

## Let the Chips Fall

At Penn State, thousands of potato varieties from around the globe are put through extensive cross-breeding programs, genetic research, and intercollegiate collaborations. But once a year, the University's potato researchers switch from pipettes, computers, and other high-tech equipment to potato peelers, slicers, and a deep fryer. It's potato-chipping time.

For a few days, research technicians head for Building C at Penn State's Russell E. Larson Agricultural Research Center at Rock Springs to fry and rate potato chips. They test four potato varieties at a time, taking eight slices from the center of each to fry them in commercial fryers. Laying out 16 separate piles on a table, the researchers meticulously evaluate the chips with a 10-stage, light-to-dark visual rating chart that shows the chips' levels of darkness immediately after frying.

Barbara Christ, head of the plant pathology department who oversees the potato research program and annual chipping process (and serves as a hands-on member of the chipping crew), says there's plenty of tasting, but the potatoes aren't being rated for flavor. Up to 240 discrete varieties are being rated for appearance only, as researchers find out which spuds can be turned into pale-golden, crispy chips after four months in cold storage. From exotically colored imports to table-quality tubers, each is evaluated for chip-worthiness.

"We've tried some red and blue chips, but usually we're using white- and yellow-fleshed varieties," Christ says. And there are regional differences about what makes a good chip. Midwesterners prefer a lighter, milder chip, while easterners like a stronger-flavored, darker chip and the Northeast states and Canada favor salt-and-vinegar-flavored chips.

While many researchers and commercial outfits are growing and developing hundreds of potato varieties, Christ explains, not

many places actually give them the chip test. "We're actually one of a very few programs that does chip processing," she says. "The University of Maine and Penn State are the only two on the East Coast

facturing, with 24 companies turning out about \$57 million worth of potato chips annually, according to the state agriculture department. "Historically, a lot of chip companies originated in Pennsylvania,"



**Discussing the fine points of potato-chip coloration, plant scientist Barbara Christ explains that Penn State testing helps bridge the gap between advanced research and the state's snack-food industry.**

that do this much chip processing, and I think we do much more than most across the country. If someone has a variety from Idaho, they may ask us to put it in our chipping trials. Our reputation is built on the amount of testing and processing that we do."

There's a good reason why Penn State tests potatoes for their chipping traits. Pennsylvania is the nation's number one source of chipping potatoes, accounting for about one-quarter of the U.S. supply. Moreover, Pennsylvania ranks first among states in chip manu-

Christ says. "There were many one-room, mom-and-pop chip companies that would sell at certain times of the year."

Despite the relative success of the chip industry, the state has lost potato growers, in part due to land prices. Twenty years ago, Christ notes, York County was one of the largest producers, but development reduced available agricultural land, and many remaining growers began to specialize in higher-value crops.



"Another factor is that potatoes produced on the East Coast suffer with more climate-related foliar diseases and more insect problems, so our cost of production is higher," she adds. "Our soil types are so variable that quality out of a single field can fluctuate, whereas in Idaho, production tends to be more uniform."

As a result, overall potato production has declined in Pennsylvania, which ranks only eighteenth in total potato output (\$20.5 million in 2007), 70 percent of which is used for chipping. "When I arrived at Penn State in 1984, the state had 25,000 acres of potatoes," Christ says. "We're down to 11,000 acres now."

For remaining producers, Christ and her team evaluate varieties from university, USDA, and commercial sources from across the country and assemble an extensive report on clone performance and herbicide and fungicide trials. The information is made available to extension educators as well as to growers through the Pennsylvania Department of Agriculture's potato research board.

Helping growers overcome challenges and maintain their market is Christ's motivation for temporarily putting aside her lab's molecular work identifying genetic markers and sequencing genes to work with a deep fryer and piles of chips. In addition to being fun, it fills a valuable function.

"My grandfather grew potatoes, and there's a lot of basic research not understood by growers," she relates. "I've tried to take the time and effort to work with the growers so I could understand their needs and interests. By talking with local growers about how their potato varieties perform in chips, I can tell them in layman's terms what it takes to get where they want to go next season, and I can help them understand that some cross-breeding projects take 20 years. So our research has immediate and long-term impacts."

—Gary Abdullah