

Bearing Fruit

College Researchers Tap New Specialty Crop Funding

Story and photos by Steve Williams

WHILE WAITING IN THE Philadelphia International Airport for the last plane in a long trip home from Italy in 2006, Katy Lesser worked on a PowerPoint presentation that, unbeknownst to her, would eventually lead to a \$1 million grant from the federal government. Lesser, coordinator of Penn State Cooperative Extension's Ag Innovations initiative in Adams County, was returning from InterPoma, an international agricultural trade show featuring the latest European technology for apple production, storage, and marketing. She'd been particularly interested in orchard platforms—mobile machines that move picking crews through orchards faster than the traditional box-and-ladder method. But what ended up grabbing her attention was something completely different: the German-made “Darwin string thinner,” a device that removes tiny apples early in the growing season so remaining apples can grow larger and become more valuable.

At the Fruit Research and Extension Center in Biglerville, Ag Innovations coordinator Katy Lesser is shown with a Darwin string thinner, a machine she first saw at a European trade show.



“I liked the string thinner immediately,” Lesser says. “I knew some of my colleagues had been working on chemical ways to thin peach blossoms. With peaches, crews remove blossoms instead of immature fruit. It’s labor intensive, so growers have been experimenting with chemical thinners. But consumers balk at the use of chemicals. The Darwin string thinner seemed like a simple solution. I don’t have a horticulture background, but I thought it made sense to consider using this device with peaches.”

Lesser presented the Darwin thinner to the Ag Innovations advisory committee the next day, then again at extension’s Winter Fruit School. “We had producers out of their seats the moment Katy’s talk was over saying, ‘We have to have that string thinner,’” says Jim Schupp, a pomologist at Penn State’s Fruit Research and Extension Center in Biglerville. “There is an acute awareness in the fruit industry that we can’t continue doing things the way we always have.”

To provide the size and quality of fruit consumers expect, growers must carefully manage crop loads in stone fruits such as peaches. That means thinning blossoms by hand—an expensive and labor-intensive process. Alternatively, growers have tried chemical thinners. These sprays will eliminate a certain percentage of the blossoms but provide no control over which blossoms are killed. And it takes time to gauge the effectiveness of the application.

“It’s unlikely anyone will invest in developing a new chemical thinner; the economics don’t support it,” Schupp

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says. “And with mechanized thinning, you see the results immediately.”

Making the decision to try the string thinner was easy, according to Lesser. “Getting it here was another thing,” she says. “The Fruit Research and Extension Center partnered with industry to cover the cost, but try ordering a large, unusual piece of machinery over the phone from Germany when you don’t speak the language.”

Luckily, Lesser knew a local family hosting a German exchange student. The high school student translated and helped work out details with the vendor to get the machine to Biglerville.

When the machine finally arrived, Schupp and extension educator Tara Baugher began experimenting. While the Darwin string thinner works non-selectively—removing blossoms from fruit trees in a more-or-less random fashion—Schupp and Baugher wondered whether a selective machine could be developed that considers which blossoms would be best to remove. To do that, they needed an engineer.

Opportunity Knocks

In the meantime, growers of fruits, vegetables, and other horticultural crops were pressuring Congress to add a specialty-crops title to the 2008 Farm Bill. They received support from many non-corn-belt legislators, such as Pennsylvania U.S. Senator Robert Casey Jr., who told an audience at Penn State’s 2007 Ag Progress Days event that he would work to achieve regional equity so that the bill would account for the diversity of the state’s agricultural industry. “Our fruit and vegetable growers receive only marginal assistance,” he said, “even though we have specialty crops all across Pennsylvania that account for 51 percent of all farm receipts. And you know the list—we’re in the top ten in virtually any specialty crop you talk about.”

Indeed, Pennsylvania has a wide diversity of specialty-crop operations. Besides being the nation’s top producer of mushrooms, the state is among the leaders in the production of pumpkins (third), apples (fourth), grapes (fourth), peaches (sixth), and snap beans (sixth). Nationally, specialty crops constitute an industry worth \$49 billion annually.

The lobbying effort was successful. While commodities such as corn, soybeans, peanuts, sugar, and wheat are traditionally the major beneficiaries of Farm Bill support, so-called minor crops (now referred to as “specialty crops”)—which include fruits, vegetables, tree nuts, and nursery crops—received new, dedicated funding in the Farm Bill of 2008. Under the legislation, growers will not receive direct crop subsidies. However, the Spe-

cialty Crop Research Initiative will provide funding for studies to develop sustainable and profitable solutions to the unique problems they encounter.

Specialty crops make up a lot of what you see for sale in the grocery store. All the fresh fruits and vegetables in the produce section are specialty crops. Wander up and down the canned-food aisles and

is happening as consumers demand better quality, different options, and good value at the grocery store.

In the first fiscal year of the new Farm Bill, the U.S. Department of Agriculture authorized \$28 million in grants for specialty-crop research. The narrow application window and competitive environment favored those with strong con-

nections to industry and collaborations with other institutions. Largely because the College of Agricultural Sciences had both, it was the lead institution or a participant on three proposals funded for \$7 million—25 percent of the total allocation.

“The college was well positioned to respond in this area,” says Bruce McPherson, the college’s associate dean for research, who notes that Penn State has a long history of research and extension programs related to specialty-crop production. “We either led or were part of sixteen proposals to this initiative, and faculty had one month to respond from the time that the requests for applications were issued from USDA. I would argue that represents a bit of pent-up demand. On top of that, these grants required a 100 percent match from funding sources that were not federal.”

That’s where the college’s industry connections came in. Support for the mechanical-thinning project didn’t just happen overnight but developed over years of collaboration, so when the time came to raise a mil-

lion dollars in matching funds, the right connections were already in place.



