1.0 Agriculture and Food Systems

Brief Summary of Program

Our research and education is directed toward improvement of food system as a whole from farm to table. Cooperative Extension (CCE) and applied research programs work together to cover multiple aspects of agriculture and food systems such as soil resources and soil health, crop plant genomics, field evaluation of crops, reliable production guidelines, genetic improvement of animals and animal production, economics of production and farm management, integrated pest management, healthy produce, fruit and vegetable production and storage and facilitation of sustainable agriculture. Education complements research by encouraging farmers to grow new crop varieties and employ new production and business practices, through programs for agriculture sector businesses, and by informing consumers about new or improved food products. Research analysis and education also affect policies to reform governmental food and agriculture related programs.

Cornell University has a commitment to agriculture, horticulture, and natural resources enterprises and assisting them in making informed choices when selecting production principles and practices to enhance economic and environmental sustainability. Cornell offers research and education programming focused on assessing existing and new production and management practices and techniques with special emphasis on both business vitality and agricultural environmental management. As part of our strategy, we emphasize integration of research and extension to accelerate: identification of problems, focusing scientific effort to resolving problems, field-testing and evaluation of technology and cultural practices, and implementation of environmentally superior innovations/practices for the agricultural, horticultural, and natural resource communities.

As a result of our applied research and cooperative extension efforts, farm businesses, horticulturist, and natural resource managers utilize research-based knowledge to continue producing a stable, safe and affordable food, feed, fiber, and fuel supplies and robust, attractive horticultural plants in economically and environmentally sustainable ways.

Situation and Priorities Statement

Agricultural and food industries contribute an estimated $30 billion a year to New York State’s economy. Improving production efficiency, quality, and safety of plants and animals in agricultural, horticultural, and natural resource production systems is fundamental to improving our ability to compete in a global economy. Managers of New York’s 35,000+ farms, horticultural, and forestry operations face dynamic and complex production environments. Extensive knowledge and skills are needed for identifying, selecting, and adopting principles and practices that optimize production management and improve profitability and sustainability in accordance with business goals. Technologies such as genetic engineering, satellite imagery and GIS, computer aided management decision tools are readily available today for adoption and use. Technical assistance providers have similar needs to remain up-to-date and able to provide appropriate recommendations for each enterprise.

Program priorities include: protecting and enhancing soil resources, crop plant genomics, field evaluation of crops, reliable production guidelines, genetic improvement of animals and animal production, economics of production and farm management, integrated pest management, healthy produce, fruit and vegetable production and storage, facilitation of sustainable agriculture and analyses of food system policies. Education
promotes use or development of new crop varieties and employment of new production and business practices, supports a viable agriculture business sector in the economy and informs consumers about improved food products and how to improve their food security. Promoting understanding of the economic and social roles of agriculture is important to sustainability of the agriculture sector.

Assumptions

- New science is needed for the production and procurement of adequate and acceptable nourishment for the world’s population.
- Tackling the issues of agriculture and food systems requires multidisciplinary, multi-institutional and collaborative research and extension efforts.
- Food system research and education must encompass a broad spectrum of from the study of basic plant and animal genomes, to effective and efficient production, to marketing, distribution and consumption practices, to policies affecting the quality and availability of a secure food supply.
- Integrated systems approaches are needed to expand our understanding of trade-offs and develop BMPs that better address current and future challenges as well as food safety.
- Producers, horticultural business people, and natural resource managers often are not fully aware of or skillful in managing production principles and practices that may help optimize their operations for economic and environmental sustainability and/or business management and development needs.
- Many agricultural/horticultural/natural resources businesses have opportunity to strengthen profitability through improved planning and management.
- There is opportunity for growth in the agricultural/horticultural/natural resources sectors through alternative, new, and value added enterprises which may not be apparent to potential investors.
- The supply and effective management of labor resources is a key to the viability of agricultural/horticultural/natural resources enterprises.
- Producers, horticultural business people, and natural resource managers 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, horticultural business people, and natural resource managers have parallel needs for current information on appropriate production practices.
- In most cases, it is possible to simultaneously meet economic and environmental sustainability goals.

Ultimate Goal(s) of the Program - Boost the sustainable production of safe and nutritious food.

