

MESSAGE FROM THE COORDINATOR

Next year, we will celebrate the 20th anniversary of Project GREEN (Generating Research and Extension to meet Economic and Environmental Needs). It's exciting to see how far we've come in the nearly two decades since we began this initiative. We set out to create a program that would provide plant-based industries in Michigan with relevant research and extension in a timely manner, especially to address emergent issues. We have accomplished that and much more with the generous support of the Michigan Legislature and the Michigan plant-based commodity organizations. I'd like to thank everyone who has been involved in making Project GREEN into what it is today.

There is a lot of work ahead of us, though. In many circles, science is being challenged and the integrity of our food system is in question. I'm pleased to be involved in creating a new initiative at Michigan State University (MSU) that is addressing both concerns.

Food @ MSU launched this summer and is a public awareness campaign geared at creating meaningful conversations around food-related topics. We've worked with MSU Shadows within the Department of Forestry to create a one-of-a-kind table made from fallen campus trees. This fall we will begin taking "Our Table" out into various communities to host roundtable discussions on food, including its impact on our health and on the planet.

Be sure to visit food.msu.edu to learn more.

There has arguably never been a more important time to communicate science in easy-to-understand language. As a scientist, I can attest that we sometimes don't do a good job of listening. A big part of this campaign is about listening to consumers and hearing what types of concerns and questions they have when it comes to their food, the way it's produced and its impact on the environment. I feel that we have done a good job of listening to you as an industry; we now need to extend that to the broader public.

This publication is just one example of the type of communication we need to do more of. I hope you find this information useful as you make decisions about how we feed ourselves and those around us.



Doug Buhler
Coordinator, Project GREEN
Director, MSU AgBioResearch



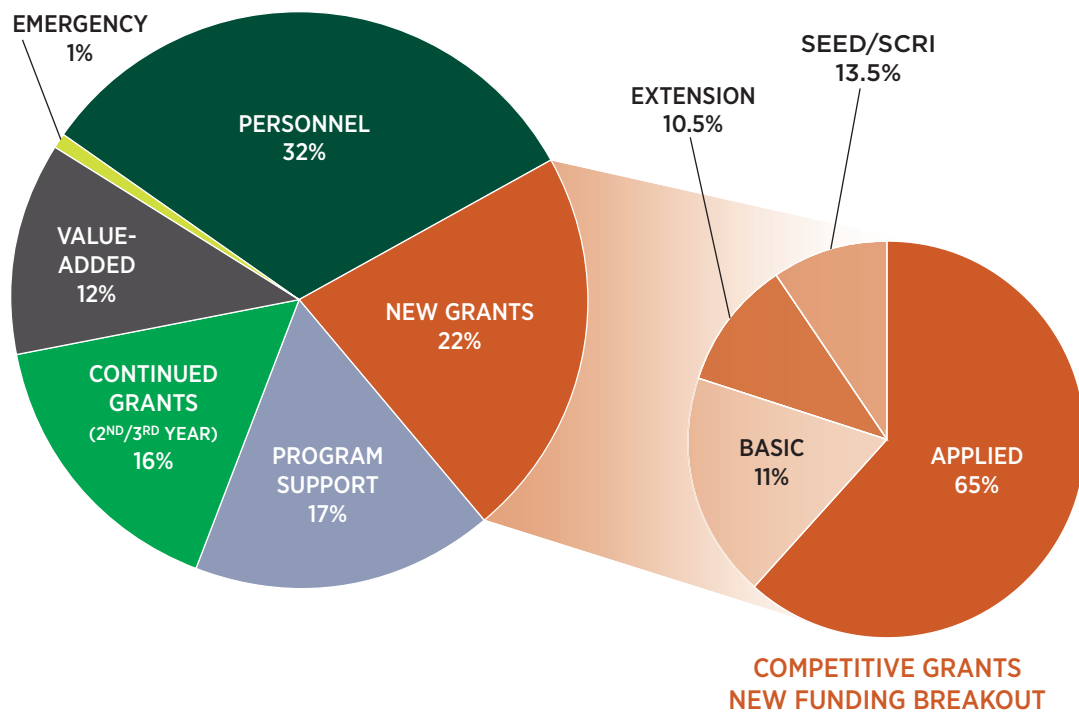
DOUG BUHLER

DIRECTORS' ACTION TEAM

The Directors' Action Team is the decision-making body that establishes goals and strategic action plans for Project GREEN.

