

INTEGRATED PEST MANAGEMENT

Insights

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Contact Us

607-255-8815
northeastipm@cornell.edu

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Beyond Agriculture: The Whole Farm Approach to Pests

What makes you change your way of life? Sometimes an internal calling brings about new behavior. Government regulations can force change. Change can be rapid or slow in forming, requiring years of stimuli, until one day something clicks, or just makes more sense. Often, if you make a habit of personal reflection, new opportunities appear when you look back at what just happened.

Ecology of Change

Christopher Philips of the University of Minnesota and co-authors describe the “IPM continuum,” a concept that ranges from none, to low-level, to high-level IPM. For the moment, set aside the practices. What is the thinking?

On a 175-acre vegetable farm in Pennsylvania, a farmer plants winter cover crops, uses a roller crimper to knock them down, then transplants her tomatoes into a thick mulch. Soon, she begins to see a delay in early blight, and less pest pressure generally.

In an apartment high-rise, the manager takes ownership of the building’s entire pest control operations. He oversees frequent monitoring, the sealing of openings and cracks, and the keeping of disposal areas free from food waste.

The farmer and the building manager have in common an approach that views the theater—whether farm or building—as an ecosystem. The theater could be a farm field, a garden, someone’s backyard, or a 64,000 square-mile watershed.

Gaining Momentum

A decade ago, the Sustainable Agriculture Research and Education (SARE) program documented growers and researchers taking a whole farm approach to managing pests in crop fields. Fast forward to today and you’ll see the “whole farm” idea used for any number of settings, such as schools, ranches, single-family homes, factories, warehouses, and offices.

For the farmer, perhaps she sees the benefits of a resilient system much more resistant to pests. For

the building manager, evidence of long-term savings and lower risks to human health may bring the tipping point.

Ecological pest management employs a whole farm approach where no rock in the field is left unturned, and no brick in the building is overlooked.



Roller crimper in action. Photo by Steven Mirsky, U.S. Department of Agriculture.

A Framework, Not Tools

Early advocates of IPM believed that a single approach is a poor substitute for a system-wide strategy to control pests. IPM is a process that mimics nature as much as possible, adapting with the landscape as the farmer grows food and fiber, and as the building manager keeps pests at bay by preventing them from entering the structure. IPM proponents—on farms, in cities, in parks, and wherever else pests may occur—have a whole farm mentality for limiting pests and their damage.

—Chris Gonzales and Steve Young

Reference

Philips, Christopher R; Kuhar, Thomas P; Hoffmann, Michael P; Zalom, Frank G; Hallberg, Rosemary; Herbert, D Ames; Gonzales, Christopher; and Elliott, Steve (October 2014) Integrated Pest Management. In: eLS. John Wiley & Sons, Ltd: Chichester. DOI: 10.1002/9780470015902.a0003248.pub2



Plants have natural defense systems

Plants use a variety of natural defense mechanisms to counter attacks by pests. Not only can healthy plants out-compete a pest by growing rapidly, but they also produce chemicals to slow insect feeding or inhibit bacterial or fungal infection. Some plants emit chemical “help” signals that call natural enemies—such as beneficial insects—to their aid. Farmers can manage crops to maximize plant defenses.

The Northeastern IPM Center is part of a five-year, multi-state research and extension project that began in 2015 to harness chemical ecology and to address pest and pollinator priorities. Through this project, researchers are seeking alternative, non-pesticidal strategies that unite several disciplines and lead to sustainable solutions.

These efforts aim to reduce the impacts of insect pests, protect valuable pollinators, support organic agriculture, and develop holistic, ecology-based systems.

For further details, see <http://neipmc.org/go/AWWp>

Applying the “Whole Farm” Concept to Apartment Buildings

That cockroach creeping across your neighbor’s apartment floor is certainly spewing forth tiny asthma-triggering allergens—a vicious band of Wild West gunmen raiding the whole farm of human dwellings. Indeed, a 2005 National Institutes of Health study found that cockroach allergens have the greatest impact on childhood asthma in urban settings.¹

“Think of the building as an ecosystem,” says Jody Gangloff-Kaufmann with the New York State IPM Program. “Apartments, high rises, and basically any built structure that interfaces with the environment can be considered an ecosystem that offers entry points for pests.”

