean for research in the College of Agricultural, Consumer and Environmental Sciences (1998-2005). In addition he served as Director of the National Soybean Research Laboratory and Director of Global Connect, an initiative focused on the globalization of the college's academic, research and outreach programs. Before moving to the University of Illinois, Pueppke served as chair of Plant Pathology and Unit Leader of Plant Science at the University of Missouri. He was a visiting professor at the University of Geneva, Switzerland (1989-90), and the University of Marburg, Germany (1996-97). He was also a faculty member at the University of Florida and the University of Missouri-St. Louis. Pueppke is past president of the Board of Directors of the National Council on Food and Agricultural Research and past chairperson of the National Agricultural Biotechnology Council. He has served on the USDA Advisory Committee on Biotechnology and 21st Century Agriculture and on the Michigan Renewable Fuels Commission. A Fellow of the American Phytopathological Society and a member of numerous professional societies, including Phi Kappa Phi and Sigma Xi, he has coauthored 125 peer reviewed scientific articles. His current professional interests include biotechnology, renewable energy, and strategy.

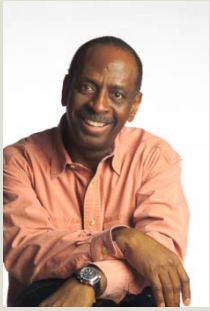
Dr. Steven A. Slack, Associate Vice President for Agricultural Administration, Director, Ohio Agricultural Research and Development Center, The Ohio State University

Steve Slack has been at the Ohio State University since 1999 as Associate Vice President for Agricultural Administration and Director of the Ohio Agricultural Research and Development Center. Dr. Slack received his B.S. and M.S. degrees from the University of Arkansas - Fayetteville and his Ph.D. degree from the University of California - Davis. In 1975, he joined the faculty of the Plant Pathology Department at the University of Wisconsin at Madison and in 1988 he joined the Cornell University faculty as the Henry and Mildred Uihlein Professor of Plant Pathology and was department chair from 1995 - 1999. He is a fellow and past President of the American Phytopathological Society, an honorary life member and past President of the Potato Association of America, and a fellow of the American Association for the Advancement of Science (AAAS). Honors include a USDA Group Honor Award for Excellence in 1995 for work on a non-pesticidal control strategy for the potato golden nematode, the Outstanding Alumnus award from the Dale Bumpers College of Agricultural, Food and Life Sciences at the University of Arkansas in 1996, and the meritorious service award for research by the National Potato Council in 1997.

Moderator Biographies

Sam Swanson, Senior Policy Advisor, Pace Energy and Climate Center

Recently Sam Swanson's work at the Pace Energy and Climate Center has focused on characterizing the real environmental impacts associated with biofuel technologies, developing a handbook for the development of small scale biomass fueled electric generation, addressing impact evaluation for energy efficiency programs, and addressing the barriers inhibiting the deployment of solar PV and hydrogen technologies. He is responsible for the development and maintenance of the Power Scorecard. Sam Swanson also serves as Co-chair of the Vermont Clean Energy Development Board that is responsible for deploying grant and incentive funding assistance for clean energy development in Vermont.



Dr. Larry Walker, Professor Department of Biological and Environmental Engineering, Director, Northeast Sun Grant Institute of Excellence, and Director of the Cornell Biofuels Research Laboratory, Cornell University

Dr. Larry P. Walker is a Professor in the Department of Biological and Environmental Engineering at Cornell University, and the Director of the Northeast Sun Grant Institute of Excellence - leading a fourteen-state regional research and economic development program focused on biofuels and bioproducts. He is also the Director of Cornell's Biofuels Research Laboratory – a new state-of-the-art industrial biotechnology laboratory that mimics all the essential steps in a cellulosic biorefinery. During his 30 years at Cornell, Dr. Walker has been involved in a number of biomass to energy projects, including an assessment of NYS biomass resources available for ethanol production, farm-scale methane production and co-generation, the application of nanotechnology to discover and study important biocatalysts for biofuels and industrial biotechnology, and the optimization of solid-state fermentation for the production of natural products. Throughout his career he has sought to integrate his research outcomes into a systems engineering perspective on how to evolve sustainable biobased industries. Dr. Walker has served in numerous leadership roles including membership on the National Biomass Research and Development Technical Advisory Committee. He is Co-Editor in Chief for the journal, *Industrial Biotechnology,* a member of the Education Committee of the American Council of Renewable Energy, and a member of the Advisory Board for the Presidential Forum on Renewable Energy. In 2009 he was elected as a fellow in the American Institute of Medical and Biological Engineering, and he was awarded the Outstanding Faculty Award from the College of Agriculture and Life Sciences Alumni Association and the College of Agriculture and Life Sciences.

Zywia Wojnar, Research Director, Pace Energy and Climate Center, Pace University

Zywia Wojnar, as Research Director, manages outreach and technical communications projects, such as the multi-year NYSERDA contract with the Environmental Monitoring, Evaluation, and Protection (EMEP) program, which addresses the effects on human health and the environment from energy production and use. Ms. Wojnar coordinates the production of numerous written publications, web materials, and other outreach projects, including major studies on market-based emissions programs and liquid biofuels, and the NYSERDA-funded Renewable Fuels Roadmap and Sustainable Biomass Feedstock Supply for New York. Prior to joining the Pace Energy and Climate Center, Ms. Wojnar worked in academia and the private sector acquiring science-based, health-related, and industry expertise in diverse environmental areas. Ms. Wojnar attended Swarthmore College and received her MS in Biology from the Jagiellonian University in Krakow, Poland. She also holds an MBA degree from the Arthur D. Little School of Management, aka the Hult International Business School.

Poster Presenters Biographies

Dr. Lars Angenent, Associate Professor, Department of Biological and Environmental Engineering, Cornell University

Dr. Lars Angenent is currently an Associate Professor in the Department of Biological and Environmental Engineering at Cornell University. He received his PhD degree from Iowa State University, worked at University of Illinois at Urbana-Champaign and University of Colorado at Boulder as post-docs, and at Washington University in St. Louis as an Assistant Professor. Dr. Angenent holds two US patents and has published over 40 peer-reviewed papers. His recent awards include the Kavli Fellow Award from the U.S. National Academy of Sciences in 2008, the Excellence in Review Award from the Environmental Science & Technology and the NSF CAREER award from the U.S. National Science Foundation in 2007. Dr. Angenent's research interests include bioenergy and bioaerosols. His research lab incorporates molecular biology techniques, such as PCR assays and hybridization assays, to solve environmental engineering problems.

Ryan Baxter, Senior Research Assistant, The Pennsylvania State University

Mr. Baxter is a member of the research faculty at the Penn State Institutes of Energy and the Environment (PSIEE) and an instructor in the Department of Geography at The Pennsylvania State University. He serves as the Information Technology Coordinator for Pennsylvania's spatial data clearinghouse (PASDA) and lead developer for several other regional and national projects. His teaching and research interests include geographic information science, spatial database development, and the spatial analysis of land use, energy and the environment.

Dr. Antonio Bento, Associate Professor Applied Economics and Management, Cornell University

Antonio Bento, Associate Professor in the department of Applied Economics and Management at Cornell, is a leading environmental economist who has established a distinguished publication record in the areas of environmental taxation and regulation. His work lies at the boundaries of environmental, public and urban economics. Most of his work appears in the leading economics journals, such as the American Economic Review and the Review of Economics and Statistics, and major field journals, such as the Journal of Environmental Economics and Management, the Journal of Urban Economics and the American Journal of Agricultural Economics. His highly cited work on environmental taxation, which is central to current debates surrounding the choice of carbon taxes and cap-and-trade programs, demonstrates the conditions under which an environmental tax reform can increase environmental quality while, at the same time, improve the efficiency of the tax system. His empirical work on the links between urban spatial structure and travel demand and the effects of the 1990 Clean Air Act Amendments is equally well cited and has been central to recent reports of the EPA and National Academies. Currently, Prof. Bento's research program focuses on the economics of renewable energy and climate change. He is examining the effects of biofules policies, policies to promote the adoption of hybrid vehicles, and the market for carbon offsets. Currently he serves on the NY Governor's Climate Change Action Plan Committee, and on various panels of the US EPA's Science Advisory Board and the National Academy of Sciences.

Dr. Gary C. Bergstrom, Professor of Plant Pathology, Cornell University

Gary C. Bergstrom is Professor of Plant Pathology and Plant-Microbe Biology at Cornell University. Dr. Bergstrom received his graduate training from Purdue University and the University of Kentucky. He conducts research and extension programs on the epidemiology and management of diseases in field crops, including perennial grasses for biofuel production. He is co-chair of Cornell Cooperative Extension's Statewide Program Work Team on Integrated Field Crop, Soil, and Pest Management. He is a Fellow of the American Phytopathological Society and recipient of the Distinguished Agricultural Alumni Award from Purdue University and the Excellence in Applied Research Award from Cornell's College of Agriculture and Life Sciences.

Dr. Stacy A Bonos, Assistant Professor in Plant Biology and Pathology, Rutgers, The State University of New Jersey

Dr. Stacy A. Bonos has been an Assistant Professor of Turfgrass Breeding in the Department of Plant Biology and Pathology since 2004. She is focusing her research on the development of improved, pest-resistant and stress-tolerant turfgrasses, including native grasses, using an integration of classical and molecular techniques. Additionally, she has been breeding warm-season perennial grasses for biofuels since 2004. She has co-developed over 70 cultivars. Dr. Bonos is the recipient of the 2005 Young Crop Scientist Award of the Crop Science Society of America and the inaugural Early Career Excellence Award in Plant Breeding presented by the Plant Breeding Coordinating Committee. Dr. Bonos has been growing and conducting switchgrass field trials over the past six years.

