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Kernels of Resistance

MAIZE, FOOD SOVEREIGNTY, AND COLLECTIVE POWER

Liza Grandia

KERNELS OF RESISTANCE

LIZA GRANDIA

Kernels of Resistance

Maize, Food Sovereignty, and Collective Power

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Composed in Minion Pro

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FOR DWIGHT GRANDIA,
whose $100 ear
of corn taught me values
of autonomy and
abundance.

AND FOR ADELAIDE,
my cherished child
of maize (and tortilla chips),
who lost her Papa D
too soon.

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FIGURE 1. My first trip to a milpa with Paco, Violeta, and his siblings, 1993. Photo taken by Paco.

Preface

I was into the third month of what would become many village sojourns as an anthropologist in northern Guatemala—a country described in many Mayan languages as *Iximulew*, meaning "place of maize." I had spent my first two months as a guest of newlyweds Violeta and Paco Gomez, in a tiny ten-by-ten-foot thatched hut on the edge of the rainforest. In the company of my generous and talkative hosts, I took my first trip to a swidden milpa (see fig. 1). Although they were mestizo Salvadoran refugees, Violeta and Paco took as much pride in maize cropping as their Maya neighbors. I enjoyed my time with them, but village leaders suggested that I rotate every two months to a different family. For my next homestay I readily accepted an invitation to live with Consuela and Lorenzo and their Q'eqchi' family of six, in their thirty-by-fifteen-foot thatched home. It afforded me the opportunity to learn Guatemala's second-most-spoken Mayan language, plus the Caals (pronounced kah-AHLs) were one of the few village families with the luxury of a pit latrine and a personal well.

On my second or third night with the Caals (perhaps it was September 4, 1993), I heard the family arise, light candles, and speak in hushed Q'eqchi' tones. They were gathered on the far side of the hut and energetically stomping. Unsure if I might be witnessing a secret Maya rite, I pretended to remain asleep. In the morning I summoned the courage to ask what had happened in the night. "Ants." In my stammering high school–level Spanish I asked if had I understood them correctly. Ants? Yes. Consuela, the lady of the house who became like a sister to me, explained that fire ants had invaded the kitchen hearth area. She asked if I would buy them some *volatón* (phoxim) insecticide powder on my next trip to town.

Pleased to have an opportunity to be helpful to my hosts, I embraced the errand. The market vendor measured the phoxim into a cheap plastic

sandwich bag that I naively brought home in the shopping bag holding the week's groceries. To my horror, after using it to kill the ants, Lorenzo sprinkled the leftover powder over the dried cobs in their maize storage bin. This episode burst my romantic teenage notions of organic living in a rainforest frontier. The morning tortillas never tasted quite the same.

Over seven years of fieldwork I routinely observed the application of phoxim as common practice to prevent postharvest storage losses.[1] Although hybrid corn brings higher yields, it is more susceptible to weevils than native maize. By contrast, traditional maize varieties naturally withstand bugs, especially when stacked into traditional bins and sprinkled with wood ash (or the same store-bought calcium carbonate powder used to prepare tortillas) or layered with the leaves of allspice or other medicinal plant leaves. I later learned that the World Health Organization classifies phoxim as a "moderately toxic" insecticide-rodenticide, and the US Environmental Protection Agency deems it hazardous to the brain because it disrupts the critical neurotransmitter acetylcholinesterase.

I never explicitly set out to study pesticides or corn/maize. Other topics—women's health, agrarian politics, Indigenous rights, and biodiversity issues—were my primary focus. Even so, conversations about maize permeated my fieldnotes since maize farming (*milpa* in Spanish) structures everyday life in the rural communities of northern Guatemala and southern Belize. (N.B.: Both corn and maize are the same species, *Zea mays*. Spanish speakers would say *maíz* for both, but I take advantage of the English synonyms in this book to differentiate between open-pollinating native *maize* and modern hybrid or commodity *corn*.)

Small talk around the maize cycle was a reliable way to break any ice. Farmers always took pride in showing me their milpas and their wives often accompanied us on these merry excursions—perhaps to keep a watchful eye on the gringa, since the invitation, "Let's go to the milpa," apparently has a double sexual innuendo. "No, no," I reassured them, "I'm not luring your husband into an affair. I'm genuinely interested in intercropping" (or whatever aspect of rural life I was trying to understand). For a deeper and longitudinal understanding of maize agriculture, I was fortunate to

be mentored by one of Ruben Reina's students, Norman Schwartz, who studied Petenero milpas for fifty-eight years and bequeathed those fieldnotes to me upon his death.

SEPTEMBER SONGS

Two events during graduate school at the University of California (UC), Berkeley, further kindled my interest in maize. On *September 4*, 2001—an important date in my story—Dr. Ignacio Chapela, a microbial ecologist working in a building across campus, announced the shocking discovery of genetic contamination of native maize in Oaxaca, Mexico, even after the Mexican government had placed a moratorium on growing genetically modified (GM) corn. The discovery was particularly disturbing because Oaxaca is the center of agrobiodiversity of the world's most productive grain crop. Unfortunately for Chapela, his department had previously accepted a $25 million donation from the biotech corporation Novartis, and in exchange Novartis received a right of refusal for five years on any research patents filed by the department's faculty. When UC Berkeley denied tenure to Chapela in 2003, I followed the debates surrounding his case more from the angle of academic freedom than from an interest in GMOs or herbicides per se.

Ignorance is not bliss. After graduate school, during my first year as an assistant professor, I was diagnosed with non-Hodgkin's lymphoma, a cancer more commonly found among retired farmers than young academics. During the slow drip of chemotherapy infusions, I thought a lot about phoxim and the many other pesticides to which I had been exposed during my fieldwork.[2] Through my networks I realized that I knew an unusually high number of foreigners who had worked in this region and then faced cancers of the immune system. So I combed through my old fieldnotes and survey data and discovered that the three most-used herbicides on maize crops in Guatemala at the time were paraquat, 2,4-Dichlorophenoxyacetic acid (2,4-D), and glyphosate (better known as Roundup)—all three of which are strongly correlated with lymphomas and leukemias.

After a grueling regimen of chemotherapy, I limped through my last day of radiation on September 4, 2008. This is my official cancer remission date.

Unfolding over the next few September 4ths came a serendipitous series of connected incidents related to corn, corruption, and civil disobedience that compelled me to write this book. Although I am the granddaughter of Dutch immigrant corn farmers from Iowa, I grew up in the Deep South and knew little about the shocking quantities of oil that the US corn crop guzzles, until I read Michael Pollan's *Omnivore's Dilemma: A Natural History of Four Meals*. While I appreciated Pollan's pithy presentation of the petrochemical perversities of US corn cultivation, his privileged food politics overlooked the meaning of maize to Mesoamerica. After completing my first two books on the relationship between corporate trade and land grabs, I therefore began comparing how US trade agreements with Mexico in 1994 and the Central American region in 2005 impacted maize markets.[3] I also started a side investigation into gossip that illegal GM corn seeds were entering northern Guatemala.

Then, in April 2009, while traveling home from a routine monitoring PET/CT scan at Dana-Farber Cancer Institute, I happened to hear a National Public Radio (NPR) story that filled me with icy rage: Dow Chemical had just filed a lawsuit against Canada through the North American Free Trade Agreement (NAFTA) to challenge Quebec laws that banned certain herbicides like 2,4-D for cosmetic lawn use. 2,4-D was one of the two active ingredients in the infamous Vietnam War defoliant Agent Orange (sold to the military by both Dow and Monsanto). I recognized the mention of the herbicide both because it was thought to cause lymphoma and because I had been exposed frequently to it in Guatemalan villages, where it is sold under the brand name Hedonal.

Due to the rising number of medical studies that suggested 2,4-D causes a variety of cancers, several Nordic countries plus Belize, South Korea, and Kuwait had also banned it. Following Sweden's ban, associated cancer rates in that country apparently went down.[4] Although Dow had convinced the North American public that 2,4-D was safe for homeowners to apply, a small-town physician from Quebec, Dr. June Irwin, wondered if its use was related to the strange ailments and rashes she was seeing in her

patients. In 1985 Irwin began monitoring her patients' blood and sending the results to her town's council. In 1991 her town of Hudson was the first in North America to ban the use of "cosmetic" pesticides on public and residential property. By the late 1990s almost two-thirds of Canadian towns and municipalities had followed suit.[5]

Predictably, the turf industry challenged the 2,4-D ban. Nonetheless, the Canadian Supreme Court in 2001 upheld these public health regulations for "our common future." That case was the first to introduce the "precautionary principle" into Canadian jurisprudence. Canadians were understandably outraged that a US-based corporation had leveraged the fine print of NAFTA to challenge their country's sovereign, democratic laws. Unlike other corporations that had used NAFTA to sue Mexico, Canada, or the United States to strike down regulations or receive compensation in the hundreds of millions, Dow demanded only $2 million from Canada—a puzzling sum that was surely less than its own legal fees. Two years later Dow agreed to withdraw its NAFTA lawsuit once the Quebec government publicly stated that 2,4-D was not a risk to human health if label instructions were followed.[6] It was such a peculiar outcome that I applied for and won a Fulbright scholarship in 2012 to conduct ethnographic research about Canadians' reactions to the case. I wanted to understand why Canadians were more risk-averse than my fellow US citizens, who applied 16 million pounds of 2,4-D to their lawns in 2005 and even more thereafter.[7]

Unfortunately, I had to forfeit my Fulbright scholarship when I accepted a job at UC Davis that same year. Although housing prices near campus were shocking, I happily found an old house in the more affordable town of Woodland, the county agricultural seat located just ten miles north of campus. A few months after settling in, my parents came to visit. I vividly remember when we took an excursion west out of town—possibly it was a September 4th—and how startled I was to see a Monsanto sign in front of a large mysterious gated complex about a quarter mile down Highway 16. An internet search revealed that Monsanto's largest vegetable seed research facility in the United States was located but two miles from my new home. I soon realized that it was not just Monsanto. On my drives between Woodland and Davis I noticed that Dow, Syngenta, and many

other biotech and chemical corporations had facilities nearby, likely to partner with (or poach) university research.

That fall I was anxious to learn the mundane logistics of teaching (like how to reserve books at the library), but all the new faculty orientations I attended focused more on how lab scientists could negotiate patent agreements with the surrounding corporate labs. Although Big Ag clearly dominated campus research, I soon realized that many earnest "Aggie" students at UC Davis dream of ditching corporate jobs to work in sustainable agriculture. For them I began teaching a new upper-level course, "Native Foods and Farming of the Americas," in 2014, right before the events recounted in this book unfolded in Guatemala.

Until 2014 Monsanto held a virtual monopoly on the major GM food and fiber crops, all strategically engineered to be sprayed with its proprietary Roundup herbicide, whose active ingredient is glyphosate. Yet weeds evolve. Bugs evolve. Since the COVID pandemic, we all have learned how quickly viruses evolve. Any plant botanist, ecologist, or entomologist with a rudimentary understanding of the Green Revolution could have predicted that the productivity of GM crops would be transitory and ever-new herbicides would be needed. In 1996, the same year Monsanto launched its GM soybean seed, scientists documented the first case of weed resistance to Roundup in an Australian apple orchard. By 2000 the first Roundup-resistant weeds associated with a GM crop system appeared in Delaware, and many more cases would follow.[8]

By 2014 Dow Chemical saw an opportunity to compete with Monsanto by commercializing GM corn, soy, and cotton seeds paired with Dow's own signature herbicide, 2,4-D, once used in Agent Orange. Insulting the three hundred thousand veterans who died from diseases associated with Agent Orange exposure during the Vietnam War, Dow had the audacity to brand its new GM technology with the trademarked name Enlist.[9] Both the Veterans Administration and a coalition of fifty scientists filed vociferous complaints with the US Department of Agriculture (USDA).[10] In an unusual move, the USDA punted Dow's application to the US Environmental Protection Agency (EPA), asking for an environmental impact study. More scientists filed concerns about 2,4-D's volatility and capacity to travel by

wind a hundred miles from application. With a potential fourfold increase in the use of 2,4-D were Enlist to be approved, an additional 3,247 elementary schools downwind would be exposed—inevitably adding more cases to the eight hundred children and young adults already diagnosed each year with non-Hodgkin's lymphoma.[11] Unfolding research also implicates 2,4-D with a spectrum of neurological disorders, including Parkinson's, amyotrophic lateral sclerosis (ALS), and perhaps autism.[12]

My UC Davis undergrads were aghast to learn that "Agent Orange corn" might soon become legal. We organized an extracurricular club to follow the USDA regulatory process. After class one afternoon our little group phoned into a public comment session and were shocked to realize how few other people were on the call. Afterward, our group began contacting all the major food nonprofit organizations to learn whether they might be joining the advocacy movement against the approval of Enlist crops. Other than a campaign led by the Center for Food Safety, all the other food organizations we contacted seemed to have been focused on lobbying for the nation's first buyer-beware GMO labeling law, passed by the tiny (and very white) state of Vermont in May 2014.

If ever there was an opportunity to ban a GM crop, this was it! During that summer of 2014, the media rehashed news items about two different neurodegenerative illnesses possibly linked to herbicide exposure. Robin Williams had just committed suicide after developing symptoms from Lewy body dementia.[13] In those dog days of August, after its ice-bucket challenge went viral, the ALS Association raised $115 million for research into amyotrophic lateral sclerosis. Had more "foodie" citizens, disease research groups, or anti-GM organizations connected these dots, the USDA/EPA review of Dow's Enlist crop system might have ended differently. Although born into a neoliberal age that had relegated political agency to consumer spending alone, my millennial students realized our government could have preemptively banned Dow's dangerous new GM seed and herbicide package for everyone.

Tiny Guatemala attempted to do just that. Until the summer of 2014, Guatemala was among the few countries in the world that had banned all GM crops. However, the US government pressured the Guatemalan Con-

gress into legalizing GM crops through a secretive vote just before the June start of the 2014 Soccer World Cup. When social movements learned of this "Monsanto Law," street protests broke out in the capital. Maya elders and mayors held consultations at numerous locations throughout the highlands over the month of August. They carefully timed their civil disobedience actions for September 2, or 13 Ahau (Lord/God) in the Maya calendar. Until then, it was the largest civic uprising in Guatemala's history. More than one hundred thousand people blocked the Pan-American Highway for ten hours, while Anonymous hacktivists took down government websites and urban foodies and agronomists blockaded the congressional building.

In a stunning reversal, the Guatemalan Congress voted to repeal the law. The vote fell on September 4, 2014, which in the Maya calendar is 2 Wind (written •• *Iq*), a day for healing rituals to purge illness from the body—in this instance, the social body. After decades of war, narco violence, and unabated corruption, it was Guatemala's first major citizen victory in living memory. By contrast, just a fortnight later (on September 17) hardly any US citizens seemed to notice when the USDA quietly approved Dow Chemical's 2,4-D–resistant Enlist corn seed for use in the United States.

In Guatemala the unusual rural-urban alliance that had spontaneously erupted against the Monsanto Law continued clamoring for the restoration of democracy after sixty years of repression. The next spring, a United Nations (UN) anticorruption commission revealed that Guatemala's authoritarian president (and former general) was involved in an elaborate scheme to steal the country's customs revenues. Tens of thousands of Guatemalans converged in the plaza outside the presidential palace for seventeen consecutive weekends in 2015, calling for his resignation. Exactly one year after the Monsanto uprising, the president's own right-wing Patriot Party voted to rescind his immunity from prosecution. The next morning, September 4, 2015, a judge ordered the arrest of the fallen president.[14] Never before had such a high-level politician been held accountable for stealing from the country's public coffers. The president eventually spent eight years in military prison for his corruption crimes and may one day also be tried for his complicity in the Guatemalan genocide as field commander and then head of military intelligence during the worst years of state-sponsored vi-

olence. With support from a UN anticorruption commission, Guatemala began jailing more high-level officials, including several other ex-presidents.

Skipping ahead to the Sunday morning news "roundup" on September 4, 2016: it was agribusiness as usual for the gringos. The US Department of Justice had just approved the megamerger of Syngenta with China's largest chemical corporation, ChemChina.[15] Two months later, several cornbelt states gave Donald Trump his electoral college victory. Among many other corporate nominees, Trump appointed a former Dow Chemical lawyer, Scott Pruitt, as EPA administrator. Twenty days after holding a meeting with Dow Chemical's CEO, Andrew Liveris, Pruitt controversially overturned the EPA ban on chlorpyrifos, a neurotoxic pesticide manufactured by Dow. In 2000 the Clinton administration had restricted chlorpyrifos from home use but permitted the agricultural industry to continue spraying it on many crops (including Christmas trees) despite documented evidence that it damaged the brains of children. It had taken farmworker advocacy organizations fifteen years to win the total ban that Pruitt refused to enforce.[16]

While following these fluky but somehow connected September 4ths, I was struck by the contrast between how Guatemalans voted with their feet to maintain a ban on GM crops while the US food movement asked only for warning labels. Beyond the spiritual blasphemy of genetically modifying a sacred crop (maize), the Guatemalan public articulated environmental, geopolitical, legal, agronomic, and economic concerns about GM technology not often heard in US food activist circles. US citizens expressed worry about personal health and the safety of corn for consumers, while the Guatemalan public emphasized the threat of GM corn to the livelihood, dignity, and cultural survival of maize producers. Although foodies see themselves as vanguard agents of change who "vote with their forks," this book will show how and why the older "pitchfork" moral economy of farmers represents a more formidable resistance to the use of GM crops.

LOVE-HATE LABELS

Having lost much generational wisdom and community cohesion, modern consumers must rely on government-mandated food labels or their own

research to make healthy purchasing decisions. Unlike organic certification that comes with government-enforced standards, the quest for GMO-labeling assumes that corporations will be honest with the public. Labels devolve regulatory responsibility onto consumers, most of whom are ill-equipped to assess the deception lurking behind many corporate claims.[17] It is not just food labels. From carpets to clothes to cars to construction to tourism to recycling, corporations have invented their own labels to greenwash their business practices. Labeling is a marketing solution to avoid resolving deeper environmental problems.[18] The US public is now so obsessed with logos, labels, and social media endorsements that young people now speak about building a "personal brand."

From "natural" to "farm fresh" to "free range" to "low-fat" to "low sugar," consumers are especially awash in misleading food labels. All these labels have created "more work for mother[s]," who assume a disproportionate time burden on family well-being.[19] In outsourcing responsibility for health onto individuals, the focus and reliance on food labeling (and other forms of eco-labeling) has also deflected citizens' attention and energy away from demanding government-enforced regulations to protect everyone.[20] As a cancer survivor, I have a love-hate relationship with labels. While they are a necessary means for protecting myself, I would far prefer to have a functioning Food and Drug Administration (FDA) or EPA protecting *everyone*, not just overeducated label-readers. As a single mother working long hours, the time I spend reading labels directly encroaches on the time I could spend making calls or writing letters to my legislative representatives, asking for systemic solutions.

The food movement has now invested ten years into the fight for caveat emptor labels, and for what? GMOs have become so ubiquitous in the US food chain (integrated into some 70–80 percent of foods) that labels are essentially meaningless. Corporate lobbyists narrowly defeated the first ballot initiatives in California (2012), Colorado (2014), Oregon (2002, 2014), and Washington (2013) to require that foods containing GMOs be labeled as such.[21] When Vermont finally succeeded in passing its GMO disclosure law in 2014, the US Congress soon overrode it to save the food industry the complexity of labeling only part of the commodity chain. This is how

the United States became the sixty-fifth country to require GMO labeling of food at a national level. But even this laggard decision was a pyrrhic victory.

The legal loopholes were more like craters. Trump's secretary of agriculture, Sonny Perdue, easily undermined the intent of the law by changing the language required on the label from the popularly known term "GMOs" to "bioengineered." Worse yet, Perdue allowed the food industry to substitute a QR code or a text number for information that should appear on the label. Exempted from labeling are foods that contain refined GM crops or whose first ingredients are meat, eggs, broth, or water.[22] Furthermore, the food industry is not required to disclose herbicide residues on GM foods, which are disturbingly pervasive, according to recent Mexican studies (see chapter 5). The Center for Food Safety did us all a service by suing the USDA to revise the QR code rule.[23] Civic pressure can indeed protect everyone, not just privileged consumers who tend to read labels.

CHEMISTRY MATTERS

September 4, 2017: Looking back on my sent emails, I enrolled that morning in an undergraduate organic chemistry course. This opportunity was made possible by a generous New Directions Fellowship from the Mellon Foundation. Over sixteen months I sweated through twenty-four toxicology and environmental epidemiology courses to infuse more scientific rigor into my passion for environmental justice. I wanted to understand how and why $C_3H_8NO_5P$ almost took my life. Or was the culprit $C_8H_6Cl_2O_3$? Or perhaps something else entirely, like $C_{12}H_{14}$?

The next month, while slogging through problem sets on chirality, I discovered my daughter's school district was violating state laws by spraying indoors during school hours a pesticide banned by the European Union. Through public records requests and some cross-sleuthing at the county agricultural commission, I uncovered evidence that for years the school district had failed to report to the state or notify parents about their other monthly habit of blitzing school fields with Monsanto's Roundup. Hell hath no fury like a cancer survivor whose daughter was being exposed to herbicides and insecticides during lunch and recess. Through grassroots

organizing on this and other issues, we mothers compelled a school district in a town where Monsanto is a major employer to become one of the first in the United States to ban the use of Roundup on school property.[24]

Although the school board trustees initially ignored the mothers' concerns, the board quickly changed its policy after Dewayne "Lee" Johnson's pathbreaking lawsuit against Monsanto.[25] Johnson's lawyers saw the potential for filing lawsuits on the West Coast after California's EPA filed a public notice of intent on September 4, 2015, to add glyphosate (Roundup's active ingredient) to the Proposition 65 list of carcinogens. A groundskeeper for the Benicia School District, located about an hour from my home, Johnson proved himself to be an ideal plaintiff.[26] He had developed a terminal and particularly painful cutaneous lymphoma after accidentally soaking himself while on the job with Ranger Pro, which is a slightly more diluted form of glyphosate than Roundup. When he called Monsanto's consumer hotline, a corporate employee took detailed notes, promised to collect information for him, then never called him back. So, he continued spraying the herbicide even as his health deteriorated.[27] During the trial Johnson's lawyers showed that Monsanto had ghostwritten numerous "scientific" articles presenting false safety data about Roundup. In a stunning victory in August 2018, a California jury ruled that Monsanto had willfully hidden evidence from regulators about the hazards of its signature herbicide. The jury ordered Monsanto to pay $289 million in penalties and compensation to Mr. Johnson.[28]

Yet almost 99 percent of the US public has Roundup circulating, involuntarily, in our bloodstreams. Children often have higher levels of this herbicide per unit of body weight.[29] Curious about where on the spectrum my daughter and I might sit, I submitted our urine samples for testing in 2020. Although she had almost always eaten organic food in my home, and the school district is no longer spraying Roundup, my child still had more than twice the amount of glyphosate (per billion blood parts) as me. How could this be? And what are the implications for her lifelong health? Beyond cancer, the more we learn about Roundup, the more disturbing the research is. Roundup is now linked with obesity, inflammation, diabetes,

liver and kidney damage, endocrine disruption, neurotoxicity, infertility, and birth defects.[30]

After Bayer bought Monsanto in 2018, it inherited almost 150,000 lawsuits from other Roundup victims. Ironically, Bayer's home country, Germany, had banned GM crops in 2015. Then in 2019 (once again, on a September 4th), Germany announced that it would phase out the use of Roundup by 2024. Although the EU controversially relicensed glyphosate for another ten years in November 2023, German ministers indicated they would continue restricting its use.[31] Seeing the writing on the wall, Bayer announced in 2021 that it would voluntarily remove glyphosate from US lawn products. Even so, US officials continue to insist that Mexico and the sovereign nations of Central America are not themselves free to regulate Roundup, according to terms of the "free" trade agreements they signed with the United States.

CALENDAR-KEEPING

This sequence of September 4ths in my life may be coincidental, but perhaps not. The longer I collaborate with Maya movements, the more I realize how carefully they align their strategies with the Maya calendar. Maya scribes began using zero around 350 CE, at the start of the ancient Maya renaissance known as the Classic period.[32] Without calculators or any magnifying instruments, Maya astronomers designed a calendar so accurate that one long cycle of time (5,129 years) ended precisely on a winter solstice: December 21, 2012. These brilliant ancient astronomers backdated their zero year to 3114 BCE, which was just about the time ancient Mesoamerican farmers had domesticated teosinte into more productive maize cobs. Quite literally, Maya time coevolved with maize.

The Maya calendar weaves together two interlocking wheels. The first is a *winal*, or 20 days, representing the number of fingers and toes on the human body. It interfaces with a second wheel of 13 sacred days. Multiplied together they make a *tzolk'in*, a 260-day cycle, which is also the period of human gestation. Maya leaders known as calendar-keepers (*Aj Q'ijab*)

make offerings of maize gruel to the gods every 260 days to welcome each new cycle of time. The sacred calendar-keepers also lead celebrations that commemorate the solar calendar, the *tun* (equaling 18 winals, or 360 days plus 5 dangerous transitional days, the latter of which are known as the *wayeb'*). Subtracting the tzolk'in from the solar calendar leaves 105 days, which is roughly the lowland growing season for rain-fed maize. At Guatemalan latitudes, 105 days is also the period between the solar zeniths (when the sun passes directly overhead) in the spring and fall.

Twenty tuns make a *k'atun* and twenty k'atuns make a *baktun*. Thirteen baktuns ended in the Gregorian calendar on December 21, 2012. On that day in the Maya Long Count calendar the base-20 system rolled over from 12.19.19.17.19 to 13.0.0.0.0. Contrary to apocalyptic media hype, Maya elders explained that this passage, from one cycle of thirteen baktuns to the next, was not expected to be a doomsday. Maya prophecy did, however, foretell a period of intense social struggle and transformation around this temporal transition. For certain this new baktun has opened with epic battles by Indigenous peoples in Mexico and Guatemala in defense of their seed sovereignty and maize-based cultures.

For some reason my life has been enmeshed with these temporal transitions. I was born under the Maya sign *Aj K'at*, which makes me a "net," or connector. From the foot stomping "ritual" I witnessed in my host family's hut to my 2008 cancer survivor anniversary to Guatemala's 2014 victory over Monsanto, this remarkable chain of September 4ths is a story I felt compelled to write. In Maya belief, a good life is one in which a person discovers and fulfills his or her destiny. In sharing the kernels of Mesoamerican resistance to Monsanto—and what that means not only for human health, but also for the health of democracy—I hope to fulfill part of mine.

This preface was finalized on the Corn Moon, September 4, 2022, in Woodland, California. (September's full moon is usually the time of the "harvest moon," but about every five years October's full moon is closer to the equinox than September's. When that happens, October's becomes the Harvest Moon and September's the Corn Moon.)

Acknowledgments

Native American food sovereignty leader Winona LaDuke (Anishinaabe) once related how her father challenged her to walk the walk by saying, "You know, Winona, you're a really smart young woman, but I don't want to hear your philosophy if you can't grow corn" ("Seeds of Our Ancestors, Seeds of Life," TEDx Talks, 2012). My father shared similar folksy wisdom with me. He was the eldest of a large family that sharecropped or rented farmland in Iowa. At college was the first time he had an indoor toilet. His family was dirt poor but always had a home garden, a tradition he continued when he became a father. After retirement, he and my mother then farmed a couple of acres on her family's homeplace in northwest Alabama. With a catfish pond, timber, fruit trees and berry bushes, beehives, and a summer garden, they were remarkably self-sufficient.

From my mama's consistent cooking I enjoyed many homemade dishes of corn. My big brother, Tim, supplied corn jokes and guided my love for the lyrical wisdom of Broadway musicals (especially Stephen Sondheim's verse "Greens, greens, nothing but greens" from *Into the Woods* that inspired parts of the conclusion). I am grateful to have grown up with him on the southern vegetable meals our mama made from scratch: they typically consisted of peas, cornbread, turnip or mustard greens with pepper sauce, skillet-fried squash or okra, creamed corn, and fresh tomatoes on the side. So, when I moved to Guatemala, I felt at home with Mesoamerican cuisine of black beans, tortillas, field greens, and fresh salsas.

For their summer garden Mama started her seeds in old yogurt containers and Daddy kept track of other inputs: fertilizer, a few store-bought seeds (since mostly he saved or traded local seeds with relatives), and, despite my objections, some occasional pesticides. He usually spent about one hundred dollars a season. When the garden harvest came in, he would relish the first

ear of sweet corn. He called it his "one-hundred-dollar corn on the cob." He considered everything else from the garden to be completely free. With joy he gave away his produce to family, friends, community members, and almost anyone who stopped by and "sat a bit" on the porch in the southern tradition. Before he died from cancer during the pandemic, he asked that this epitaph be engraved on his tombstone: "Closer to God in a garden." I am grateful to him for that sense of abundance and generosity and how sacred the sowing of seeds can be. While my own gardening skills pale in comparison, I try to live up to his largess by generously sharing my time on the porch of public scholarship to help fix the problems about which I write.

Unfortunately, not all professors work for the public good. In 2015, Mars Inc. hosted a food symposium at a farm-to-table restaurant in downtown Davis, to brainstorm priorities for the new UC Davis World Food Center. During the cocktail hour I found myself chatting with a group of scientists who had put their brains in service of agribusiness corporations. One was studying the gut microbiomes of factory-farmed cows and another analyzed big data to help corporations predict food demand. A third saw my name tag and pointedly asked, "What does Native American studies have to do with food?" I explained I was writing an article about Guatemala's uprising against the 2014 Monsanto Law, which would have legalized genetically modified corn. Another man nearby overheard the word Monsanto and asked excitedly, "Oh, is Monsanto here?" Glancing toward the scientist who had questioned my participation as an Indigenous-allied anthropologist, I quipped, "Perhaps I should change my name tag affiliation to Monsanto to listen to what people might say to me and learn what it costs to buy a professor's research agenda." Afraid I might contaminate his chance to schmooze company reps, the Monsanto aficionado looked nervous. Backing away, he made excuses to get another drink.

That night I decided to go beyond the article I was working on and instead write a book. I reckon I should thank that sneering scientist for the inspiration. Happily, many other university colleagues refuse to sell out their research agendas to big business. At UC Davis I have been grateful for conversations with Amanda Crump, Ryan Galt, Ines and Juan Hernández-Avila, Beth Rose Middleton, Susette Min, Maywa Montenegro, José

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I am grateful to my many graduate students and postdocs who felt more like colleagues than mentees, including Nadya Alexander, Cinthya Ammerman, Gio Batz, Alejandra Cano, Marc Dadigan, Laura Gálvez, Jessa Rae Growing Thunder, Becky Kaump, Mayra Sánchez, Ingrid Sub Cuc, Marina Vergara, and most especially Kenji Tomari who has generously offered his graphic design talents for many a good cause. Undergraduate research assistants Lena Buelow, Sandra Vivian Calderón, Rocio González, Marissa Jacquemin, Christine Kelly, Janelle Vasquez, and especially Celia Amezcua (who pounded out a draft translation to Spanish to share with colleagues in Mexico and Guatemala) all cheerfully supported me with tasks small and large. Another wonderful group of students workshopped a book draft in an overload group study course and amazed me with their online sleuthing skills. They included Victoria Arana, Bella Di Francesco, Michelle Estrada, Dayna Garcia, Elliott Ge, Julia Kennon, Noah King, Sam Saxe-Taller, Binti Sohn, and Caitlin Weeth.

Beyond the altruistic and astute suggestions from two of the three anonymous reviewers and the nine external letter writers who read the manuscript for my promotional review, correspondence and conversations with other academic and activist colleagues made this book better, including Marisa Brandt, Claudia Irene Calderón, David Carr, Jennifer Casolo, Jennifer Devine, Emily Eaton, Liz Fitting, Ellen Foley, Meredith Fort, Jonathan Fox, Erich Fox Tree, Tom Guthrie, Ryan Isakson, Cindy Isenhour, Barbara

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I have reaped many other harvests from the perennial seeds planted by my esteemed mentors: Laura Nader (for a model of how to use anthropology to "study up" and challenge corporate power), Michael Watts (for introducing me to agrarian studies and for an unforgettable rant about factory chickens being forced to wear red contact lenses), the late James C. Scott (for how vernacular diversity is the best resistance to empire), Marc Edelman (for a unique undergraduate induction into environmental anthropology), and the late Norman Schwartz (for enchantment with Petén and the milpa system).

Beyond the NSF GRFP and Berkeley Fellowship that supported my research, funding for follow-up work came from the Land Deals Politics Initiative, the UC Davis Academic Senate, an L&S Dean's Office research recovery grant, the Davis Humanities Institute, and overload teaching in the First-Year Seminar program. Above all, I give thanks to Michael Ladisch and the Open Access Fund from the UC Davis Shields Library to make this book freely available online. The Mellon New Directions Fellowship was manna from heaven; it allowed me to take courses to understand the environmental health science around pesticides. Although taking a year and a half for this toxicological training prolonged my time line to completion, my dear editor, Lorri Hagman, supported the project even past retirement. Editors Larin McLaughlin and Joeth Zucco, proofreader Judy Loeven, and indexer Ben Murphy did superb work. I look forward to working with Raúl Figueroa Sartí and Maria Alejandra Monterroso on the Spanish edition.

Every Cassandra needs friends who recognize the doom that others dismiss. Vic Edgerton and Nancy Alderman enriched my understanding of toxic threats. Locally, I am grateful to the core group behind the Woodland Coalition for Green Schools—Clara Olmedo, Laura Martínez-Chavez, Deborah Zavala, Shengchi Huang, Jen Hulbert, David Kupfer, Susan Pelican, and Juliette Beck—who were willing to go to war with me when the school district sprayed pesticides while children were in school. Neighbors Carole Sciebienski, Mark and Mary Aulman, Clara Olmedo, and Laura Martínez-Chavez kindly looked after my home and garden during research trips.

Speaking of sojourns, this book builds on many years of ethnographic work in six villages across two countries, acknowledged in greater detail in my first two published monographs. Here I wish to reacknowledge two of my village hosts, the late Nina and Deysi. They first taught me to mold and toast maize tortillas over a hearth, as their Indigenous ancestors have done for millennia. More than hosts, they were like the sisters I never had. Both died in their forties of gruesome diseases linked to pesticide exposure. While their untimely deaths can never be made right, I hope that this book may help save others from the same fate. My other sister-friends are the brilliant women who have led ProPetén over the last two decades—Rosa María Chan, Rosita Contreras, and Yadira Pantí—and who always had a desk space and good *chisme* for me. Another ProPetén pal, Luis Pantí, went underground in 2010 to help me understand the maize-cattle nexus and Guatemala's vulnerabilities to GM corn. Survey work with Amilcar Corzo and the late Oscar Obando provided other important data points. Two Belizean research assistants in particular, Juan Pop and Lydia Keh, went beyond duty to guide me through Q'eqchi' origin stories, milpa practices, and maize recipes that unfolded into the "Wealth Trilogy" from which I have drawn many examples. It has been a joy to collaborate with tireless Q'eqchi' peasant organizers Alfredo Che, Domingo Choc, and especially José Xoj, all of whom clarified or confirmed aspects of their culture over many days spent in Guatemala, chat threads, and video calls.

When new threats emerged in 2023, I was fortunate to meet with Juan Castro, Carmela Curup, and the whole Bufete para Pueblos Indígenas

team. It has been a delight to message and strategize with them as well as with Byron Garoz, Mario Godinez, Eliane Hauri, Ronny Palacios, David Paredes, and Pablo Sigüenza. Many of them courteously reviewed draft copies of this book's manuscript. The illustrious Elena Álvarez-Buylla connected our Guatemalan WhatsApp group with Doctors Alejandro Espinosa, Alma Piñeyro-Nelson, and Emmanuel González; they all graciously shared resources and solidarity from Mexico. During a final period of "action" research, other investigative reporters, columnists, and nonprofit policy analysts shared scoops and photos they could have easily hoarded but did not: Jeff Abbott, Kajkoj Ba Tiul, Ricard Busquets, José Manuel Chacón, Carey Gillam, César Mendoza, Gary Ruskin, Mark Schapiro, and especially Luis Solano, who has taught me so much about Guatemalan power networks.

I understand from Zapatista scholars that the translation for "resistance" in Tsotsil Mayan is a word akin to "suffering." Having written this book on the tail end of cancer and through the travails of Long COVID, I am grateful to open-minded doctors who helped bring me back to health: Stacy Berrong, David C. Fisher, Eric Gordon, Sonia Reichert, Arturo Savaadra, Sudershan Singh, and Diana Wilkinson. For alternative healing my thanks go to Linda Coco, Susan Fischer, Sara Heitler, Alzada Magdalena, and Bhavya Theissen. Michael Singer supplied the medicine of his wit; Miguel Hilario *ánimo* for the revisions; Rob Lautt the courage not to mince words; and Ryan Hammond nourishment through copyedits. If I have forgotten to acknowledge anyone, please forgive my memory lapses.

Above all, I am grateful for and to Adelaide, my miracle daughter born after oncologists predicted that my chemotherapied body could never have children. Born with gluten and other food allergies (perhaps related to my prior conditions), she shares my love of all things maize, especially corn chips. She laughed her first deep guttural chuckle as a baby when my own mama blew her a dandelion puff. Adelaide became a lover of other weed flowers, collecting countless bouquets of the yellow oxalis blooms that have taken over our herbicide-free yard. Over the many years this book unfolded and expanded, she was ultra patient with her mother's "boring" life typing at the computer, which caused many late-night (but

always home-cooked) dinners. An aspiring journalist, she has chosen this career path as her rebellion to a mama "who takes too long to write a book." Her obsession with the *Back to the Future* movies inspired the idea of how "residual counterhegemony" is often a more powerful version of resistance than trendy political correctness (see my eponymous article in *Antipoda* 40 [2020]).

Through fierce vigilance I have tried to protect Adelaide's body and brain from pesticides. In our society, mothers (especially single mothers dealing with deadbeat dads) bear disproportionate responsibility for emotional labor, the worry of schedules and household management, and the work of modern consumption. I am busy enough. I would rather not also assume the "triple shift" work of scrutinizing labels and instead be able to rely on a democratic government that seeks structural solutions to remove pollutants on everyone's behalf. As ecologist Sandra Steingraber emphasized, mothers should not have to serve as de facto regulatory agencies (see her *Raising Elijah* [2011]). I am fortunate to live in a state with an active citizen lobby for greater legislative protections that hopefully will offer future mothers some relief from defensive label reading. If for every act of green consumerism we also take time to call our regulators, write our representatives, or take to the streets, all our children collectively will lead healthier lives. I hope you, gentle reader, gain inspiration to act from this story.

Action updates on this struggle are posted on my personal website. For more information about how to support or donate to any of the local grassroots movements cited here or for other feedback, you are welcome to write to me at kernelsofresistance@yahoo.com.

Abbreviations

2,4-D	2,4-Dichlorophenoxyacetic acid
2,4,5-T	2,4,5-Triclorophenoxyacetic acid
ALS	amyotrophic lateral sclerosis
BASF	Baden Aniline and Soda Factory
CIMMYT	International Maize and Wheat Improvement Center
CONAP	National Council of Protected Areas (Guatemala)
DR-CAFTA	Dominican Republic–Central America Free Trade Agreement
ECNAM	The Countryside Can Bear No More, *El Campo No Aguanta Más*
EPA	US Environmental Protection Agency
FAS	US Foreign Agricultural Service
FDA	US Food and Drug Administration
GATT	General Agreement on Tariffs and Trade
GEF	Global Environmental Facility
GM	genetically modified (adjective)
GMO	genetically modified organism
HFCS	High-fructose corn syrup
IARC	International Agency for Research on Cancer
ICTA	Institute of Agricultural Science and Technology (Guatemala)
NAFTA	North American Free Trade Agreement
NHL	non-Hodgkin's lymphoma
OPV	open-pollinated variety
PL-480	Public Law 480
PRI	Institutional Revolutionary Party
REDSAG	National Network for the Defense of Guatemala's Food Sovereignty
UC	University of California
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPOV	Union for the Protection of New Varieties of Plants
USDA	United States Department of Agriculture
USMCA	United States–Mexico–Canada Agreement
WTO	World Trade Organization

KERNELS OF RESISTANCE

INTRODUCTION

The Milperos' Dilemma

It was February 17, 2004, 11 *Tz'i'*, or 12.19.11.0.10, a day in the Maya calendar symbolizing justice, law, spiritual authority, and the balance between individual and collective good. Don Pablo B'otz was one of the most joyful and gentle souls I had the privilege to meet during my years living in Q'eqchi' Maya territory. Born in Guatemala, he fled the civil war for refuge across the border to Jaguarwood village in southern Belize.[1] We met because an Indigenous nonprofit had enlisted me to film and document the elders' traditional ecological knowledge in the Sarstoon-Temash watershed in order to support a Maya constitutional claim for territorial autonomy and community comanagement of a national park. In a meeting during which the Q'eqchi' elders defined the terms of my research, Don Pablo had volunteered to demonstrate traditional candlemaking using forest-harvested wax from wild, endemic *Melipona* bees. On the scheduled day (11 Tz'i'), I arrived at his house by dawn, but he was running late following a 3:00 a.m. community pig slaughter. His wife wanted to harvest some slow-growing *tapikal* beans, so when Don Pablo arrived back home at 6:20 a.m., we changed plans to visit his milpa (the traditional term for a polycropped maize field). Like a proverbial trip to grandmother's house, we went over the river in a borrowed dugout canoe and through the woods, then walked another four kilometers to reach a mosaic of connected plots that he and seven close friends and compadres had slashed, burned, and helped one another plant.

To adapt a line from the musical *Oklahoma!*, the maize in Don Pablo's field was as high as a jaguar's eye. When I queried how much he had planted, Don Pablo responded not in acres or workdays, but with the traditional

metric of the number of sown maize cobs: one hundred for the wet season and three hundred for the dry season. His agrodiverse milpa involved far more than the proverbial "three sisters" companion planting of maize, nitrogen-fixing beans that trellis up the stalk and fertilize the maize naturally, and squash as a ground cover that naturally suppresses weeds. Don Pablo began by pulling some onions to use in cooking the pork soup planned for lunch, remarking that he would leave the rest to go to seed when the field was fallowed. He checked his rice sprouts and dug up a few sweet potatoes (*ix*) and *macal* roots (*ox*) that had been planted while offering special prayers he had learned from an elder, who had learned them from an elder before him, and so on, rearward for millennia. His chili peppers were ripening, and I spotted pineapples in another corner near a patch of *ub'el* (or *Santa María*, in Spanish). To an outsider these greens might look like weeds. However, Don Pablo explained that some folks like to eat them boiled or sautéed, but his family mostly used them to wrap fish from the river or snails from the creek before roasting. Because I was running a fever, we chatted about some other medicinal plants growing in his milpa. At the forest's edge we collected vines for making a wheel to dip the natural beeswax candles that would provide light during his all-night vigil before planting to accompany the soul (*xmuhel*) of his maize seeds.

