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Genetically Modified Hawaii

New varieties of genetically engineered crops thrive in the world's most isolated landmass

By Robynne Boyd

Just beyond the defunct Koloa Sugar Mill on the Hawaiian island of Kauai's south shore are acres of cornfields that have sprouted over the past decade in a state made famous by its pineapples, bananas and sugarcane crops. Slightly out of place in the Aloha State, they otherwise look quite conventional, although in fact they are not: The crop is among a bounty of others in the state that are grown from seeds that have been [genetically engineered or modified](#) (GM) to produce sturdier plants able to withstand weather and disease as well as [thrive in the face of insects](#) and chemicals sprayed on them to kill destructive weeds.

In front of one plot of corn stalks is a red and white sign warning, "Danger: pesticides. Keep out." Tacked to it is a list containing 15 chemicals that may have been applied to the crop. In this case, the chemicals circled are the herbicides pendimethalin (brand name: Prowl), dicamba (Banvel) and atrazine, the latter of which is banned in the European Union (E.U.) because of its [link to birth defects in frogs](#) that live in groundwater contaminated with it.

I pass these corn fields every day when I go to the beach to go swimming," says Marty Kuala, 68, a 36-year resident of the town Koloa who worked in a plant nursery (that grew native plants such as naupaka, a'ali'i, and naio) in 2005. "It's kind of a new thing that we're starting to see these fields [of genetically modified or engineered crops] all over the place. GMOs [genetically modified organisms] are growing in the Mahaulepu area on Kauai's south shore and even in the large populated areas of Lihue, our biggest town."

This year, only 1.67 million tons of raw sugar were produced, nearly one million tons less than just a decade earlier; only 13,900 acres (5,625 hectares) in the state were set aside for pineapples in 2006 [the latest year for which pineapple stats are available] compared with a whopping 76,700 acres (31,039 hectares) in 1991.

The other crops vying for state land: flowers and nursery plants, macademia nuts, coffee, milk, algae, tomatoes, bananas and papaya.

[Genetically modified food](#) has been a source of debate since hitting the market in 1994. The E.U. had banned the imports of [GM crops](#) for 20 years, however in 2006 the World Trade Organization (WTO) ruled that the ban violated international trade rules. The U.S. Food and Drug Administration (FDA) has deemed it safe and has so far declined to limit or block the burgeoning industry.

The extraordinary [biodiversity](#) (and, so, native plants competing for space and nutrients), along with the intractable problem of [invasive species](#) would seem to make Hawaii the least likely place to grow controversial crops, risking their uncontrollable [spread](#). But scientists seed companies and some scientists believe say the benefits outweigh the risks of damage to the fragile ecosystem, most notably Hawaii's crop-friendly moderate year-round climate—an average of 75 degrees Fahrenheit (24 degrees Celsius)—and its open acreage. And over the past 10 years, Hawaii has become the locus for genetically modified crop field trials and a microcosm for the controversies over the safety of growing and eating transgenic food.

To date, Hawaii's fertile soil has nourished more than 2,230 field trials of genetically modified (GM) crops, including corn, soybeans, cotton, potatoes, wheat, alfalfa, beets, rice, safflower, and sorghum—more than any other state. A total of 4,800 acres (1,940 hectares) of such crops now grow throughout the state, some 3,500 (1,415) of which are corn and soybeans, 1,000 acres (405 hectares) of which yield genetically engineered papaya, and the remaining 10 percent are field trials for new potential GM crops. "Hawaii is ideally suited for field trials and seed production, because of the climate and the ability to grow corn and soybeans 52 weeks a year," says Cindy Goldstein, a spokesperson for Johnston, Ia.-based Pioneer Hi-Bred International (a subsidiary of DuPont) in Waimea, Kauai. Her company has been producing GM corn and soybeans in Hawaii since the mid-1990's, when the FDA approved the crops for commercial sale.

Goldstein says that [seed companies](#) can harvest three to four yields of corn per year in Hawaii compared with only a single yield in the continental U.S. thanks to its temperate tropical climate. Other parts of the world with similar climates may also be well suited for corn and soybean seed production. But Goldstein notes that Hawaii has the added advantage of extensive amounts of available land due to the downturn in sugar and pineapple over the past

decade, a victim of skyrocketing production costs compared with lower rates in [developing countries](#).

As a result, many U.S. seed companies, including Pioneer Hi-Bred, Monsanto and Syngenta, have turned the Islands into a sprawling living nursery for [GM corn](#) seed. Genetically engineered corn seed is now the top crop in Hawaii, comprising 92 percent of the state's GM seed industry valued at \$97.6 million for the 2006 to 2007 season.

