

# Eating Tomorrow

AGRIBUSINESS, FAMILY  
FARMERS, AND THE BATTLE  
FOR THE FUTURE OF FOOD

Timothy A. Wise



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## Monsanto Invades Corn's Garden of Eden in Mexico

By the time I arrived in Mexico City in 2014, the corn issue on people's minds wasn't the ethanol-driven spike in tortilla prices, or the apparent return to punishingly low crop prices for Mexican corn farmers thanks to NAFTA. It was the battle to keep GM corn out of Mexico.

In 2009, Monsanto, Syngenta, Dow, DuPont, Pioneer, and other multinational agro-chemical companies petitioned the Mexican government for land in northern Mexico for the commercial production of genetically modified (GM) corn. The government reshuffled its bureaucracy and adjusted its laws to accommodate the agribusiness giants, quickly approving permits for experimental and trial planting, the precursor, they all assumed, for the quick issuing of commercial licenses. Indeed, those commercial license requests would be for nearly 7 million acres. But in September 2013, Judge Jaime Eduardo Verdugo J. issued a precautionary injunction on all further permits, citing "the risk of imminent harm to the environment." A group of fifty-three individuals and twenty-two organizations, in the name of a coalition of farmer, consumer, and environmental groups (La Demanda Colectiva), had petitioned for a ban on GM corn, arguing that inevitable gene flow from GM to native corn would threaten Mexico's maize diversity.<sup>1</sup>



Tractor caravan leaves Chihuahua to join the January 2008 “Without Corn There Is No Country” farmer protest in Mexico City. *Enrique Pérez S/ANEC*

When I arrived in Mexico six months later the injunction was still in place. It was difficult to imagine a more unlikely place to stop the biotech giants. The Mexican government, a subservient U.S. partner under NAFTA, fully backed their requests. Between the companies and the government, they had more than 100 lawyers working to overturn the injunction. The Gene Goliaths had already filed more than sixty legal challenges. Taking them on was a plucky little David of a public interest law firm, and a strong and well-organized group of leaders who had been fighting for Mexico's maize diversity for years. Armed only with legal slingshots, they had beaten back every challenge, relying on new powers that came with Mexico's recognition for the first time of class action suits. Still, with Mexico's well-documented history of government corruption, what chance did David & Co. LLC have of stopping a genetically modified Goliath? Yet another legal challenge, from Monsanto, was pending before yet another judge.

Since it was Easter Sunday, I attended mass at San Hipólito Church in the heart of Mexico's historic city center. Locally, the eighteenth-century church is known less for Saint Hipólito than for San Judas Tadeo, the "patron saint of lost causes," according to the translation at the church entrance. I didn't think the GM lawsuit was a lost cause, but it sure seemed a long shot. I lit a candle and said a prayer. I'm not Catholic, nor even very religious, but it seemed the least I could do. The next day, the judge denied Monsanto's request, leaving the injunction in place.

I told René Sánchez Galindo, the public interest lawyer on the case, that I'd said a prayer to San Judas. He laughed a knowing laugh. He told me that he is not very religious, but when he was nine years old he fell off his bike, hit his head, and went into a coma. His family didn't know if he was going to survive. He came out of his coma on October 28, the day the church devotes to San Judas Tadeo. "My aunt is a firm believer," he said. "She told me that she had prayed to San Judas when I was in the hospital and that he had saved my life."

Sánchez Galindo thanked me for my prayer but offered a different explanation for defeating the latest legal challenge. "The judge surely eats tacos," he smiled. "Everyone here eats tacos. They know maize is different."<sup>2</sup>

### *A Question of Contamination*

Adelita San Vicente, lead plaintiff in the class action suit and director of Semillas de Vida (Seeds of Life), a nonprofit organization working to promote and conserve seed diversity, explained the stakes in the legal fight. "It is difficult to imagine a worse place to grow GM maize than Mexico." The country, with its neighbors to the south, had been part of the Mayan civilization, whose Mesoamerican ancestors domesticated maize some 9,000 years ago. As a "center of origin" for the crop, Mexico has among the greatest diversity of maize types—known as landraces—in the world.<sup>3</sup> The crop evolved with human civilizations as part of the distinctive

*milpa* system of intercropping, taught in the United States as the “three sisters” of maize, beans, and squash, which sustained the soil while providing a nutritionally diverse diet.<sup>4</sup> Maize is one of the world’s most important food crops, as I’d seen in places as far away as Southern Africa, so the agricultural biodiversity is a vital global natural resource. The distinct landraces, each evolved into myriad local varieties adapted to the ecological and cultural needs of a region and its people, served as the raw material for modern crop breeding. “Mexican maize is a gift from Mesoamerica to the world, which they are trying to privatize with patented GM seeds,” said San Vicente.

The legal case is complex, but the core issue couldn’t be simpler. Maize is an open-pollinated crop: the pollen that sprinkles from the tassels at the top of the plant falls or blows onto the silks of any ear of maize, near or far, pollinating the crop kernel by kernel, each having generated its own silk. Cross-breeding—human-directed or wild—is particularly easy with maize, which is why it developed into such a wide diversity of varieties. But uncontrolled cross-pollination can result in unwanted varieties. Over millennia, farmers learned to protect the integrity of their best varieties by isolating plots from one another, then selecting the purest, best kernels to save as seeds for the next year’s crop. The fear about transgenic maize is that its pollen, borne on the wind, could unintentionally pollinate native maize varieties, undermining the genetic purity of the crops.

The issue of transgenic gene flow was not hypothetical. In 2002, transgenic traits were found in native maize varieties in the southeastern state of Oaxaca. The discovery, by two U.S.-based scientists, Ignacio Chapela and David Quist, sounded alarms throughout Mexico. Not only had the transgene migrated on the wind, through maize’s open pollination, it had done so despite a nationwide ban on the planting of transgenic maize. That 1998 moratorium was based on scientific advice of the National Agricultural Biosafety Committee, convened by the government to help develop policies and regulations to deal with what was then a very new technology.<sup>5</sup>

Obviously, transgenic maize had been planted, though not on a scale at all comparable to the commercial farming now being proposed. But even in such low densities gene flow had occurred.

Though it was impossible to confirm the source of the contamination, evidence strongly suggested that it came from the inadvertent planting of a GM seed by a farmer who had received a ration of maize, in kernel form, from the rural anti-poverty program DICONSA. At the time, the agency included imported U.S. maize in such distributions, with no labeling that such grain likely contained GM kernels and should not be planted. (That practice has since been discontinued.) The peasant farmer most likely did what peasant farmers do—experiment with new seeds in their fields.

