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Eco Plots for Small Farms Serving Cities

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WOOSTER, Ohio — Joe Kovach set out to gross \$10 per row foot, equal to a robust \$90,000 per acre, in his innovative farm plots of mixed fruits and vegetables.

So far, based on the crops that he has in production, the Ohio State University scientist has achieved exactly that. The two final crops in the lineup, apples and peaches, are set to start producing this summer.

An ecological pest management expert, Kovach is midway through a six-year study of four different types of polyculture modules — plots with a mix of such high-value crops as snap peas, green beans, blueberries, raspberries, strawberries, tomatoes and edamame, or edible soybeans.

He aims to determine the best-working layout — best in terms of economics, efficiency and pest density — for intensive mixed plantings by small farmers. He calls it “modular ecological design.” The goal is food for urban consumers that needs precious little oil to reach them.

“The whole concept of urban agriculture is to grow the food close to where the people are,” said Kovach, who holds joint appointments with the Ohio Agricultural Research and Development Center (OARDC) and with Ohio State University Extension.

Urban agriculture cuts shipping and fuel use; Ohio’s rural/urban Medina County, for example, is closer to Cleveland than California is.

“My view,” Kovach said, “has always been that eventually we’re going to run out of oil.”

Good for Small Farms, Big Yards

The researcher, who heads Ohio State’s Integrated Pest Management (IPM) Program, designed, established and continues to study a total of 16 polyculture plots: four treatments replicated four times each. Each plot measures about 44 by 60 feet, good for small farms or even big yards.

The study began in 2005.

“My goal at the start was to get \$10 per foot of row,” Kovach said. “Of the six crops we had producing last summer, on average, we got \$10 per foot of row. We lost on things like edamame soybeans, but we made it up on other crops.

“Right now, we’re still not in full production,” he said. “We don’t have any peaches or apples yet. So we haven’t technically hit our goal. But I’m hopeful with everything producing we will. I don’t think we’ll have any problem reaching it.”

The peach trees were planted in 2005. But spring frost killed their flowers in both 2006 and 2007.

The apple trees, planted in 2006, will start to bear fruit this summer.

“Then we’ll really get an idea of how productive we can be,” Kovach said. “The system’s starting to balance out now. It takes a while. But I think we’re reaching some stability.”

Among the past three years’ returns, all based on prices received through a local farmers’ market: \$1.99 per row foot for green beans in 2005; \$3.65 per row foot for edamame last year; \$5.67 for blueberries last year, the first fruiting year; \$11.83 for tomatoes in 2005, \$26.67 in 2006 and \$25.52 last year; \$9.21 and \$12.65 for strawberries in 2006 and last year, respectively; and last year \$13.27 for summer raspberries and \$15.36 for fall raspberries.

Layouts Hinder Pest Spread

The four test treatments — solid row, mixed row, mixed row on raised beds and “checkerboard” — represent four different ways to arrange the crops.

The aim of each treatment is to earn a living — for a farmer or gardener to do it, that is — while keeping pests from doing the same.

The layouts are meant to stop or slow the spread of pests from plant to plant — previous studies having shown that alternating crops and heights can do that. Kovach wants to verify it and to see which arrangement does it best.

Each “solid row” grows a single crop, with crop height switching from row to row: a row of tall apples, a row of short strawberries.

The “mixed row” treatment has multiple crops in a single row but keeps tall types and short types together in their own rows: a row of tall apples, peaches and raspberries; a row of short tomatoes and strawberries. The same layout then is used in raised beds to make up treatment #3.

The “checkerboard” treatment has varying types of crops within a row and also alternates heights in the row. The same row down the line may have low tomatoes, high apples, low strawberries and tall peaches.

New High Tunnels a Boon

Changes made last year included laying weed-stopping landscape fabric in all 16 of the plots. And high tunnels were set up over four of the plots — one plot representing each treatment.

The landscape fabric eliminated the need to weed or mulch the plots. “Basically, weeds are a non-issue now,” Kovach said. Weeding costs, thanks to the fabric, fell from \$1.35 per foot to less than 10 cents per foot.

And the high tunnels — unheated structures covered by clear plastic designed to lengthen the growing season — boosted average growth inside by 14 percent when compared to the same crops grown outside.

Tunnel-grown raspberries especially saw big gains: the yield of summer raspberries inside went up by 96 percent, of fall raspberries, by 79 percent.

The tunnels added \$9.50 per foot to the \$3.20-per-foot establishment cost of the basic, non-tunneled, plant-in-the-ground plots.

The raised beds added \$1.20 per foot to the basic establishment cost.

All together, the establishment cost for the raised-bed plots totaled \$4.40 per row foot, for the high-tunnel plots \$12.70, and for the raised-beds-in-high-tunnel plots \$13.90.

Are raised beds, high tunnels or both in fact worth it? The results so far suggest that they are. Kovach said the yield jump seen in the raised beds — 20 percent to 125 percent more than the on-the-ground plots, depending on the crop and probably due to better drainage and fewer pests — paid for their extra cost the first year. After that, the yield jump is “pure profit,” he said.

The high tunnels, meanwhile, will take another year or two to pay off their establishment cost. Then their higher yields should start to show up, too, as profit.

Overall, the crops in the tunnels saw different but generally fewer pest problems. For example, last summer, while Japanese beetles plagued outside crops, few of the pests ended up getting inside. Instead, the tunnel crops saw aphids and mites and also more powdery mildew, a disease.

The tunnel's benefits, including greater growth, higher-quality fruit, and earlier- and later-in-the-season yields, should more than offset such drawbacks, Kovach said.

The Japanese beetle indeed created tremendous problems last summer, Kovach noted, especially on raspberries and edamame. Populations of the ravenous pest were 15 to 20 times higher than they had been the past two years.

"We kind of expected that to happen," Kovach said, since the beetle is a generalist and the plots serve a wide-ranging, general menu. Certain varieties of certain crops saw little if any damage, however — a possible clue to controlling the pest.

"If it wasn't for the Japanese beetle," Kovach said, "it would have been paradise out there."

Also invading Eden last year: deer, which jumped the electrified woodchuck-height fencing and caused modest but unwanted crop damage. Tall, plastic deer fencing went up.

The plots stand ready for 2008.

'I'm Pretty Optimistic'

"Right now I'm pretty optimistic," Kovach said. "We've accomplished our goal of increasing biodiversity out there. We have spatial diversity — we have different heights of plants — and we have temporal diversity through different planting times and different varieties and when they mature.

“I think we can produce a lot of food,” he said. “But success all depends on your market. The more you can get, the better off you are; it’s a lot easier to earn \$10 per foot of row if you get \$6 a pound for a crop versus \$2. You really need to make sure that your market is available. I think that it is.

“All indications are that we’re moving in a direction where this will work.”

Links: Ohio State modular ecological design research, <http://ipm.osu.edu/pageview.asp?id=16>. Ohio State high-tunnel research, <http://www.ag.ohio-state.edu/~news/story.php?id=3392>, <http://www.ag.ohio-state.edu/~news/story.php?id=3944>.

<http://www.ipm.osu.edu/files/SW%20Ohio.pdf>

Dear Reader,

I wish that he were organic, no-till. I believe that his goal should be highest profit per acre rather than highest gross per acre.

See the Joe Kovach Farm folder above. PDF file of photos and information.

Ken Hargesheimer