3.0 Environment and Natural Resources and Sustainable Energy

Brief Summary of Program

This planned program is intended to develop and maintain connections between applied research and Cornell Cooperative Extension (CCE) programs focused on natural resources conservation/protection and sustainable energy education that work toward long term planning for sustainable energy and proper use of natural resources.

Programs in this plan reach varied audiences, addressing agricultural and natural resource producers, community decision makers, businesses, organizations, and individual consumers. The planned program includes applied research and education on natural resources management, inventory and mapping methods; habitat; solid waste management, outreach practices, and sustainable energy.

The outcomes of this plan are for individuals, families, communities, farmers, and businesses to make economically viable, sustainability-based decisions with the help of readily available research based education.

Situation and Priorities Statement

This planned program includes applied research and Cornell Cooperative Extension efforts related to bio/alternative energy, consumer energy conservation waste management and natural resource conservation.

Sustainable Energy: With some of the highest energy costs in the nation, New York residents, businesses, and organizations need current information and decision-making criteria and approaches for energy supply alternatives and practical energy conservation and cost-saving measures to maintain financial security and vitality. Additionally, with more than 1 million acres of viable and non-food producing land available for production of biomass, and organic waste streams from dairy farms and concentrated urban areas, New York has multiple resource streams to contribute to the small, distributive renewable energy systems that are considered a vital part of forward-looking national energy policy. Producers and community leaders are hungry for information on viable renewable energy production and strategies to promote energy conservation, while farmers, forest owners and agricultural producers are eager to explore new markets.

Our sustainable energy program has two broad emphases: energy and agriculture and consumer and community energy resources. The agriculture program addresses NIFA priorities related to the goal of energy independence, development of biomass for bioenergy, design of optimum forestry and crops for bioenergy production, and production of value-added bio-based industrial products. The program also addresses energy conservation through agricultural applications of additional energy alternatives such as wood and grass pellet fuel production, recycling of vegetable oils as biodiesel, wind and solar energy production. Conversion of corn to ethanol, wind energy and hydro power are currently driving alternative energy systems in the U.S. longer-term, grasses and/or wood products may provide a substantial source of cellulosic ethanol and other bioenergy to meet the world’s energy needs. We have research strengths to pursue these opportunities and the agricultural and forestry resources to contribute substantively to energy production.

Waste Management: With a wide range of waste producers, including individuals, agriculture, industry, and government, New York residents, agricultural producers, businesses/industry, and governments need current information and solutions on techniques for managing waste, reducing waste at the
source, minimizing energy use and costs, and managing the risk and environmental inequities resulting from waste generation and disposal practices.

Environment & Natural Resources: New York residents rely on a wide variety of natural resources including forested mountains; aquatic environments (wetlands, marshes, estuaries, streams and lakes); and an accompanying diversity of plant and animal species, for recreation, tourism, and raw products. Agricultural and natural resource producers, community decision makers, businesses, organizations, and individual consumers need current information on good management practices, alternative land uses, protection of open space, and development of environmentally-sustainable natural resource-based businesses. Communities need education targeted to their specific concerns, including the interaction of natural resources, the environment, and the economy.

Assumptions

- The environment and natural resource require protecting and in some cases citizen action for remediation.
- Producers, local government, individuals, organizations, and businesses often are not fully aware of potential environmental impacts of their operations and/or requirements and opportunities of environmental regulations and programs.
- Knowledge of the interactions of environmental resources, public health, quality of life, and local economies will lead to an involved, proactive citizenry.
- It is possible to simultaneously meet economic and environmental sustainability goals; a sustainable, healthy economy depends on a healthy environment.
- There are new and renewed opportunities for locally owned energy production.
- Small distributive energy systems may be more economically feasible given biomass characteristics than large-scale production and may have other benefits in terms of local economics and energy security.
- Energy expenditures on local or in-state owned production alternatives stay in the state and local economies to the betterment of residents.
- Reduction of energy use provides cost savings to businesses and may retain dollars in the state and local economies.
- Significant barriers to the widespread adoption of renewable energy technologies – economic, environmental, social, logistic and physical—can be overcome with dedicated research and extension.
- As a major energy consumer, New York can contribute substantively to energy independence through energy conservation and adoption of renewable energy sources.
- Producers, local governments, individuals, organizations, and businesses and industry often are not fully aware of potential environmental impacts of their operations and/or requirements and opportunities of environmental regulations and programs.
- Technical assistance providers relied upon by producers, local governments, individuals, organizations, and businesses and industry have parallel needs for current information on appropriate waste management and reduction practices.
- Increased adoption of “clean” renewable energy technologies will help mitigate the threat of climate change.
- We need an energy literate public to move forward responsibly.

