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THE DEATH OF DIVERSITY

Has the quest for perfect produce set us up for catastrophic losses when disease strikes?

BY CHRIS COOPER



Food is naturally diverse, and crops protect themselves from disease and predators through tiny genetic differences. When **rice grassy stunt virus** threatened to wipe out rice paddies from India to Indonesia in the 1970s, its advance was halted when a resistant strand of wild rice was found and crossbred with plants on the front line.

Modern strains of corn, wheat and fruit are bred for mass production. Top-producing crops are cloned and share the same strengths—and weaknesses—as their parents. As a result, they might be immune to some problems but more susceptible to others. When calamity strikes, entire harvests can be affected instead of just remote pockets of plants that share the same weaknesses. Ireland's reliance on the Lumper variety of potato was a primary cause of the 1845 famine that led to a million deaths and 2 million displacements when potato blight ruined crops.

"Diversity is our protection as we face disease, whether you're talking about corn or apples or cows or kids," said John Bunker of FedCo Seeds. Bunker is known as "The Apple Guy" among farmers concerned with restoring crop diversity.

Our fields and orchards might produce more than they did a century ago, but many are more fragile. Whole varieties of fruit could be wiped out by a single unforeseeable problem. In the pursuit of plenty, is our table becoming less stable?

This tree might not produce perfect Red Delicious apples, but it might be resistant to diseases that threaten commercial trees with little genetic diversity.



John Bunker (right) of FedCo Seeds is known as “The Apple Guy,” and he believes genetic diversity is key to preserving our food supply.



Bunker founded FedCo Seeds after he realized his small town in Maine was full of ancient apple trees.

Roots of The Apple Guy

As a young man, Bunker wasn't interested in the history of apples. He just wanted to eat. When he was 21, Bunker built a small cabin in the woods outside a small town in Maine.

“I wanted to get away from all that I perceived was wrong with the world,” said Bunker, now 63. But he needed food, and when he realized his town was full of ancient apple trees no one picked, he started filling his larder with the apples. Then he built a root cellar and started growing his own trees, pressing cider and learning to bake.

“I'd always ask permission to pick the trees, and I'd start to meet people in these old homesteads.”

At the time, many Maine households were multigenerational, with the kids at school, parents at work and grandparents home to chat with the young Bunker. They'd often talk about the trees while he picked.

“I'd hear these names, and I started writing them down in a journal,” Bunker said. “Baldwin, Wolf River, Collins Sweet.”

It dawned on Bunker that he was finding dozens of different apples beyond the McIntosh and Red Delicious varieties common in the grocery store. He started taking cuttings from his favorite trees and growing them on his own farm. As the

legend of The Apple Guy grew, FedCo Seeds was born, and now Bunker sells trees and apples for a living.

Apple trees grown from seed aren't replicas of their parents. Each is unique. Pioneers trekking through the wilderness or traveling upriver by schooner carried seeds, and some of the resulting trees didn't bear fruit. Some of the apples were good enough for animal feed, and some could be used for stock or cider. But occasionally a tree would produce fruit tasty enough to be eaten fresh or used in a pie, and its seedlings would be passed around to neighboring farms through grafting.

“When you graft, you take a little snippet off the tree you want to replicate, and you splice it onto another tree with roots,” Bunker said. “That allows you to replicate the variety.”

With sharing came the need for naming, and simple monikers such as “Snow” or “John's Favorite” were attached.

As the seeded orchard gave way to the grafted orchard to maximize yield of preferred apples, the resulting fruit created a saleable surplus. But a marketable apple needs a recognizable name, a middleman and a uniform appearance.

“Over time, the farmers began to grow a smaller number of varieties that could be pooled together and sold,” Bunker said.

As the farms became more dependent on apple revenue, they discarded varieties that didn't produce a crop every year. Dessert apples—crunchy off the tree, sweet and small enough to fit into a lunchbox—were favored by breeders. Apples bred for pies, ciders or other uses were almost entirely abandoned.

“This is how we got the Braeburn and the Fuji and the Honeycrisp: marketplace desire,” Bunker said.

Land-grant colleges built to teach agriculture, mechanization and military tactics furthered the consolidation of apple varieties. The schools worked to standardize a crop into distinct varieties, then patented or trademarked each and licensed its use to farmers to generate revenue. Farms began to specialize in certain brands and eliminate all others. According to Bunker, this practice has a downside: Each type of tree is susceptible to various diseases and requires fertilizers and pesticides to ensure it produces apples every year. When a new disease, insect or fungus appears, the orchards aren't equipped to meet the new threat.

“Putting all your eggs in one basket—or very few—is asking for trouble,” Bunker said. “There have already been major scares in the U.S. around corn and citrus; there's another coming for bananas. If you look at the top 25 (apple) varieties sold worldwide now, the same parents (Golden Delicious, Cox's Orange

Pippin, McIntosh and Red Delicious) are in the parentage of almost every variety being sold now. Is that scary? Some say yes.”