Local farmers did not call the finding gene flow, they called it contamination, genetic pollution, and they demanded an investigation. In concert with Greenpeace and other advocacy groups, they filed a citizen petition for a high-level study of the issue by the North American Commission for Environmental Cooperation, the environmental body created by NAFTA. The request was granted, despite immediate industry efforts to malign Chapela and Quist's research. The commission formed an expert panel to carry out the investigation. This was no slapdash inquiry. Headed by noted Mexican scientist José Sarukhán, the research involved some eighteen authors contributing ten chapters covering the evidence of gene flow, the risks to human health and the environment, the implications for biodiversity, and frameworks for assessing risks and benefits. Each chapter was peer-reviewed by an additional set of experts, and the public was invited to review drafts and submit comments. The result was the most cutting-edge scientific assessment ever carried out into transgenic gene flow and its implications.<sup>6</sup>

I was in Oaxaca City in 2004 for the commission's presentation of its draft report. The luxurious Victoria Hotel barely contained the crowd of nearly 400, a mix of government officials, researchers, environmentalists, and, most notably, indigenous maize farmers from the surrounding area. Many farmers spoke movingly of their reverence for maize and its importance to their cultures. Some held



disfigured ears of maize that they said came from the transgenic contamination. They stressed that they considered the contamination an invasion, that they had not been consulted or informed it was taking place, and that they had no interest in exploring the possible benefits of GM maize in their fields.

The commission's report was more sober, but no less clear. It confirmed the gene flow found by Chapela and Quist, and it identified potential threats to both maize biodiversity and wild biodiversity, stressing that the U.S. GM experience, with little native maize diversity to protect, was a poor guide for mega-diverse Mexico. Similarly, the chapter on human health impacts confirmed that to date there had been few negative impacts from consuming existing GM crops, but Mexico had particular reasons for precaution because Mexicans directly consume so much maize. All the safety evidence came from the United States, where consumers, the unwitting (and unconsenting) guinea pigs in the industry's unlabeled GM human feeding trials, eat a lot of GM food—in more processed foods than we would like to believe—but almost none directly, as ears, kernels, or meal.

Almost no country in the world gets a larger share of its calories and protein from maize. Tortillas, tamales, and other maize-based foods provide an estimated 53 percent of the calories and a substantial share of the protein for the average Mexican.<sup>7</sup> Commission researchers recognized that we really don't know what the health impacts might be with such high consumption levels. Less known still are the potential health effects of GM maize on vulnerable populations—pregnant women, babies, and young children.

Citing these uncertainties and Mexico's particular vulnerability, the commission's scientists recommended precaution in Mexico's interactions with GM maize. They even recommended the suspension of Mexico's importation of unlabeled maize from the United States unless it was milled into cornmeal immediately upon entering the country, to prevent farmers from unknowingly planting it. Mexico's National Commission for the Knowledge and Use of Biodiversity (CONABIO), the National Institute of Ecology (INE),

and the Bureau of Biodiversity, Genetic Resources, and Protected Areas of the Secretariat of Environment and Natural Resources submitted a joint statement generally supporting the report's characterization of the science literature and the scientists' call for precaution.<sup>8</sup>

The commission's own Joint Public Advisory Committee, which involves civil society representatives from the three NAFTA countries, went further in a letter to the U.S., Canadian, and Mexican environment officials. "Minimally, a moratorium on imports of transgenic corn to Mexico should be put in place until the risks to human health, cultural integrity of maize producers in Mexico and the environment generally are better understood and appropriate long-term decisions can be made."<sup>9</sup>

The biotech industry, of course, went ballistic, calling for "greater scientific objectivity" and asserting, with no new evidence, that GM maize "does not represent a threat to landrace maize breeds."<sup>10</sup> All three governments, most notably Mexico's, toed the agribusiness line, rejecting the report's recommendations. No restrictions on imports. No precautionary policies. The U.S. government insisted on having its objections published as an appendix in the final commission report, accusing the commission of failing to adequately include input from "key stakeholders." We all knew whom they were talking about: biotechnology firms. (Biotech would similarly prompt the U.S. government to pull its support from the 2009 International Assessment for Agricultural Knowledge, Science, Technology, and Development, a comprehensive interagency report that proved too critical of biotech solutions for world agriculture.<sup>11</sup>) The summary report was published, but the full set of studies never was, though they remain publicly available thanks to the commission's strong transparency provisions.<sup>12</sup>

The Mexican government barely waited for the critical report to be published before contradicting its recommendations. In 2005, Mexico lifted its seven-year-old moratorium on planting and pushed through a biosafety law—dubbed "the Monsanto Law" by critics—that allowed the experimental and commercial planting of

GM crops, including maize.<sup>13</sup> The Mexican government had disbanded its Biosafety Commission years earlier. The law stipulated that GM maize could be planted, but not in any area of Mexico considered a “center of origin.” That vague recognition of the need for special protection of native maize would help in the later legal challenge.

### *The Answer Is Blowing in the Wind*

Dr. José Sarukhán, chair of that esteemed commission, received me in his office in Mexico City’s Tlalpan district. He now headed a more permanent commission, Mexico’s national biodiversity commission, CONABIO, an agency within the country’s environment ministry. On the issue of GM maize, he was getting no more respect than he had a decade earlier, even though he was now within the government. He seemed tired but determined.

“We should avoid gene flow when the impacts remain uncertain,” he told me. Sarukhán had initially offered conditional support for the GM maize trials, because they were confined to the less biodiverse northern part of the country. His agency’s 2006 map had, in effect, defined what parts of Mexico should be considered “centers of origin,” with significant populations of native maize, and which shouldn’t. The map actually ignored existing expertise on maize diversity, which documented plenty of native maize in northern Mexico. CONABIO’s 2006 map, which was used in the 2012 government document to define the areas protected as “centers of origin and genetic diversification,” in effect declared sections of northern Mexico, including most irrigated areas of the industrial maize state of Sinaloa, open for GM business.<sup>14</sup>

When I saw Sarukhán in 2014, he had changed his mind, and he told me why. His agency had commissioned a new survey, collecting samples (called “accessions”) for the nation’s gene bank. It showed a much different picture. “We had 7,000 accessions in our gene banks” before the new survey, which was published in 2011. “We ended with 23,000.” More than three times the number of

distinct varieties, thanks to the more extensive survey. He said researchers may have identified six new landraces and several places where *teosinte*, the mother of modern maize, was still growing. Most important for the GM maize lawsuit, researchers found a far greater diversity of native maize in the north, in the areas where the government had approved GM planting. In Sinaloa, home to Monsanto's GM trials, the known number of distinct native varieties increased 253 percent.<sup>15</sup> Sarukhán said they had submitted a new map, to update the legal definition of "center of origin." It showed that 90 percent of Mexico's agricultural land contains native maize species worthy of protection from GM maize. To date, the government—his bosses—had not accepted it.

Sarukhán said he now believes the government should cancel all GM maize plantings, even on the remaining 10 percent of farmland. "I don't believe this country has the capacity—or the will—to regulate transgenic maize," he told me. Small amounts of GM cotton, a non-food crop, had been given planting permits several years earlier, yet now researchers had found transgenes in cotton's wild relatives, far from the designated zone for planting. "If the government can't regulate something as simple as cotton, how is it going to regulate something as large and promiscuous as maize?"

Francisca Acevedo, CONABIO scientist, gave me a beautiful poster showing the newly expanded number of Mexican landraces. The diversity jumps off the page. Sizes vary from long and fat to short and squat. Kernel patterns are equally varied. And the colors boggle the mind: every shade of yellow-orange, some pure white, pinks and reds, and purples so dark they almost look black. Why, I asked her, are the companies so interested in getting into Mexico, given the widespread opposition and the obvious reasons for precaution?