Ultimate Goals of the program

- Healthy ecosystems
Youth, families, communities, farms, businesses that engage in long term planning for proper use of natural resources, sustainable energy, and environmental priorities.

- Natural resources that are protected and available for multiple uses, including agroforestry, fishing, recreation, agriculture, recreation, tourism, and other businesses/industry.
- The economic vitality of agricultural/natural resources and other businesses is improved, the health of individuals and families are enhanced, and local government operations are made more sustainable through the availability of high quality natural resources.
- Improved waste management and waste reduction efforts will result in an enhanced and protected environment, including soil, air, and water, and reduced risk for individuals and families.
- New York State becomes a leader in pursuing the national goal of energy independence.
- Use of locally produced and owned energy sources and/or lower cost external sources retains energy dollars within the local and state economy providing enhanced economic well-being.
- The economic vitality of agriculture/horticulture/natural resource and supporting businesses, and the financial security of individuals and families are enhanced and local government operations made more sustainable through reduced energy costs.
- Improved waste management and waste reduction efforts will result in an enhanced and protected environment, including improved soil, air, and water quality, and reduced risk for individuals and families.
- The economic vitality of agriculture/horticulture/natural resources and other businesses is improved, the health of individuals and families is enhanced, and local government operations are made more sustainable through waste reduction and economical and safe management of waste.

Activities

This is a program entailing a wide range of applied research activities and multiple education methods depending on local context and need. Campus-based faculty and extension associates, regional specialists and county-based educators all are involved in designing, implementing, and evaluating tailored applied research and educational efforts depending on the focus and scope of their role.

Topics include: Waste management, wildlife management and forestry, renewable energy resources, energy conservation and efficiency, heating with wood, forestry etc.

Sample Statewide/Regional Initiatives that fall within this Plan of Work

- Consumer Education Program for Residential Energy Efficiency
- Energy Education in Camp
- Farm Energy Audits
- Farm Waste Management
- Green Building Seminar Series
- Maple Program
- Master Composters
- Master Forest Owners
- Master Naturalist
- Private Forest Stewardship Program
- Recycling Ag Plastics
- Save Energy, Save Dollars
- Urban Forestry
Target Audiences

- Key audiences served, directly and indirectly include: agricultural and natural resource producers; consumers and property owners, businesses and organizations, teachers, youth professionals and volunteers, local/state/federal governmental leaders.
- Businesses, organizations, and producers are targeted with information about improved management practices and alternative land uses, such as agroforestry. Environmental planners and managers and technical assistance providers, such as foresters, are targeted with in-depth information related to their audiences/constituents. Teachers, youth professionals and volunteers are targeted with in-depth knowledge for youth enrichment.
- Agricultural/horticulture/natural resource and supporting businesses are targeted both regarding bioenergy production opportunities and information regarding alternative energy sources and conservation. Consumers are targeted for information regarding energy supply alternatives and energy conservation options for residential, facilities, and transportation needs.
- Residents and property owners are targeted with stewardship and waste reduction and management in their homes and on their properties. Businesses, organizations, and producers are targeted with information about reducing impacts of their operations. Teachers and youth professionals and volunteers are provided with curriculum and training. Youth are targeted with age appropriate education.
### Output and Outcome Indicators

Highlighted indicators are collected annually. Highlighted indicators are collected and reported annually. Others are shown in logic model format to demonstrate the progression from typical planned programs (outputs) → skill & knowledge development (near-term) → behavior changes (mid-term) → societal changes (long-term). Staff are expected to use program evaluations report on selected indicators.

#### 3.1 Bioenergy

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<thead>
<tr>
<th>Output Indicators</th>
<th>Near-Term Outcome Indicators</th>
<th>Mid-Term Outcome Indicators</th>
<th>Long-Term Outcome Indicators</th>
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<tbody>
<tr>
<td>Number of agricultural producers and agribusiness representatives completing educational programs on the potential for development of biologically-based fuels.</td>
<td>Number of agricultural producers, agribusiness, or local and state leaders who demonstrate knowledge gains about the potential for development of biologically-based fuels.</td>
<td>(3.1a) Number of producers, economic development organizations and other groups who collaborate to establish bioenergy as a viable alternative crop.</td>
<td>(3.1c) Number of producers, horticulture businesses and/or natural resource managers reporting that cropping for and/or use of bioenergy leads to increased economic returns to their enterprises.</td>
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<tr>
<td>Number of local and state leaders completing educational programs on the potential for development of biologically-based fuels such as biodiesel, ethanol, methane, recycled vegetable oils, space heating fuels etc.</td>
<td>Number of forest owners and purchasers of forest products who demonstrate knowledge or skills gains about current markets for firewood and chips/pellets and associated cropping practices.</td>
<td>(3.1b) Number of existing or new producers documented to have adopted appropriate alternative energy sources and/or energy conservation practices for bioenergy production, harvesting, and/or storage systems.</td>
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<tr>
<td>Number of agricultural producers and agribusiness, and natural resource business representatives completing educational programs about cropping for bioenergy production.</td>
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#### 3.2 Producer Energy Alternatives/Conservation

