

Biofuels Center of North Carolina Annual Report

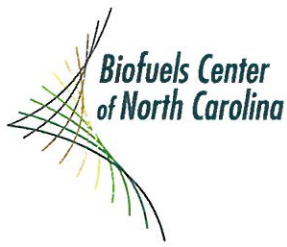
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The Joint Legislative Commission on Governmental Operations
The Fiscal Research Division

Submitting Entity:

The Biofuels Center of North Carolina



31 August 2012

To *Joint Legislative Commission on Governmental Operations and
the Fiscal Research Division*

From *W. Steven Burke · President and CEO
Remona Callair-Simmons · Vice President, Finance and Administration*

*Report on prior State fiscal year program activities, objectives, and accomplishments, and prior
State fiscal year itemized expenditures and fund sources, as per STATE-AID REPORTING
REQUIREMENTS, SECTION 14.22.(a) of Session Law 2009-451.*

SECTION 14.22.(a)(1)

PRIOR STATE FISCAL YEAR PROGRAM ACTIVITIES, OBJECTIVES, AND ACCOMPLISHMENTS

2011-2012 PROGRAM ACTIVITIES

The Biofuels Center of North Carolina undertakes activities and funds projects supporting its legislatively mandated mission: implementation of *North Carolina's Strategic Plan for Biofuels Leadership* (S.L. 2006-206) and that accelerate development of biofuels capabilities, sector, and industry statewide. To achieve the goal of the *Plan* and the policy goal of the state – that 10 percent of North Carolina's liquid transportation fuels come from biofuels grown and produced in-state by 2017 – the Center identifies annually areas of greatest need to move science, research, and feedstocks to commercialization, production, and consumer acceptance.

Center programs and activities are designed comprehensively to identify and bridge gaps in knowledge and information, speed the development of technology to industry, create a functioning continuum from agriculture to transportation fuels, and assist the activities of a growing biofuels community. Activities in total work over time to create a new technology, a large agricultural sector, national credibility and leadership as site for investment, production facilities varying in type and output, vitalization of rural communities, and economic benefit.

The task is enormously complex. With realistic ambition, North Carolina is the only state targeting long-term biofuels development through a comprehensive agency.

2011-2012 OBJECTIVE

As conveyed to the North Carolina Department of Agriculture and Consumer Services Budget and Finance Division: Grantee's Scope of Work – Attachment C on 11 December 2007.

Continue to assist universities, companies and agencies to implement the legislatively mandated (S.L. 2006-206) *Strategic Plan for Biofuels Leadership* by varied dovetailed activities: encourage and fund research; identify, verify, and conduct growth trials on new crops; encourage growth and production of biomass and feedstocks in rural areas; seek supplemental funding for research, development, and facilities; bring both entrepreneurial and national companies to the state; and ensure unified state approaches to incentives, agriculture and manufacturing production, job creation, distribution, economic analyses, public education, environmental issues, and workforce development.

2011-2012 ACCOMPLISHMENTS

Among key varied accomplishments and activities to develop a new sector statewide, under six headings:

1 · Documentation of First Four Years of Work: The Report [Four Years On and Growing Strong: Building a Biofuels Sector Across North Carolina](#)

North Carolina's strategic and policy commitment to biofuels in 2007 was particularly ambitious for a state with scant capability, few resources, and no national credibility. The activities and tasks noted above are large – and must be placed within a disciplined framework of approach and outcomes. A complicated, sustained, and economically rich biofuels sector is not created with just good intentions or scatter-shot activities.

The Center undertook a full analysis of its first four years, from initial staffing in January 2008 through early 2012. Information describes the Center's methodical approach – addressing logically the steps of societal need, science and research, new feedstocks, logistics, production and distribution, public and policy, and eventual consumers – and documented work, outcomes, and the growing community it assists. Three responsible and appropriate questions shaped the varied content:

- In just more than four years, how has the Center moved bold vision and legislative policy to reality?
- How has the Center methodically initiated its large mandate and responsibility: development of a new sector, new agriculture, new technology, and millions of gallons of biofuels?

- How have five years of legislative appropriations totaling \$19,825,000 been targeted to those outcomes?

Because key to this year's report, the 12-page document is included as *Appendix* below and is also found online at www.biofuelscenter.org/4years.

2 · Grants Awarded

Twelve grants totaling \$1,454,949 were awarded to nonprofit organizations and academic institutions across the state following a widely distributed program announcement and a disciplined peer-review evaluation process.

Funded projects to North Carolina universities and nonprofit entities addressed four main areas of determined need and emphasis:

- *Civic and Small-scale Biofuels* · Five projects awarded.
- *Future Demand on North Carolina's Woody and Agricultural Biomass Resources* · Two projects awarded.
- *Biofuels Feedstock Production* · Four projects awarded.
- *Strengthening Biofuels Commercialization, Production, and Companies* · One project awarded.

In addition, staff necessarily administered and oversaw the 48 awards, totaling \$6,906,060, made in the preceding 2007-08, 2008-09, and 2010-11 grants programs. Descriptions of all 60 funded projects are available on the Center's website home page:
www.biofuelscenter.org/grants.

3 · Targeted Projects and Accelerated Initiatives

Accelerated Initiative projects and activities incisively target needs, immediate opportunity, or resource strengthening within a statewide biofuels endeavor. Seventeen projects totaling \$1,022,025 addressed:

- Continued trial-growing and agronomic data about varied biofuels feedstocks including: the energy grasses *Arundo donax*, Giant Miscanthus, and Switchgrass; High Biomass and Forage Sorghum; and Hybrid Poplars. As North Carolina by policy will not base its biofuels endeavor on corn, identifying other appropriate crops to sustainably yield great biomass statewide is a key Center task. Work is undertaken on North Carolina's Biofuels

Campus in Oxford, at the Williamsdale Biofuels Farm in Duplin County, at research stations, and with industry partners.

- Commercial management of varied feedstocks to assess invasiveness risk, tolerance of herbicides, financial impact, and sustainability.
- Increased resources and growing at the Williamsdale Biofuels Farm in Duplin County. Funded by the Center as a partnership with North Carolina State University, the site serves for trial-growing, for demonstrations, and as nursery for energy grasses increasingly to be used for production feedstocks in eastern North Carolina.
- Matching funds to support implementation of the new Catawba County-Appalachian State University facility as a model statewide for biofuels production from local and municipal feedstocks.
- Matching funds to support curriculum and training development to improve skills of new professional loggers, necessary as biofuels production in coming years draws increasingly on forest resources as a feedstock source.

4 · Project Administration and Staff

Sixteen staff members oversaw and administered key projects, activities, and service responses for the biofuels community statewide in five main areas: administration and finance; business and production; policy and environmental issues; agriculture and forestry; and communications. Technology requirements, meetings, and the Center's headquarters on North Carolina's Biofuels Campus were supported.

Among targeted activities developed and administered in 2011-12:

TARGETED COMPANY SUPPORT: CHEMTEx INTERNATIONAL

Strategic, steady, and targeted attention has assisted Chemtex International – supporting and making feasible its intent to place in Sampson County the nation's first commercial-scale facility to convert cellulosic energy grasses to 20 million gallons of ethanol annually.

The Center has worked extensively with – and usually coordinated – varied state agencies and other entities to assist the company with feedstock analysis, development of a nursery, access to sprayfields, access to partner North Carolina financial support, a framework for

environmental responses, assistance with a necessary U.S. Department of Agriculture loan guarantee, and support from legislative, state, and congressional leaders.

The intent of Chemtex to locate in North Carolina a nationally leading facility for conversion of energy grasses to ethanol is manifest sign of growing state capacity and leadership.

COMPANY PARTNERSHIPS, RECRUITMENT, AND PRODUCTION FACILITIES

A large biofuels sector cannot grow without development, support, or recruitment of varied companies – engaged in support, feedstock growing, technology, and production. Some work within the state already; others must be developed internally or recruited to projects and eventual facilities. Bringing North Carolina's resources to the attention of national production and technology companies is a prime Center activity; until recently, the state was not seen as a lead place for biofuels development in an increasingly competitive national biofuels industry.