Poster Presenters Biographies

Gustavo Camargo, Research Assistant, The Pennsylvania State University

Gustavo Camargo is an agricultural and biological engineer at Penn State University. His research focuses on energy use and greenhouse gas emissions from conventional and alternative farming systems. He is the developer of the Farm Energy Analysis Tool (FEAT), a spreadsheet tool for calculating energy and carbon impacts for complete systems of farming inputs, outputs, and production practices. He is currently applying this tool to long term cropping system experiments at Penn State and the USDA Beltsville.

Dr. Dan Ciolkosz, Sr. Extension Associate, The Pennsylvania State University

Daniel Ciolkosz serves as Sr. Extension Associate at The Pennsylvania State University. His research interests include Biomass Energy Systems, Energy Efficiency, Solar Energy Resource Evaluation, and Controlled Environments. His active research projects include Mid-Atlantic Clean Energy Application Center and Online Demonstration and Measurement of Renewable Energy Technologies. Daniel received a B.A.E. in Architectural Engineering at The Pennsylvania State University, M.S. in Agricultural Engineering at The Pennsylvania State University, and Ph.D. in Agricultural Engineering at Cornell University.

David Dowler, County Extension Director, The Pennsylvania State University

David Dowler serves as the County Extension Director at Penn State University, Senior Extension Educator of Farm Business Management, and Dairy Team Leader in Northwestern Pennsylvania. He received an MBA in Business Administration from the Pennsylvania State University and a BS in Dairy and Animal Science from The Ohio State University. His professional interests include Farm business, tax and estate planning, building rural communities with renewable energy and investigating camelina and continuous no-till programs for the northeast. He was awarded over $1M in grants in 2009 and gave many seminars and invited lectures.

Dr. Daniel Haworth, Professor of Computational Thermal- fluids, The Pennsylvania State University

Daniel C. Haworth received his Ph.D. in Mechanical Engineering in 1986 from Cornell University. He joined the Penn State faculty in 1999 following 13 years at GM's Research & Development Center and 12 years as an adjunct faculty member in the School of Engineering and Computer Science at Oakland University. Dr. Haworth's research interests are in the computational thermal-fluids sciences. His work spans three levels of numerical computation: "numerical experiments" to elucidate fundamental physical processes; development of physical models and numerical algorithms for engineering computer codes; and applications to IC engines and other devices. Since coming to Penn State, Dr. Haworth has been affiliated with the Propulsion Engineering Research Center. He has been teaching and has built a funded research program in the computational thermal-fluids sciences with an emphasis on advanced propulsion systems. Dr. Haworth has secured funding from industrial and governmental sponsors, and has diversified into areas including information technology, biotechnology, advanced transportation systems, and K-12 education. He has established collaborations with the Computational Mechanics Division in Penn State's Applied Research Laboratory, with the Vehicle Systems & Safety (VS&S) Program in the Thomas D. Larson Pennsylvania Transportation Institute, with the Energy Institute in the College of Earth & Mineral Sciences, and with the Science Education program in the College of Education. Dr. Haworth has served as the VS&S Program Director since January 2006, and has served as faculty advisor to Penn State's Advanced Vehicle Technology Competition teams since 2001. He is a Fellow of ASME and of SAE International, and is an Associate Editor of Combustion and Flame.

Dr. Stephen Herbert, Associate Dean for Agricultural Research and Outreach, College of Natural Sciences, University of Massachusetts, Amherst

Dr. Stephen Herbert serves as the Director of the Center for Agriculture and the Director of the Massachusetts Agricultural Experiment Station. In these roles, he oversees and promotes research and extension in applied agriculture appropriate to farmers and citizens in the Commonwealth of Massachusetts. He continues research in field crops, pasture intensification, renewable energy, and cropping systems for improved nutrient cycling and environmental protection.

Poster Presenters Biographies

Dr. David Hodge, Assistant Professor Chemical Engineering, Michigan State University

I'm originally from Alabama and received a BS degree in Chemical Engineering with a specialization in Pulp and Paper Engineering from Auburn University and worked for a year in the area of process control in a paper mill in Alabama. This was followed by an MS and PhD from Colorado State University in Chemical Engineering with projects focusing on ethanol fermentation of 5 carbon sugars, optimal control of ethanol fermentations, and enzymatic conversion of plant biomass to fermentable sugars. The last 2 years of my PhD were performed at National Renewable Energy Laboratory (NREL) in Golden, Colorado where I continued as a postdoc. Following this I took a position as a research faculty at Luleå University of Technology in Sweden to work in the department of Chemical Engineering with research focused on the integration of fermentation-based platform chemicals production from hemicellulose into the Kraft process. I started at Michigan State University as an assistant professor in Chemical Engineering in the fall of 2008. My research interests revolve around converting plant (lignocellulosic) biomass to fuels and chemicals with a particular focus on biotechnology and the forest products industry. I also teach courses on Material and Energy Balances and Biomass Conversion Engineering.

Dr. Peter Kahn, Professor, Department of Biochemistry and Microbiology, Rutgers, The State University of New Jersey

Dr. Peter Kahn is a Professor in the Dept. of Biochemistry and Microbiology at Rutgers University. He served as visiting Professor at the University of Helsinki, Biotechnology Institute and also at the Université René Descartes, Paris. Dr. Kahn has received the Academic and Professional Excellence award, Research Excellence Award, Teacher of the Year Award, President's Award for Public Service, Warren Susman Award for Excellence in Teaching, Academic and Professional Excellence Award, Research Fellowship, Finnish Academy of Sciences, and he was a Guest of Honor at the First Conference on the Bosnian Academic Diaspora, Sarajevo. Dr. Kahn received a BA in Biochemistry from Harvard College and a Ph.D. in Biochemistry from Columbia University.

Dr. Roger Koide, Professor, Horticultural Ecology, The Pennsylvania State University

Roger Koide, Professor of Horticultural Ecology, The Pennsylvania State University. He received his BA in 1980 in Biology from Pomona College, Claremont, CA, and his PhD in 1984 in Botany from the University of California Berkeley. He performed postdoctoral research in the Department of Biological Sciences at Stanford University from 1984-1986. Dr. Koide is is particularly fond of the ecophysiology and community ecology of mycorrhizal fungi and their host plants.

Dr. Yebo Li, Assistant Professor Department of Food, Agricultural and Biological Engineering, The Ohio State University

Dr. Yebo Li is an assistant professor in the Department of Food, Agricultural, and Biological Engineering, The Ohio State University, based on Ohio Agricultural Research and Development Center's (OARDC) Wooster campus. His research area is bioproducts and bioenergy. He joined the Ohio State University in 2007. While at OARDC, Dr. Li has received nearly $4 million in research and training grants from funding agencies such as the US Department of Agricultural, the US Department of Energy, North Central Sun Grant, and the Third Frontier Program of Ohio. He has received over $2.5 million in research funding as principal investigator. He has published 3 book chapters, almost 50 peer reviewed journal articles, and has five patents (three awarded, two pending). Among other awards, Dr. Li has been awarded the 2010 Lumley Research Award of College of Engineering, The Ohio State University and the 2007 outstanding young investigator of School of Agriculture and Environmental Sciences, North Carolina A&T State University. Dr. Li's research interests include feedstock logistics, anaerobic digestion, and biological and thermal chemical conversion of biomass (including algae) to fuels and chemicals. He has five (5) Ph.D. students and four (4) M.S. students, and three postdoctoral researchers working in his group.

Poster Presenters Biographies

Dr. Wei Liao, Assistant Professor Biosystems & Agricultural Engineering, Michigan State University

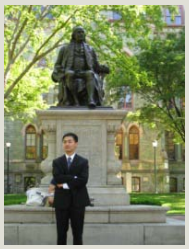
Dr. Wei Liao, a registered professional engineering and an assistant professor at the department of Biosystems & Agricultural Engineering at Michigan State University, has been working on bioenergy/bioproducts area for more than 10 years. Dr. Liao is leading an active research program on biological conversion of agricultural residues into bioenergy/chemical products at Michigan State University. Current research projects Dr. Liao is working on are: developing an environmental-friendly bio-conversion process to cellulosic ethanol biorefinery, co-producing methane/biorefinery feedstock co-production from lignocellulosic residues using anaerobic microbial consortia, and improving energy efficiency and generating high-value co-products from an integrated small-scale animal manure management system, etc. Dr. Liao received both his undergraduate degree and Master degree in fermentation engineering from Jiangnan University, China. He received a doctorate in biosystems engineering from Washington State University. Dr. Liao was a research associate at Washington State University before moving to Michigan State University.

Dr. Jude Liu, Professor Department of Agriculture and Biological Engineering, The Pennsylvania State University

Jude Liu received B.Sc., M.Sc., and Ph.D. degrees all in Automotive Engineering at Jilin University, China. He was a faculty member in Mechanical Engineering Department at the Qingdao Technological University from 1992 to 1999. He received his second Ph.D. degree in Biosystems Engineering at the University of Manitoba Canada. While in Canada between 1999 and 2007, he worked on crop harvesting technologies and equipment development. He also studied on crop residue management and conservation tillage. He started his teaching and research position in the Department of Agricultural and Biological Engineering at the Pennsylvania State University in December 2007.

Dr. Dan Luo, Associate Professor Department of Biological and Environmental Engineering Cornell University

Dr. Dan Luo is currently an Associate Professor in the Department of Biological and Environmental Engineering at Cornell University. He is also a faculty member of the Nanobiotechnology Center, Cornell Center for Materials Research, Biomedical Engineering and New Life Science Initiatives at Cornell. He obtained his B.S. degree from the University of Science and Technology of China in 1989 and his Ph.D. in Molecular, Cellular and Developmental Biology from The Ohio State University in 1997. After his postdoctoral training at the School of Chemical Engineering at Cornell (under Prof. Mark Saltzman), he joined the Cornell faculty in 2001. Currently he is Associate Editor for the *Journal of Biomedical Nanotechnology* and Editorial Board Member for *Nanomedicine*, *Current Nanoscience, Nano Biomedicine and Engineering, Nano Today,* and *Nanomedicine: Nanotechnology, Biology and Medicine*. He was awarded the National Science Foundation's CAREER award in 2006 and the Cornell Provost's Award for Distinguished Scholarship in 2007. He is also a recipient of the New York State Foundation for Science, Technology and Innovation (NYSTAR) Technology Transfer Incentive Program Award (2005), NYSTAR Faculty Development Program Award (2007), and SUNY Chancellor's Award for Excellence in Scholarship and Creative Activities (2008). Recently (2010), Dr. Luo was awarded the the *Journal of Materials Chemistry* Editorial Board Award for honouring "a younger scientist who has made a significant contribution to the materials chemistry field". Dr. Luo was also selected three times (in 2005, 2008, and 2010) by undergraduate students as a Cornell outstanding educator for having most influenced a Merrill Presidential Scholar.