A north wind rustled through the maize, as if whispering the secrets of the ancestors. That season Don Pablo had only planted white maize, but in the past he had planted other maize colors. Gesturing to his forearms, head, and belly, Don Pablo explained that his people were made from maize. In fact, the five colors of maize "are like our bodies—red for blood, yellow for skin, white for bones, blue-black for hair, and green for the sky-earth."[2] His somatic description of being made from the flesh of maize echoes a classic Maya tale recorded in the sixteenth-century sacred text, the *Popol Vuh*. Central to pan-Maya identity, this creation story was kept alive in many different languages through oral histories passed down over generations of people living in even the most remote rainforest villages, like Jaguarwood. Over the next two months that I lived in Jaguarwood, other elders shared stories of how maize colors came from Paxil, a sacred mountain. They also explained the tradition of planting three kernels in

every hole: one for the mountain gods, one for the animals or bugs, and one for themselves. This triad is a gesture to abundance and plenty for all, and of farming *with* nature rather than *against* it.

Weighed down with full sacks of bounty, we merrily headed home. After leaving the lushness of Don Pablo's complex multicropped and organic milpa, we passed through an adjacent monocropped field that had been blitzed with paraquat, a highly toxic herbicide now banned in almost sixty countries.[3] A strange, slippery fungus was growing on the barren earth between the maize stalks. "How foolish [my son] is," Don Pablo lamented. "He could have planted so many good foods." Encouraged by foreign missionaries to use Western inputs, Don Pablo's son had begun to reject the old ways after he married a Baptist girl and converted to Protestantism. Don Pablo explained that his son was also "a little lazy" and wanted to save time by spraying herbicides instead of weeding by machete. I correctly surmised that his son's field was planted with store-bought hybrid seeds because it was already pollinating. This set the stage for the first conversation I had in Q'eqchi' about GMOs, or *iyaj jalb'il xyuam rik'in b'an* (roughly, seeds whose life is changed with chemicals).

A few months before, I had taken a weeklong break from fieldwork to attend a forum hosted by La Vía Campesina (henceforth Via Campesina), an alliance of international small farmer organizations, in opposition to the Fifth World Trade Organization (WTO) ministerial in Cancún, Mexico. Before departing, I attended an improvised teach-in at Guatemala's public university, which had been quickly organized after many nonprofit representatives and academics were denied travel visas to Mexico. For my Guatemalan comrades not able to travel, I promised to report back what I learned and witnessed. After a long overland bus journey, I arrived in Cancún and wandered into an old school building where Via Campesina was using its logistical prowess to feed and house hundreds of peasant leaders from around the world. Throughout the city, numerous foundations and nonprofits, including Via Campesina and the International Forum on Globalization, were hosting parallel teach-ins to discuss emerging trade threats. Honestly, I learned more about corporate power in that one week in Cancún than I did during my four years attending Yale University.

Among the most discussed cases was that of Canadian canola farmer Percy Schmeiser, whose crops had been involuntarily contaminated by GM pollen. Monsanto investigators had trespassed on his land to collect samples, and when they found trace amounts of transgenes with Roundup resistance, they threatened to sue him for patent infringement unless he paid a fifteen-dollar-an-acre licensing fee for the 1,030 acres he had planted using his own saved seed inherited from his father. Having been a small-town mayor and regional legislator, Schmeiser appealed his case all the way to the Canadian Supreme Court. In a shocking verdict, the court ruled that Schmeiser, not Monsanto, was in the wrong. After losing his constitutional case, an indignant Schmeiser traveled the world to tell his story, becoming a symbol and inspiration for farmer resistance to GM crops and eventually winning the Right Livelihood award in 2007.

Another farming folk hero emerged that week in Cancún. On September 10, 2004, I joined a march of peasants and Indigenous peoples. From a few meters away I witnessed college-educated South Korean farm leader Lee Kyung Hae climb a police barricade, shout "The WTO kills farmers!," then plunge a knife into his own chest. Although Lee's cattle farm had been a model training site recognized by the United Nations, he lost the farm when South Korea opened its borders to subsidized Australian beef after signing the GATT (General Agreement on Tariffs and Trade), which preceded the WTO.[4] Shortly before his dramatic political suicide, Lee penned an indignant letter about how commodity dumping had destroyed his livelihood: "Since [massive importing,] we small farmers have never been paid over our production costs. What would be your emotional reaction if your salary dropped to half without understanding the reasons?"[5]

Sobered by Lee's spectacular martyrdom, members of more than two hundred farm groups from thirty-four countries gathered for a solidarity protest three days later. The crowd parted in silence when the South Korean delegation arrived (fig. 2). They walked to the front of the barricades, sat, sang a song, and then pulled out a heavy rope borrowed from some local fisherfolk. Like a tug-of-war against the global corporatocracy, the delegation used this humble gift of solidarity to pull down many layers of concrete barricades. It was one of the most moving gestures of allyship I

FIGURE 2. South Korean delegation, before pulling down the barricades in Cancún, 2003.

have ever personally witnessed. And, hypothetically, the night before, a pair of gringas may have "drunkenly" distracted Cancún police officers long enough for climbers to scale a construction crane and hang a banner illustrated with a balled fist and an ear of maize next to an anti-WTO message.

As a Swaziland delegate commented to one activist, these and many other direct actions outside the WTO meeting in Cancún emboldened her and other African delegates to stand against the hypocrisy of the Global North. If poor countries were expected to open their borders to "free trade," then rich countries should have to cut their farm subsidies. When agribusiness interests blocked this needed international dialogue over subsidies, a Kenyan delegate announced, "This meeting is over. This is another Seattle."[6] A bloc of twenty countries walked out and this WTO tribunal (and most that followed) ended in disarray.

For months after Cancún, Lee Kyung Hae's sacrifice and Percy Schmeiser's court case had weighed on my mind. With the best toxicology I could

FIGURE 3. Barricades pulled down at the Cancún WTO tribunal, 2003.

muster in Q'eqchi', I shared with Don Pablo what I then knew about the health hazards of herbicides. I explained how the "rich men" (*aj b'iomeb'*) that patented GM seeds also required the purchase of a special herbicide, Roundup. I spoke about Schmeiser's battle with Monsanto—how pollen from a nearby field had contaminated his canola fields and Monsanto had sued Schmeiser for the "crime" of planting seeds passed down through his family. Without hesitation, Don Pablo responded with an uncharacteristic flash of anger. "That is evil" (*Ink'a us*).

Many elements of that memorable visit to Don Pablo's milpa—the *Melipona* bees, the sacrilege of crop contamination, the erosion of agrodiversity, and the nutritional and medicinal value of "weeds"—became universal themes of resistance to GM corn throughout Mesoamerica. Although Belize quickly decided to prohibit GM crops in 2011, they had been legal for a brief time. Like its neighboring countries, Belize imports a significant quantity

of GM corn from the United States. It is possible that Don Pablo's native maize had already been contaminated with transgenic splices. With corn pollen able to travel up to half a mile, just one flowering GM stalk in a gust of wind could contaminate dozens of adjacent milpas.

That is the essence of the "*milperos*' dilemma": how to defend their sacred maize against an invisible technological threat in a world of interconnected trade and corporate aggression. For Michael Pollan, in *The Omnivore's Dilemma* (singular possessive), the challenge is how to eat more ethically and healthfully through individualized dietary responsibility. For the human "omnivore" of the Global North, food is merely a mode of consumption that begs for "food rules" about what to eat in the context of mass-produced industrial food that has replaced so many food heritage traditions. For milperos, however, maize is a means of production that expresses history, cultural heritage, culinary tradition, landscape, kinship, community, and sense of home. Overwhelmed by too many consumer choices, the omnivore begs for labels to simplify shopping decisions, while Mesoamerican milperos lament the loss of the choice to plant the seeds of their ancestors. The omnivore signals virtue by what she, he, or they buy or do not buy, while the milperos' ethics are relationally formed in community. The omnivore belongs to a silent majority opposed to GMOs, but milperos have become a repressed majority. The omnivore wonders if GM food is safe to eat. The milperos ask if it is safe to grow. The omnivore hopes that self-control and ethical choices can save the planet from catastrophe; the milperos know they must join broader agrarian and regulatory struggles for food sovereignty, climate justice, and environmental health to counteract supranational corporate interests.[7]

In these and other ways, the kernels of Mesoamerican resistance to GM corn provide counterpoints to the individualistic, consumer-driven, and parochial food politics that Michael Pollan's work inspired. Consumer politics end at the cash register, but collective Mesoamerican resistance to GMOs has germinated broader—even state-sponsored—support for reviving agroecological practices that can repair the damages of industrial agriculture. The methods and processes by which Mexican and Guatemalan social movements won their struggles against GM corn also teach

deeper lessons of diversity and plurality. In Mexico, members of a motley movement to defend maize are now in high positions of state leadership, designing strategies to reinvigorate milpa systems and support a national glyphosate detox. In Guatemala, renewed civic confidence after the defeat of the first Monsanto Law germinated a generalized defiance against corruption and seeded a new political movement, the Movimiento Semilla, literally the "Seed" party, which won the presidency in 2023 in a surprise landslide. To defend those election results and prevent a second Monsanto Law from slipping through the outgoing Congress, Indigenous ancestral authorities used roadblocks to paralyze the country for more than a month and maintained a peaceful encampment in the capital for 105 days straight (a number with deep calendrical meaning), from October 2, 2023, to the delayed presidential inauguration held on January 14, 2024.

A fortnight after this democratic transition, a Poqomam congresswoman introduced legislative bill no. 6086 to protect both biodiversity and collective ancestral knowledge from privatization. Five hundred years after Pedro Alvarado brutally invaded the region that became Guatemala, Maya peoples are redefining their nation according to principals of dignity and plurality, or, as the Maya Zapatistas in Mexico would say, "a world where many worlds fit" (*un mundo donde quepan muchos mundos*).

The aim of this book, therefore, is simple: by sharing how the People of Maize defeated one of the world's largest and most reviled corporations and planted renewed seeds of democracy, I hope to reinvigorate the political hopes and aspirations of we, the People of High-Fructose Corn Syrup, to demand greater collective regulatory protections, stand up to the corporate interests bullying our Mesoamerican neighbors, and codevelop agroecological pathways to more climate-wise forms of agriculture.

POLLAN-ATED FOOD POLITICS

Back in the United States on the same day in 2004 when I visited Don Pablo's milpa, Michael Pollan was likely receiving fan mail about his first magazine article about the anxieties of being an "omnivore" during the mad cow scare.[8] His prior bestselling book, *The Botany of Desire* (2001),

popularized the food commodity genre. Through subsequent columns in the *New York Times*, Pollan reported on the lunacy of the farm subsidies whose biggest payout goes to corn—some $90 billion between 1995 and 2010.[9] This became the central theme of his 2006 book, *The Omnivore's Dilemma*, in which Pollan followed the production of a bushel of corn as both the symbol and substance of all that is wrong with industrial agriculture. With vivid prose he made the wonky issue of farm bill policies a hot topic.

Pollan dates the problem of US overproduction of corn ("cornification") to the year I was born. Between the New Deal and 1973, to prevent another Dust Bowl and to stabilize grain prices, the US government sometimes paid farmers to leave fields fallow or purchased grains during bumper years to save those harvests for leaner times. However, Richard Nixon's secretary of agriculture, Earl Butz, considered this conservation strategy foolish.[10] To exert US "agripower" abroad, he wanted to maximize corn production no matter the ecological cost. Butz abolished the national granary, encouraged farmers to plant fencerow to fencerow, and built a new system of subsidies that forced corn farmers to "get big or get out."[11] Although diplomats cringed from his boorish behavior, Butz brokered big deals, even selling grain to the Soviets in 1972. He continued to travel the world to off-load surplus grain production as either a trade or an "aid" weapon in the Cold War.

US farmers subsequently enjoyed several years of prosperity; many took out loans to expand their acreage. But when interest rates rose in the 1980s, this confluence of factors bankrupted many small farms.[12] When the smaller farms were bought out by investors, the average farm size doubled from 200 to 400 acres. Today, corporate (nonfamily-owned) farms control three-quarters of US agricultural production and gobble up most government subsidies.[13]

Corn production skyrocketed from 20 bushels an acre in 1920 to as many as 200 today.[14] This mirage of plenty, however, was conjured by petroleum fumes. When factoring in the use of agrochemicals and fuel, each US corn acre burns through fifty gallons of oil every year. Today it takes ten calories of oil to grow one calorie of corn.[15] More subsidies embedded

into the 1996 and 2002 farm bills skewed a system already obsessed with yield into outlandish production goals. With the US spending $315 billion annually on crop subsidies, that congressional pork pie costs each taxpayer approximately $2,000. The wealthiest 10 percent of farms commandeer 71 percent of corn subsidies and the richest 2 percent take a third. So many farming businesses began growing corn in a chase for subsidies that the total US corn crop now covers an area the size of California.[16]

Where do these mountains of corn go? Around 40 percent gets processed into ethanol—meaning we are spending oil to produce corn to make ethanol to replace oil, all at an energetic loss. The Biden administration, nevertheless, is working on a plan to require airlines to blend more corn ethanol into jet fuel. Feedlots consume another third of the corn crop and 10 to 20 percent is dumped on export markets.[17] The rest goes toward industrial food and beverages. A fourth of the estimated 45,000 products in a typical supermarket (including inedible products like diapers) now contain corn derivatives.[18] With corn concentrated into meat, soft drinks, other processed foods, and ethanol, the average person in the United States indirectly consumes far more corn than subsistence farmers like Don Pablo eat directly through a tortilla-based diet. One of Pollan's most memorable tidbits is that US meat eaters have a higher corn biomarker in their bones (a carbon-13 isotope) than do Mesoamericans for whom maize is a staple.[19]

Perhaps counterintuitively, omnivores who want to consume less corn should just start eating more tortillas and less meat.[20] If US corn were eaten directly, one Iowa acre could, in theory, sustain fourteen people. Yet, when subtracting for caloric loss in its transformation into meat and dairy, one industrial corn-acre feeds only three people (which actually is lower than the productivity of small farmers in countries such as Bangladesh, Vietnam, and Guatemala).[21] MacArthur "genius" Lester Brown calculated in 2007 that the corn it takes to fill a twenty-five-gallon SUV tank with ethanol could feed a family for a year on a maize-based diet.[22]

Although meat production consumes far more grain, Pollan saved his most strident critiques for the 3 percent of corn that turned US consumers into the People of High-Fructose Corn Syrup. Per capita US consumption of high-fructose corn syrup (HFCS) grew from 45 pounds in 1985

to 60 pounds in 2006. That equaled almost 10 percent of average daily food intake.[23] In selling two million copies of his book, Pollan almost single-handedly inspired wealthy consumers to reject HFCS. Responding to Pollan's famous *New York Times* "voting with your fork" column, the first commenter exclaimed, "It sometimes seems daunting to try and change things through the political system—you could get shot or even assassinated—but I dare them to force me to eat high fructose corn syrup!"[24] Many such foodies returned to the colonial sweetener of yore: cane sugar.[25] Where did the excess HFCS go? To export. By 2015, three-quarters of US HFCS exports were dumped on Mexico.[26]

Yet, other than a couple of breezy and anachronistic sentences about how "Mexicans" domesticated corn, Pollan paid scant attention to maize's deep millennial symbolism for millions of Indigenous Mesoamericans past and present. Despite his professed passion for the natural history of cooking, he devoted nary a sentence to the culinary brilliance of how Mesoamerican women transform maize into hundreds of savory and sweet dishes. For an investigative journalist with an ample travel budget, Pollan seems embarrassingly ethnocentric. He parrots the typical white settler-colonial narrative of the foolishness of "Squanto," who "handed the white man precisely the tool he needed to dispossess the Indian."[27] Expressing an odd reversal of fortune, Pollan remarked in a 2003 NPR Thanksgiving interview, "Our entire diet has been colonized by this one plant. We're probably doing more for corn than corn is doing for us. It has gotten the upper hand in this relationship, and we need to bring it back under control."[28] In his mind, gringos are the victims of this "welfare queen" who is so "greedy" for nutrients that she leaves "cornsick" land.[29]

Besides his apparent disdain for corn, Pollan espouses throughout his corpus a Jeffersonian nostalgia for self-made yeoman homestead farms, where settler farmers mix their labor with the land in a Lockean logic of private ownership.[30] Pollan's other ideal citizen (actually, he prefers the word "eater") is a self-reliant epicure who "votes" with a fork through farmers market foraging, backyard gardening, home cooking, and label reading.[31] The "Pollan-ated" foodie mythology goes something like this: through friendly face-to-face conversations at the farmers market, the

enlightened "eater" exerts a culinary noblesse oblige, strategically spending money ("buycotting") to coax even the most curmudgeonly conventional farmer to learn more sustainable values and adapt the family farm to local market demands.[32] Reflecting this romanticization of rural life, one dating app (FarmersD) can even match "city beauties" with food producers.[33] I have seen UC Davis professors who auction their research to agribusiness corporations assuage their consciences by shopping local at the well-known Davis Farmers Market (est. 1976). But, as Laura DeLind counters, buying local "ultimately . . . does more to comfort and accommodate the individual eater (i.e., the locavore) than it does to challenge inequity and existing power structures."[34]

The inference is that if consumers make an effort to "know where your food comes from," it will lead them toward more ethical and sustainable choices. This supposition reflects an ableist assumption that eaters have both the energy and the mobility to procure fresh local foods, as well as an Antoinette-ish attitude that people can afford to do so.[35] In a Pollan-ated food politics, the implicit adversary is the consumer's own will—or the fatness of the same consumer's wallet. Justifying his own admitted sense that "elites can be ahead of the curve on some things," Pollan hopes that the soft politics of enlightened epicureanism might inspire eaters to later engage in the hard politics of legislative change.[36] Other scholars beg to differ, noting that political struggle is rarely pleasurable;[37] that voluntary actions in the marketplace seldom build the collective social momentum needed to resist state regulatory power;[38] and that corporations so deeply manipulate consumer desire, via many of the same PR firms hired by the tobacco industry, that consumer choices can hardly be considered autonomous.[39]

While on tour promoting *The Omnivore's Dilemma*, Pollan published an editorial, trying to convince the nation that "you can vote with your fork, in other words, and you can do it three times a day." In response to critics, Pollan backpedaled in a 2007 editorial, stating that "voting with our forks can advance reform only so far" and that concerned citizens must "vote with their votes as well."[40] However, the damage was done. Although Pollan would likely disdain drinking Kool-Aid, middle-class consumers drank his enchantment for the local and forgot his more important message

about farm subsidies.[41] In 2007 the *Oxford English Dictionary* proclaimed "locavore" as its word of the year.[42] *Time* magazine ran a March 17, 2007, cover with the heading "Forget Organic. Eat Local."[43] Borrowing from weight anxiety and dieting, more authors and food movement leaders have followed Pollan's calorie critiques of industrial agriculture and pledged to eat local to reduce their "food miles."[44]

WHEN THE CENTRAL VALLEY IS "LOCAL"

In celebrating the local, Pollan's corpus has an odd libertarian streak that rejects formally regulated organic certification for other voluntary labels like "biodynamic."[45] Less than a decade after his book was published, sustainable agriculture students at UC Davis had clearly absorbed his skepticism for large-scale organic production. Even though we are surrounded by "Big Agriculture" and get regularly doused by aerial pesticides, my students fervently believe in voting local with their forks.

I noticed this via one Socratic dialogue with the undergrads enrolled in my 2014 Native Foods and Farming of the Americas course, after I had spontaneously posed this dilemma: If you walked into the Davis Food Co-op and the same vegetable was being sold at identical prices in both the conventional "local" section and in the organic section (the latter with unknown provenance), which would you choose? I was startled that nine-tenths instinctively opted for the local vegetable, even though crop dusters fill the skies where we live and the conventional local produce would almost certainly be laced with pesticides. They told me they wanted to know where their food came from. As Pollan later argued, "Shake the hand that feeds you. . . . Regulation is an imperfect substitute for the accountability, and trust, built into a market in which food producers meet the gaze of eaters and vice versa."[46] Following this communitarian but almost libertarian sentiment, local food advocates argue that personal relationships are superior to regulations.[47]

Indeed, many of my students earnestly assert that farmers market booths with handwritten "pesticide-free" or "noncertified organic" are better than the produce coming from "big organic."[48] Having had market vendors and

pick-your-own farm owners baldly lie to me about their pesticide use, I frankly prefer third-party certification. When ill from chemotherapy but determined to ingest extra antioxidants, I once called a local blueberry farm to verify if it was organic. The farmer assured me his crop was pesticide free but his farm was too small to get certified. So I picked sixty pounds of his blueberries to store in my freezer, only to fall violently ill from eating the first bowl. A telephone call revealed he had sprayed an exceptional herbicide to kill the poison ivy invading his bushes on the day before I showed up to pick fruit to fill my cancer-fighting pantry.

After I reoriented that course in order to challenge the next student cohort to think beyond their own youthful sense of immortality—and consider the farmworkers whose bodies would be exposed to pesticides to produce that "local" food—the students' answers began to change.[49] Former students courageously stepped forward to share their own experiences being sickened by pesticides through their campus laboratory jobs or summer field jobs. I also began emphasizing the extraordinary accomplishments of transnational agrarian movements to help young people see that corporate power is not infallible and can be defeated in solidarity with collective, global struggles.[50]

I, of course, understand why my sustainable agriculture students aspire to build livelihoods with "their hands in the dirt." The serotonin-producing bacteria in organic soil makes me happy too. However, a revolutionary transformation of the food system will also require the "dull work" of putting hands on computer keyboards to lobby for policies to restrict subsidies, reduce food waste, help young farmers buy land, break up factory animal farms with environmental laws, and prevent trade agreements that wreck the lives of small farmers elsewhere.

When white and wealthier communities mobilize against ugly or environmentally damaging projects near them, their actions often push those harmful developments onto communities of color. The environmental justice movement rightly denounces this as NIMBYism ("not in my backyard"). Yet, the food corollary—what I might call CHOMPism ("choosing health on my plate")—remains a troublingly acceptable marker of food politics. I recall one student who indignantly scribbled on my local vs. or-

ganic poll that he would never be caught buying local food and would only chomp his own homegrown food. I could not help but chuckle that part of his "wokeness" included the cup of imported coffee he brought to every lecture. Caffeinated stimulants, tropical fruits (pineapples, bananas), and chocolate—all of which drove colonial expansion—remained somehow exempt from this young man's local food rules. Apparently, some foodies give themselves a "Marco Polo exception": if the explorer could have carried it home, unrefrigerated, for months on a slow boat, then it can be an ethical "splurge." According to this logic, immigrant farm laborers should forgo imports of their own cherished heritage foods, while their transnational migration to produce "local food" remains invisibilized.[51]

Besides these hypocrisies, the neoliberal logic of local eating falls short of the systemic changes needed to solve our food problems.[52] Like so many other militarized aspects of industrial agriculture, the US Army published a study in 1969 to first promote "local" food as a survival technique during nuclear war.[53] Questioning his previous pretension for local food, historian James McWilliams realized that going local is like "turning ourselves into a gated community."[54] Digging into the entire food cycle, it turns out that transportation is just a sliver of the environmental impact of our diets (only 11 percent). Farming and food processing represent 46 percent, home cooking 25 percent, and restaurants serve up 16 percent.[55] Yet, as McWilliams quips, "'Cook efficiently' just doesn't have the same rousing ring as 'eat local.'"[56]

Because 80 percent of US grains go into animal feed, the single most impactful act any "eater" can do for climate change or global hunger is to consume less meat.[57] The average steer requires 130 gallons (3 barrels) of oil over its lifetime.[58] A US family can offset its average annual car travel (2,938 miles) simply by cutting its meat consumption in half.[59] Even more astounding, the energy used to produce only the meat a typical US omnivore consumes is equivalent to the total average annual energy consumption for someone living in the Global South.[60] Happily, one can eat less meat without resorting to gruel or the generic Esperanto cuisine of "hippie food."[61] Mesoamerica boasts a plant-based cuisine that the UN Educational, Scientific and Cultural Organization (UNESCO) honored in

2010 as an Intangible Cultural Heritage of Humanity.[62] The complexity of the region's sauces, beverages, and versatile staples are mirrored in the beauty of its polycropped milpa system.

Although local food opens a path for people to withdraw a piece of their lives from corporate markets, it does not spontaneously produce democracy nor does it challenge global inequities of food distribution.[63] Like the "Fifty Simple Things You Can Do to Save the Earth" (popularized in an eponymous book published for Earth Day 1990), there is a profound disconnect between simplistic individual actions—like driving an SUV to a store, then buying local food, and bagging it with a reusable tote—and the pace and scale of planetary destruction we collectively face.[64] Former vice president Al Gore, for example, could have used his bully pulpit to confront the one hundred corporations responsible for 71 percent of the world's greenhouse gas emissions, but instead he encouraged individuals in his documentary film, *An Inconvenient Truth*, to simply change a lightbulb.[65] We now know that one oil company (British Petroleum) birthed the concept of "carbon footprint" to deflect responsibility for the climate crisis onto consumers rather than on the oil industry.[66] Agribusiness is essentially doing the same through the notion of food miles.

Proof in the (HFCS-free) pudding is how easily globetrotting corporations have co-opted the concept to "localwash" themselves. Walmart—arguably one of the least local businesses ever created—is a corporation that does not even bank locally and instead wires its profits every night to Arkansas. Yet it successfully made much ado about starting to procure "local" food, while at the same time lowballing local farmers.[67] The southern supermarket chain Winn Dixie launched an ad campaign in 2009 called "Local Flavor since 1956," but also paved over a local field where my family once picked blackberries and wild plums. Barnes and Noble, which decimated local independent bookstores during my youth, later launched a website saying "All bookselling is local."[68] Need I continue?

The most insidious effect of locavorism is how it reinforces a parochial sense of US exceptionalism. Switching from beef to ostrich meat might reduce carbon emissions, but simply ostrich-izing our food politics will not. Opting out of industrial food at home does nothing to repair the

damage of US corporate aggression abroad. Like it or not, all localities are enmeshed in global trade, and "no group can delink from a world in which we are all already implicated in concrete historically produced planetary effects."[69] Instead of filling our Facebook feeds with vanity photos of our dinner plates, we could use that space to discuss how corporate bullies are ravaging the food sovereignty of neighboring nations.

By its presence or absence, mass sentiment profoundly shapes government and multilateral policy. For instance, in the delusional belief that a nuclear attack could somehow be survived, the construction of expensive fallout shelters became a craze among well-to-do families . . . and they became less concerned about peace.[70] When the wealthy think they can opt out of planetary problems through consumption alone, this has profound consequences for a democratic society.[71]

Don't get me wrong: I love my home garden as much as anyone else. And sure, before Long COVID disabled me, I enjoyed biking to the nearby farmers market, where I regularly had pleasant conversations with a local farmer about growing nopales, blackberries, and tomatoes, and the reason he farms organically (so as not to expose his grandchildren to pesticides when they visit). But these local gestures are not a substitute for political action. Nor will they help the millions of people in distant places whose livelihoods have been "Butzed" by corporate commodity dumping. As any kind of direct rebuttal to Pollan, this book comes far too late, and I have likely already spilled too much ink on how much *The Omnivore's Dilemma* got under my pericarp.[72] The deeper questions are how and why Pollan's ideas fell on fertile ground.

Although we ought to be united against a food system that coddles corporations, the People of High-Fructose Corn Syrup and the People of Maize express significantly different assumptions about social change. According to the dominant "educational" model of social transformation in the United States, if "eaters" can be armed with better information (read: labels), they will become more socially responsible consumers of local, organic, GMO-free, seasonal, or even homegrown food, and the sum of these acts will somehow ripple up the food chain to transform corporate practices. At the very moment the food movement could have demanded

regulation, solidarity, and transnational solutions, locavore fantasies and the quest for consumer labels diverted the movement's revolutionary potential. Individual behavioral acts of resistance may sometimes add up, but they rarely multiply unless people step forward to contribute toward something larger than themselves.[73] By contrast, through more direct repertoires of protest, many countries in the Global South—even those with a long history of state oppression, weak environmental agencies, and little consumer information—have won more aggressive action to reinvigorate democracy in order to regulate genetically modified crops (as in Guatemala) and to defend, celebrate, and renew small farming techniques for climate resilience at a scale only possible with state support (as in Mexico).

CLIMATE-WISE NOT CLIMATE-SMART AGRICULTURE

Despite surplus calories being consumed by the People of High-Fructose Corn Syrup and their industrial feedlots, agribusiness has frightened policymakers, research professors, and the public into believing that the People of Maize must be forced into a "gene revolution" to be able to sustain the masses in a climate-altered world. After two decades of the repeated claim that they would "feed the hungry," genetically modified crops clearly have not. Hunger is a problem of inequitable land tenure and food distribution, full stop. The world already produces more than enough food to fill every person's caloric needs, yet 800 million people go hungry every night.[74] Today, only 23 percent of cultivated land goes toward plant crops (providing 82 and 63 percent of humanity's calories and protein, respectively). The remaining 77 percent is tied up in producing feed crops (many of them GMOs) for meat and dairy, which then supply a mere 18 percent of global calories and 37 percent of global protein consumption.[75]

After the blazing summer of 2023, it seems clear that we are moving from global warming to global *heating* faster than scientists ever predicted. Historic heat records last year led scientists to warn that the homogeneity of grain monocultures, especially corn, leaves the world at risk of "synchronized crop failures."[76] This has happened once before.

In the past, hybrid breeders detasseled male corn inflorescence by hand,

but this was time-consuming and time-sensitive, requiring hefty labor costs. My father, in fact, earned money as an Iowa teenager to pay for college this way. After breeders discovered a gene for corn male sterility in Peru and Chile in 1965, they introduced it through conventional breeding into hybrid seed production, and soon this gene (cms-T) appeared across 75–90 percent of commercial corn.[77] The 1970 season was unusually wet and hot. A corn blight that originated in the Philippines in 1964 spread throughout the US Southeast by June 1970; a month later, it engulfed Iowa and Wisconsin; by August it was attacking fields all over the place, including Canada. Only hybrid crops based on the cms-T sterility gene were affected. In some areas of the US South, losses were as high as 50 percent. All told, the blight wiped out 15 percent of the US crop, amounting to a billion-dollar loss (roughly $15 billion today).[78]

To restore genetic vigor against the disease, in 1971 corn breeders returned to Mexican landraces.[79] Still, aside from the occasional lecture in a plant pathology course, the seed sector appears to have forgotten this cautionary tale. They stack homogenous GM traits onto a similarly narrow set of homogenous hybrids. A 2017 study found that 45 percent of GM corn seeds share the same hybrid base.[80] The four countries that produce more than half of global corn are still 84–88 percent reliant on Corn Belt Dent (CBD) germplasm.[81] A researcher for the USDA (hardly a radical institution) warned: "With the development of biotechnology, specifically genetic engineering, one wonders if we are setting ourselves up for another fall by increasing genetic uniformity of our crops."[82]

As the climate crisis grows more urgent every year, it can be tempting to look for silver bullet technologies—but, as Vandana Shiva quips, Monsanto gets the silver and farmers get the bullet.[83] In a strange way, the "buy local" mantra also functions as a rhetorical silver bullet, promising miraculous results from a single solution. Yet climate solutions inherently must be plural; it would be foolish to gamble on fragile corporate monocultures or expect that some elusive future tech will save us.[84] As wisely stated in a popular quote attributed to Albert Einstein, "We cannot solve our problems with the same thinking we used when we created them."

Biotechnologists claimed that by helping farmers lower their agro-

chemical use, they could fix the problems of industrial agriculture.[85] Yet herbicide use instead went *up* dramatically. Following the introduction of Roundup Ready crops, herbicide use increased by 527 million pounds in the United States from 1996 to 2011.[86] That includes the half pound of glyphosate applied on average to every cultivated acre.[87] By 2016 global herbicide use had multiplied fifteenfold. Around the world, 523 weeds are known to be resistant to herbicides, including 357 that are impervious to glyphosate.[88] Scholars from the Global South foresaw this based on their own Green Revolution experiences.[89] Monocultures of any kind invite pests. Agrochemicals kill friendly species and disrupt the ecological balance. Fertilizers cause the soil to release carbon and dry out. Weeds and insects reproduce quickly and will inevitably become resistant to pesticides and insecticides.[90]

Just when the bad news was piling up, the World Bank inadvertently (and then purposefully) gave the biotech industry new rhetoric to smother its weed problems. The World Bank first invoked "climate-smart agriculture" in 2009 as part of a gender empowerment program in Africa.[91] Biotech firms quickly co-opted this phrase to turn the climate crisis into profit.[92] By 2014 the World Bank and other "stakeholders" launched the Global Alliance for Climate Smart Agriculture to help promote GM crops, especially in Africa.[93] One member of this climate-smart alliance is Yara, the world's largest fertilizer manufacturer, which is especially ironic given that the nitrous oxide emitted from fertilizers is an even more potent greenhouse gas than CO_2.

Biotech PR talking points go something like this: with "smart" herbicide-resistant crops, farmers can avoid plowing before they plant and thus save a little gasoline. Industry front groups serve up factoids like: "Each additional hectare/2.47 acres of land converted to no-till has a CO_2 impact equivalent of erasing the carbon emissions from a drive from Boston to Philadelphia."[94] What about the rest of greenhouse gas emissions? All the gasoline consumed in the mechanized farming cycle should be counted, as well as the aforementioned release of nitrous oxide, the soil carbon lost from fertilizers, the petrochemicals used to make pesticides and herbicides, and the deforestation underway to make room for GM crops, especially

in the Amazon. Biotechnologists bragging about helping a few corporate farms shift to no-till agriculture are like lazy husbands who boast and beg to be congratulated for occasionally "helping" to wash the dishes while ignoring everything else their wives do to sustain the household—from emotional labor to scheduling, budgeting, childcare, cooking, cleaning, and endless laundry.[95] Touting boutique humanitarian projects like the benefits of golden rice or virus-resistant papayas is equally unimpressive.[96]

Yet 99 percent of GM seeds sown today are either engineered to be resistant to herbicides or are Bt insecticidal crops. They are mostly destined to be feed for animals, to factories, and to agrofuel plants—not for people.[97] Although the biotech industry promotes "drought-tolerant" seeds as the future's miracle solution, plant adaptation to abiotic stressors requires interaction among multiple genes, so adaptation to unpredictable rainfall can never be solved by singular genetic modifications.[98]

Cor[n]porations complain it costs them $130 million and thirteen years, on average, to develop each new GM seed that will "save" the world from climate change.[99] That single sum would be enough to finance Guatemala's entire public seed research program for eighty-five years. If more funding were available to work in partnership with Indigenous peoples, imagine how many open-pollinated varieties might be bred to adapt to climate change and then be exchanged for free, farmer to farmer. Yet currently less than 15 percent of the US agricultural research budget supports alternative techniques and far less goes to holistic agroecological transitions.[100] Even fewer US resources are directed to support agroecological projects for the Global South.

Biotechnology is inherently a myopic and vertically integrated laboratory science run by a tiny group of scientists who operate as though separated from social realities, whereas agroecology (a blend of agronomy and ecology) seeks to cocreate holistic solutions through respectful relations with the lived experience of peasants and Indigenous peoples as knowledge-holders of agrodiversity.[101] Gaining global recognition through Via Campesina, agroecology is also now a collective political movement based on principles of cultural diversity; it seeks to defend "seeds, biodiversity, land and territories, water, knowledge, culture, and other common

goods."[102] With the goal of recycling resources on the farm, agroecology looks to the knowledge passed down over generations, rather than external modern inputs. Genuine agroecological systems are already close to net-zero energy use; they rebuild soil carbon; they have greater elasticity for intensification via polycropping; and they are more resilient in the face of disaster.[103] For example, after 1988's Hurricane Mitch, the second deadliest Atlantic Ocean storm that killed at least twenty-two thousand people, a large Central American survey showed that hillside plots farmed with agroecological methods retained 20 to 40 percent more of their topsoil, whereas conventional farms suffered tremendous erosion.[104]

To question GMOs is not to be antiscience. Rather, it is to value the wisdom of agroecological science tested on a longer timescale. For instance, a 150-year experiment at Rothamsted Station in England clearly shows that organic-based systems (in the form of recycling manure from farm animals) yield more over time than chemically fertilized crops. Since 1981, other long-term experiments by the Rodale Institute have shown that organic corn cropping earns 25 percent more profit and it sequesters tremendously more carbon.[105] In turn, this organic matter in the soil holds more water, serving as a natural solution to drought. With relatively modest investments, Rodale estimates that if farmers shifted to agroecological production tomorrow, this "down-to-earth" sequestration of carbon could offset *100 percent* of annual CO_2 emissions. Even if an immediate shift to organic is unlikely, the US-based Project Drawdown estimates that stepwise agroecological conversion could contribute as much as 45 percent of necessary carbon reduction by 2050.[106] We need not wait for some future technological wizardry to save the planet: regenerative organic agriculture can substantially mitigate climate change now.[107]

To be sure, scientific breakthroughs in genetic engineering since 2012 have allowed plant breeders and other scientists to modify specific genes at significantly lowered research and development (R&D) costs than what it took to develop the first generation of GMOs (by inserting transpecies genes through a cauliflower mosaic virus).[108] Using enzymes to more accurately modify genes, the new CRISPR-Cas9 technology has led to an explosion of genetic engineering for medications, vaccine development, and envi-

ronmental remediation that could be beneficial for humanity. Soon a GM crop could perhaps be made in someone's garage.[109] Even without physical seeds, anyone can now experiment on plant genetic sequences using big data analysis.[110] In theory, breeders could use CRISPR technology to create more resilient crops that require fewer chemical inputs. But who will do this needed research? Land-grant universities now seem functionally beholden to agribusiness.[111] The corporate behemoths that controlled the first-generation herbicide-resistant GM crops will easily acquire and squelch any innovative CRISPR technology invented by research professors that might compete with their profit models.[112]

Although they have cornered the market in the United States, Bayer-Monsanto and other biotech firms have had less success in penetrating the enormous but opaque agricultural markets of developing countries. Were GM crops truly healthy, hearty, high-yielding, and drought-resistant, biotech corporations would not need to resort to legal bullying to transform autonomous small farmers from the Global South into clients. At present no corporate giant is researching varieties that succeed in the marginal, mountainous, degraded soils of impoverished countries.[113] Instead, they "stack" more genetic traits onto hybrids that were originally bred to maximize yield in northern latitudes on flat irrigated land nursed by synthetic fertilizers. However, maize is very sensitive to day length, altitude, wind, soil, water, and heat, so seeds designed for US midwestern corn monocropping will not produce the same yield elsewhere.

Happily, farmers in the Global South have conserved maize diversity and possess the techniques, skills, and social networks to learn from one another. They have been doing so with little to no money. Upward of half the world's farming population remains engaged in agricultural production on small farms. Eighty percent of farmers in the Global South still save their own seeds because their local varieties are better adapted to the marginal lands left to them after colonial land grabs. Native seeds offer more resilience to climate change, exhibiting more phenotypic plasticity against abiotic stressors than hybrids or GMOs.[114] Many maize landraces already exist that can thrive under conditions of climate change; others may be adaptively developing under the watchful eye of wise milperos.[115] Through emails and

texts, Guatemalan colleagues have reported maize landraces that resist floods, produce low oleic levels for long-term storage, and display other assisted evolutionary marvels.[116] Gene flow between maize and its hardier wild ancestor, teosinte, offers "unexploited genetic diversity for novel traits" and stress tolerance.[117] As journalist Peter Canby has mused, "Would it be fair to think of landrace ["native"] corn as having already achieved, on some level, the very properties that genetic-engineering firms were spending hundreds of millions of dollars to try to breed into commercial corn?"[118]

Because most small farmers in the Global South source their seeds locally and often within their own families, a very simple climate solution would be to fund structures (seed fairs and the like) for them to share promising seeds and seek contextual advice from other farmers outside their ordinary networks.[119] Sometimes all that is needed is a gentle suggestion to awaken the scientific curiosity of small producers. One agroecology research team reported that after a simple transect walk accompanied by some Nicaraguan farmers who were asked, Why do you think x bean variety does well in this space?, many of those farmers spontaneously began experimenting with multiple beans within their fields. Within just a couple of seasons, they had figured out which seeds yielded best according to different soil moistures.[120]

Thinking that time is running out, policymakers may be tempted to support a single stopgap solution coming from a lab. It would be reckless to bet on these single high-tech "fixes." In a global game of roulette, sure, the risk of "smart" solutions to climate change might produce a bigger payout. But corporations will be the ones cashing in their chips. A much safer bet would be distributed over a larger set of numbers—such as on the thirteen million Mesoamerican farmers working today, including the one million Q'eqchi' Maya among whom I had the honor of learning.