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<tbody>
<tr>
<td>Number of agricultural/horticulture/natural resource and supporting business representatives completing educational programs about the availability and pros and cons of alternative energy sources and/or technologies</td>
<td>Number of agricultural/horticulture/natural resource and supporting businesses who demonstrate knowledge or skills gains about the availability and pros and cons of alternative energy sources and/or potential energy</td>
<td>(3.2a) Number of agricultural/horticultural/natural resource businesses documented to have adopted appropriate alternative energy sources and/or energy conservation practices.</td>
<td>(3.2b) Number of producers/horticulture businesses/natural resource managers documented to have improved economic returns to agricultural/horticultural business profitability and vitality resulting from adopting</td>
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about potential energy savings in operations.

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<th>3.3 Consumer Energy Alternatives</th>
<th>3.4 Consumer Energy Costs</th>
<th>3.5 Community Energy Planning</th>
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<td><strong>Output Indicators</strong></td>
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<tr>
<td>Number of consumers and community leaders completing educational programs about the availability and pros and cons of alternative energy.</td>
<td>Number of consumers, property managers, and/or housing officials completing educational programs about potential energy cost savings, including selecting energy providers, and energy conservation strategies and measures especially related to housing and transportation.</td>
<td>Number of community members, leaders and officials completing education programs about the relationships between development patterns and energy use/costs. Number of workforce professionals, economic developers and/or entrepreneurs participating in educational programs on energy workforce and business opportunities.</td>
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<td><strong>Near-Term Outcome Indicators</strong></td>
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<tr>
<td>Number of consumers and/or community leaders who demonstrate knowledge or skills gains about the availability and pros and cons of alternative energy sources especially related to housing and transportation.</td>
<td>Number of consumers, property managers, and/or housing officials who demonstrate knowledge or skills gains and/or can articulate specific actions they will take related to energy cost controls and conservation measures especially related to housing and transportation.</td>
<td>Number of community members, leaders and officials who demonstrate knowledge gains about the relationships between development patterns and energy use/costs. Number of workforce professionals, economic developers and/or entrepreneurs demonstrating knowledge gains related to energy workforce and business opportunities.</td>
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<tr>
<td>(3.3a) Number of consumers documented to have adopted appropriate alternative energy sources.</td>
<td>(3.4a) Number of consumers reporting to have adopted appropriate energy cost control and/or conservation practices.</td>
<td>(3.5a) Number of communities documented to have assessed local energy development proposals and/or the relationships between current policies and regulations and energy conservation.</td>
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<td>(3.3b) Number of consumers who report savings on energy costs attributable to adopting alternative energy sources.</td>
<td>(3.4b) Number of property managers, and/or housing officials documented to have taken measures to improve energy cost control or efficiency of existing and new buildings.</td>
<td>(3.5b) Number of community agencies/organizations documented to have adopted appropriate alternative energy sources.</td>
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<td><strong>Long-Term Outcome Indicators</strong></td>
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<td><strong>Long-Term Outcome Indicators</strong></td>
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<tr>
<td>(3.3b) Number of consumers who report savings on energy costs attributable to adopting alternative energy sources.</td>
<td>(3.4c) Number of consumers who report savings on energy costs attributable to adopting energy conservation measures.</td>
<td>Number of new workers trained and energy-related businesses established at least in part due to participation in the program.</td>
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<td>(3.4d) Number of municipalities documented to have established or modified land use and development policies to promote energy conservation.</td>
<td>(3.5d) Number of communities documented to have established or modified land use and development policies to promote energy conservation.</td>
<td>(3.5e) Number of community agencies/organizations documented to have established or modified land use and development policies to promote energy conservation.</td>
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<td>Number of municipalities involved in energy literacy trainings.</td>
<td>that demonstrate knowledge gains about systems approaches to energy transitions.</td>
<td>communities that adapt or revise policies in response to large scale energy development (e.g., Marcellus shale development) and/or include energy as a component of their comprehensive plans.</td>
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### 3.6 Waste Management and Energy

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<tr>
<td>Number of agricultural/natural resources producers, organization and business representatives, community leaders, and/or residents completing educational programs on managing and reducing waste</td>
<td>(3.6a) Number of agricultural/natural resources producers, organization and business representatives, community leaders, and/or residents who demonstrate knowledge gains about waste management and reduction</td>
<td>(3.6b) Number of agricultural/natural resources producers, organization and business representatives, community leaders, and/or residents documented to have modified existing practices or technologies and/or adopted new practices to manage and reduce waste.</td>
<td>(3.6c) Number of agricultural/natural resources producers, organization and business representatives, community leaders, and/or residents documented to have reduced costs through improved waste management practices.</td>
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### 3.7 Environment & Natural Resources

