

INTEGRATED PEST MANAGEMENT

Insights



July 2016: Volume 13, Issue 3



July 2016

Volume 13, Issue 3

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Signature Programs



Challenges and Opportunities for Ecologically-Based Growers

Aldo Leopold, who in 1949 published *The Land Ethic*, a founding text of the conservation movement, knew the challenges for the farmer: feed a growing population, improve the productivity of agricultural land, and protect the integrity of the environment for future generations. Today, an increasing number of people have expectations for higher quality food—for example, organic, unprocessed, un-packaged, and healthy products. Even as expectations rise, we face water and air pollution, loss of beneficial organisms, and increasing persistence of pests. Yet these challenges are being met head on by the organic movement and the IPM tradition, whose adherents see a need for greater adoption of ecologically-based practices among growers and the general public.

The benefits of organic growing are many: fewer adverse environmental impacts, no synthetic pesticide residues, and documented improvements in nutritional quality in dairy and in some fruits and vegetables. The benefits of IPM: reduced reliance on single tactics, as well as reduced pesticide residues, production costs, risks, and health and environmental impacts. Fundamental principles of IPM can be applied to any pest problem.

One of the limitations of organic growing is the rigorous restriction of pesticide and fertilizer inputs, all of which must be derived from natural products. Meanwhile, a limitation of IPM is that, on a continuum, the benefits are dependent on the extent to which tactics are adopted. Also there is lack of consumer understanding of IPM.

There are commonalities to organic, IPM, and even conventional farming. Organic producers practice IPM, for example, by using cultural, biological, and in some cases chemical controls. Some ecologically-based growing practices are becoming more common in conventional farming, including cover crops and reduced tillage systems. Organic food has broad consumer awareness and support, price premiums, and a clear set of standards through the National Organic Program (NOP).



Still life with organic fruit and vegetables.

Both types of ecologically-based growing, organic and IPM, are knowledge-intensive and require a systems approach that focuses on understanding a problem, rather than simply applying patent- and revenue-driven products in the field. This is a major constraint to adoption of organic and IPM. Ecologically-based growing may cost more in the short term, yet it pays off in the long term. Ecologically-based growing delivers ecosystem services, such as clean water, soil health, and environmental biodiversity, not to mention a sustainably-grown crop. Despite these benefits, market premiums are necessary to provide incentives for growing organic food, even while demand outstrips supply. Furthermore, IPM is not recognized by retail consumers. In this context, one could argue that IPM and organic would be best served by positioning themselves together under a single “ecologically-based growing” umbrella.

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This issue is based on work of the North Central IPM Center’s Organic and IPM Working Group.

Challenges and Opportunities

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Adherents of IPM and organic growing share common priorities. Ecologically-based growers need increased resources for research, technology transfer, education, and outreach. Public policy changes and private-sector incentives could level the playing field. There are answers for growers battling long-fought pests like fire blight in apples and pears, late blight in tomatoes and potatoes, and agriculture weeds that thrive in reduced-tillage systems. Ecologically-based approaches could tackle newly introduced pests such as spotted wing drosophila, brown marmorated stink bug, and Asian citrus psyllid. However, the political and social interest in learning them is often lacking. Ecologically-based solutions, which are rarely discovered overnight nor through a single company or individual, take consistent, sustained efforts by the widest

group who is willing to share in both the challenges and the successes.

Organic and IPM groups are finally working together. But this shouldn't be such a revelation. Individuals using ecologically-based methods have been working together for centuries prior to the chemical revolution and Rachel Carson's book *Silent Spring*. The critical issues of today, such as climate change, pesticide resistance, and off-target chemical movement, are driving us back to the basics upon which organic and IPM were founded. We need resilient farming systems that can endure environmental problems that are occurring naturally and due to our own mistakes. We need to look in the mirror and ask ourselves the question, "Is this the best we can do?" If Aldo Leopold was looking to a sustainable future, so should we. ■

Foundations of IPM, Organic Point Way Over Barriers

Adherents of organic and IPM practices share a basic principle: emphasis is placed on human health, the environment, and economics. This means that the practices developed and adopted with both approaches must align with the principle. Historically, IPM has focused on pests of any stripe, and was born in response to the overuse of pesticides. Growers have used organic practices for centuries on farms and in fields, big and small, and have developed new ideas along the way. When the USDA established the organic certification program, growers had the option of producing food guided by laws. Meanwhile, growers practicing IPM have operated without a clear definition. Even the highest level of IPM, which has aims similar to organic, receives no price premiums or special marketing.