"It's like getting to the moon and planting a flag," she said after a thoughtful pause. "If you can do it in the center of origin for maize in Mexico, you can do anything."

"The entire country is a center of origin," said Antonio Serratos when I met him later. He should know. He participated in the new

survey of maize biodiversity, and he had published a study intended to define “center of origin” based on existing research.<sup>16</sup> “You can’t just isolate the communities where you find native maize.” His own study for the CONABIO project, which found native maize within the confines of Mexico’s sprawling capital city, had surprised him in two ways. “First, that we found so much diversity. In an area so small, so urban, it was so unlikely,” he said, and encouraging. “The other surprise was finding transgenics.” Researchers found transgenic traits in 70 percent of the samples from the area of Xochimilco and 49 percent of those from nearby Tlalpan.<sup>17</sup> Other studies have found the presence of transgenes in native maize in nearly half of Mexico’s states.

Serratos offered a particularly educated perspective. He has a PhD in biotechnology from Mexico’s most important biotech research center. “I was fascinated by the science, which was new in 1985.” He started out working to develop transgenic maize varieties. “I began to have doubts when I saw mutations, unexpected changes, in my own research.” He served on the biosecurity commission that drafted the 1998 law, which included the moratorium on GM maize, and he was a researcher on the NAFTA study of GM contamination. He clearly felt now that the government had failed to heed its clear warnings. I told him I was surprised in my research that so few people seemed to even know about the NAFTA study.

“It is Orwellian that this history is unknown.” He shook his head. “It’s as if the biotechnology debate just began. Only the present matters, there is no past. History does not matter. This is not just a disagreement between Monsanto and a few environmentalists.”

I told him I’d heard Monsanto say that in its experimental fields they had reduced gene flow to just 0.5 percent of nearby plants, a level they deemed acceptable. Serratos nearly choked on his taco. “Maize pollen has been known to travel as far as one kilometer.” He took a deep breath and explained the science of gene flow to this nonscientist.

An acre of maize will have about 15,000 plants. One-half a percent of that is 75 plants. Each plant has about 200 grains on one ear of maize, with each grain pollinated separately through the plant's silk threads. If 75 plants get some level of contamination, that can mean up to 15,000 grains. And if any of those grains are later planted as seed, they will produce pollen, even if they don't produce usable ears of maize. That pollen will travel with the wind, easily pollinating maize within 100 meters, further spreading the transgenes.

And wind-borne gene flow isn't even the most pervasive source of contamination, he told me. Seeds travel far and wide—in farmers' pockets and in transport across Mexico. Small-scale farmers are relentless experimenters, trying every seed they get their hands on to see if it produces something valuable. That's how maize has evolved into the wide and useful range of varieties we see today. That is also how imported GM maize traveled to Oaxaca, got planted by an unwitting farmer, and spread transgenes to native plants.

"If the seeds of maize are sold or exchanged, the contamination will grow exponentially," he warned. "That is the point of no return." He feared that the levels of contamination Mexico was already seeing in its native maize, even without commercial GM production in the fields, were proof that the country had already waited too long.

"We are working in evolutionary time," Serratos warned. "In Mexican fields, transgenic native maize is being created."

"It is inevitable," said Antonio Turrent, former director of INIFAP, Mexico's agricultural research institute. An Iowa-trained maize breeder and soil scientist, Turrent is president of Mexico's Association of Socially Committed Scientists (UCCS by its Spanish acronym), and he is one of the plaintiffs in the class action suit. Biotechnology advocates downplay concerns about gene flow. They argue that the "introgression" of transgenes doesn't confer an evolutionary advantage on the plants, so farmers will not select such maize for seed and replant. Not so fast, says Turrent. "The Bt transgene might prove effective in controlling a pest it was never

even tested for.” In that case, an unsuspecting farmer might select the successful seed and unknowingly propagate an entirely new crossbred maize, one of Serratos’s transgenic native varieties. “This could happen in any part of Mexico,” warned Turrent, inadvertently undermining the integrity of native maize varieties.

“You don’t know it,” explained Serratos, “but you’re adapting a native plant to an Iowa GMO. It’s a blind selection. Like a genetic disease transmitted only by the mother, like hemophilia.”

### *High Risks, Few Rewards*

It was easy to understand why small-scale farmers growing native maize varieties would oppose the entrance of GM crops. They had nothing to gain and quite a bit to lose. But what about larger-scale commercial farmers, like those in the northern state of Sinaloa? No matter what the seed companies say about helping poor farmers and feeding the world, their market is industrial-scale farms producing commercial crops. To listen to the companies, such farmers in Mexico are clamoring for access to the same advanced technologies as their competitors to the north.

From what I could tell, they are not, and the reason is simple. Existing GM maize varieties deal with two problems most Mexican farmers don’t have, at least not in the same way farmers do in Iowa. Bt maize is engineered to have an insecticide in the maize plant itself to repel the European corn borer. Herbicide-tolerant maize, such as Monsanto’s Roundup Ready variety, fights a broad range of weeds by allowing frequent broadcast spraying of Roundup. According to a recent academic study by Michelle Chauvet and Elena Lazos, Sinaloa’s farmers would see limited savings, if any, due to reduced insecticide applications, thanks to Bt seeds. They just don’t have the same corn borer problems, since the main growing season, under irrigation, is during the cooler fall–winter months. And they wouldn’t save much on herbicides or farm labor from the reduced weeding afforded by Roundup Ready maize, because farm labor is inexpensive and the weed problems

in northern Mexico's fall–winter season are not as severe as in Iowa. They spend very little now on weed and pest control, so Monsanto is offering something they don't really need. And the increased cost of GM seeds would be significantly higher, more than offsetting any savings.<sup>18</sup>

Victor Suárez, head of Mexico's largest independent association of basic grains farmers, which goes by the Spanish acronym ANEC, said that one Sinaloa farmer told him he wasn't opposed to GM crops in principle, he just didn't see any use for the ones on the market now. He already gets high yields, without GM maize, and his costs are lower. Suárez also told me that they don't want to jeopardize sales to markets that demand non-GM maize. He said China had just been on the market, specifying that they wouldn't buy GM. Why would farmers limit the potential demand for their products?

What about Suárez's own farmers, mostly midsize commercial growers with 10–100 acres of land? He sent me out to see for myself. Olga Alcaráz Andrades, the dynamic woman who leads one of the association's most successful cooperatives in Guayangareo, west of the city near Morelia, was openly dismissive of GM crops. She said the biggest problem her farmers face is high input costs and monopoly control of markets by multinational firms. Why, she asked, would we want to increase our dependence? Instead, farmers are breeding their own hybrid maize varieties, with help from the national research station. They now sell high-quality seeds to local farmers for 30 percent of the cost. She showed me their composting operation, which was giving farmers some respite from high fertilizer prices. Nearby farmers in Irapuato were doing the same for sorghum, after realizing that 95 percent of the seeds on the local market were from the transnational firms. The national research station found in its gene banks a highly productive variety that the companies hadn't wanted to produce because they didn't own the seed. Farmers grew it out themselves and they now offer high-quality sorghum seed at a 70 percent savings.