- DOUG BUHLER**
MSU AgBioResearch
- JEFF DWYER**
MSU Extension
- RAY HAMMERSCHMIDT**
MSU Department of Plant, Soil and Microbial Sciences
- VANCE BAIRD**
MSU Department of Horticulture
- JAMIE CLOVER ADAMS**
GORDON WENK
ROBIN ROSENBAUM
Michigan Department of Agriculture and Rural Development

FINANCE AND OPERATIONS



COMPETITIVE GRANT SUMMARIES

Competitive grants are the foundation of Project GREEN. Michigan State University, the Michigan Department of Agriculture and Rural Development, and Michigan plant commodity organizations work together to ensure that Project GREEN research aligns with industry priorities and scientists respond to the changing needs of plant agriculture in Michigan.



Examining the role of cover crops in soil health

Lisa Tiemann
Awarded: \$69,400 | Leveraged: \$300,000

Soil health and sustainability are critical issues that need to be addressed to maintain agricultural productivity. With the global population expected to exceed 9 billion by 2050, more food will need to be grown using less land and natural resources. Soil organic matter is the foundation of a healthy soil because it mediates the soil processes that control plant productivity, health, and air and water quality. One effective way to build soil organic matter is by adding high-quality organic amendments to soils that promote microbial growth. MSU assistant professor Lisa Tiemann is using Project GREEN funding to target soil used to grow potatoes at the Montcalm Research Center. She believes cover crops can provide the necessary nutrients to continue high-level potato production. Depletion of soil organic matter and concurrent declines in soil structure and soil fertility are particularly acute in potato cropping systems because of intensive tillage, low organic inputs and a preferential use of sandy soils. By using several metrics to quantify microbial activity and nitrogen availability throughout the year, the team is beginning to better understand the timing of the breakdown of different cover crop residues, which controls the timing of nutrient release and availability for potato uptake. Tiemann said the work provides evidence for the benefits of cover crops and cover crop diversity important for not only potato production but also for most all row crop agriculture taking place in depleted soils.

Digital extension media to improve field crop disease education, management and profitability

Martin Chilvers
Awarded: \$33,450 | Leveraged: \$10,000

Despite the major contribution of field crops to Michigan agriculture, few resources exist to disseminate information for the management of field crop diseases to growers and the public. Martin Chilvers, an assistant professor in the MSU Department of Plant, Soil and Microbial Sciences, and his team have developed information delivery methods and materials in an effort to reach the greatest number of growers and industry professionals. Videos and corresponding digital fact sheets have been created. Chilvers said that Michigan plant agriculture benefits from this extension and outreach through improved management of field crop diseases. The information reduces unwarranted and ineffective fungicide applications, and improves disease control and return on investment when fungicide applications are necessary. Information is shared through various channels, including the Crop Protection Network, a multi-state group of researchers sharing research-based information with growers and the general public. Project GREEN funding has enabled the group to develop a video production pipeline and devote resources to written content creation. Chilvers said they will continue to hone content delivery and production skills. In addition, the team has worked with groups such as MSU associate professor Kurt Steinke's soil fertility lab to produce collaborative videos, and make equipment and expertise available to others.