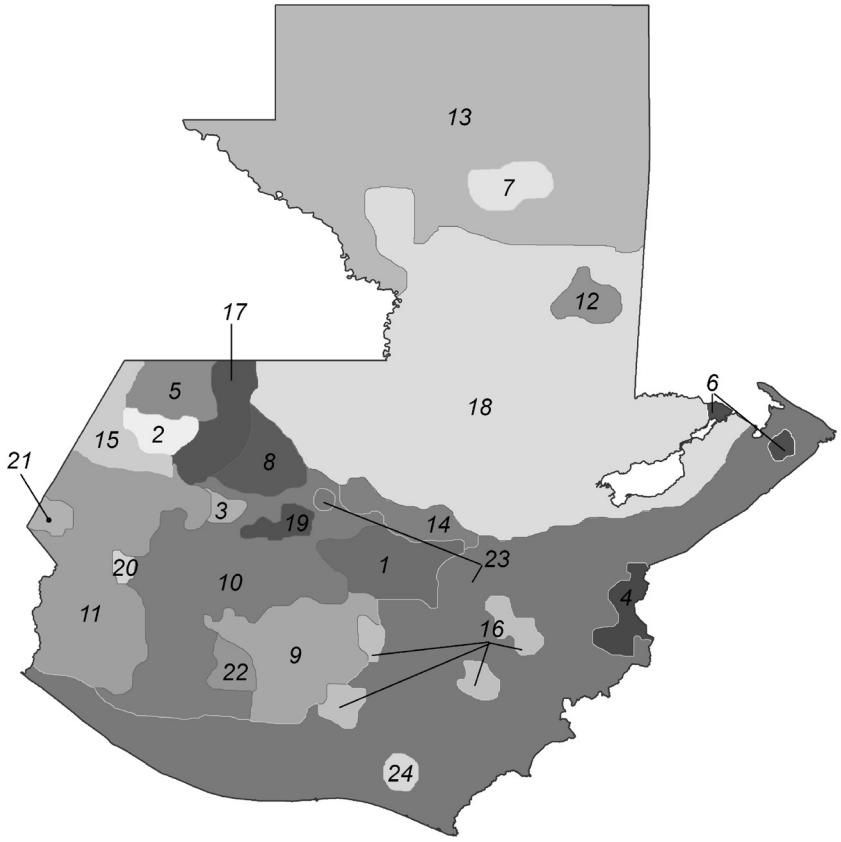
METHODS IN MILPAMERICA

Whether in Q'eqchi' or Spanish, the words for milpa and maize are colloquially synonymous. Milpa entered Spanish from the Aztec term for "cultivated place," or "milli pan." In Q'eqchi', "to farm" means "to plant

milpa" (*k'alek*), that is, to plant maize. The Q'eqchi' word for maizefield (*k'al*) has the same double meaning as "milpa," referring to both the land parcel and the maize crop itself. The word for "village" (*k'aleb'aal*) means "the place of maize fields."

In 1998, 82 percent of the lowland Q'eqchi' population self-identified as farmers; 99 percent of those reported maize as their principal crop. As Guatemala's most prodigious maize producers, Q'eqchi' families have transformed the northern lowland departments of Alta Verapaz, Petén, and Izabal into the country's "tortilla basket." In these lowland regions, Q'eqchi' Maya farmers can coax up to three annual maize crops from thin karstic tropical soils through swidden cropping fed only by ashes, rain, and sun. An older generation of other Maya (Itza' and Mopan), Petenero, and ladino farmers also once extensively cultivated maize across this region, but their children and grandchildren have tended to seek nonagricultural employment. So although they constitute only 7 percent of Guatemala's population, Q'eqchi' farmers are now disproportionately responsible for producing approximately 20 percent of commodity corn sold nationally. Even while engaging with markets, Q'eqchi' farming families enmesh their own subsistence maize production with ceremony and Maya cosmology.[121]

From seven years living in six different Q'eqchi' villages, two Itza'-"Mayero" towns, and traveling to many more peasant communities, I eventually amassed some three thousand pages of fieldnotes with marginalia on lowland maize farming techniques, rural household budgets, pesticide use, and more.[122] Complementing my participant observations, I was codesigner of two major stratified surveys (in 1999 and 2009). With a sample size of a thousand households each, they provided quantitative insights into the economics and agricultural logics of maize/corn production.[123] In conversation with countless women, I also spent thousands of hours making tortillas, tamales, and other ritual foods. Later commissioned by an Indigenous Belizean nonprofit to write a monograph series about cultural aspects of farming, forest knowledge, recipes, and traditional stories, I gained other insights into the deeper spiritual dimensions of the milpa (swidden) system.[124]



MAP 1. Linguistic areas of Guatemala: 1. Achi; 2. Akateco; 3. Awakateco; 4. Ch'orti'; 5. Chuj; 6. Garifuna; 7. Itza'; 8. Ixil; 9. Kaqchikel; 10. Kiche; 11. Mam; 12. Mopan; 13. non-Indigenous; 14. Pocomchi; 15. Popti'; 16. Poqomam; 17. Q'anjob'al; 18. Q'eqchi'; 19. Sakapulteco; 20. Sipakapense; 21. Tektiteka; 22. Tz'utujil; 23. Uspanteko; 24. Xinka. Map by Jason Arnold and Daniel Irwin, NASA/SERVIR, 2010.

For the past decade I have collaborated with the largest Q'eqchi' peasant federation in Guatemala. Unlike my prior community-based fieldwork, as a primarily long-distance ally to this organization, I became more of an observant correspondent than a participant-observer.[125] Through regular texts, emails, and social media posts with Q'eqchi' leaders and farmers, I acquired a feeling for how they not only read the news, but also how they "read" institutions to find conjunctural cracks, apertures, trim tabs,

MAP 2. Guatemala and Belize, showing approximate locations of research sites. Map by Jason Arnold and Daniel Irwin, NASA/SERVIR, 2010.

or other openings for change. Grassroots movements operating on a perpetual shoestring need to plan carefully when to bide their time and when to strike.

As described in the preface, an uncanny series of cyclical coincidences drew me into their struggles to defend maize from gringo GM corn. This involved no new rural fieldwork per se, though, like Sidney Mintz, "I stumbled across issues that might be better understood" from my previous

village sojourns.[126] Although I was not in Guatemala when the 2014 Monsanto Law protests erupted, prior ethnographic understanding allowed me to read between the lines of what a broad cross section of the Guatemalan public were saying in their blog comments and other forms of social media, which I cataloged and coded. Despite a long history of political repression, Guatemalans of diverse backgrounds have embraced Feis (the local name for Facebook), community journalism, and comment pages on mainstream news sites to express themselves with surprising candor and crystalline articulations of "moral economy."[127] This virtual topography of protest has likewise rendered visible a multicultural discourse that is otherwise typically missing from mainstream news and official texts.

Of course, social media also has a bias toward rupture, fissure, scandal, uprising, novelty, and breaks with the past. It tells little about the slow-moving underground or the long-term organizing of civil society.[128] Through readers' likes and reposts, however, one can glean a sense of the connective threads among and between actors—the mycelium, as it were, to these grassroots networks. To verify whether I had accurately captured the meaning of social media ephemera, I consulted regularly with key leaders, academics, and organizers. Believing more in "people review" than academic peer review, I then circulated a quick "artisanal" translation of a first book draft with a core group of organizers.[129] I also shared the research behind this current book, gaining new insights from strategic dialogues in a private WhatsApp group chat and public postings to a larger Facebook group. Making lemonade from life's cancer lemons, I realized one of the contributions I could make from afar to movements on the ground was to summarize, distill, and translate toxicological and other environmental health research on the hazards of pesticides. I have spent time every day for the last decade reading PubMed and other technical literature on toxic threats; eventually this "hobby" turned into a new field of expertise in service to Indigenous movements.

As Karl Marx once noted, the point is not simply to interpret the world, but to change it. As a lifelong ally of agrarian movements, Peter Rosset shares this perspective:

> You have to find a way to participate in the movement in order to deserve the access that you're given to it. Some people have said that in the best case, research with social movements is the collective construction of knowledge—collectively by both researchers and movement activists . . . And in practical terms, if you want to be able to work with social movements, you can't just do what you want to do with them. You have to put yourself at the service of the movement . . . Whatever it is, you have to be always available to do whatever has to be done to the best of your ability, and in exchange, maybe at some point you get to do a little bit of research with the movement.[130]

Following these same ethics, this book took more years to germinate than I might have wished. I began writing it simply to share the story of the Guatemalan Maya movement's inspiring victory over Monsanto in 2014. While the humanities and social science literature on corn is bountiful, most is focused on the United States or Mexico. On an academic panel in 2016, filled with luminaries of GMO struggles in Latin America whose work I deeply respect and admire, I was stunned that no one knew what had happened in Guatemala. While Mexico's rumbles with Monsanto became a cause célèbre for hundreds of international allies, scholars, journalists, and watchdog groups (boasting 55,700 results in Google Scholar), Guatemala's resistance to GM corn remained relatively unknown outside the country, except for a small number of dissertation projects and papers.

When Guatemala was forced into legalizing GM corn in 2019 through a backdoor customs deal with Honduras, I realized that I had to widen my analysis to understand the GMO policies of the rest of Mexico and Central America.[131] As a cultural region centered around maize but also threatened by trade agreements and development projects, Mesoamerica should really be known as "Milpamerica."[132] In the additional years that Long COVID slowed my expanded research, Mexico dramatically reversed course after a quarter century of US corn dumping, state permits for GM corn field trials, and the consequent contamination of native maize. The

moral of Mexico's turnabout became suddenly (and inductively) clear: the diversity of social opposition led to this dramatic policy shift, just as the plurality of Guatemala's underdog uprising to the Monsanto Law initially defeated it, then crescendoed into a greater democratic uprising in 2023.

How will this end? In the years of working on this book, my thoughts have teetered between hope and anguish. Then I realized that like maize and beans, these sentiments can coexist. I was reminded by fellow southerner Janisse Ray that "there's no despair in a seed . . . only life, waiting for the right conditions—sun and water, warmth and soil—to be set free."[133] As a bridge between past and future, seeds are themselves nuggets of hope. To make change, one must necessarily enter a dark space of fallowed grief on which new ideas can sprout. As Rebecca Solnit puts it,

> Hope locates itself in the premises that we don't know what will happen and that in the spaciousness of uncertainty is room to act. When you recognize uncertainty, you recognize that you may be able to influence the outcomes—you alone or you in concert with a few dozen or several million others. Hope is an embrace of the unknown and the unknowable, and alternative to the certainty of both optimists and pessimists . . . It's the belief that what we do matters even though how and when it may matter, who and what it may impact, are not things we can know beforehand.[134]

Or, as F. Scott Fitzgerald quipped (or perhaps plagiarized from his wife, Zelda), "One should, for example, be able to see that things are hopeless and yet be determined to make them otherwise."[135]

Of course, like all environmental struggles, resistance to agricultural technology and corporatization will be a perpetual struggle. When an uprising fails, pundits often poke fun at the instigators. We also tend to distrust our victories—or ignore them—to dwell upon failures and heckle ourselves. Yet, as Ralph Nader often says, you lose, you lose, you lose, you lose, and then you win. Failed uprisings become the compost that creates fertile ground for future harvests or "wins." As Martin Luther King Jr. said so beautifully, "The arc of the moral universe is long, but it bends toward

justice"—if only we can persist in the struggle and learn valuable lessons along the way. While this story will, of course, continue to unfurl past this publication, I set it free with the following structure.

CHAPTER OVERVIEWS

As a book for the general public, here are a few notes about implicit academic conventions. Nonacademic readers are welcome to graze the theoretical appetizers in chapter 1, but should not miss the main and dessert courses (subsections) about how the call for food sovereignty arose in response to corporate concentration and profiteering. Due the density of the cites in this book, daily newspaper articles are cited only in endnotes. I heed the orthography of the Guatemalan Academy of Mayan Languages. Except when referring to languages, I use the preferred form "Maya" as both noun and adjective. Although "genetically modified" and "genetically engineered" are used interchangeably, I use the term GMOs, in English, even though the Spanish term *transgénico* more rightly emphasizes the taking of genes from one species and inserting them into another. Generally, material from ethnographic fieldnotes and correspondence is not cited, except where reviewers asked for more detail about the source. Following ethnographic ethics, village names are pseudonyms.

Chapter 1 presents the food regime scholarship that inspired my dialectical comparison of milperos and omnivores. From these canonical works, food studies and peasant studies morphed into an electrifying new field of critical agrarian studies co-constructed with the input of the peasant organizing juggernaut, Via Campesina. Against predictions that Indigenous people and peasants would disappear, small farmers continue to persist and organize by thinking locally and acting globally against transnational corporations, and especially Monsanto. Even though Bayer acquired Monsanto in 2018, I use Monsanto's maiden name throughout this book because most of the events described herein occurred under the auspices of Monsanto alone.[136] After a slurry of mergers in the late 2010s, just three large seed and chemical corporations—whom I call the "three wicked stepsisters"—dominate the global seed/agrochemical trade: Bayer-

Monsanto, Dow-DuPont, and Syngenta-ChemChina. However, they all face growing legal liability for the toxicity of their herbicides. Waiting for a laboratory miracle from this trio or hoping for salvation from seeds being stored in ex situ seed banks are poor planetary bets for a climate-altered world. Rather than gambling on fragile corporate corn futures, I argue that going "back to the future" to support (free) farmer-to-farmer exchanges of evolving Mesoamerican maize varieties would be a better societal investment for climate resilience.

To appreciate the deep tenacity of maize and its people, chapter 2 bends backward through history to trace the ancient transformation of teosinte grass into tiny domesticated cobs. These proto-maize plants then traveled the hemisphere—transforming the cultures, languages, rituals, cuisines, and social life of almost all Indigenous farmers of the Americas, but especially at its center of origin. This chapter also pays tribute to the unsung genius of Mesoamerican women, whose cooking technologies made maize an even more nourishing staple. Although the Spanish aggressively imposed European germs, weeds, and cattle onto the ecology of the Americas, they could not persuade Mesoamericans to abandon maize for their "more civilized" wheat. Foodways, therefore, became an important idiom of Indigenous resistance from the Spanish invasion to the present. A final case study of biopiracy orchestrated by Mars Inc. and UC Davis serves as a reminder that colonial-style thefts of Indigenous knowledge continue today.

Chapter 3 surveys the history of industrial corn in the context of Cold War military and development politics and describes how Monsanto and Dow, as manufacturers of chemical weapons, reinvented themselves as agrochemical providers and then GM seed sellers. Through nonprofit industrial hybrid research centers like CIMMYT in Mexico (funded by the Rockefeller and Ford Foundations) and supplemented by US "aid," the Green[go] Revolution clearly served gringo geopolitical interests. By deepening dependency on agrochemical inputs, I argue that the present day "gene revolution" represents a difference in degree, not kind, from the Green Revolution.

Chapter 4 describes how Mesoamerica has been stalked by corporate

trade. Immediately following NAFTA's implementation, some 1.5 million Mexican farmers lost their lands and livelihoods. This chapter explores how and why this occurred as well as the ways that corporations have used contamination, convoluted trade agreements, and diplomatic pressure to force Mesoamerican countries to open their borders to biotech seeds. Beyond the legal mazes of US trade policy, this chapter discusses alternative legal agreements, like the United Nations Declaration on the Rights of Indigenous People (UNDRIP), which could support collective rights to save seeds.

Chapters 5 and 6 chronicle how pan-Indigenous movements in both Mexico and Guatemala have formed strategic alliances with strange bedfellows to resist the foreign imposition of GM seeds . . . and won. These chapters also show the potential for radical change when social movements can compel states to take proactive steps to support food sovereignty (in the case of Mexico's Fourth Transformation), or, at the very least, to stop corruption and reinvest in the eroded public sector (in the case of Guatemala's 2023 plurinational strike, which ushered in a new democratic age after seventy years of political violence and repression). Reflecting a Maya sense of cyclical time, these chapters are presented in roughly, but not perfectly, chronological order—with many uncanny repetitions, some setbacks, then incredible advancements. The remarkable arc of Mesoamerican resistance to GM corn does seem to be bending toward food and environmental justice.

The conclusion circles back to the US Midwest and one of the great forgotten victories of the anti-GMO movement: how Canadian and US farmers defeated GM wheat by uniting their pitchforks with forktivist-inspired consumer movements. This case addresses the broader potential for food movements to form diverse alliances across borders, as well as other recipes for radicals. My final reflections on weeds and other ancient wisdom gleaned from our plant relatives in a milpa system aim to help you, gentle reader, think anew (or, an-old) about agrarian and climate struggles.

ONE

Maize Futures

Like chanting monks, howler monkeys (*Alouatta pigra*) greet the shivery gray dawn of the lowland Maya forests with a guttural concert that can travel three miles. In nearby villages this howler chorus makes for a free, reliable alarm clock. Their intimidating roar belies how small these mammals are: about twenty pounds and just two to three feet tall. In ancient Maya art the howler monkey figures as a deity of art, sculpture, and music. In the Maya calendar, it symbolizes divination and historical knowledge.

Half a world away, street traffic awakens another kind of primate in the Windy City. This one dons a gray suit and has a quick "breakfast of biodiversity": coffee with corn-derived creamer, bananas, sausage, and a bagel smeared with a spread containing palm oil, which is responsible for most tropical deforestation today.[1] Using his opposable thumbs, he grabs these items from a street cart that is perhaps staffed by a Mesoamerican migrant displaced by trade agreements. After guzzling his cappuccino, this corporate capuchin dashes to catch a subway to the Chicago stock exchange—on lands that were once a trading nexus for many maize-based Native American tribes, including the Peoria, Potawatomi, Myaamia, Kaskaskia, and Kiikaapoi nations.

As Q'eqchi' farmers walk to their milpas, the gray-suited corporate creature begins his monkey business, howling orders ("open-outcry trading") on the floor of the stock exchange.[2] In a bizarre ritual dating back to the 1880s, he trades in "corn futures," that is, speculation on the price of future harvests. With a push of a button, these subsidized corn prices set through the Chicago Board of Trade radiate misery around the world for small maize producers. Like the monkey characters with wooden souls

in the *Popol Vuh*, this corporate trader is blissfully unaware of his sins against Mesoamerica.

This chapter deploys food regime theory to explain the entanglement of these two scenes and how "corn futures" threaten "maize futures." As Raj Patel has brilliantly argued in his comparative book, *Stuffed and Starved*, the quandaries of global consumers (the omnivores, as it were) and the small producers (the milperos) are interconnected. As Patel notes, when analytically separated, "we are dissuaded from asking hard questions, not only about how our individual tastes and preferences are manipulated, but about how our choices at the checkout take away the choices of those who grow our food."[3] People enslaved to corporate cubicles make split-second decisions from a distance that affect the fates of millions of small producers around the world struggling to survive.

Although the corporate trader considers himself uniquely cosmopolitan, peasants have also become global actors in the fight against the financialization of food. They united in the 1990s to build La Vía Campesina (The Peasant Way), likely the largest and most diverse social movement in world history. Morphing from a "class-in-itself" to a politicized "class-for-itself," that transition has been closely chronicled by and co-constructed with the field of critical agrarian studies.[4] Like women's and gender studies, ethnic studies, and Native American and Indigenous studies, this new field is "politically-engaged, pluralist, and internationalist."[5] It aims to both understand and change societal trends and help assure a future in which small farmers, many of whom are also Indigenous, can continue to save seed as their ancestors have for thousands of years.

Protecting maize diversity for another millennia therefore requires us to know something about the corporate creatures who make short-sighted gambles based on quarterly profit reports. Although it may not be possible to overthrow capitalism writ large, civil society could work to reign in corporate corruption, collusion, and political profiteering by removing the recent rights corporations have acquired as "legal persons." These bizarrely constructed legal identities unfortunately threaten the real futures of living people. Ergo, those who wish to revitalize "three sisters" agriculture (intercropped maize, beans, and squash) must also vigilantly

monitor the changing kinship and corporate stratagems of what I call the "three evil [corporate] stepsisters."

FROM COLONIAL TO CORPORATE FOOD REGIMES

Omnivores and milperos express different assumptions about social change. This chapter shows how the fates of these two groups became codependent through colonial trade—long before climate change began to threaten everyone's mutual survival. Academic literature reviews typically cite a slew of case studies, creating a kind of "localism" within theory. However, this book is being released in 2024, which is 502 years after Hernán Cortés seized the Aztec Empire and exactly five centuries after Cortés sent Pedro Alvarado to lead a brutal invasion of Guatemala. Given this epochal timing, it seems more appropriate to take a wider lens and situate the story of Mesoamerican resistance to agribusiness within deeper historical transformations to a "world food economy," or what Harriet Friedmann in a 1993 influential essay famously described as sequential "food regimes."[6]

Later, when Friedmann began collaborating with Philip McMichael, this dynamic duo defined food regimes as "rule-governed structure[s] of production and consumption of food on a world scale."[7] Friedmann had initially divided food regimes into two periods, but McMichael added a third: European colonial empire (1870s to World War II), US hegemony (1940s–70s), and globalized corporate and market rule (1980s–present). They both emphasize how across the ages food trade has had one common denominator: the provision of cheap food for the masses to legitimize political order and pacify labor.[8]

While empire was fattening itself by moving commodities from point to point, mercantile colonialism disrupted Indigenous foodways, but foods from the Americas also fundamentally transformed the world economy.[9] Maize spontaneously traveled the world as an "underdog" crop, helping to sustain colonized people as well as the Euro-American poor.[10] Driving the early colonial food regime was trade in luxury goods.[11] By the nineteenth century, however, trade in staple grain crops like wheat reshaped patterns of colonial settlement.[12] When colonial mercantilism shifted to

industrialization, what were once luxury goods (tea, sugar, coffee) became everyday staples for the working masses, entwining slavery with industrial capitalism.

A canonical text about this transition was Sidney Mintz's ethnohistory, *Sweetness and Power: The Place of Sugar in Modern History*.[13] Originally domesticated in New Guinea, sugar cane (*Saccharum officinarum*) traveled through the Philippines, into India, then into the Arab world and the Mediterranean. When Christopher Columbus set sail the second time for "the Indies" in 1493, he carried with him sugarcane cuttings from the Portuguese-colonized Canary Islands.[14] More preoccupied with mining precious metals than agriculture, the Spanish Empire never did grow much cane. When the British Empire seized control of the Caribbean, however, sugar became the "speartip of modern colonialism."[15]

Besides describing the horrific labor conditions on sugar plantations, Mintz's twist was to show how sugar also enslaved the new English working class to the time discipline of the factory.[16] Before the eighteenth century, sugar was a novelty in Europe—used only in small quantities and prized as medicine, decoration, or a spice to enhance flavor, similar to the way Chinese cuisine incorporates sugar. European peasant diets prior to industrialization were not all that different from Mesoamerican ones or any traditional world cuisine. They consisted of a versatile carbohydrate staple, supplemented by small dishes that provided vitamins, protein, and umami flavor.[17] Barley- and bread-eating English peasants lost this traditional diet when enclosures expelled them from the countryside.[18]

Forced into cities, British peasants had little choice but to join the working class. Sugar and colonial stimulants like tea and coffee helped adapt these new proletarians to the long hours of factory life. Sugar provided new "break" foods (bread with jam, pastries, etc.) that did not need to be reheated and could boost worker energy with quick calories. "By provisioning, sating—and, indeed, drugging—farm and factory workers, [sugar] sharply reduced the overall cost of creating and sustaining the metropolitan proletariat."[19] Soon the poor became the largest consumers of sucrose, and their health began to suffer.[20] By the opening of the twentieth century sugar contributed one-sixth of the national British caloric intake.

In the British Empire, daily life, holidays, and life rituals began to revolve around sugar—from afternoon tea to elaborate wedding cakes. The shift to industrial modernity not only changed what and how much we ate, but also how and when we ate it.[21] Mintz shows that food consumption is never simply a matter of individual choice, but an expression of social arrangements, cultural values, and inherited historical patterns.[22]

With the collapse of British Empire after World War II, food power pivoted into a second regime dominated by the United States. After industrializing its own food system according to Henry Ford's principles of production (both farming and mass food production), the United States began exporting technical aid to convince other developing countries to do the same.[23] Through the 1954 Agricultural Trade Development and Assistance Act, better known as Public Law 480 (PL-480), the United States also began selling its own surplus corn abroad as "food aid" to create "ship-to-mouth" geopolitical dependencies and allegiances during the Cold War.[24] This was a pragmatic, not philanthropic, decision. It cost less to ship surplus grain to the Third World than to store it in US facilities.[25] Just two corporations, which now control 65 percent of global grain trade, made out like bandits.[26] Dumping surplus grain abroad also helped protect farm gate prices at home. William Baud, USAID administrator, retrospectively called this a Green Revolution—green not in an ecological sense, but green as a force opposed to "red" communism or the "white" Iranian revolution.[27]

For corporations, these food-for-peace programs proved to be more food-for-profiteering within the third "corporate food regime," established in the 1990s and 2000s through new trade rules and institutions.[28] Many developing countries, which found themselves in arrears on bad development debts from the 1980s, abandoned state supports for food security and began producing high-value agro-exports at the expense of their own staples.[29] Once the 1996 US Farm Bill shifted all federal grain storage to the private sector, grain corporations acquired even more power in moving commodities south to north and north to south. By 2002 Archer-Daniels-Midland (ADM) and Cargill controlled 30 percent of all global grain trade and a whopping 75 percent of US food aid.[30] Today just four companies control

two-thirds of global trade in grain and palm oil, of which the two largest, Cargill and ADM, are US firms.[31]

Under corporate pressure, the US government permitted gradual deregulation of the commodities sector in the 1980s and 1990s, and the 2000 US Commodity Futures Modernization Act codified this transition. The act allowed new corporate entities to speculate on food prices, and the commodities sector almost doubled between 2006 and 2011—from $65 to $126 billion. With this financialization of food, banks and commodity corporations began to sell investment products to hedge funds and pension funds. These included commodity index funds (CIFS), which allow investors to invest in commodities without assuming the risks involved with directly purchasing commodity futures contracts.[32]

Since then, food prices have become frighteningly fragile, dependent more on the whims of the stock market than on the whims of the weather. War, climate, and political crises unrelated to food can quickly send ripples through the global food system. Many blame the 2007–8 food price crisis, for example, on financial speculation around ethanol. Russia's recent invasion of Ukraine has sent similar shocks through the global system.

Cargill's history exemplifies these food regime transitions. Cargill is the largest private company in the United States and also consistently among the private companies with the highest revenues worldwide.[33] Some consider Cargill the "worst company in the world."[34] Founded in 1865 by a white western settler, W. W. Cargill, the company began with one grain house sitting next to an Iowa railroad station.[35] After expanding and incorporating in the tax haven state of Delaware, Cargill was thrown out of the futures market for corruption eighty years ago.[36] But the company bounced back with the government contracts it won in World Wars I and II. In the 1950s Cargill dominated PL-480 food aid logistics. Instead of giving out Christmas cards to employees in 1957, it gave a Scrooge-ish donation to CARE, the nonprofit partner that distributes Cargill's commodities as food aid.[37] More recently, after posting $165 billion in revenue, Cargill boasted a $14 million "donation" to CARE. Since the project was spread out over three years, Cargill's largess represents a minuscule portion of its revenue (just

0.0028 percent). With 155,000 employees, the company probably spent more money on toilet paper than on helping alleviate hunger.

Cargill also happens to be one of the largest neocolonial salt processors and distributors in the world today—salt it poured on Mexico's NAFTA wounds.[38] After two decades of dumping US commodity corn on Mexico that likely contaminated that country's native maize, Cargill had the audacity to sue Mexico for trade barriers in 2009. The company claimed Mexico violated NAFTA when putting a tax on soft drinks sweetened with high-fructose corn syrup in an effort to both tackle its national obesity epidemic and support its own sugar industry. Amazingly, the company won the trade dispute and collected a cool $77.3 million from Mexico.[39] So, it had plenty of spare change when the Commodities Future Trading Commission fined Cargill $10 million in 2017 for cooking its books.[40]

To give another example of the cruel ironies and interconnections of US trade agreements with Mexico (in the form of NAFTA) and Central America (DR-CAFTA), a disturbing number of small farmers who emigrated to the United States after being displaced by Cargill's corn dumping find themselves laboring in Cargill-owned slaughterhouses to process livestock fattened by the same midwestern corn that decimated their village economies. Mexicans and Guatemalans only represent one-third of immigrant workers but a whopping 58 percent of meat-processing workers. When accounting for health costs and planetary harm, a burger from those midwestern slaughterhouses ought to cost something like $200, but because consumers pay only $4 or so for that invisibly subsidized mass-produced edible, they often eat to excess.[41]

Through companies like Cargill, the corporate food regime also brought about vertically integrated commodity chains, the expansion of supermarkets, and new country players in the global food trade like Brazil and Argentina, which now produce grain for industrial animal farming and vegetables and fruits for northern consumers.[42] This created crazy food production circuits: pears grown in Argentina, shipped to Thailand to be canned in syrup, and then transported back across the Atlantic to be sold in the United States. Philip McMichael describes this as a transition of "food from somewhere" to "food from nowhere"[43]—or, rather, food from

everywhere. Extending McMichael's metaphor, I would characterize the colonial regime as "food from over there" (see table 1). Should global food movements successfully use the crucible of climate change or the specter of mass cancer to motivate policy changes that could push us into a fourth food regime through ecological intensification, then food will have to come "from manywheres"—or plurinationally grounded in a multitude of places that have removed themselves from the corporate economy.[44]

Continuing to use food regimes as food for thought, if sugar was the primary commodity that changed colonial dietary habits and wheat, the commodity that dominated the Cold War, then industrial corn clearly embodies the current corporate food regime. Should Mesoamerican movements to defend maize prove victorious, then perhaps the fourth regime will be about genuine sweetness and plenty. It is beyond the scope of this book to predict whether the climate emergency will transition us into a more sustainable fourth global regime or a global apocalypse. However, it is safe to say that climate adaptation will clearly require more than a switch to "local" consumption. It will also demand renewed state and international regulation to defend people and the planet from corporate plunder. Mexico's dramatic decision to protect its national maize markets from corporate GM corn dumping is a sign of reengaged state leadership to provide more ecological and healthy food for all, not just elite consumers in global circuits.[45]

I have also long pondered what in today's world would be an equivalent symbolic action against corporate power to Mahatma Gandhi's *satyagraha* (nonviolent truth-force) against the British Empire. A genius at illuminating British greed, Gandhi promoted simple methods (making salt, spinning thread) through which millions could participate in civil disobedience against colonialism. By encouraging people to grow their own gardens, the food movement similarly gives people a method and means to remove a piece of their lives from corporate markets and build community.[46] The home and community gardening movement cuts across the political spectrum and shows how the personal can be political. Like making salt, growing maize in polycrops from saved seed is a similarly humble and horizontal symbol of diversity and autonomy.

TABLE 1. Food regimes

Food regime	*Period*	*Hegemony*	*"From where?"*	*Diet characterized by*	*Sweetness and . . .*
FIRST	Colonial	European	"Over there"	Sugar	Power
SECOND	Cold War	United States	"Somewhere"	Refined wheat	Poison
THIRD	Corporate	Corporate personhood based in the United States	"Nowhere"	High-fructose corn syrup	Profiteering
EMERGENT FOURTH?	Climate resilience	Indigenous peoples, smallholders	"Many wheres"	Natural sweetness	Plenty

Sources: Sidney Mintz's *Sweetness and Power* metaphor inspired the sweetness periodizations in this table. Philip McMichael's "Political Economy" added the idea of food coming from "somewhere" and "nowhere" in the second and third food regimes. Gerardo Otero et al., in "Food Security," suggested that certain food commodities were associated with different food regimes.

DIALECTICAL DIETS

Although prior global food regimes leveraged cheap food for power, that plenitude depended on imperialism, pesticides, and (bio)piracy.[47] Foods were cheap only because they externalized costs onto peasants, the poor, and the working classes. In the current corporate food regime, cheap industrial food, especially fast food, has created an obesity epidemic. As a causal percent of health spending, obesity has grown from 6 percent of medical costs in 1998 to 12 percent in 2006, and 21 percent today.[48] Such juxtapositions star in Raj Patel's brilliant 2012 opus, *Stuffed and Starved*. For the first time in human history, more people go to sleep obese (1 billion) than hungry (800 million). Patel notes how these two categories oddly overlap among people who are overweight but also malnourished, due to their junky Western diets.[49] The Global South is passing through what public health experts describe as an "epidemiological transition" from

dying from infectious diseases to being sickened from diseases associated with affluence and pollution, like heart problems and diabetes.[50]

Besides Patel and Mintz, I have drawn inspiration from other dialectical stories of an interconnected world economy. Although academic discourse about "global flows" suggests that globalization covers the earth, corporate power tends to congeal in certain places. Anthropologist James Ferguson's insight, that globalization "hops over" places more than it flows through them, got me thinking about how the mountains of excess midwestern corn must be dumped somewhere. If not converted into ethanol at an energetic loss, these caloric mounds land into people's bodies or onto foreign markets.[51]

Hazardous waste disposal, the sale of pesticides, and other environmental justice issues share similar point-to-point problems, but also circular loops. An imperialist loophole in US and European Union policies allows agrochemical corporations to export pesticides to the Global South that the Global North banned.[52] Journalists David Weir and Mark Schapiro evocatively depicted this as a "circle of poison," because illegal pesticide residues return to northern consumers on imported fruits and vegetables.[53]

Introduced to pesticides through US aid programs during the Cold War, Mesoamerican countries now supply many of our winter groceries by applying the highest per capita use of pesticides in the world.[54] The human consequences are horrific. With excruciating ethnographic detail, Angus Wright documented the death and poisoning of Mexican farmworkers like Ramón González.[55] Medical anthropologist and MD Seth Holmes followed the migration trail that produces "fresh fruit, [but] broken bodies."[56] Guatemalan Nobel laureate Rigoberta Menchú shared her own tale of losing a little brother to the aftereffects of aerial spraying on a coffee plantation.[57] Ted Fischer and Peter Benson tracked the "bitter vegetables" that now connect Maya highland producers with US supermarkets (N.B.: those imported broccoli crowns are often laced with illegal pesticides).[58]

For me the most haunting chronicle of how commodity circuits co-construct poisonous geopolitics was *Bitter Fruit* by Stephen Schlesinger and Stephen Kinzer.[59] Their diplomatic history of how United Fruit introduced pesticides to Guatemala and then lobbied the CIA to overthrow Guatemala's

first democratically elected president in 1954 propelled me to devote my life to tracking (and countering) the many other ways the United States has continued to intervene in Guatemala's agrarian politics through trade agreements, foreign "aid," and other diplomatic pressures on behalf of corporations.[60] Guatemala's crime in 1954? A modest land reform to support Indigenous people who had just been freed from de facto slavery in 1944. After the CIA's puppet government gave this land back to the oligarchs, both peasants and Maya peoples joined guerrilla forces in the 1960s and 1970s to demand agrarian reform and began to realize they share similar class interests and blended identities.

PARADOXES OF THE PEASANTRY

Beyond Guatemala, civil wars over agrarian reform raged throughout Latin America and Asia during the second food regime. In the midst of this upheaval, Alexandr Chayanov's 1925 Russian masterpiece, *The Theory of Peasant Economy*, was translated into English and reopened academic debates about agrarian modernity.[61] Chayanov (1888–1937) was a pioneering statistician who assembled incontrovertible evidence that peasant agriculture was more efficient than large industrial farms.[62] However, Josef Stalin preferred his omelets large and was willing to smash eggs to create his collectivization. In that process, fifteen million people starved to death from fabricated famines like the Ukrainian Holodomor. Stalin sent Chayanov to a Kazakhstan labor camp and eventually had him shot for the "crime" of showing why revolutionary Russia should sustain small-scale agricultural production. Stalin also imprisoned and starved to death the great Russian seed botanist Nikolai Vavilov, who championed crop diversity by collecting some two hundred thousand seed samples from around the world, including many maize specimens.[63] Having silenced these defenders of small-scale agroecology, the Soviets embraced large-scale agriculture and petrochemical poisons just like the United States had. But elsewhere peasants held on.

As Chayanov argued, peasants are paradoxical people: neither capitalist nor fully autonomous, but "self-exploiting." As both owners and workers,

peasants reside in an uncomfortable class limbo. They earn cash when needed but make decisions about their own labor. Their work is elastic. With the help of all family members, including children, peasants are willing to work impossibly hard to avoid starvation. Once subsistence needs are met, however, peasants have little incentive to continue accumulating because of the diminishing returns for their drudgery.[64] Put in more contemporary terms, peasants work to live, not live to work. This autonomous flexibility of peasant labor is what enables smallholders to intensify and innovate based on close observation of their crops.[65]

As an in-between category, peasants provided fodder for many fusty academic debates in twentieth-century agrarian studies.[66] Are peasants victims or subjects of development? Are they plodding or skilled? Manipulable or cunning? Submissive or rebellious? Trenchantly backward or peculiarly progressive? Victims or survivors? Uncivilized or romantically close to the earth? Environmental destructors or saviors? These are false binaries that Native American scholars also critique. Just as white colonizers wrongly predicted Native Americans were doomed to disappear, agrarian scholars from the Cold War era also portrayed peasants as "rustics or relics of a rapidly vanishing past."[67] Despite botched bureaucratic attempts at ethnocide and platitudes of their passing, both peasants and Indigenous peoples resiliently survived into the modern world.[68] In many (if not most) cases in Latin America—especially in Andean and Mesoamerican regions—peasants are also Indigenous peoples.

Although the world is now mostly urban, peasants still constitute two-fifths of the world's population, and the absolute number of small farmers is the largest it has ever been in human history.[69] What's more, on just 20 percent of the world's land, small rural producers produce 70 percent of the world's food, while simultaneously conserving humanity's plant diversity in situ.[70] Small farms excel not only in total quantity of food produced, but also sequester the most health benefits, nutrition, and carbon per acre. Industrial farming only seems more productive because economists do not deduct the huge energy inputs that prop up this system nor subtract the cost of human and environmental health problems associated with chemical agriculture.[71]

In the United States, small family farms produce $15,104 of food per hectare, while large subsidized industrial farms make only $249 from the same land.[72] Industrial farming is actually quite expensive—costing annually $22 billion in fertilizer, $12 billion in fuel, $22 million in seed, $13 billion in farm machinery, and $10 billion in loan interest, not to mention the cost of herbicides and pesticides.[73] On top of that, industrial farmers receive $700 billion annually in agricultural subsidies.[74] Another wild card is how much of the global cost of cancer can be attributed to industrial farming. Imagine if even a fraction of all those sums were redirected to agroecological research, extension, and peasant movements.[75]

Although small farming is clearly more productive, due to inadequate land, commodity dumping, and rising cost of inputs, more than two-thirds of these small producers and agricultural laborers—especially women and children—unjustly experience hunger.[76] While just 8 percent of Latin America's population is Indigenous, Indigenous people represent approximately 14 percent of the poor and 17 percent of the extremely poor in Latin America. However, in majority-Indigenous countries like Guatemala and majority-Indigenous states of Mexico, these disparities are even more extreme.

As James C. Scott once famously argued, "It was the smallness of what was left rather than the amount taken (the two are obviously related, but by no means identical) that moved peasants to rebel."[77] Or, as recent Guatemalan protest signs have declared, "They stole so much, they stole our fear." Peasants' hunger and a hunger to remain farmers have inspired a formidable counterforce against trade liberalization.[78] Unlike localized peasant rebellions of yore, this global peasant movement recognizes the global sphere of corporate power as its real antagonist.

VIA CAMPESINA, THE PEASANT WAY

Established in 1993 as a movement of peasant movements, Via Campesina emerged from the prior Latin American network called the Coordination of Rural Organizations (CLOC). By 1996 Via Campesina had united forty-seven organizations from nineteen countries.[79] Through hard organizing

against long odds, this transnational coalition has grown to include 180 organizations from eighty countries, representing some 200 million small farmers today. These are all genuinely grassroots, member-based organizations with relatively few staff compared to their memberships.[80] Despite shoestring budgets, Via Campesina groups have "projected a shadow much bigger than [they] really were" to take on global institutions and transnational companies.[81]

Long before the 1999 Battle for Seattle, Via Campesina had begun analyzing and formulating strategies of resistance to the globalization of agriculture, starting at its first international meeting in Mons, Belgium, in 1993.[82] By necessity, peasant leaders became experts in trade agreements, intellectual property, GMOs, grain markets, farm subsidies, and toxicology of pesticides. Operating at global fora, Via Campesina peasant activists are among some of the most urbane, well-traveled, knowledgeable, policy-savvy, and theoretically innovative intellectuals on the planet. Yet, as "rooted cosmopolitans," even Via Campesina's most famous leaders, such as Rafael Alegría (a Honduran peasant who chaired the organization between 1996 and 2004), must remain connected to their rural places of origin to avoid accusations of being "kites" or high-flying globe-trotters. While juggling their own farming demands with international travel, they have transformed or thwarted global institutions through a sophisticated repertoire of multiscalar organizing, insider-outsider tactics, strategic alliances—and, when necessary, direct action.[83]

Unlike Pollan's omnivores, Via Campesina and its allies have excelled at *thinking* locally and *acting* globally.[84] In some cases Via Campesina leapfrogged into multilateral venues to use its international legitimacy to amplify small farmer power at home and pressure nation-states for reforms worldwide.[85] To defend peasant livelihoods, this grassroots coalition also realized it had to confront how institutions like the World Trade Organization (established 1995) or the World Bank were stacking trade rules and land policies against peasants. Via Campesina does not oppose global trade per se, but it does question how new rules enshrined in trade agreements favor transnational corporations. Most of its member organizations hail from previously colonized countries which were forcibly integrated into the

world economy and which cannot exit from commodity markets overnight. To survive in a globalized world, peasants do "need to have the right to protect domestic markets and to have public sector budgets for agriculture that may include subsidies which do not lead to excessive production, exports, dumping, and damage to other countries."[86] Another derivative issue for Via Campesina was control over seeds, which brought peasants' struggles to the attention of the food and foodie movements concerned about the growing homogeneity of the world's food system.[87]

Although food regimes have long divided producers and consumers, Via Campesina brought them under one umbrella with remarkably tighter coordination, discipline, and structure than other international movements (feminist, environmentalist, human rights, etc.).[88] Although still disproportionately rooted in Latin America, Via Campesina is governed by a representative commission composed of member pairs (one female, one male) from each of Via Campesina's nine regions: South Asia, Southeast and East Asia, Southern and Eastern Africa, Western and Central Africa, Central America, South America, the Caribbean, Europe, and North America.[89] With a forward-leaning logo depicting peasant figures from every continent, the coalition's diversity is a model for the "possibility of a plurality of movement organizations and alliances, scales, sites and forms," including even farmer movements from the Global North.[90]

Although "small farms" in the EU and North American regions would be considered "estates" for most peasants in the Global South, some northern family farmers recognize the mutual threat of the international trade system to their livelihoods.[91] As Via Campesina's first North American representative, Nettie Wiebe, a Canadian farmer, expressed it,

> The difficulty for us, as farming people, is that we are rooted in the places where we live and grow our food. The other side, the corporate world, is globally mobile. This is a big difficulty for us. But our way of approaching it is not to become globally mobile ourselves, which is impossible. We can't move our gardens around the world. Nor do we want to. The way in which we've approached this is to recognize there are people like us everywhere in the world who are

> farming people, who are rooted, culturally rooted, in their places. And what we need to do is build bridges of solidarity with each other which respect that unique place each of us has in our own community, in our own country. These bridges will unite us on those issues or in those places where we have to meet at a global level.[92]

To unify organizational identity across its many disparate geographic regions, the coalition opens every meeting with a transcultural ceremonial "mystique" (*mística*): a ritual of seeds, soil, water, and fire that honors Via Campesina's Indigenous members.[93] Also drawing from Indigenous wisdom and governance, Via Campesina conferences revolve around open-ended "dialogue of knowledges" (*diálogo de saberes*) that put UN diplomacy to shame. They offer translations into four official languages—English, Spanish, French, and Portuguese—plus whatever additional languages are needed such as Hindi, Nepali, Tamil, Bahasa, Thai, Korean, and Japanese. Working against leftist vanguardism that "there is only one correct analysis, organization, strategy and form of struggle,"[94] the coalition builds consensus by parsing and blending subaltern knowledge into something greater than the sum of its parts.[95] Sometimes this requires tabling difficult issues for resolution on another day, when member organizations are more ready "to build unity within the diversity of [its] organizations."[96]

Through difficult dialogues they have wrangled with internal labor, gender, and age conflicts to welcome landless rural workers, women farmers, youth, and even consumer organizations into the fold. The incorporation of peoples (such as nomadic pastoralists, fisherfolk, and Indigenous peoples) whose livelihoods depend on collective access to traditional territory rather than ownership of agricultural property, challenged Via Campesina to confront its own agrarian bias.[97] To reflect this inclusivity, Via Campesina now refers to "land and territory" as categories that are not always synonymous, especially for stateless people like Palestinians, who are among Via Campesina's newest members.[98] As of late, this coalition has even begun to forge an alliance with the Vatican—"a startling reversal, considering the Catholic hierarchy's historical ties to conservative rural elites."[99]

As a connective issue for all these constituencies, Via Campesina sounded an early alarm and educated its members about the threat of GMOs to farmers' ancestral right to save seeds.[100] Although the coalition subsequently endorsed GMO labels, Via Campesina recognizes that consumers alone cannot fix the food system. Small producers need agrarian reform and other supportive state policies to defend their livelihoods. Thus the concept of "food sovereignty" emerged from its second global conference in Tlaxcala, Mexico, in 1996. While dominant state and international programs oriented toward "food security" might provide people a minimal number of calories, such programs avoid questions of who produces what, how it is produced, or where it is produced.[101] The counterpoint concept of food sovereignty then took on a life of its own.[102] At a 2007 meeting in Mali, Via Campesina released its Nyéléni Declaration, which defined food sovereignty as "the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems."[103]

Who and what is "sovereign" in food sovereignty remains evocatively ambiguous.[104] Sovereignty itself is a social construct of the "imagined community" of nation-states whose borders were shaped by colonial history.[105] Some, therefore, interpret the concept as the right of nation-states to develop food policies to protect the health, environment, and cultural contexts of their citizens.[106] Seven states—Ecuador, Bolivia, Venezuela, Nepal, Nicaragua, Mali, and Senegal—have already incorporated food sovereignty wording and ideas into national law. Others imagine the sovereign at other scales (community, region, foodshed, tribal nation, and so forth). As Via Campesina intellectuals elaborated in a 2013 newsletter, food sovereignty "is as much a space of resistance to neoliberalism, free market capitalism, destructive trade and investment, as [it is] a space to build democratic food and economic systems, and just and sustainable futures."[107] They later reflected that food sovereignty has become both "the territory and platform for our multi-sectoral convergence process" and has given the coalition "principles, a political framework, [and] methodologies."[108]

Even without direct coordination, the polycentric collective struggles of Indigenous peoples and peasants have opened spaces for one another.