I asked Alcaráz if she thought her farmers would benefit from



a drought-tolerant GM seed if one came on the market. She looked exasperated. “Sure, if it’s also flood-tolerant, heat-tolerant, and cold-tolerant.” That range of extreme weather was how their climate was changing. Working with ecological scientists, they were adapting without GM, thank you. ANEC’s lead agricultural engineer, Juan José Valdespino, wasn’t as gracious. “I wish we could genetically modify their brains so they could see other alternatives.”

### *Maize Is Different*

And consumers? Was René Sánchez Galindo right when he told me that even the judge eats tacos and knows maize is different? Cristina Barros, a Mexico City food writer, explained why UNESCO had recently recognized the country’s maize-centered cuisine as a protected Patrimony of Humanity. “I don’t think there is any crop in the world that has as deep a connection to its culture, starting with our myth of origin.” According to Mayan lore, god created humans from maize, a mythology Mexicans embrace when they say they are *hombres de maíz*, people of maize. “No other crop has generated as many different dishes, not rice, not wheat,” said Barros. “Maize is exceptional in every sense.” She told me the government had not even supported the application to UNESCO, which she worked on. “They knew it would impede the entry of GM maize.”

I met Marcela Bris at her restaurant, El Cardenal, which had grown from a popular little downtown lunch spot to become the Hilton Hotel’s main dining room. El Cardenal had a reputation for its authentic Mexican dishes using traditional local ingredients. “We are in danger of losing our maize,” she said, which is why she and other chefs are so actively supporting the anti-GM cause. They had recently published a letter demanding that the government stop supporting the biotech companies.<sup>19</sup>

We talked over lunch, which she ordered to impress, as if I were a restaurant reviewer instead of a wonky researcher. I complimented her on her tortilla soup, with its rich tomato broth filled



Hundreds of thousands of farmers flood the streets of Mexico City in January 2008 to protest anti-farmer government policies. *Enrique Pérez S/ANEC*

with avocado, mild Mexican cheese, dried ancho chile strips, cream, raw onions, fried corn tortilla strips, and a healthy squirt of lime. What makes Mexican cuisine so distinctive, she said, is “avocado, chile, lime, and maize. Above all maize.”

A fresh basket of warm tortillas from a native maize variety arrived at the table, on cue. “Do you know that tortillas have a left and a right side?” she asked. The right side, she showed me, is the second side that cooks when the raw *masa* pancake is turned into a tortilla. As the first side cooks, the other side puffs with warm air, so when it’s flipped the right side ends up with a slightly crispier center. “That is the side you put the filling on,” Marcela said as she spooned *mixiote* from an earthen bowl, explaining that the native dish was made with beans, onions, and *escamoles*—ant egg sacs the size and texture of Israeli couscous—all gently seasoned and sautéed. I did the same, on the crispier right side of a tortilla. The taste was sweet, delicate, nuanced.

In the United States, GM crops are approved quickly because, the industry argues, they are “substantially equivalent” to non-GM varieties. That doesn’t get very far in Mexico. Bris visibly stiffened at the concept. “Transgenic maize is just a commodity,” she said. “I can’t make a good *pozole* from a commodity. Or a good tortilla. It is substantially *different*, not substantially equivalent! Besides, if it’s not different why can Monsanto patent it?”

Bris said she was glad the class action suit focused on the threat to native maize and not concerns about human health. “I see the ownership of patents over seeds as more horrific than the issue of health.” She was right. Not only would farmers not be allowed to replant GM maize, any presence of transgenes in their own crops would subject them to legal action for patent infringement. Monsanto had certainly demonstrated its willingness to unleash its fierce legal department on unsuspecting farmers, even those who had not intentionally infringed on the company’s patents.<sup>20</sup>

### *Monsanto’s “2020 Vision”: Market Dominance*

I had, of course, asked to meet with Monsanto officials, to get their perspective. I expected a polite “no” or maybe a short meeting with a foot soldier in the company’s public relations army. After all, I’d written critical pieces about the technology and the company. So I was a little surprised to find myself in a conference room in Monsanto Mexico’s high-rise office in the Santa Fe business district for what would turn into a five-hour interview with six company officials.

I introduced myself, told them what I was researching, and said I would be particularly interested in their responses to the criticisms I’d heard thus far. After all, farmers, researchers, chefs, and even government officials had basically told me that gene flow from GM to native maize was a real danger, that farmers didn’t need or want it, and that consumers didn’t either. They listened politely and launched into a detailed sales pitch, starting with a

slick PowerPoint titled "Vision 2020" on the beneficent nature of their work. In that genetically modified vision, transgenic maize is key to feeding Mexico and the world. In Mexico, it would help double Mexican maize production, reduce persistent rural poverty among the country's small-scale maize farmers, restore the country's self-sufficiency in its key food staple, and reduce the negative environmental impacts of maize farming. It would feed a growing population, estimated to reach 150 million by 2050, and combat climate change, projected to reduce the country's agricultural productivity by 26 percent by 2080. Monsanto, they told me, was all about "improving the quality of life for farmers." It was, they told me, about achieving "food sovereignty" for Mexico.

I nearly fell off my chair. This was more than a vision; this was a hallucination. Food sovereignty? That is the most radical of agriculture policy fireworks. The term was coined by La Via Campesina, the international peasant movement, and one of its targets was multinational agribusiness firms like Monsanto, which are seen as imposing their technologies on the world. The right to save seeds is at the heart of food sovereignty. I don't think I'd ever heard a more breathtaking, tone-deaf attempt at co-optation. I fastened my seat belt and reminded myself to take very, very good notes.

Dr. Juan Manuel Oyervides, a crop breeder and former colleague of Antonio Turrent's at the national research station, presented a long-view perspective on yield gains in Mexican maize. He chose to highlight his speculative estimate that the government's delay in allowing GM maize had resulted in a "lost decade" of productivity stagnation since 2000, sacrificing 12 percent of potential yield improvements worth \$9.3 billion. If GM maize is approved, he projected a doubling of yield gains over current projections by 2030.

"Lost decade?" I asked him to go back to that historical slide. Doesn't your graph show that the fastest yield growth in maize had come since 2000 using conventional hybrid seeds and native maize varieties? It sure didn't look like yields were stagnating, just the opposite. And doesn't your data on Sinaloa, the heart of industrial

maize production, show that yields are already comparable to those in the United States even without GM maize? Oyervides directed my attention back to the supposed 12 percent reduction from the denial of GM permits and the spectacular growth Mexico could see from widespread adoption.

That growth, of course, is a complete fantasy. A 2016 National Academy of Sciences report found “there was little evidence” that introduction of genetically modified crops in the United States has led to yield gains beyond those seen in conventional crops.<sup>21</sup> The main benefit, when there was one, came in the reduced need for labor. Since Mexico’s rural poverty problem has everything to do with the lack of jobs, it was hard to see how labor-saving technology would be a boon to the rural poor.