Assessment of allergenic potential of wheat lines from the MSU breeding program

Perry Ng
Awarded: \$80,000 | Leveraged: \$45,000

Increased prevalence of wheat allergies and gluten disorders (celiac disease and non-celiac gluten sensitivity) in recent years has resulted in avoidance of wheat products by millions of consumers worldwide — causing an adverse effect on the wheat industry. According to research published in the journal *Gastroenterology*, celiac disease is four times as common today as it was 50 years ago. There is an urgent need to uncover the fundamental mechanisms of why and how wheat causes these disorders to inform the development of methods to prevent and treat wheat-induced illnesses. MSU professor Perry Ng and his team used a two-year funding award from Project GREEN to create a program that examines the allergenic potential of wheat, in collaboration with the wheat breeding program at MSU. To increase the team's capacity, Ng recruited a postdoctoral research associate, one doctoral student, one undergraduate research assistant, two volunteer research assistants and one international exchange visiting student from Brazil. The team successfully optimized the protocols and produced high-quality wheat proteins from two wheat varieties: a soft and a durum wheat. Then, they established ultrasensitive and highly specific enzyme-linked immunosorbent assay (ELISA)-based methods for measurement of a wheat-specific allergenic antibody and two non-allergenic antibodies. A mouse model was used to develop a wheat allergy blood bank that will be used to create an in vitro method to assess allergenicity. The team is currently seeking extramural grant funding to continue the project.

Downy mildew on hop: Tools to protect Michigan's new industry

Mary Hausbeck
Awarded: \$80,000 | Leveraged: \$92,167

Michigan is the largest hop producer outside of the Pacific Northwest. In 2016, hops were grown on 800 Michigan acres and valued at \$16.4 million. Downy mildew is the No. 1 threat to Michigan hops. It causes lesions on the leaves, cones and bracts — acting similarly to the closely related cucurbit downy mildew pathogen. Currently, state-specific control strategies are not available for hop downy mildew but will be accomplished through developing greenhouse, nursery and hop recommendations to include fungicides and identification of resistant commercial cultivars. MSU plant pathologist Mary Hausbeck is leading the charge against downy mildew in hops, as she is looking to develop a robust management plan for Michigan. Fungicides with different active ingredients have been tested for efficacy under Michigan conditions. Multiple fungicide active ingredients are needed to delay the development of fungicide insensitivity in the pathogen. Growers have been advised on how to maximize the efficacy of currently registered fungicides in managing hop downy mildew. Multiple hop cultivars have been tested for resistance to the strains of downy mildew present in Michigan. Incorporating resistant cultivars and effective fungicides as part of an integrated management system can contribute to long-term management of hop downy mildew. The research initiated by this project is ongoing for 2017.

COMPETITIVE GRANT SUMMARIES CONTINUED...

Managing a resurgent pest: Stem gall wasp in Michigan blueberries

Rufus Isaacs
Awarded: \$72,400 | Leveraged: \$20,000

With one generation each year, the blueberry stem gall wasp is a sporadic but increasing pest of highbush blueberries in Michigan. This insect causes damage when eggs are laid in growing shoots. As the larva feeds on plant tissue, it stimulates the plant to form galls that harden and kill the developing shoot. The galls are also a contamination risk for machine-harvested fields, leading to lost sales by processors. MSU entomologist Rufus Isaacs is using Project GREEN funding to create novel methods of managing the pest. One significant challenge with gall wasp control comes from the fact that this insect is a wasp, and therefore closely related to bees. During bloom, growers must take care not to poison bees. This restricts the types of insecticides that may be applied to blueberries. The current project has identified numerous varieties of highbush blueberries highly susceptible to infestation. This information can be used in planting decisions. A number of new insecticides were discovered on a trial at the Trevor Nichols Research Center and in on-farm trials in spring 2017. Post-bloom sprays at a high water volume have been shown to reduce the gall size, number or both. In less susceptible cultivars at a high water volume, this effect can carry over to the following year. This could potentially reduce the number of sprays required, leading to a reduction in applications of insecticide and increased cost savings for growers.