Wen Lv, Department of Animal Sciences, The Ohio State University

Bachelor of Science in College of Life Science and Technology, majored in National Training Base for Life Science Talents, Huazhong Agricultural University (HZAU), Wuhan, China

Poster Presenters Biographies

Dr. Marc McDill, Associate Professor, Penn State School of Forest Resources, The Pennsylvania State University

Dr. Marc McDill is an associate professor and forest science program chair in the Penn State School of Forest Resources. He teaches planning and information systems, woody biomass production and logistics, the impacts of climate change on forests, forest property taxes, sustainable forestry and ecosystem management, timber supplies, and forest growth and yield. Dr. McDill received his Ph.D. in forest economics from Virginia Tech in 1989. He was a post-doc at the University of Minnesota and an assistant professor of forest management at Louisiana State University before coming to Penn State in 1997.

Dr. Ramani Narayan, University Distinguished Professor at Michigan State University

He has 130 refereed publications in leading journals to his credit, 25 issued patents, and several pending patents, edited three books and one expert dossier in the area of bio-based polymeric materials. His research encompasses design & engineering of sustainable, biobased products, biodegradable plastics and polymers, biofiber reinforced composites, reactive extrusion polymerization and processing, studies in plastic end-of-life options like biodegradation and composting. His research involves developing carbon and environmental footprint of biobased and biodegradable plastics and products using biocarbon content analysis (ASTM D6866) and LCA (life cycle assessment) methodology respectively. Under his supervision, 20 students have obtained their Master's degree, 15 students their Ph.D. degrees and six are working towards their Ph.D. He has major research programs with industry and serves as consultant for several companies. He serves as the Scientific Chair of the Biodegradable Products Institute (BPI), North America www.bpiworld.org. He served on the Board of Directors of ASTM International (www.astm.org), a premier international standards setting organization and currently chairs the committee on Environmentally Degradable Plastics and Biobased Products (D20.96) and the Plastics Terminology committee D20.92. He serves as the USA technical expert to ISO (International Standards Organization) TC 61 on Plastics, and serves as the Chairman of ISO TC 61 SC 1 on Terminology. He is Convener of working group 7 of ISO TC 120 SC 4 on Packaging and the Environment He has testified before U.S. congressional hearings on the biodegradable and biobased plastics issues. He serves on the Board of Directors of Northern Technologies International (www.ntic.com) – a $100 million publicly traded micro cap company, and on the Technical Advisory board of Tate & Lyle (www.tateandlyle.com)– a world leading manufacturer of renewable food and industrial ingredients.

Dr. Chris Saffron, Assistant Professor, Department of Biosystems and Agricultural Engineering and Department of Forestry, Michigan State University

Dr. Christopher Saffron is an Assistant Professor in the Dept. of Biosystems and Agricultural Engineering at Michigan State University. His research interest is in the thermochemical conversion of biomass to fuels and chemicals. Current research projects include: Bio-oil tan reduction by selection amongst native warm-season grasses to promote biomass densification by pyrolysis; Woody biomass conversion to value-added chemicals using fast pyrolysis and catalysis; and Transforming and densifying biomass in the Regional Biomass Processing Center (RBPC).

Dr. Paul Salon, Plant Materials Specialist, USDA

Paul Salon has a Ph.D. in Plant Breeding from Cornell University working on eastern gamagrass a warm season grass with forage production potential. He has worked with the USDA-NRCS for 28 years. Working as a Research Agronomist at the USDA-NRCS Big Flats Plant Materials Center for 18 years as a Research Agronomist and is now the Plant Materials Specialist covering the NE states for the agency. Paul has worked on establishment of warm season grasses including switchgrass, big bluestem and indiangrass for wildlife, stabilization, forage quality and biofuels.

Poster Presenters Biographies

Deborah Sills, Graduate Student, Civil and Environmental Engineering, Cornell University

Deborah Sills is a Ph.D. candidate in the Dept. of Civil and Environmental Engineering at Cornell University. She obtained an M.S. Degree in Environmental Engineering at Cornell and a B.S. in Civil Engineering at Montana State Univ. Her main research interest is the breakdown of plant-cell walls into simple sugars (e.g. glucose) which is a major bottleneck in the production of bio-based fuels and materials from lignocellulose. Deborah's research focuses on combined thermochemical pretreatment and enzymatic hydrolysis of perennial biomasses. She is quantifying differences between alkaline and acidic pretreatments with enzymatic assays and Fourier Transform Infrared Spectroscopy coupled with multivariate analyses.

David Specca, Assistant Director for Bioenergy Technologies, Rutgers EcoComplex, Rutgers, The State University of New Jersey

David Specca has worked for the past twelve years on small and large scale bioenergy projects at the Rutgers EcoComplex. His activities include identifying, demonstrating and promoting appropriate renewable energy technologies. Currently, his projects include working on technologies in landfill gas cleanup and utilization, microturbine co-generation, anaerobic digestion, ethanol production, biodiesel, and biomass pyrolysis. As part of the environmental business development activities of the EcoComplex, Dave is a member of the NJ Business Incubator Network, Board member of the Rutgers Energy Institute, and Co-chair of the Clean Energy Alliance, a nationwide network of clean energy incubator facilities. He also directs the activities of a one-acre hydroponic vegetable and aquaculture greenhouse facility powered by two landfill gas to energy technologies. He was part of the NJAES team that produced the "Assessment of Biomass Energy Potential in NJ" and has written a paper looking at crop based bioenergy in NJ, "Opportunities for Agricultural-based Bioenergy in New Jersey, a case study of switchgrass and field corn".

Dr. Mario Teisl, Professor, School of Economics, Director, School of Policy and International Affairs, University of Maine

Dr. Teisl is a Professor of Economics at the University of Maine. He received a Ph.D. in Agricultural and Resource Economics at the University of Maryland, and M.S. in Resource Economics and Policy at the University of Maine. His research areas include Information Economics; Food Safety; Environmental and Social Marketing; Environmental Economics. Dr. Teisl has over 50 journal articles and monographs, and over 75 presentations related to the economics of nutrition labeling and promotion, health-claims policy and food safety or environmental labeling and marketing policy. The papers have been published in some of the top journals while many of the presentations have been as invited papers at economic or health related professional meetings, or as testimony at Federal or State hearings. Dr. Teisl has received the NSFA Research Award and was the recipient of the Fulbright teaching/research award at the School of Economics and Business – University of Zagreb, Croatia.

Mary Wrege, Renewable Energy Educator, Cornell Cooperative Extension

Mary Wrege serves as Cornell Cooperative Extension (CCE) Oneida County's Renewable Energy Educator as well as CCE's Agriculture and Energy Educator statewide. She regularly interfaces with those in the agricultural community, legislative and public officials, as well as communities and the general public on various aspects of renewable and alternative energy. Wrege's initiatives include promotion of those in the dairy industry to secure baseline evaluations of direct energy use and costs, and linking those businesses with certified energy auditors. She provides information on new renewable crops and initiatives to those in the agriculture and education fields to broaden the scope of options for emerging biomass and alternative energy markets. Her previous professional experience and perspective in federal and state agricultural positions with the U.S. Department of Agriculture and the NYS Department of Agriculture and Markets, along with her present responsibilities with Cornell Extension, is helpful to positioning Oneida County and NYS to play a significant role in our future and evolving bioeconomy. Wrege's educational background includes: Environmental Law and public policy and studies in land-use planning (MSEL) from Vermont Law School, Agricultural Education (MAT) and Integrated Pest Management and Plant Pathology/Entomology (BS) from Cornell University, and Nursery Management (AAS) from SUNY Cobleskill. Wrege resides with her family on their farm in Clinton, NY. She is also an active member and advocate for the Central New York Parkinson's Support Group Inc. and helped to secure the model Parkinson's Unit at the Presbyterian Home of CNY. Wrege also is owner of Healthful Solutions, a company specializing in health and wellness.

Poster Abstracts

Producing Butanol from Syngas

Hanno Richter, Nasib Qureshi, Michael A. Cotta and **Largus T. Angenent**

Our goal is to establish a technology that will remove the limitations for economical syngas fermentation to generate the biofuel butanol. We are planning to develop a bioreactor in which syngas is fed continuously through hollow fiber membranes, while growth-medium is supplied and butanol removed and concentrated by gas-stripping. Here, we present preliminary achievements in our lab, which make this goal feasible. Over the past year, we have been optimizing gas-stripping technology for online removal of butanol produced in continuous cultures of *Clostridium saccharoperbutylacetonicum* N1-4 (ATCC 27021) by reducing externally supplied butyric acid to butanol with glucose as electron donor and energy source. We determined the optimum conditions for growth and solvent production for strain N1-4. A pH of 4.8 was determined as a switch point at which the culture becomes solventogenic in glucose-fed batch cultures. To maintain N1-4 in the solventogenic state, we found that a concentration of 0.3-0.8 g/L undissociated butyric acid is required. Therefore, we were able to trigger solventogenesis at pH values up to 6.4, provided we maintained high enough concentrations of butyrate. However, these studies were performed in batch cultures, while our ultimate goal is to produce butanol continuously. We, therefore, established a 2-stage pH-auxostat continuous-culture system equipped with gas stripping for solvent removal. In this system, we were able to maintain the culture in solventogenic state for up to two weeks by keeping the butyrate concentration at a sufficiently high value. We are now further optimizing this continuous fermentation process to increase the period of stable solvent production and the ratio of butyrate:glucose conversion. The ultimate goal, however, is to replace glucose with a more economic energy- and electron donor. For this, we acquired and started working with a bacterial strain (i.e., *Clostridium carboxidivorans*), which ferments syngas to short chain fatty acids and alcohols. We are currently optimizing the growth conditions in serum bottles to increase syngas consumption and butanol production.