- Improve global capacity to meet growing food demand in spite of changing climate.
- Assure the long-term viability and well-being of the agricultural/horticulture industry and rural communities in New York State.
- Promote economically and environmentally sound products and practices, and safer and healthier products.
- Assist producers, horticulture businesses, and natural resource managers to optimize production management and improve profitability and sustainability in accordance with their goals.
- Increase the use of sustainable practices to result in improved or protected soil, air and water quality and production of high quality and safe food and fiber.
- Improve soil health and productivity, resulting in increased farm profitability and improved environmental quality.
Activities

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

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

- Capital Area Agriculture and Horticulture Program
- Central NY Dairy & Field Crops Program
- Cornell Vegetable Program
- Eastern NY Commercial Horticulture Program
- Finger Lakes Grape Program
- Harvest NY
- Integrated Pest Management
- Lake Erie Regional Grape Program
- Lake Ontario Fruit Program
- Northern NY Agriculture
- Northwest NY Dairy, Livestock & Field Crops Program
- Pesticide Management Education Program
- South Central NY Dairy and Field Crops Program

Target Audiences

Key audiences served, directly and indirectly, in enhancing agribusiness viability include: established producers; new and young producers, consultants and service providers, input suppliers, cooperative directors and managers, marketing firms, governmental agencies, lenders, and local/state/federal governmental leaders.

Output and Outcome Indicators

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 to report on selected indicators.
<table>
<thead>
<tr>
<th>Business Management Emphasis</th>
<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 producers/ horticulture/natural resources business persons completing education programs on business management, finance, business planning and marketing, human resource management, risk management, production economics, and business transitions.</td>
<td>Number of participants demonstrating knowledge or skill gains in business management, finance, business planning and marketing, human resource management, risk management, production economics, intergenerational transfer and other business transitions.</td>
<td>(1.1a) Number of participants documented to have applied knowledge or skills gained to strengthen existing business operations.</td>
<td>(1.1c) Number of participants reporting improved agricultural/horticultural business profitability attributed at least in part to program participation.</td>
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<td>(1.1b) Number of participating family-owned agricultural/horticultural/natural resources businesses that plan for succession, transfer, or sale of their business.</td>
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<tr>
<td>Agriculture/Natural Resources Enterprises Labor</td>
<td>(1.2a) Number of participants who demonstrate knowledge gains related to needs of potential employees and/or availability of qualified employees.</td>
<td>(1.2b) Number of participants documented to have made one or more changes in human resources practices to enhance labor availability or retention.</td>
<td>(1.2c) Number of producers/horticultural businesses reporting improved labor availability, performance, and/or retention of higher skilled and more valuable human resource team members attributed at least in part to program participation.</td>
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<tr>
<td>Producer Alternatives/New Ventures</td>
<td>Output Indicators</td>
<td>Near-Term Outcome Indicators</td>
<td>Mid-Term Outcome Indicators</td>
<td>Long-Term Outcome Indicators</td>
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<td>Number of producers/ horticulture business persons completing programs to expand profitability, develop marketing options, diversify or substitute alternative products or enterprises, and/or</td>
<td>Number of participants demonstrating knowledge or skill gains related to expanding profitability, developing marketing options, diversifying or substituting alternative products or enterprises, and/or increasing</td>
<td>(1.3a) Number of participants documented to have adopted innovations in food enterprises including production, allied services, processing, and distribution.</td>
<td>(1.3c) Number of new food, horticultural, and agricultural businesses and/or new enterprises within existing businesses reported by program participants and attributed at least in part to program participation.</td>
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increase operational efficiencies.

operational efficiencies to solve immediate concerns.

(1.3b) Number of participants or producer groups who adopt practices of value-added production through retaining control of their product further in the processing chain, starting their own value added business, or forming alliances.

General Production Practices

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<tr>
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<tbody>
<tr>
<td>Number of producers, horticulture business persons, and/or natural resource managers completing education programs on existing and new production-management practices and techniques.</td>
<td>Number of producers, horticulture business persons, and/or natural resource managers demonstrating knowledge/skill gains in existing/new practices and techniques; improved product handling and storage to maintain quality and food safety; and/or improving production efficiency and/or environmental protection through adoption of best management practices.</td>
<td>(1.4a) Number of producers, horticulture business persons, and/or natural resource managers modifying existing practices and/or adopted new production best practices or technologies to address current issues and improve yield efficiency, consistency and/or quality and/or conservation of resources.</td>
<td>(1.4d) Number of producers or horticulture business persons, reporting increased dollar returns per acre or reduced costs per acre.</td>
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<td>(1.4b) Number of producers, horticulture business persons, and/or natural resource managers who report improved ability to anticipate and respond to environmental and market variations through alternative production management strategies.</td>
<td>(1.4c) Number of technical assistance providers documented to have incorporated current best management practices in their recommendations.</td>
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### Agricultural Environmental Management