Survey RE: Hemlock woolly adelgid

Deborah McCullough
Awarded: \$20,000 | Leveraged: \$314,453

Hemlock woolly adelgid (HWA) is an invasive forest pest that has been a nuisance to Michigan trees for years. Eastern hemlock is highly vulnerable to this pest, and infested trees typically die within 10 years. Hundreds of thousands of hemlocks in eastern forests have been killed by HWA since this invader was first reported in Virginia in 1951. Funding provided by Project GREEN for Deborah McCullough, a professor in the MSU departments of Forestry and Entomology, enabled her to rapidly initiate a systematic, adaptive HWA survey in Michigan's Ottawa and Muskegon counties, with a particular focus on areas near and between known HWA infestations. Her team also began developing and evaluating a geographic information system-based, high-resolution model to project the likelihood of hemlock presence in residential and urban areas, as well as forested areas. Results of 2015-16 surveys were regularly provided to cooperators at state regulatory and natural resource agencies. The work contributed to an improved understanding of the extent of the HWA invasion, eventually leading to a decision that HWA eradication was not feasible. The project also reinforced the need for better statewide information on distribution, size and condition of the hemlock resource in forests, as well as in residential or urban areas. McCullough's group is continuing to cooperate with state personnel and collaborating with other MSU faculty to address this and related HWA issues in Michigan.

Web-accessible advanced IPM scout training for underserved berry growers to manage new invasive species

Carlos Garcia-Salazar
Awarded: \$25,000 | Leveraged: \$356,912

The arrival of the spotted wing drosophila (SWD) in Michigan in 2010 devastated the small fruit industry. Underserved and minority growers have been the most affected. In 2014, 28 surveyed Latino blueberry growers indicated losses due to SWD, amounting to 58 percent of their income. The problem has grown so fast that the Michigan Blueberry Advisory Committee placed it at the top of its priorities for research and extension in 2016. However, growers require advanced integrated pest management (IPM) tools and a systems approach for pest management to incorporate SWD into their current IPM programs. They need more knowledge and understanding of how insecticide applications should be adjusted to account for pest behavior, weather conditions and sprayer equipment. A research team led by MSU Extension educator Carlos Garcia-Salazar has created English and Spanish web-accessible resources for farmers. The usefulness of the training with web-accessible materials resulted in a highly successful implementation of SWD management. Salazar said that when growers are taught complex subject such as a systems approach to pest management with simplified, web-accessible educational materials, small working groups and experiential learning, they are capable of using those resources to develop successful SWD management programs. Growers farming 738 acres of more than 2,684,834 pounds of blueberries were affected by this training. The total market value of protected berries was \$3,490,284.

ACADEMIC INFRASTRUCTURE REPORTS AND PROGRAM SUMMARIES

MSU Land Management Office

The Land Management Office utilizes Project GREEN funding to help keep MSU AgBioResearch centers operating. Funds are often used for new equipment and skilled labor positions. Many research centers were able to provide maintenance and repair services to infrastructure in 2016-17 through Project GREEN, as well as funding for field trials, pest management and more. The Clarksville Research Center, for example, was able to use funding to undertake asphalt and landscape projects.

Several research center projects also benefited from Project GREEN dollars, including:

- Potato breeding and potato blight trials.
- Breeding of new varieties of tart cherries that have improved fruit quality and disease resistance.
- Spotted wing drosophila monitoring in fruit crops at multiple research centers.
- Dry bean white mold research.
- The preparation of three acres for new apple and plum plantings at Trevor Nichols Research Center.



For a complete list of academic infrastructure reports and program summaries, visit green.msu.edu.

Project GREEN helping Christmas tree industry thrive



Photo courtesy of Bert Cregg

Precocious coning in Fraser fir.

For nearly 20 years, Project GREEN has been funding research that addresses some of the most pressing plant agriculture needs.

Throughout those two decades, Jill O'Donnell has been an essential figure in the Michigan Christmas tree industry every step of the way.

O'Donnell, who has worked at Michigan State University (MSU) for more than 35 years, is an MSU senior Extension educator. In 1995, O'Donnell stepped into her present position, which is currently funded by Project GREEN.



Jill O'Donnell, MSU Extension educator

Her statewide appointment allows her to troubleshoot issues for a variety of tree species in different environmental scenarios. She provides education on numerous topics, including information on getting started with growing Christmas trees, and pest and nutrient management.