Private industry, now looking carefully at North Carolina's agricultural and technology capabilities, comes to the Center with questions, needs, or partnership ideas within the state. For projects, data analysis, growing, site evaluation, or production facility establishment, the Center has this year worked with or responded to companies and related entities in the broad areas of biofuels development:

Production

Chemtex International, Domtar, DuPont Cellulosic Ethanol, Rentech, TRI: ThermoChem Recovery International, Entsorga, Ineos, Gevo, Inbicon, Piedmont Biofuels, Triangle Biofuels, Blue Ridge Biofuels, Foothills Biofuels

Agriculture, Energy Crop, and Feedstock Supply Chain

Arborgen, Ceres, Chromatin/Sorghum Partners, Genera Energy, GrassRoots Biotechnology, Repreve Renewables, Weyerhaeuser, GFR, Vecoplan, Murphy-Brown, Prestage Farms, Goldsboro Milling, the North Carolina Pork Council

Technology Providers

Novozymes North America, DuPont, Agrivida, RTI International, Syngenta, HCL CleanTech/Virdia

PROJECT EASTERN BIOFUELS

Military services have a strong base presence in North Carolina, providing billions of dollars annually to state revenues. Project Eastern Biofuels was initiated to support the state's military and its mandated need for petroleum alternatives. The Project works in the short term to position the state's biofuels endeavor for military purchasing and in the longer term to produce 50 million gallons annually of bio-jet fuel for consumption at state military bases by 2015.

REGIONAL PROJECTS MERGING NEW FEEDSTOCKS AND PRODUCTION

With industry partners and N.C. State University, the Center is growing high-yield energy grasses on swine sprayfields to affirm economic gain to swine producers within prescribed waste management standards. North Carolina's swine sprayfields have attracted much commercial cellulosic biofuels and bioproducts interest based on contiguous supply chain advantages. Regulatory approval and access to the sprayfields is required before commercial development of associated advanced biofuels investments can proceed.

SECOND BIOFUELS JOB CENSUS

A second annual survey and study of biofuels jobs in 76 organizations statewide revealed that 554 North Carolinians were employed in production, technology, agency, agbiotech, forestry, research, and education settings. The data, gained from an external firm, showed an increase of 111 jobs in comparison to the 2011 jobs census. The survey verifies that biofuels is yielding jobs sooner than expected from a newly developing sector.

DEVELOPMENT OF NORTH CAROLINA'S BIOFUELS CAMPUS, OXFORD

The Center is located in Oxford on a former USDA tobacco research station turned over to the N.C. Department of Agriculture and Consumer Services in 2006. With the NCDA, the Center this year began to initiate the 10-year Master Plan largely developed in the preceding fiscal year. Three first projects are tangible and promising: completion and operation of the Oxford Biodiesel Plant, a small production facility to be particularly used by the NCDA to gain biodiesel; the Biofuels Company Accelerator, eight recently upfitted research labs available to start-up and other companies; and a large significant international company partnership project, to be likely announced in the fall of 2012.

The 426-acre Campus is the nation's only large-acreage site for biofuels development, and can over time yield an enormous competitive resource and focal point for North Carolina's biofuels endeavor. Uniquely, it provides site to place and dovetail the four main areas required for biofuels development: trial-growing, pilot and demonstration facilities, public education, and varied company research, partnerships, and projects.

5 · Communications, Education, and Public Information

Audience-directed communicational and educational activities preparing the public for North Carolina-produced biofuels included: three websites, targeting the Center, public information, and industry information; the email newsletter, *Biofuels Headline*, reaching more than 6,500 recipients nationally and internationally; grassroots outreach and education; varied materials for information and branding; and national meetings and trade shows.

6 · National Verification

Practical success and models are needed on the ground, in varied states, in a nation working for new biofuels goals, growing, and production. Two strong national verifications of North Carolina's approach were gained over the year: the requested testimony of the Center's president and CEO before the U.S. House of Representatives Subcommittee on Energy and the Environment; and the May visit to the Center and North Carolina's Biofuels Campus of U.S. Secretary of Agriculture Tom Vilsack. Commendation in his address about North Carolina's biofuels commitment approach was strong and welcome to 300 assembled state leaders and biofuels community members.

SECTION 14.22.(a)(1)

PRIOR STATE FISCAL YEAR ITEMIZED EXPENDITURES AND FUND SOURCES

Fund Source:	Amount
2011-2012 Appropriation from North Carolina General Assembly	\$ 4,500,000
2010-2011 Carry-over: Unobligated funds	\$ 606,926
2010-2011 Carry-over: Obligated funds under contract	\$ 118,919
Grant Refunds 07/08 & 08/09	\$ 94,400
Total Fund Sources	\$ 5,320,245
Expenditures:	
Targeted Projects and Accelerated Initiatives	\$ 1,022,025
Grant Program	\$ 1,454,949
2010-2011 Obligated Funds expended	\$ 118,484
Communications and Public Information	\$ 96,728
Project and Sponsored Meetings or Events	\$ 14,044
Legal and Professional Fees	\$ 66,507
Administrative staff salaries and benefits	\$ 1,514,289
Contractual Services	\$ 116,128
Travel	\$ 81,868
General and Administrative	\$ 156,682
Total Expenditures	\$ 4,641,704

SECTION 14.22.(a)(2)

COPY OF THE ORGANIZATION'S ANNUAL AUDITED FINANCIAL STATEMENT

The Biofuels Center of North Carolina will provide to the Fiscal Research Division a copy of the organization's annual audited financial statement within 30 days of issuance of the statement. The auditing firm of Boyce Furr and Company has scheduled a fiscal year 2011-2012 audit for the week of 24 September 2012.

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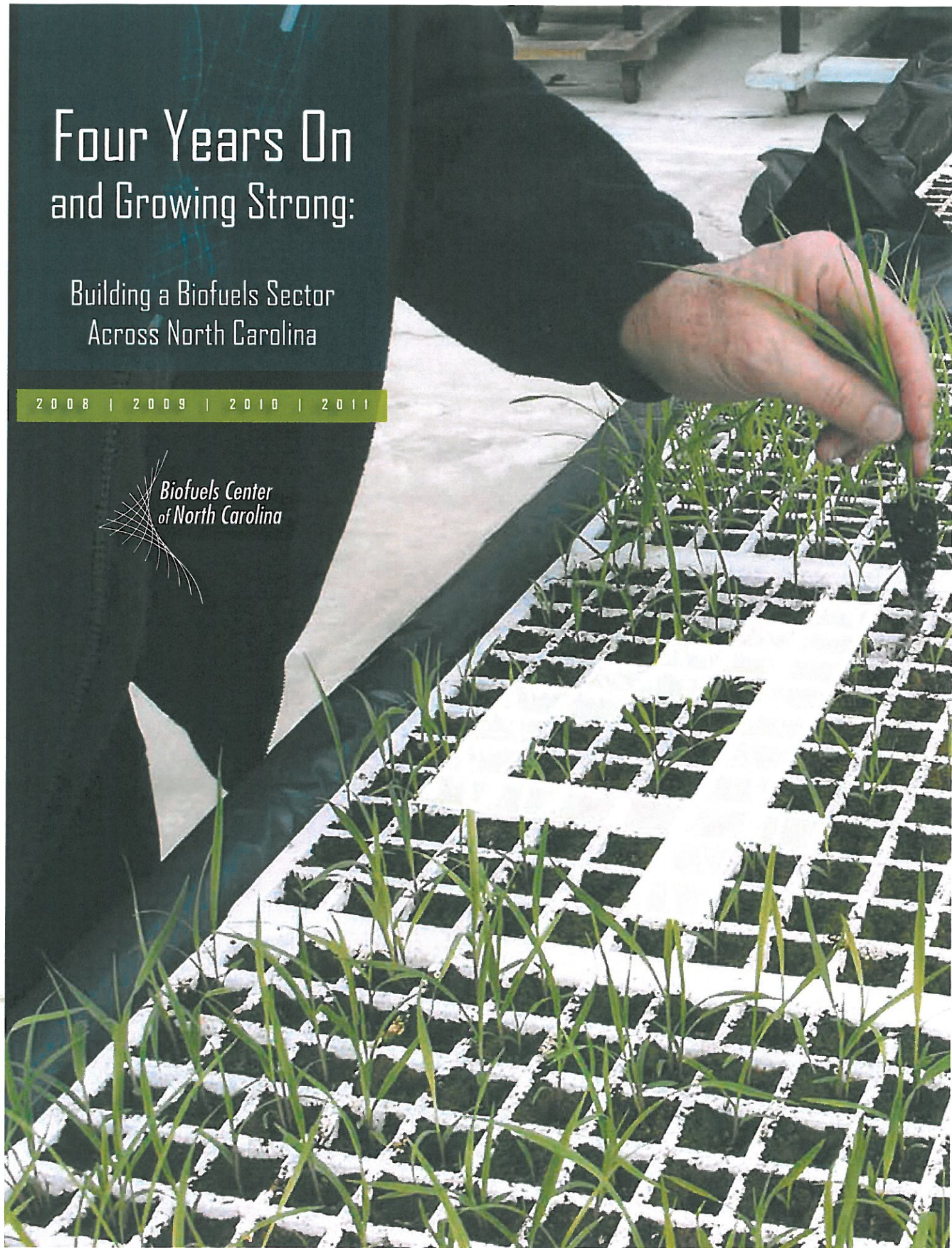
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Four Years On and Growing Strong:

Building a Biofuels Sector
Across North Carolina

2008 | 2009 | 2010 | 2011

*Biofuels Center
of North Carolina*





Building the Biofuels Sector

The Biofuels Center of North Carolina was legislatively established in 2007 and began work in January of 2008. In just more than four years, how has the Center moved bold vision and legislative policy to reality? How has the Center methodically

Smart, future-thinking places are well-advised to think about ensuring and strengthening their energy resources, availability, and capabilities. Such places match their resources and strengths to practical policies, economic strategies, and long-term economic development. Gaining large capacity for renewable liquid transportation fuels—ethanol and biodiesel today, others in the future—serves both these resources and strengths well.