Although it took fourteen years of Indigenous mobilization within the United Nations to win the 2007 Declaration on the Rights of Indigenous Peoples (UNDRIP), Via Campesina piggybacked on this momentum, and in just six years secured a complementary UN Declaration on the Rights of Peasants and Other People Working in Rural Areas (UNDROP) in 2018.[109] Bolivia, an Indigenous-majority country, chaired those latter negotiations and suspended the UN Economic and Social Council (ECOSOC) accreditation process to enable more direct participation by grassroots peasant organizations than otherwise would have been possible. Article 19 of UNDROP fleshes out seed rights that were previously mentioned in UNDRIP's Article 31. Meanwhile, states that have incorporated UNDRIP into their constitutions opened legislative pathways to incorporate principles from UNDROP into national legal codes.[110]

In these and other ways, Via Campesina gave new life to the graying field of agrarian studies to ask fresh questions about the future of food for the twenty-first century and beyond. A relatively small group of thoughtful, committed academic allies and NGOs that are engaged in action-research like the ETC Group, GRAIN, Focus on the Global South, Food First, and the Yale Program in Agrarian Studies helped amplify Via Campesina's theoretical frames, especially its germinal concept of food sovereignty.[111] Together they forged a blended "tradition of research, thought and political action . . . and an informal network (or various networks) that links professional intellectuals, agriculturalists, scientific journals and alternative media, and non-governmental development organizations, as well as activists in agrarian, environmentalist, agroecology, food, feminist, indigenous and human rights movements."[112] They began organizing meetings and programs that were quite different from the soporific panels typical of most academic conferences by holding events that "also served as a reminder to the participants that the academy is not the only place in which important knowledge is generated; . . . the political trenches and agrarian movements are also sites and producers of knowledge."[113] Alongside the 1994 Maya Zapatista revolt, agrarian studies became hip again. The *Journal of Peasant Studies* catapulted from academic obscurity to become the most cited publication among eighty-one anthropological journals. Peasant and

Indigenous studies became exhilarating spaces of political and theoretical praxis against neoliberalism both South and North.[114]

FOOD MOVEMENT

Like Via Campesina, the northern food movement is raucously diverse—including Christian homemakers who see Monsanto as Monsatan, doomsday preppers, Hollywood actresses, celebrity doctors, conspiracy theorists concerned about Bill Gates buying farmland, progressive urbanites, and even Britain's King Charles III, who as prince broke the royal family's apoliticality to speak against GMOs in his Reith lecture: "I happen to believe that if a fraction of the money currently being invested in developing genetically manipulated crops were applied to understanding and improving traditional systems of agriculture, which have stood the all-important test of time, the results would be remarkable. There is already plenty of evidence of just what can be achieved through applying more knowledge and fewer chemicals to diverse cropping systems."[115] Beyond kings and celebrities, peasant organizations have formed savvy alliances through fair and direct trade associations with other wealthy slow foodies, chefs, and geopolitical friends to help them revitalize age-old demands for land reform, integrated agrarian development, and food sovereignty.[116] The potential of these transnational connections to critique corporate power is what originally inspired me to follow the food movement.

However, there are key differences between wealthy food movements and grassroots struggles for food justice. In the Global North, much ink has been spilled debating the personal health effects of genetically modified foods (aka the Frankenfood and farmageddon debates).[117] Northern debates also often concentrate on the (religious) morality or monstrosity of transgenic seeds themselves, with less attention paid to the political-economic-cultural-academic landscapes in which the technology was developed.[118] By contrast, peasant movements from the Global South have objected to GMOs from a clearer historic, contextual, and agroecological perspective. They recognize that a corporate-controlled gene revolution would extend

and exacerbate the inequalities and impoverishment already induced by the Green Revolution.

Although Via Campesina incorporates small settler farmers from both the United States and Canada, it has yet to establish formal relationships with North American tribal governments. Yet even without these direct connections, Via Campesina's concept of food sovereignty strongly resonates with Native American and First Nation struggles for self-determination.[119] As Sugar Bear Smith (Oneida) once remarked, "You can't say you're sovereign if you can't feed yourself."[120] Although Native American seed-saving networks and organizations dedicated to revitalizing three sisters agriculture are blossoming independent of Via Campesina, one of the seeds I want to plant here is the untapped potential of tribal governments to legally test their own treaty sovereignty by countersuing corporations for contamination of their native seeds. Arthur Manuel (Secwépemc), the son of George Manuel, similarly suggested that First Nations of Canada could challenge logging corporations through the World Trade Organization.[121] Winona LaDuke's White Earth Reservation is primed to do so, having both banned the use of GMOs and given personhood to *manoomin* (the sacred wild rice and staple of her people).[122] Tribal governments could also ratify both the Cartagena and Nagoya protocols and levy fines on corporation "people" that privatize and profit from collective knowledge of Indigenous peoples and other small farmers, based on a bizarre construction of legal personhood acquired in the United States from the late nineteenth century onward.

CORPORATE COLLUSION

When US settlers rebelled against the British Empire, they initially wanted to avoid the grotesque disparities of aristocratic wealth and privilege in Europe they had fled. During the first hundred years of the republic, states would grant short-term charters to form corporations for only a specific function, like building a road or a bridge. Corporations could not marry. They could not own another corporation. In the late nineteenth century,

however, New Jersey and then Delaware began allowing corporations to buy other corporations in the hopes of attracting business to their small states. (In the United States, the fifty states, not the federal government, grant charters to corporations.) Among the young chemical and agricultural corporations incorporated in Delaware were DuPont and Cargill. Other states followed suit, leading to the flurry of mergers between 1895 and 1904 that produced the nouveau riche robber barons.[123] By the turn of the century, the families of John D. Rockefeller, Henry Ford, Andrew Carnegie, Cornelius Vanderbilt, Andrew Mellon, J. P. Morgan, and other political and economic dynasties rose to unfathomable wealth. The Rockefeller Foundation (est. 1913) and the Ford Foundation (est. 1946) then became key actors in the Green and gene revolutions.

Today, US constitutional law considers corporations to be immortal "legal people," often with greater rights than actual human citizens. Corporations now have psychological rights to free speech (won in the 1986 case *PG&E v. Public Utilities Commission*), religious rights to dictate their employees' health insurance coverage (the 2014 case *Sebelius v. Hobby Lobby Stores*), and even political rights to influence elections (the 2010 case *Citizens United v. Federal Election Commission*). Through self-serving discourse about "social responsibility," corporations now even pretend to be generous philanthropists.[124] If they were actually people, corporations would exhibit psychopathic characteristics—being utterly remorseless in extracting profits from the poorest of the poor or risking the loss of millennial lifeways.[125] Frankly, I will not believe a corporation is a "person" unless Monsanto gets cancer or Cargill loses some weight.

Since 1994, the World Trade Organization and regional trade agreements like the DR-CAFTA have forced other countries to accept the absurd rights of legal personhood that the United States has given to corporations. These trade agreements have essentially turned corporations into gringo *mochileros* (tourist backpackers) who, despite their relative wealth, haggle poor countries for the lowest wages and tax perks—or, in the case of shipping conglomerates, dump commodities below market prices. Where legislatively they are unable to secure market access, corporations have resorted to backdoor bullying and bribery to pry open the markets of developing

countries. Against corporate claims to being a personified "stakeholder" at global food fora, peasant and Indigenous movements demand a different type of power as "rights holders."

Corporate personhood and power accumulated incrementally;[126] so surely we can also dismantle it incrementally. The problem is not an amorphous "neoliberal" agricultural system. Rather, it is a very specific *corporate* capture of agriculture in recent living memory, made possible by state acquiescence during a third food regime.[127] The difference may seem like academic semantics, but I think the crimes of particular corporations can get lost in generalized griping about "neoliberalism" or "capitalism" writ large. After five centuries of Euro-American imperialism, "decolonization" will take time, but there is plenty of low-hanging fruit to be immediately plucked in "decorporatization." For example, only since passage of the 1980 Bayh-Dole Act have corporations been able to patent inventions (including seeds) funded by federal research.[128] If this rule were repealed, public university professors might be more interested in partnerships with tribal governments for food sovereignty instead of the pursuit of lucrative contracts with biotech corporations.

Although only four corporations control 70 to 90 percent of the global grain trade, the glass is still more than half full. Most grains never cross a national border; only 10 percent of cultivated corn gets traded.[129] At the very least we should prevent new types of corporate capture of public or global institutions, such as the recently signed letter of intent between CropLife International and the Food and Agriculture Organization (FAO). Such new collusions could be reversed if more people watchdogged these processes or cared about how corporations have wrecked other countries' democracies for profit.[130]

As Guatemala painfully learned when dealing with the United Fruit Company, should a country attempt to reclaim its power from corporations, the United States has proved willing, time and again, to invade or overthrow other sovereign governments.[131] Banana companies dominated Central America in the twentieth century, but today Monsanto and other biotech corporations want that role. No other industry (except perhaps the defense industry) has enjoyed such collusion with foreign aid, regulators,

diplomacy, and higher education. The endgame seems to be to compel every farmer worldwide to purchase inputs and seeds from a corporate vendor.[132]

To give an example of seed gunboat diplomacy from another part of the world, Iraq's national gene bank was looted during the US invasion in 2003. The leader of the US occupation force, Paul Bremer, issued an order (no. 81) criminalizing farmers not just for replanting or sharing GM seeds, but for using any of their own seeds at all.[133] Like Mesoamerican farmers, Iraqis descend from one of the world's ancient centers of domestication. Although the Iraqi Congress eventually watered down the occupation mandate, its agricultural sector was decimated and corporate suppliers now provide 94 percent of the seeds used in the country. USAID put a former Cargill executive turned director of the North American Export Grain Association, Dan Amstutz, in charge of Iraq's agricultural reconstruction in 2003.

The Iraq story may seem an extreme example of "disaster capitalism."[134] But the agritech industry itself evolved from war technologies. After both world wars of the early twentieth century, munitions factories repurposed ammonia into fertilizer. Nerve gases became pesticides. Defoliants became herbicides. Back on the home front, war profiteers convinced families to apply these killer chemicals on their manicured lawns. While expanding domestic sales, Monsanto and Dow Chemical profited from blitzing Southeast Asia with Agent Orange. Then cancer and pollution lawsuits caught up with them, leading these warmongering corporations to rebirth themselves as "life science" companies.[135] It is an odd business sector that claims to be committed to "a world where biodiversity thrives in harmony with humankind" but then bullies, bullshits, and buries its own customers.[136]

With their sights now on Mesoamerica, multinational corporations seek to destroy one of the healthiest and most sustainable subsistence diets in the world for both people and the land. When measured by calories per hectare, a fertilized and chemically doused midwestern cornfield, of course, beats a Mesoamerican maize field. However, when measured by nutrition, climate resilience, and cultural value, the polycropped milpa wins every time. Indigenous horticultural tribes throughout Turtle Island (North America) share common stories about the ancient relationality of the three sisters—maize, beans, and squash—which agribusiness now wants

to separate into orphaned monocrops. Three sisters agriculture cannot be revitalized, therefore, without vigilance over the three evil stepsisters of agribusiness—Bayer-Monsanto, Dow-DuPont, and Syngenta-ChemChina—and other corporations nipping at their heels.

THE THREE EVIL STEPSISTERS

Like an Agatha Christie murder mystery, at first there were ten companies, then six.[137] Today only three are left standing (plus Baden Aniline and Soda Factory [BASF], as a distant fourth cousin).[138] These final mergers occurred in quick succession right after Monsanto's patents on Roundup Ready seeds began to expire in 2015. In 1994 the top three firms controlled 21 percent of the market; by 2009 it was 54 percent; and today they commandeer at least 62 percent of agrochemical sales and half of global seed sales.[139] Little wonder that a recent poll of US farmers revealed that 93 percent felt the Bayer-Monsanto merger would adversely affect them.[140]

These mergers almost perfectly blended the profit dowries from chemical corporations with the bridal trousseaus of GM seed technology (table 2). All easily agreed to a "prenuptial" agreement to externalize health and environmental costs onto society, ghostwrite scientific assurances of agrochemical safety, and collude with regulators.[141] Although Monsanto has maintained the most high-profile appointments of former executives and lawyers to regulatory bodies and even the US Supreme Court, all the major biotech firms have enjoyed a revolving door with government agencies. The Department of Justice ignored the unfolding conditions of oligopoly or "agropoly" and amazingly approved every merger with only cosmetic restructuring.[142] Barely past their honeymoons, however, Bayer, Dow, and ChemChina may be regretting some of the legal debts inherited from their partners.

Bayer-Monsanto

Founded as a chemical company, Monsanto was the first to integrate seeds into its central business plan to create a genetic-pesticide treadmill.[143]

TABLE 2. Three Evil Stepsisters (and a distant fourth cousin)

	Acquisition date	*Mergers of*	*Signature herbicides*	*Sales of seeds and seed traits in $ millions*	*Sales of agricultural chemicals in $ millions*	*Combined sales in $ millions (100%)*
BAYER-MONSANTO	July 2018	Bayer		$1,416 (13%)	$9,173 (87%)	$10,589
		Monsanto	Roundup Dicamba	$10,243 (68%)	$4,758 (32%)	$15,001
DOW-DUPONT	December 2015	Dow	2,4-D Glusofinate	$1,409 (22%)	$4,977 (78%)	$6,386
		Dupont		$6,785 (69%)	$3,013 (31%)	$9,798
SYNGENTA-CHEMCHINA	February 2016; renamed Sinochem in 2021	Syngenta	Atrazine	$2,838 (22%)	$10,005 (78%)	$12,843
		ChemChina		negligible	unknown	unknown
BASF	n/a			negligible	$6,455	$6,455

Sources: MacDonald (2019) based on 2015 sales before mergers began; author calculations of comparative percents of revenue; and see Strömberg and Howard, "Recent Changes in the Global Seed Industry," on prior acquistions of smaller companies.

Once Monsanto won the race in 1996 to bring to market GM seeds for feed and fiber crops, a quarter of US farmers became their customers in four years. By 2001 Monsanto had filed 188 patents on maize seeds and 266 patents on soybean seeds.[144] By 2009, GMOs accounted for 85 percent of feed crops.[145] By 2020, GMOs constituted 94 percent of soy, 96 percent of cotton, and 92 percent of corn grown in the United States.[146] Between 1996 and 2018, Monsanto acquired a hundred seed companies, including Central America's Cristiani Burkhard. Monsanto's future spouse, Bayer, purchased another fifty.[147]

Having secured almost 90 percent control of the global GM seed market, Monsanto became a meta-symbol among food activists for the ills of industrial, vertically integrated, and transnational agriculture. It also became the company everyone loves to hate.[148] As a Mexican journalist noted, "Monsanto is not a decent corporation. The one merit that can be attributed to it is that it has sparked a dynamic global movement against it that is demanding accountability for who grows our food and how they do it."[149]

For decades, Monsanto assured the public that Roundup was "less toxic to rats than table salt following acute oral ingestion."[150] Monsanto apparently paid scientists to publish ghostwritten articles that manipulated safety data in favor of Monsanto.[151] In the 1980s Monsanto paid a retainer of $1,500 *a day* to Sir Richard Droll, a renowned epidemiologist, who reciprocated this corporate patronage by downplaying occupational chemical exposures as a cause of cancer and by directly intervening in an Australian investigation of Agent Orange.[152] But not everyone could be so easily bought.

Monsanto's fall from grace began with the 2012 study by French scientist Gilles Eric Séralini showing that rats fed Roundup Ready corn over a long period of time had a two- to threefold higher mortality rate.[153] Because the effects were different in female and male animals, Séralini's study suggested that Roundup (glyphosate) is not just mutagenic, but also possibly an endocrine disruptor—meaning that even low doses could alter hormonal systems and induce other health problems. Building on that insight, in 2014 Nancy L. Swanson published a study that crossed US government databases of Roundup applications with epidemiological data of diseases such as thyroid cancer, liver cancer, bladder cancer, pancreatic cancer, kidney

cancer, diabetes, strokes, autism, and hypertension.[154] Her research and other studies show an unusually high rate of miscarriages, birth defects, and premature deliveries among farming families that use Roundup.[155]

Why had the EPA not foreseen these adverse health impacts before it approved glyphosate, the active ingredient in Roundup, in 1974? The answer is disturbingly simple: the EPA does not conduct toxicological tests of its own and instead trusts the agrochemical industry to be truthful and comprehensive in its private testing. Nor does the EPA inquire about inactive ingredients in formulated pesticides. Some 85 percent of pesticide applications presented to the EPA contain no health data at all, but nevertheless get rubber-stamped.[156] In the case of Monsanto, the company selectively presented data from internal experiments on pure glyphosate, not on *formulated* Roundup. Roundup is a mixture of glyphosate with other inactive ingredients like solvents, carriers, emulsifiers, and surfactants that help the herbicide penetrate weed cells. It's that chemical cocktail that apparently makes glyphosate all the more mutagenic (causing DNA damage), oncogenic (producing tumors), teratogenic (inducing birth defects), endocrine disrupting (altering the hormonal system), and ecotoxic (causing harm to other biological organisms). When reviewing the international literature on formulated Roundup, the International Agency for Research on Cancer (IARC) concluded in 2015 that the herbicide was, in fact, a Class 2A "probable carcinogen."[157] (To put the severity of that ruling into perspective, the IARC also classified the infamously carcinogenic DDT as class 2A.) California's EPA reclassified glyphosate as a Proposition 65 carcinogen shortly thereafter.

Taking into account the new toxicological data on Roundup, US lawyers launched a series of lawsuits on behalf of sickened users. One California jury awarded school groundskeeper Lee Johnson a record-breaking settlement of $289 million in 2018. The next two major lawsuits against Monsanto involved California homeowners with non-Hodgkin's lymphoma who had also sprayed the weedkiller on their properties over decades. The Hardemans (from Sonoma) won $80 million in 2019. In the next case, brought by the Pilliods (from Livermore, also 2019), the jury slammed Monsanto with $2 billion in punitive damages for willfully covering up

evidence of its carcinogenicity. By June 2020 Bayer had announced it would pay more than $10 billion to close the first round of lawsuits. The US Supreme Court rejected Bayer's proposed cap, and civil litigation continues moving forward without limits. At least thirty thousand lawsuits remain pending.[158] Accusing Bayer of false advertising, New York's attorney general won another a $7 million settlement.[159] In late 2023 a Philadelphia jury awarded Ernest Caranci $175 million for the lymphatic cancer he developed after decades of heavy Roundup use on his lawn and garden. Then in early 2024, a Pennsylvania jury fined Bayer $2.25 billion in punitive damages for another lymphoma victim. With other law firms now collecting mass tort cases for several other lymphatic cancers, there is no end in sight for Bayer.

To be sure, Bayer is not an innocent victim holding the bag of Monsanto's wrongdoing. Under Bayer's management, the old Monsanto team commercialized its GM Extendimax package of dicamba-resistant crops. Fully cognizant of how far its dicamba herbicide can drift, corporate leaders apparently figured that if enough neighboring farms had their crops ruined, they would feel compelled to start buying the Extendimax seeds themselves. One executive wrote in an email memo: "I think we can significantly grow business . . . if we reach out to the drift people . . . [who] can be turned into new users."[160] The "drift people" were angry; one even killed his neighbor over dicamba drift.[161] As of 2020 Bayer faced 120,000 lawsuits for drift damage. In February 2024 a US judge issued a judgment to ban dicamba-based herbicides, arguing that the EPA had failed to solicit public comment through which farmers could have testified to these known problems of herbicide drift.[162] New studies suggest that dicamba threatens monarch butterflies and may also be carcinogenic.[163] Sadly, other herbicides may also cause harm. A new study shows that both Roundup's competitor (2,4-D) has negative effects on human adolescents' brains, including leading to impaired memory and anxiety.[164]

Dow-DuPont

The year after Monsanto bought Dekalb Seed Company, DuPont acquired a stake in Pioneer Hi-Bred Seed Co. (descended from Henry Wallace's

original company) and completed its takeover in 1999. Meanwhile, Dow purchased the biotech firm Mycogen in 1996, which claimed to have an insect-resistant corn product in production. Then, like Monsanto, Dow bet big on pairing its signature herbicide, 2,4-D, with its GM seeds. However, the IARC reclassified 2,4-D herbicide as Class 2B ("possibly carcinogenic") in 2016.[165] Nevertheless, Dow continued forward with Orwellian web pages asserting the safety of 2,4-D and the company's good intentions to help "agricultural communities thrive." Dow has also used trade agreements to attack Canadian restrictions on the use of 2,4-D (described in the preface).

One of the oldest chemical herbicides on the market, 2,4-D has been used since World War II primarily on grain crops and pastureland (35 million pounds annually), but also on residential lawns and gardens (11 million pounds annually) under brand names Weed B Gon, Killex, and Tri-Kil. Mocking the suffering of soldiers and Southeast Asian villages caused by Agent Orange, Dow branded its new line of GM seeds paired with 2,4-D with the trademarked name Enlist. The Center for Food Safety is now suing the EPA for failing to consider the health and environmental harms of 2,4-D when it renewed approval of Enlist in 2022.[166] Nipping at Monsanto's heels, Dow has also spun new "stacked" traits and combo-herbicide products with its other proprietary herbicide, Liberty (glufosinate-ammonium).

Dow's merger with DuPont came with skeletons from both closets. DuPont's signature repellant, Teflon, is manufactured from long-chained carbon molecules called PFAS (polyfluoroalkyl substances), better known as "forever chemicals" because they never break down. Recent research suggests that PFAS from agrochemical containers leach into the pesticide containers and permanently pollute agricultural fields.[167] Facing lawsuits for PFAS and other chemicals, Dow-DuPont reorganized its seed business into a new subdivision called Corteva. Corteva will likely bring the first CRISPR-edited GM corn crop to market—specifically to enhance the waxiness of a corn used for glossy paper or other industrial food uses—unless Syngenta develops a CRISPR-edited seed first.[168]

Syngenta-ChemChina

Syngenta's corporate kinship is the most convoluted. The UK-based Astra merged with Sweden's Zeneca in 1998. A year later, AstraZeneca made a deal with the Swiss corporation Novartis to spin off its respective chemical and agritech businesses to form Syngenta.[169] Like other agritech firms, Syngenta has enjoyed a long but often controversial relationship with public universities. In addition to harassing Ignacio Chapela, Syngenta stalked another UC Berkeley biologist, Tyrone Hayes, after he showed that atrazine changes the sex of frog gonads and can disrupt endocrine systems.[170] Atrazine is the second-most commonly used herbicide in the United States and has tainted the water systems of nearly eight million people, possibly causing cancer and birth defects.[171] Syngenta manufactures another killer herbicide: paraquat, alleged to cause Parkinson's disease.[172]

Syngenta created more controversy with Enogen, a GM corn modified by a bacteria that lives in the scalding vents on the ocean floor.[173] This corn produces an amylase enzyme that remains stable at high temperatures, which helps agrofuel factories break down corn starch into sugar for ethanol. That same trait, however, ruins food factory operations with even minor contamination.[174] One Enogen kernel mixed among ten thousand normal kernels is enough to disrupt proper starch levels during industrial food processing. Although Syngenta created a purple kernel to identify and isolate Enogen harvests, grain elevators were not prepared to prevent comingling. Like StarLink corn (see chapter 4), Enogen corn keeps showing up in the food supply where it should not. A Latino grocery store chain in Los Angeles reported that many customers had their Christmas tamales ruined and some people fell ill from an Enogen-contaminated *masa* (dough). Farmers who grow non-GM or organic corn for specialty markets have also lost their certification due to cross-pollination with Enogen.[175]

Undeterred by this red flag, Monsanto spied Syngenta across a crowded room in 2015, but Syngenta did not reciprocate the affection. After Monsanto's failed takeover, China's state-run ChemChina won Syngenta's heart with an almost identical bid in 2016 for $43 billion—the largest acquisition in Chinese history.[176] Shortly before that cross-cultural marriage, in April

2015 Syngenta announced a "breakthrough" corn herbicide called Acuron, which blends bicyclopyrone with atrazine, S-Metolachlor, and mesotrione.[177] Although Syngenta ranks a distant third for GM crop development behind Monsanto and Dow, this corporation has a particularly large R&D team devoted to the new CRISPR ("gene editing") technology.[178]

Although it previously banned GM crops, China signaled in the late 2010s that it might welcome applications for CRISPR technology that would make seeds "the 'computer chips' of agriculture."[179] Before it acquired Syngenta, China was already spending twice what the United States invests in corporate-driven agricultural research.[180] In the mid-1990s China began producing more pesticides; by 2018 it was manufacturing and exporting 46 percent of herbicides used worldwide.[181] It is currently the largest global importer of commodity corn, purchasing one and a half times more than Mexico.[182] With 20 percent of the global population living on only 7 percent of its land base, China needs more feed crops to provide meat for its growing middle class.[183] Having decimated its small farms through collectivization and destroyed even more farmland through urban sprawl, China has committed to a future of industrial farming. It quickly approved Syngenta's first GM-corn product in 2022.[184]

Though ostensibly competitors, all three mega corporations sell the same formula: genetically modified seeds that require proprietary herbicides or that make plants themselves insecticidal. All claim that they can wave a technological wand that will save the world from climate change. But it seems clear they have no interest in creating pathways to a more sustainable future. Their central business seems to be to file princely biotech patents to sell more herbicides. Like Cinderella's golden coach, these companies' GM seeds have a patent time limit, but also seem to lose productivity after five to ten years. Because of the perennial problem of weed resistance, those Frankenseeds will turn back into a pumpkin at midnight. Although GMO discourse would lead us to believe such technologies are the "future" of agriculture, the real path forward is "back to the future," using the diversity of farmer-saved seeds in situ.

This raises the question about what to call farmer-saved seeds. In the academic literature they are often known as "farmer varieties" or "traditional cultivars," and are juxtaposed against "modern varieties" or "breeder varieties." In colloquial terms, despite being pre-Columbian crops, native maize seed varieties in Mesoamerica are oddly known as "creole" (criollo) seeds, but food movements in both Mexico and Guatemala increasingly use the term "native" maize(s). I follow this lead. In early manuscript drafts I called them "heirloom," both to emphasize that they should be treasured and to build bridges with gardeners. Then one reviewer pointed out that the term "heirloom" conveys a sense of fragility or something to be saved in a curio cabinet. Unlike standardized and stagnant corporate seeds, open-pollinated varieties are continuously strengthened by cross-pollination with wild progenitors.[185] They are arguably more "modern" than the seeds frozen in "doomsday" seed banks intended to help breeders hedge against future disasters.[186]

Helen Curry's monumental history of Mexican maize collections reveals just how fragile, if not useless, the seeds stored in those ex situ seed banks are.[187] Imagining that Indigenous seeds were disappearing along with Indigenous cultures, the Rockefeller Foundation supported "salvage" collection projects in the 1940s. Although only the gringo botanists took credit for the collections, Mexican scientists like Efraím Hernández Xolocotzi did much of the real work.[188] After a frenzied decade of collection, the "Maize Committee" of the US National Academy of Sciences belatedly realized a plan was needed for storing, naming conventions, and tagging. "'Doubtful' that Indigenous farmers 'played a conscious role in the creation of new races of maize,'" the committee chose new names and erased the local nomenclatures on which they had relied for collection.[189] Also, doubtful that the Mexican government could manage the collection, they sent duplicate seeds to a USDA facility in Glenn Dale, Maryland, which was later transferred to Fort Collins, Colorado. Through his service on the committee, William Brown secured duplicate seeds for his employer, Pioneer Hi-Bred (now owned by Dow-DuPont's Corteva Division).[190]

After decades of a continuing comedy of errors, poor management, and arrogance on the part of the US botanists, a corn scientist, Major Goodman, became interested in using tropical varieties to add vigor to corn breeding lines. Taking on seed bank organization as his personal crusade, he cochaired, with William Brown, a new "crop advisory committee" to the US secretary of agriculture. Goodman realized that almost all the aging collections needed to be regenerated and duplicated. Most of them lacked contextual markers and phenotypic descriptions from the field, because the collectors did not think Indigenous knowledge mattered. Again, Pioneer Hi-Bred volunteered to "help" with the seed duplication and probably helped themselves to the seeds.[191]

After sifting through decades of correspondence about these mishaps, Curry reached the conclusion that in situ seed conservation strategies are superior because "crop varieties do not survive, or do not survive well, without cultivators." When banked, "seeds had to be endlessly reborn and yet remain forever the same."[192] To avoid genetic erosion, she recommends that ex situ seed banks should coordinate more closely with local communities and other in situ conservation efforts.[193] Moreover, in any major disaster, seeds preserved through an external "Noah's ark"–like bank could never immediately restore crops.[194] They would have to be tediously grown out over several crop cycles to multiply sufficient seeds to restore agriculture at a mass scale—that is, if the seed banks even survived catastrophe.[195] In 2017 the "fail-safe" Global Seed Vault located on a remote Norwegian island flooded when permafrost melted and poured into the underground tunnel entrance.[196] Apparently we need a backup of the backup.

Seeds will survive only when intergenerational knowledge, landscapes, stories, and community traditions exist to support them.[197] Plant diversity requires human diversity.[198] In a rare longitudinal study, Marianna Fenzi and her team found that following climate disturbances in the Yucatán Peninsula, farmers were understandably risk averse the next season, returning to tried-and-true varieties. They restored milpa diversity thereafter through local seed exchanges. Just as it takes a village to raise a child, it takes a community to save a seed.[199]

Across Mexico, thousands of communities continue to plant 11.5 million

acres with native seeds that one research team calculated could cross-pollinate to create 138 billion genetically unique maize plants every planting season—a cornucopia of maize diversity adapting in real time to climate change. Small farmers' conservation efforts can also take into account the plant's phenotypic characteristics, not just the seed appearance after harvest. Laboratories can never approximate the ongoing experimentation and observant seed selection of Indigenous horticulturalists.[200] What's more, small farmers already have the techniques, skills, and social networks to learn from one another how to adapt seeds in real time to the changing weather. The millennial seeds of Mesoamerica *are* modern; they are the true foundation of resilience. Maize as a more-than-human relative continues to share its knowledge with the peoples who continuously cocreated it through hard times.

Maize also traversed the world via colonial voyages. From China to West Africa to Romania, small farmers adapted maizes to thousands more ecological niches around the world in the sixteenth and seventeenth centuries.[201] Today, in a similar way, ecological farming associations in France are experimenting with how to use tropical maize diversity to readapt maize to a new European climate.[202] Unlike biotech corporations, those French farmers have committed to maintaining these seeds as a common open-pollinating resource.

In conclusion, rather than thinking about native seeds as "traditional," let us reimagine them as *transitional* varieties for climate change. As Bryan Kamaoli Kuwada puts it, "Standing on our mountain of connections, our foundation of history and stories and love, we can see both where the path behind us has come from and where the path ahead leads. . . . The future is a realm we have inhabited for thousands of years."[203] Maize connects past, present, and future in an evolving chain between ancestors and descendants. If I were a betting woman, I would hedge against the corporate capuchins and up the ante for the climate-wise practices of ongoing Mesoamerican milpas.

TWO

Sacred Maize, Stalwart Maize

World historians once dated the birth of agriculture to the domestication of einkorn wheat in the Fertile Crescent between the Tigris and Euphrates Rivers in approximately 7500 BCE. Around the same time, early horticulturalists in the Americas were already domesticating squashes and gourds in present-day Mexico. If we were to overlay that history of agriculture onto a twenty-four-hour clock (with wheat's domestication starting at 12:00 midnight), soon thereafter Mesoamerican peoples began experimenting with the wild grass teosinte; by 9:00 a.m. they had coaxed teosinte's seeds into tiny husked cobs of maize. Maize cobs grew in size between 11:00 a.m. and 2:00 p.m. That bounty nourished the first Mesoamerica cities into a long period of prosperity starting around 3:50 p.m.; Europeans invaded at 10:44 p.m.; and US breeders hybridized corn at 11:48. Genetic modification of corn DNA occurred at 11:56 p.m.; and evidence that these new genetic sequences contaminated native maize varieties in Oaxaca, the birthplace of maize, surprised the world at three minutes to midnight. In the global race against a climate clock, Mesoamericans have since organized to defend their ancient legacy and the world's third most important grain against the relatively recent and reckless introduction of GM corn into maize's center of origin.

Biotechnologists make short-term decisions based on quarterly returns, but Mesoamericans rely on ancestral memories from thousands of years of cultural coexistence with maize. As people famous for forgetting history, Westerners might be skeptical that traditional maize knowledge was coherently passed down over millennia, imagining it to be eroded like a children's game of "telephone." Yet, when divided by the average

reproductive span of twenty-eight years, ten millennia represent just 321 generations, who could easily pass down coherent and consistent maize knowledge. This is because they are also people with strong cultural traditions for sharing transgenerational stories. Having spent many years living among Maya maize farming families who continuously impressed me with their investigatory skills, recollection, hard work, kitchen craft, and intergenerational pedagogy, I take seriously the wisdom embedded in their oral history, which is only recently being vetted by genetics.

Maize is humble, versatile, and malleable into endlessly mesmerizing varieties. It sustained Indigenous peoples of the Americas through hard centuries of colonialism. Tall and long-armed with tasseled hair, maize seems almost human.[1] More than just a staple, maize has been a stalwart companion of Mesoamerica's peoples and cultures. Small farmers who recognized maize's potential and acclimated its seeds to new ecological niches turned it into the most productive crop on the planet. Building from my own ethnographic research among lowland Q'eqchi' Maya communities who are now Guatemala's most productive maize cultivators, this chapter blends narrative, archaeology, biology, and economy to trace the story of maize, its travels, and associated cooking techniques to highlight the special role that women play in conserving agroecological cultivars for their culinary traditions.

TENACIOUS TEOSINTE

Teosintes (also written as *teocintle*, from the Nahuatl) are tall, wild grasses from the genus *Zea* and the family Poaceae. *Zea luxurians* and *Zea nicaraguensis*, as well as the abundant *parviglumis* and *mexicana* subspecies of *Zea mays,* are all annuals; the relatively narrowly distributed *Zea diploperennis* and *Zea perennis* are perennials. The grasses are endemic to Mexico, two regions of Guatemala, as well as western Honduras and northwestern Nicaragua. Scientists continue to discover new teosinte populations throughout the region.[2] Before domestication, hunting-gathering peoples may have consumed teosintes' sugary stalks directly or fermented them. But the hard coating on the plant's triangular seeds made them inedible

until someone realized they burst when heated, leading to the first ancient popcorn party. In an influential 1983 article in *Science*, ethnobotanist Hugh Iltis argues that Amerindian people were not just passively harvesting teosinte, but also purposefully planting it outside its natural range.[3] In other words, teosinte likely traveled through ancient trade and community networks before it was turned into maize.[4]

Without human intervention, teosinte would never have spontaneously mutated into maize. Through observations recorded through strong social systems for conserving intergenerational knowledge, the original peoples of Middle America gradually stewarded small molecular changes into significant morphological changes. In the Nahuatl language *teocintli* means "[mother] deity of maize." Although Mesoamericans inscribed this history of domestication within their own language, Western geneticists pedantically debated for decades whether or how maize evolved from teosinte. Invisibilizing Indigenous agency, some thought maize had another wild ancestor that went extinct; others contended that South American maize had separate origins.[5] Eventually archaeologists and geneticists concurred that maize was domesticated in the Balsas River region of southwest Mexico from one teosinte species.[6] The most recent genetic research suggests that hybridization with a second teosinte in the highlands of the Mexican Central Plateau likely played a crucial role in the evolution of modern maize as well.[7]

How might this have happened? Wild teosinte is a grass that looks almost identical to maize when young, but matures into a plant with multiple sweet stalks. Each stalk produces small ears or "spikelets" with five to twelve hard-coated seeds that shatter and replant themselves. Ancient horticulturalists might have first noticed a mutated teosinte with softer seeds and replanted them. Then they likely selected teosinte varieties whose lowered tassels and clustered ears made them easier to harvest. The next step (about 6,250 years ago) was probably to reduce the multistalked grass into a stronger single stalk that could support a one-inch cob. In the 1960s an archaeological team found a trove of one-inch cobs in the Guilá Naquitz Cave in Oaxaca, dating this stage of maize's evolution to 4,200 years ago.[8] Those tiny cobs of proto-maize developed a leafy husk to protect the ker-

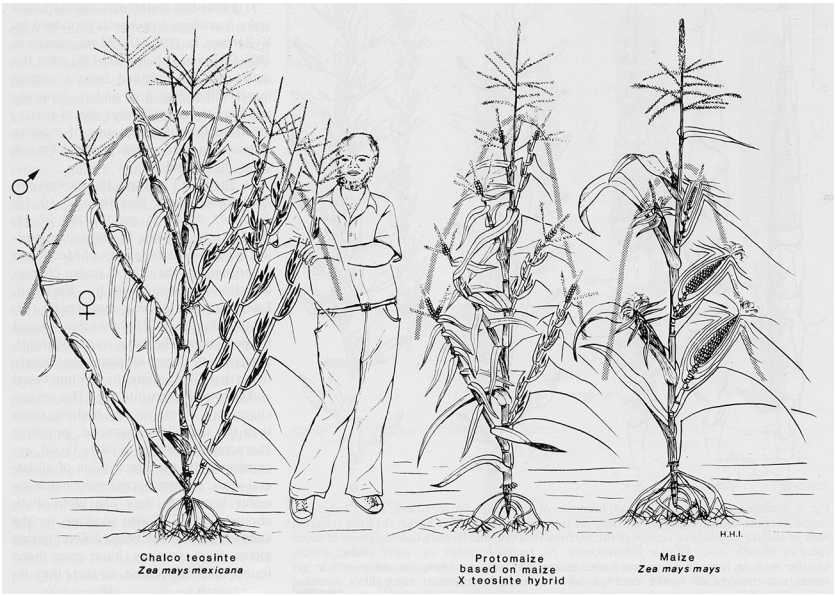


FIGURE 4. Proto-maize, as it evolved from teosinte. Drawings by Hugh Iltis.

nels. Evolutionarily this progression would have been useless in the wild, because even if those husks had fallen directly to the ground, the seeds inside would have been too crowded to sprout. However, that husk gave humans a chance to harvest the kernels before they spontaneously scattered.[9]

Although prior theories imagined that those early maize cobs had slowly diffused via trade and cultural exchange, new genetic evidence from Belizean caves indicates that people also moved alongside maize. This suggests that a proto-maize may have traveled from Oaxaca southward through the Andes into Peru and Bolivia seven thousand years ago. These improved cobs may have returned to Mesoamerica via Chibchan speakers from present-day Costa Rica or Panama into Belize.[10] These archaeological findings correspond to Guna stories of the isthmian land bridge being the origin center of "Abya Yala," a term many Indigenous have adopted to replace "the Americas" to avoid honoring a colonizer.[11]

Native or "open-pollinated" varieties of Mesoamerican maize also continue to cross-pollinate with teosinte whenever the two come into

contact.[12] The famed botanist George Beadle bred some fifty thousand hybrid plants of crosses between teosinte and maize, and from morphological observation Beadle concluded that they differed by only five genes.[13] Cross-pollination continues, because teosinte and rainfed maize share a growing season with both flowering in September.[14] Next to milpas, wild teosinte populations continue to enhance the vigor of domesticated maize in its cradle of origin, such that Garrison Wilkes called these patches "evolutionary gardens."[15] Although "domestication" suggests a closed event, maize evolution was an extended, people-assisted process that continues today through the hard work of small farmers who enrich their landraces with teosinte.[16] Gene flow from teosinte can confer pest resistance, flood tolerance, nutritional value, and other adaptive traits for climate change.[17]

Remaining patches of teosinte are small, sometimes just two square kilometers.[18] Just 11 percent of extant teosinte grows in protected areas of Mesoamerica.[19] Elsewhere, cattle and urbanization threaten teosinte populations.[20] For example, after NAFTA decimated maize prices (see chapter 4), cattle replaced half a million acres of maize in Oaxaca's Balsas watershed, threatening those ancient stands of teosinte.[21] To maintain teosinte reservoirs for resistance to pest, pathogen, and abiotic stressors, teosinte expert Garrison Wilkes published an impassioned "Urgent Notice to All Maize Researchers" about the endangerment of teosinte, especially in Guatemala, along with low-cost recommendations for participatory research with small farmers.[22] Wilkes's admirers raised crowdsource funding to open a teosinte greenhouse in Mexico.[23] Elsewhere teosinte remains endangered. In Guatemala, mining projects threaten the Huista habitat.[24] An investigative journalist, Jeff Abbott, traveled through Huehuetenango in 2019 in search of one of Guatemala's two endemic teosinte species. He never found the wild relative, but farmers showed him what appear to be teosinte-maize hybrids formed at the milpa's edge, so teosinte must have been growing nearby.

