

Project Title: Sustainable Greenhouse Management

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Project Overview

According to the USDA New England Agricultural Statistics, nursery and greenhouse production was ranked first among the state's agricultural commodities in 2012 with sales estimated at \$156 million. According to a 2009 survey, conducted by the New England Nursery Association there are more than 5,130 firms that are involved in production (nurseries, greenhouses, herbs, cut flowers, turfgrass) retail (garden centers, florists) and landscape services. Forty-six percent of these operations combined these different business elements. The industry consists of wholesale growers and grower retailers, including a rising number of diversified farms that are adding greenhouse crops to their businesses strategies. Plant production is also the basis for many associated horticultural industries such as plant and seed propagators, product suppliers and service industries. These companies together have significant economic and environmental impacts for Massachusetts. Sustainable greenhouse management requires solutions to problems of energy, pest management, trained labor, water quality, production practices and plant nutrition for a diverse range of crops and complex agricultural and environmental issues.

As Massachusetts undergoes cultural, economic and climatic changes, both new and established growers will need to learn to use practices that are economically, environmentally and socially sustainable. The Sustainable Greenhouse Management program will undertake applied research and educational opportunities to address key problems and opportunities facing the industry and the public. Programs on greenhouse crop production, integrated pest management, water and nutrient management, waste management and energy will be delivered through a variety of newsletters, websites and message board, publications, workshops, conferences, training programs, diagnostic services and applied research. Applied research is being conducted on organic growing media and fertilizers for ornamental greenhouse crops.

Situation & Priorities

Exotic pests, diseases, and invasive species. Exotic pests, diseases and invasive species are important problems that face the greenhouse and floriculture industry and are a threat to the economic viability of the industry and to the environment. Crops that become infected with an exotic diseases or infested with

exotic pests in most cases, become unmarketable and can be very costly to manage. Some pests and diseases on ornamentals may threaten food crops and some overwinter, becoming an on-going expensive problem. The globalized production and importation of crops and the distribution system for greenhouse crops increases the risk for introducing exotic pests, diseases and invasive species. There are a variety of pests that currently threaten specific crops and markets within the horticultural industry. In 2012, the destructive disease Impatiens downy mildew killed garden impatiens in greenhouses, gardens and landscapes throughout MA and the region. Garden impatiens are an important economically significant plant in the ornamental industry. In 2009, the destructive disease, phytophthora was distributed to commercial farms throughout the northeast through plants grown for home gardeners and distributed through retail outlets. Basil downy mildew, a new disease in 2008, continues to be a problem. Other recent exotic pest include the quarantined disease, Chrysanthemum White Rust on garden mums, Lily leaf beetle on lilies, Ralstonia on geraniums, Q-strain whitefly, Daylily rust, boxwood blight and the list goes on. Invasive plant species are also creating problems in Massachusetts and the potential for future problems is significant. Invasive plant species typically are habitat generalists and aggressive colonizers and outbreaks are difficult to contain and almost impossible to eliminate unless discovered and addressed early in the invasion. Our established Greenhouse Crops and Floriculture Extension program with our strong network of Extension educators, web-based message alerts and email list direct to growers will deliver research-based information to the industry that will be used to educate their customers including home gardeners in MA. Extension staff will also continue to expand and enhance a searchable, web-based photo library of pests and diseases. This helps growers to identify problems early and take action to avoid, detect and control exotic pests and invasive species.

Water Protection Water resources must be protected through conservation and pollution prevention to provide clean drinking water, support viable terrestrial, wetland and aquatic ecosystems, serve as an essential resource for businesses, and provide recreational opportunities. Contingent on continued external funds, our greenhouse crops and floriculture program, will continue to promote cost share programs and provide educational activities for growers of greenhouse crops to help growers implement water conservation practices and proper plant nutrition practices to help protect our water resources.