Cellulosic Biofuel Feedstock Potential in the Chesapeake Bay Watershed

Ryan Baxter

This poster illustrates a spatial assessment of potential land areas and production totals of cellulosic feedstocks in the Chesapeake Bay region. Specifically, the potential of small grain double crops and switchgrass are evaluated in such a way as to minimize competition with other agricultural production. Land areas are selected in the following categories: underutilized cropland, recently abandoned cropland, failed cropland, idle cropland, fallow cropland and abandoned mine land. Results show the potential of producing 500 million gallons of cellulosic biofuels from these sources annually.

Efficiency Effects of Increased Biofuels Mandates

Antonio Bento

The purpose of this poster is to examine the effects of the RFS, employing a multi-market simulation model to evaluate the policy's efficiency and distributional implications. We investigate the impacts of increased U.S. biofuels mandates for corn-based ethanol between 2008 and 2015 on blended fuel consumption, relating these impacts to changes in fuel mix (regular gasoline and ethanol), changes in fleet composition (e.g. shifts to higher mileage automobiles), vehicle miles traveled (VMT) and overall dependence on crude oil dependence and crude oil expenditures. We also examine the impacts of increased U.S. biofuels mandates

on agricultural production, relating these effects to changes in the acreage of four major crops (corn, soybeans, wheat and hay), rotation practices (e.g. single and multi-crop rotations), tillage systems (conventional, reduced and conservation), land allocated to the conservation reserve program (CRP), and the volume of crop exports.

In addition, we evaluate the economy-wide costs of increased biofuels mandates, and explore how pre-existing distortions caused by the volumetric ethanol excise tax credit (VEETC) and the gasoline tax as well as fluctuations in the international price of crude oil affect the (gross) costs of this policy.

Plant Pathogens of Feedstock Crops as a Source of Useful Enzymes for Lignocellulosic Conversion

Gary C. Bergstrom

Plant pathogenic fungi that parasitize feedstock grasses represent an underdeveloped novel source of cell wall degrading enzymes for lignocellulosic conversion. We isolated 400 fungal strains from leaves, crowns, and roots of perennial grass crops in New York, focusing on leaf and stem blighting pathogens but also including 12 genera of saprophytic and weakly pathogenic fungi. We used high throughput screening methods to determine which isolates grow best on and enzymatically degrade complex biomass substrates (including corn stalks, switchgrass, tall fescue, reed canary grass, big bluestem, and Eastern gamagrass) in addition to isolated cellulose and xylans. *Fusarium* spp. and *Colletotrichum navitas* (causal agent of switchgrass anthracnose) were the top-performing taxa when hydrolysis of four types of substrates (cellulose, hemicellulose, biomass, pretreated biomass) was weighted equally. These two taxa were also superior to saprophytic fungi in the degradation of grass biomass. Our results indicate that *Fusarium* spp. and *C. navitas* possess an extensive enzymatic arsenal for hydrolysing plant material. Remaining efforts will identify top candidate isolates based on 1) their degradation of general and specific grass substrates and 2) their relative cellulase and xylanase activities.

Comparison of Switchgrass Cultivars and Genotypes Grown on Marginal Land in the Northeastern US

Stacy A Bonos

The national strategy is to produce bioenergy crops on marginal cropland where there will be no competition with food production. Although perennial grasses such as switchgrasses are expected to be used as a biofuel crop on marginal land there has been no extensive research to evaluate their performance on marginal land. Our main objective is to identify switchgrass cultivars and germplasm with improved performance on marginal land and to identify optimum breeding and selection techniques for developing switchgrass on marginal land (with low N) in Northeastern US. This study was established in a 'paired' field trial (on two marginal soils and one on prime farmland soil) in NJ. A set of 50 clones and 14 cultivars were planted in a randomized complete block design with six and three replications, respectively in 2009. Switchgrass genotypes established well at all locations. Percent cover of switchgrass cultivars ranged from 10-30% cover at Somerset, 10- 60% cover at Jackson, to 45-95% cover at Freehold, NJ. Biomass and agronomic data will be collected in 2010 and 2011 to determine soil type effects on biomass yield. This information will be used to develop cultivars with improved biomass yield on marginal land in the northeast US.

Poster Abstracts

Modeling Energy and Greenhouse Gas Emissions for Farm-Scale Production

Gustavo Camargo

The main purpose of this research was to use energy and greenhouse gas (GHG) analysis to explore and evaluate double cropping systems, livestock interactions, biofuel production for on-farm use, and export biofuel production systems. Whole-farm computer models were used to compare these different agricultural strategies and systems. These tools simulate the whole farm systems making it is possible to analyze a very large range of possibilities, and evaluate their performance under different assumptions. The Farm Energy Analysis Tool (FEAT), a static, deterministic, data-base model, was created to use a whole-farm approach to evaluate energy and GHG for different agricultural systems. This research identified cropping strategies and systems that resulted in a higher energetic efficiency and lower net GHG emissions. This simple, yet effective, computer modeling approach allowed for a rapid evaluation provided useful estimates that are needed for decision making and policy establishment.

Online Demonstration and Measurement of Renewable Energy Technologies

Dan Ciolkosz

This project aims to create a real-time energy monitoring tool that is able to measure and report the impacts of renewable energy projects throughout Pennsylvania. Monitoring equipment were installed at selected sites, resulting in measurements of petroleum savings, energy use, cost savings, and CO2 emissions avoided. This information is be provided to the public on an intuitive and informational web site that is designed to grow over time to include information from a large number of projects in the region. The system is a valuable teaching tool for extension educators, providing a platform for renewable energy education to farmers, institutional managers, homeowners, and K-12 students, among others. Educational program material will be developed to utilize this resource and maximize its usefulness. It will also serve to showcase the region's efforts towards improving the energy sustainability of the northeast. The measured data will also be stored and made available for investigations into the implementation-scale performance of renewable energy systems.

Camelina: A New Oilseed Crop for Permanent No-till Systems in the Northeast.

David Dowler

After two years of growing camelina in northwest Pennsylvania, we have learned much about its potential as a major bio-diesel feedstock for the northeast. This work was funded by the Northeast Sun Grant program.

Camelina yields of 1200 pound/acre are very achievable and yields of 2000 pounds/acre or more have been obtained. Like canola, camelina has an oil content of around 40 percent, or twice the oil content of soybean. Researchers and extension educators at Penn State University have studied many facets of this oil seed over the last two years. We have accumulated field data on culture, production, harvesting, storing, processing, marketing of the seed and meal, and using the oil as a feedstock for bio-diesel production. Research data from PSU poultry trials have demonstrated that the omega-3's from camelina do transfer into eggs and poultry tissue when chickens are fed camelina meal. The high level of omega-3 fatty acids found in camelina meal make it an ideal feed replacement for flax in poultry and as a value added protein feedstuff for other classes of livestock.

In 2008 we grew 316 acres of camelina with nine participating growers. In 2009 we grew another 225 acres of camelina with six participating growers. This practical application gave us insight on the economics of camelina production in no-till systems. We also included a companion clover crop in some acreage. Each crop in the companion planting performed suitably. When the camelina was harvested, the underlying clover developed quickly providing a quality legume forage harvest in September, an overwintering cover crop, and substantial fixed nitrogen for the corn crop to follow next spring. Other double-cropping and/or cover cropping opportunities – a rarity in Northern Pennsylvania – offer real potential. This low-input brassica crop could serve to break cyclic disease and pest problems that can plague common (and anemic) crop rotation of corn (or other cereal grass) and soybean. Along these lines, through collaboration with others, camelina and camelina meal have been investigated for potential of bio-pesticide properties such as effects on nematodes pests in orchards. We believe that successful camelina production will depend upon capitalizing on its uniqueness and the subsequent opportunities it creates for diversity, rotations, and significant cover cropping opportunities incorporated into and enhancing our current cropping systems.

Currently, the County Commissioners of Crawford County have signed a memorandum of understanding with Penn State University to use approximately 100 acres of their county farm ground to further our investigation, research and demonstration of renewable fuel production.

Joining PSU in this effort were three critical partners including Hero BX (formerly known as Lake Erie Biodiesel), Ernst Conservation Seeds, a local and nationally known seed producer for renewable fuels, and Northwest Grain Processors, a co-owned local soybean crushing plant that was setting idle, and now converted into a crushing plant for camelina and canola.

While camelina remains promising as a major bio-diesel feedstock in the northeast, many challenges remain. However, apparent adaptability and uniqueness of this simple cool season annual crop seems to offer enormous potential as an economical source of valuable oil components and a value-added source of livestock high-protein feed. Whether the oil is utilized as a biodiesel feedstock or as an economic source of valuable vegetable oil components, both the interest and potential are formidable.