Oyervides’s projection was also just plain insulting. Here Monsanto was calculating the gains from wholesale adoption of GM maize throughout Mexico. But the law prohibits the use of GM seeds in the areas of Mexico considered centers of origin. Clearly the company had its transgenic sights set on more than yellow maize in Sinaloa in northern Mexico, even though that’s what the majority of their suspended permits allowed. Just as the north was considered safer for environmental reasons, yellow maize was seen as less objectionable because the product was not directly consumed by humans. Most U.S. maize exports to Mexico are yellow maize, and they are used for livestock and in a lot of processed foods. Mexicans have grown accustomed to yellow GM maize, via imports, but they don’t have to eat it, at least not directly. (Like us, they eat more than they know in their growing diet of imported and processed foods, which have given Mexico the unenviable distinction of toppling the United States from the number-one position in childhood obesity.<sup>22</sup>) There had been a big backlash when Mexicans discovered that the two tortilla conglomerates in the country were adulterating their tortillas, traditionally made with the kind of white maize grown in Sinaloa, with cheaper imported yellow maize. The practice was supposed to have stopped. Everyone knows that Mexicans don’t want anyone to mess with their tortillas.

I asked my Monsanto hosts whether their goal was to open only yellow maize markets in Mexico to transgenics. You already have the Mexican market for yellow maize seeds, right? Some 95 percent of U.S. maize is GM, and that is where nearly all of Mexico's yellow maize comes from. Your seed market won't get bigger because some of the seeds get planted in Mexico, right?

The response was surprisingly frank, a less clouded 2020 vision. "In order for the penetration of biotechnology crops to be successful, it will have to be for both white and yellow corn," said Jaime Mijares Noriega, the company's Latin America director for corporate affairs. "If it was only yellow, we would not be investing."

I was shocked. Why would company officials, in the middle of a lawsuit, state so openly that their goal is to put transgenic maize into Mexican tortillas? Did they have GM white maize ready for Mexico? "We are prepared for both white and yellow." He said he thought as much as half of current hybrid white maize could be converted to GM varieties. Their sights were clearly set on Mexico's tortillas, and on maize land that could extend well into the areas deemed to be "centers of origin" for maize.

What about their field trials, now suspended by the class action suit? Oscar Heredia, head of regulatory agronomy, gave me the rose-colored version of the results: a 10 percent yield gain over hybrid maize seeds, 13 percent in Sinaloa. That is a very small gain for a technology that will be much more expensive. He touted the great benefits of improved insect and weed control, but noted that production costs were 13–24 percent higher.

So why, exactly, did they think anyone would buy their controversial seeds? Monsanto's own data show that Sinaloa's farmers, using nontransgenic varieties, already get yields higher than those on the company's carefully controlled experimental fields. Even if they got approval to plant, wouldn't the company have a tough sell in Sinaloa? They nodded: it might take time to win over Mexico's farmers.

Won't it also close off markets in countries that do not want GM maize? I asked. "The loss of export markets is a red herring for

Mexico,” said Philip Eppard, regional representative for regulatory affairs and the only other U.S. native in the room. “Mexico is not exporting.” That would be news to farm groups trying to increase non-GM maize exports to bolster sagging prices.

Heredia went back to the field trials. He wanted me to understand how safe GM maize was. One of the things they were testing was gene flow, with different buffer zones to reduce cross-pollination. He proudly announced that at 25 meters gene flow was detected in just 0.5 percent or fewer of plants. I asked if the company’s goal was to achieve zero percent gene flow. He said that would be unrealistic. Indeed it would, which is why people like Antonio Serratos are concerned.

“We are very sensitive to Mexico being a center of origin, to the cultural significance of maize,” said Mijares, sensing my concern but then showing complete disregard for it. He noted that most gene flow comes from transported maize. “If there is pollen flow to native maize, what happens? There are very few pure landraces in Mexico today. Many have already gotten genes from hybrids. And the native seeds are preserved in gene banks.”

And how did they expect to control GM gene flow if transgenic maize was more widely planted? “We can’t really ensure how grains are transported and where they end up,” Heredia said. “It’s almost impossible to control,” said another colleague, as if to hammer home Dr. Sarukhán’s rationale for opposing GM permits.

Were Monsanto officials really telling me that gene flow is inevitable and it doesn’t matter anyway because contamination from the company’s imported transgenic maize had already polluted the native gene pool? I was shocked. Not that they thought such things; their actions spoke louder than their “2020 Vision” presentations. I was shocked they would state them, and so dismissively. I guess my outrage didn’t register on my face, and certainly not in their minds. So the conversation continued.

I was surprised they had barely invoked the threats of climate change in their 2020 vision. In Africa, that was the cudgel being used to beat governments into opening their regulatory doors to

GM crops. How will you feed your teeming hordes without our drought-tolerant maize, with our magic “cold gene” that confers some resistance to water stress? It doesn't, at least not very much and not in the kinds of droughts I'd seen in Southern Africa. I told my Monsanto hosts what farm leader Olga Alcaráz had said when I asked her about drought-tolerant GM maize: Sure, if it's also resistant to floods and heat and cold. One of the intrepid plant breeders was quick to respond. “They're going to need our stacked traits,” he said with a straight face. He said future seeds might have as many as twenty different transgenic traits “stacked” within the genome.

This was genetically modified thinking at its worst, the reductionist “monoculture of the mind” Vandana Shiva had so brilliantly called out.<sup>23</sup> I thought of what Cecilia Conde, at Mexico's environment ministry, had said when I asked her if GM maize was a solution to climate change, which was projected to cut the country's maize production by up to 20 percent.<sup>24</sup> “It is a very inflexible response in the face of an uncertain future.”

The Monsanto meeting had gone on for five hours. I was exhausted and hungry. I was relieved they did not invite me to lunch. I was starting to feel like a corn borer in a field of Bt corn; I wouldn't have touched anything they served.

### *“Our Problems Are Not Solved with One Gene”*

Victor Suárez did offer me lunch. He could tell I was a little battered from my Monsanto meeting. He ordered me a shot of smooth tequila and a warm bowl of my favorite comfort food, tortilla soup for the soul. I was comforted, and I told him about that last response about the stacked traits to deal with climate change. He's been at this a long time, he's seen and heard it all. But that one surprised even Suárez.

“We need complex solutions to complex problems,” he said. “Transgenics are simplistic. Our problems are not solved with one gene.”

His jaw dropped when I told him Monsanto said it was promoting “food sovereignty.” Monsanto Mexico was everything he and



the other advocates of food sovereignty were committed to stopping. Monsanto is the threat to food sovereignty, using its political and economic power to lobby the Mexican government for regulations that could permanently limit, via contamination of native maize varieties, the ability of Mexico's people to determine how they want to meet their future food needs.

Suárez's organization was all about food sovereignty, and it didn't just involve growing more maize by applying more inputs. He called their new program "Peasant Agriculture with Integrated Knowledge Systems."<sup>25</sup> It was another case in which the Spanish, "conocimientos integrales," was far more eloquent than the English, "We need to bring scientific expertise together with farmer expertise," explained Suárez, with those two knowledge systems enhanced by recent scientific advances in understanding the soil and plant microbiomes. Suárez was excited, describing the recent discovery of 2,000 new families of microorganisms. "It's like discovering the Americas, or a new planet." And the implications are profound. "It allows us to analyze the metabolism of the plant and the soil."