NATIONAL IMPERATIVE

The U.S. has set forward-thinking goals for biofuels. The current Renewable Fuel Standard mandates the nation to gain 25 percent of its liquid fuels—likely 36 billion gallons—from internal biomass by 2022. Presently, about 14 billion gallons of ethanol is produced, all from corn and largely in a small number of Midwestern states. To gain the additional 22 billion gallons and to ensure national capacity, America must gain new states with new models to produce large amounts of fuels from non-corn sources. Challenge and opportunity are at hand.

To date, no state has addressed the complex problem-solving required for large production of fuels from non-corn feedstock sources: from energy grasses or wood, municipal waste, algae, or other biomass. North Carolina can realistically be among lead places for new American biofuels capacity.



NORTH CAROLINA'S COMMITMENT AND IMPERATIVE

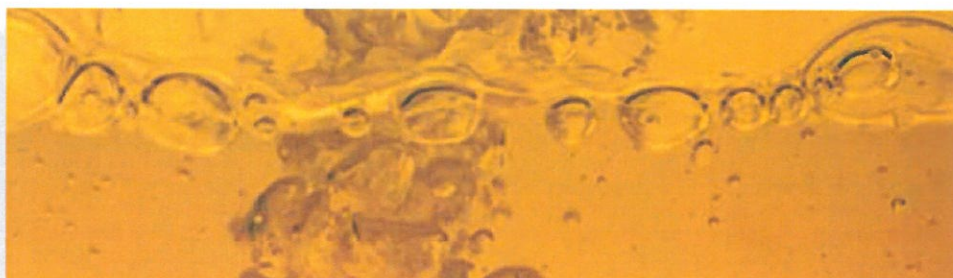
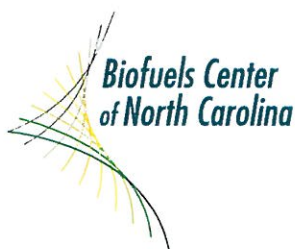
North Carolina legislative, institutional, and policy leaders turned attention in 2006 to the developing biofuels sector and soon reached a surprising recognition: The state had developed no vision, commitment, or operative framework to gain renewable liquid transportation fuels. Failure to capture the sector was clearly disadvantageous to future economic gain, energy policy, and agricultural enrichment. Triggered by a legislative mandate, almost 100 North Carolinians from different vantage points worked purposefully to craft *North Carolina's Strategic Plan for Biofuels Leadership*. Presented to a responsive legislature in April of 2007, the *Plan* was shaped by realistic thinking and nine broad long-term strategies.



The first strategy set a functional goal to shape activities, resources, and committed persons: *By 2017, 10 percent of North Carolina's liquid transportation fuels—likely to be more than 500 million gallons annually—will come from biofuels grown and produced internally.* To ensure a disciplined, statewide, and comprehensive approach over years, the second strategy of the *Plan* called for a central catalyzing agency. The Biofuels Center of North Carolina was established with legislative funding in 2007 to ensure a comprehensive approach and to aggressively work toward the 10-percent goal.

Furthermore, the *Plan* affirmed that the state's biofuels endeavor would not be based on corn or other food crops. As a result, the Center and partners statewide would, over years, identify and explore what other crop and tree resources could best be grown in significant amounts for conversion to fuels.

Implementing state policy and constituted as a service agency, the Center assists all parties to create a new biofuels sector and, eventually, large amounts of liquid fuels. *The Center's operative approach for activities and funding, below, moves from Societal Need to Consumers pleased to purchase home-grown fuels.*



initiated its large mandate and responsibility: development of a new sector, new agriculture, new technology, and millions of gallons of biofuels? How have five years of appropriations totaling \$19,825,000 been targeted to those outcomes?

GAIN STATEWIDE

The biofuels sector is wonderfully matched to North Carolina's strengths in agriculture, manufacturing, technology, and biotechnology—all required for biofuels. How often does a state have opportunity to target a new economic development sector that dovetails so realistically to its resources and future?

Increasing benefits to North Carolinians are varied and large. Over time, biofuels statewide will yield:

- Enrichment of the agricultural and forestry sectors, core to the state's heritage, land, and economy.
- Gain in particular for the rural counties and places most in need of economic advantage.
- Smart anticipation of future transportation energy needs.
- National competitiveness in a significant long-term sector.
- New imperatives and opportunities for research universities and community college programs.
- New direct employment in production, with 554 already seen in biofuels-related jobs, up from the 443 in the 2011 jobs survey. More importantly, larger benefit will come to persons in existing related and support sectors: agriculture, forestry, construction, and distribution.



In addition, economic impact will be enormous from the growing, harvesting, distribution, selling, and production facilities required for hundreds of millions of gallons of fuel. The impact will have added value as North Carolinians will no longer send the cost of millions of gallons of fuel to other places.

TASKS AND CHALLENGES ARE LARGE

In the absence of a blueprint or a model, the Center and varied partners must methodically build resources, capabilities, and outcomes over time—not unlike the state's remarkably successful creation more than 25 years of the biotechnology sector. The reality of the challenge and task can be seen varied ways:

NEW TECHNOLOGY · A new technology must be understood, created, and shaped to North Carolina resources and companies. Gaining biofuels from land and conversion requires technology as complex and costly as any other significant new sector.

COMPREHENSIVE APPROACH · Development of a multi-component and complex technology requires a comprehensive approach. All aspects of the biofuels process and sector must be effectively addressed and integrated. The lessons of technology and sector development over the past 50 years are clear: piecemeal attention to single components is unlikely to yield success.

The schema on pg. 2 shapes the comprehensive approach and thinking of the state and of the Center.

UNPRECEDENTED JUNCTURE · Biofuels requires an unprecedented juncture of two large components simultaneously: biomass and production. For the first: A production facility will not be sited without assured and enormous amounts of feedstocks available throughout the year. For the second: Farmers and landowners will not commit to growing or harvesting those feedstocks—often new to North Carolina—without an assured production facility as market. Gaining the two in balance for fuels from non-corn feedstocks is demanding and not yet seen in this country. Moreover, the feedstocks and production facilities must be geographically close. Moving weighty biomass large distances is not economically feasible.

The schematic map on pgs. 8 and 9 visualizes the geographic juncture of land, certain feedstocks, and new production facilities.

LAND AND BIOMASS · The impact and opportunity to North Carolina land and agriculture are large in equal measure. A 20-million-gallon-per-year cellulosic ethanol production facility, for instance, could require 15,000-20,000 acres of land consistently producing 300,000 tons of feedstock annually.

NEW PRODUCTION FACILITIES · To produce 500+ million gallons of biofuels annually, North Carolina must gain and support a range of production facilities varying widely in output. Some will be smaller, perhaps local and likely producing biodiesel; others will produce 20+ million gallons of biofuels.

ECONOMIC GAIN · Return from biofuels must be quickly verified to all involved parties: investors, support and distribution companies, and to farmers and landowners.





Taking Stock: Work Since 2008

The Center's activities over the last four years focused on developing the operative framework needed to gain renewable liquid transportation fuels for North Carolina.