Determination of the Underlying Cause of the Biodiesel NOx Effect in Common-Rail Diesel Engines

André L. Boehman and **Daniel C. Haworth**

Biodiesel fueling of direct-injection diesel engines has been shown to cause an increase in NOx emissions. The biodiesel-NOx effect is well understood in engines that use pump-line-nozzle type fuel injection systems: there the higher bulk modulus of the biodiesel fuel leads to an advanced injection timing which in turn leads to an earlier maximum cylinder temperature and higher levels of thermal NO. However, in modern common-rail diesel engines, shifts in fuel compressibility do not directly lead to shifts in fuel-injection timing, and there is an insufficient understanding of the source of the biodiesel-NOx effect in such engines. Recent work in optical engines and high-pressure shock tubes has suggested several different possibilities for the biodiesel-NOx effect in common-rail diesel engines. In this research, high-fidelity computational fluid dynamics (CFD)-based tools are being used to explore the effects of fuel properties on NOx emissions in a modern small-bore common-rail diesel engine, and thereby to test the hypotheses that have been proposed for the biodiesel-NOx effect. The model features comprehensive liquid fuel spray and vaporization treatments, detailed gas-phase chemical kinetics, a detailed soot model, accounting for turbulence-chemistry interactions, and radiation heat transfer.

Poster Abstracts

Optimal Harvest Time of Switchgrass: Yield, Nutrient Cycling, Air Emissions

Stephen Herbert, Leryn Gorlitsky, Masoud Hashemi, Randall Prostak, and Sarah Weis

Switchgrass once established grows back each year, and can be harvested for many years when sustainable methods are employed to manage, harvest, and process the crop. Switchgrass has an extensive root structure, which aids its survival during winter months and regrowth in the spring/summer. Field Studies are being conducted to assess the effect of harvest time (late summer, fall and after winter) and cutting height on non-structural carbohydrate root reserves, summer regrowth and yield. The effect of harvest time on nitrogen fertility and air emissions are also being examined at two locations in Massachusetts. Treatments include nitrogen application rates of 0, 67, 135 kg N/ha and three harvest times of August, October and April in two field studies. In another study five varieties are being harvested at the three dates. Increased N did not significantly increase yield. These studies will continue to examine the interaction with harvest time and possible N recycling. the harvest date did affect carbohydrate reserves. Sucrose levels nearly doubled between August and October harvest, indicating that the plant was storing non-structural carbohydrates for the winter.

Alkaline Hemicellulose Extraction and Solubility-Based Separation from Acer saccharum

David Hodge

Woody biomass presents a unique opportunity for the production of liquid biofuels and other chemicals from renewable resources. One challenge is to integrate existing alkaline pulping processes with extraction processes that utilize the hemicellulose and lignin fractions for fermentation-based fuels, solid fuels, and chemicals. Overall, the goal of this work is to better characterize the impacts of these extraction processes on the properties of the solubilized biopolymers and the potential for solubility-based separations to recover useful hemicellulose and lignin fractions. An alkaline pre-extraction before pulping or black liquor removal during pulping can permit use of the hemicellulose and lignin fractions for higher value fuels and chemicals. Extracted and solubilized hemicellulose and lignin exhibit different functionalities due to their chemical alteration from the original biopolymer. Recovery of the soluble biopolymers from the pretreatment liquors can be accomplished through solubility-based separations such as adjusting the pH or the addition of an organic solvent to precipitate and recover a fraction of the hemicellulose and/or lignin from the liquid phase. The recovered hemicellulose sugars can be either acid or enzymatically hydrolyzed and fermented to, for example, liquid transportation fuels with the advantage that these polymeric hemicelluloses are separated from other soluble inhibitors of fermentation from the liquid phase. Specifically, this poster will present preliminary data on the properties of these extracted biopolymers, how the extraction conditions affect these properties, and how these properties and affect their recovery from solution.

On the Role of Buried Charge in Protein Stability or How to Make Thermophilic Proteins from "Normal" Proteins with a Potential Application to Bioenergy

Nicholas A. Sawyer, Jack D. Leo, Ekta K. Makwana, Adrian Goldman, Douglas Eveleigh, and **Peter C. Kahn**

All non-covalent interactions in biological systems are strongly influenced by water, as these interactions displace water of hydration. This includes, among others, substrate & inhibitor binding to enzymes and

protein conformational stability. We have analyzed the solvent exposed surface area of 124 well-resolved proteins spanning a wide range of sizes and found that many more charged atoms are buried in the protein interior than previously believed (Kajander *et al.* 2000, *Structure* 8: 1203-1214). Such burial upon folding carries a free energy cost and contributes a normally destabilizing component to the balance of forces involved in native protein stability. Replacement of a buried charged aspartic acid by neutral asparagine led to a 4.2 C increase in stability. We are applying these ideas to CelB2 a cellulase from *Streptomyces lividans*, a well characterized soil microorganism. The wild type gene has been expressed in *E. coli* and found to be catalytically active. Four mutants in which negatively charged residues have been replaced by their neutral analogues have been made and are also catalytically active. Preliminary results on stability will be presented.

Contrasting Soil Carbon Sequestration by Soybean and Canola

Roger Koide

Replacing petroleum diesel with biodiesel can theoretically reduce net CO_2 emissions primarily by photosynthetic recycling of CO_2. Carbon (C) sequestration in the soil during the growth of the biodiesel feedstock crop also contributes to a reduction in net CO_2 emissions. Currently the most valuable domestic biodiesel feedstock crop is soy. In Europe and Canada canola (rape) is a more important oilseed crop. One major difference between the two crops in terms of soil C sequestration is that soy forms a mutualistic symbiosis with mycorrhizal fungi while canola does not. Mycorrhizal fungi may contribute to soil C sequestration in three ways. First, the fungal hyphae occur in very high concentrations in the soil. Second, hyphal entanglement stabilizes soil aggregates, which may stabilize organic matter against rapid decomposition. Third, hyphae of arbuscular mycorrhizal fungi produce the glycoprotein, glomalin, which may combine with tannin-like compounds to form a very resistant form of organic matter that only slowly decomposes. Thus, we hypothesize that soy, which is mycorrhizal, will sequester C in the soil better than canola. Mycorrhizal fungi influence production systems in other ways as well. Following a nonmycorrhizal crop such as canola, the populations of mycorrhizal fungi may be diminished, and this may have negative consequences for subsequent mycorrhizal crops. In this presentation I focus on the effects of canola and soy on a subsequent crop of corn.

Soil organic matter concentration was not significantly reduced following canola compared to soy. Therefore it is unlikely that soil carbon sequestration will be significantly reduced after a single year of canola compared to soy. However, compared to soy, canola significantly reduced mycorrhizal fungal populations, which may have resulted in reduced P uptake and yield in a subsequent corn crop.

Development of an Integrated Anaerobic Digestion System (iADs) for Methane Production from Organic Waste

Yebo Li

Liquid Anaerobic Digestion (L-AD) is usually operated with a total solid concentration of 0.5% to 13% and a liquid effluent need is produced. Solid state anaerobic digestion (SS-AD) generally contains 20-55% total solids (TS), so it can treat more organic waste in the same size reactor and produce a compost-like finished material. However, the SS-AD process requires large amounts of inoculation materials, up to five parts digestate to one part fresh feedstock, and supplementation of nitrogen when lignocellulosic biomass is used. We have developed an integrated anaerobic digestion system (iADs, OSU patent pending)

to address these issues of L- AD (liquid effluent handling) and SS-AD (recycle large amount of digestate for inoculation) via using effluent of L- AD to inoculate fresh feedstock for SS-AD. Key factors (liquid effluent/corn stover ratio, solid content of feedstock, alkali loading for pretreatment, temperature) affecting the performance of iADs was studied in this project. The results indicated the optimal effluent/corn stover ratio of the substrate ranges from 4:1 to 6:1. Pretreatment of corn stover with 5% NaOH (dry basis) at room temperature for 24h caused a 32.6% increase in biogas production at 37°C. The degradation ratio of the substrate reached 42%.

Enzymatic Hydrolysis of Ammonia Fiber Expansion (AFEX) Treated Corn Stover Using Different Enzyme Cocktails

Liang Zhang, Xiaorui Niu, Ying Liu, Yan (Susie) Liu, **Wei Liao**

A three-way completely randomized design (CRD) was used to study the deconstruction effects of enzyme cocktails of cellulase, xylanase and β-glucosidase on ammonia fiber expansion (AFEX) treated corn stover. Three levels of cellulase (1, 2.5 and 5 unit/g AFEX fiber), xylanase (1.15, 2 and 3 unit/g fiber) and β-glucosidase (1.68, 2 and 2.5 unit/g fiber) were applied on 5% of AFEX to produce sugars at 50°C. Samples were taken each day for totally 4 days to analyze the sugar profiles by HPLC. A numerical model was developed to simulate the sugar conversion as a function of variables of enzyme ratio and dose and hydrolysis time. Model verification was conducted using three enzyme cocktails: Accellulase 1500, enyzmes produced from AFEX-treated corn stover medium and chemical defined medium using pelletized *Trichoderma reesei* ATCC 56765. Comparison of synergistically enzymatic hydrolysis of AFEX-treated corn stover with those enzyme cocktails was conducted as well.

Square Bale Densification and Relevant Logistics Studies

Jude Liu

Low bulk density is the main roadblock of reducing bale handling costs. Bale densification was studied. A commercial baler can produce bales with different densities; but, its density is not high enough. To optimize the energy needed to densify a bale, two different studies are being conducted: (1) To quantify the energy requirements of increasing the bulk density of large square bales of swichgrass through a range of densities achievable by a modern large square baler, and (2) to measure energy consumption of compressing large square bales using a commercial compressor. Initial results indicated that fuel consumption went up from 4.6 gallon/hr to 5.8 gal/hr if increasing the bale density from 9.8 lb/ft^3 to 13.8 lb/ft^3 for alfalfa hey; a bale compressor w/slicer operated at 0.1104 hours per ton and 0.5435 gallons of fuel per ton to compress a large square bale to 18.2 lb/ft^3. Effect of initial bale density on the fuel consumption of bale compression needs to be studied.

Three harvesting systems were evaluated and the results were utilized to create a computer model of harvesting and transporting switchgrass to a plant. Chopped loose grass, round and large square bales were three options.