The peach trees surrounding extension educator Tara Baugher are growing on a trellis system that helps facilitate mechanical thinning and harvesting.

most of these products, as well as those in the frozen food cases, are specialty crops. These are the foods that make our plates rich. Research will help ensure that the supermarket—and the farmer’s market—remains stocked with fresh, safe foods with longer shelf lives and greater availability throughout the year. In addition, new technologies will reduce the impact of labor shortages and rising labor costs, helping growers maintain profits in the face of rising energy costs. And all of this

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Building a Better Thinner

Two years elapsed between Katy Lesser’s Italy trip and the call for research proposals that followed passage of the 2008 Farm Bill. During that time, it became apparent to Schupp and Baugher that mechanical thinning was a viable option for Pennsylvania’s fruit industry. This led the group, including agricultural engineer Paul Heinemann, to apply for and receive one of the first specialty-crop research grants funded by the bill.

Heinemann is the principal investigator of the project, which will look at in-

novative technologies for thinning fruit with the aim of advancing the development and use of mechanical thinners in peaches and other tree fruits.

“We proposed to further test and refine nonselective thinners,” says Heinemann. “But we also hope to develop a selective thinner that knows which are the best blossoms to pick. Such a ma-

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chine would require the use of advanced technologies such as machine vision and robotic mechanization to pull or cut off the blossoms, perhaps with high-pressure water or air jets. Working on selective thinners is a look toward the future.”

In addition to developing thinners, Heinemann notes that the researchers will also look at orchard structure. “It’s important to develop tree structure that is most suited to the machines,” he says. The scientists also will examine the sociological and economic implications of this new technology so that growers can make informed decisions about when and how to implement it.

Reducing Labor Automatically

The new funding for specialty-crop research has supported the development of connections with nontraditional partners who have the special expertise needed to tackle a specific problem. Baugher, the tree fruit extension educator in Adams County, is the principal investigator for a project aimed at developing comprehensive automation systems for specialty crops. The nearly \$800,000 project is part of a \$6-million grant to Carnegie Mellon University.

“Citrus, grape, and other tree and vine crops have the same mechanization needs that we find in apples or peaches,” says Baugher. “We’ve started working together across production areas and with growers around the country to find fund-



ing and start solving some of the issues they’re facing. As we began to look at the challenges faced in automation, we realized we didn’t have people at Penn State working in robotics necessary for tree fruit demands. So we looked to Carnegie Mellon for their expertise.”

The project will focus on methods to significantly reduce production costs for fruit and other specialty-crop industries. Researchers will look at information, mobility, and manipulation technologies to improve decision making, enhance crop-load scouting, and augment harvesting. Plant-science work—led by entomologist Larry Hull and plant pathologist Henry Nguni at the Fruit Research and Exten-

Agricultural and biological engineer Paul Heinemann is helping develop fruit-thinning technology that will rely on sensors and robotics.

sion Center—will be aimed at developing better ways to monitor insect infestations and detect plant stress and disease.

Each of these technologies and techniques will be assessed with respect to social and economic feasibility and tested both in the lab and in the field to make sure they are effective and affordable.

Understanding the Market

A third Farm Bill–funded project, led by horticulturist Kathy Kelley, will bring



A project led by horticulturist Kathy Kelley will help the Mid-Atlantic specialty-crop industry respond to new marketing opportunities and evolving consumer demands.

together a Mid-Atlantic coalition of specialty-crop producers, processors, wholesalers, retailers, researchers, and educators in a series of discussions culminating in a strategic-planning conference to address issues related to consumer demand, marketing, production practices, and research and extension-education needs.

Consumer demands for variety, availability, safety, and quality are placing increasing pressure on specialty-crop producers. In addition, rising transportation costs for producers in California, Florida, and southern-hemisphere countries that supply fresh fruits and vegetables to the Mid-Atlantic region are creating opportunities for local specialty-crop producers. But to meet these demands and capitalize on these opportunities, growers need knowledge.

Kelley says the \$100,000 project will help industry and academia make sound decisions about how best to focus resources. “Conference participants will identify issues to be addressed through research and help guide development of educa-

“Producers want help understanding consumer behavior so they can use that information to expand and improve their businesses. But first we need to know what is taking place—and what is changing—in the market.”

tional programs to make businesses more profitable,” she explains. “We’ll develop action plans that include best-practice approaches to production, integrated pest management, processing, and food safety.

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that more closely reflects consumer taste and interests, says one Penn State agricultural economist.

“People are interested in eating healthier, interested in locally grown food or maybe organic,” says Jeffrey Hyde, who often works with producers interested in specialty crops and alternative agricultural enterprises. “These characteristics are more often associated with specialty crops than they are with commodity crops. It signals an acknowledgment that consumers have changed their minds to some degree about the foods they eat and the characteristics of that food. Supporting specialty crops will help meet those evolving demands.”

Faculty and staff referenced in this article are Katheryn Lesser, extension educator and coordinator of the Ag Innovations initiative in Adams County; James Schupp, associate professor of pomology; Tara Baugher, tree fruit extension educator in Adams County; Bruce McPheron, associate dean for research and graduate education; Paul Heinemann, professor of agricultural and biological engineering; Larry Hull, professor of entomology; Henry Ngugi, assistant professor of plant pathology; Kathleen Kelley, associate professor of horticultural marketing and business management; and Jeffrey Hyde, associate professor of agricultural economics and extension state program leader for entrepreneurial and value-added agricultural systems.

Other institutions collaborating on the projects described include Carnegie Mellon University, the University of California–Davis, the University of Maryland, Washington State University, Clemson University, and the University of Illinois.

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