This long-continued labor of domestication is honored by origin stories retold throughout Mesoamerica, which describe hardworking ants as having discovered maize through a cleft in Paxil, the mountain of sustenance. As told in different Mayan languages, animal deities discovered the

ants' secret and began to steal the maize, but wanted more. They enlisted the thunder gods to pierce the mountain to reveal the maize inside. Both K'iche' and Jakaltek Maya versions of this story explain that the mountain deity, Paxil, pinched the ants (or tied them with twine) as punishment for having revealed the maize source; and, to this day, these ants announce planting time by swarming.[25] (See the conclusion for a Q'eqchi' version of this story.) In the Aztec iteration of the story, the god Quetzalcoatl transformed himself into an ant to fetch corn from Tonacatepetl, another mountain of sustenance.[26]

Through teosinte's loss of the ability to reproduce itself, Mesoamericans began a long reciprocal relationship with maize.[27] Maize became kin, but also a responsibility.[28] Perhaps this is why Mesoamerican people still regard the spilling of maize seeds as taboo or the burning of tortillas as bad luck. As Rigoberta Menchú notes in her 1983 autobiography, "The child . . . is told that he will eat maize and that, naturally, he is already made of maize because his mother ate it while he was forming in her stomach. He must respect the maize; even the grain of maize which has been thrown away, he must pick up."[29] After learning that it is a sin (*xmaak*) to waste even a single kernel, I began to notice in Q'eqchi' villages that whenever a kernel accidentally fell to the ground, someone would always pick it up. Should maize accidentally sprout somewhere from a fallen seed, it must be left to mature even if it is in the middle of a path.[30] Q'eqchi' leader Sebastián Cux recently copied me on an email in which he admonished a project director to be more careful in not wasting tortillas to feed trainees. "Not only is the sacred corn so expensive and in short supply, I say this for the good of ourselves because if we do not respect our corn, it could bring a punishment to us."[31] These and other examples show domestication is not merely the adaptation of a "wild" species to human will, but a continuing process of mutual respect and biosocial entanglement.[32]

ADAPTABLE MAIZE

Maize remained thumb-sized, with about fifty small kernels, for another two millennia.[33] Then around four thousand years ago, the archaeologi-

cal record shows increased pollen, charcoal, and other evidence of more extensive burning and maize cultivation.[34] Rather than following patterns of concentric diffusion, maize appears to have traveled quickly into North America and the South American lowlands. According to recent genetic research, another variation traveled through southern Mexico into Guatemala and the Caribbean—precisely when glottochronology would date the appearance of the proto-Mayan word for maize.[35]

As maize adapted to new homelands, it flourished, and this agricultural surplus ushered in an age of great urban cities and empires. From the Anasazi of the desert Southwest to the great Olmec, to the ancient Mayas, to the Aztecs, as well as the majestic Inca city of Machu Picchu in South America, maize nourished many peoples that built great civilizations.[36] In almost all instances, their pre-Columbian cities were larger than any of those of their ancient or medieval European counterparts.[37] The 230-foot Danta Pyramid near El Mirador, a city in northern Guatemala founded in the third century CE, is second to only to the Egyptian pyramids in terms of mass. After Tenochtitlan was founded as the center of the Aztec Empire in 1350, it became home to two hundred thousand people; only Paris, Venice, and Constantinople were larger at the time of the 1519 Spanish mainland invasion.

A phylogenetic tree of maize's evolution now confirms oral histories that maize began spreading overland from the US Southwest to the eastern US seaboard and by 700 BCE was being sown in Canada.[38] Because Native tribes of the Mississippian region and eastern woodlands were already skilled horticulturalists, they easily integrated maize as a minor crop among other regional cultivars. Then, between 750 and 1000 CE, these local maizes evolved into the dietary staple that gave rise to the five large tribal confederations of the Southeast. Maize gave energy to Mississippian cultures, which were able to move 55 million cubic feet of earth to build the great Cahokia Mounds, the largest being ten stories tall.

Although a great many scientists were intrigued by the original domestication of teosinte, perhaps the more interesting story is how Indigenous peoples so quickly and effectively adapted it to so many diverse habitats. Manipulating its visible and flexible genetics, Indigenous farmers now

grow maize in locations from the Tierra del Fuego tip of Chile to as far north as wintry Canada.[39] One flint variety adapted by Mi'kmaq peoples to the Gaspé Peninsula of Quebec grows to just two to three feet tall with four-inch cobs that mature in just sixty days—a truly extraordinary feat, considering that maize is so sensitive to day length.[40]

Over millennia Indigenous peoples of the Americas adapted maize to the harshest of microclimates, from arid mountaintops to lowland rainforests. A blue Hopi maize can germinate through two feet of sandy, desert soils; some Hopi tribe members have obtained consistent yields from the same fields for sixty years without inputs or irrigation.[41] A Nambé Pueblo white maize thrives at an altitude of six thousand feet in New Mexico. Rarámuri Gileno maize also does well at similar desert altitudes.[42] Bolivia and Peru have adapted maize to the Andean slopes and can boast almost as many endemic landraces as Mexico has produced on either side of the Sierra Madre. As Chilean poet Pablo Neruda wrote in his "Ode to Maize,"

> America, from a grain
> of maize you grew
> to crown
> with spacious lands
> the ocean
> foam.
> A grain of maize was your geography.[43]

During the colonial period, when left with the worst lands that colonizers disdained (swamps, hillsides, arid regions), Indigenous, Native, and mestizo farmers readapted their maize and labor practices for survival. How did they rebuild agroecological systems after colonial holocausts had forced relocation to different ecosystems? They parsed risk with communal social supports, relational thinking, polycultural systems, agroforestry, and organic mulching crops ("green manure") to ensure food year-round and to optimize production when fallowing was not possible.[44] Above all, contemporary maize seed diversity "is a testament to the resiliency of campesinos" and Indigenous peoples through hard times.[45] The gorgeous

"glass gem" maize bred by Cherokee farmer Carl Barnes is a tribute to Native American strength and "survivance."[46]

Maize can be planted with pointed "dibble" sticks close to sea level in the tropics, it can be buried in the desert Southwest, and it can be hoed into hillsides of the Andes. One variety called Puno is cultivated at twelve thousand feet, near Lake Titicaca.[47] As a rain-fed crop, farmers adapted it to places having as little as ten inches of precipitation to rainforests deluged by two hundred or more inches annually. Hopi and Navajo maize varieties have morphologically adapted to being planted eight to twelve inches under sand dunes, producing strong shoots that can break to the surface.[48] Maize's growing season typically lasts 120 frost-free days, but in the Maya lowlands farmers plant two, and sometimes three crops a year using hybrid seeds that can mature in 50 days. Others are slowly interbreeding "seven-week" hybrids into open pollinators.[49] At high altitudes the growing season will be much longer.[50]

In each of these regions, farming families selected for starchiness and kernel type best suited to the local climate and their culinary preferences. The starches and kernels in the five broad types of maize—popcorn, flint, dent, flour, and sweet—react to heat and kitchen processing in different ways.[51] Popcorn maize is probably the oldest varietal: a small-kerneled corn with a hard endosperm and little starch. Flint corn produces an elongated kernel with a high fiber and protein content that makes for a low glycemic index. The field or dent corn grown in the US Midwest evolved from crosses between traditional flour varietals and New England flints. With an extra high starch content, these kernels compress and form a dimple as they dry. Dent corn is not particularly palatable but can be fed to livestock or used for industrial processes. Flour corn has denser, fatter kernels that make for a malleable staple. Sweet corn comes from a recessive mutation that arose in at least two places in pre-Columbian times: Andean peoples developed a sugary maize called Chullpi and northeastern tribes of the United States stewarded a sweet version called "Papoon Corn," which George Washington's soldiers stole when they came across a field of it during a scorched earth campaign against the Haudenosaunee.[52] What people consume today as "corn on the cob" is a variety further sweetened through Cold War military

experiments that irradiated seeds. Corn breeder John Laughnan happened to taste a radiated sample in his lab in 1959, which he crossed with other hybrids to make a marketable seed.[53]

To conserve the robustness of a field's diversity, farmers must take continual care not to allow certain varieties to cross-pollinate. For instance, if flint corn is pollinated with sweet corn, the resulting ear will have shriveled kernels.[54] Itza' Maya farmers say that black and yellow maize has a "violent" nature—meaning those seeds germinate quickly—and therefore must be planted away from their white maize.[55] Guaraní farmers plant different fields of ceremonial maize, staple maize, and popcorn.[56] Bestselling Potawatomi author Robin Wall Kimmerer interprets the four colors as a reminder that humans have four ways of perceiving and understanding the world: using the mind, the body, the emotions, and the spirit.[57] The examples could go on.

Alongside maize's gorgeous diversity is a parallel medley of complementary crops adapted to its germination, height, width, seasonality, and water requirements. Beans that trellis up a maize stalk must not overtake the maize's own growth cycle. Companion squashes depend on local pollinators.[58] The many other species central to Mesoamerican diets in addition to these two sister crops include cacao, amaranth, chia, chilies, nopales, mushrooms, tomatillos, tomatoes, and root vegetables.[59] The fallow maize milpa hosts other species such as fruit trees, medicines, and greens. In oral histories among Q'eqchi' Mayan speakers in southern Belize, I documented around eighty wild and cultivated foods in or around their milpas.[60] However, although some other crops require special prayers when being harvested or used, in these polycropped mixtures only maize is sanctified—such that in Nahuatl it has become a fused word: *centeotzintli* or "sacred maize."[61]

The Mesoamerican diet of maize, beans, and milpa vegetables constitutes one of the healthiest subsistence diets in the world. Although Mesoamerica had few animals that could be domesticated other than chihuahuas, turkeys, dogs, and ducks, its people were nevertheless extraordinarily well-nourished. Long before Michael Pollan celebrated an omnivore diet that is mostly plant-based with only occasional meat con-

sumption, Mesoamericans were the quintessential omnivores bar none. They get two-thirds to three-quarters of their dietary carbohydrates and protein from maize, with other foods serving as condiments.[62] Despite the many jokes about tacos making people fat, one would be hard-pressed to gain serious weight on a traditional low-meat Mesoamerican diet. In fact, European invaders often remarked in their journals and sketches their admiration for the relative height, muscularity, and regality of Indigenous peoples of the Americas, as compared to their own stunted growth from centuries of feudal poverty.[63]

Wherever Europeans invaded, they brought domesticated animals and, with them, associated zoonotic diseases. Nine-tenths of America's original peoples perished within a century of contact—mostly from epidemic diseases, but slavery, labor conscription, forced relocation, and military violence also took a terrible toll.[64] Spanish priests systematically burned Mayan hieroglyphic books, erasing thousands of years of accumulated agronomic knowledge; only four books (codices) survived their Inquisitorial fires. Even after independence from Spain, colonizers continued to enslave Indigenous people onto haciendas and plantations through debt peonage. Q'eqchi' Maya elders related to me in vivid terms how their overseers restricted the time and acreage they could devote to subsistence crops. Civil wars of the twentieth century further disrupted seed saving and maize diversity.[65]

Despite all this trauma, Guatemala has conserved thirteen maize varieties ("races" in botanical terminology) and Mexico an astounding sixty-four, all with different agronomic and nutritional properties. Some maizes contain higher amounts of essential aminos acids, while others have special phytonutrients.[66] As a general rule, the first places where maize was domesticated and improved continue to host the most diversity today: Jalisco, Michoacán, Guerrero, Oaxaca, Mexico, Morelos, and Puebla.[67] Mexico has stored at least ten thousand accessions in its National Institute of Forestry, Agriculture and Livestock Research seed bank.[68] Hidden in the countryside are likely others that have stood the test of time but as yet undocumented by Western science.

ORIGIN STORIES OF THE PEOPLE OF MAIZE

The three great ancient civilizations of Mesoamerica—Olmec, Maya, then Aztec—as well as peoples that remained independent of the Aztecs, like the P'urhépecha—all revered maize deities. Maize first appeared in Olmec art by 3000 BCE, and it continued as the central symbol in Maya and then Aztecan sculpture, architecture, and pottery. Not just in Mexico but throughout the Mesoamerican region, people maintain a rich oral tradition as to why they refer to themselves in daily and idiomatic expression as "people of maize." These stories are simultaneously scientific, ceremonial, and metaphorical.[69]

The Maya version comes from the mythohistorical tale called the *Popol Vuh*. The original document, in hieroglyphic script, was lost to Spanish bonfires, but K'iche' Mayan–speaking intellectuals rewrote a bilingual version in Romanic script with the help of a Spanish priest in the sixteenth century.[70] That text moved around the world in a veritable cloak-and-dagger story. The eighteenth-century Dominican friar Francisco Ximénez made a Spanish copy of the original text. A French abbot stole that, and it was passed through many European collections until it made its way back to North America, eventually landing at Chicago's Newberry Library. Since then, multiple transcriptions and translations have appeared in contemporary Spanish and English, as well as children's books and "New Age" websites.[71] Murals discovered in 2001 at San Bartolo, a site north of Tikal in the Petén region of Guatemala where I lived, depict scenes from the *Popol Vuh*. Many believe the Candelaria Caves in Alta Verapaz are the entrance to the ancient Maya underworld, where Ixmucane's grandsons defeated the lords of death. Elements of this nonlinear narrative also remain very much alive in the countryside, in the tales passed down by elders and from whom I heard remarkably consistent versions across Q'eqchi' communities in both Guatemala and southern Belize.[72]

The Maya creation story goes like this: Long ago, the gods found themselves lonely and therefore decided to experiment with other materials to fashion new creatures who would keep them company.[73] Heart of the Sky

and other deities joined together. First they created animals, but the animals wandered about, squeaking and howling and unable to speak. The deities again tried to create people out of mud, but those clay creatures crumbled and were too weak to think. The gods tried again using wood, but those creatures lacked respect for their creator and abused smaller animals, so the gods exiled them to the forest as monkeys. The fourth creation was the charm: the female deity Xmucane used the white and yellow maize kernels she discovered inside a sacred mountain, grinding them nine times into dough. With that dough she created four articulate men of maize. However, they were perhaps *too* intelligent, because they spoke disrespectfully to the gods. The gods decided to dull the vision of the maize people. Like the haze of breath on a mirror, humans now can see only what is close to them and only the gods remain omniscient. To cheer the four men, they created four women. These couples are the ancestors of the Maya people. (To this day, the Q'eqchi' political governance system is anchored by councils of four men and four women.)

In the Aztec version of the story, the gods created people five times over, using teosinte as the base material for the third and fourth people, but the gods remained dissatisfied with their creations until they tried using maize.[74] For this fifth step the serpent lady Cihuacóatl ground sacred maize with a bit of sacrificial blood from Quetzalcóatl. In four days a man emerged from the dough; he was followed four days later by a woman.[75] Puebloan cultures that adopted maize as early as the Maya also spoke of being made of maize, whose colors are symbolic of the four cardinal points: red represents the birth of the rising sun, black with night and death, white the northern wind, and yellow the material world.[76]

In contrast, traditional stories about maize among tribes that adopted maize at a later time—such as in the northern and eastern regions of North America—tend to describe the crop arriving as a gift from a deity or visitor or as an act of female sacrifice. The Oneidas describe maize coming from "the woman who falls from the sky"; from Little Giver in Seminole (Muskogee); from the Unknown Woman ("Ohoyo Osh Chisba" in Choctaw); and from Onatah for the Haudenosaunee.[77] Maize was gifted to the Dakota people by a woman who rose from Spirit Lake (where the

Wapetunwan and Sisisituwan bands still remain) and "from then on we treated it like a delicacy."[78] Cherokees venerate Selu, the goddess who could rub maize from her belly and whose blood fertilized the crop after her twin sons killed her. The Potawatomi story similarly speaks of a corn mother who sacrificed herself for her children. Just as Native stories preserve the memory of traumatic catastrophes, they also record triumphant achievements.[79] Although maize rituals in the eastern United States have less symbolism than those of the US Southwest and Mesoamerica, almost all northern Native American nations celebrate some type of Green Corn Ceremony for the first harvest.[80]

Settlers also told exculpatory stories of being "gifted" maize by the Wampanoag—a gift they perceived as a possessive entitlement. The Wampanoag brought popped maize to the so-called Thanksgiving feast and shared their maize knowledge with the starving Pilgrims.[81] Then governor Bradford of Plymouth falsely claimed white agency for this "discovery," writing, "And sure it was God's good providence that we found this corn for we know not how else we should have done."[82] These early colonists raided granaries of villages that had been wiped out by European diseases.[83] Later they turned corn into whisky, which fueled the North American fur trade and frontier expansion.

Spaniards also depended on maize to sustain their marauding armies in the early conquest, but complained in their journals about the "misery of maize cakes."[84] Had Cortés not also received in present-day Tabasco, Mexico, a gift of fifteen to twenty enslaved women to grind maize (including the woman who would become his mistress and translator, Marina–Malitzin–La Malinche), he might not have been able to keep his mercenaries alive to seize Tenochtitlan.[85] Whether mestizo (mixed race) or Indigenous, Mesoamerican women have sustained their culinary traditions through frugality, ingenuity and hard work.

GENDERED GASTRONOMY

Perhaps because of maize's monoecious nature—feminine and masculine flowers live on the same plant but are separated from one another—maize

created many cultures that valued both masculine and feminine deities with balanced gender relations in everyday life.[86] However, with the notable exceptions of Betty Fussell and Sophie Coe, male scholars mostly dominated the modern recorded history of maize and paid little attention to the culinary challenges of making a grain palatable and pleasing as a staple.[87] In colonial times as well, women's voices are clearly absent from gastronomic descriptions by priests like Diego de Landa and Bernardino de Sahagún.[88]

Yet, one cannot fully understand the cultural centrality of maize in Mesoamerica without considering how women's daily lives are enmeshed with the "daily grind" of its flesh.[89] They spend three to eight "grueling" hours each day, cooking, shelling, washing, grinding, kneading, stirring, patting, and toasting this adaptable substance.[90] Before the mid-twentieth century advent of motors or hand-cranked metal grinders, women spent many hours breaking kernels by hand on a *metate* (grinding stone). Today in most Guatemalan villages someone operates a diesel mill as a small business, and women carefully guard their cents for the service.[91] Because this maize dough ("masa") is still somewhat coarse even after passing through a mill grinding, many women regrind it by hand on the metate stone. In Q'eqchi' there are two different verbs for grinding: the first breaking of maize (*ke'ek*) and the second refinement (*litz'ok*).[92]

Day in and day out, with little more than firewood, a mortar and pestle, a metate, a few pots, and a clay griddle, women tirelessly prepare and cook maize and foods from the milpa and the forest in dozens of creative ways. Key to this transformation is *nixtamalization*—which comes from the Nahuatl term *nextamalli*, a combination of the words for ashes (*nixti*) and dough (*tamalli*)[93]—from which the Spanish "tamale" derives. Every two days or so, household members collaborate to shell fifteen to twenty pounds of maize kernels, depending on their needs. Women then boil the dry kernels in alkalinized water (created by adding slaked lime or calcium hydroxide) then let them soak overnight to soften the pericarp. In this state, cooked maize stays preserved for several days without refrigeration. However, once the kernels are washed, the outer hull slips off and the maize

begins to spoil (or purposefully ferment into special recipes), so women must wake very early to make the morning tortillas.

Traditionally (and still in the western highlands), women slap tortillas with the palms of their hands. In the lowlands and urban places, tortillas are more commonly pressed by hand on plastic. Then it takes skilled wrists to transfer an ultrathin tortilla onto a hot metal or clay comal (a griddle) above a wood fire. With intuitive rhythm and toughened fingers, women multitask the pressing of tortillas with flipping them twice on the griddle. On the third toast, a well-made maize tortilla will inflate with hot air inside. By arranging the finished tortillas in a cloth-lined basket or as a vertical stack, the tortillas remain warm until all the masa is processed. Critical to a good tortilla is the proper starchiness and stretchiness of the dough.

Crop choices fundamentally depend on what people want to eat and what makes cooking easiest. For this reason women are the de facto curators of seed diversity. I was struck when reading that Q'eqchi' women once told a botanist they preferred softer maize varieties (with more flour quality) for grinding, while the researcher's male informants preferred to grow harder flint varieties that would be less subject to post-harvest loss in storage. By reducing the labor of grinding, diesel mills made these differences in seed selection less important.[94] Nevertheless, women complain that dough from modern varieties turn rancid more quickly even if hybrids may yield more at harvest. They also insist that native maize takes less time to cook, makes a stickier dough to make thinner tortillas and tostadas, and yields more tortillas per pound of kernels.[95]

Almost all Maya people eat maize tortillas three times a day and claim that without them they cannot feel full. While urban consumption is less, Guatemalans consume on average one pound of maize per person per day. Rice, yucca, spaghetti, and any other starchy carbohydrate get served in Maya households along with tortillas, the latter of which function simultaneously as plate, tableware, and napkin. Even dogs eat leftover tortillas. No part is wasted. The husks can be used as wrappers or for making tamales. The cobs (*baqlaq*) are saved for various household uses. Bug-bitten maize serves as animal feed or for making fermented maize drinks.

When combined with beans or amaranth, maize makes a perfect carbohydrate and provides the full spectrum of vegetarian protein—but only through nixtamalization. Cooking maize in alkali water loosens the husks, but also adds more calcium, makes the B-vitamins more bioavailable, and increases its lysine and tryptophan content.[96] Maize is otherwise deficient in tryptophan, which the body needs to synthesize niacin and which naturally reduces mycotoxins.[97] Without nixtamalization, a maize-staple diet could never have nourished the ancient civilizations as it did. In other words, plant domestication required some domestic ingenuity.

There are two main methods for nixtamalization: boiling the kernels in an alkali substance or grinding the kernels dry and then reconstituting them with alkalized water. Almost all Indigenous groups of the Americas that integrated maize into their diets also developed some form of nixtamalization.[98] In New England, tribes of the Iroquois Confederacy make hominy from wood ashes. To make the traditional flatbread (*piki*) found in the US Southwest, the Hopis boil blue maize with burnt willow branches.[99] An alkaline solution deepens the blue color of the maize into black, whereas acidic solutions turn it red.

These days Mesoamericans tend to purchase store-bought "cal" (calcium carbonate), but some elders still remember the olden times when they used wood ash or snail shells or burned special limestone rocks in kilns. Under high heat, limestone becomes "quicklime," or calcium oxide, which when added to water becomes calcium hydroxide.[100] Mesoamerica is a land of karstic caves and sunken wells where limestone abounds and where excellent roadbuilding techniques linked the region's great cities with bright white royal roads (*b'e*). Although archaeologists link the advent of this quicklime technology with an increase in pottery and colanders (about three thousand years ago), women may have also cooked slaked maize using hot stones in woven baskets or in vats in the ground.[101] María Caal, the matriarch of a Q'eqchi' family with whom I lived over many years, described having cooked her *nixtamal* this way in the new hamlets she and her husband founded in the dense Petén forest in the mid-twentieth century.[102]

How did women originally learn to do this? One male author hypoth-

esizes that perhaps a male farmer noticed that maize stored and smoked in the rafters of a hut were more impervious to insects, inspiring him to instruct his wife to add wood ashes to the family pot.[103] More probably a woman accidentally spilled ashes into her maize pot and noticed the kernels cooked faster and softer, saving labor from the daily grind.[104] The latter idea is woven into a syncretic Mexican story told about the Virgin Mary, who

> was sitting on a stone suckling her baby, Jesus Christ. She was thoughtful, worrying about how she would sustain herself and her son. All of a sudden, she noticed a movement under her stone. She saw that there were ants carrying something that neither she, nor any human, had seen before. She asked herself what it could be, and soon discovered it was [maize] . . .
>
> When the Virgin ate the [maize] she felt queasy, it didn't do her any good. She sat on her stone once more and a thought occurred: "What if I use this stone to make lime to cook the [maize] with? Then it will be better for me."[105]

From nixtamalized maize, steamed tamales likely came first. The date that pottery records show the advent of tortillas remains a spirited subject of debate. Some say that in the Central Mexican highlands tortillas date back to only 700 CE and then spread regionally under the Aztec Empire.[106] Although clay griddles were absent from the archaeological record before then, women may also have been cooking on stone slabs that would not necessarily be distinguishable from grinding stones.[107] Early Spanish colonial texts describe lowland Maya communities as consuming most of their maize in liquid form (as soups or a gruel-infused drink called an *atole*, or dissolved in hot chocolate).

In the thousands of hours that I spent cooking and visiting with Q'eqchi' women in their homes I documented almost thirty different Q'eqchi' names for methods of cooking maize, plus dozens more names in recipes of maize combined with other foods.[108] My list is undoubtedly incomplete because even after years of working in different villages, women were still surprising me with new maize-based delights. White maize is generally preferred for daily tortillas, but Maya women prefer blue ("black"), yellow,

and red varieties for ritual tamales and for making special maize drinks. Among Q'eqchi' communities where I worked, fermented tamales (*poch*) are favored for ritual community meals, the preparation of which can involve bawdy jokes for women's nether parts (also called *poch*). Because making tortillas is so time consuming, women often mentioned to me their gratitude if they had husbands willing to eat reheated lunch tortillas for a quick dinner.

In colonial texts, Maya women appeared considerably freer than women in the Aztec Empire of highland Mexico, who were expected to produce labor-intensive tortillas at every meal.[109] The frequency and type of tortilla preparation in Mesoamerica, therefore, could be a reverse indicator of women's status. In highland Guatemala, where women have a strong public or market position, they substitute entire meals with savory maize drinks that are faster to prepare. In the matriarchal societies of Oaxaca, Indigenous women (Zapotec, Mixtec, Chinantec) shape remarkably oversized tortillas—one of which is sufficient for a meal. For wage-working women in the modern era, industrial tortillas—though not particularly tasty—do represent a gendered break from the backbreaking labor of milpa cuisine.

In 1982, Mexico's Museum of Popular Culture published perhaps the most comprehensive maize recipe book, including more than six hundred culinary uses of maize.[110] The sophistication of "Mexican" cuisine is indubitably a legacy of the ancient "foodie" traditions of Aztec nobility. Great Aztec banquets involved dozens of courses cooked with particular types of firewood and served with complementary flowers. Montezuma is reported to have sampled more than thirty dishes every day.[111] Based on this, the work of anthropologist Sophie Coe challenges food historians to consider menus, presentation, and manners holistically. As the faculty wife of another anthropologist but also credentialed in the same field, Coe undoubtedly used these skills in fulfilling gendered expectations to host faculty dinners over her lifetime (1933–94).

Rather than reducing the stunning diversity of regional and subregional cuisines and cooking styles to the label "Mexican food," it would be more accurate and inclusive of Central America to say "milpa-based cuisines."[112]

Scholars and social change agents are reinvigorating these recipes for "decolonized diets," using modern cooking techniques for Mesoamerican communities in diaspora.[113] TikTok and YouTube channels now celebrate the skills of mothers and grandmothers. My favorite is one young Poqomchi' Maya man, Miguel Babo, who travels the country with his mother, Yolanda, documenting recipes; his videos have attracted half a million followers and earned him Guatemala's first TikToker of the Year award.

When I assign students to interview an elder about heritage recipes, it often opens up conversations about rural life and production of maize that young people had never had. As one student emailed to me, "It gave me ideas of what to speak to my parents about their past, since I never really knew how to approach that topic. It was just something that was never brought up between my parents and me. I definitely feel closer and more connected to them, and I cannot put into words how much that means to me." As my colleague Inés Hernández-Ávila notes, "Many Native American people who have been cut off from their traditions are hungry to recapture their ways or, at the very least, have a sense of what they have lost. Grandpa Raymond always said, 'The ceremonies, the language, the songs, the dances are not lost. We are lost; they are where they have always been, just waiting to be [re]called.'"[114]

LANGUAGE AND RITUAL LIFE OF MAIZE

As with most Maya groups, words for the cultivation and preparation of maize remain central to the Q'eqchi' language. The word for tortilla, *wa*, is embedded in multiple ways into Q'eqchi' morphology. To eat is *waak* (a passive construction that roughly means "to become one with tortillas"). Ordinal words refer to the stack of steaming hot tortillas prepared for every meal, so "first" literally means "the tortilla on top" (*x'ben wa*), second means "the second tortilla" (*xka wa*), and so forth. *Wa uk'a* (tortilla, drink) means "sustenance." Little wonder that Q'eqchi' speakers describe the wheat bread brought by the Spanish as *kaxlan wa*, translated as "foreign tortilla." Most Q'eqchi' ceremonies—whether organized as a community or as a family—involve an offering known as a *wa'tesink* (the "giving to

eat of tortillas"). Paying respect for the planting of maize with a wa'tesink is an essential feature of Q'eqchi' ritual life and community organization.

Events surrounding the maize season confirm and reaffirm religious holidays, kinship, friendships, and, indeed, the whole social network. Even among mixed race (mestizo or ladino) people, to say someone is a "man of maize" (*hombre de maíz*) is to compliment that person for courage or strength. Parents customarily cut an umbilical cord over a corncob and bury a baby girl's placenta under the household grinding stone to wish her skill in maize preparation. Most Catholic Q'eqchi's, and even some evangelical Protestants, practice elaborate community ceremonies (*mayejak*) for the blessing of maize seeds. For example, when shelling the seed, a farmer should loosen his belt so that his future maize harvest will also be easy to shell.[115] And to complete the blessing, the couple may sprinkle the seeds with water soaked with cacao seeds. The Tsotsil Maya of Chiapas do something similar: desiring to transfer some human soul (*ch'ulel*) to the seeds, they blow water over a basket of seeds until they are humid.[116] In Q'eqchi' cosmology, maize seed kernels have a soul or a kind of shadow spirit (*xmuhel*). To keep maize from being "lonely," Q'eqchi' families prepare a vigil for their seeds the night before planting.[117]

Women do also help the men with certain stages of maize cultivation, and female-headed households tend their milpas by themselves. Overall, however, in Q'eqchi' society maize cultivation remains primarily a male-led task and maize-processing a female-led task. Through maize the Maya household is forged. Much of the symbolism around maize planting is deeply gendered—with the earth regarded as "mother" into whose surface a seed is planted. Traditional Q'eqchi' couples will practice sexual abstinence (*k'ajb'ak*) three days before and three days after planting. In villages with a strong elder authority, four chosen Q'eqchi' men make pilgrimages accompanied by virgin children to offer incense and food offerings inside caves, which are symbolic of the womb of the earth.

While a comprehensive description of maize ritual life and taboos would be worthy of a book itself, the important thing these examples illustrate is the remarkable resilience of Mesoamerican traditions through centuries of genocide. Local maize traditions were so vital to cultural life that the

colonizing Spaniards had to acquiesce and adapt Catholic holidays and other religious festivities to the maize agricultural calendar. For Indigenous people of the time, the Christian cross looked like the foliated maize gods depicted in Mesoamerican art.[118] As bread was limited to the cities, colonial frontier friars and priests substituted maize tortillas for the Eucharist. The Otomí people of Mexico developed elaborate festival tortillas stamped with Christian religious symbols using natural dyes derived from cochineal and plants.[119] As a symbol of Mexico, the Virgin Mary herself was legitimated by the miracle of her apparition at the shrine of Tonantzin, the Aztec goddess of earth and maize.[120]

PEOPLE OF PELLAGRA

Although the Spanish disdained maize, it was the real treasure of the New World. The annual value of maize and other American crops that traveled the world was probably $200 billion in 1980—a higher value than all the precious metals exported from the Spanish colonies over the course of the entire colonial period.[121] Mexico is the center of origin to 15 percent of the world food system.[122] Although his journal is not clear, Christopher Columbus and his men were introduced to maize on their third day, or at least by their third week in the Antilles. Columbus may or may not have taken seeds home on the first return journey, but the chronicles of Pedro Mártir de Anglería definitely note that they took white and blue maize seeds back to Europe in 1494.[123] Maize was grown in Spain by 1498.[124] Ferdinand Magellan carried maize seeds to the Philippines in 1519.[125] Through medieval trade routes, maize found its way to China by 1555, confusing European historians into thinking the Chinese had domesticated it.[126] When maize returned to Europe via the Ottoman Empire, the English called it Turkish wheat. John Locke reported seeing maize fields in southern France in the 1670s, where it was called Spanish wheat.[127]

Describing it as a "botanical bastard," the late Mexican anthropologist Arturo Warman depicted maize as "an adventurer, a settler of new lands, one of those that helped fashion the modern world from the distant sidelines."[128] Maize became a food of underdogs. Today, more than fifty countries grow

maize on a quarter million acres and it directly feeds one-third of the world's population.[129] The United States, China, Brazil, Argentina, Ukraine, and India are now the top six producers of commercial corn.[130] Roughly one-fourth of the world's population consumes maize directly, while others use commercial corn as animal feed or industrial food ingredient.[131] In Africa, maize integrated well into local multicropping systems. With a double annual harvest and less spoilage, maize began to replace the annual sorghum crop, and some argue that these calories helped feed the slave trade.[132]

In Europe, maize was mostly used as biomass for animal silage, making it the world's first "flex" crop.[133] In some places, though, it was cultivated in the fallow fields of other cereals, and it replaced the less predictable millet. Maize provided more than twice the calories on the same amount of land as wheat and barley. Eastern European countries enthusiastically integrated it as a staple, and by the 1920s Romania was the second largest maize exporter in the world.[134] Maize was the salvation and curse of the Italian peasantry: the direct grinding of maize for porridge or as polenta created a filling food for the poor.[135] In the early United States, corn was half the cost half of wheat, so it also became a frugal part of settlers' diets.[136]

Although maize traveled far and wide, Mesoamerican women's knowledge of nixtamalization did not. Without this technique, maize eaters can develop pellagra, a disease caused by a nutritional deficiency of niacin. By 1784 an estimated 5–20 percent of the Italian polenta-eating population suffered from pellagra, which causes diarrhea, dermatitis, dementia, and even death.[137] In the American South, enslaved people ate as much maize as Italians did (as grits or cornbread), but pellagra was initially uncommon because plantations provided rations of pork lard that contained the missing amino acids. However, after Emancipation, pellagra became a serious problem for African American sharecroppers, annually causing an estimated one hundred thousand excruciating deaths in the early twentieth century.[138]

To the detriment of human health, the United States continued industrializing corn without nixtamalization. Colgate and Company began producing cornstarch from corn in 1844.[139] By the time of Michael Pollan's *The Omnivore's Dilemma*, hundreds of industrial by-products of yellow dent

corn—alcohol, starch, guar gum, maltodextrin, MSG, malt, and, especially, high-fructose corn syrup—are again making the North American public ill. The US corn crop is so deeply mechanized that "from field to soda can or gas tank, a human will likely never touch the grain."[140]

COMMODITY MAIZE

In contrast, on the eve of planting, a Q'eqchi' farmer traditionally invites his kin and neighbors for a late-night household vigil to accompany the living soul of his maize seeds. They pass the night by drinking *b'oj* (a fermented drink), telling stories, enjoying harp or marimba music, and perhaps playing a game called *b'uluk* that is similar to the modern board games of Parcheesi and Trouble.[141] How children behave during these and other ritual activities at home is as important for the milpa's success as the men's planting work. Everyone's shared responsibility for the success of the maize harvest is reflected in the duality and balance appreciated in a good marriage. As the men play and night fades into dawn, the planting

FIGURE 5. Playing the game of *b'uluk*, 2024. Courtesy of Jose Xoj and the elders of San Pablo.

FIGURE 6. Maize growing in a highland town backyard, 1993.

group stays awake, making jokes and friendly bets about how the maize crop will grow that year.[142] Meanwhile, thousands of miles away, commodities brokers make financialized bets on corn harvests that can irrevocably undermine Q'eqchi' lifeways and livelihoods.

As anthropologist Michael Taussig points out in his study of commodity fetishism in South America, a society can produce for small market exchange even while preventing those market principles to dominate and sicken the whole society.[143] Throughout Guatemala, even when it makes no economic sense to do so, Maya people plant maize on "parcels that would hardly be large enough to bury the owner."[144] Likewise, in tiny backyards, urban Maya families might plant stalks of maize *para el gasto* ("for the spending," a phrase used to describe household subsistence or the usufruct value of maize) (see fig. 6). Ethnohistorian David Cary Jr. notes that even powerful Kaqchikel professionals living in Guatemala City or other urban

areas may plant maize in their home communities to maintain a connection to their spiritual roots.[145] In the western highlands, where many Maya farmers produce winter vegetable crops for export, they buy market corn for daily use but still plant heirloom maize varieties for special holiday events. Despite years of state pressure to abandon the milpa, many Mexican farmers continue to plant maize for subsistence, even using off-farm or migrant wages to subsidize its continuation.[146]

Although the Q'eqchi' have become Guatemala's primary maize producers for urban markets, they continue to envelop the commercial production of maize with community ritual and kinship through labor groups with their neighbors. Where Q'eqchi' people have strayed from this collective path, the gods sometimes send corrective messages. Q'eqchi' elders in Belize told of a man from a village near Agoutiville, Guatemala, who was kidnapped by a mountain god called a *Tzuultaq'a*. The displeased god taught the man three lessons through song and instructed him to travel and teach these lessons to others. Hearing about his experience, the villagers of Jaguarville invited the traveler to come to Belize. They held an all-night vigil to memorize his songs, including a maize song that went like this:

There were once people
Before in the olden days.
Very important was their work
To plant the sacred maize.

Tomorrow, they are off to plant their milpa.
They scold the children to behave.
Three times, they will burn incense.
Morning, noon, and evening.

Thirteen great mountains
Whose names we recite,
And one to which the elders go
To give our thanks.

Those of us alive today
Forget what is sacred.
Oh, young people!
Do not forget these sacred gifts.

If you learn to speak Spanish and how to write,
Don't forget your mother and father.
Don't be like the animals,
Who eat what they haven't planted.

Maize domestication is what separates people from animals. And, despite the Green Revolution and US-imposed trade agreements, the Maize People have not forgotten their mothers and fathers. They continue to tend their evolving milpas as their ancestors did before them. Mesoamerican campesinos (peasants) and Indigenous people are "heirs to, and trustees of, the largest genetic diversity of maize in the world."[147] As Zapotec-Oaxacan activist Aldo González Rojas states so eloquently, "I plant and will continue to plant the seeds that our grandparents bequeathed to us, and I will assure that my children, their children and the children of their children continue to grow them. I will not allow them to kill the maize, because our maize will only die the day the sun dies."[148] González has also become a key Indigenous voice in denouncing the neocolonial theft of Oaxacan olotón maize by Mars Inc. and affiliated researchers from my own university, a travesty to which I turn next and last in this chapter.

MARS INC.

In 1979 Thomas Boone Hallberg (an expatriate botanist who lived fifty years in Mexico and became a research professor for a Oaxacan university) stumbled across a maize variety in the mountains of Oaxaca that grew to twenty feet on extremely poor soils and produced a mucilaginous gel on its aerial roots.[149] Hallberg reported this and returned in 1992 with Mexican scientists, who hypothesized that this maize could indeed receive nitrogen from the air. Mexican biologist Ronald Ferrara-Cerrato published a

1993 report confirming this. In short, this olotón maize produces its own fertilizer[150]—potentially a "holy grail" for industrial corn farming.[151] In the official investigation of GMO contamination of Oaxacan maize, Mexican scientists highlighted olotón maize as a uniquely endangered species.[152]

Despite these prior publications, a public-private partnership between Mars Inc. and scientists at UC Davis and the University of Wisconsin has claimed "discovery" of this maize variety. A key figure in this drama is Howard-Yana Shapiro, Mars's "chief agricultural officer," who holds a cross-adjunct appointment at UC Davis. During his hippie days, Shapiro originally collected the maize without prior informed consent while living in a Oaxacan town called Totontepec.[153] In 1990 he became vice president of an organic company called Seeds of Change. His then boss, Stephen Badger, is great-grandson (and heir) to the founder of Mars Inc. They sold their company to Mars in 1997.[154]

Shortly after I arrived to UC Davis, the university hosted visioning sessions for a World Food Center. I attended a few sessions, hopeful that I might bring some dissident perspectives to the center's planning about the value of Indigenous agriculture. I consciously ended my participation once Mars Inc. became the center's outsized benefactor in 2015 (with a $40 million "gift" matched by the university's $20 million). Mars Inc. and its subsidiary BioN2 directed two unrestricted University of California grants (totaling $4.3 million) to a research team led by UC Davis professor Alan Bennett with thirteen other UC Davis scientists and six University of Wisconsin scientists to explore the genetics of olotón.[155] One Wisconsin faculty member withdrew from the team and just published a riveting 2024 exposé with two other Wisconsin colleagues, a Guatemalan biologist and a famous plant patent historian.[156]

Although many details remain murky, UC Davis negotiated a "material transfer agreement" with the town of Totontepec, decades after Shapiro collected his original samples in the 1980s.[157] While serving as an associate vice chancellor of UC Davis, Alan Bennett signed that 2005 agreement with Totontepec. It permitted the transfer of maize samples to the university for research but not for commercialization. In return Totontepec received a donation to renovate municipal buildings and to publish a children's book

about biodiversity. Before that agreement expired in 2010, it was extended to 2019. Shortly thereafter (in 2012), Mexico ratified the international Nagoya Protocol, designed to prevent neocolonial biopiracy by requiring "fair and equitable" benefit-sharing and compliance paperwork with national governments. (See chapter 6 for more details on this procedural addendum to the 2000 Cartagena Protocol on Biosafety to the 1992 Convention on Biological Diversity.)