Organic and IPM production brings a common benefit: reduced consumer exposure to pesticides in the diet. IPM and organic production brings another equally important benefit: biodiversity in the environment. In addition, some organic foods can have higher levels of certain specific nutritional components, higher antioxidant levels, and greater nutrient density than some conventionally produced foods.

Overcoming the Barriers to More IPM and Organic

Organic and IPM adoption—and benefits—remain far short of potential. Less than 1% of US cropland is certified organic (USDA ERS 2013). Only about 10% of cropland benefits from a high level of IPM practices (USDA NRCS CEAP). Nevertheless, agriculture research, development, and outreach benefit everyone. Because IPM and organic practices are knowledge-intensive and focus on ecologically-based problem solving, they

could be easily adopted and widely used, even in conventionally-grown crops. The small share of revenue in organic and IPM production is not a fair measure of success. Knowledge cannot be bought or sold, like a jug of chemicals or a bag of compost. Farmers—whether organic, IPM, or conventional—who apply excessive inputs are seldom held accountable. However, corporate sustainability efforts are increasing pressure on all growers to improve.



If you could purchase a bunch of "IPM certified" carrots, would you?

A New Approach

IPM could help growers solve many problems with numerous pests. In the case of weeds, the knowledge infrastructure needed to practice Integrated Weed Management (IWM) is being compromised by the ease of single applications of herbicides to crops grown in monoculture and genetically engineered to be tolerant of a chemical. It's no wonder that weeds in much of the corn and soybeans in the US are managed without IWM. The IPM model is based on knowledge, understanding, and often requires outside-the-box thinking, all of which take time. The practices that do not use IWM are based primarily on salable products and powerful market mechanisms to push them along.

Public funding to Land Grant universities is on the decline, yet institutions still need money to educate students and make new scientific discoveries. However, patents, as revenue streams, do not work, let's say, on cover-cropping practices that will decrease soil pests. This forces some researchers to choose to identify the active components that suppress pests, which generates funding for their program, but prevents them from doing the ecologically-based research on cover crop systems. Actually growing and incorporating a cover crop

IPM and Organic

Both Are Ecologically-Based Growing



Source: The Northeastern IPM Center, based on the work of the North Central IPM Center's Organic and IPM Working Group.

might improve several aspects of soil health, including organic matter as well as beneficial microbes, but selling a pest-suppressing chemical brings short-term financial gain. And innovative systems thinking is kept on the back burner for another day.

Expanding Adoption

Some growers use the “high-input” strategy to meet expectations for top yields and economic returns without regard to externalized environmental and human health costs. The business model promotes this focus, even for IPM and organic. When implemented by farmers who seek to maximize short-term profits and who are not expected to pay for those external costs, the resulting environmental impacts are often linked to major issues—like hypoxia in the Chesapeake Bay, Great Lakes, and Gulf of Mexico. Or groundwater contamination by nutrients and pesticides. Or unacceptable levels of soil erosion.

Eco-Growing

IPM and Organic Meet Needs



Growers need to feed a growing population

increase ag land productivity

preserve health and environmental integrity for future generations

meet rising expectations for higher quality food



and organic & IPM communities seek greater adoption

increasing resilience of pests are challenges

loss of beneficial organisms

but water and air pollution



organic benefits

fewer adverse environmental impacts, no synthetic pesticide residues

IPM benefits

address any pest, lower pesticide residues, costs; fewer health, environmental impacts



Source: The Northeastern IPM Center, based on the work of the North Central IPM Center's Organic and IPM Working Group.