The German cockroach not only annoys, says Changlu Wang of Rutgers University, it tops the public housing enemy list not only because of its prevalence, but because of health risks associated with asthma and improper use of insecticide sprays. In New York City alone, 16 percent of households have cockroach infestations.²

If an apartment building is the whole farm, then the German cockroaches would be the cattle rustlers. Residents wielding cans of insecticide would be the misguided vigilantes. Wang and his partner Amanda Eiden of Rutgers would be riding white horses and wearing Stetson hats, trying to help people breathe more easily and reduce unnecessary exposure to pesticides.

“You risk your skin catching killers and the juries turn them loose so they can come back and shoot at you again,” said the character Martin in the 1952 movie *High Noon*, a quote related to our story only metaphorically.

But we can see this metaphor play out as risky chemical sprays are used, killing a small portion of the cockroach population, only to have those hiding in the walls cause the numbers to rebound. A whole-farm approach requires the conditions that support the cockroach population (water, food, and shelter) to be eliminated, and involves all the players—residents, building managers, and pest control technicians—joining forces against the raiders, and using more effective IPM tools, such as vacuums and baits.

A recent survey shows 71 percent of residents applied insecticide sprays for cockroach control, even though IPM strategies are safer and more effective.

“Spraying cockroaches is like farming them,” said



Riding white horses and wearing Stetson hats—practicing IPM may help people breathe more easily. Photo: iStock.

Susannah Reese of the Stop Pests in Housing Program. “Sprays take out some, but the population keeps growing.”

In 2017, the Northeastern IPM Center awarded Wang and Eiden \$50,000 to study people’s reactions to cockroach infestations. They want to understand when people start to reach for the can of all-purpose roach spray—and hopefully cut them off at the pass.

To do so, they are developing a threshold measure they call “aesthetic injury level,” or AIL.

The aim is to monitor AIL and cockroach populations and better understand the association between them.

In Wild West terms, it’s a plan to clean this town up, make it fit for families with kids to live in. And keep the raiders off the farm in the first place.

—Chris Gonzales and Susannah Reese

References

1 – <https://www.sciencedaily.com/releases/2005/03/050321085558.htm>

2 – <http://www.realtor.com/news/trends/americas-worst-pest-infested-cities>

When the Whole Farm Is the Region

The idea of “whole farm” pest management came to life recently for growers in the Northeast.

In 2014, the Northeastern IPM Center awarded a \$49,487 Partnership Grant to Katie Campbell-Nelson, Ann Hazelrigg, and Andy Radin to build and maintain the New England Fruit and Vegetable Scouting Network.

Using field walks at sentinel farms in Vermont, Massachusetts, and Rhode Island, the team provided growers with hands-on training in IPM methods for key pests and diseases in vegetable and fruit crops. Then they distributed weekly pest alerts to an audience of over two thousand people.

When you think of the *region* as the whole farm, now you're really talking.

“Mother Nature has given us incredibly powerful tools.”

The entomologist Joe Lewis is often quoted for a simple message: “Let’s learn how to use Mother Nature’s tools.” Across the country, researchers are finding that whole-farm, ecological systems work. In Pennsylvania, for a positive example, 80 percent of apple growers now rely on the black ladybird beetle to control European red mites.

For a negative example, in Eastern states, corn and soybean growers have watched at least ten species of annual weeds become resistant to triazine herbicides. Now, in no-till systems, producers use four to five different herbicides to control the weeds once stopped by atrazine. Similarly, the costly Colorado potato beetle has become resistant to many pesticides.

Single-tool management ignores basic ecological principles, and fails because it does not consider problems as symptoms of a system whose intricate natural controls have collapsed.

Strategies for managing pests

“The laws of nature demand that we look at the whole system,” says John Teasdale, a weed scientist with USDA’s Agricultural Research Service in Beltsville, Maryland.

In order to maintain populations of beneficial insects against pest organisms, growers can follow some specific strategies and practices. First, they can leave some undisturbed areas on a farm.

Agricultural disturbances such as tillage, harvest, and fertilizer and pesticide application all can provoke pest problems, but there are ways to avoid stimulating

pests at the wrong time. For example, till fields before final seedbed preparation to stimulate weed germination, then cultivate before planting to lower the density of weeds infesting a crop.

Diversity, both in the crops grown and how they are managed, can reduce pest problems, and decrease the risks of market and weather fluctuations. Growers can enrich diversity across the landscape, throughout the season, and from year to year.