Societal Need



- **Biofuels Jobs** - A survey of biofuels jobs statewide revealed 443 North Carolinians already employed in various settings
- **Campus Master Plan** - Campus Plan for North Carolina's Biofuels Campus in Oxford moved from vision to a 10-year plan, identifying four areas for biofuels development

Science & Research



- **Strategic Partnerships** - Established Memoranda of Understanding with professional agencies statewide to provide services for Biofuels Company Accelerator clients on North Carolina's Biofuels Campus in Oxford
- **Technology Advancement** - Five grants and six Accelerated Initiatives totaling \$733,318 supported the study of new technologies to advance production processes and methods to protect state resources
- **New Value from Sprayfields** - A \$239,450 Accelerated Initiative funded the trial-growing of energy grasses in a sprayfield environment to determine the effect of harvest timing on yield and to evaluate the nutrient rate response of potential crops

New Feedstocks



- **Assessing Feedstocks** - Twenty-one acres of Giant Reed energy grasses planted to gain agronomic data new to North Carolina farmers
- **Waste to Biofuels** - Two grants totaling \$239,107 awarded to study the availability, technologies, and economic feasibility of converting municipal waste into biofuels
- **Woody Biomass Assessment** - Four grants and one Accelerated Initiatives totaling \$363,200 supported the first-ever woody biomass study to verify the state's wood feedstock supply in seven economic development regions
- **Investment in Potential Feedstocks** - Four grants and four Accelerated Initiatives totaling \$551,939 supported the development of new feedstocks, including sorghum, perennial grasses, used cooking oil, and Giant Reed
- **Eastern Campus Site** - Partnership developed with N.C. State University to manage Williamsdale Biofuels Farm in Duplin County

Logistics



- **Trial-growing** - Began initial work of harvesting new energy grasses on North Carolina's Biofuels Campus, studying the feasibility of storing and transporting feedstocks
- **Agricultural Learning** - Participated in North Carolina Farm Show to share with farmers the planting, management, and harvesting techniques utilized for emerging biofuels feedstock crops

2011

- **Biofuelist of the Year** - Governor Bev Perdue awarded local biofuels producer as 2010 Biofuelist of the Year, promoting the growing biofuels industry and key advancements toward the state's goal of more than 500 millions-gallons-per-year
- **Strategic Convenings** - Partnered with N.C. Military Growth Task Force for biofuels summit in Jones County with more than 200 participants from across eastern North Carolina

- **Sector Development** - Virdia, formerly HCL CleanTech, an Israeli biofuels technology development company, selected North Carolina for its first pilot plant; its headquarters were established in the Biofuels Company Accelerator on North Carolina's Biofuels Campus
- **Federal Grant** - With support of Congressman G.K. Butterfield, federal monies secured to add company laboratory and support facilities to the Biofuels Company Accelerator on North Carolina's Biofuels Campus

- **NC Grows Biofuels Project** - Trial-growing at sites statewide gained agronomic data verifying 14 crops and trees for biofuels feedstocks and biomass
- **Intercropping** - Accelerated Initiative totaling \$32,500 funded a study, conducted by Weyerhaeuser, which included the co-growing of Miscanthus, an energy grass, with pines; Miscanthus yield will be assessed for biofuels and pine yields for construction markets
- **Trial-growing** - Identified energy grasses as a key resource for advanced biofuels development

- **Military Biofuels** - Defined the necessary quantities and types of fuel needed to provide biofuels to the armed forces
- **Agricultural Learning** - Participated in North Carolina Farm Show to share with farmers the planting, management, and harvesting techniques utilized for emerging biofuels feedstock crops

2010

- **NC Grows Biofuels Project** - Hosted convening of 200 industry leaders, elected officials, and farmers to showcase a dozen varieties of potential biofuels feedstocks being grown on North Carolina's Biofuels Campus
- **Developing Future Leaders** - A grant totaling \$49,097 supported renewable fuels development training for high school students, local farmers, and community members in Craven and Carteret counties

- **Economic Viability** - Nine grants and four Accelerated Initiatives totaling \$1,642,235 supported the identification of cost-effective feedstocks and economically viable production design options and business models

- **Investment in Potential Feedstocks** - Two grants and four Accelerated Initiatives totaling \$393,503 supported development of new biofuels feedstocks including energy canes, tropical sugarbeets, and woody biomass
- **NC Grows Biofuels Project** - Possible feedstocks quantified against agricultural and forestry outputs to ensure economic, environmental, and social sustainability while prioritizing key North Carolina resources

- **Agricultural Learning** - Participated in North Carolina Farm Show to share with farmers the planting, management, and harvesting techniques utilized for emerging biofuels feedstock crops

2009

- **Implementing North Carolina's Strategic Plan** - Staff began charting a course for a new industry sector in North Carolina
- **North Carolina's Biofuels Campus** - Biofuels Center Grand Opening held in May; staff moved into former tobacco research building on North Carolina's Biofuels Campus
- **Developing Future Leaders** - Three grants totaling \$358,159 supported infrastructure for biofuels production in K-12, community college, and university settings

- **Technology Advancement** - Three grants totaling \$536,866 supported research of enhancement strategies for improved biofuels production; projects addressed commercially focused woody biomass gasification, yeast development for ethanol efficiency, and extracting value from pre-combustion produced ethanol

- **Trial-growing** - Three grants totaling \$596,766 supported the development of new feedstocks for biofuels production, including industrial sweet potatoes, duckweed, and waste oil
- **Trial-growing** - Identified woody biomass as the most abundant resource useful for advanced biofuels development

These pages outline key projects, with enormous variety in complexity and length of time. For more detailed information about the activities and projects on this page, visit www.biofuelscenter.org/4years.

Production & Distribution



- **Biofuels Commercialization** - An Accelerated Initiative totaling \$40,100 supported the Oxford Biodiesel Plant, a partnership with the N.C. Dept. of Agriculture, and the first pilot production facility on North Carolina's Biofuels Campus
- **Strategic Convenings** - First Civic and Small-scale Biofuels Project convening held in Winston-Salem
- **Small-scale Production** - More than 25 briefings conducted by staff on commercial biodiesel production from used cooking oil
- **Sector Development** - Identified needs and secured resources to assist Chemtex International
- **Sector Development** - Targeted meetings held with industry leaders across the nation to induce North Carolina's biofuels development
- **Military Biofuels** - Partnered with the U.S. military and eastern N.C. organizations to initiate biomass and production infrastructure creation for military installations
- **Congressional Testimony** - Testified at Congressional Subcommittee on Energy and Environment and discussed North Carolina's policy and strategic approach to biofuels development

- **Biofuels Technology** - Initiated discussions with companies developing thermochemical and biochemical technologies needed for conversion of materials into biofuels
- **Biodiesel Capacity Building** - Provided funding, consulting, and small business resources for biofuels projects, stimulating biodiesel production across North Carolina, including a significant research facility and production for small government fleets
- **Biofuels Verified Profitable** - *The Business of Biofuels* project, undertaken by the Center with the Kenan Institute of Private Enterprise and funded by Golden LEAF, confirmed biofuels can be profitable and positively impact the state's rural economy

- **Building Biofuels Capacity** - Six grants totaling \$957,867 supported the expansion of North Carolina production capabilities through new technologies and processing strategies
- **Sector Development** - To create a new sector and new resource, targeted work included meetings with more than 20 international companies
- **Sector Development** - Identified companies to recruit with appropriate technologies for North Carolina's existing and future biofuels feedstocks

- **Building Biofuels Capacity** - Three grants and two loans totaling \$1,036,500 supported the expansion of biofuels production and economic modeling across North Carolina
- **Sector Development** - Targeted meetings held with industry leaders across the nation to induce North Carolina's biofuels development

Public & Policy



- **Strategic Convenings** - Invasiveness Working Group convened to create a forum for discussion of issues related to new energy crops and development of *Best Management Practices* document to minimize invasiveness risks
- **Strategic Convenings** - Biofuels regional meeting convened in Asheville to discuss biofuels projects in western N.C.
- **Testimonials** - More than 20 presentations given statewide and nationally about North Carolina's Biofuels Center, endeavor, policy, and strategies
- **International Biofuels** - President/CEO spoke at the Chemtex/M&G biofuels facility groundbreaking in Italy, representing North Carolina's commitment to international biofuels participation and Chemtex's interest in North Carolina
- **Civic and Small-scale Biofuels Project** - Established to encourage and help communities gain locally produced fuels, economic benefit, and environmental advantage