Integrated Pest Management (IPM) - The use of IPM for greenhouse crops can reduce management and production costs, reduce the risk of contamination, help to protect bees and other pollinators, increase marketability, and improve the health of soil and water. Our Greenhouse Crops and Floriculture extension program will provide educational opportunities for growers on IPM through newsletters, our website, on-line message board and photo libraries, workshops, diagnostic services and web based apps for handheld devices.

Workforce Development - Employees of greenhouse crop production businesses need training opportunities to grow greenhouse crops that are economically viable and environmentally responsible for businesses to remain profitable. Employees of garden retailers need training to provide accurate, unbiased information to the public that is safe for people and the environment. The Greenhouse Crops and Floriculture Program will provide educational training opportunities to growers and retailers.

Activity Summary - 2018

- Applied Research on organic growing media and fertilizers for ornamental greenhouse crops (1)
- Summer Meeting & Educational Program (1)
- Winter Meeting & Educational Program (1)
- Greenhouse Production & Management 2018 (1)

- Floral Notes Newsletter (6)
- Greenhouse-Related Consultations Based on Plant Samples Submitted to UMass Extension's Plant Diagnostic Lab (91)
- One on one Consultations (42)
- Greenhouse Update Photo Library (1)
- Greenhouse Update email (13)
- 2018 Greenhouse Webinar Series (9)
- Educational Publications: Revised New England Greenhouse Floriculture Guide and gardening fact sheets, to be printed and distributed through garden retailers (4)
- Educational workshops and conferences on sustainable greenhouse crop production for growers, and garden retailers and agency staff (7)
- Pesticide education training (1)
- Web-based educational materials for sustainable greenhouse crop production: photo library, message board and grower resources (25)

Total educational contacts

	Adult Contacts
In Person	774
Indirect Contacts (Print, Web, etc...)	654355

Narrative Summary and Impact

Sustainable greenhouse production addressed the following important issues: Maintaining economic viability for the floriculture and greenhouse industries and enhancing environmental sustainability, (greenhouse cultural practices, integrated pest management, organic production, water and energy conservation and exotic diseases, insects and invasives). Programs addressing these issues were delivered through a variety of educational mechanisms including workshops and conferences, grower site visits, newsletters, electronic media including websites, Facebook and email lists and diagnostic services.

Activities included: grower consultations; educational workshops and conferences (day-long Fall Grower Educational Program, Ins and Outs of Biological Control, Growing Spring Crops in Greenhouses, day-long Winter Grower Educational Program, Greenhouse Plant Disease Diagnostic Workshop, Summer Field Day, Greenhouse Biological Control Conference); articles publications and newsletters (Floral Notes and Mayflower - 300 growers), maintaining up-to-date information on websites (www.negreenhouseupdate.info - message update – 30,000 users (36,512 sessions) per year, www.umass.edu/umext/floriculture - 925,598 sessions (740,811 users per year and YouTube videos on a variety of greenhouse production subjects were viewed by 17,000.

Based on workshop written evaluations, as a result of Extension Greenhouse Crops and Floriculture program activities, 79 growers plan to use learned practices that will result in economically benefitting their business; 4 growers intend to use organic fertilizers on greenhouse crops; 42 will better use bio-

fungicides over this next year; 45 are better able to evaluate their biological control program; 46 are better able to conserve natural enemies; 37 adopted a new pest management practice such as better identification and scouting of pests; 30 are planning to use information learned at the pollinator conference such as providing advice to customers, reducing pesticide use, creating bee gardens and other bee habitats and; 24 intend to use information presented at the greenhouse vegetable production program such as growing benchtop greens, cucumbers, tomatoes, using bio-controls and adjusting their present practices. Over 100 growers collected information and talked one-to-one with Extension staff exhibiting information at trade shows. Sixty growers received pesticide recertification credits.

Collaborating Organizations

- **Massachusetts Department of Agricultural Resources**
- **Massachusetts Flower Growers Association**
- **New England Floriculture, Inc.**