In the 2005 material transfer agreement, these "men from Mars" had originally promised 50 percent of any patent income to the town of Totontepec. In 2015, however, lawyers for the UC Davis–Mars team renegotiated another benefit sharing agreement that reduced the community share to 1 percent.[158] Other forms of genuine benefit-sharing might have included scholarships for Mixe youth or, more relevant, a promise for improved maize cultivars that would grow at Oaxaca's latitude and altitude. When interviewed by an investigative journalist, Bennett claimed he had not seen the contract.[159] However, someone anonymously leaked it to the above group of critical University of Wisconsin professors, from which they stitched together a rough chronology.[160]

The appropriate Mexican governmental agencies were neither included in these negotiations nor did they receive copies of the contracts. Bennett excused that "oversight," arguing to a journalist that since Indigenous communities were autonomous under the Mexican constitution, his team did not need the state's permission.[161] Through the campus grapevine I heard that many UC Davis colleagues attending a campus seminar about olotón had asked about community compensation, but Bennett repeatedly dodged their questions. However, he was quoted in the campus newspaper that UC Davis had negotiated an agreement to commercialize the corn, "but if we do commercialize it then any economic benefits that come back to the university will be shared with the community."[162]

Without any proof that the maize originated in Totontepec, the Mars-supported team conveniently ignored that many other communities in the Mixe mountains, the Sierra Juarez, and beyond have stewarded this same maize.[163] The same Major Goodman who crusaded to integrate more farmer knowledge into seed bank storage systems indicated that

the presence of olotón maize also extends into Guatemala.[164] Outraged Mexican scientists are documenting olotón's broader geographical range to register it as a collective breed in Mexico's National Catalogue of Vegetable Varieties.[165] And a Oaxacan grassroots organization called "Espacio" continues to denounce this theft of collective Indigenous patrimony. At a 2019 conference, members symbolically gifted olotón seeds to a representative of Via Campesina "so that through this organization small farmers in their respective countries may plant them without having to buy them from transnational corporations."[166]

Mesoamerican farmers speaking different languages have stewarded this agrodiversity over millennia, but Mars Inc. leadership thinks the corporation can make a patent claim to the "corn of the future" [singular] by applying additional "cutting edge technology" to understand its genomics.[167] Yet, even after ten years of research, the Mars team can still only estimate that "29%–82% of the plant nitrogen is derived from atmospheric nitrogen."[168] They have yet to pin down any genes at work or determine which of the thousands of microbes in the root gel are responsible for the nitrogen fixation.[169] Nonetheless, they have apparently applied (and been denied) twice for a patent on olotón discoveries.[170] Meanwhile, they have continued to shop for more corporate sponsors. Commented Shapiro to a reporter for *The Atlantic*: "It probably won't be Mars Inc., 'cause we're not a maize company, but I'm trying to find the right partner."[171]

Although seed buccaneers like these Mars men have not paid a cent, much less a buck, for the right to tinker with the collective heritage of maize, they think if they tweak a gene or two, they deserve to file patents on them. This example reminds us how slow and clunky of a process it is to make "technical fixes" in real life. It takes corporations a decade or longer to bring a new seed to market. Meanwhile, small farmers use observational science to select and improve seeds for survival every planting season. They do so according to the cultural values and culinary preferences described in this chapter.

As Potawatomi philosopher Kyle Powys Whyte argues, culturally cen-

tral foods like maize for Mesoamericans or manoomin (wild rice) for the Anishinaabe or salmon for California and Pacific Northwest tribes are "irreplaceable elements of a community's range of collective capacities to adapt to change."[172] These affective staples fuel bodies but also motivate collectivities to organize against structural injustices. The right to grow particular foods is connected to the right to grow as peoples towards self-determination. Defending or rebuilding these "collective food relations" contributes to cultural continuance.[173] Decolonization happens not in discourse but in "everyday practices of resurgence" from fields to kitchens to university campuses that can connect past, present, and future.[174]

THREE

Green to Gene Revolution

It was July 2003 and I was deciding on where to spend the next half year of fieldwork. I had heard from many people that the villages on a road along the Sierra Santa Cruz were famous for their sorcerers. Having spent many happy days reciprocally sharing medicinal plant knowledge with healers and midwives farther north in Petén, I decided to hitchhike down that dirt road. I knew from government archives that Q'eqchi' communities in these foothills had legalized their village lands collectively but during Guatemala's civil war were forced to subdivide them into private parcels.

The mayor was absent in the first village, so the next day I proceeded down the road a few more kilometers to Agoutiville. Sitting down at the village store, I bought a bottle of Coca-Cola (which in Guatemala is made with real sugar, not high-fructose corn syrup). As luck would have it, Agoutiville's mayor, Santiago Mo, was waiting to hitchhike in the opposite direction to sell an agouti (*Dasyprocta punctata* or "tepezcuintle") that he had trapped that morning. Considered the most delectable of Guatemala's wild meats, the agouti would fetch a good price.

Though he would miss the meeting himself, Don Santiago let me know the village elders were gathering that very afternoon to plan their planting ceremony. After introducing myself to the elders, one leader asked directly: Would I live in the village, and was I accustomed to rural life? I recounted the places I had lived before, and they recognized the names of the villages and some related families. After conferring, the elders welcomed me to do research in the village and recommended a four-generational host family. I merrily settled in. The next morning Santiago sent his daughter to invite me to visit his home.

The road I traveled had been a mixed blessing for the village. It allowed them to get crops to market but also brought cattle ranchers, who bought up land cheap. After selling half his parcel, Santiago began planting two acres of maize on the hill behind his house. Despite the steep incline, the soils looked rich and well drained. He excitedly showed me that most stalks had three, even four ears. It was blue maize that his wife liked to cook into tamales, but for the dry season he planted white maize for the family's tortillas. I asked if he fertilized. No, he replied, that costs money. Instead he sows a green mulch cover crop (*Mucuna* spp., a nonedible nitrogen-fixing bean with medicinal properties) between maize seasons—just as his father taught him. In most Q'eqchi' villages, maize planting is a communal and ceremonial activity, but prepping the ground, mulching or weeding throughout the season, and harvesting the produce are solitary tasks. Santiago said he enjoys the collective work because it is fast and merry.

Santiago noted that he sprayed the fast-acting herbicide paraquat before planting, but thereafter would weed his field by machete four times (twice as often as farmers in the north). Back at the house, I asked how much he expected to fetch at market. Oh no, he said, selling your maize is foolish. You only get 20 quetzals ($2.67) for a sack in August, but six months later you'll be buying maize back at $10.67 or more. In his milpa he also grew sugar cane, four cacao trees, a patch of pineapples, and some watermelons, then intercropped soft squashes for "pepita" seeds, other pumpkins, and amaranth. The cacao trees came from the custom of mixing seven cacao seeds with one hundred ears of seed kernels: prior to planting, Q'eqchi' women weave special planting bags and whichever neighbor finds the cacao in his bag (*koxtal*) plants the cacao. During the milpa's fallow season those cacao seeds grow into fruiting trees. The number seven is significant because the couple must maintain abstinence for three days before and three days after the day of planting.

Back in the day, Don Santiago explained, if you needed money you had to carry a sack of maize on your back using a tumpline and walk four hours to the river port, where the maize would be sold downstream to banana workers on the United Fruit plantation. People also sold ancient artifacts they found in their milpas—a reminder of how long these lands

have sustained Maya families. These days, he said, instead of selling some of the maize harvest for cash, he preferred to work as a day laborer for the ranchers, earning $3.80 a day for machete weeding. (For people willing to spray pesticides without protection, the ranchers would pay an extra $1.30.) If he got desperate for more money, he would hitchhike to the Belize border and take a 2:00 a.m. bus ride to the district capital to do construction or yard work for $10.30 a day.

Returning home, his vivacious wife, Rosa, offered us gourds of maize dough dissolved in water. Rosa was also president of the women's club, which was trying to raise funds to buy a diesel cornmill they intended to operate communally to grind nixtamalized maize at a lower cost. Rosa explained that the private village mill was operated by a family who had sided with the military in the civil war. Twenty years later, many of the village women still felt uncomfortable going there.

Over the next few months I learned that other Agoutiville villagers planted hybrid corn during the wet season for market sale and planted their own saved heirloom seed during the dry season for home consumption. Squeezed among cattle ranches, nickel mines, sugar and banana plantations, and coffee farms, these farmers adaptively blended subsistence and cash cropping. Some sporadically used fertilizer and herbicides to save time to do off-farm cash labor, but most frowned upon the use of insecticides.

From conversations in Agoutiville, I learned to see how Q'eqchi' maize farmers make improvised observational decisions from day to day and from one season to the next, and not as part of a grand ideological master plan. With agronomic bricolage they select and combine Western inputs in ways that may seem dissonant to an outsider but make contextual economic sense for subsistence farming.[1] From countless hours of conversation and observation with maize farmers across many villages, it became clear to me that the Green Revolution was not—and never will be—a permanent, linear transition.

While small farmers use some modern elements, genetic modification of their sacred maize remains anathema. Although the corporations hawking GM technology claim their transgenic seeds will reduce pesticide use and "green" the Green Revolution, mounting evidence shows that GM crops

require even more herbicides than their predecessors. The differences between the Green and gene revolutions are better considered variations in the degree of the commodification of agriculture rather than differences in kind. Both have wrought greater corporate concentration, less farmer autonomy, higher costs of inputs, more economic precarity, and worsened health. Rather than constituting a momentous break from the past, GMO technology fell on "fertile ground"—or, rather, the eroded soil—of the Green Revolution. Despite Malthusian rhetoric of the necessity of GM crops to feed a climate-altered world, these chemical-seed packages offer little advantage to small farmers in countries like Guatemala, where grassroots leaders are already keenly aware of the dependency trap of pesticides peddled to them through US "aid."

A MILITARIZED GREEN REVOLUTION

The many domesticated foods of the Americas—maize, potatoes, tomatoes, chocolate, vanilla, beans, avocados, and more—transformed the world's cuisines, but lost much of their agrodiversity outside their places of origin. Euro-Americans were picky in the varietals they took from the Americas, and folly followed. Only two of Peru's three thousand potato varieties made their way to Ireland. They brought a newfound prosperity for Irish peasants, until a disease wiped out half the 1845 crop and the entire 1846 crop. A million people perished in the famine.

Lucky for Euro-American farmers and settlers, breeders were able to return to Peru to replace the blighted potato with more resistant varieties that Andean farmers had stewarded to grow along a four-mile-high vertical gradient. On the sides of the Machu Picchu ruins are ancient tiny terraces that appear to be experimental beds placed at different altitudes and angles of sunlight.[2] Here Michael Pollan nails it: "Instead of attempting as most farmers do, to change the environment to suit the single optimal spud—the Russet Burbank, say—the Incas developed a different spud [three thousand, in fact] for every environment."[3] Despite Ireland's cautionary tale to the world, however, twentieth-century agricultural modernizers persisted

in their vision to standardize, control, and manage nature scientifically to suit a homogenous seed.

The modernizers' so-called Green Revolution refers to "improved" seeds bred to maximize yield when paired with other technological inputs manufactured from petroleum (fertilizers, pesticides, herbicides, etc.). A surprising number of these postwar technologies launched in the 1940s and 1950s derived from military-funded R&D.[4] Financed with tactical philanthropic donations by the Ford and Rockefeller Foundations to research centers and land grant universities, the Green Revolution deeply benefited the robber baron wealth of families whose fortunes were connected to oil. Had public institutions invested research into organic inputs and the breeding of open-pollinated plants with a zeal equal to how they touted agrochemicals and hybrids, the Green Revolution might not have resulted in the current threat of vertically integrated GM crop systems and extreme corporate profiteering.[5]

From the outset, agricultural industrialization had roots in war. In the post–US Civil War era, munition foundries were converted to produce steel farm tools. These inspired the first gasoline-powered tractor in 1903, which spread across rural America in the 1920s. In tandem with the Model T, Henry Ford commercialized small tractors for the everyday farmer. Hybrid seeds were developed in part to suit the machines.[6] Small farmers who harvest by hand appreciate the fact that native maizes produce ears at different stalk heights that ripen at different times. For larger farms that can afford mechanical harvesting, however, crops need to mature uniformly. In 1938 only 15 percent of US corn production was harvested by machine, but in Iowa within a decade that figure had soared to 70 percent. Mechanization led to land concentration, because the wealthier farmers who could afford the newest machinery desired more acreage to make the most of their machines and the new seed offerings.[7]

The process of changing seeds began in 1917, when D. F. Jones, a graduate student working at a Connecticut agricultural experimental station, demonstrated that by detasseling corn, he could control male-female pollination. Doing so, he made a two-generational cross that resulted

in progeny more vigorous and homogenous than the parents. However, because Henry A. Wallace (1888–1965) became the key political patron for hybrid corn, Wallace, and not Jones, is remembered as the "father of industrial agriculture."[8]

Like the seeds he championed, Henry A. came from a long line of inherited "highbred" privilege. His grandfather, the first Henry Wallace (1836–1916), was the son of Irish immigrants. A newsletter and editorial writer, Grandfather Henry served on Theodore Roosevelt's Country Life Commission and was president of Gifford Pinchot's National Conservation Commission.[9] Henry A.'s father, Henry Cantwell (C.) Wallace, was a professor at Iowa State University, where he mentored George Washington Carver between 1891 and 1894. Young Henry A. was allowed to tag along to the fields with Carver, to whom he credited his lifelong fascination with plant botany.[10] When Grandfather Henry died, grandson Henry A. continued to work alongside his father, eventually converting the family newsletter into an influential newspaper, *Wallace's Farmer*. Young Henry A. also devised a "yield" contest at the Iowa State Fair in 1920 to generate human-interest news stories around the harvest.

When father Henry C. became Warren G. Harding's secretary of agriculture, Henry A. began selling hybrid corn, known then as "double-crossed seeds." In 1923, he won a gold medal in his own yield contest. Soon thereafter, Henry A. founded Hi-Bred Corn, the first commercial company devoted to hybrid seed production, which later evolved into Pioneer Hi-Bred (and was acquired by DuPont in 1997, then merged with Dow in 2017).[11] By age forty-four, Henry A., like his father before him, rose to become secretary of agriculture (1933–40) in Franklin D. Roosevelt's first and second terms, then ascended to vice president during FDR's unprecedented third term (1941–45). Harry Truman won the vice president spot during Roosevelt's fourth term. Although Henry A. Wallace lost the chance to be president after FDR's death, he left a different lasting mark on Cold War history through his support for Green Revolution research in Mexico that extended to Guatemala.

Intrigued by the Mexican Revolution and the diversity of that country's domestic maize crop, Henry A. Wallace organized a Spanish-language

luncheon for his USDA staff while serving as agricultural secretary. When FDR asked him to become vice president, Wallace agreed but asked to take a short sabbatical to tour Latin America to practice his Spanish before assuming the higher office. Because polio paralysis made it difficult for FDR to travel, Roosevelt asked Wallace to stand in for him at Manuel Camacho's 1940 presidential inauguration. Taking a slow road trip through the countryside on his way to Mexico City, Wallace expressed pity for the poverty he witnessed but also admired the potential for land reform. Upon his return, Wallace met with Rockefeller Foundation president Raymond Fosdick, with whom he shared Malthusian lamentations of Mexico's supposed overpopulation.[12]

In this tight world of political and scientific elites, John D. Rockefeller's grandson and heir, the young Nelson Rockefeller, was already coordinating FDR's Inter-American Affairs, promoting technical exchanges (*servicios*) with Latin American governments to strengthen commercial relations and counter communism in the region.[13] Even so, the Rockefeller Foundation was initially skeptical of extending its reach into Mexico. What eventually convinced the foundation's leaders to proceed were the commonalities they saw in public health and agricultural problems among both African American sharecroppers and Mexican peasants. In 1941 John Ferrell, who directed the foundation's health program, penned the proposal for an agricultural improvement project with FDR's ambassador to Mexico, Josephus Daniels, who happened to be Ferrell's old friend from North Carolina.[14]

Rockefeller Foundation president Raymond Fosdick endorsed the proposal and allocated funding to dispatch a team of three scientists to Mexico, with the expectation that they would report back on agricultural conditions and problems. One of the trio was Paul C. Mangelsdorf, a central figure in research on teosinte.[15] The trio's report noted that Mexican farmers would be loath to purchase US seeds and recommended that programs should instead focus on distributing fertilizer and subsidized seed. Based on the scientists' recommendations, the foundation entered into an agreement with President Camacho to open a Mexican Agricultural Program (MAP) within the Mexican Department of Agriculture that became known locally as the Office of Special Studies (OSS).[16]

Led by J. George Harrar, the MAP initiative began with a direct operational budget of $100,000.[17] Edwin Wellhausen was the program's first hire; he was tasked with identifying native (criollo) seeds for improved breeding.[18] Alongside Mexican scientists including Efraím Hernández Xolocotzi, Wellhausen's team collected more than two thousand maize samples, about which they published the Spanish-language book *Maize Races in Mexico* in 1951, which was translated to English in 1952 along with another survey of Central America.[19] Iowa State College and Henry A. Wallace's Pioneer Hi-Bred company sponsored a parallel Guatemalan survey.[20] They found more maize varieties in Guatemala's Cuchumatanes mountain range (an area about the size of Iowa) than exist in the entire United States.[21] In both these salvage surveys, the white men's ethnocentric naming nevertheless relegated maize varieties to a distant past (e.g., "Ancient Indigenous," "Pre-Columbian Exotic," "Pre-Historic Mestizo," and "Modern Incipient").[22] Wellhausen doubted "that the Guatemalan Indian . . . played a conscious role in the creation of new races of maize."[23]

Revisionist histories of this period have shown that the original scientific team were progressive New Dealers. In 1947, while operating out of a field station adjacent to the Chapingo National Agricultural School, the team named the first improved seed line Rocamex, in honor of their employer and host country. From prior experiences working in the poorest areas of the US South, they respected that the Mexican context was different from Iowa. They agreed with Mangelsdorf's recommendation that the Rockefeller Foundation should support development of OPVs (open-pollinated varieties) that could be freely shared, rather than hybrid seeds that would have to be purchased anew every planting.[24]

Iowan by birth and fresh from DuPont's wartime labs, Norman Borlaug (1914–2009) saw things differently. He first demanded to move his wheat research to Sonora to work with large wealthy plantation owners, but MAP director Harrar reminded Borlaug that their job was to serve the poor. Borlaug threatened to quit, but a senior New York–based foundation manager sided with Borlaug. Seeing an opportunity to use seed distribution to secure political party loyalty, the incoming Mexican president Miguel Alemán (1946–52) also favored hybrids.[25] By the mid-1950s the maize

team had abandoned their progressive ideals and shifted to research into commercial corn hybrids.

Increasingly concerned about "overpopulation," the Rockefeller Foundation thereafter followed Borlaug's elitist vision when setting up research centers in Colombia (1950), in Chile (1955), in India (1957), and in the Philippines (1960). Those programs emphasized yield above other social and cultural factors. As other donors (including the Ford and Kellogg Foundations) joined the Rockefeller effort, the Mexican research program evolved into a research program located *in* Mexico but no longer devoted *to* Mexico.[26] In 1966 Borlaug became the first director of the newly organized International Maize and Wheat Improvement Center (CIMMYT, pronounced see-MEET), sited outside of Mexico City. Under his leadership CIMMYT eagerly collaborated with the private sector. Three decades later, three-quarters of all seeds sold by private Latin American companies originate from CIMMYT germplasm.[27] Almost invariably these were chemical-hungry hybrids—which led to far-reaching consequences for human and planetary health.

HYBRID HOOPLA

Prior to 1935 the term "hybrid" colloquially referred to the crossing of any two different varieties. Maize's unique genetics, however, gave new meaning and methods to the term. While maize can self-pollinate—as each stalk contains both male and female parts—it more typically cross-pollinates. Over five to six days the plants shed prolific pollen, most of which falls within a couple of feet of the "father" plant, but in moderate wind conditions pollen can travel as much as half a mile.[28] Promiscuous pollination is what produces the rainbow of colors found in traditional maize. However, by detasseling (demasculinating) adjacent rows, a corn plant can be forced to self-pollinate over seven or more subsequent generations.[29] This self-pollination produces a pure, or "inbred," variety. Crossing two inbred lines creates stronger progeny, but the hybrid yield boost lasts only one season. When replanted to the F1 (first filial) generation, the yield drops by a third, and then drops again by a fifth in each of the F2 and F3 generations.

Although not biologically sterile, hybrid seeds are therefore effectively "economically sterile," as famously argued by Jack Kloppenburg Jr. in his research on the political economy of seeds.[30] To avoid cross-pollination, farmers should either plant just one hybrid seed type or carefully control pollination timing according to distance between fields. Should hybrid seeds happen to cross-pollinate or open-pollinate, the harvest and its natural offspring will be less productive than the grandparents. Although theoretically any farmer could breed his or her own hybrid seeds, economies of scale favor corporate seed breeders that rely on machines and standardized processes to produce reliable hybrids. Hybrids also need consistent soil moisture, thereby begging for irrigation systems and fertilizers to maximize yield potential.[31]

Early hybrid corn breeders could have selected plants for any number of admirable agroecological characteristics such as drought resistance, taste, restoration of soil fertility, or longer storability. However, under the Wallace family's leadership, the first-generation commercial seed companies created hybrids with excellent yield and suitable phenotypic qualities for machine harvesting (e.g., stiff stalks and strong roots). Seed companies strategically marketed these early hybrids to growers in states like Iowa, where they would lead to the most impressive harvest results. In the United States, the corn hybrid market share rose meteorically—from 0.4 percent in 1933 to 90 percent by 1940, and a near-universal 96 percent by 1945.[32] This all happened so quickly that by the 1950s, Henry A. Wallace himself became alarmed by the growing genetic homogenization of corn seeds and predicted disaster if breeders continued altering "the plant irrevocably and, in evolutionary lingo, more 'catastrophically' than all the millennia over which it had evolved."[33] He was right to be worried. Hybrids over the long term did not produce superior yields.[34] But private sector companies kept directing public scientific research toward the creation of "economically sterile" varieties.[35] Since commercial varieties have to be replaced every five to ten years, this kept professors busy.[36]

Hybrid seeds demand one input after another. Having exhausted finite supplies of natural fertilizers like seabird and bat droppings ("guano") at the end of the nineteenth century, US farmers needed a new source of fertilizer to optimize hybrid seeds. Once again, military R&D proved useful. In 1909 the German chemist Franz Haber had developed a method to synthesize ammonia out of nitrogen and hydrogen gases. Munitions factories seized the same technology to produce explosives.[37] After World War I, BASF and other chemical companies converted surplus ammonium nitrate into synthetic fertilizers that would enrich the nitrogen content of soils.[38] After World War II, the ten largest nitrate companies that had manufactured bombs pivoted their factories to produce chemical fertilizers.[39]

Those synthetic fertilizers were a meteoric commercial success. In 1940 only seven corporations were producing ammonia; by 1966, sixty-five companies had joined the business of converting petroleum to fertilizer. Between 1950 and 1980, farmers' application of nitrogen fertilizers increased by a factor of seventeen. The US corn crop yield doubled, and corn botanists like Mangelsdorf went so far as to suggest that fertilized hybrid corn had stopped the spread of communism.[40] With the subsequent overproduction of grains and falling commodity prices, however, US farmers found themselves obliged to apply more and more fertilizer to maintain a competitive edge, but with diminishing returns. The first time a farmer applies a synthetic fertilizer, it will produce twenty-four additional pounds of food. However, the next fertilized season renders a boost of only twelve pounds, then eight pounds, and eventually less than one extra pound by the fifth growing season.[41]

The luxuriant fertilized growth displayed by hybrid corn planted in dense rows invited new pests that had never been a problem in native maize fields. This created additional demand for newly invented insecticides, herbicides, and other pesticides (fungicides, rodenticides, and so forth).[42] Again, these all derived from military research. For example, the commercial herbicide (2,4-Dichlorophenoxyacetic acid, better known as 2,4-D) was originally concocted in a University of Chicago research lab,

then was field-tested at both Bushnell Army Airfield in Florida and at Camp Detrick in Maryland as a tactical biological weapon for destroying Japanese rice fields.[43] When the war ended, the American Chemical Paint Company (AmChem, which later merged into Union Carbide) began selling 2,4-D as Weedone. Through a publicity stunt on the Washington Mall and at the Chevy Chase Country Club in 1946, Dow Chemical helped normalize the perceived "safety" of 2,4-D by popularizing it as a lawncare tool to "control" dandelions, despite internal evidence of its toxicity.[44]

Meanwhile, the military continued its own internal research on tactical herbicides for combat in the Korean War and later in the Vietnam War. It also awarded contracts to private corporations to concoct new fast-acting defoliants and exempted those corporations from ordinary regulatory review under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Monsanto submitted 2,183 applications, followed by Dow at 129.[45] The Department of Defense chose five herbicide formulations for the Vietnam War—Agent Pink, Agent Green, Agent White, Agent Blue, and the most frequently deployed, Agent Orange—that each combined different amounts of 2,4-D, picloram, and 2,4,5-T (2,4,5-Trichlorophenoxyacetic acid).[46] The Pentagon hired Dow Chemical and Monsanto to manufacture these poisons. While 2,4-D's companion ingredient, 2,4,5-T, was eventually removed from the market due to dioxin contamination, the manufacture of 2,4-D may create dioxin by-products in smaller quantities.[47] Internal Monsanto documents from 1983, in fact, discuss the presence of dioxin in 2,4-D at 10 parts per billion.[48]

Such details were forgotten, perhaps because Monsanto paid epidemiologists like Sir Richard Droll, a retainer of $1,500 a day in the 1980s. Famous for helping establish a link between smoking and cancer, Droll changed tunes and began downplaying occupational chemical exposures as a cause of cancer. Reciprocating his corporate patronage, Droll also attacked a Scandinavian scientist researching links between dioxin and cancer.[49] Other civilian scientists, however, independently began to test 2,4-D for adverse health effects. A 1986 study published in the prestigious *Journal of the American Medical Association* showed that a Kansas farmer who used 2,4-D

twenty days a year had a sixfold higher rate of non-Hodgkin's lymphoma compared to all Kansas farmers.[50]

Synthetic pesticides share a similar militarized history. As related in a riveting revisionist history of the pesticide industry by Adam Romero, US farms became "wastelands" for absorbing toxic by-products from war industries.[51] To be sure, prior to the age of synthetic pesticides, US farmers were already spraying tens of millions of pounds of insecticides manufactured using heavy metals like lead and arsenic, as well as other more "natural" formulas from tobacco (for nicotine) and chrysanthemum flowers (for pyrethrins). The war on bugs, however, escalated with the wartime discovery of nerve gases.

Germany was the center of this experimentation, as the Nazis needed to develop insecticides that could be synthesized locally after Germany lost access to tobacco products from abroad.[52] Bayer's first pesticide was HETP (hexaethyl tetraphosphate), a synthetic substitute for nicotine that evolved into a broader class of chemicals known as neonicotinoids (now known to be responsible for bee colony demise).[53] Gerhard Schrader, another German chemist working for IG Farben (Bayer's parent company), accidentally discovered one nerve gas so potent that it was fatal within twenty minutes. The Nazis named it "Tabun" for the German word for taboo.[54] Schrader also discovered sarin, a nerve gas that agrochemists later emulated to create carbamate insecticides like Sevin, which disrupt insects' neurotransmitters (known in toxicology circles as "cholinesterase inhibitors").

After both wars the Crop Protection Institute supported many land grant universities, especially in California, to screen toxic wastes from the military-industrial complex for their potential use as pesticides.[55] Military research also indirectly propelled the most famous pesticide of all time, DDT (dichlorodiphenyltrichloroethane), into agriculture. An Austrian chemistry student by the name of Othmar Zeidler invented DDT in his laboratory in 1874. As a chlorinated hydrocarbon, it was insoluble in water and known to persist for a long time in the environment with a fifty-year half-life. A Geigy scientist based in Switzerland, Paul Müller, suggested in 1939 that it might be applied to killing bugs.[56] The US military then began

researching DDT for use in protecting troops from malaria in the Pacific campaign. Toward World War II's end the Swiss government collaborated with the US Department of Agriculture to test DDT on the Colorado potato beetle. Soon DDT became ubiquitous for insect control in farms, homes, and communities around the world. Although the United States banned DDT in 1972, we are still living with its adverse epigenetic health effects, including transgenerational cancers.[57]

Although pesticides are not the only cause of exploding cancer rates, the correlation is strong—from a lifetime risk of one in thirty people in 1900 to one in five by 1980, one in four by 1990, one in three just five years later, and one in two by 2000. Today US farmers apply six pounds of pesticide for every man, woman, and child in the country. Globally that figure is one pound per capita. Even though impoverished countries use fewer agrochemicals, 99 percent of acute pesticide poisoning fatalities occur in the Third World due to lack of protective equipment.[58] This human toll appears to have been for naught. The late entomologist David Pimentel showed that pest-driven crop losses actually increased from 31 percent in 1942 to 37 percent by 1987.[59] Robert van den Bosch puts it bluntly: "Pesticides are an ideal product: like heroin, they promise paradise and deliver addiction. And dope and pesticide peddlers have only one cure for addiction: use more and more of the product at whatever cost in dollars and human suffering."[60]

LEGACIES OF THE GREEN REVOLUTION

The focus on maximizing yield on large monocropped farms was, above all, a political choice.[61] When agronomists compare the yields of rainfed native maize per acre to that of petrochemically boosted US corn hybrids in the Great Plains, the US hybrids will, of course, win Wallace's rigged contest. However, if they consider the nutritional and cultural value of the dozens of free species cultivated among maize plants and in the fallows of small but carefully tended swidden farms, then milpa and other polycropped systems would emerge victorious. Green Revolution technologies are clearly not scale (nor taste) neutral. Large agricultural operations that

TABLE 3. Crop loss before and after the Green Revolution

Reason for crop loss	*Percentage lost in 1942*	*Percentage lost in 1987*
Insects	7%	13%
Weeds	13.8%	12%
Plant pathogens	10.5%	12%
Total	31.3%	37%

Source: Pimentel, "Is *Silent Spring* behind Us?"

have the wherewithal to purchase the complete set of interconnected inputs—machinery, fertilizers, pesticides—benefit more from them than poor farmers.[62]

As argued by Vandana Shiva's in her prescient book, *The Violence of the Green Revolution*, to convince government policymakers in the Global South to ignore the clear advantages of millennia-tested local agricultural knowledge required significant Western propaganda.[63] Building on Rockefeller-funded conferences and scholarships, the World Bank underwrote this process of agricultural concentration. As both a lender and knowledge broker the Bank played a critical role in touting the superiority of Green Revolution technologies to Third World elites.[64] Former secretary of defense Robert McNamara was the first non-Ford person to be president of the Ford Company, before becoming president of the World Bank.[65] At McNamara's initiative, the World Bank championed the creation of a consortium of research groups modeled on CIMMYT in Mexico. Established in 1971, the Consultative Group on International Agricultural Research (CGIAR) now coordinates fifteen such research centers.[66]

Through workshops, training sessions, conferences, exchanges, papers, and more mechanisms of groupthink, these institutional assemblages crafted an intellectual apparatus to bolster the Green Revolution against a growing body of evidence of its adverse social and ecological impacts. Prior to the advent of social media and other improvements in telecommunications, the ability to travel and connect ideas was once a privilege of the elite only. Although peasant and food movements have recently been able to connect their ideas across borders through umbrella organi-

zations like Via Campesina, grassroots networks remain at a comparative disadvantage to the highly endowed and globally institutionalized system that promotes biotech.

The geopolitical impacts were significant. Green Revolution proponents espoused that modernizing agriculture would free labor for industrialization, provide food for growing urban areas, and boost national income from the export of new cash crops. By reframing the discussion as a technical problem of production, they diverted attention from the grassroots clamor for land redistribution and agrarian justice. Just when developing countries declared independence from colonial empires in the 1950s, the Green Revolution unfortunately preempted true democratization and decolonization.

The shift to industrial agriculture left new nation-states in the Americas, in Asia, and in Africa beholden to geopolitically controlled oil extraction systems overseen by world powers. Both communists and capitalists alike crushed their countries' small farms (Mao and Stalin, infamously so) and subsidized large-scale industrial agriculture. To draw the Third World into their orbit, Western development banks proffered credit schemes that left developing countries hopelessly indebted and beholden to structural adjustment policies (SAPS) in the 1980s.[67] Government policies favoring export crops became one way impoverished countries could generate dollars to settle interest on those debts. Guatemala's history shows that fertilizer distribution was another key Cold War weapon in the 1980s Maya genocide.

A CAMOUFLAGED GREEN REVOLUTION

After the 1954 CIA coup that halted President Jacobo Arbenz's land reform in Guatemala, US intervention into the country's agrarian affairs proceeded apace. Between 1954 and 1957, the United States channeled $100 million in aid to Guatemala's military junta for large agro-export plantations of cane and cotton on the south coast.[68] Through the Cold War–inspired Alliance for Progress, the US government also poured funds into projects to convert the rich volcanic soils of the Maya highlands into producing pesticide-laden vegetables and fruit for export.[69] Although these cash crops

initially brought increased incomes for highland Maya farmers, those who also continued to plant native maize *por el gusto* ("for enjoyment") and *por el gasto* ("for frugality and autonomy") have greater food security today.[70] The photo of one urban road blockage (see fig. 14, chap. 6) shows that just meters from the edge of any highland town are traditional milpas.

As chronicled by a Catholic priest who witnessed the early stages of the Green Revolution in the highlands of Guatemala in the 1960s, Maya farmers were initially skeptical of fertilizers.[71] The bumper harvests of early converts, however, encouraged others to jump on the input treadmill. Following a typical Green Revolution pattern, production boomed and then stagnated.[72] Within a few years the fertilizer seemed to have "burned" the soil, compelling farmers to double or even triple its application to maintain yields.[73] Even while the acreage devoted to maize production remained constant, the national use of chemical fertilizers increased nearly sevenfold during the 1960s and 1970s.[74] By creating top-heavy plants, fertilizers exacerbated small farmers' losses to strong winds.

US agribusiness corporations flooded the Guatemalan market with pesticides in the 1970s, including DDT even after it was banned in the United States. A 1979 WHO study showed that Guatemalan women had the highest documented levels of DDT in breast milk in the world: ninety times higher levels than recommended by the WHO.[75] The US government also sponsored aerial bombardments of malathion to protect commercial crops from the Mediterranean fruit fly. To this day many Maya highlanders believe that this pest control program brought snakes, worms, and more pests to their fields that can only be combatted with costly chemicals. As Nicholas Copeland notes, such conspiracy theories are a way of describing "an unjust and racist political order motivated by greed" and identifying "states and corporations as interlinked and intentional agencies . . . willing and able to destroy Mayan life to turn a profit."[76]

To offset the conversion of highland subsistence farms to cash crops, the gringos recommended bulldozing roads into the northern lowland rainforest to attract colonists who might plant commodity corn or establish cattle ranches to satiate the rising US demand for cheap beef in fast food.[77] With sweat, axes, and machetes, Q'eqchi'- and Spanish-speaking settlers

began to transform the northern lowlands from a region of dense tropical forests into the breadbasket, or rather the "tortilla basket," of Guatemala. Ranchers followed behind, buying up the cleared land and displacing the agricultural frontier northward.[78]

The United States supported agricultural modernization through a parastatal Institute of Agricultural Science and Technology (ICTA) that was loosely managed by Guatemala's Ministry of Agriculture.[79] Although ICTA initially tried to develop hybrids for the highlands, this majority-Maya region tried and then rejected them.[80] Today less than 1 percent of highland Maya farmers plant hybrid corn. Under military control, the lowlands became Guatemala's dynamic new zone for national corn and bean production. Here ICTA had better luck introducing hybrid seeds (one colloquially called Selection in 1978 and another known by its number, HB-83, in 1995). Many Q'eqchi' and even poor ladino (mestizo) farmers disclosed to me that when agronomists representing a genocidal state showed up with seeds, they felt compelled to obey and try them.

To give one example that happened in the Ixcán lowlands, the right-wing coffee planter José Luis Arenas Barrera (aka "the Tiger of Ixcán") administered the government's corn seed distribution program during the Castillo Armas dictatorship, before presiding over the Ministry of Agriculture (1970–72). For his "crimes against the poor," including the theft of Maya lands and chronic underpayment or use of fake money to pay plantation laborers, the Guerrilla Army of the Poor famously assassinated Arenas Barrera in 1975. His sons became born-again Christians, ran a CIA front, and turned the family coffee plantation into an "Armed Evangelical Military Camp" staffed with missionaries from the Wycliffe Bible Translators (an organization loosely connected with Nelson Rockefeller) and the Church of the Word.[81]

Along with distribution of chemicals to eradicate mosquitos and flies, the Ronald Reagan administration militarized Guatemala's Green Revolution by giving armaments to General Efraín Ríos Montt, who seized power in 1982–83. Ordained as an evangelical minister for Church of the Word while in exile in the 1970s in Eureka, California, Ríos Montt became friends with Jerry Falwell, who with other televangelists had helped elect Reagan.

Also trained in counterinsurgency at the infamous School of the Americas in Fort Benning, Georgia, Ríos Montt launched a scorched earth campaign that he branded "rifles and beans" (*fusiles y frijoles*). With support from missionaries, Ríos Montt preached to the Guatemalan public in televised addresses, saying, "If you are with us, we'll feed you, if not, we'll kill you."[82] During his regime the army killed about seventy thousand people, most of whom were Maya.[83] During this period USAID generously funded the Committee of National Reconstruction, which was under the command of air force colonel Eduardo Wohlers (another School of the Americas graduate), to continue convincing highland Maya farmers to convert to agricultural export crops amid the violence.[84]

War eroded other structures of food security. Besides delivering machine guns, the Reagan administration began selling food "aid" in 1985 to Guatemala through PL-480. Prior to this, Guatemala had a decentralized maize storage system run by the National Agricultural Commercialization Institute (INDECA), which bought grain at guaranteed prices and was able to store up to 820,000 quintals.[85] However, Ríos Montt raided the national silos to distribute the grains to military sympathizers as part of his rifles-and-beans campaign—but then never replaced the grain. The silos fell into disrepair. With a population of 17 million today, Guatemala now has storage capacity for only 302,000 quintals across just three sites. After 1997 the silos stopped buying local maize and have since only served as temporary storage places for food aid.[86] Small maize farmers are left to fend for themselves. INDECA's silos once strictly controlled humidity below 14 percent to prevent mold. However, maize sold today through private middlemen without regulatory oversight often becomes a breeding ground for aflatoxins, which when consumed can cause liver damage and other ailments.

All told during the civil war, the Guatemalan military attacked some six hundred villages, killing an estimated two hundred thousand people, 83 percent of whom were Maya.[87] Troops often burned subsistence crops of communities they merely suspected to be guerrilla sympathizers. The military's scorched-earth policy is one of many reasons why the United Nations' Truth and Reconciliation Commission concluded the Guatemalan government had committed genocide, as this military memo attests: "Their

sowings must be destroyed to cut them off from their sources of supply and to oblige them to surrender due to hunger or to reveal themselves for their movements through the areas they visit and thus be able to fight them, with the objective of disorganising them."[88] More than a million people (in a country of just seven million in the early 1980s) fled for their lives, taking refuge in the forests or migrating northward to refugee camps in Chiapas, Mexico.[89] With aid from missionaries, the military also resettled "pacified" communities (mostly Q'eqchi') into "development poles" across Guatemala's wide lowland zone south of the Petén panhandle.[90]

In the context of this mayhem and forced relocations, maize diversity suffered.[91] A team that returned in 2001 to the villages originally surveyed in the 1940s by US scientists found only thirteen of the thirty previously recorded maize varieties.[92] Military violence curtailed collective rituals and community labor, interrupting intergenerational learning that occurs during those events. In every village where I worked, Q'eqchi' elders lamented the loss of traditional maize varieties they had planted before the war.

Q'eqchi' farmers call modern hybrids "seven-week corn" because the plants mature faster than native varieties. As I learned in Agoutiville, villagers who grow hybrids for market can fetch a higher price because their crop is ready before the slower-growing highland maize is ready for harvest. ICTA's hybrids also produce a maize plant with a shorter stalk, a smaller cob, and larger kernels, making the ears easier to shuck for commercial sale. Genetically uniform hybrids may yield more total quantity but they are also vulnerable to pests in storage and in the field. For example, since 2008 a "tar spot" disease (*mancha de asfalto*, *Phyllachora maydis*) has caused losses among Petén farmers planting hybrids.

Many small farmers want to return to the old ways of planting. As one Guatemalan woman eloquently explains, "Before we stored our [maize] in the husk to keep the seeds, but then they convinced us that hybrid seeds were better, produced more. We've learned now that if you don't apply all the inputs, this hybrid corn doesn't work and is very expensive, but now we've lost our local [creole] seeds."[93] During my ethnographic research, many Q'eqchi' farmers were disillusioned with hybrids but could not source

the native seeds they once planted. After the promising new NGO REDSAG (National Network for the Defense of Guatemala's Food Sovereignty) was founded in 2004, Maya farmers throughout Guatemala responded enthusiastically to traditional seed exchanges and other regional seed fairs.