"This is not about the defense of traditional agriculture. We are not idealizing smallholders, we are promoting technological progress," Suárez told me. "The strategy is to bring the innovation straight into the producers' organization, so the innovation comes from the producers." He clarified that much of the farmer work I'd seen in Guayangareo and Irapuato was driven precisely by this vision of food sovereignty, of freeing farmers from their dependence on transnational firms. They were producing their own seeds, generating their own compost, even producing their own microbial soil applications. In Guayangareo they were culturing their own Bt, the same bacterium from which Monsanto had derived the gene for its Bt corn and cotton. Bt, which has been used for a long time, has a host of valuable properties for soil enrichment, beyond pest resistance.<sup>26</sup> "Industrial agriculture's strategy is to kill pests. We seek to understand them and help the plant respond."

"I'm not an ecologist," Suárez told me defiantly, indicating he was tired of taking U.S. environmentalists around ANEC's farms only

to hear them criticize the farmers for still using some chemical fertilizer. “My focus is making the peasant farmer viable. I don’t come to it through agro-ecology. I come through survival, lowering costs, increasing independence. We got to this program through economic necessity.” And for ANEC’s producers—small- to mid-scale farmers, many of them heavily dependent on chemical inputs to grow hybrid white maize and other crops, often in monoculture, for commercial sale—that necessity has everything to do with the kinds of pressures George Naylor faces in Iowa. The new solution is not a pure agro-ecology but a transition, reducing costs by reducing the need for commercial inputs, mainly by using agro-ecological science to improve the quality of farmers’ soil.

Juan José Valdespino, ANEC’s soil-meister, was as passionate about the potential of emerging soil science as he was about the dead end of current technologies. “Who controls agriculture? The seed companies, the chemical companies. We need to break that paradigm,” he told me as we headed out to the experimental field station in Villa Diego. “There is no one magic solution. It is not a seed. It is not a fertilizer. It is an entire system that needs to be managed, beginning with the soil. We are not just changing the input recipe, we are changing the understanding of what agriculture is. People don’t understand that it isn’t just about chemicals.”

We met Leobardo Contreras, the manager of the station, in the field. The two of them showed us the difference between a healthy soil and one lacking organic matter. Valdespino pointed to some soil rich in organic matter but without the microbial diversity to effectively metabolize nutrients for the barley they were growing there. That’s where the new soil science comes in, he said, with precision microbial applications to regenerate a living soil. Valdespino said when he got there the soil was fairly rich in organic matter thanks to Contreras, but it was lacking soil microbes.

Contreras was a believer. “He achieved in sixty days what I haven’t been able to do in seventeen years here.” He said the soil became soft and rich. Barley yields jumped from 4 tons per hectare to 6.5 tons. More important to the farmer, earnings went up even more

dramatically, doubling with the reduced cost of inputs. That's on experimental fields. What about among ANEC farmers? According to one study of early adopters, maize production increased 30 percent, costs went down 30 percent, and profits increased 60 percent. For sorghum, similar gains in production and reductions in cost took producers from bare subsistence to healthy profitability.<sup>27</sup>

One Jalisco maize farmer explained to me how that worked. With the help of ANEC's extension agents he had reduced input costs by two-thirds and, despite a slight drop in productivity at first, he experienced a significant increase in profitability. Slightly lower yields but much lower costs. What practices was he introducing? Some associated with agro-ecology, such as compost instead of fertilizer, and microbial applications to release soil fertility. And some that are not part of the agro-ecology package, such as hybrid maize seeds that his cooperative could produce for one-third the cost of the varieties sold by multinational firms. He said his fertilizer applications had been reduced from two to one per season, and pesticide use had declined as well. Soil quality was slowly improving, and he expected further reductions in chemical use. Did he expect he would reduce it to zero? No. Did he care? Not much.

Suárez doesn't care much either. He cares about food sovereignty. "Our goal is the small producer, not the northern consumer who wants organic food even if it's made by transnational companies," he told me, taking a slap at those U.S. environmentalists. "That agenda is completely controlled by transnationals. We can learn from the new science and leave farmers in control."

After Monsanto, Suárez's optimism was welcome, bringing my own depleted reserves back to life. "This is a living agriculture growing new solutions to our problems. The extreme idea of capitalism is to turn agriculture into an industry. They either turn it into an extractive industry, like a mine, or they turn it into an industrial process. But they don't make it a better system, a better *culture*."

"Native seeds are living things. They need protection," he went on. "But to survive they need investment in their improvement and development, which is investment in the farm communities themselves."

### *Achieving Mexico's Maize Potential*

That's what ANEC has been doing for years. With small funding for a pilot program to raise maize yields among small- and medium-scale producers, they trained and deployed extension agents to work with ANEC farmers to close the so-called yield gap, the difference between current and attainable yields using readily available technologies. Studies have shown that the yield gap among Mexico's industrial-scale farmers is very low, around 10 percent, but among smaller scale farmers without irrigation yield gaps are estimated at 43 percent. Most of the country's small- to medium-scale maize farmers are operating at less than 50 percent of potential.<sup>28</sup>

In just a few years, ANEC got dramatic results, raising yields 55 to 70 percent in one project carried out in several states. The project did not presume the introduction of new seeds. No transgenic fantasy projections here, just basic soil analysis, improved use of fertilizers and other inputs, and the incorporation of more sustainable soil management. They saw positive results among producers on both high-quality and more marginal lands and with those using hybrid seeds as well as those relying on native maize varieties.<sup>29</sup>

Inspired in part by this impressive pilot project, Antonio Turrent, Elise Garvey, and I had previously published a report demonstrating that Mexico could indeed regain its self-sufficiency in maize production, without transgenic seeds or the hallucinations they seem to induce. We examined the potential productivity gains in Mexico's diverse maize-producing sectors—irrigated and rain-fed, industrial-scale and small-scale, using hybrid seeds and native varieties, with strong and weak access to natural resources. We estimated that within 10–15 years Mexico could increase annual production on current lands from 23 to 33 million tons. That would eliminate the need for imports from the United States, which currently cover the country's annual shortfall of about 10 million tons, the imports costing more than \$4 billion in 2008. Additional public investment in irrigation and infrastructure projects in the southern part of the country, where water is plentiful and rural poverty is the

most prevalent, could allow producers to grow another 24 million tons per year. This would be more than enough to meet Mexico's growing demand for maize, estimated to reach 39 million tons per year by 2025. Mexico could even become a maize exporter.<sup>30</sup>

This is exactly the kind of pro-poor investment in small-scale farming that international agencies advocated in the wake of the food crisis. Public investment should go where the yield gaps are the greatest, among small- to medium-scale farmers. This is also where private investment is scarce and where market failures are prevalent.<sup>31</sup>

In Tlaxcala, just east of Mexico City, they aren't waiting for public investment to protect their native seeds or improve their productivity. The state government passed its own law declaring Tlaxcala a GM-free zone. Pánfido Hernández Ortíz, of the Vicente Guerrero Integrated Rural Development Project, had no doubts about what food sovereignty meant to Tlaxcala. "We have a simple message: Mexico is not appropriate for GM maize." He said they were following a basic "food first" strategy. "If we can ensure the provision of maize and beans, we can deal with other problems."

The cooperative, which is part of ANEC, is doing its part by maintaining a seed bank of native maize varieties and promoting their use, along with the adoption of sustainable farming methods. They use the same kind of tried-and-tested farmer-to-farmer training I'd seen in Malawi, and the cooperative now has some 5,000 producers using native seeds and making that transition to agro-ecological methods. They showed me the elaborate earthen seed bank, which stood in the back of their small headquarters. I climbed the ladder to look down at a neatly labeled set of maize collections.