Compensating Environmental and Societal Benefits

Farmers are, of course, central to agroecosystems. Whether a grower uses certified organic, conventional, or IPM practices, too often the yield of their crop is their sole measure of success. For sustainable agriculture to thrive, growers as well as input suppliers and even insurance providers must value additional measures of success. Improved soil health, reduced greenhouse gas emissions, reduced energy consumption, decreased pesticide use, community vitality, and other societal and environmental measures—all need to be teamed with economic success. Farmers are well-positioned to be the leaders in sustainability. Innovation, problem-solving, and conservation will happen when America focuses on more than just yield and economics. ■

IPM and Organic

Limitations, Commonalities, and Differences

1 Limitations

Limitations of organic

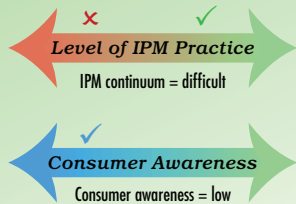


Often lower yield



Restrictions on pesticides, fertilizers

Limitations of IPM

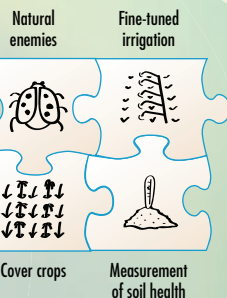


2 Commonalities

Organic and IPM are both systems approaches to growing

Organic growers use IPM, such as cultural and biological controls

Some IPM growing practices are more common in conventional farming



3 Differences

Organic food has broad consumer awareness and support.

Organics also enjoy price premiums and have a standard: the USDA National Organic Program (NOP).



Source: The Northeastern IPM Center, based on the work of the North Central IPM Center's Organic and IPM Working Group.

Common Priorities of IPM and Organic

1 Dollars for . . .

- Research
- Tech Transfer
- Education
- Outreach



2 Public Policy

- Legislation
- Support



3 Solutions for Growers

- Fire Blight
- Late Blight
- Brown Marmorated Stink Bug
- Spotted Wing Drosophila
- Asian Citrus Psyllid



Source: The Northeastern IPM Center, based on the work of the North Central IPM Center's Organic and IPM Working Group.

Moving Forward

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fit for organic growers. For the long-term, however, an equal investment is needed to uncover the ecological solutions at the systems level. Researchers and growers who use a two-pronged approach, tightly linking the short-term with long-term outcomes, can be very successful—making new discoveries and identifying emerging threats. The ecologically-based approach must fully incorporate the use of biological, cultural, mechanical, and optional chemical approaches. The framework needed for broad and open distribution of IPM knowledge—about the biology, ecology, and prevention of pest outbreaks—already exists through the Northeastern IPM Center and other like-minded organizations.

Making Gains

Sustainable products are in high demand in the market. Organic and high-level IPM growers are responding by producing healthy food that leaves a smaller environmental footprint. However, more research is needed to better understand the systematic nature of the problems, rather than simply responding to the symptoms. In addition, short-term outcomes and long-term research must be conducted in tandem and coordinated across regions and disciplines. Involving professional societies could provide significant strength in the enactment of this recommendation. In practice, a greater adoption of ecologically-based approaches is needed, to focus on all three legs of the sustainability stool: the environment, human health, and economics. ■

References — Find references from the July 2016 issue of *IPM Insights* at this link: <http://neipmc.org/go/PAjE>

Ecologically-Based Growers Face Obstacles and Market Could Help

Money, as they say, makes the world go round. So too money has spun the world of food, particularly food produced using IPM and organic practices. For decades, corporations have responded to consumer preference by supplying food that is produced and sold inexpensively. With the rise in rapid communications like social media and the Internet, and an increasingly educated and concerned public, consumers have begun voicing their concerns in the food marketplace. Consumers are choosing organic, healthy, and less-processed food. Along with the rise of health food stores is demand for sustainable production practices, which are being scrutinized more closely by food suppliers and distributors of all scales.

What will happen to conventional farming practices in the coming years? Will the market lead to reduced use of pesticides? Or will pesticide resistance—and toxicity in humans and the environment—lead to more regulation? Will IPM and organic fill the gap? A combination of these scenarios could happen. If so, significantly more research dollars will be needed to uncover ecologically-based answers to the problems, which have been given temporary fixes for far too long.

At present, adherents of the organic movement create market demand for products, practices, and their related ecosystem services. Still, more could be done. IPM is a part of organic just as it is a part of conventional agriculture. Will environmental issues like we have never had before force change to happen? The timing may be right for IPM to shift conventional growers toward more ecologically-based practices, which would have the greatest impact on all practices, including organic.