High-throughput Cellulase Engineering via P-gel

Dan Luo

Enzymatic conversion of natural cellulose, in particular, non-food/biomass cellulose, to bioethanol will have great impact on alternative and renewable energy development, local economy, and environment protection. However, economical production of bioethanol from cellulosic biomass is currently impeded by the high cost and low efficiency of cellulase complexes. We are focused on using directed evolution to engineering cellulase complexes. The greatest advantage of directed evolution is that it is independent of knowledge of enzyme structure and of the interactions between enzyme and substrate. Recently, we have developed a novel hydrogel (termed P-gel) which can efficiently produce proteins without any living cells. Our P-gel system is totally cell-free and entirely based on chemical reactions, thus it is ideally suited to express protein complexes without worrying about the toxic effect to or low-yield problems in living cells. Combining the molecular evolution approach with our P-gel, we are engineering cellulase complexes in a high-throughput fashion via the microfluidic and robotic format. We have obtained preliminary data in obtaining a robot, procuring the genes, preparing the biomass substrates, and more importantly, created prototype of microfluidics that can be manipulated by a robot. Expression of proteins in a high-throughput manner is ongoing.

Anaerobic digestion of dairy manure by a temperature-phased anaerobic digestion system (TPAD)

Wen Lv, Abhay Koppar, Floyd Schanbacher, and Zhongtang Yu

In this study we assessed dairy manure digestion using a temperature-phased anaerobic digestion (TPAD) system. This system consists of a thermophilic first phase and a mesophilic second phase, with working volumes of 1L and 2L. The thermophilic digester was inoculated with a cellulolytic enrichment culture that was previously enriched at 55°C. The TPAD system was fed with manure slurry containing 13% total solid (TS) in fed-batch mode at 8.74g TS/L/d and operated at a 15-day hydraulic retention time (5 days for the thermophilic and 10 days for the mesophilic phase). The thermophilic digester produced approximately 1 L biogas/L/day, while the mesophilic digester yielded 2.6 L biogas/L/day. When the thermophilic digester was operated at 50°C, 55°C, or 60°C, the overall biogas production was similar. The methane content of the biogas ranged from 41.7% to 68.6% for the thermophilic and from 64.7% to 72.4% for the mesophilic phase. Overall, total solid was reduced by ~30%, while volatile solid by ~37%. The ammonia concentration in the mesophilic phase averaged 350 mg N/L, while the concentration in the thermophilic phase averaged 500 mg N/L, but increased to 580 mg N/L when operated at 50°C. Digestate samples are being analyzed for short-chain fatty acids.

Modeling the Cost of Using Mechanized Systems for Woody Biomass Harvests

Marc McDill

In the northeastern United States, woody biomass is increasingly being used as a source of renewable energy. However, highly mechanized logging systems requiring substantial capital investments may be needed to meet production needs. We collected detailed operational cost data from four mechanized harvest operations that implemented three silvicultural treatments: two thinnings, a shelterwood harvest and a clearcut. Data collected from the harvest operations, knowledge from industry professionals, and existing

literature, were used to develop a harvest cost model to estimate the cost of woody biomass production from a variety of sites.

Advanced Biofuels using Ozone Mediated Technology

Ramani Narayan

The presence of double bonds (unsaturation) in fatty acid methyl esters (FAME) of vegetable oils, like soybean, and the relatively high average molecular weights (MW) affect the thermo-oxidative stability, flow and compatibility of biodiesel compared with a petroleum-based diesel. This project targets production of new, advanced biofuels with enhanced thermal and oxidative stability, improved low temperature properties, low viscosity, and high volatility. This is achieved by reacting the double bonds in the fatty acid esters with ozone and an alcohol under base catalysis to yield esters. Preliminary data indicate that the oxidative stability of the new esters and di-esters product mixture is drastically improved once the double bonds are eliminated. The thermal stability in air even at elevated temperatures is greatly improved. Furthermore, the lower molecular weight mixture has similar viscosity and volatility to petroleum Diesel #2 fuel.

The low MW fragments are expected to lower the cloud point and pour point. Furthermore, the ozonation process enriches the oxygen content making the product suitable as fuel oxygenates, improve fuel economy and reduced harmful air emission. These new biofuels are non-toxic and readily biodegrade in the environment.

Thermochemical Biomass Conversion – State of the Technology

Chris Saffron

Thermochemical technologies for biomass conversion are increasingly being considered for fuels and chemicals production. These technologies use heat in the absence or limited presence of oxygen to transform reactant biomass into desired products. Pyrolysis, gasification and torrefaction are examples of thermochemical technologies that are either being practiced or considered for implementation. Historically, adoption of thermochemical approaches has been hindered by the quality of the product. Biomass fast pyrolysis produces high yields of a liquid, known as bio-oil, which can potentially be converted into transportation fuels. Because bio-oil is corrosive to metal surfaces, it requires upgrading to improve fuel properties prior to storage and internal combustion. Gasification typically occurs in a limited oxygen environment to produce gas mixtures rich in carbon monoxide and hydrogen which can be subsequently converted to heat and power or transportation fuels. However, producer gas from gasification contains ash and tar that limit the subsequent production of liquid fuels by solid catalysts. Torrefaction is a mild pyrolysis that is used to create a solid fuel with improved combustion and storage properties, though at the expense of bulk density. Through the combined efforts of industry and academia, new strategies are being investigated to address these barriers.

Yield, Quality and Time of Harvest of Tall Wheatgrass for Biomass Energy

Paul R. Salon, Tibor Horvath, Martin van der Grinten, and Hilary Mayton

The use of perennial grass for energy production is a sustainable alternative to annual crops and provides many ecosystems services. Two tall wheatgrass studies were established on 9/4/07 in Corning, NY on a

Unadilla silt loam soil and evaluated in 2008 and 2009. A cultivar yield trial was conducted with tall wheatgrass varieties; 'Alkar', 'Jose', 'Largo' and 'Szarvasi-1', intermediate wheatgrass 9051920 and 'Bellevue' and 'Chiefton' reed canarygrass. The grasses were managed under a two cut harvest regime, and fertilized twice per year with 74 kg/N/ha. The second study evaluated first cutting dates with two varieties of tall wheatgrass 'Alkar' and 'Szarvasi-1', fertilized once per year with 84 kg/N/ha. The cutting dates started on 7/3 and continued approximately once a week for four weeks. Chemical analysis for fiber, ash and minerals was conducted in 2009. In the cultivar yield study the wheatgrass yields were comparable to the reed canarygrass, with average yields of both grasses for both years of 11.2 Mg/ha (5.0 t/a). In the tall wheat grass time of cutting trial 85% of the total yield was obtained from the single cut system in the last week of July with an overall average yield for both years of 9.9 Mg/ha (4.4 t/a). The late July cutting date is compatible with ground nesting bird management and occurs at a time with easier drying and harvesting. The chemical analysis showed trends of decreasing K (1.0%), Cl (.15%) and Ash (3.4%) with later cutting dates perhaps due to senescence and lower leaf:stem ratios.

Assessment of Commercial Enzyme Preparations for Saccharification of Pretreated Perennial Biomass

Deborah Sills

Ethanol production from lignocellulosic biomass must accommodate feedstocks that vary regionally and seasonally. To what extent must hydrolysis conditions be customized to such variations? This question was addressed through studies with two perennial biomasses — switchgrass and a low-impact, high-diversity (LIHD) mixture of 32 different species grown together. Each biomass was subjected to two pretreatment regimes— a representative alkaline and a representative acidic. Enzymatic hydrolysis was conducted with various loadings of commercial cellulase and β-glucosidase (Spezyme CP and Novozyme 188) and two hemicellulase preparations (Multifect Xylanase [MX] and Mulifect Pectinase). The base-case hydrolysis reaction was operated with cellulase and β-glucosidase only, at a loading of 7 mg protein per g TS. Four-hour glucose yields were consistently higher for pretreated LIHD compared to pretreated switchgrass at all enzyme loadings for both pretreatments, suggesting that the cellulose in LIHD was more accessible and/or digestible than the cellulose in switchgrass. Addition of MX or additional cellulase and □-glucosidase to the base-case reaction resulted in similar improvements of 72-h glucose yields for both alkaline pretreated biomasses, suggesting that there is no need to customize enzyme mixtures for switchgrass and LIHD.

Hydrogen, Natural Gas, Electricity, and Heat from Landfill Gas: Integration of Emerging Technologies for a Quad-Generation Demonstration Project

David R. Specca

Utilizing landfill gas (LFG) for bioenergy production is difficult. Not only is the gas saturated with water and high in hydrogen sulfide, it also contains contaminants from a list of over 300 troublesome chemicals, including siloxanes, which can impair or disable equipment operation. Despite these challenges, a robust LFG cleanup system, invented and developed by Acrion Technologies, Inc. (Acrion), has been demonstrated at the Rutgers EcoComplex to clean LFG to acceptable levels for the Fuel Cell Energy, Inc. (FCE) molten carbonate fuel cell. Acrion's smallest commercial scale LFG cleanup system treats 300 standard cubic feet per minute (scfm) of raw LFG at 50% methane content to produce 150 scfm of clean methane - enough methane to power the fuel cell (approximately 50 scfm) and produce compressed natural

gas (CNG) for transportation fuel (approximately 100 scfm or about 1150 gasoline gallons equivalent per day). FCE's 300 kW molten carbonate fuel cell can produce up to 150 kg per day of excess hydrogen gas that can be captured, cleaned, compressed, and dispensed as transportation fuel using proven Linde, Inc. technology.

The overall objective of this project is to perform an Engineering, Environmental, and Economic Analysis of an integrated system of these emerging technologies that will utilize landfill gas to produce hydrogen, compressed natural gas, carbon dioxide, electricity and heat.