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<tr>
<td>Number of participants completing educational programs featuring natural resources management and the environment.</td>
<td>Number of agricultural/natural resources producers, organization and business representatives, community leaders, and/or residents who demonstrate knowledge gains that reflect a new appreciation for natural resources management and the environment.</td>
<td>(3.7a) Number of agricultural/natural resources producers, organization and business representatives, community leaders, and/or residents documented to have modified existing practices or technologies that will assist with natural resources management and the environment.</td>
<td>Number of instances documented showing evidence of long term planning goals for natural resources or environmental management.</td>
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<td>Number of instances where enhanced quality of life/ecosystem indicators are observed as the end result of intentional planned programs.</td>
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<td>Number of policy changes or documented community action to protect, enhance or mitigate natural resources occurring as the result of intentional planned programs.</td>
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External Factors

The interaction between natural disasters, the economy, energy and waste management costs is well documented. Weather in particular has interrupted supplies and dramatically influences heating and cooling costs. Appropriations, public policy, and regulations directly affect the ability to pursue energy source alternatives, including bioenergy development, and to implement energy conservation alternatives, particularly for low-income households. Dramatic cuts in state funding for consumer energy education is a significant barrier. Public and private funders and CCE may have fewer fiscal resources and other resources to devote to energy and natural resource protection matters. These trends are expected to continue.

Evaluation

Each of the plans addresses a broad combination of applied research and extension initiatives spanning multiple audiences, methods, and intended outcomes. A combination of routine program monitoring and documentation, near-term outcome assessment, and targeted follow-up activities provides comprehensive assessment. We work towards this goal by doing two things – professional development to enhance evaluation capacity of our system and looking for program documentation of local, regional and statewide programs.

Evaluation Capacity Building: The CORE Evaluation Capacity-Building project with CCE came to a close at the close of the 2015 fiscal year. CCE staff continue to have full use of the web-based Netway program for program modeling and evaluation planning, and that the Netway includes online training components and resources such as the measures archive. Additional staff training in evaluation planning and practices to meet system wide outcomes will continue.

Regional/Statewide documentation examples. Many of our regional and statewide programs are receiving federal capacity funds. Documentation of outcomes will continue to be a requirement of funding. Results shape future program efforts and impact program design.

There is also a requirement for our local and regional programs to report on statewide outcomes/indicators: Program documentation results are aggregated in a statewide accountability database which includes both qualitative and quantitative data for reporting and helping us to better understand impacts.

In 2016, we will continue to review the national outcome framework and connect it, as possible, to our statewide outcome framework.

Recent Example – from the ForestConnect Program – use of pre-post survey

AGROFORESTRY-SILVOPASTURE
Silvopasturing is the deliberate and intensive integration of livestock in wooded pastures or pasturized woodlands. Silvopasturing uses rotational intensive grazing, and trees are managed through planting into pastures or thinning to retain low densities of high quality trees. Forest regeneration requires additional attention to prevent damage by livestock. Cooperative Extension programs on silvopasture can improve livestock producer profits, reduce environmental impacts of livestock, and improve the growth and productivity of farm woodlots.

Two day-long silvopasture workshops were offered for woodlot owners, foresters, graziers, and agency staff. There were 44 participants from NY, PA, CT, WV, VT, and NH. They owned or managed more than 235,000
acres each year. Before these workshops, participants indicated they had a moderate understanding of the definition of silvopasture (3.2/5.0 scale) recognized they had not been practicing silvopasture (2.1/5.0 scale). After the workshops, awareness of the definition increased (4.5/5), participants understood the principles (4.4/5.0), could articulate the activities necessary to begin a silvopasture system (4.0/5.0) and felt that silvopasture had good potential in the Northeast (3.5/5.0). The primary barriers to implementation of silvopasture practices were knowledge of the more complex integration of forest, forage, and livestock; the added time and labor requirement to implement the system, access to technical assistance, and the cost for implementation. The silvopasture social media site http://silvopasture.ning.com was developed to connect those interested in silvopasture. There are 162 members from Arkansas, California, Connecticut, Florida, Illinois, Indiana, Maryland, Massachusetts, Missouri, Nebraska, New Hampshire, New York, North Carolina, Pennsylvania, Rhode Island, Vermont, Virginia plus Australia and the Philippines. This site includes blogs, a forum, pictures, events, and links to resources. The development of a comprehensive statewide and regional program is underway. A professional development grant has been developed and submitted.

http://silvopasture.ning.com