"Genetically engineered crops can actually help our environment, help our economy, and secure jobs for our agricultural workers," says Ching Yuan Hu, associate dean of research at the University of Hawaii at Manoa's College of Tropical Agriculture and Human Resources. Hu is quick to point out, however, that he only supports the development of GM crops in which cross-pollination with non-GM crops can be prevented to ensure that engineered traits will not dilute the gene pool of conventional crops, thereby causing target species to develop resistance.

The university is currently engineering seeds for disease-resistant [bananas](#), a new variety of papaya, and Spanish lime—plants that Hu deems safe. Hu notes that it generally takes from seven to nine years to bring a new GM seed to market.

But not everyone is on the GM bandwagon. Critics worry that the pests genetically engineered crops were originally created to withstand will eventually build resistance to the crop, and that the engineered traits will spread virulently via the wind, [birds and bees](#).

"One of the biggest concerns with growing crops like [Bt \[Bacillus thuringiensis\] corn](#) [engineered to produce the pest killer, Bt, which has been used for decades by organic farmers to control crop-eating insects] is that you're putting insects under the greatest selection pressure to become resistant to Bt, a natural insecticide," says Bill Freese of the Center For Food Safety, an environmental advocacy group in Washington, D.C., that promotes alternatives to unsustainable food technologies. He adds that if insects become resistant to this natural pesticide, [organic farmers](#) may lose one of their best and safest antipest weapons.

"The broader implications of growing GM crops is that it will create unwanted genetic material and traits in a wider and wider swath of major crops," such as spreading [herbicide tolerance](#) or pest resistance into wild relatives and then outward from there, Freese adds.

Conventional Hawaiian papayas have already come under scrutiny by organic farmers and environmental organizations in Hawaii for "genetic drift"—crops grown from non-GM seeds that test positive for being GM. In response, South Korea stopped buying papayas from the island of Hawaii, and Hawaiian papaya farmers who ship to Japan now have to test their trees for [contamination](#) and certify that they're "clean". In other words, these countries don't trust the genetic integrity of Hawaii's "non-GM papayas," which in turn has economically harmed many of the islands organic papaya farmers, and can lead to them losing their organic certification.

There have also been questions about the [safety of genetically engineered foods](#). In Europe, the European Food Safety Authority determines whether new GM products are safe for consumers and the environment. That view is then considered by the 27 member states, which make the final decision. It requires all genetically modified foods to be labeled, and, currently, only one genetically modified crop—Bt corn—has been approved to grow in the E.U. (mainly in Spain, but also in Germany, the Czech Republic and Portugal).

The FDA does not require GM foods to be labeled as such, insisting that studies have shown it to be as safe as foods produced using conventional breeding techniques. It is the seed companies that conduct the safety tests for new GM food products, passing the safety and nutritional information to the FDA for the agency's scientific evaluation.

"I haven't seen sufficient data from a legitimate organization without a conflict of interest to show that the stuff is healthy or safe," says Lorrin Pang, a public health specialist in Maui, and a consultant to the World Health Organization on tropical diseases, "I haven't seen data that says it isn't, either—but I'm from a drug and vaccine background that operates on the precautionary principle: You don't give something to the public until it's proven safe."

Pioneer Hi-Bred's Goldstein insists that foods made with genetically modified ingredients are safe, noting that they have been in the U.S. marketplace since 1996 and that "over a trillion meals containing biotech ingredients have been consumed in the U.S. with no documented negative health impacts."

The genetically modified seed biz may be booming in the 50th state, but not everyone is pleased about it. The Hawaii County Council (county legislature) last month voted to ban the growth of genetically modified taro (a tropical plant whose potato-like root is a staple of the Hawaiian diet) and coffee on the Big Island (Hawaii). The reason: pollen from [GM crops could contaminate the non-gm varieties](#) and destroy farmers' livelihoods. The concern seems to be greater with these products, because they're specialty crops commonly grown on the Islands, as opposed to corn, raising the possibility of cross-pollination.

There is also an emotional element to banning GM taro. According to legend, the taro plant originated when a child of the gods was born lifeless. From the child's grave sprouted the first taro plant, forever casting it as a sacred

subsistence food and an ancestor to native Hawaiians.

Despite the hoopla, Carol Okada, manager for the Plant Quarantine Branch of Hawaii's Department of Agriculture, says the business is here to stay and will still be booming in Hawaii 10 years down the road. "Even though it's controversial here," she says, "the [GM] seed industry is now the No. 1 industry for us and it is very important in terms of the economy, dealing with invasive species, and giving farmers choices."

The bottom line: Hawaii may be the GM crop test capital of the world, but the debate over biotech foods is far from over.

Further Reading

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[News Scan Briefs: Blocking Sound with Holes](#)

[Reel Life: *The Day the Earth Stood Still*](#)

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[GM Plugs Its Chevy Volt Hybrid, but Will It Be Road-Ready In Time?](#)

["Greener" Laundry by the Load: Fabric Softener versus Dryer Sheets](#)

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