- **New Value from Sprayfields** - Worked with state technical committee to obtain regulatory approval for the hog lagoon sprayfield project
- **National Presence** - Worked with the U.S. Dept. of Agriculture (USDA) to convene a North Carolina meeting on USDA's national biofuels roadmap
- **Congressional Testimony** - Provided testimony at congressional hearing on the Farm Bill
- **Energy Savings** - Funded by the American Recovery and Reinvestment Act, the Center's headquarters building was completely retrofitted to the latest energy efficient standards, displaying responsible environment and energy stewardship

- **Emerging Biomass** - *Envisioning North Carolina's Biomass Future* document developed, outlining a framework for thought and action for the state's abundant woody biomass resources
- **Strategic Convenings** - Public biofuels dialogues held to advance statewide support, addressing issues such as incentives and policy, education, and workforce development

- **Valuable Leadership** - Biofuels Center Executive Committee established
- **Strategic Convenings** - Convened people from agriculture, academia, industry, environmental groups, government, and policy organizations to reach consensus on factual responses to misinformation about biofuels
- **Serving the State** - Biofuels Center assumes responsibility as service organization to North Carolina's leadership about biofuels

Consumers



- **Biofuels Wiki** - Biofuels Wiki website attracted traffic from 60 countries
- **Biofuels on the Interstate** - Signs installed on I-85 verifying the importance of the Biofuels Center to North Carolina

- **The Biofuels Headline** - Newsletter launched, providing information about N.C. biofuels to more than 7,000 inboxes around the world
- **Biofuels Online Community** - Launched ncbiofuels.net, YouTube, Facebook, and Twitter accounts, allowing public interaction
- **Advancing Public Education** - Federally funded biofuels public education campaign included television and web-based advertisements, reaching more than 4.8 million licensed drivers or about 80 percent of state motorists
- **Communications and Public Outreach** - More than 550 video endorsements of North Carolina biofuels produced by N.C. State Fair visitors

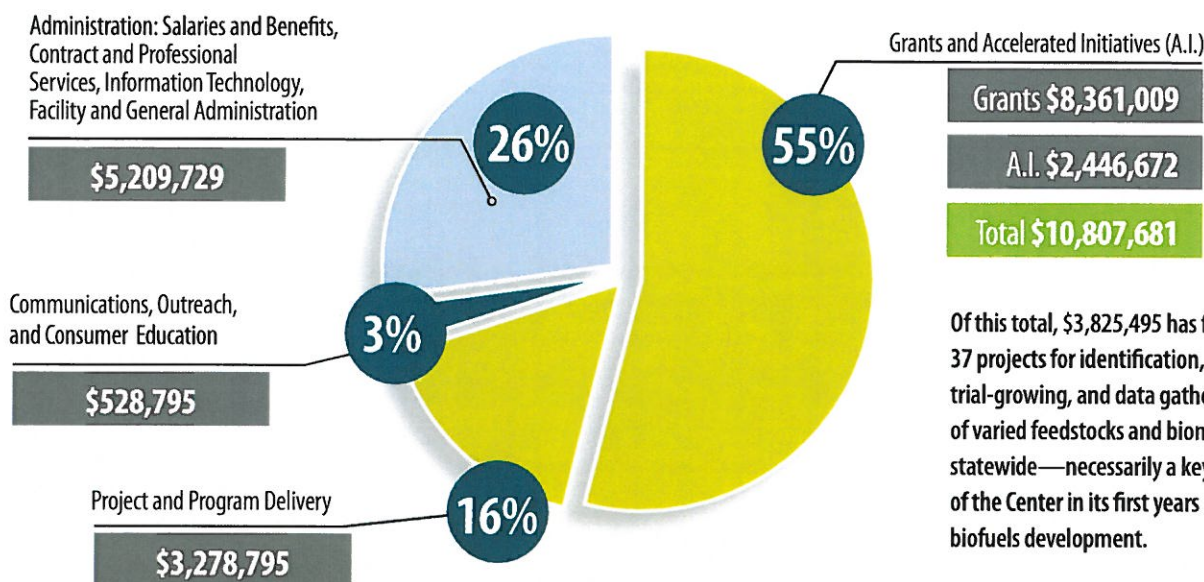
- **From Bluegrass to Switchgrass** - To advance public commitment to biofuels, North Carolina artists donated tracks to an album that provided biofuels-related information
- **Biofuels Branding** - More than 3,400 people voted on 12 icons to begin branding the N.C. Biofuels industry

- **Biofuels Voices** - Podcasts began; experts share in their own words and voice their respective roles in the development of a sector
- **Biofuels Website** - Biofuels Center site launched, initiating Center dissemination of information
- **Education** - Biofuels placemat placed in General Assembly cafeteria each year, familiarizing legislators and public about biofuels
- **Communications and Public Outreach** - Participated at the State Fair each year, informing more than 80,000 people about biofuels annually



Center Expenditures and Funded Projects: FY 2007-08 to FY 2011-12

Over five fiscal years, the Center has directed its **\$19,825,000** legislative appropriation to strengthen biofuels capability statewide. A competitive, peer-reviewed annual grants program and board-approved Accelerated Initiatives program fund varied research and activities, resources and facilities, and areas of targeted importance to establish a new sector as efficiently as possible.



Project Title	Award Recipient	Amount	Counties/Agencies Impacted
2008			
Building a Bio-Refinery	Piedmont Biofuels, LLC	\$250,000	Anson, Chatham, Columbus, New Hanover
Industrial Sweet Potatoes	N.C. State University	\$197,033	Duplin, Granville, Greene, Lenoir, Rockingham, Sampson, Washington
Biodiesel Production Expansion	Blue Ridge Biofuels	\$250,000	Buncombe, Cherokee, Haywood, Henderson, Jackson, Madison, McDowell, Polk, Rutherford, Swain, Transylvania, Yancey
Biofuels Production Laboratory Equipment	Central Carolina Community College	\$195,000	Chatham, Davidson, Durham, Guilford, Harnett, Lee, Orange, Randolph, Rockingham, Wake
Haywood County Biofuels Production, Education and Training Project	Haywood Community College	\$135,245	Haywood, Jackson
Woody Biomass Gasification	The Abell Foundation, Inc.	\$200,000	Durham, Catawba
Renewable Fuels Program	Washington High School	\$27,314	Beaufort
N.C. Biofuels LLC Site Development	N.C.'s Northeast Economic Development Commission	\$22,000	Chowan, Northampton
High-Value Transportation Fuels	N.C. State University	\$200,000	Wake
Carbon to Liquid	Southern Research Institute	\$200,000	Durham
Dekkera Bruxellensis	N.C. State University	\$138,688	Wake
Extracting Value Prior to Combustion	N.C. State University	\$198,178	Wake
Bioenergy Plantations	N.C. State University	\$187,700	All 100 N.C. Counties
STARworks Biofuels	Central Park N.C.	\$148,800	Anson, Davidson, Montgomery, Moore, Randolph, Richmond, Rowan, Stanley
Duckweed on Swine Wastewater	N.C. State University	\$199,733	Johnston, Wake
2009			
Energy Cane: Ideal Feedstocks for N.C.'s Diverse Energy Needs	N.C. State University	\$171,293	Duplin, Granville, Henderson
Biodiesel Feedstock Research	N.C. Department of Agriculture and Consumer Services	\$35,415	Duplin, Granville, Rutherford, Surry, Wake, Wayne
Algae Downstream Processes Automated for Commercialization	Cape Fear Resource Conservation and Development	\$108,800	Bladen, Brunswick, Caldwell, New Hanover
Reducing Natural Resource Impacts Related to Biodiesel Production	Carolina Land & Lakes R&D	\$180,496	Caldwell, Catawba, Gaston, Watauga
Optimal N.C. Energy Crop Gasification	The Abell Foundation, Inc.	\$200,000	Durham
Low Cost Conversion of Industrial Sludges to Ethanol	N.C. State University	\$183,802	Wake
Optimizing Cultivation and Conversion of Efficient Sweet Sorghum Bioethanol	N.C. State University	\$183,468	Duplin, Granville, Henderson, Johnston, Jones, Person, Washington
Fungal Biopulping for Improved Ethanol Production from Wood	University of North Carolina at Charlotte	\$150,295	Catawba, Mecklenburg
Gasification Tar Cracking Catalyst Development for Biofuels Synthesis	Research Triangle Institute	\$184,891	Durham
Enzymatic Processing of Biodiesel	Chatham County Economic Development Corporation	\$167,061	Chatham
Low-Cost Torrefaction-Gasification for Production of Biofuels from Forests	N.C. State University	\$199,128	Wake
Economic Analysis of Pine Biomass Feedstocks for Ethanol Production	N.C. State University	\$162,438	Wake
Greater Charlotte Region Biofuel Facility	Centralina Council of Governments	\$99,850	Gaston, Mecklenburg
Extraction and Refinement of Oils from Biodiesel Feedstocks	Appalachian State University	\$129,133	Alexander, Buncombe, Burke, Caldwell, Catawba, Jackson, Haywood, Wake, Watauga
Feedstock Processing Station	Catawba County	\$150,000	Catawba
From Farms to Fuels: Renewable Energy Production	Craven County Schools	\$49,097	Carteret, Craven
Canola Production, Processing, and Market Development for Biodiesel	N.C. Solar Center	\$194,375	Beaufort, Caldwell, Carteret, Chatham, Craven, Duplin, Franklin, Jones, Lenoir, Montgomery, Onslow, Pamlico, Pender, Wake
Biodiesel Pilot Plant Demonstration and Outreach Program	N.C. Solar Center	\$198,385	Chatham, Lenoir, Wake, Wilson
Responsible Use Initiative 2009	Institute of Forest Biotech	\$10,000	All 100 N.C. Counties
U.S. Department of Energy Corridor Match	Triangle J Council of Governments	\$14,000	Buncombe, Wake, Western N.C. counties
Biomass from Biotechnology Trees	Institute of Forest Biotech & N.C. State University	\$135,000	All 100 N.C. Counties
Plant Feasibility Assessment	N.C. Solar Center	\$1,000	Alexander, Wake
N.C. Grows Biofuels	Center's Ag Resource Partners	\$1,897	Granville at North Carolina's Biofuels Campus