Specific objectives include;

1. Develop a Process Flow Diagram (PFD) for the complete integrated system under various operating scenarios.

2. Quantify process material and energy balances.

3. Define engineering requirements to maximize system reliability.

4. Define the optimum size for the demonstration project.

5. Based on the above, size key equipment, determine equipment cost, and establish capital and operating expense.

6. Calculate and summarize Greenhouse Gas (GHG) reductions as compared to fossil fuel based equipment.

7. Based on present product values, establish revenues and project payout.

The final product will be a report that can be used by project developers for financing and constructing a demonstration system at the Rutgers EcoComplex and for commercializing the integrated system at landfills and anaerobic digesters throughout the US. The EcoComplex will utilize electricity and heat from the fuel cell and the excess electricity will be exported to the local power grid. The EcoComplex's close proximity to Interstates 95 and 295 makes it an ideal location to dispense fuel for the proposed "Route 95 Hydrogen Highway". LFG and anaerobic digester gas are abundant, renewable fuels in the Northeastern USA. Transportation fuels produced by this system will reduce GHG emissions through cleaner burning engine technology, as compared with gasoline and diesel engines, and reduce dependence on imported oil.

The Dimensions of Biofuel Demand

Mario Teisl

Understanding the role expectations and knowledge play in affecting consumer demand for new products is a key step in improving the effectiveness of product introduction. Current studies indicate consumers differ in their acceptance, and willingness to pay for, 'green' products but consumers lack information on the options available or hold erroneous preconceived notions regarding product attributes. We expand this literature by examining the characteristics that differentiate consumer segments in the market for biofuels.

New England consumers vary widely in their attitudes towards, and knowledge of, biofuels and biofuel attributes. Additionally, consumer concern regarding environmental degradation, nation security and local economic impacts differ across geographic regions and by the amount of experience consumers have with

ethanol. Consumers' perceptions of the benefits/risks associated with biofuel production and use impacts their demand for biofuels (e.g., consumers who place a higher value on fuels that decrease global warming are more likely to purchase biofuel). These attitudes and values vary by geographic region and by individual characteristics.

In total, the results show the importance of underlying attitudinal factors, and individual's priors of biofuels and related issues (e.g. energy and economic security and environmental impacts) in driving the demand for biofuels with specific attribute profiles (e.g., cellulosic biofuels are preferred to corn-based ethanol and gasoline alone). We conclude with specific recommendations to increase the effectiveness of materials aimed at educating consumers/policy makers about products.

FuelSmart II: A Biofuel Education Outreach Tool

Mary Wrege

Fuelsmart II's proposed work is to: (1) Prepare Extension educators with a research-based, critically reviewed package of information that is ready for electronic presentation and distribution to meet the growing need for sustainable biofuels knowledge in their communities and to (2) provide a new cellulosic ethanol biofuel electronic knowledge base package targeting grades 7-12 that is aligned with sate learning standards, and delivered using interactive whiteboard (IWB) technology.

Cornell University developed a teaching board game "Biofuels: Race to the Pump" in 2006. The "original" board game followed the path of biomass conversion by moving biomass feedstock-carrying, hand-held toy pick-up trucks through the steps from the field, through chemical conversions, to the markets.

While attractive to children and the general public, the extra effort in learning, understanding, and explaining the pathways proved to be challenging for most educators. The PI viewed these challenges, doubled with the extra work involved in constructing the game pieces, to be significant barriers to the "game's" success and use. Ms. Wrege and team is adapting the board and the content to improve its ease of use, adding narration and electronic delivery, thus making it adaptable for use with different audiences. Wrege's proposal to build on this tool, includes enhanced applications to the classroom using module lessons that will be aligned with state learning standards, thus making it easy to integrate and immediately available for educational purposes.

Presentation Abstracts

Renewable Fuels Roadmap and Sustainable Biomass Feedstock Supply for New York State

Ms. Judy Jarnefeld, New York State Energy Research and Development Authority (NYSERDA)

Produced following a recommendation of Governor David Paterson's Renewable Energy Task Force, the *Renewable Fuels Roadmap and Sustainable Biomass Feedstock Supply for New York State* was developed to help guide state policy on renewable fuels for the New York State Energy Research and Development Authority (NYSERDA), the New York State Department of Environmental Conservation (NYSDEC), and the New York State Department of Agriculture and Markets.

The Roadmap evaluates the future of biomass and liquid biofuel production for transportation purposes in New York State in order to address increasing greenhouse gas emissions as well as independence from petroleum usage. It presents a snapshot of New York's current biomass production, including agricultural products and forest products and addresses biomass feedstock inventory; land uses; transportation and distribution infrastructure; competing uses for biomass; and biofuel conversion technologies.

Northeast/Mid-Atlantic Low Carbon Fuels Initiative: Status Update

Matt Solomon, Mobile Source Analyst, NESCAUM

Status update on the 11-state effort to develop a low-carbon fuels program for the Northeast and Mid-Atlantic regions. Indirect land use change (iLUC), which has been identified as a key contributor to total lifecycle GHG emissions for some fuel pathways, can result when feedstocks are diverted from existing markets to biofuels production. Additional research is needed to identify and quantify the impacts on existing markets of specific regional waste and biomass fuel pathways.

Transportation, Distribution, and Infrastructure Roles in Bioenergy Pathways

Dr. James J. Corbett, Professor in the College of Earth Ocean and Environment, University of Delaware

This presentation will discuss infrastructure issues related to transportation and distribution of biofuel feedstock, intermediate products, and finished products. Transportation and distribution is a necessary element of the total fuel cycle for biofuels pathways that may provide direct impacts on congestion, emissions and air quality, and resource investments. Considering ways to utilize transportation services to meet the demand for sustainable production of biofuels may involve innovative combinations of infrastructure, transportation energy (fuels), technology, operating practices, and logistics. Fundamental transportation concepts applied in the context of biofuels pathways will be overviewed forbroad discussion.

Perspective on the State of the Biofuels Industry in the U.S.

Mr. Zia Haq, Senior Analyst, U.S. Department of Energy

The U.S. Department of Energy (DOE) is actively involved in funding research, development, and deployment of biofuels production technologies. This presentation will provide an overview of DOE's biofuels activities and one perspective on the potential future of this industry. The DOE program is focused on a variety of fuels including ethanol and renewable jet fuel/diesel/gasoline. The feedstocks of interest are lignocellulosic waste materials, sustainably grown energy crops, and algae. A variety of scales and conversion technologies are being tested in partnership with industry. In addition, the national laboratories are involved in two consortia (algae and advanced hydrocarbon compatible biofuels) to develop the next generation conversion technologies. Biofuels are being developed in the context of broader greenhouse gas reduction

and energy security goals. The program is guided by sustainability and analysis activities and highlights of these tasks will be presented.

Northeast Regional Renewable Energy Policy and its Impact on Biofuels Development

Nathan L. Rudgers Senior Vice President Director, Business Development Farm Credit East

Regional renewable energy stakeholders, including 25x'25, have long called on federal and State policy makers to adopt a stable, long-term and comprehensive plan that will assure America's global leadership in the pursuit of a clean energy future. So, it was with considerable disappointment that we continue to see that efforts to introduce legislative proposals with the potential to get all parties back to the table to talk about energy and climate solutions, including those from the land, face delays.

There is still time for wise leaders in Washington and our Northeast State Capitals to take deliberate and thoughtful action and put in place a comprehensive long term national energy plans that will reduce our dependence on foreign oil, improve our environment and boost our economy.

The signs that our energy security remains threatened are obvious and foreboding. Gas prices are moving back to $3 per gallon. Instability in the Middle East and our dependence on oil from that region and other parts of the world hostile to U.S. interests underscore our vulnerability.

My discussion will focus on the need for effective policy which provides stable market signals for biofuels developers, allows for the deployment of underutilized land resources in a rational manner, and provides focus on the reality that biofuels are major part of Northeastern US clean energy solutions, not a part of the problem.

Biofuel Industry Economic Impacts and Analysis

David Swenson, Associate Scientist, Department of Economics, College of Agriculture, Iowa State Univ.

My contributions to the NYSERDA Roadmap involved compiling potential regional and statewide economic impacts that would be reasonably expected were different advanced biofuels scenarios to evolve in New York.

New biofuels industrial activity in a region or state creates an overall economic impact that is greater than the sales value of the biofuels. Advanced biofuels production in New York will create jobs at the biofuel refineries, but more importantly, it will create new jobs producing, pre-processing, and transporting feedstocks to the plants. Commercial scale advanced biofuels industries, however, do not currently exist in the U.S.; hence, the potential job, labor income, and value added impacts for all new sectors of productivity needed to be estimated using an input-output modeling process that introduces several new categories of industrial activity into the New York economy. This research relied greatly on other work conducted by the Roadmap Team, to include feedstock yield, prices, transport costs, capital cost assumptions. In compiling and reporting the results, this research explains the modeling processes, the inherent assumptions deployed, and limits to the analysis.

Presentation Abstracts

Attitudes and Attributes: What Determines Fuel Choice?

Dr. Mario Teisl, Professor, School of Economics, Director, School of Policy and International Affairs, University of Maine

Understanding public preferences and behaviors related to energy consumption is important in multiple realms. Firms may want to maximize consumer demand for their particular type of biofuel while policymakers may want to maximize the production and use of biofuels that minimize global warming gases or maximize local economic benefits. As attitudes are commonly linked to intentions and behavior, their involvement in determining fuel choice may be important to consider in conjunction with the attributes of the fuels. Our objective is to determine how consumers' characteristics affect the demand for biofuels which vary in their economic and environmental attributes, and ascertain consumer awareness of these differences.

Costs and Returns of the Production of Warm Season Grasses for Direct Combustion

Dr. Zane Helsel, Professor and Agriculture Energy Specialist, Department of Plant Biology & Pathology
Dr. Robin Brumfield, Department of Agricultural, Food and Resource Economics, Rutgers, The State University of New Jersey

We developed native perennial grass (switch grass, specifically) production budgets for Northeastern producers considering pelletizing biomass for sale or on farm use to replace purchased fuels. Variables include costs of the establishment and established years of production, irrigated versus non-irrigated stands, and wholesale and retail sales. Sensitivity analyses compare the impacts of changes in prices and yields.