Maya farmers have resisted the Green Revolution in other ways as well. As documented by myself and others, small farmers "recycle" hybrid seeds despite yield losses upon replanting.[94] In the north I found similar practices of small farmers replanting corn hybrids for commercial sale, but also planting native maize varieties for local consumption. At least 91 percent of highland farmers who apply fertilizer save their own seeds. Although small-scale maize farmers have engaged with the Green Revolution, "they have done so in ways that intersect with rather than subsume traditional practice"—to the displeasure of agricultural attachés posted to the US Embassy who monitor agricultural trends for gringo "gain."[95]

GLOBAL AGRICULTURE INFORMATION NETWORK

The USDA has an unusually long history of donating self-interested "aid" to the Global South. The US State Department began formally placing employees abroad in 1901 through its Section of Foreign Markets. Then in 1930 the Herbert Hoover administration signed into law the creation of an agricultural attaché service that held diplomatic status, which became known as the Foreign Agricultural Service division (FAS). Four years later Congress passed another trade law requiring the US president to consult with the Department of Agriculture about agricultural tariffs. Agricultural Secretary Henry A. Wallace delegated this responsibility to the FAS. He also sent Lester D. Mallory to Mexico in 1939 as agricultural attaché to pursue food, rubber, medicinal plants, and other strategic war commodities. In that role Mallory served as Wallace's personal escort on his famous 1940 tour of Mexico that led to the creation of CIMMYT. After a stint in Jordan, Mallory was promoted to Ambassador to Guatemala in the post-coup years of 1958–59.

FAS personnel also gather data on foreign markets on behalf of US agricultural interests, which is collated and organized in a searchable da-

tabase through the Global Agriculture Information Network (GAIN). The Guatemalan FAS currently boasts six full-time employees who produce annual reports on sugar, coffee, processed food ingredients, retail foods, hotel and restaurant procurement, and import-export regulations. The team's incredibly detailed "Grain and Feed" newsletters pimp intimate details about seasonal maize farming of subsistence farmers to US corporations and farm lobby organizations.[96] The FAS's *Agricultural Biotechnology Annual* report overtly mulls how to force Guatemala to lift its tacit ban on GM crops.

The FAS bureau also sponsors high-level exchanges between Guatemalan and US business interests.[97] Invitation lists that I trawled from deep within the USDA website show that Guatemalan ministers, journalists, and other political appointees are regularly invited to agricultural expositions, where they are wined and dined by representatives from Monsanto, Pioneer, and other transnational corporations.[98] The USDA office of the undersecretary for Trade and Foreign Agricultural Affairs, led by Ted McKinney, recently arranged 450 personal meetings for a delegation of thirty-four agribusiness companies to Guatemala.[99]

Other USDA-sponsored training programs include the Norman E. Borlaug International Agricultural Science and Technology Fellowship Program for early- to mid-career research scientists and faculty to spend six to twelve weeks with a US mentor, who will reciprocate with a visit to Guatemala. According to the program's flyer, the program explicitly seeks to "address obstacles to the adoption of technology such as ineffectual policies and regulations" and expand research into "GM corn adaptable to the highlands or remote areas of Guatemala."[100] In another case, Madelyn E. Spirnak, biotechnology advisor to the US State Department, met in 2005 with Guatemalan congressional representatives to promote GM technology during a vulnerable moment of hunger crisis following Hurricane Stan.[101] Two other embassy fellowship programs connect policymakers from developing countries with US experts through exchanges to "strengthen and enhance trade links with the United States."[102]

The US Embassy regularly hosts academic speakers like Dr. Wayne Parrott from the University of Georgia, to parrot corporate talking points.[103]

Descended from Guatemalan plantation owners, Parrott posts regularly on the website AgBioChatter to harass scientists like Gilles-Éric Seralini, the French scientist who first documented Roundup's carcinogenicity.[104] Parrott's university website shows he regularly trains postdocs, who then go on to work for Bayer-Monsanto on maize genetics.

Surveys show that Guatemalan farmers almost universally reject the hypothetical prospect of planting GM corn. One intriguing nuance is that they are less concerned with the ethical issues of trans-species genetics that seem to mesmerize their gringo consumers.[105] They are also more concerned about yield instability and dependence on foreign inputs.[106] For certain, they have justifiable historical reasons to be wary of a gringo gene revolution designed for US growing conditions.

GMOS 101

The gene revolution began when the founders of Genentech, Stanley Cohen and Herbert Boyer, developed a technology that could splice genes into bacteria for the development of pharmaceuticals and medical treatments in the 1970s. A key US Supreme Court ruling in 1980 allowed corporations to patent living organisms (*Diamond v. Chakrabarty*); that case involved a bacteria designed to break down crude oil spills but said nothing about food. The food question fell to the FDA, which made an administrative decision in 1992 that GM crops were "substantially equivalent" to other crops and needed no special regulation.[107] Two years later the FDA rubber-stamped the first commercial GM food crop, Calgene's Flavr Savr tomato, whose genes were engineered to delay ripening and maintain a longer shelf life.

Unlike the implicit promise of its nomenclature, the Flavr Savr tomato had little flavor and proved to be a commercial disaster. Monsanto gradually bought the company for $320 million between 1995 and 1997 and pulled the product from the market in 1997.[108] However, for a brief period Flavr Savr seeds were being produced in Guatemala outside of the Q'eqchi' capital of Cobán. When Guatemalan environmentalists inadvertently learned the seeds were being sent through regular mail without respect for

biosafety protocols, they triggered a policy review that led to the country's tacit ban on GM crops.[109]

Corporations raced during the 1990s to genetically modify key grain and fiber crops paired with their signature weed killers. As Monsanto CEO Bob Shapiro commented in a World Bank group magazine, "It is truly easy to make a great deal of money dealing with very primary needs: food, shelter, clothing."[110] Monsanto soon pushed to the front of the pack and emerged victorious with the first major herbicide-resistant crops—Roundup Ready soy (1996), then canola and cotton (1997), corn (1998), and eventually alfalfa and sugarbeets (2005). These GM seeds were born addicted to chemicals. Monsanto also became the first major purveyor of another type of GM seed: Bt technology (marketed under the name YieldGard), which integrates a protein from a bacterium, *Bacillus thuringiensis*, that produces a toxin lethal to some insects. Every cell of a Bt crop, including the edible parts, contains tiny amounts of this toxin.[111] This proved hazardous to nontarget species, like Monarch butterflies, which can be killed by Bt-laced pollen that falls on their milkweed foliage.[112]

Both types of GM crops disrupt the ecological balance, whether via toxic herbicide residue or toxin-infused plants.[113] Glyphosate and its metabolites can persist in the soil longer than originally imagined. In fact, British Columbia scientists found glyphosate residue in wild species harvested by First Nations more than a year after aerial spraying.[114] Besides being absorbed by nontarget plants and being toxic to fish and mammals, the herbicide can harm beneficial insects.

As any entomologist or plant scientist knows, bugs reproduce within days or weeks and weeds sprout at least annually, so the question is not whether pests and weeds will become resistant to Bt or herbicide packages, but "how fast."[115] Could crops themselves become weeds? Can herbicides affect beetles and insects that otherwise might eat weed seeds?[116] Can trace amounts of these chemicals alter human (or animal) microbiomes at levels that are not considered carcinogenic but which can nonetheless harm their health?[117]

Most of these systemic questions remain unanswered, in part because Monsanto has sustained a revolving door with the key government regu-

latory agencies tasked with overseeing its technology. Michael R. Taylor, for example, worked at the FDA between 1976 and 1980 and then moved to a private law firm whose clients included Monsanto. A decade later he returned to the FDA as deputy commissioner for policy; for three years he helped Monsanto win approval for its bovine growth hormone. After working at the FDA, he published a toxicology article that helped persuade the FDA to allow low-level carcinogens in food.[118] After his next stint at the USDA, Monsanto hired him as a vice president for public policy, where he served from 1998 to 2001.[119] Taylor reappeared in 2009 in the Obama administration, where he acted as a senior food safety advisor to the FDA commissioner.

Another former Monsanto lawyer and board member, Michael "Mickey" Kantor, chaired the Clinton-Gore election campaign in 1992, went on to become Clinton's trade representative from 1993 to 1996, and was then promoted to US secretary of commerce between 1996 and 1997. Yet another Monsanto scientist, Margaret Miller, became deputy director of the FDA. Rufus Yerza, former chief counsel for Monsanto, became Clinton's appointee to the World Trade Organization. The EPA has also employed former or soon-to-be Monsanto officials in top leadership positions. Assistant Administrator Linda J. Fisher left the EPA in 1993 to become a Monsanto vice president from 1995 to 2000; she then returned to the EPA in a higher position.[120] The EPA's first director, William Ruckelshaus, went on to serve on Monsanto's board after leaving government service.[121]

Last but not least, US Supreme Court justice Clarence Thomas worked for Monsanto between 1977 and 1979. Despite his infamously long silence on the court, Thomas nevertheless volunteered to write the brief in a 2001 case for Pioneer Hi-Bred that solidified GMO patent rights, and then wrote another brief in 2013 in a ruling for Monsanto against seventy-five-year-old farmer Vernon Bowman for patent infringement. Bowman's crime? In 1999 he bought generic soybeans destined for market, sprayed them with Roundup, identified the resistant seeds, and replanted them.[122]

Farmers are clever folk and love frugal hacks.[123] GM seeds are, therefore, a tricky business, because "seed is grain is seed is grain" and thus every corn kernel "is both means of production and, as grain, the product."[124]

Because seeds naturally regenerate themselves, they resist subsumption to the commodity form. Although replanting hybrids makes little economic sense, GM varieties can in theory be replanted year after year with no consequence for production (although, in the case of corn, the GM product is based on a hybrid variety).

To prevent shrewd farmers like Bowman from replanting any of these GM seeds, farmers must sign legal agreements not to replant "second generation" seeds. Monsanto has ruthlessly pursued and prosecuted farmers for patent infringement and once even employed the infamous Pinkerton Detective Agency to enforce its patents. Former CEO Bob Shapiro claimed that farmers *wanted* this surveillance: "No one is eager to pay fees, but have accepted that that's the price of getting better quality and new traits. What the farm community has been very emphatic on is that they don't want to have some farmers paying and other farmers cheating by retaining seed and not paying for its use."[125] As of this writing, Bayer still maintains Monsanto's convenient 1-800-ROUND-UP phone number for anonymous snitching: just press (option) 3 to inform about the "misuse of seed." Farmers report having been tailed, having their phones tapped, having their signatures forged, or being entrapped by Monsanto agents posing as black-market seed sellers.[126]

Most North American farmers who find themselves in Monsanto's crosshairs settle in arbitration, paying on average $412,000.[127] By 2006 Monsanto had collected between $85 and $160 million from out-of-court settlements. One notable exception was Canadian canola farmer Percy Schmeiser who refused to be silenced when Monsanto sued him. Monsanto also ruthlessly prosecutes seed sellers, cooperative silos, and even country stores[128]—claiming that it must do so to offset the $2 million a day it reportedly spends on research. However, Bill Freese from the Center for Food Safety estimates that Monsanto spends more money harassing farmers than it spends on its R&D budget.[129]

Beyond legal bullying, Monsanto has made other troubling moves to force farmers to pay for seeds year after year. Monsanto acquired a small biotech company, Delta & Pine Land, which had patented "genetic use restriction technology" (GURT) (pat. no. 5,723,765) to produce sterile

second-generation seeds. The public outcry that this "Terminator" technology could irreversibly threaten the world's food supply led Monsanto to pledge that it would not move forward with commercializing GURT products. However, the other major players—Syngenta, Pharmacia, DuPont, and BASF—independently developed this same technology and filed fourteen GURT patents by 2001.[130] Despite current industry promises not to market these sterilizing seeds, agribusiness corporations have a strong profit motive to oblige farmers forevermore to purchase their patented seeds.[131]

To be sure, control of seeds is just a conduit for the greater profits to be made in complementary agrochemical inputs. Roundup Ready crops introduced in 1996 were a salve for the expiration of Monsanto's patent on its signature Roundup herbicide in September 2000. For another fifteen years they obliged farmers to continue buying Monsanto's proprietary herbicide. Starting in 2015, however, the Roundup Ready seed patents themselves began to expire, meaning farmers like Bowman could then legally buy and replant the seeds. How then to compel farmers to continue purchasing their complete packages? Monsanto began launching new products with more than one genetic modification known as "stacked traits." More, however, is not always better. In the American Midwest, one of Monsanto's newest genetically modified corn products, SmartStax, which has eight stacked genes, yielded no more than a less expensive product with only three inserted genes.[132]

Argentina's experience with Roundup Ready soybeans is another illustrative example of Monsanto's false promises. When acquiring permission to enter the Argentinean market in 1996, Monsanto lowered seed prices by a third, waived all royalties, and promised government officials that it would never sue farmers who replanted the seeds.[133] Through backchannels, however, Argentina was compelled to establish a registry of "seed users" to help breeders enforce their patents.[134] Breaking its promise, Monsanto then attempted to levy patent infringement fines on any soy being sent to European ports, threatening an important source of expected revenue (worth $10 billion annually) of an Argentinian state budget still in recovery from its 2001 financial crisis.[135]

A decade later, Roundup Ready soybeans had spread to 60 percent of

the country's cultivated land. The average farm size in the country more than doubled and almost a third of farmers (160,000 families) went out of business.[136] Surviving farmers had to increase herbicide applications dramatically to combat the glyphosate-resistant Johnsongrass spreading across at least ten thousand hectares of the pampas. Annual use of glyphosate (the active ingredient in Roundup) increased from just one million liters before the introduction of Roundup Ready soybeans to 150 million liters by 2005.[137] Scientists also began noticing increased occurrence of health problems in Argentina's soybean production zones, including reproductive, thyroid, respiratory, kidney, and dermatological diseases.[138]

In consolidating the corporate monopoly over the agricultural cycle, GM seed technology is perhaps more an accelerant than a break from the past. Both the Green and the gene revolutions homogenized crops on a massive scale.[139] The tight coupling of seeds and proprietary agrochemicals with GMOs intensified the pace of major corporate mergers and acquisitions—more than four hundred consolidations between 1996 and 2018.[140] Despite corporate name changes, most of the original chemical companies involved with military R&D in the world wars remain key players.

Monsanto would like us to believe that "sustainable agriculture is possible only with [continued advances in] biotechnology and imaginative chemistry."[141] But the obsession with genetics to solve world hunger ignores the greater potential of land reform, fair markets, or other state interventions to support small farming systems. Both the Green and the gene revolutions aim to replace farmer knowledge with the "mental monoculture" of standardized advice from agricultural extension agencies and pesticide vendors.[142] Yet, blindly following recommendations narrowly focused on crop yield would be folly for small farmers who must also worry about storability, drought resistance, seed variety against pests, culinary preferences, and harvest time. Above all, peasants must try to reduce risk, because ill health or crop failure can mean starvation for people living off the land without government subsidies.[143] As a people historically subjected

to debt peonage, self-reliant Maya farmers like Don Santiago Mo have an understandable aversion to spending money on seeds.

If not for Maya farmers, perhaps we ought to be worried for ourselves. Although it is hard to measure, according to 2015 data from the FAO, humanity has already lost three-quarters of the seed diversity that existed prior to the Green Revolution.[144] If the center of the world's genetic maize diversity in Mesoamerica gets irreversibly contaminated by homogenous GM strains, humanity's third-largest food crop could become susceptible to an unsolvable plague.[145] Have we learned nothing from the nineteenth-century Irish potato famine or the 1970s corn blight?

FOUR

Legal Maze

While in Paris in 1927, Guatemalan diplomat and writer Miguel Angel Asturias (1899–1974) discovered a colonial priest's transcription of the pre-Columbian Maya creation story, the *Popol Vuh*. Asturias wove elements of this narrative into his 1949 literary masterpiece, *Hombres de Maíz* (*Men of Maize*). In the opening passage of this novel, the Earth calls upon the main character, maize farmer Gaspar Ilom, to lead an Indigenous guerrilla rebellion against the ladinos (mestizos) who have intruded upon Maya lands to grow corn for profit: "The [corn]grower sets fire to the brush and does for the timber in a matter of hours. . . . Smoke, flames, ashes. Different if it was just to eat. It's to make money . . . The corn impoverishes the earth and makes no one rich. Neither the boss nor the men. Sown to be eaten it is the sacred sustenance of the men who were made of maize. Sown to make money it means famine for the men who were made of maize."[1] Later in the story, Ilom observes: "Those who sow corn for profit leave the earth empty of bones, because it is the bones of the forefathers that give the maize, and then the earth demands bones, and the softest ones, those of children, pile up on top of her and beneath her black crust, to feed her."[2] Another character comments, "The corngrower leaves the land in the end, because he's beaten it to death, like killing a snake, with his planting and planting, over and over . . . It's progress advancing with the tread of the conqueror."[3] In these juxtapositions between maize's use value (subsistence) and corn's exchange value (commodity), Asturias's novel seems almost prophetic.

The word "maize" comes from the Taíno word that Columbus heard in the Caribbean: *mahiz*. Centuries later, Carl Linneaus used this same

Indigenous word as a species label in his taxonomic system. The genus *Zea* comes from the Greek, meaning "life-giving."[4] Mesoamerican languages, of course, use other words as well. In Mayan tongues they are typically variations of *ixim*. The reason we tend to call *Zea mays* "corn" in English goes back to early colonial Brits, who described all cereals (including wheat) as corn. To differentiate maize, they called it "Indian corn." Of course, commercial corn and maize are the same species, so pollen flows freely between them. Nevertheless, in writing about *Zea mays* I am making strategic use of the plant's two synonymous English terms to differentiate between colonized, industrial, foreign, or genetically modified *corn* and sacred, embodied Indigenous native *maize*.

Colonizers and neo-colonizers have leveraged laws and trade policies to supplant maize with commodity corn across different historical periods (Spanish invasion, colonial period, liberal nationalism, and modern militarism and neoliberalism). Although trade agreements and farm bills make for dry reading material, more than any other factors, NAFTA in Mexico and the DR-CAFTA in Central America have made ashes of the Mesoamerican small farming sector by allowing the United States to dump cheap corn on their markets. As Asturias foretold, this has driven a migration exodus northward across borderland deserts that have claimed the bones of about ten thousand Maize People, including children, since 1994 when NAFTA went into effect. While hypocritically condemning the emigration induced by its own trade aggression, the US government continues to bully its southern neighbors to boost the profits of corporate agribusiness. Although small farmers tenaciously survived the Green Revolution, the technicalities and tricky treaties hidden within the "legal mazes" of verbose trade agreements have tragically ruined many of their livelihoods.

CORN AND CONQUEST

While Jared Diamond and other cultural historians credit germs, guns, and steel for European conquest, food was arguably more consequential. In their chronicles about occupying the capital of Tenochtitlan, the Spanish hijacked the preexisting tribute system of the Aztec Empire to support the

continued occupation and invasion of the mainland Americas. In 1533 Cortes's personal household received fifteen loads of maize, eighty baskets of tortillas, game meat, fruit, salt, chilies, and firewood every week.[5] Although they initially depended on local foods, the Spaniards derided them as inferior—if not heathen (in the case of amaranth)—and aimed to supplant them with their Old World diet of wheat, olive oil, wine, dairy, and meat. As much as the quest for gold (*el dorado*), Spanish mercenaries' expeditions moved southward in search of familiar Iberian agri-scapes, which they found in the South American pampas. As the colonizers settled across the continent, they began demanding tributes in cash rather than local foods.[6] To hoard luxury items like capers, wine, and olives, they passed laws prohibiting Indigenous consumption of Spanish imports. Spanish officials even debated for five years whether Indigenous peoples were sufficiently human to eat European meats and later obsessively regulated butcheries and wheat mills.[7]

The litany and specificity of early municipal edicts (*actos de cabildo*) about food reflect the Spaniards' preoccupation with sabotage and starvation. The specific details about how comestible tributes should not be contaminated with dust, insects, spit, or spiderwebs suggest that colonized subjects must have been adulterating food to obstruct their new overlords.[8] Indigenous leaders meanwhile filed copious legal complaints to the Spanish Crown about how the colonizers' cattle were decimating their maize fields. Like narcissistic abusers, the invaders made counteraccusations that Indigenous people were to blame by "maliciously planting their crops where they knew they would be destroyed by European livestock."[9] While outside historians tend to privilege political revolts, equally important to Indigenous survival was the resistance embedded in everyday life to maintain foodways. During times when direct political confrontation is not possible, resistance can manifest simply as cultural continuity.[10]

LIBERALISM TO MILITARIZED MODERNISM

Mexican and Central American independence from Spain, unfortunately, brought little relief for Indigenous maize growers, who continued to suffer

apartheid rule by the white Spanish-descended (criollo) elite. Except during occasional famines, when profits could be made on sharecropped corn from colonial estates, colonial markets largely left subsistence maize untouched.[11] Conservative colonial elites (*hacendados*) valued ranch self-sufficiency and continued to share dietary elements with their indentured Indigenous labor force. However, after independence from Spain in the early nineteenth century, a new class of liberal elites broke this stasis and looked toward Europe for culinary status. For example, Porfirio Díaz's liberal "scientific" advisors, los Científicos, touted wheat as culturally superior to Mexican maize.[12] These elites were liberal in an economic sense of embracing free markets and foreign trade, but not in the contemporary political sense of supporting social justice and welfare.

Conservative versus liberal dietary legacies remain palpable today. When I was conducting ethnographic field research on the cattle economy in northern Guatemala between 2003 and 2004, I enjoyed the hospitality of conservative ranchers with tortilla-centered meals. However, in the few instances I was invited to dinner at the home of the 1 percent urban liberal elite, they conspicuously offered rolls, Italian breadsticks, or some other soft white bread in lieu of tortillas.

After a half century of palace coups, swinging between liberal and conservative power brokers, by the late nineteenth century liberal dictators (caudillos) claimed more permanent power in Mexico and throughout Central America. In the name of "modernization," these caudillos seized communal Indigenous lands previously devoted to maize cultivation and privatized them to foment agricultural exports (coffee, bananas, etc.) through free or low-cost land grants to foreign colonizers and companies. During the last two decades of the nineteenth century, Euro-American coffee businesses swallowed whole villages across the Q'eqchi' region. They converted the populace into "resident workers" (*mozo colonos*) and kept them enslaved via plantation store debts. Guatemala's longest liberal dictatorship, under Jorge Ubico (1931–44), reinforced this system of debt peonage with vagrancy laws that required land-poor and landless Maya peoples not already enslaved as mozo colonos to carry booklets to prove they had labored on a plantation 150 days a year. Ubico allowed subsistence maize cropping only insofar

as it would allow Indigenous workers to subsist on submarket wages on plantations or for provisioning themselves for state labor brigades.[13] Akin to colonial Spanish labor drafts (*repartamientos*), Ubico's *mandamientos* forcibly conscripted not only Indigenous men into road construction, but also Indigenous women as maize grinders for the road crews.[14]

Partially offsetting the damage of plantation land grabs to national food security, Ubico's road construction in Guatemala and Porfirio Díaz's railroads in Mexico opened new corn markets during this era.[15] Even so, domestic commercial corn production did not always keep pace with population growth. Basic grain availability went down 50 percent per capita under Mexico's Porfiriato regime.[16] Between 1871 and 1940, Guatemala also suffered repeated corn shortages and, as a result, remained dependent on corn imports until 1930.[17] Without state investment in proper silos, corn prices would plummet in good harvest years due to oversupply and skyrocket in bad weather years, creating a perverse pattern of dependency on corn imports.[18] However, by the 1940s agriculture for domestic consumption actually contributed $100 million more to the economy than exports.[19]

In the early to mid-twentieth century, Mexico and Guatemala enjoyed brief democratic periods following revolutions that ousted their liberal caudillos. A new generation of democratic presidents—Lázaro Cárdenas in Mexico (1934–40), and Juan José Arévalo (1945–51) and Jacobo Arbenz (1952–54) in Guatemala—recognized the value of smallholder agriculture for national development.[20] Nonetheless, Mexico's postrevolutionary ruling party, the PRI, kept a stranglehold on power from 1929 to 2000, in part through a political patronage system that addicted rural farmers to the use of fertilizers, hybrid seeds, and other agricultural modernization inputs.[21]

The Arbenz administration also promoted agricultural modernization alongside agrarian reform. Arbenz's own cotton farm, El Cajón, became a model for modernized production.[22] In less than two years his government expropriated and redistributed a million acres to one hundred thousand rural families, roughly 16 percent of the Guatemalan population. Maize production increased by a notable 12 percent after just one year of land reform.[23] But after the US CIA unjustly deposed Arbenz in 1954, a military

junta returned 79 percent of the land to elites and plantations, and national maize production fell 10 percent by 1956.[24]

The United States took advantage of the CIA coup to dump $3.8 million worth of corn onto Guatemalan markets in 1955 and $2.3 million in 1956. The harm to subsistence maize growers was so apparent that the CIA's own puppet regime, led by General Castillo Armas, appealed to the United States to halve these corn shipments to twenty-five thousand tons.[25] Corn dumping continued under John F. Kennedy's Alliance for Progress, which turned the US Midwest into a world farm.[26] Even after the disintegration of the Soviet Union, the United States continued its Cold War–driven commodity "aid," despite vocal critiques from global humanitarian experts that it was undermining local farming. After US farmers converted to GM crops, US food aid became a potent source of maize contamination.

Kennedy's Alliance for Progress also encouraged cattle encroachment onto Indigenous lands to satiate the rising US demand for fast-food-chain hamburgers.[27] The Guatemalan state gave some cattle ranchers parcels in the northern lowlands that were forty-five times larger than those awarded to Q'eqchi' farmers. Nonetheless, an indomitable Q'eqchi' work ethic led to corn surplus sales that soon fed one-fifth of the country's population.[28] Today, Q'eqchi' farmers grow maize for themselves but also produce almost half the country's surplus white corn that urban dwellers buy for their tortillas.[29] As such, Q'eqchi' farmers are bellwethers of how cattle, corporate trade, and climate change impinge upon the maize economy.

A downward spiral of drought and unpredictable corn markets induced many small Q'eqchi' farmers to sell their parcels after the signing of DR-CAFTA.[30] Agrofuel speculation further accelerated the land rush. Like corn and sugar, palm oil is a speculative flex crop, meaning it can be sold both as fuel and as a food or cosmetic ingredient.[31] The Guatemalan government and investors have relentlessly targeted Q'eqchi' maize growing regions for permanent conversion to agrofuel plantations.[32] Oligarchic plantation owners are able to command the state to brutally evict Q'eqchi' communities by torching their homes, fields, and maize bins (see fig. 7). Yet arguably more insidious than this overt violence is the "silent violence" of corporate trade

FIGURE 7. Q'eqchi' maize burnt in an eviction, 2023. Photo courtesy of Jose Xoj, 2023.

agreements, which undercut maize prices and left Q'eqchi' territory with the highest rates of childhood malnutrition in the country.[33]

SUBSIDIES AND TARIFFS, DEBT AND TRADE

Trade should have never become a weapon. To the contrary, after the horrors of World War II, world leaders surmised that countries who traded together would avoid future armed conflict. The General Agreement on Tariffs and Trade (GATT), a key process arising from the Bretton Wood accords, was just a voluntary commitment to hold regular consensual meetings. Limited to discussions about commercial goods, the GATT left agriculture and food security policies to the discretion of sovereign nations.[34] After world leaders institutionalized the GATT (1986–93) into the World Trade Organization (WTO), however, they sought to expand trade rules over agriculture.[35] The anti-[corporate]-globalization movement countermobilized against the WTO, which became the foil to the global peasant network Via Campesina.

While free trade proponents espouse a rhetoric of "equalizing" or "harmonizing" trade, the WTO and other trade agreements establish uneven playing fields. Historically, rich countries have buttressed their farming sectors with direct payments, especially for products that instill national pride or maintain culture. France subsidizes wheat and dairy, Japan subsidizes rice, and the United States its "heartland" corn belt. With a smaller tax base, poor countries have instead historically relied on tariffs, quotas, and price regulations to protect their farming sectors. In a nutshell, trade agreements wipe out tariff protections in the Global South without addressing how the Global North underwrites the overproduction of cheap commodity foods that can be dumped on the markets of poorer countries. This pushes impoverished village farmers into direct competition with global commodities markets governed more by casino-like odds than fair economic rules.

To put this in perspective, US subsidies now constitute 40 percent of farm income, but agribusiness corporations—not small farmers—commandeer most government payouts.[36] Three in five US farmers receive no subsidies whatsoever, while the richest companies earn nearly half a million each.[37] In 2000, US corn farmers alone received about $10 billion—roughly ten times the entire Mexican government budget for agriculture.[38] The current value of these subsidies is ironically equal to the amount of corn the United States exports to Mexico (about 4 percent of the US harvest).[39]

To produce this surplus, US farmers have access to various types of federal and private insurance programs that protect them from harvest losses or price fluctuations.[40] More than 90 percent of the US corn crop is underwritten by agriculture risk coverage (read: crop insurance), which pays farmers $2.8 billion annually. Above and beyond these direct price guarantees to farmers, other subsidies, both direct and indirect, include:

- the vast flat lands stolen from Native Americans that permit mechanization
- land-grant university extension support from endowments created by the continued theft of Native American land via the Morrill Acts[41]
- cheap irrigation water

- transportation infrastructure[42]
- access to low-interest credit[43]
- technology and low-cost fuel for farm machinery
- technology for long-term storage facilities that allow corporate grain sellers to game the market system
- endowed public university–funded research into hybrid and GM seeds[44]
- scales of economy for large farms
- state cleanup of environmental externalities, like algal blooms from nitrogen fertilizer runoff into the Mississippi River
- insurance or public health care budgets that pay for the cancers and other morbidities suffered by farmworkers who have applied unsafe pesticides and whose corporate peddlers, in turn, are protected from litigation by ineffectual EPA regulations that presume chemicals are safe until proven guilty
- a military-industrial complex willing to embark upon trillion-dollar wars to maintain US access to cheap oil in the Middle East, which artificially supports the entire warped industrial food system with cheap petroleum fertilizers, agrochemicals, and asphalted roads

Together these direct and indirect subsidies allow corporations to sell corn at least 25–30 percent below the full cost of production.[45] By 2019, Guatemalan prices for white maize and yellow corn grown domestically were 38 percent and 50 percent *higher* than corn imported from the US under DR-CAFTA and WTO quotas.[46]

Working without any of these safety nets, Mesoamerica maize farmers tend their rain-fed crops with machetes, hoes, and hard work. With remarkably little change in prices over the centuries, they sell cheap and buy dear. As a mountainous region, very little Central American land can be mechanized. With loans to buy farm machinery, a US grower can produce a ton of corn using 1.2 labor hours. A Mexican farmer, by contrast, would need 17.8 labor hours to produce the same.[47] US corn yields are about five times those in Central America (178 versus 36 quintals per

hectare, respectively).[48] Sophisticated silo storage facilities exacerbate these disparities, allowing US corn growers to hold their grain while waiting to sell until prices rise, whereas most Central American maize farmers must immediately sell their harvests when the market is glutted to avoid postharvest losses.

The issue of transnational commodity dumping inspired the Via Campesina protests that brought down the barricades at the 2003 WTO tribunal in Cancún. A bloc of developing countries walked out of the tribunal and effectively shut down that meeting which, procedurally, requires a global consensus to move forward.[49] Agricultural subsidies continued to stalemate discussions at subsequent WTO tribunals. Unable to bully its trade interests through the WTO, the United States retreated to a neo–Monroe Doctrine policy approach in the Western Hemisphere, to push for a series of regional and bilateral trade agreements modeled on NAFTA in places where it would have outsized negotiating power.

CORPORATE CON OF NAFTA AND THEREAFTER

NAFTA began as a negotiation between just the United States and Canada, as relatively equal parties that signed a 1989 trade agreement. Mexican president Salinas de Gortari then requested bilateral trade talks with the George H. W. Bush administration. Advised by economists educated at Harvard University and the University of Chicago, Salinas hoped to gain relief from harsh structural adjustments imposed by the International Monetary Fund (IMF) after Mexico defaulted on its debt in 1982 and to win more favorable human migration terms. Canada unexpectedly inserted itself into the US-Mexico negotiations. Weighted in favor of the richer countries, that trilateral agreement was finalized in late 1992, ratified and signed in 1993 under the Clinton administration, and took effect January 1, 1994. Presciently recognizing the threat to Mexico's Indigenous peoples from this neoliberal trade and market-oriented policy reform, the Zapatista Army of National Liberation (EZLN) declared "enough is enough" and symbolically timed its first (and only) offensive strike on NAFTA's implementation day.

Unfortunately, much of the damage was already done. In preparation for NAFTA, Mexico had rolled back previous support to rural farming as preconditions for the treaty. Most controversially, the Salinas administration revoked constitutional land reform Article 27, to allow the privatization of common municipal farming lands (the *ejidos*). Salinas also replaced Mexico's modest price supports for small farmers (dating back to the 1938 postrevolutionary government) with a new program that benefited larger farmers through technological incentives and payments based on acreage planted.[50] NAFTA also deregulated the seed sector by curtailing the power of the National Seed Inspection and Certification Service. Private control of seed sales rose from 22 percent in 1980 to 93 percent by 1993.[51]

The United States, of course, avoided any changes to its own subsidy system. At the time of NAFTA's negotiation, subsidized US corn cost $101 a ton—less than half the price of Mexican white maize, at $240 a ton.[52] Prior to NAFTA, Mexico had high tariffs on corn imports to protect its national staple.[53] In theory Mexico agreed to open its market to a base quota of 2.5 million tons and gradually increase imports by 3 percent per annum to allow farmers fifteen years to adjust.[54] Instead, Mexican officials inexplicably welcomed double the base quota.[55] By forgoing tariffs above the negotiated quota, Mexico sacrificed over $2 billion in fiscal revenue by 2003.[56] These profits went into the pockets of large industrial food millers, including Maseca and Bimbo, and grain exporters like ADM and Cargill, which tripled their earnings in the seven years after the signing of NAFTA (going from $253 to $714 million in combined revenues).[57] Although the Mexican Congress belatedly attempted to levy the proper tariff on corn imports in 2000, neoliberal government officials ignored its directive.[58]

Instead of a gradual influx of US corn, NAFTA turned into a dumping deluge. US presidential candidate Ross Perot famously predicted "a giant sucking sound" of US jobs leaving for Mexico, but NAFTA actually hoovered Mexican, not US, livelihoods. The market share for US corn in Mexico jumped from 2 percent to 25 percent by 1999. In international markets white maize typically fetches a quarter more than yellow dent corn, but NAFTA treated them the same.[59] Thus although the US silos full of yellow corn being offloaded to Mexico are destined for animal feed and industrial

foods, their existence undercuts the price of white maize used for tortillas.[60] For the small farmers who produced 40 percent of Mexico's (mostly white) maize before NAFTA, market prices fell by 45 percent between 1993 and 1999.[61] Indigenous farming families, who at that time comprised 60 percent of Mexican maize growers, were disproportionately hurt.[62]

Those who migrated to become farm laborers on industrialized farms in northern Mexico encountered staggering wage cuts, as rural wages fell one-third by 2008 compared to pre-NAFTA figures.[63] Without the time or state support to adapt, emigration presented a better option, and half a million people left annually for the United States over the next decade. By 2006 almost 13 million Mexicans—roughly 10 percent of the population—were living in the United States.[64] Mexican economist Alejandro Nadal notes this had "a corrosive effect on social institutions, collective community actions, and traditional knowledge systems and practices that have historically been central to resource management and conservation of genetic diversity in many rural communities."[65] Remittances became Mexico's second most important source of revenue.

Even after ethanol speculation began to divert US corn harvests from commodity dumping, small Mexican farmers could not recover because so many of the state structures supporting them had been dismantled.[66] Large mechanized and irrigated farms in Sinaloa and Jalisco commandeered fertilizer subsidies and acreage payments ($52–$83 per hectare) from the PROCAMPO program established in 1993.[67] Those farmers now produce 70 percent of Mexico's maize—even though their own regional diet ironically features bread, wheat tortillas, and rice.[68]

The Mexican milperos' loss was a US gain. As the National Corn Growers Association brags on its website, "The North American Free Trade Agreement (NAFTA) has been an unequivocal success for American corn farmers. Since 1994, US corn exports to these regional partners have increased 300 percent and Mexico is now the top export destination for US corn."[69] Before President López Obrador began a major initiative for import substitution in 2021, one-third of Mexico's corn (mostly yellow dent for industrial foods and animal feed) was coming from the United States, at 30 percent below the real cost of production.[70]

Despite NAFTA's promises for prosperity, 60 percent of Mexico's population now falls below the poverty line. From being calorically self-sufficient in 1970, Mexico now imports more food than any other country besides Indonesia and China.[71] Walmart has replaced fresh open markets as the country's primary grocery retailer. Mexico's own Chamber of Commerce acknowledges that for every new convenience store that opens, five traditional shops ("tiendas") go out of business. With corporate stores now supplying 35 percent of food sales, processed foods have replaced wholesome traditional Mexican meals.[72] To conform to US business hours, Mexico ended the cultural practice of the long siesta that allowed time for a home-cooked midday meal. US fast-food chains are also running local eateries out of business.[73]

Despite previously having had one of the healthiest autochthonous cuisines in the world, based on complex carbohydrates, vegetables, and plant-based proteins, Mexico is now among the countries with the highest diabetes rates in the world. Affecting 16 percent of the population (compared with 11 percent in the United States and 7 percent in Canada), diabetes is now Mexico's number one killer. Seven out of ten Mexicans are overweight and one-third are considered clinically obese.[74] For Central American countries subjected to an even more pro-corporate trade agreement, "eating CAFTA" has caused similar social indigestion.[75]

CAFTA COERCION

The Central American Free Trade Agreement was never about trade, but rather US imperialism, corporate greed, and presidential egos. Representing just 1.6 percent of exports from and 1.0 percent of imports to the United States, Central America was not particularly important to the US economy. Besides, Central America already held a concise (twenty-six-page) trade agreement with the United States called the Caribbean Basin Initiative, which excluded "sensitive" commodities like white maize essential for food sovereignty. Most analysts agree the United States only proposed CAFTA as a trial run for a larger Free Trade Agreement of the Americas (FTAA), scheduled to be negotiated later in 2004.[76] Like Mexico, many Central

American countries were enticed into these ridiculously imbalanced negotiations with promises of migration reforms on which the United States never delivered. Central America also hoped to secure more market access for beef, dairy, sugar, tobacco, and cotton—but the United States kept its crop subsidies intact.[77] Although it may seem they had been duped into a terrible agreement, Central American elites knew their private companies would benefit, even if the everyday farmer did not.

Although NAFTA was negotiated publicly over several years (allowing environmental and labor groups to secure side chapters, albeit nonbinding ones), the United States drafted the DR-CAFTA in English behind closed doors over just eleven months in 2003. US negotiators required Central American countries to sign a secrecy clause during the second round of negotiations in Ohio.[78] They also repeatedly refused FOIA (Freedom of Information Act) requests for the draft document, apparently modeled on the bilateral Chilean agreement, which then represented the most extreme neoliberal trade agreement ever devised.[79] Despite claiming that national security required them to hide treaty drafts from their own citizens and the press, the Office of the US Trade Representative (USTR) gave a network of five hundred corporate trade advisors access to the document. Central American civil society leaders, however, were excluded from negotiations and complained their country delegates spent more time tourist-ing and shopping than attending the sessions. When Central American government representatives did show up, their legal teams were outnumbered one hundred to one. The result was a twenty-four-hundred-page document filled with legalese—longer than Leo Tolstoy's *War and Peace* and the King James Bible combined.

Central America was ill-prepared for these fast-paced, asymmetrical, and secretive trade negotiations. Costa Rica was arguably the strongest negotiating entity from the region, but even its lead delegate stated to the press that she had simply trusted the United States to write the appendix chapters fairly—which is precisely where corporate lobbyists inserted perks and loopholes and embedded other treaty requirements to their advantage. The USTR unilaterally announced the Dominican Republic as an added party with an almost identical bilateral treaty in August 2004,

and CAFTA confusingly became the DR-CAFTA. The United States, oddly, excluded Panama so as to negotiate continued control of the Panama Canal through a separate agreement. With fox-henhouse irony, USAID allocated $38 million in technical assistance to "help" the Central American countries negotiate with the USTR.[80] As Salvadoran economist Raul Moreno put it, the CAFTA negotiations were like letting loose a tiger on a herd of tethered donkeys. A Nicaraguan leader likened Central America to a one-legged spider that tangled itself in its own net of legalese. As he observed, "We negotiated like a region without being a region. . . . [Central America] was not prepared for this negotiation; it did not have defined regional priorities, only national priorities. . . . The United States took good advantage of all our contradictions."[81]

Because the five most-subsidized US products (rice, sugar, milk, wheat, beef) constitute half the agricultural GDP of Central America, Central American delegates did attempt to protect their food staples against commodity dumping. The United States "conceded" by allowing each country to pick one or two culturally sensitive food items to protect, with a gradual tariff phaseout over twenty years. The United States exempted sugar, while Costa Rica protected dairy, potatoes, and onions; Nicaragua chose beans; Honduras focused on pork; El Salvador excluded rice; and Guatemala prioritized maize and, to a lesser degree, poultry.