Each grant and project is necessarily awarded to, or is administered by, a single main recipient. However, projects are sought that as much as possible yield eventual economic and agricultural impact across counties or regions—particularly possible with projects directed to feedstocks, production technology, or assessments.



Project Title	Award Recipient	Amount	Counties/Agencies Impacted
2010			
N.C. Grows Biofuels	Center's Ag Resource Partners	\$7,383	Granville at North Carolina's Biofuels Campus
Tropical Sugar Beets Production Potential	N.C. State University and Syngenta	\$28,513	Duplin, Granville, Moore, Wake, Washington
Industry/University Cooperative Research Center	N.C. State University	\$40,000	All 100 N.C. Counties
Estimates of Available Woody Biomass	N.C. State University Cooperative Extension	\$16,979	All 100 N.C. Counties
Tree Improvement Cooperative	N.C. State University	\$5,000	All 100 N.C. Counties
Williamsdale Bioenergy Field Lab	N.C. State University	\$50,000	Duplin
Biofuels Bus-Learning and Education	Washington High School	\$2,975	Beaufort, Chatham
North Carolina's Biofuels Campus Biodiesel Production Facility	N.C. Department of Agriculture and Consumer Services	\$3,500	Granville at North Carolina's Biofuels Campus
Evaluation of Existing Laboratories	Delta Laboratory Services	\$2,800	Granville at North Carolina's Biofuels Campus
Intercropping with Weyerhaeuser – Miscanthus and Pine Trees	N.C. State University and Weyerhaeuser	\$16,065	Lenoir
2011			
Pilot-scale Continuous Flow Microwave Pretreatment of Energy Grasses	N.C. State University	\$141,082	Wake
Assess Potential of Woody Biomass for Advance Biofuels Production	N.C.'s Eastern Region	\$50,000	Carteret, Craven, Duplin, Edgecombe, Greene, Jones, Lenoir, Nash, Onslow, Pamlico, Pitt, Wayne, Wilson
Loblolly Pine Biomass Genetics/Cropping Study	N.C. State University	\$148,419	Durham, Granville, Wake
Sorghum Biofuels: A Route to Commercialization in N.C.	N.C. State University Biological & Agricultural Engineering	\$149,488	Washington
Efficient Biodiesel Production from Inexpensive Feedstock	Wake Forest University	\$141,665	Forsyth
Environmental Protection and Biofuel Production on Waste Application Fields	N.C. State University	\$97,088	Onslow, Scotland, Wake
Assessment of Municipal Solid Wastes into Biofuels via Pyrolysis	N.C. Agricultural and Technical State University	\$145,988	Guilford
Native and Non-native Mouse Interactions in Switchgrass-pine Systems	University of North Carolina at Greensboro	\$135,776	Guilford, Lenoir
Expanding Piedmont Perennial Grass Production Through Grower Engagement	N.C. State University	\$150,000	Economic Development Region: Piedmont Triad
Regional Analysis of Assets for Biofuels Firm	Charlotte Regional Partnership	\$50,000	Alexander, Anson, Cabarrus, Catawba, Cleveland, Gaston, Iredell, Lincoln, Mecklenburg, Rowan, Stanley, Union
Using Municipal Solid Waste as a Biofuel Feedstock	Environmental Research & Education Foundation	\$93,119	All 100 N.C. Counties
Suitability of N.C. Piedmont Soils for Bioenergy Crop Production	N.C. State University	\$85,542	Rowan
Regional Site Assessment of Woody Biomass Resources in N.C.'s Northeast	Northeast Economic Development Commission	\$50,000	Beaufort, Bertie, Camden, Chowan, Currituck, Dare, Gates, Halifax, Hertford, Hyde, Martin, Northampton, Pasquotank, Perquimans, Tyrrell, Washington
Cooking Oil Recycling Program	Metropolitan Sewerage District of Buncombe County	\$119,675	Buncombe, Madison, Mitchell
Woody Biomass Supply for Biofuels Commercialization	N.C.'s Southeast Region	\$50,000	Bladen, Brunswick, Columbus, Cumberland, Hoke, New Hanover, Pender, Richmond, Robeson, Sampson, Scotland
Intercropping with Weyerhaeuser – Miscanthus and Pine Trees	N.C. State University/Weyerhaeuser/N.C.'s Eastern Region	\$32,500	Lenoir
Partnership Project with Eastern Region	N.C.'s Eastern Region	\$40,000	Duplin, Granville, Moore, Wake, Washington
Tropical Sugar Beet Production Potential Year 2	N.C. State University	\$10,000	Lenoir
Trial-growing – Transgenic Populus	Oregon State University	\$11,916	Duplin, Granville, Henderson
Biofuels Campus Master Plan	O'Brien Atkins Associates	\$204,240	Granville at North Carolina's Biofuels Campus
Biofuels Company Accelerator-2nd Floor Lab Upfit	Matching funds for U.S. Department of Energy Grant	\$247,392	Granville at North Carolina's Biofuels Campus
N.C. Grows Biofuels Year 3	Center's Ag Resource Partners	\$11,995	Granville at North Carolina's Biofuels Campus
Biofuels and New Value From Sprayfields	N.C. State University	\$239,450	Duplin, Sampson, Wayne
Trial-growing – Unstead Biofuel Farm	N.C. Department of Agriculture and Consumer Services /NCSU	\$1,777	Granville at North Carolina's Biofuels Campus
Pretreatment for Non-woody Biomass to Maximize Sugar Recovery	N.C. State University and Wood to Ethanol Research Consortium	\$15,000	Wake
N.C. State University Extension Residual Study	N.C. State University	\$20,000	All 100 N.C. Counties
Investigating Nutrient Uptake and Removal	N.C. State University	\$2,937	Wake
Woody Biomass Assessment	Gelbert, Fullbright & Randolph Forestry Consultants, PLLC	\$163,200	Three Economic Development Regions: Advantage West, Piedmont Triad, Research Triangle Park
Shaping N.C.'s Future—Financial Resources Study	Consultant	\$8,500	Granville at North Carolina's Biofuels Campus
Center Headquarters Retrofit for Energy Efficiency	Linc Services	\$2,799	Granville at North Carolina's Biofuels Campus
Utility Assessment of North Carolina's Biofuels Campus	McKim and Creed	\$7,665	Granville at North Carolina's Biofuels Campus
Architectural Model-North Carolina's Biofuels Campus	O'Brien Atkins Associates	\$5,500	Granville at North Carolina's Biofuels Campus
North Carolina's Biofuels Campus Biodiesel Production Facility	N.C. Department of Agriculture and Consumer Services /NCSU	\$36,600	Granville at North Carolina's Biofuels Campus
2012			
Accessing Quarterly Timber Market Data	Forest2Market	\$6,400	All 100 N.C. Counties
Accessing Grow Data, Resource Drain and Future Supply and Demand	Southern Forest Resource Assessment Consortium	\$4,000	All 100 N.C. Counties
Intercropping with Weyerhaeuser – Miscanthus and Pine Trees	N.C. State University/Weyerhaeuser	\$32,500	Lenoir
Biofuels Company Accelerator Best Practices Plan	Sequoia Research, Inc.,	\$14,250	Granville at North Carolina's Biofuels Campus
Arundo Donax Bachelor Farm	N.C. Department of Agriculture and Consumer Services	\$9,572	Duplin
Commercial Management of Energy Grasses	N.C. State University	\$50,000	Duplin, Granville, Wake
N.C. Grows Biofuels Year 4	Center's Ag Resource Partners	\$30,966	Twelve Research Stations Across N.C.
Williamsdale Biofuels Farm	N.C. State University	\$178,000	Duplin
Appalachian Biodiesel Research, Development, and Production Facility	Appalachian State University	\$75,000	Catawba
North Carolina's Biofuels Campus Development	Various	\$59,170	Granville at North Carolina's Biofuels Campus
Forestry Equipment Operator Curriculum	N.C. Association of Professional Loggers	\$10,000	Pitt
Mendel Biotechnology – Miscanthus Plugs	Mendel Biotechnology	\$5,400	Duplin, Sampson, Wayne
Biofuels and New Value From Sprayfields	N.C. State University	\$180,684	Duplin, Sampson, Wayne
Piofuels Crop Invasiveness Model	Virginia Tech	\$53,000	Coastal Plains
Irrigation on Williamsdale Biofuels Farm	N.C. Department of Agriculture and Consumer Services	\$70,000	Duplin
Hybrid Poplar and Cottonwood Trials for Biofuels Feedstock Production	N.C. State University	\$271,148	Granville, Johnston, Moore, Scotland
2012 Grants Pending Board Approval 5/8/2012			
Increasing Biofuels Production and Use at HCC Materials Recovery Center	Haywood Community College	\$15,770	Haywood
N.C.'s Role in the Global Biomass Energy Market	University of North Carolina	\$75,000	All 100 N.C. Counties
The Economic Impact of Biomass Alternatives on N.C.'s Economy	University of North Carolina	\$50,000	All 100 N.C. Counties
Evaluating Biomass Harvesting Practices with Respect to Wildlife Sustainability	N.C. State University	\$100,000	Beaufort
Delivering an Enzyme-based Solution for the NC Biodiesel Industry	Chatham County Economic Development Corporation	\$99,994	Chatham
Integrating Ethanol Production with Municipal Waste Mgmt., Catawba County	University of North Carolina at Charlotte	\$95,200	Catawba, Mecklenburg
Assessment of Energy Crop Production at Wastewater Treatment Facilities	City of Raleigh	\$100,000	Wake
Suitability of N.C. Piedmont Soils for Bioenergy Crop Production Year 2	N.C. State University	\$47,346	Rowan, Wake
Modeling Impacts of Biomass Production on Landscapes and Wildlife	N.C. State University	\$98,038	Wake
Accelerating the Western N.C. Biofuels Industry	AdvantageWest Economic Development Group	\$130,000	Advantage West Region
Biodiesel Feedstock Harvesting and Production Improvements	Catawba County	\$75,000	Catawba
Arundo Donax Response to Nitrogen in Central Piedmont Soils	N.C. State University	\$568,601	Duplin, Granville, Wake