Emiliano Juárez Franco took me out to his farm. He has about 5 acres and uses a variety of maize seeds, native and hybrid, and *acriollado* varieties developed locally as farmers experimented with cross-breeding native seeds with hybrids. He grows them in rotation with beans and squash in the classic *milpa*, the "three sisters" intercropping method, developed by the Mesoamerican cultures that predated the Maya, to regenerate the soil without having to leave it fallow while providing a diverse diet. His fields, which sit on a gentle

slope, are terraced to prevent erosion and retain water. Many farms are terraced, and he told me it was because the community had restored the tradition of *mano vuelta* work exchange, in which everyone pitches in on a particularly labor-intensive job knowing their turn will come. Think barn-raising, with everybody pitching in to help their neighbors.

I asked Juárez how long he had been farming this way. He smiled, "Since our ancestors." He said he'd been working with the cooperative to improve his farming for many years. And why not? Even with the intercropping, which uses maize land for beans and squash too, Juárez said his maize harvests have quadrupled with the agro-ecology methods. He now grows enough to last the whole year—it used to run out after ten months—and he still has 40 percent of the harvest to sell for cash, giving his family of eight the money it needs for other expenses. Costs are way down too, with most seeds saved year-to-year, and with fertilizer applications cut from two applications to one. Push-pull pest control methods have reduced the need for pesticides.

This was closing the yield gap, the key to restoring food self-sufficiency in Mexico. As the co-op leaders stressed, this was about food sovereignty, protecting their agriculture and food systems with a moratorium on GM seeds while they reduced dependence on purchased inputs through their journey toward agro-ecology. Whether they reached that destination or not.

### *Food Sovereignty in Puebla*

They'd pretty well reached the destination in Cuetzalán, a collection of remote villages in the northeastern corner of the state of Puebla, east of Mexico City. There, a remarkable union of cooperatives called Tosepan Titataniske had drawn on the communities' indigenous Nahuatl traditions and used their remoteness to carve out not just an area free of transgenics but a territory free of megaprojects. It hadn't come easy.

When the environment ministry announced the large "Cloud Forest" ecotourism project for the area in the late 1990s, the

community mobilized. They had already seen the negative impacts of such projects. Mines were contaminating rivers. Hydroelectric projects, taking advantage of the abundant rains in the mountainous area, were destroying the local environment. There were ninety-eight land concessions for such projects in the area.

Tosepan Titataniske, which means “together we shall overcome” in the local Nahuatl language, organized, taking advantage of a national law that allows communities to zone for different land uses. With a series of technical studies and community consultations that involved up to 5,000 people, they approved their “Ecological Land-Use Zoning for the Sierra Norte of Puebla.” The plan identified areas approved for conservation, restoration, sustainable use, and protection (including the main watersheds). Mining and most other megaprojects were defined as categorically incompatible with all four zones.

Getting the plan enforced was another matter, as the companies pushed back. Tosepan created its own Territorial Defense Committee to monitor company activities and filed a class action suit to have its zoning plan recognized and enforced. They won their case in March 2015, but enforcement is still a problem. Still, Tosepan leader Enrique Fernández told us that they had successfully stopped four hydroelectric projects and a Walmart through a mixture of legal action, lobbying, and direct action to stop the bulldozers and backhoes.<sup>32</sup>

Stopping Walmart and the national electric company got my attention. Was this another little David taking on a different set of Goliaths? Little wasn't the word that came to mind as I learned more about Tosepan. The organization, which started in 1977, now has 410 cooperatives involving more than 30,000 families in 25 municipalities (similar to U.S. counties) across the remote region. Leonardo Durán Olguín, the young multilingual local who briefed our small group on the organization, said the goal of the group was *yeknemilis* in Nahuatl, *buenvivir* in Spanish, and of course we don't really have a good phrase for such a lovely concept in English. Good living? No matter, they showed us what they meant.

Their schools, which were in session, were a good place to start. Tosepan runs its own autonomous school system recognized by the

government under a program for remote communities. They get no funds from the government, just some books. It's supported like many other cooperatives in the community, with donations and a lot of volunteer labor. Their teachers, however, are trained on the Montessori model as bilingual Spanish-Nahuatl instructors. Indeed, in one fourth-grade class the teacher went back and forth between the two languages seamlessly. The goal is to have all children functionally bilingual by sixth grade. She said that younger children come in with stronger Nahuatl (or Tutunaku, the other indigenous language in the region) than Spanish. They want children to be able to function in the larger Spanish-speaking society, assigning books and book reports in Spanish. ("In a country where our president does not read books," one teacher told us, "we want children who read." Amen, I thought in 2015, and I didn't even know what was coming back home.) They keep older children from losing their local language by involving them in cultural projects, including their own weekly radio show in Nahuatl, called *Vida Digna* in Spanish. (Again, our English isn't up to the elegance: Dignified Life?) It includes high-schoolers interviewing their grandmothers or older community leaders in their native language.

These were impressive kids, particularly the girls, so poised and articulate as they toured us around the school, showed us their school newspaper, explained how they make biological fertilizers as part of their practical work curriculum. No wonder. Their regular school day involves only two and a half hours of academic instruction. The rest is spent on farmwork, physical education, and arts and local crafts, with an hour for recess and lunch. The food is donated by community members and prepared by a student-staffed cafeteria. Everybody's involved in community projects. The eco-lodge we stayed in, made entirely with bamboo from a Tosepan project that makes furniture and building materials, is run by a youth cooperative. Other students staff the community store, selling eggs and other farm produce. It is just part of the culture, with all community members participating in *tequio*, or community labor.

Economic projects center mainly on coffee, which grows on



beautiful shaded hillsides that contain 150 different plant species. Their cooperative control of the process has boosted farmer income from coffee 200 percent. Cooperatives also have a successful organic bee/honey operation and the bamboo workshop producing furniture for the local market. We visited the large processing plant in town where they produce high-quality organic pepper for export to the Middle East and Europe. And of course they grow maize, usually intercropped with beans, squash, chiles, and other edible plants. Leonardo said the community is largely self-sufficient in basic foods.<sup>33</sup>

It was easy to romanticize Tosepan as being “off the grid,” but as Leonardo made clear they know that with megaprojects threatening them they need to engage with the larger national and international economy. They just need to do so strategically, not letting the market decide their collective futures. Certainly Monsanto was not going to decide what they grow or eat in Tosepan.

### *Biodiversity as a Right*

I was back in Mexico City in September 2015, participating in ANEC’s international agro-ecology conference. The title of the conference left no doubts about its agenda: “Food and Nutritional Sovereignty and Security: With Peasants and Agro-Ecology, Without Transgenics, Monopolies, or Free Trade Agreements.” Victor Suárez was at his fiery best, taking advantage of the ceremonial presence of new agriculture minister José Eduardo Calzada Roviro to decry “the tyranny of the market,” demand that the government “resist pressures from monopolies like Monsanto,” and “stop treating peasants like poor people, instead of producers.” In front of 200 people, with TV cameras rolling, Suárez even demanded a meeting and presented the captive minister with ANEC’s demands. It was an offer he couldn’t refuse.