For example, many of those parent plants are susceptible to a disease called “scab.” Prevention of the disfiguring disease requires spraying herbicides. Heirloom apples—grown closer to the wild on small family farms and regularly exposed to diseases—don't require the same treatment. Herbicides are expensive, and “scab” is becoming more resistant to those currently available to orchardists.

“No one thinks poisoned food is better, so they're looking for alternatives,” Bunker said.

This has led many larger commercial orchards to seek out Bunker's heirloom varieties to breed into their crop. Some of these trees are resistant to “scab,” though they lack dessert-like qualities.

Trees can live to be 200 years old, and Bunker still travels around Maine seeking them. Through grafting, he can reincarnate a near-dead tree. But apples might be the bright-red canary in the coalmine; other fruits are closer to extinction than ever despite laboratory efforts to “improve” them.

Tropical Race 4

You don't eat the same banana your grandmother did.

In the early 20th century, the Gros Michel was the world's most popular banana. By 1953, it was extinct, wiped out by a pathogen called Panama disease—specifically a strain called Tropical Race 1. Most other varieties of banana died with it. Among the surviving strains was the Cavendish, which is immune to Race 1 and now makes up 99 percent of the world's exportable banana crop.

But the Cavendish is highly susceptible to Tropical Race 4, a new strain of the pathogen. And as the disease spreads, the Cavendish might disappear entirely. This time, there's no ready replacement waiting.

Race 4 is soil borne and can travel in contaminated harvest machinery, tools and the clothing of migrant workers. It hasn't yet arrived in Latin America, where over 70 percent of the world's bananas are grown, but many experts believe it's just a matter of time.

Florida's citrus crop decreased by 28 percent in 2014, according to the U.S. Department of Agriculture's National Agricultural Statistics Service, largely due to a disease called huanglongbing in China ("yellow dragon disease"). It's caused by a type of bacteria spread by the Asian citrus psyllid, an insect, and there's no cure for what's referred to as "citrus greening disease" by Florida farmers. Growers have no choice but to charge more or sell their groves, and scarcity will drive long-term prices ever higher. Government agencies are currently attempting to breed a wasp to prey on the psyllids.

The so-called Green Revolution—the practice of breeding new genotypes to increase yield in the '40s to the '60s—caused a massive crop failure in the U.S. in the 1970s, according to [Oregon State University documents](#). The Texas Male Sterile (TMS) seed was resistant to most common corn diseases but not to southern corn-leaf blight. The disease swept through the Corn Belt in 1969-70, wiping out one-fourth of the annual harvest. The Oregon State document also claims wheat harvests were reduced by up to 85 percent in regions of India, Afghanistan and western Pakistan when imported monocultural crops were devastated by diseases to which native crops were immune.

Attempts to improve on natural selection and diversity have sometimes traded short-term gain for long-term fragility. How can an individual consumer help balance the food scales?



Heirloom varieties of apples can be found and bred into commercial trees to add diversity to the orchard.



In a strange twist, the future of commercial farming might be found on the back 40s of homesteads where someone planted a tree 150 years ago.

Following the Market

The pursuit of the perfect apple is driven by the lunch box: what will kids eat? What apple can be picked in Mexico in September and still look perfect in Michigan weeks later? Which has the most marketable name, like Honeycrisp?

Bunker believes large-scale commercial orchards will start growing more rare varieties to meet consumer demand.

"The public wants their food to be sprayed as minimally as possible," Bunker said. "They don't necessarily have to understand what it means to be organic; they just want less poison on their fruit."

The market for apple ciders has also been on the rise. Shanken News, which reports on statistics in the wine, beer and alcohol industry, said cider sales jumped **78 percent in 2013**. It takes about 40 apples to produce one bottle of cider.

Rising interest in specialty foods and cooking has also created a new awareness of apple varieties.

"I've been working with the people at Whole Foods in Portland, and I'm hoping they're going to offer four pie apples a year," Bunker said. "One in summer, one in August, one in September, one in November. People want that now."

Governments are cooperating to store strands of native crops in the [Global Seed Vault](#), a repository located between Norway and the North Pole. Governments also provide industrial farms and seed laboratories with grants and tax breaks to produce specialty strands that unfortunately come with built-in fragility.

The simplest solution to maintaining crop diversity might be to buy food grown locally. Transportation, pesticides and susceptibility to disease are the downsides of large-scale farming. Smaller orchards on older farms are more likely to have a diverse genome. Their produce also requires less transportation and frequently carries less herbicide residue because small-scale farmers can't afford the chemicals or perhaps don't need them due to crops that are naturally disease resistant.

And local farmers can probably tell you all about the roots of their apples. ■

About the Author

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