Total \$10,807,681

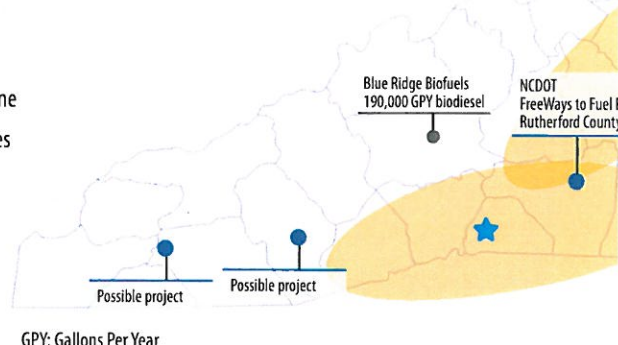


Taking Stock: A Growing Community and Sector

Gaining 10 percent of the state's liquid transportation fuels by 2017 will require a range of production facilities, feedstocks, and technologies. Not exact, the map conveys the sort of development possibly to be seen statewide in coming years.

Growing & Production

- Existing biodiesel production facilities
- Possible civic and small-scale production
- ★ Hypothetical new production facility within growing zone
- Mixed woody biomass and energy grasses growing zones
- Woody biomass growing zones
- Energy grasses growing zones
- Municipal solid waste: possible regional facility
- Algae: possible biomass source and facility



Varied organizations, facilities, agencies, and technology providers across North Carolina strengthen the biofuels endeavor. Some are directly and extensively involved; others come new to the sector as it develops and over time affects their ongoing work.

Agriculture



Agri-Technologies
Agrivida
Agrofuel
Algaen
Alganomics
Bard Holding
BASF Plant Science
Bayer CropScience
Cargill
Ceres
Chemtex Agro
Chromatin
Crop Technology Integration
East Carolina Soy Processors
Enterprise Rendering Company
Goldsboro Milling

GrassRoots Biotechnology
Jordan Lumber
Mendel Biotechnology
Murphy Brown
Murphy Family Ventures
N.C.'s Biofuels Campus
N.C. Biotechnology Center
N.C. Department of Agriculture
and Consumer Services
N.C. Farm Bureau
N.C. Pork Council
Phytonix Corporation
Prestage Farms
Syngenta Biotechnology
Unifi-REPREVE Renewables
Williamsdale Biofuels Farm

Logistics



Caterpillar
Ceres
Chemtex Agro
Claas
Eco Collection Systems
EJE Recycling and Disposal
Genera
John Deere
Kenan Transport Company
New Holland
University of Tennessee
Valley Proteins

Banking & Finance



BB&T
Cape Fear Farm Credit
CompassNC
PNC Bank
Stern Brothers
U.S. Department of Agriculture
U.S. Department of Energy

Civic & Environmental



Catawba County
Centralina Clean Fuels Coalition
Centralina Council of Governments
City of Oxford
City of Raleigh
County of Catawba Utilities and
Engineering (EcoComplex)
Craven County Schools
Environmental Defense Fund
Gaston County Schools
Granville County
Jackson County Green Energy Park
Land-of-Sky Regional Council
Metropolitan Sewerage District of Buncombe Co.
N.C. Department of Environment
and Natural Resources
N.C. Department of Transportation
Southern Alliance for Clean Energy
Town of Cary
Town of Oak Island
Triangle J Council of Governments/Triangle
Clean Cities Coalition

Science & Research



Advanced Vehicle Research Center
Appalachian State University
BioRxn
Carolina Land and Lakes Resource
Conservation Development Councils
Chemtex International
Duke University Nicholas Institute for
Environmental Policy Solutions
East Carolina University
Elizabeth City State University
Environmental Research and Education
Foundation
Flad Architects
Glycotech
MarBioNC

Marshallton Research Laboratories
M & G Group
N.C. A&T State University
N.C. Solar Center
N.C. State University
RTI International
Southern Research Institute/C2L
UNC-Charlotte
UNC-CH, Kenan-Flagler Business School
UNC-Greensboro
Wake Forest University
Weyerhaeuser N.C. Timberlands
Research
Wood to Ethanol Research Consortium

Production



Blue Ridge Biofuels
Carolina Biodiesel
Central Carolina Community College
Chemtex/M&G
Foothills Bio-Energies
Haywood Community College
Maverick Biofuels
Metrolina Biofuels
Novozymes North America
Patriot Biodiesel
Piedmont Biofuels
Red Wolf Refining
Southeast Biodiesel
STARworks NC
ThermoChem Recovery International
Triangle Biofuels Industries
Washington High School
Yadkin-Pee Dee Lakes Project



Twelve Representative Snapshots

To create a new sector and a new technology, the Biofuels Center initiates targeted projects, partnerships, and business models as part of a comprehensive approach to gain large biofuels capacity.

1 The Business of Biofuels

The Business of Biofuels project, undertaken by the Biofuels Center with the Kenan Institute of Private Enterprise and funded by Golden LEAF, yielded verifiable economic models and data for gain from seven hypothetical large-scale biofuels production facilities positioned across the state.

The project also modeled the economic impact of 600 million gallons of biofuels production yielding more than 3,300 jobs in coming years, of which most will likely occur in rural counties. Furthermore, as the study only accounts for jobs directly correlated to biofuels plant construction and operation, secondary job growth such as fuel blenders and gasoline retailers will only increase the biofuels industry's economic impact.