Collaborating on projects with colleagues such as Bert Cregg, an associate professor in the MSU departments of Forestry and Horticulture, O'Donnell sees herself as a resource for growers looking to improve their Christmas tree operations.

"Growers can call me anytime if they have a problem, and I'm fortunate to be able to travel around the state to visit with them," O'Donnell said. "I can then relay those things back to campus, which is filled with experts and specialists who are willing to work with me on any issue our industry is facing."

O'Donnell and Cregg have been busy the last several years with a Fraser fir malady called precocious coning.

Fraser fir is one of the four leading Christmas tree species in Michigan, alongside Douglas fir, Scots pine and Colorado blue spruce.

The trees are not native to Michigan, however, indigenously

residing in the southern Appalachian Mountains at high elevations. Acidic, well-draining soils and areas with abundant rainfall are the preferred Fraser fir habitat, presenting problems for Michigan growers needing to replicate those conditions.

O'Donnell and Cregg have created online resources for growers interested in Fraser fir, one of which compares Lansing, Michigan, weather to that of Boone, North Carolina — a location within the tree's natural range.

"Lansing gets roughly half the rainfall annually that Boone does, so that's obviously problematic," O'Donnell said. "It's also a few degrees warmer on average during midsummer in Lansing, and that tells us that irrigation is extremely important here."

Precocious coning causes early cone production in Fraser fir, a process that normally doesn't take place until the trees are at least 15 years old. The cones break apart and leave an unsightly stalk that devalues the trees. Removal is done by hand, a costly and laborious undertaking.

"It's not a sustainable method of dealing with precocious coning to hand-remove all of the cones, so we need to find a preventative measure," O'Donnell said. "We're looking at growth regulators and alternative methods that kill the cones but don't hurt the trees."

The researchers haven't determined the exact cause of precocious coning, but they have uncovered some clues. O'Donnell said that high soil pH appears to be the primary limiting factor in successful Fraser fir plantings. This can contribute to rapid cone development and can be difficult to combat, given the multitude of soil types in Michigan.

The precocious coning work began with Project GREEN funding and now receives national dollars from the Christmas Tree Promotion Board.

"Christmas trees are a beloved aspect of our culture for many people," O'Donnell said. "I'm thrilled that we are supported at both the state and national levels to be responsive to grower needs and ensure that we have a thriving industry."

Project GREEN

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RECOGNIZING INDUSTRY PARTNERS

Our research is aided by organizations that identify critical agricultural issues. Project GREEN would not be possible without these valuable partners:

- Celery Research Inc.
- Corn Marketing Program of Michigan and the Michigan Corn Growers' Association
- Great Lakes Canola Association
- Growing U.P. Agricultural Association
- Hop Growers of Michigan
- Michigan Apple Committee
- Michigan Asparagus Research Inc.
- Michigan Bean Commission and Michigan Bean Shippers' Association
- Michigan Blueberry Advisory Council
- Michigan Carrot Committee
- Michigan Cherry Committee
- Michigan Christmas Tree Association
- Michigan Commercial Beekeepers Association
- Michigan Cranberry Council
- Michigan Crop Improvement Association
- Michigan Farm Bureau
- Michigan Floriculture Growers Council
- Michigan Grape and Wine Industry Council
- Michigan Grape Society
- Michigan Hay and Grazing Council
- Michigan Integrated Food and Farming Systems
- Michigan Nursery and Landscape Association
- Michigan Onion Committee
- Michigan Organic Food and Farm Alliance
- Michigan Peach Sponsors
- Michigan Pear Research Committee
- Michigan Plum Advisory Board
- Michigan Potato Industry Commission
- Michigan Sod Growers Association
- Michigan Soybean Promotion Committee
- Michigan State Millers' Association
- Michigan Turfgrass Foundation
- Michigan Vegetable Council
- Michigan Wheat Program
- Michigan Wine Collaborative
- Midwest Nut Producers
- National Grape Cooperative
- Pickle Seed Research Fund
- Sugarbeet Advancement Committee
- Western Michigan Greenhouse Association



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2017 LEGISLATIVE REPORT

