

Project Title: Sustainable Greenhouse Management

Project Leader: Jason Lanier

Project Overview

According to the most recent USDA Census of Agriculture (2017), horticultural production including greenhouse and floriculture (as well as nursery and sod) is ranked first among Massachusetts agricultural commodities with sales estimated at approximately \$140 million, which accounts for nearly 1/3 of total agricultural sales in the Commonwealth. In the same survey, 449 Massachusetts firms are credited with producing floriculture or bedding crops under 7.3 million square feet of glass or other protection, while 252 firms produced food crops under approximately 1.8 million square feet of cover. The greenhouse industry consists of wholesale growers and grower retailers, including a rising number of diversified operations that are adding greenhouse crops to their business strategies. Greenhouse crop production also provides a basis for many associated horticultural interests such as plant and seed propagators, equipment and materials suppliers and service providers. These interests considered together have considerable economic, societal, and environmental impacts for Massachusetts. Sustainable greenhouse management requires solutions to problems of energy, pest management, trained labor, water protection and conservation, 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 and apply practices that are economically, socially, and environmentally sustainable. At the same time, UMass Extension's Greenhouse Crops and Floriculture program has experienced considerable recent reductions in capacity because of faculty and staff retirements, re-assignment of existing staff, and an uncertain funding future. The program will interpret applied research and offer educational support to address key problems and opportunities facing the industry and the public to the extent of its capabilities. Education on pertinent topics including greenhouse crop production, integrated pest management, water and nutrient management, waste management and energy will be delivered through a variety of web resources, social media, publications, face-to-face training programs and diagnostic services.

Situation and 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 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 show up in the industry. Other recent exotic pests include the quarantined disease, Chrysanthemum White Rust on garden mums, Lily leaf beetle on lilies, Ralstonia on geraniums, Q-strain whitefly, Daylily rust, and boxwood blight. Invasive plant and insect species are also creating problems in Massachusetts and the potential for future problems is significant. Invasive species typically are hardy 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 and social media-based rapid response capability will deliver research-based information to the industry that will in turn be used to educate their customers, including home gardeners in MA. Extension staff will also continue to expand and enhance a searchable, web-based library of fact sheets and photos, thereby helping growers to identify problems early and take action to avoid, detect and control exotic pests and invasive species.

Input Reduction and Natural Resource Protection

Protection of water resources from horticultural endeavors includes the protection of water quantity as well as water quality. As a result of growing populations and increased frequency of drought events, water use restrictions are becoming more commonplace in the Northeast region, which reduces water availability and may increase production costs. Pesticides and fertilizers used for agricultural production have the potential to negatively impact water quality, and are therefore the subject of increasing scrutiny throughout the region, nation and world. Water resources must be protected through conservation and pollution prevention to provide clean drinking water, to support viable terrestrial, wetland and aquatic ecosystems, to serve as an essential resource for businesses, and to provide recreational opportunities. UMass Extension's Greenhouse Crops and Floriculture program will continue to promote and provide educational resources for growers of greenhouse crops to provide guidance in the implementation of water conservation techniques and proper and responsible plant nutrition and pesticide use practices to help protect precious water resources.

Integrated Pest Management (IPM) and Biological Control

Pest management, especially the management of insects and fungal diseases, is of paramount importance for producing marketable greenhouse crops. The use of IPM for greenhouse crops can reduce management and production costs, reduce the risk of pollution and contamination, increase marketability, help to protect bees and other pollinators, and improve the health of soil and water. Particular care is also necessary for implementing pest control strategies for edible vs. non-edible crops. The use of biological control agents is an aspect of IPM particularly well-suited to the greenhouse environment. Carefully controlled conditions allow for greater establishment, persistence and success with biological control approaches relative to other horticultural systems, and can dramatically reduce the use of chemical pesticides for the production of a marketable crop. Our Greenhouse Crops and Floriculture program will provide educational opportunities for growers on IPM and biological control through our website, social media, photo libraries, workshops, diagnostic services and consultations.

Workforce Development

Based on survey data and other avenues of grower input, the availability of trained labor is one of the primary challenges facing the greenhouse industry at the current time. This issue is not unique to greenhouse production, and extends to other horticultural and agricultural concerns. Employers need adequate labor resources to meet production and sales goals, and to enable business growth. 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 provides education and training opportunities to growers and retailers.

Activity Summary - 2020

- Creation of fact sheets and management guides, and review and revision of existing resources (14)
- General Web and Social Media Communication (62)
- Winter Meeting & Educational Program (1)
- Greenhouse Production & Management Workshop (1)
- MFGA Summer Meeting & Education Webinars (2)
- MFGA Winter Meeting & Education Program (2)
- One-on-One Consultations (62)
- Timely management updates for greenhouse producers (16)

	Adult Contacts
Direct Contacts	499
Indirect Contacts (Print, Web, etc...)	674666

Narrative Summary and Impact

Over the past few years, the Greenhouse Crops and Floriculture Team has worked to improve and expand its web presence, as well as enhance response capabilities for emerging issues through the use of social media and other modern communications tools. This meant the Team in one regard was well-situated to continue to provide educational resources, services, and consultations in a relatively normal fashion despite travel bans and social distancing requirements. On the other hand, traditional in-person programs were significantly affected. Two key winter meetings proceeded as normal, but programs later in the year had to be transitioned to remote delivery. The annual summer meeting was adapted via two successful webinars held in August and September. The biennial Northeast Greenhouse Conference, a regional effort for which UMass Extension assists in development and facilitation, pivoted into a series of well-received webinars. Key diagnostic services from UMass Extension’s Plant Diagnostic lab persevered, despite a lengthy lab shutdown in the spring.

While the COVID-19 pandemic negatively affected many areas of the economy, the fact that many people spent more time at home increased interest in beautifying properties and growing food. These trends lead to one of the busiest and most successful seasons on record for greenhouse-based businesses. This boom put the spotlight on the persistent issue of a skilled labor shortage in the horticultural industries. UMass

Extension's Greenhouse Crops and Floriculture Team worked to connect growers with up-to-date, research-based information to help those new to the industry, as well as experienced practitioners, to advance their skills and achieve necessary industry licensing and certifications. Front and center were perennial educational themes including sustainability, IPM, and Best Management Practices. These principles help to promote input reduction, natural resource protection, and production efficiency, which leads to higher quality plants for consumers and service providers, lower environmental impacts, and more successful and profitable businesses.

Total web and social media contacts exceeded 650,000, an increase of nearly 20% relative to FY19, which spoke to the reality of folks seeking to learn in virtual, non-traditional ways. Despite the circumstances, the team was able to provide 125 direct consultations via e-mail, phone, and other contact-free means; 43 of which were based on plant samples submitted by mail or delivery to UMass Extension's Plant Diagnostic Lab. New and veteran practitioners alike were able to receive valued greenhouse-specific training for not only important industry priorities including IPM and Best Management Practices, but also in support of critical pesticide licensing, for which the system was substantially disrupted by the pandemic. Summer webinars were partially underwritten by the Massachusetts Flower Growers Association, who with this support expressed that the industry was trusting of and grateful for our novel efforts.

Collaborating Organizations

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

