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Farmers Find Organic Arsenal to Wage War on Pests

By Jim Robbins

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DAVIS, Calif. Mark Van Horn, director of the student farm at the University of California, is nearly lost as he walks through a yellow cloud of wild sunflowers around the edge of a field of tomatoes and sweet corn.

They aren't here for their beauty or as a cash crop they are a key pest control strategy down on the organic farm.

Research here on wild sunflowers, he says, shows they are home to lady beetles and parasitic wasps, which are good bugs that kill bad bugs.

"The sunflowers help us provide a bed-and-breakfast for beneficial insects and keep them going year round," he said. "And native sunflowers are a lot better at it than domestic. There's a lot more insect biodiversity in wild sunflowers."

While conventional farmers have a quiver full of chemical arrows to battle the invasion of weeds and pests, the organic farmer has a tougher row to hoe. There simply aren't organic bug sprays that can match the power of synthetic chemicals and almost nothing in the way of organic herbicides.

Instead, there's a growing understanding among organic farmers of ways to harness natural systems as part of what is called integrated pest management.

And there's a small burst of new research into organic farming techniques as a result of the 2008 farm bill, which finances a range of agricultural programs at a total of $307 billion. For years such research was financed at $3 million a year, and though the funds are still minuscule compared with conventional agricultural research, it's now $20 million annually for the next few years, and may increase further. Instead of five to seven research grants per year, there are now two dozen.

"You aren't considered a kook anymore if you do this kind of research, as you were in the 1980s," said Fred Kirschenmann, an organic farmer and a distinguished fellow at the Leopold Center for Sustainable Agriculture in Iowa.

Research on organic agricultural ecosystems in the last few years has made some key findings and refined techniques organic growers use.

A paper published in Nature this year confirmed what organic farmers have long suspected that conventional farming can make the pest problem worse. David Crowder, an entomologist at Washington State University and an author of the paper, says that if there are more varieties of plants around the field, and no broad-spectrum pesticides, as in organic farming, it promotes balance among insect species, rather than letting one species dominate. "There are more natural enemies and they do a lot better job in organic fields controlling pests," Dr. Crowder said.

Natural enemies are key to the organic approach. Eric Brennan is the lone full-time organic researcher for the Agriculture Department, and he works in the Salinas Valley, the so-called salad bowl of America, where some 80 percent of the country gets its salad greens. One of the most difficult pests is the lettuce aphid.

REFINED TECHNIQUES The Swanton Berry Farm in California. Some strawberry farmers use “trap crops” to lure insects away from their cash crop. Jim Wilson/The New York Times

The treatment of choice for commercial organic lettuce is to plant an ornamental flower called alyssum among lettuce beds, taking up 5 to 10 percent of the total field. Hoverflies live in the alyssum and need a source of aphids to feed their young, so they lay their eggs in the lettuce. When they hatch, the larvae start preying on the aphids.

“If you were an aphid on a head of lettuce, a hoverfly larva would be a nightmare,” said Dr. Brennan. “They are voracious eaters of aphids. One larva per plant will control the aphids.” Dr. Brennan is studying the most effective configuration of lettuce and alyssum beds.

Some organic strawberry farmers use “trap crops” to lure insects away from their cash crop. Lygus bugs cause the berries to deform. But the bugs like alfalfa better than strawberries, so some farmers plant one bed of alfalfa for every 50 rows of berries. As the lygus bugs crowd into the green growth, a giant tractor-mounted vacuum cleaner comes by and sucks them up. Other farmers simply suck the bugs off the strawberry plants.

Increasing native vegetation in the farm fields for biodiversity’s sake is not without controversy. After an outbreak of E. coli in 2006 in spinach, some produce buyers told farmers they would not buy crops from farmers whose fields weren’t clean, because brush could harbor rodents or other animals that might carry disease. Despite a lack of scientific evidence, Dr. Brennan said, some farmers have torn out vegetation.

Not all predators are other bugs. Rachael Long has studied bats and their role in pest management in the Central Valley of California for 15 years. Pear, walnut and apple orchardists were fighting the codling moth. By studying DNA in the undigested parts of bat waste, she found they did eat the moths and other insects, equal to their body weight each night.

The next phase, which took eight years, was to find out how to attract bats to bat houses. “The pups are born without hair,” Ms. Long says. “So you have to put them where they get morning sun, so they are warm in the morning, and shade in the afternoon, so it’s not too hot.”

There’s a huge demand for bats in farm country, she said. “They eat a ton of insects,” Ms. Long said. “They also eat cucumber beetles and stink bugs, which affect tomatoes.”

A bat house needs to be attached to a structure like a barn or a bridge, she says, and not mounted on a pole. Hawks will wait for young bats to come out of a house, if it’s not sheltered, Ms. Long says, and pick them off one by one.

Organic researchers are also studying the role of soil fertility in pest control. Some studies show nutrient-rich soil may enhance the plant’s immune system and increase natural resistance to insects and pests, or provide a home to natural enemies. Organic soil in potato fields that Dr. Crowder studied, for example, has higher levels of a fungus that kills potato beetle larva than conventional fields.

Cover cropping, planting grasses and legumes that fix nitrogen between cash crops, can make a tremendous difference in soil, according to studies by Dr. Brennan. “If we can get farmers to plant a cover crop every three years instead of every 10, we would be much further ahead” in soil fertility, he said. “There’s a huge difference.”

Organic farmers aren’t averse to rolling out certain kinds of chemical sprays. Some the so-called killer spices are made from a blend of essential oils and water from strong-smelling plants like clove, mint and thyme. A decade of studies in Canada show that they can be very effective at repelling and killing pests, and are safe, though they aren’t active in the environment long and require multiple applications.

As far as weeds on organic farms, the biggest help there may also be cover crops, things like rye and fava beans. Many cover crops aren't seeded at a high enough rate, Dr. Brennan said. "We have five times more weeds in vegetables where cover crop is the accepted rate," he said. "If we increase the seeding rate by three times, we have virtually no weeds. That's extremely important because organic farmers have no herbicides."

The scientific search continues for a blend of systems that will grow food naturally and be good for nature on and beyond the farm field. "That's the holy grail," says Mr. Van Horn. "An agricultural system that mimics a natural system."