Our initial results show that on-farm production as a replacement for purchased fuel is more profitable than selling pellets, simply because of the pricing structure. Farmers who producing their own fuel reduce the price risk of inputs by knowing what their fuel costs will be. Adding energy production to their businesses may help producers spread their overhead costs over more of the year as well as extend employment opportunities. Smaller growers who do not want to invest in the capital equipment may be able to custom hire the pelletizing. Or, if they simply want to farm and not take market risks, they may function as contract growers and sell their biomass crops. Some farmers manage land planted with warm-season perennial grasses for wildlife habitat, and periodically selling the biomass will give them another income outlet.

Feedstock Production Potential and Greenhouse Gas Balance in the NE Sun Grant Region

Peter Woodbury, Senior Research Associate, Department of Crop and Soil Science, Cornell University

Society is demanding increased production of diverse products and services from our agricultural lands, including clean air, clean water, food, feed, fiber, and recently feedstocks for bioenergy. There is great interest in various forms of bioenergy, all of which will require dramatically increasing sustainable feedstock production. We used geospatial and other modeling approaches to integrate data from remotely-sensed land cover, agricultural production, and field trials of dedicated feedstocks such as switchgrass and short-rotation willow. We analyzed land availability and suitability and potential feedstock production throughout the conterminous US. We are also conducting increasingly detailed analyses for the Northeastern Sun Grant region (Michigan to West Virginia to Maine), and for New York State. Results will be discussed in the context of current trends in agricultural production and the interest in reducing greenhouse gas emissions while maintaining air, soil, and water quality.

Presentation Abstracts

Potential Supply of Woody Biomass from Forests in NY

Dr. Timothy Volk, Senior Research Associate, State University of New York, College of Environmental Science and Forestry

The development of sustainably produced, reliable and consistent supply of biomass as a feedstock for biofuels, bioproducts and bioenergy is a critical national priority due to concerns about energy security, environment and human health, rural economic development, and the need to diversify products and markets for forestry and agriculture. Biomass feedstocks can come from a variety of sources including forests, agricultural crops, various residue streams, and dedicated woody or herbaceous crops. The feedstock assessment portion of the NY Renewable Fuel Roadmap looked at a range of these biomass sources, one of which was forest biomass. As part of this assessment, multiple restrictions and limitations were identified and applied. The study estimated that the sustainable level of woody biomass that could be harvested from NY forests on an annual basis was between 4.8 – 6.4 million odt. This is over and above the harvesting that currently occurs for traditional wood products in NY. This represents between 44 and 51% of the potential annual biomass supply from all sources in NY.

Hydrogen, Natural Gas, Electricity and Heat from Landfill Gas

Mr. David Specca, Assistant Director for Bioenergy Technologies, Rutgers EcoComplex, Rutgers, The State University of New Jersey

Solid Waste is an abundant resource for bioenergy production in the Northeast. Some of the advantages of solid waste feedstocks include; year round supply, existing collection and delivery infrastructure, low or negative feedstock cost, and avoided environmental impacts from diversion from landfills. The disadvantages of its use, such as being comingled with plastics, glass and metals, can be overcome with new and existing technologies and policies that encourage separating the materials at the source. This presentation will examine the quantity of solid waste materials available within the Northeast and identify opportunities for bioenergy projects that combine agricultural and forest materials with solid waste feedstocks for improved profitability.

Thermochemical Biomass Conversion - State of the Technology

Dr. Chris Saffron, Assistant Professor, Department of Biosystems and Agricultural Engineering and Department of Forestry, Michigan State University

Thermochemical technologies for biomass conversion are increasingly being considered for fuels and chemicals production. These technologies use heat in the absence or limited presence of oxygen to transform reactant biomass into desired products. Pyrolysis, gasification and torrefaction are examples of thermochemical technologies that are either being practiced or considered for implementation. Historically, adoption of thermochemical approaches has been hindered by the quality of the product. Biomass fast pyrolysis produces high yields of a liquid, known as bio-oil, which can potentially be converted into transportation fuels. Because bio-oil is corrosive to metal surfaces, it requires upgrading to improve fuel properties prior to storage and internal combustion. Gasification typically occurs in a limited oxygen environment to produce gas mixtures rich in carbon monoxide and hydrogen which can be subsequently converted to heat and power or transportation fuels. However, producer gas from gasification contains ash and tar that limit the subsequent production of liquid fuels by solid catalysts. Torrefaction is a mild pyrolysis that is used to create a solid fuel with improved combustion and storage properties, though at the expense of

bulk density. Through the combined efforts of industry and academia, new strategies are being investigated to address these barriers.

Biophysical Considerations Bearing on Increasing Stability and Catalytic Activity of Enzymes for Biomass Conversion

Dr. Peter Kahn, Professor, Department of Biochemistry and Microbiology, Rutgers, The State University of New Jersey

Considerable effort has been devoted over many years to increasing the catalytic efficiency of enzymes which could be used to convert biomass to industrially useful feedstocks. Much effort has also gone into understanding the structural bases of protein conformational stability, as industrial processes are more efficient at high temperature. The literature on enzymes from thermophilic microorganisms, for example, is large and growing. Less abundant are studies linking amino acid sequence differences which affect stability with effects on catalytic activity. There is a trade-off between these. Increased stability usually comes at the cost of less conformational flexibility and thus of less efficient catalysis. Our understanding of the structural connections between these is limited, making escape from the constraint difficult. Potentially useful approaches will be outlined.

Dinner Program Keynote Address: New York State Agriculture's Role in an Energy Constrained Future

Patrick Hooker, New York State Agriculture Commissioner

Hydrogen production from α-1,4 and β-1,4 linked Saccharides by Deep-Sea Hyperthermophilic Archaea

Dr. James F. Holden, Associate Professor of Microbiology, University of Massachusetts Amherst

Twenty strains of hyperthermophilic (growth temperature optimum > 80°C) heterotrophs from marine hydrothermal environments grew on cellobiose- (beta-1,4-diglucose), maltose-(alpha-1,4-diglucose), and peptide-only medium and produced hydrogen gas when elemental sulfur was present. Ten strains contained genes for extracellular starch degradation, but only one strain, Pyrococcus furiosus, contained a gene for an extracellular cellulase. P. furiosus was serially adapted to growth on 0.5% (w/v) cellulose powder CF11 and 0.01% (w/v) yeast extract without sulfur with concomitant hydrogen production. There was a linear relationship between hydrogen produced and cell concentration with 20-25 fmol of hydrogen produced per cell per doubling. The maximum cell concentration and total amount of hydrogen produced doubled when cultures were stirred during growth. P. furiosus did not grow when Avicel and SolkaFloc were tested as sources of cellulose. These results suggest that P. furiosus and other hyperthermophilic heterotrophs may be suitable for hydrogen production in a single, large-scale processor using polysaccharide- and protein-containing compounds as a feedstock.

Presentation Abstracts

Re-imagining Northeast Farms and Forests for Sustainable Bioenergy

Dr. Thomas Richard, Professor, Department of Agricultural and Biological Engineering, Pennsylvania State University

The last two years have seen serious critiques of previous assumptions about the nature and scale of a sustainable biomass feedstock supply. Issues of soil carbon, indirect land-use, and competition with food and feed have driven many of those concerns. In response, attention has focused on a handful of strategies that can produce large quantities of biofuel feedstocks without negative impacts on food production or the environment. Our project investigated three such strategies: dedicated energy crops on abandoned and marginal land, intensified management of natural forests, and the integration of energy double crops in the open windows between summer annuals like soybeans and corn. In much of the Northeast a range of energy double crops (e.g. rye, barley, canola) can be grown in that winter window with minimal impacts on the summer crops.

A Review of Five Years of Commercializing Biobased Products with Ohio Agricultural, Chemical and Polymer Industries

Mr. Dennis Hall, Assistant Director, Ohio BioProducts Innovation Center

Established in 2005, OBIC has helped Ohio companies by integrating academia and industry towards development of renewable specialty chemicals, polymers/plastics and advanced materials. The Center operates on a market-pull business model linking core research capabilities and product development towards commercialization of bioproducts representing a value proposition to industry members. The alliance builds on the strength of Ohio's agriculture and polymer industry sectors. Strong advocacy by OBIC alliance members has led to significant recognition across the public and private sector relative to the importance of bioproducts. OBIC key capabilities and Cell to Sell® innovation process exist as a resource for companies and scientists interested in accelerating the commercialization of high-value co-products from biobased industries such as food, fuel, and energy.

Ecomagination and the Sustainable Energy Advanced Technology Program: GE's Commitment to Cleaner Technology Development

Tiffany Westerdorf, Chemical Engineer, GE Global Research

In the 5 years since GE launched its Ecomagination initiative, the company has made significant progress toward its aims of growing its portfolio of environmentally friendly technology solutions, and of driving awareness that improving environmental impact is good for business. A critical component of this initiative is investment in research and development of cleaner technologies. GE has invested a total of more than $4 billion since the inception of the Ecomagination program, much of which funds research at its four Global Research Centers, located in Niskayuna, NY; Shanghai, China; Munich, Germany; and Bangalore, India. In this session, an overview of GE's Sustainable Energy Advanced Technology program activities will be discussed, with focused attention to its activities in biomass utilization and biofuels development. Through these activities, GE researchers strive to create technologies that meet the rising demand for energy and generate less environmental impact.

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A critical objective of the Northeast Sun Grant Initiative is to harness and support science and engineering projects that seek to improve rural economic diversification while simultaneously reducing dependence on foreign sources of petroleum in environmentally sustainable ways. This is supported through a strong commitment to development and implementation of new technologies and biobased products into the marketplace and is also represented in the National Academies *New Biology for the 21st Century*, and the National Transportation Research Board's *America's Energy Future: Technology and Transformation*. The Northeast Region is home to over 400 companies with a specific interest in biotechnology or biobased products.