Challenges

People in the public sector are discussing a number of agriculture-related issues with regard to food safety, production practices, and human health. The National Water Quality Inventory Report to Congress indicates agriculture continues to be the US's leading source of surface-water pollutants. Poor pesticide-use practices have led to more than 1,000 species of insects, mites, plant diseases and weeds developing resistance to pesticides worldwide, generating more than US\$1.5 billion in costs per year (Pimentel 2005). Losses include damage by resistant pests, costs of additional pesticide applications required to control resistant pests, and costs associated with bringing new pesticides to market to replace those no longer effective due to resistance. Current estimates are that 237 weed species have developed resistance to 155 different herbicides (Heap 2014) in 66 crops in 61 countries worldwide. Farm workers have elevated risks of brain, cervix, prostate, stomach, lymphatic and bone cancers. Calvert et al. (2008) reported 3,271 acute pesticide-related illnesses among farm workers between 1998 and 2005.

A growing body of literature on occupational exposure to pesticides makes it a high priority across the globe.

A Model: Organics in the Market

Money that finally flowed into organic programs, like the National Organic Program (NOP), Organic Materials Review Institute (OMRI), and USDA helped fuel the emerging movement and fledgling industry that supported it. Now, organic is seeing exponential growth in production and product sales, with demand for many products continuing to exceed supply.

The same cannot be said for marketing “IPM-grown,” which is hindered by low consumer awareness and appreciation. With federal regulation of the organic label, and the marketing and education campaigns that accompanied it, came a surge in demand for organic products in the marketplace, along with greater legitimacy for organic methods within the agricultural research and Extension establishment. Global sales of organic in 2012 were approximately US\$63.8 billion. Despite all the growth, organic remains a tiny fraction of world and US agricultural production. The US has a total of 844 million acres (342 million Ha) of land in agricultural production, with 0.6% of it organic. Depending on your viewpoint, the glass is either half full or half empty.



What are the challenges for a farmer with radishes?

What's in a Name?

One challenge with IPM is in the name; integrated pest management. As much as people do not like pests, they loathe even more a pest label put on their food. In the 1990s, the New York State IPM Program and a large grocery store chain attempted an IPM labeling program. Support for the program was pulled in 1999, as there were several associated issues such as lack of recognition of IPM by consumers, a third category on already crowded shelves, stereotype associated with pesticides, and association of the word “pest” with the purchase of food.

A viable solution, for IPM, would be to follow industry in creating a new name. Crop consultants now specialize in resistance management and stewardship, which are synonymous with IPM in addressing pesticide resistant weeds, insects, and diseases. A similar approach could be used for labeling IPM food, such as integrated crop management (ICM) or sustainable agricultural solutions (SAS). Some groups, such as the not-for-profit food organization Red Tomato, the USDA's Sustainable Agriculture Research and Education (SARE), and the Natural Resources Conservation Service (NRCS) are already moving in this direction. Will IPM adherents lag behind, or lead the way to a sustainable future? ■

IPM and Organic Moving Forward Together



Organic and IPM, working together, a win/win.

As a discipline, agriculture has a need for resources to support research, education, Extension, and technology transfer. Within the field of crop production and protection, IPM and organic are no different. Yet, their basic philosophy—which places an emphasis on the environment, human health, and profitability—sets them apart from other approaches.

It has been said that if you can't beat 'em, join 'em. IPM and organic communities have definitely not been beaten, but they are not growing as rapidly as they could be, considering the demand in the marketplace. The USDA's Sustainable Agriculture Research and Education (SARE) program has funded and supported more projects in both IPM and organic than any other government agency. Perhaps their success is in their name, "sustainable agriculture." Is it time to re-assess and re-label both IPM and organic as ecologically-based?

Because organic farmers are restricted from using synthetic insecticides, beneficial populations are rarely reduced to the levels found with other practices. IPM systems are generally designed to preserve

beneficial organisms by using selective and fewer insecticides, adjusting timing of application, incorporating trap crops, and improving the habitat for natural enemies. While introduced exotic pests, such as spotted wing drosophila, brown marmorated stink bug, and Asian citrus psyllid threaten organic and conventional crops alike, the negative impacts to human health and the environment should be weighed equally with potential economic losses.

A Two-Pronged Approach

Individual practices, such as soil and nutrient management, and tools like natural herbicides and biological controls, provide short-term bene-

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Credits

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The Northeastern IPM Center is supported by the National Institute of Food and Agriculture, Crop Protection and Pest Management, Regional Coordination Program, Grant #2014-70006-22484. Printed on recycled paper. 4.5M; CP 7/16



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