3 Road Music: From Bluegrass to Switchgrass

To advance public commitment to biofuels, the Biofuels Center tapped into North Carolina's cultural heritage, including its love affair with its music and cars. Twenty-two artists from across the state donated tracks to *Road Music: From Bluegrass to Switchgrass*.



2 North Carolina's Biofuels Campus

Established to facilitate multi-party research and industry partnerships, North Carolina's Biofuels Campus in Oxford will in time take shape as the nation's only large-acreage site for biofuels trial-growing, company incubation and partnerships, demonstration facilities, and public education. North Carolina's Biofuels Campus is a partnership project of the Biofuels Center of North Carolina and the N.C. Department of Agriculture and Consumer Services.



4 Nine Significant Numbers

- 17 billion dollars that North Carolina spends to buy liquid transportation fuel annually
- 95 percent of gasoline sold in North Carolina contains 10-percent biofuels
- 939,968,875 is the estimated total annual impact in dollars of seven projected biofuels production facilities in North Carolina
- 59 percent of greenhouse gas reduction was attributed to U.S. ethanol use in 2009
- 25 percent of global oil production is consumed by the U.S.
- 10 percent of global oil production is produced by the U.S.
- 50 percent is the amount of fuel that the U.S. Air Force plans to obtain from biofuels by 2016
- 200 additional dollars is required by U.S. automakers to manufacture a flex-fuel vehicle

85

percent of ethanol
blended in a gallon
of E85 fuel



5 Consumer Outreach

A key component of the Biofuels Center's work has been to engage and educate consumers in North Carolina about the economic and environmental benefit of biofuels—from presentations to schools and tours of the Biofuels Campus to speaking engagements with civic groups and outreach at public events. Two projects of note involve the Center's presence at the State Fair, in which as many as 300,000 fairgoers have been informed about biofuels. In addition, the Center received federal funding from the U.S. Department of Energy to implement a biofuels public education campaign, which



included television and web-based advertisements. More than 4.8 million licensed drivers, or about 80 percent of state motorists, were reached by the television public service announcements.

6 Civic and Small-scale Biofuels

Catalyzing the development of new municipal and regional biofuels projects is a priority of the Biofuels Center, as production at both large



and small scale will be required to meet the state's 10-percent biofuels goal. The Center's Civic and Small-scale Biofuels Project springs from the intersection of simultaneous challenges and opportunities: economic imperatives, civic goals, waste materials and management, and new energy production. The Center works to identify and strengthen community biofuels projects in every region of North Carolina so that communities can gain locally produced fuels, economic benefit, and environmental advantage. More than 20 existing

civic and small-scale biofuels projects are in development and operation throughout the state, verifying both need and smart solutions.

Some are large and sustained, others specific in duration and intent. All in total support a complex, sustained, and multi-party statewide endeavor.

7 Chemtex International

Chemtex is part of the Italian Gruppo Mossi & Ghisolfi (M&G), with its engineering headquarters based in Wilmington, N.C. Chemtex has targeted biologically based—non-petroleum and renewable—fuels, chemicals, and materials for future development and growth.

The company had initially not considered North Carolina as a site for its North American facility. Over the past 18 months, the Biofuels Center, other agencies, and legislative participants have assisted Chemtex with problem-solving as well as access to North Carolina lands, sprayfields, partners, financing, and sites.



The company hopes to locate in Sampson County its 20-million-gallons-per-year facility for converting up to 20,000 acres of energy grasses to ethanol. The \$170-million facility will employ more than 65 workers directly and will in addition benefit hundreds of associated landowners, harvesters, truckers, and related agricultural-support workers.

8 Sprayfield Project

A low-cost, sustainable supply of biomass is a critical factor to biofuels producers. The Center's Sprayfield Project verifies the value of energy grasses to landowners in eastern North Carolina who are currently growing hay for remediating effluent from swine lagoons. In the three-county pork-producing region of Duplin, Sampson, and Wayne counties, nearly 100,000 acres of sprayfields are ideal for conversion from Coastal Bermuda grass to energy grasses, which allows landowners to make more money while providing a cost-competitive feedstock supply.

9 Project Eastern Biofuels

Military services have a strong base presence in North Carolina, providing billions of dollars annually to state revenues. Project Eastern Biofuels was initiated to support the state's military and its mandated need for petroleum alternatives. The Project works in the short-term to position the state's biofuels endeavor for military purchasing and in the longer-term to produce 50 million gallons annually of bio-jet fuel for consumption at state military bases.



10 Best Management Practices for Energy Grasses

The demand for feedstocks by North Carolina's biofuels and bioproducts industry sector will transform the agricultural landscape of the state. New energy crops will be grown that are vigorous, high-yielding, and drought-resistant—often the same characteristics of invasive plants. To ensure the transformation is positive, the North Carolina Department of Agriculture, North Carolina Cooperative Extension, and the Biofuels Center developed best management practices to help energy feedstock growers reduce the risk of unintentionally initiating the spread of energy crops.



11 First Biofuels Jobs Census

The 2011 first-ever survey of biofuels jobs statewide revealed that 443 North Carolinians were already employed in production, technology, agency, agbiotech, forestry, research, and education settings. Future surveys can better capture the likely largest area of job gain as biofuels expands: not just in new facilities, but to enrich existing agricultural, forestry, logistics, and distribution employment.

12 Woody Biomass Assessments

Woody biomass, derived from forests and trees, will with energy grasses yield the main biofuels feedstocks statewide. Production companies are moving to feasible conversion of wood materials at commercial scale—and thus are looking at Southeastern states strong in forest resources for sites and partners. To verify state capabilities, the Center has commissioned a strategic woody biomass study within each of North Carolina's seven economic development regions. Full and detailed supply assessments, quantification of demand, and long-term supply price expectations by wood classifications will be gained from two sites per region.



THE NEXT SIX YEARS

Four years into its first decade of mandated work, the Biofuels Center and the statewide biofuels endeavor have verified sector promise, strengthened reputation and resources, gained wide and nonpartisan support, and been appropriated \$19,825,000 to build credibility and capability.

Work and mandate are challenging. To move biofuels from vision and good intentions, an entire new sector must be created within a decade, from the ground up and across the state. No model or blueprint exists for doing so. The Biofuels Center is the nation's only comprehensive agency working purposefully over time to create a model for this new sector.

The task goes well, for North Carolinians are undaunted by large challenge and find biofuels capacity to be a smart goal. A good idea has been given structure and proven feasible. North Carolina is no longer largely devoid of biofuels intention or capability. New crops have been explored and identified; growers and landowners have begun to learn and commit. Agricultural companies, technology providers, and the production industry now place North Carolina on their list of promising states as they turn attention from the Midwest to the biomass-rich Southeast. Industry visits and proposed projects verify real interest and an economically viable biofuels sector.



Initial industry verification is significant. Chemtex, a leading international technology company, hopes to place in Sampson County one of this nation's first advanced facilities for making fuels from energy grasses grown in surrounding counties. The \$170-million plant will directly employ around 65 workers and make 20 million gallons of ethanol a year.

Other plants will cluster and follow.

Biofuels now has place, stronger resources, and realistic grounding in North Carolina. A foundation has been established and grows.

Working with partners and policy leaders, key tasks of the Center over the next six years are large and clear:

- Extraordinarily large amounts of biomass must be newly grown and gained, affecting the land and the agricultural community with unprecedented impact.
- Production companies must be induced to invest and construct facilities across the state, matching their conversion technologies to regional feedstocks. How many facilities will be required to produce 500 million gallons or more is unknown, as will be their locations and costs.
- Gain from new jobs and to existing sectors must be apparent and measurable.
- Economic gain must be as readily quantifiable as the number of gallons produced.
- North Carolina's national positioning within an increasingly competitive sector must be strengthened.
- The visible state policy commitment that proves compelling to companies seeking sites must be maintained.
- Strategic attention must be paid to the increasing overlap of biofuels with other biomaterials and biochemicals, all to spring from the same biomass and often involving the same companies. North Carolina is thus well-positioned to expand from biofuels to other large agriculturally based sectors and products.
- Agricultural, environmental, and economic imperatives must be functionally and responsibly balanced.
- Millions of gallons of renewable fuels must be steadily and sustainably produced.

A landscape-changing endeavor is realistically anticipated statewide from these tasks and outcomes. Economic and agricultural impact will be large but not easily or quickly gained.

Biofuels Center of North Carolina

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