Black ladybird beetles can control European red mites. Photo by Whitney Cranshaw, Colorado State University, Bugwood.org.

Cultivate rich soils

As plant variety spreads above ground, diversity builds in the soil. Through a system of checks and balances, a medley of soil organisms helps maintain low populations of many pests.

“You can redesign the farm to become a more complex agricultural ecosystem,” says Teasdale. “In an agroecosystem, the crop is going to dominate. But within that much simpler, very managed system, we can apply many principles from natural ecosystems to make it easier to control pests.”

Campbell-Nelson and the New England Fruit and Vegetable Scouting Network are aiming toward a goal of a farm that mimics nature. And good work on one farm can spread by communication to the broader region, and beyond.

For further exploration: John Vandermeer of the University of Michigan describes the linkages between predator-prey insects in coffee. Start the video at 30:00 to hear him describe ants, flies, and beetles in particular. <http://neipmc.org/go/Wfcj>

This issue was produced in partnership with the Sustainable Agriculture Research and Education (SARE) program, which provided text and examples. See <http://neipmc.org/go/aLjm> for the 20-page bulletin that inspired this issue.



Resources

Scientific Coalition on Pest Exclusion

78 people like this.
Let's add more!
<http://neipmc.org/go/EDyA>

The “Why IPM” video series page

<http://neipmc.org/go/WhyIPM>

IPM Symposium

The 9th International IPM Symposium will be held March 19–22, 2018 at the Renaissance Baltimore Harborplace Hotel, 202 East Pratt Street, Baltimore, Maryland, USA. <https://ipmsymposium.org/2018/>

Alerts issued by the North Central IPM Center

Spotted Lanternfly
<http://neipmc.org/go/QBGS>

European Cherry Fruit Fly
<http://neipmc.org/go/jpCg>



Adult spotted lanternfly photo by Holly Raguza, Pennsylvania Department of Agriculture.

2017 Partnership Grants Announced



In 2017, the Northeastern IPM Center awarded more than \$250,000 for research and outreach through its IPM Partnership Grants, a competitive funding program.

“This year’s awards reflect the diverse issues and opportunities related to pest management in our region,” said Steve Young, director of the Northeastern IPM

Center. “We wish we could have funded more projects, as this year was a competitive one with a number of innovative proposals.”

The total amount awarded is \$253,378.

The Projects

Title, Amount, Project Directors – Institution

Engaging School Nurses as Key Change Agents to Promote IPM Adoption in Northeast Schools, \$19,985, Kathy Murray – Maine Department of Agriculture, Conservation, and Forestry. **A New England Tree Fruit Management Guide for the Next Generation**, \$19,991, Daniel Cooley, Jon Clements – UMass Amherst. **Northeast Invasive Hardy Kiwi Working Group**, \$20,000, Jane Winn – Berkshire Environmental Action Team (BEAT). **Establishing a Northeastern IPM Weeds Working Group**, \$20,000, Antonio DiTommaso – Cornell University. **Developing Aesthetic Injury Level for German Cockroach IPM**, \$50,000, Changlu Wang,

Amanda Eiden – Rutgers University. **Integrating Cover Crops for Weed Management in Plasticulture Systems**, \$49,875, Kurt Vollmer, Mark VanGessel – University of Delaware. **Exploitation of Ecological Traps for the Control of a Mosquito Disease Vector**, \$48,527, Allison Gardner, Joseph Staples – UMaine. **Developing IPM Tactics for Browntail Moth Outbreak**, \$25,000, Eleanor Groden – UMaine.

The Northeastern IPM Center covers twelve states from Maine to West Virginia and the District of Columbia. It is one of four regional IPM centers in the nation. This year, the other regional centers awarded grants to conserve bees, mitigate pest resistance in corn and soybeans, provide IPM training in schools, and to study bed bugs in multifamily housing, as well as soybean looper, pecan bacterial scorch, and tawny crazy ant. Collectively the four centers will award just over a million dollars. For further details, see <http://neipmc.org/go/nQwY>

Credits

Northeastern IPM Center—Writer/Editor: Chris Gonzales, Director: Steve Young, Staff: Nancy Cusumano, Jana Hexter, Kevin Judd, Yifen Liu, Martin Murillo, Susannah Reese.



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