Meanwhile, those seed monopolies weren’t taking no for an answer on their GM maize. The judge who had ruled on the injunction had unexpectedly retired six months earlier than expected. His replacement had immediately declared the injunction invalid.

Monsanto celebrated with a blizzard of triumphalist propaganda, declaring the issue settled, just in time for the Sinaloa cropping season. The class action plaintiffs made sure the issue was anything but settled. David & Co. LLC filed an appeal within hours, keeping the precautionary injunction in place until the appeal could be heard.

Adelita San Vicente, lead plaintiff for the class action, reminded people at the conference that we were approaching the second anniversary of the precautionary injunction against GM maize. She lauded the national campaign “Sin Maíz No Hay País” (Without Corn There Is No Country) and its determined campaign to “save the country by saving the countryside.” When I spoke to her at lunch, she was worried—about the case and about contamination levels, which the environment ministry had confirmed, right in the bull’s-eye inside the center of origin, in southwestern Mexico.

Before I returned home I made another stop at the Church of San Judas Tadeo. When I’d first investigated this case a year and a half earlier, I’d said a prayer for what seemed like a difficult case, if not a lost cause. But I wasn’t a true believer. Now I was a little bit more of a believer. The injunction had withstood repeated challenges, more than the nonbeliever in me would have predicted. At the church, the priest was blessing the desperate. I lit my candle and said my prayer.

Nearly three years later, as this book goes to press, I’m even more of a believer. The injunction remains in place, headed to the Supreme Court, while lower courts consider the central claim of the class action that GM maize poses uncontrolled risks to Mexico’s maize diversity. Decisions are not expected before 2019. Monsanto and the other seed Goliaths will have lost a remarkable five planting seasons to the legal action, creating a huge sunk cost on their investment. They’d suffered other defeats as well. In November 2017, a judge revoked the company’s permit to plant GM soybeans in seven states after a different set of plaintiffs had filed suit over the contamination of their organic beehives and honey with transgenic pollen from nearby soybean fields.<sup>34</sup> And on July 1, 2018, the Gene Giants may have suffered their most decisive defeat with the

landslide victory of presidential candidate Andrés Manuel López Obrador and his Morena movement in national elections. López Obrador has been outspoken in his opposition to GM maize and his support for native maize producers. When he takes office December 1, he could withdraw government support for the companies' GM permits. As this book goes to press, the legal case goes on and the injunction remains in effect.

For Adelita San Vicente, the injunction's success was no miracle. "The collective's action was the product of many years of organization and struggle by the Mexican people. No country in the world has mobilized as much resistance as Mexico to the planting of transgenic maize."

Meanwhile, the companies were trying to bypass the courts altogether, with the U.S. government proposing in NAFTA negotiations that the three countries agree to accept one another's food and crop safety assessments, overriding Mexican law and undercutting its judicial system. More worrisome still, GM maize contamination had spread to the most popular of Mexico's foods, including its precious tortillas. A 2017 study had found that 90 percent of store-bought tortillas revealed the presence of transgenes. A shocking 82 percent of maize-based foods also showed some level of contamination. Many also contained traces of glyphosate, the herbicide in Monsanto's Roundup. No one could say whether the pollution came from illegally planted GM maize or from food companies adulterating prepared foods with cheaper imported U.S. maize.<sup>35</sup> Did that prove those cynical Monsanto forces of darkness right, that the damage has already been done, that resistance is futile?

Adelita San Vicente couldn't have been clearer. She cited Judge Walter Arrellano Hobelsberger's January 2014 decision upholding the injunction: "The use and enjoyment of biodiversity is the right of present and future generations." "We will defend our seeds and our sovereignty," said San Vicente, "not just in the courts but in the fields, in the streets, and in our collective demands for government policies that respect our rights."

53. “Diligent Tanzania Ltd,” Trickle Out Africa, n.d.; Finnigan Wa Simbeye, “Tanzania: Dutch Firm Goes Bust Leaving Thousands of Farmers in Limbo,” *Tanzania Daily News* (Dar Es Salaam), January 6, 2015.

54. Rod Nickel, “Special Report: Drowning in Grain—How Big Ag Sowed Seeds of a Profit-Slashing Glut,” Reuters, September 27, 2017, sec. Business News.

55. Ben Wolfgang, “E15 Ethanol Debate Reaches Tipping Point in Congress,” *Washington Times*, June 14, 2017; Daniel De La Torre Ugarte, “10-Year Review of Renewable Fuel Standard Impacts to the Environment, the Economy, and Advanced Biofuels Development: An Update,” *American Council for Capital Formation Blog*, June 2016

56. Timothy A. Wise and Emily Cole, “Mandating Food Insecurity: The Global Impacts of Rising Biofuel Mandates and Targets,” Working Paper (Global Development and Environment Institute, February 2015), 1–4.

## 7. Monsanto Invades Corn’s Garden of Eden in Mexico

1. “Mexican Judge Throws Out Monsanto Appeal to Confirm GM Maize Ban,” *Sustainable Pulse*, December 30, 2013.

2. *Maiz* is the Spanish word for corn, and *maize* is the English word used internationally to refer to corn. In Mexico, the word *corn* is seen to refer to U.S. yellow dent corn used for feed, ethanol, and processed foods, distinct from their maize, much of which is consumed directly. Out of deference, for the rest of this chapter I use the terms interchangeably but mainly use the term *maize*.

3. José Antonio Serratos Hernández, “The Origin and Diversity of Maize in the American Continent” (Greenpeace, January 2009).

4. Daniel Zizumbo-Villarreal and Patricia Colunga-GarcíaMarín, “Origin of Agriculture and Plant Domestication in West Mesoamerica,” *Genetic Resources and Crop Evolution* 57, no. 6 (August 2010): 813–25, doi:10.1007/s10722-009-9521-4.

5. José Antonio Serratos Hernández, “Bioseguridad y Dispersión de Maíz Transgénico en México” (Ciencias, October 2008).

6. The information in this section, except where noted, is drawn from *Maize & Biodiversity: The Effects of Transgenic Maize in Mexico: Key Findings and Recommendations* (Montréal: Commission for Environmental Cooperation, 2004).

7. Hector R. Bourges, “El Maíz: Su Importancia En La Alimentacion de La Poblacion Mexicana,” in *El Maíz En Peligro Ante Los Transgénicos?: Un Análisis Integral Sobre El Caso de México.*, ed. Elena R. Alvarez-Buylla and Alma Pinero Nelson (Mexico City: Universidad Nacional Autónoma de

México, Centro de Investigaciones Interdisciplinarias en Ciencias y Humanidades, 2013), 231–48.

8. Comments on the report *Maize & Biodiversity*.

9. Donna Tingley, “Joint Public Advisory Committee (JPAC) RE: Maize and Biodiversity Symposium of the Commission for Environmental Cooperation,” April 13, 2004, 2.

10. “Public Comments on Article 13 Report, Comisión de Biotecnología Agroalimentaria” (Consejo Nacional Agropecuario, 2004), 2.

11. “About the IAASTD Report,” Global Agriculture, n.d.

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### **Part III: Trading Away the Right to Food**

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