| Number of producers, horticulture businesses, and/or natural resource enterprise managers completing education programs on potential environmental impacts of practices, requirements and opportunities of environmental regulations and programs, and whole farm systems | Number of producers, horticulture businesses, and/or natural resource managers demonstrating knowledge/skill gains in environmental impacts of practices, environmental regulations and programs, whole farm systems including integrated nutrient management, integrated pest management, waste management, and water protection. | (1.5a) Number of producers, horticulture businesses, and/or natural resource managers documented to have assessed potential environmental impacts of their operations and developed and acted on plans to eliminate or minimize those concerns. | (1.5b) Number of producers, horticulture businesses, and/or natural resource managers documented to have developed and implemented nutrient management and/or waste management plans or modified existing plans to meet production and environmental goals or regulations. | (1.5c) Number of producers, horticulture businesses, and/or natural resource managers documented to meet or exceed current environmental protection standards as a result of participating in relevant educational programs. | (1.5d) Number of resource managers reporting reduced environmental concerns for participating enterprises. |

### External Factors

Agricultural/horticultural/natural resources enterprises operate in a complex and volatile context involving susceptibility to weather extremes, changing governmental policies and regulations, competitive land uses and shifting development patterns, evolving consumer demands, and globally influenced markets. During the last couple of years highly damaging flood events damaged crop and forest resources in highly productive areas of New York. Recovery is slow for many areas.

Fundamental change is occurring in the state and regional economies within which agricultural/horticultural/natural resources enterprises operate. The specific implications of these external factors vary greatly by locale and across commodities and business forms in some cases creating new market opportunities and in others erosion of traditional markets. Population and land use changes in farming communities has led in some places to producer/neighbor issues that influence choice of production practices. Economic stress exacerbates issues of food insecurity and hunger and many community organizations are over- burdened and unable to meet demands.

There is a growing interest by consumers, communities and producers to market local foods locally. This interest continues to influence programs, research and funding availability. These trends are expected to continue.
Evaluation Methods

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 CCE Cornell Vegetable Program – use of case studies

SUSTAINABLE PEST MANAGEMENT SAVES MONEY FOR HIGH TUNNEL WINTER GREENS PRODUCTION

Many NY vegetable growers are looking for ways to extend their season and provide fresh, locally grown produce to winter CSAs and winter farmers markets. High tunnels are proving to be an excellent way to produce ‘off-season’ greens crops with little-to-no fossil fuel based heat, contributing to environmental sustainability. These production systems also contribute to economic and social sustainability by creating year-round income and maintaining customer relations during the traditional off-season. For example NYS has now over 180 winter farmers market, with greens from hoop houses given credit in a recent USDA report for this success.

Pest infestations, such as aphids and cabbage worms, restrict the economic potential of these systems. As a grower in south west NY put it "Pest management is so much more important in the winter because your losses are so much more".

This project promoted early fall releases of parasitoids, combined with late fall and winter applications of biorational pesticides, specifically Beauvaria bassiana, a commercialized fungal pathogen of aphids. This project conducted 11 on-farm meetings, 7 formal educational seminars, and 3 professional development events with combined attendance of 516 people. Over 100 farm visits were made by project staff, 6 newsletter articles, Tweets and 1 aphid management factsheet were created. The project team evaluated adoption and impact on farms contacted through the project.

Case-study farms were recruited in late summer from across New York State. Growers' experience with winter greens ranged from 0-10 years. Twenty-eight farms initiated case-study work with the team project. However, some farms dropped out due to unexpected changes in production schedule, crop failures, etc. Over the 4
years, there were 24 different successful case studies on 20 farms in 11 counties across New York State. Twenty-four winter greens high tunnel growers adopted biological or biorational control methods to manage pests with an average increase in revenue of $2465.13. One survey indicated 61% of increased revenue was attributable to increased awareness and skills in natural pest management.

http://cvp.cce.cornell.edu/greenhouse_tunnels.php