Here's the rub: Because Central America was already a tariff-free common market that also held an agreement with Mexico, corporations could (and did) export food commodities to an already decimated Mexico or to whichever Central American country had the least trade restrictions, then resold them to the rest of the region.[82] US Embassy reports frequently make note of this loophole, as well as opportunities to add WTO quotas on top of the DR-CAFTA's tariff reductions.[83] Corporate agribusiness companies immediately began targeting Nicaragua as a conduit for rice exports, El Salvador for milk, Guatemala for poultry, and Honduras for GM-corn seed.[84]

To avoid scrutiny from a US public embittered by NAFTA, before commencing CAFTA negotiations, the USTR asked the US Congress to give it "Fast-Track" authority on July 27, 2002. Even though Fast-Track authority

undercuts its constitutional prerogative to modify or amend trade agreements, Congress abdicated its own power by a slim vote taken at 3:00 a.m., of 215-212.[85] Applied first to NAFTA, the Fast-Track designation limited Congress to just sixty days to review the proposed document (an absurdly short time frame for harried officials to read and analyze thousands of pages of legalese) and twenty hours of floor debate, after which a simple yea or nay vote was taken.[86] A Republican-controlled Congress further limited CAFTA's Fast-Track discussion to a mere two hours. While watching that "debate" live on C-Span, I was struck by how many representatives were stuck in Cold War narratives that invoked long-dead "enemies" like Che Guevara and Fidel Castro.[87]

The US Congress voted on the DR-CAFTA on July 27, 2005, or "Ajmaq" in the Maya calendar, an ill-fated date in which "the ancestors see your wrong-doings." Despite Vice President Dick Cheney's offer of pork deals in exchange for votes, the DR-CAFTA was initially defeated, tallied at 180 "against" to 175 "for" during the normal fifteen-minute voting period. In an unprecedented move, House Speaker Tom DeLay illegally held the vote open for forty-seven minutes past its official close.[88] When asked how long he would do so, he replied he would wait until he had a one-vote majority. After the Republican leadership arm-twisted out its last "aye" in broad moonlight, DeLay gaveled the DR-CAFTA into and above US law. The National Corn Growers Association bragged that its eleventh-hour lobbying helped win the closest trade vote in US history.[89] The Corn Refiners Association (CRA) rejoiced, with annual growth forecasts of $19 million.[90]

Central American ratification was also fraught. Polls showed 75–80 percent of the Guatemalan and Salvador public opposed the treaty. On the day of Guatemala's vote, social and popular movements organized a national strike and blocked access to the Congress building until police and military troops cleared the streets, killing two people and injuring another ten. Anticipating similar protests, Honduras ratified CAFTA and called a special session five days early. Labor unions and students spilled into Salvadoran and Nicaraguan streets before ratification. The most democratic nation in the agreement, Costa Rica, submitted the treaty to a referendum,

which passed only by a narrow margin after a recount. Had President Oscar Arias not campaigned for it, most analysts agree Costa Rica would have withdrawn from the treaty.[91]

TRICKS WITHIN THE TREATY

The public and most political authorities were unaware that ratification also meant commitment to multiple other treaties mentioned within it. Trade agreements thus became a new mode for corporate lobbyists to roll back a wide range of regulations and policies on which families rely for safe food, a clean environment, affordable medicines, and financial stability. Even before ratification, the USTR began arm-twisting Central American officials to get legislative changes related to the bidding of government contracts, insurance, branding and intellectual property, telecommunications, animal and vegetable sanitation, penal codes, medicine prices, occupational health, and other issues far beyond the scope of tariffs and trade. The Wikileaks trove of diplomatic cables reveals the intense pressure the US Embassy and USAID administrators put on Guatemala.[92] To give one example, the Guatemalan Congress was compelled to repeal a hard-won bill that would have allowed the sale of generic pharmaceuticals to its impoverished and largely uninsured populace.

Also smuggled into the DR-CAFTA was a fine-print requirement for every member to amend its plant patent legislation to conform with the 1991 Union for the Protection of New Varieties of Plants (UPOV).[93] While prior versions of UPOV (released in 1961, 1972, and 1978) permitted farmers to save seeds for replanting, the 1991 UPOV convention moved radically in favor of corporate seed breeders.[94] For instance, the 1991 version describes seed saving as an "optional exception" rather than a farmer's privilege.[95] It lowers the patent bar from hybridization to any "discovered" varieties, which allows a corporation to claim intellectual property and exclusive royalty rights for up to twenty years, even if its so-called finished product is only a slight variation on plants domesticated and stewarded by Mesoamerica's original peoples (e.g., Mars Inc.'s attempts to patent olotón maize).[96] To help breeders enforce these new patent rights, UPOV signatories must

establish a registry of "seed users" to facilitate the same kind of farmer surveillance Monsanto exercises in the US Midwest.[97]

With so many unratified conventions like UPOV covertly embedded within the legal maze of broader trade treaties, knowing which agreement trumps another is increasingly unclear.[98] UPOV, for example, has seventy-two adhering countries, but only twenty-four are in active process of compliance.[99] Although the USTR continues to pressure Guatemala to ratify UPOV 1991, Guatemala already subscribes to several other competing treaties that emphasize farmers' rights, including: the UN Food and Agriculture Organization (FAO) Resolution 5–89 on Phytogenic Resources (which gives farmers the right to hold breeder rights); the 2006 International Treaty on Plant Genetic Resources for Food and Agriculture (also under the FAO); the 1992 Earth Summit "precautionary principle"; and the right to free prior informed consent, which is embedded in the International Labor Organization Convention 169 and the 2007 UN Declaration on the Rights of Indigenous Peoples.

In forcing Central American countries to "harmonize" (the old lingo) or "streamline" (the new lingo) their intellectual property laws to match those of the United States, the underlying goal of the DR-CAFTA is to make it as easy for US corporations to do business in Quetzaltenango as in Kansas.[100] As one State Department cable notes, "one of the main benefits of CAFTA will be greater legal certainty, which is essential to attract foreign investors."[101] After complaining that Guatemala had an "inconsistent regulatory structure," such as "time consuming administrative procedures, bureaucratic impediments, inconsistent judicial decisions," other department cables posted by Wikileaks note that judicial corruption is common or explain how foreign investors can access high-ranking officials in order to circumvent basic rules of business incorporation.[102]

Should states not bow to transnational capital, corporations can sue. NAFTA (ratified in 1994) was the first trade agreement to allow corporations (not just states) to challenge another country's laws as an unfair barrier to trade. It is difficult to be a fan of the WTO, but that institution at least aims for a more even playing field by only allowing for trade challenges between sovereign nations. Like NAFTA, the DR-CAFTA gives corporations the legal

personhood to sue nation-states for perceived barriers to trade. Known as "Chapter 11" or "investor-to-state" disputes, these battles are arbitrated by a secret panel of three judges: one supposedly neutral, one appointed by the challenging corporation, and one by the state being sued.[103] Through this system, corporations have struck down environmental, labor, and any other democratic laws they perceive to infringe on their businesses, even laws passed in the United States and Canada. The watchdog group Public Citizen calculates that through US trade agreements with other nations, including NAFTA, countries (and, by default taxpayers) have shelled out $4.5 billion to corporations through these investor-state lawsuits, with $59 billion in pending claims.[104]

There are many examples. Under NAFTA, the US corporation Ethyl challenged a Canadian ban on the gasoline additive MMT, and settled for $13 million. A Canadian firm, Methanex, challenged California's prohibition of another gasoline additive MTBE.[105] Metalclad, a hazardous waste exporter, filed a $90 million suit against Mexico and won $15.6 million after being denied a license to construct a dump in an ecological reserve in San Luis Potosí. Canada banned the import of PCBs to protect First Nations' food systems from toxic bioaccumulation of carcinogens, but after corporate chemical coyote S. D. Meyer challenged the import ban, Canada had to repeal the law and pay the polluter $4.8 million. The tobacco industry has used NAFTA to strike down a Canadian public health law requiring cigarettes be sold in black-and-white packaging.

Even worse than NAFTA's Chapter 11, the DR-CAFTA permits corporations to bully countries through slapsuits for even larger sums that represent *hypothetical future* profits. During CAFTA negotiations, in fact, Harken Energy (on whose board then president George W. Bush had served) pre-threatened Costa Rica with a lawsuit of $57 billion (three times the country's GDP) if it were not permitted to drill for oil at a UNESCO World Heritage Site.[106] Currently, Nevada-based firm Kappes, Cassiday & Associates is suing Guatemala for more than $400 million of imagined future profits, after being denied the right to mine gold and leave open pits outside the Indigenous community of La Puya. Poor countries are simply unable to incur the kinds of legal expenses required to arbitrate this kind of corporate

blackmail and, in many instances, they have preemptively repealed their own legislation upon the threat of USTR sanctions.

DR-CAFTA AND CORN

Boasting larger budgets than the combined GDP of Central American countries, ADM and Cargill profiteered immensely from DR-CAFTA trade loopholes.[107] During the CAFTA negotiations, US yellow dent corn was priced at $120 per metric ton, 42 percent lower than Central American maize, at $206 per ton.[108] Aided by sophisticated silo storage that holds 299,735,826 metric tons, gringo grain corporations can wait to sell until prices rise.[109] As described earlier, Guatemala privatized its state silo storage in the 1990s, so by 2021 it only had a capacity for 70,000 metric tons.[110] Central American corn farmers must, therefore, either sell immediately at harvest or store what they can in rustic bins in the home or field.

Just as Mexico did, Central American countries inexplicably capitulated to US pressure to allow imports above and beyond the mandated DR-CAFTA quota system. In addition, the United States "donated" to Guatemala another 18,000 tons of yellow corn in 2006.[111] In El Salvador, one year after DR-CAFTA implementation, local maize prices fell from $12.00 to $8.50 per ton, while US corn sold for $6.40. Compounding these losses were rising fertilizer prices, which spiked over a single year, from $18 to $23 a sack.[112]

How much US corn is currently dumped on Guatemala is unknown, because, as documented by anthropologist Rebecca Galemba, corn flows freely across the Guatemala-Mexico border, with local mayors authorizing smuggling operations as "free trade." Black market trade is so routinized in this region that smugglers are deemed "merchants" or good "businessmen," while mayors endorse and "regulate" the process as an assertion of the municipal autonomy promised in Guatemala's 1996 peace accords. As one border resident put it, "Corn is not contraband, it is a basic grain."[113] US officials estimate that this contraband may be equivalent to 16 percent of national production.[114]

Within a decade following the passage of the DR-CAFTA, the United States was officially exporting to Guatemala $1.1 billion worth of yellow

corn, wheat, soybean meal, and poultry parts.[115] Barely the size of Tennessee with just three times Tennessee's population, Guatemala is now the seventh-largest importer of US corn ($219 million) behind the economic powerhouses of Mexico, Japan, China, Colombia, South Korea, and Canada.[116] US officials know very well that they are dumping corn in Guatemala at a price that is 38 percent less than national grain.[117]

US officials were also cognizant that the DR-CAFTA—like NAFTA before it—would turn human flesh into Central America's principal export. I remember seeing in 2005 the USTR website hypocritically noting, "Remittances from families in the United States are an important and rapidly growing source of foreign exchange throughout the region and help to fund continued imports of US goods and services." US officials similarly tried to console El Salvador to be grateful for new export opportunities for the "ethnic food market" in the United States.[118]

El Salvador resisted US intimidation, however, by cleverly using capitalistic principals against their corporate bullies. Prior to 2013, as part of a national Family Agriculture Program to help half a million small farmers, the Salvadoran government bought 70 percent of its annual staple seed from Monsanto's Central American subsidiary, Cristiani Burkhard, at twice the local price.[119] Discontented with these profits, the USTR and the American Chamber of Commerce complained that the Family Agriculture Program discriminated against US corporations and threatened to withdraw $277 million in foreign aid if Monsanto were not allowed to grab a larger market share. El Salvador shrewdly resisted within the rules of the capitalist game by advertising its bid process in local newspapers. The Salvadoran Ministry of Agriculture staff worked with key peasant cooperatives and associations to help them understand how to submit bids and tripled the number of participating entities in 2014. They exposed that local peasant seeds were simply better and cheaper than Monsanto's offerings.[120] By 2015 the Salvadoran government was expected to purchase nearly 50 percent of its corn seeds from local suppliers. In a world of free market fundamentalism, a literal interpretation of the rules can be an odd, but effective form of trickster resistance.

Remember, of course, that corn is grain, but it is also seed. It is anyone's guess as to how much of this US corn dumped on Central America has been planted by curious farmers and contaminated local maize varieties, but from the Aventis StarLink debacle in the early 2000s, we can assume contamination is widespread. That scandal bears re-mentioning, and not only because Bayer-Monsanto now owns Aventis. While Guatemala played only a minor role in the drama, the incident exposed fundamental gaps in regulatory structures and inspired the United Nations Environmental Programme and the World Bank to help train countries in biosafety protocols with projects that became Trojan horses for GMO legalization.[121]

Although the US FDA abdicated its regulatory authority by ruling that Roundup Ready crops were "substantially equivalent" to conventional crops, the EPA decided to review StarLink in 2000 under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), since Bt corn incorporates a pesticidal toxin into the whole plant.[122] During that regulatory process it discovered that certain StarLink proteins (Cry9C) failed to break down in the gastrointestinal tract, thereby causing anaphylactic shock and other severe allergic reactions in some people (for which Aventis eventually paid $9 million to claimants). In a rare ruling, the EPA banned StarLink from human consumption, but it had no authority to compel Aventis to report where and how it was planted for animal feed.[123] It seems regulators simply trusted that Aventis would make clear to corn farmers the need to separate StarLink by planting other non-GM crops in buffer zones and only selling StarLink harvest for animal feed.[124]

Less credulous were two nonprofit groups, the Center for Food Safety and Friends of the Earth, which began testing foods. They discovered StarLink in Taco Bell's iconic taco shell in 2000. In October of that year the USDA recalled 350,000 acres of StarLink corn that had been planted in the United States, but this corn had already traveled into processed foods destined for countries as far away as Japan and Korea.[125] Although at the time less than half a percent of the corn cultivated in the United States came from StarLink

seeds, the FDA provided little to no instruction to grain operators about separating corn for animal feed from corn destined for food, so the crops had been comingled in an "unambiguously unlawful" manner.[126] Federal inspectors found traces of StarLink genes in 10 percent of 110,000 grain tests conducted in the United States between November 2000 and April 2001.[127]

Eventually some three hundred products were recalled from US grocery store shelves, but products bound for Mexico via the Sabritas brand were not.[128] After initially responding, "We have difficulty imagining how our corn could end up in the human food supply," Aventis admitted in March 2001 that 143 million tons of corn had been contaminated, forcing farmers, seed companies, processors, and food makers to spend over $1 billion in recalls.[129] In the recall process, Aventis failed to locate 1.2 million bushels produced from seed sales in 2000.[130] Then, in July 2001, the FDA discovered StarLink genes had crossed into white corn that had been assumed to be GMO free, since only yellow corn had been genetically modified by that point in history.

In 2002, Friends of the Earth released a report documenting how USAID and the World Food Programme had sent food "aid" laced with StarLink and other GM corn brands to numerous countries, including Guatemala. While African countries began requiring the prior milling of food aid to prevent replanting, corn still arrives whole kernel in the Americas.[131] Another 2005 study showed that four-fifths of some fifty samples of corn and soy sent as food aid to Central American countries and the Dominican Republic were genetically modified. (As a point of comparison, the European Union rejects imports that have more than 0.9 percent contamination). According to a 2005 exposé published by Friends of the Earth, 80 percent of seventy-seven samples taken from food aid and corn sold on the open market in Guatemala City were already contaminated by GM traits, including StarLink.[132] Another study of food aid in the Guatemalan highlands and in Chiquimula, an impoverished state in eastern Guatemala, revealed these GM sequences: Mon NK 603 (Roundup Ready), Dow AgroSc TC1507 (Herculex Liberty Link/Bt), Syngenta Bt 11 (YieldGard), Mon 810 (YieldGard), and soya Mon 40-3-2 (Roundup Ready).[133]

In examining how and why StarLink and other experimental varieties

of GM corn not approved for commercial production continued appearing throughout the global supply chain a full five years after the first scandal, trade expert Jennifer Clapp concludes that without penalties or regulatory oversight, these "accidents" will only continue.[134] A laissez-faire system of voluntary self-policing by agribusiness is hardly a viable regulatory strategy.[135] All the major biotech companies have been caught in similar scandals. When the USDA discovered that an experimental Syngenta crop that could increase ampicillin resistance was being "accidentally" grown on fifteen thousand acres, it merely slapped the company with a $375,000 fine.[136] In another case in which an experimental rice strain was leaked, Bayer excused its mistake as "an act of God."[137]

Perhaps the biotech giants hope that governments will shrug off contamination as inevitable and regulators will loosen restrictions.[138] Indeed, one Guatemalan food industry representative suggested moving forward with biotech crops stating, "In my view, it is easier to ask for forgiveness than permission."[139] Another USDA-FAS scholarship recipient from Guatemala notes, "The best way to proceed is just to start growing [extra-legally] . . . the ministries will not care."[140] Or perhaps these "accidents" are also a backdoor trick for eventually demanding royalties on homegrown seed, as Monsanto famously did to Percy Schmeiser. The Guatemalan farmers with whom I have shared these contamination cases invariably remark, "If they can do that to the gringos, imagine what will happen to us."

Once GM corn gets planted, no farmer's crops are safe, because corn cross-pollinates by wind over long distances, irreversibly transforming plant DNA. In the United States, producers are required to leave a non-GMO "refuge" or buffer zone that is significantly larger than many entire Central American farms. One need not have passed calculus to understand that GM contamination will spread more quickly across irregularly shaped and contiguous small parcels in Mesoamerica, where farmers also routinely exchange seeds.[141] A single row of GM seed on a one-hectare plot will taint 65 percent of the parcel in a mere seven years.[142] Unlike chemical pollution, which might dissipate over time, GMOs are a "living pollution" that can spread geometrically, once transgenic traits are released into the environment.[143]

CUSMA, USMCA, LET'S CALL THE WHOLE THING OFF

Although late megatrade agreements like the Free Trade Agreement of the Americas sputtered due to activist opposition, Donald Trump made the "modernization" of NAFTA a priority of his administration, alongside his facile claims that Mexico would pay for his border wall. His staff began negotiations in August 2017 with the hope of passing a new pact before the elections of 2018. Democratic lawmakers put up a tepid fight about labor and environmental standards, but the House approved the revised version of the agreement 385–41, while the Senate vote was 89–10. Mexico ratified it in June 2019 (114–4) and Canada rushed its vote through Parliament in early 2020, before the pandemic.

Much of the language came from the failed Trans-Pacific Partnership (TPP) pushed by the Obama administration to integrate the trade activities of twelve Pacific Rim nations, which represent nearly 40 percent of the global economy. Some six hundred corporations were involved in negotiating the TPP, but US congressional representatives were forbidden from receiving copies of the actual treaty. They were told if they wanted to read the document they would have to surrender their smartphones or other recording devices before entering a secure soundproof reading room in the Capitol basement, and none of their legislative staffers could attend. The few elected officials who bothered to do so were only "in the single digits."[144]

The head of the USTR office, Ron Kirk, justified this unprecedented executive branch secrecy by arguing that that disclosure of early drafts of the Free Trade Agreement of the Americas had led to its downfall and therefore "some measure of discretion and confidentiality" was justified "to preserve negotiating strength and to encourage our partners to be willing to put issues on the table they may not otherwise."[145] The reality is that when people learn what is in these kinds of agreements, the agreements often fail. A Wikileaks release of only one of the TPP's twenty-nine chapters helped raise enough opposition to scuttle that agreement.

How many legislators actually read the new NAFTA agreement before rubber-stamping it is unknown.[146] Like the DR-CAFTA, negotiations re-

mained hidden from the public view and Freedom of Information Act requests for the "negotiating text, proposals of each Government, accompanying explanatory material, and emails related to the substance of negotiations" were denied.[147] Public participation was limited to a twenty-two-day period for submitting written comments. Testimony at a three-day oral hearing was further limited to corn grower associations, grain corporations, and food industry lobbyists. The US Corn Growers Association lobbied heavily for the "new NAFTA" to expand ethanol markets "down there."[148] Pat Binger, representing Cargill, bragged about the company's "American success story," growing from a single grain facility in 1865 to a transnational corporation with business in seventy countries and more than 150,000 employees, including 10,000 employees in Mexico and Canada and almost $2 billion annual operations in those two countries. He said, "Cargill supports trade agreements that foster the inter-connectedness of our food system . . . and reinforce the importance of rules in the global trading system."[149] Binger also championed the Chapter 11 dispute mechanisms as "a critical insurance policy for US agriculture." Although it avoids the trigger language of GMOs, and refers instead to "science based sanitary and phytosanitary measures," the new NAFTA was the first trade agreement negotiated by the United States to encompass biotechnology.[150]

While Article 5.7 of the World Trade Organization's Sanitary and Phytosanitary Measures (SPS) allows countries to pass regulations under a precautionary principle, the new NAFTA may (or may not) oblige all parties to accept products authorized by just one member state.[151] Trade analyst Steve Suppan raises another disturbing question about transnational subsidiaries. As he asks, what happens "if the exporting entity and importing one belong to the same [corporate] parent, such as Cargill North American exporting to Cargill Latin America"?[152] Contradicting a Canadian policy permitting 0.2 percent contamination of GM strains not yet approved for safety, the "new NAFTA" makes it more difficult for Mexico to reject imports contaminated by GMOs.[153] It also allows for corporations to file suit if patent rulings are "unreasonably" delayed. Most hypocritically, the new NAFTA freed Canada from "investor-state" (i.e., Chapter 11 treaty) lawsuits from

US corporations and vice versa, but Mexico inexplicably agreed to allow foreign corporations to continue challenging its democratic legislation.[154]

In social media posts Trump gloated repeatedly about his "wonderful new Trade Deal," replete with his characteristic ignorance of capitalization rules. He renamed it the "US-Mexico-Canada Agreement" just because he liked that it sounded like USMC, the acronym for the US Marine Corps. On January 30, 2020, he typed, "BIGGEST TRADE DEAL EVER MADE, the USMCA, was signed yesterday and the Fake News Media barely mentioned it. They never thought it could be done." In a mini-acronym war, Canadian prime minister Justin Trudeau called it CUSMA (Canada-US-Mexico Agreement). Incoming Mexican president Andrés Manuel López Obrador had criticized NAFTA on the campaign trail as "the biggest pillage in history."[155] López Obrador nevertheless signed his predecessor's agreement, but he made clear that whether it was called CUSMA or USMC, like the Gershwin tomato/tomahto, potato/potahto show tune debate, he would have rather "called the whole thing off."

At the URL betterseed.org, American Seed Trade Association (ASTA) lobbyists detailed the group's plan to maintain close relationships with the US Patent and Trademark Office and encourage national legislation throughout the Americas to comply with regulations in the UPOV.[156] The ASTA celebrated that the new agreement gave Mexico an explicit four-year deadline to approve UPOV 1991. Opposition from the powerful Sin Maíz no Hay País movement, however, scuttled a 2020 bill ("The Federal Law of Vegetable Varieties") to conform Mexican law to UPOV 1991, but this trade threat remains.[157]

Over the last five hundred years, foreign colonizers and corporations have attempted to conquer corn through legal edicts, contamination, and commercial lobbying, but maize has remained mutinous through the ages. By necessity, peasant networks like Via Campesina became experts in these imperial legal mazes in order to protect their millennial rights to save seeds stewarded by their ancestors. While the captains (of industry) write illegalities into their ship logs, grassroots Mesoamerican leaders have charted

a different course, mobilizing public sentiment through social media and on the streets. Although trade proponents bluster that "a rising tide raises all boats," the brute imposition of GM corn will capsize Mesoamerican farmers. Or, perhaps, the swelling waves of resistance from Mexican and Guatemalan food sovereignty movements will sink the titanic US trade power.

FIVE

Many Mexican Worlds in Defense of Maize

After several months as an uninvited guest at the Aztec court, Hernán Cortés had returned to Veracruz to meet a Spanish crew sent from Cuba to arrest him for insubordination. Cortés left his lieutenant Pedro Alvarado and eighty soldiers stationed in the Aztec capital of Tenochtitlan. On the eve of July 1, 1520, Alvarado's band, without provocation, massacred crowds celebrating a sacred festival. Realizing they were outnumbered, Spanish soldiers decided to escape with their loot. Weighted down by the heavy gold bars from melted Aztec treasures, many drowned as they fled. In Mexico, this day is remembered as "La Noche Triste" (the Night of Sorrows). Alvarado, unfortunately, survived and soon led the Spanish invasion of present-day Guatemala.[1] With his spoils of conquest, Alvarado became the second richest and most widely diversified conquistador. Like a proto-transnational corporate executive, he collected tribute from twenty-three thousand subjects, and combined those with profits in mining, cattle, transport, and gambling. By his death he had amassed a fortune worth almost $18 million in today's dollars.[2]

On July 1, 2020, exactly five hundred years after that sorrowful night, CUSMA (the "new NAFTA") took effect. Dr. Alejandro Espinosa, one of the key biologists leading Mexico's fight against GM corn, evocatively refers to Mexico's era of trade agreements in speeches as "a long neoliberal night."[3] Like the Aztec warriors who defended Tenochtitlan, Mexican state officials are now fighting back against a corporate food regime to defend the country's biocultural treasures: maize diversity and its derivative gastron-

omy. Reversing four decades of structural adjustment and corn dumping, Mexico's former president, Andrés Manuel López Obrador (often abbreviated with his initials AMLO), reasserted food sovereignty on a scale only possible with the backing of the state's political will. He pledged in 2020 that Mexico would ban Roundup, become self-sufficient in growing its own non-GM white maize for tortillas, and phase out the yellow GM corn being imported from the United States for animal feed.

Mexico's audacious attempt to overthrow its corporate food occupiers is symbolic in other ways. Not only is Mexico the birthplace of maize, it also is where Via Campesina coined the term "food sovereignty."[4] Even though Mexico hosted the world's first Green Revolution research center, one scientist employed in that endeavor, Efraím Hernández Xolocotzi (1913–91), became the father of agroecology. Although Hernández Xolocotzi trained at Cornell University in positivist science, he remained an "organic intellectual" (in the Gramscian sense).[5] From early in his childhood in Tlaxcala he recognized the intellectual contributions of Indigenous peoples and peasants as cocreators of contextual knowledge through language, territorial intimacy, and especially cultural memory.[6]

From the mountains of Chiapas, the Zapatistas led the world's first armed rebellion against neoliberalism, embracing diversity as a core principle of Indigenous autonomy. Then when GM corn contamination was discovered in Indigenous maize fields in the mountains of Oaxaca, Mexico again found itself center stage in the global debate about the perils of biotech crops. After a long struggle by diverse actors, Maya plaintiffs from another Indigenous-majority region of Mexico, the Yucatán Peninsula, won legal cases to ban GM corn.

Over its tumultuous twentieth century, Mexico's political leadership often pitted the urban poor against rural interests.[7] As a sacred foundation of the "imagined community" of Mexico, however, the charisma of maize helped mend these political fault lines. The protracted Mexican saga over GM corn illustrates that when social movements rise above traditional differences and forge complex coalitions and odd alliances, they can move mountains. Should the Mexican state successfully send its corporate bullies

scurrying, this nation could shift from being the second-largest importer of industrially grown corn to becoming an international model for agroecology and food sovereignty.

Mexico's resistance to Monsanto also matters for people far beyond its borders. The country's unique maize landraces and endemic teosintes—adapted to a dizzying array of environmental conditions, photoperiods, altitudes, rainfall, wind patterns, and soil quality—are a treasure for humanity.[8] Mexico has the genetic material within its own natural heritage and the traditional ecological knowledge embedded within its sixty-two Indigenous languages to help the world adapt to climate change. Besides being the birthplace of maize, present-day Mexico is the center of origin for dozens of other crops: beans, squashes, vanilla, chocolate, chicle, chayote, chili peppers, papayas, amaranth, avocados, agave, chia, jicama, spirulina, tomatillos, and more. Covering just 1 percent of the earth's surface, Mexico's ancestral farmers domesticated 15.4 percent of crops that entered the modern world food system.[9]

Just as women played critical roles in the Zapatista movement and the Mexican Revolution before it, Mexican opposition to GM corn is a h(er)-story of anonymous Mexican women of all ethnicities, who labor daily in their kitchens to conserve millennial foodways.[10] After NAFTA propelled millions of men to emigrate, women-headed households sustained maize cultures through hard decades of government policies and corporate plans intent on destroying their small farming economy.[11] These rural women were joined by urban housewives who banged pots to protest high tortilla prices. And forging the resistance to GM corn are brilliant urban intellectuals like Silvia Ribeiro, Maya beekeepers represented by Leydy Pech, prominent women scientists like Elena Álvarez-Buylla, and coalition organizers like Adelita San Vicente—many of whom are now in charge of the governmental ministries and agencies working to return Mexico to food sovereignty after a century of state policies intent on destroying the milpa system.

ASSAULTS ON THE COUNTRYSIDE

On the eve of the Mexican Revolution, only 4 percent of the rural population owned land. Favoring large estates (haciendas) and export plantation agriculture, the Porfirio Díaz dictatorship (1884–1911) embraced Euro-American models of modernity and land concentration. During the "Porfiriato," Mexico began importing US corn. Even a maize-centric cultural region like Oaxaca was importing one-third of its corn between 1908 and 1910.[12] Ignoring rural poverty and landlessness, Porfirio's advisors blamed Mexican underdevelopment and malnutrition on maize and promoted wheat as a more "progressive" alternative.[13]

Maize production rebounded after the Mexican Revolution because of land reform. President Lázaro Cárdenas (1934–60) redistributed 60 percent of the country's forests and fields into 29,500 municipal ejidos governed by community elections and deliberation.[14] Although Cárdenas's successors were considerably less revolution-minded, the Institutional Revolutionary Party (PRI) continued to promote national food security in an effort to secure the rural votes needed to sustain the party's long political monopoly.[15] Revenue from Mexico's oil boom helped grease the PRI's elaborate patronage system. In 1962 Mexico's president Adolfo López Mateos declared, "Mexicans would never again have to suffer the ignominy of eating tortillas made with imported corn."[16]

However, by the 1970s inflation had eroded the value of price supports, causing many farmers to seek off-farm wages. After Mexico's 1982 debt crisis, the IMF imposed austerity measures and dismantled Mexico's decentralized support to rural farmers and small tortilla businesses. By 1991 a high-ranking official from the Ministry of Agriculture went so far as to declare, "It is the policy of my government to remove half of the population from rural Mexico during the next five years."[17] In 1992 Mexico ended federal support to its hybrid seed production program (the *Productora Nacional de Semillas*). Private seed companies stepped into the void—growing from a 22 percent market share in 1980 to capturing 93 percent of the market by 1993. By deregulating the seed sector, the government rescinded its right to inspect seed, a task previously performed by the

National Seed Inspection and Certification Service. Ergo, even before GM corn entered the picture, a "neoliberal food regime" was already dismantling the traditional milpa system and maize diversity, setting the stage for GMO contamination.[18]

Despite having negotiated a tiered increase of US corn imports, in the first year of NAFTA's implementation Mexico inexplicably lifted all quotas and sacrificed $2 billion worth of tariffs it could have collected between 1994 and 1998.[19] National maize production plummeted 41 percent in 1994.[20] Before NAFTA, Mexico imported 500,000 tons of corn, but within a decade, 7.5 million tons of US corn flowed into Mexican markets at below-market prices.[21] Before NAFTA, agriculture historically employed 23 percent of the population, but between 1991 and 2007 Mexico lost 20 percent of its farm jobs, a net loss of 2.1 million livelihoods.[22]

Although Mexico maintains a stronger system of agricultural supports than most countries in Central America, the United States subsidizes its corn farmers with a sum roughly ten times the entire Mexican agricultural budget.[23] Although the Mexican government invested US$20 billion on new types of subsidies (irrigation systems, credit, and marketing support) over fifteen years (1994–2009), large industrial farmers monopolized most of these benefits. The wealthiest 10 percent of Mexican farmers—including high-profile agricultural appointees and drug lords[24]—captured more than half of these NAFTA-transition funds.[25] The transnational grain giant Cargill even collected 500 million pesos (about $38,000) of marketing support payments.[26]

Mexico's agrarian bias toward the rich was so pronounced that even the World Bank commented, "Agricultural spending is so regressive, it cancels out about half the redistributive impact of rural development spending."[27] Mexico's agriculture secretary defended this strategy, arguing that his job was to uplift "those [large farmers] who are economically viable" and incentivize subsistence producers to leave agriculture and collect welfare-type payments.[28] An undersecretary of the same ministry, speaking to the *New York Times*, even praised "rural to urban migration" as "a highly desirable phenomenon."[29]

Despite the greater productivity and higher per-acre nutritional value

of the traditional milpa system, Mexico's public investments have long discriminated against small farmers, especially Indigenous communities concentrated in southern Mexico. Mexico's sixty-eight Indigenous groups constitute a quarter of the population, but Indigenous-majority municipalities receive only 12 percent of agricultural spending, just 6 percent of environmental funds, and one-tenth of 1 percent of public agricultural credit.[30] Consequently, between 1980 and 2015, rainfed maize production decreased 53 percent in the municipal ejidos (down by 1.2 million hectares)—while irrigated industrial maize increased at a rate of 49,000 hectares (121,082 acres) per year.[31] Urbanites largely met these assaults on the countryside with apathy, until soaring tortilla prices shocked them into action.

THE TORTILLA CRISIS

During the 1980s austerity period, to avoid food riots from other budget cuts, the Mexican government continued to control maize prices and distribute tortilla flour at a 40 percent discount through a parastatal agency called the National Company for Popular Subsistence (CONASUPO), which manages its distributor network (DICONSA) of twenty-two thousand rural stores that sell discounted seeds and staple foods.[32] Starting in the late 1980s, however, President Carlos Salinas de Gortari approved an increase to the price that traditional tortilla vendors paid for maize while simultaneously fixing tortilla prices. Then, in 1990, the Mexican consumers bureau forgave the loan of any tortilla shop that shifted to dehydrated tortilla flour (*masa harina*), while traditional millers and tortilla shops still had to pay full price for maize.[33]

Combining these subsidies with economies of scale, over two-thirds of Mexican tortillas are now factory made using the Gruma corporation's Maseca flour.[34] Founded by Roberto González Barrero ("Don Maseco"), Gruma also controls 90 percent of tortilla flour markets supplying immigrants in California, as well as 80 percent of Central America's market (with manufacturing plants in Honduras, Guatemala, and Costa Rica).[35] In the lead-up to NAFTA (1991–93), the proportion of tortillas made from industrial flour nearly doubled, from 15 to 27 percent. This made Don

Maseco the seventh-richest man in Mexico and also one of the richest men in the world (number seventeen on the Forbes list).[36] After NAFTA, US grain corporations strategically acquired shares in these tortilla flour businesses: ADM aligned with Gruma, and Bunge bought out the smaller state company Minsa.[37] This duopoly controls 96 percent of Mexico's tortilla flour market.[38] At a time when commercial loans in Mexico came with 30 percent interest rates, Gruma also benefited from NAFTA's low-interest loans from the US Commodity Credit Corporation.[39]

Despite reduced labor costs for factory tortillas made from instant masa flour, the consumer price of tortillas bizarrely increased 483 percent in inflation-adjusted value in the first five years of NAFTA's implementation.[40] In the midst of this crisis, President Ernesto Zedillo inexplicitly liquidated CONASUPO. He shifted government supports from rural producers to urban consumers through a new welfare program to distribute a kilo of tortillas daily to poor families, using coupons called "tortivales," which some joked were really "torti-votos," or tortilla vote bribery.[41]

Just as US citizens grow indignant about high gas prices, tortilla prices are a common topic of daily conversation about the perceived health of the Mexican economy.[42] When Mexico eliminated the tortilla coupons in 1998, that policy change hit rural workers hard.[43] Maize accounts for 40 percent of urban calories but 70 percent of the rural diet.[44] Whereas tortillas consume perhaps 3 percent of average urban income, rural households that do not plant maize spend upward of 45 percent of their cash on tortillas.[45]

In response, the debtors' movement El Barzón and the largest peasant associations joined forces in 2002 to launch a campaign called "El Campo No Aguanta Más" (the countryside can bear no more, or ECNAM). This coalition brought together hundreds of rural associations, NGOs, government agencies, scientists, and intellectuals.[46] Through dialogue they realized Mexico's food insecurity was a consequence of a longer-term erosion of the rural economy. To defend maize, therefore, the coalition would have to defend rural lifeways holistically.[47] The ECNAM campaign coordinated a march of some one hundred thousand people in Mexico City on January 31, 2003.[48] Internationally famous Mexican intellectual Gustavo Esteva coined a phrase (and an eponymous 2003 book) that became a mantra

of the movement: "Sin maíz, no hay país" (Without maize, there is no country).[49] In a negotiated "Accord for the Countryside," the Mexican state responded with some changes to rules governing its rural DICONSA stores but skillfully avoided the fundamental issue of NAFTA corn imports.[50]

The ECNAM alliance sprang back into action in 2006, when corn prices rose after the United States diverted more of its corn crop to ethanol.[51] Mexico's incoming president in December 2006, Felipe Calderón, faced angry crowds because tortilla prices had doubled within a year to 11 pesos (three times the inflation rate and four times salary raises).[52] This *tortillazo* (tortilla crisis) aligned sectors—rural and urban, producer and consumer—that the PRI's corporatist political strategies had previously divided. Many people who had never before been politically engaged joined the demonstrations. Maize—as both staple and heritage symbol of the Mexican nation—had inspired them to act. Women banged pots in a *cacerolazo* and marchers chanted "Yes for tortillas and no to the 'PAN'!" (in reference to the National Action Party, whose ironic acronym means "bread" in Spanish).[53] In response, the state brokered a voluntary compact among tortilla factories and supermarkets. To standardize maize prices at 3.5 peso per kilo; tortilla flour at 5 pesos/kilo; and finished tortillas at 8.5 pesos/kilo, the government awarded Maseca and Minsa a subsidy of 625 pesos per ton of corn.[54] Sourced from Sinaloa's industrial farms and US imports, that tortilla flour was likely already contaminated by GM corn, as portended by Oaxaca's scandal.[55]

OAXACONTAMINATION

When Mexico negotiated NAFTA in the early 1990s, commercial GM crops were not yet a reality.[56] But the issue soon "rubbed salt into the wounds opened by NAFTA."[57] Like Europe, Mexico initially permitted field trials of GM crops, but then reversed course in late 1998 with a complete moratorium. That ban was more of a practical decision than an ideological one, as Mexican officials concluded that Monsanto's GM traits were irrelevant to the predominant pests and growing conditions of Mexico. The European corn borer, *Ostrinia nubilis*, targeted by the Bt insecticidal toxin was not

a problem for Mexican maize;[58] nor did the Mexican countryside need labor-saving herbicides, given the high rates of rural unemployment.[59] Monsanto's own data showed that regular hybrid varieties performed better than GM corn in Sinaloa trials.[60] In fact, without GMOs Mexican maize producers managed to raise their yields by 63 percent between 1980 and 2010, mostly due to irrigation and experimentation with no-till planting.[61]

Although it had technically banned GM corn, the Mexican government did nothing to test the genetic provenance of the mountains of midwestern corn kernels flowing into Mexico—of which probably 25–30 percent were then transgenic.[62] Imported as whole kernel corn, any curious farmer could plant it.[63] Greenpeace Mexico made news when it announced in March 1999 that corn entering the port of Veracruz was genetically modified. The Mexican government assured the public not to worry, claiming the grain had been sterilized with a fungicide. In response, ornery Greenpeace activists planted those kernels (but carefully destroyed the plants before they could pollinate). And, yes, apparently the US corn was viable as seed.[64]

The next year, two researchers discovered that GM corn from the United States had cross-pollinated into native Mexican landraces in Oaxaca, Mexico's cradle of maize domestication.[65] This set off a worldwide scientific scandal about the environmental risks of gene dispersal, barely one year after world nations had negotiated the Cartagena Protocol on Biosafety.[66] Because of Mexico's moratorium on GM corn, no one expected to find contamination so soon in a majority-Indigenous region (with seventeen ethnolinguistic groups) and where 93 percent of the population plants traditional, open-pollinated seeds.[67]

The Zapotec community in question, situated high in the Sierra Juarez, is twenty kilometers from a main highway. Farmers there rarely if ever buy store seed.[68] Only by happenstance did UC Berkeley graduate student David Quist stumble upon GM strains in an educational community workshop meant to demonstrate the difference between native maize varieties and canned corn from the United States.[69] Quist carefully reconfirmed the results with his advisor, Ignacio Chapela. They sampled maize from twenty-one other communities, and found GM strains in fifteen. Back in their UC Berkeley lab, Chapela's team noticed something else: the genet-

ically modified DNA sequences had fragmented and inserted themselves randomly into the native maize genome. The unpredictable effects of this genetic intrusion raised the possibility that GM strains could introgress (jump back) into teosinte, turning maize's progenitor into a superweed or cumulatively induce other catastrophic changes to maize.[70]

After rigorous peer review, one of the most prestigious scientific journals, *Nature*, published Quist and Chapela's paper.[71] In violation of academic ethics, however, Monsanto appears to have received an advanced copy of the article. On the day of its release, two fictitious personas in science chatrooms, dubbed "Mary Murphy" and "Andura Smetacek," posted immediate critiques on a pro-GMO site, AgBioWorld. It turns out "Murphy" was an employee of the Bivings Group, a public relations company subcontracted by Monsanto, and Smetacek's posts had originated from an IP address based at Monsanto offices in St. Louis, Missouri.[72] Under political pressure from corporate advertisers, and for the first time in the 130-year history of the journal, *Nature*'s editors retracted the publication and demanded further evidence about where and how these transgenes appeared in maize DNA.[73] In dispute was Quist and Chapela's minor conclusion about random gene fragmentation, but the overall result—the fundamental presence of transgenes— remained unassailable.[74]

Throwing fuel into the controversy, Novartis-Syngenta had a $25 million contract with Chapela's public university department.[75] Signed in 1998, this five-year deal gave the biotech corporation the right to file patents on a third of discoveries made using funds from the "donation."[76] Long before the Oaxaca scandal, an untenured Chapela and his students had vociferously opposed this deal.[77] When Chapela came up for tenure in 2002, the senior faculty voted 32–1 to approve his promotion, but an upper-level administrator denied it for mysterious budgetary reasons—a situation that almost never happens in academic life.[78] Chapela eventually won his case through legal appeal and continues to work at UC Berkeley, but disappointingly he did not respond to repeated email inquiries for advice about current struggles.

Before the 2001 *Nature* article was released, Chapela had shared his results with Mexico's National Biodiversity Commission (CONABIO) and

National Ecology Institute (INE).[79] Those agencies independently collected samples from twenty locales in Oaxaca and two in Mexico's other origin center of maize, Puebla. In 95 percent of those twenty-two communities, the Mexican government found that one particular transgene (a CaMV 35S promoter) tainted an average of 7 percent of the native samples, though in some communities contamination was as high as 35 percent.[80] Even more disturbing, the Mexican government confirmed in January 2002 that a possible source of contamination was corn seed distributed by its own DICONSA stores around the country.[81] At that time about 40 percent of DICONSA's supplies came from the United States with a 37 percent transgenic rate.[82] The Oaxacan maize harvest in 1997–98 was so poor that farmers may have turned to DICONSA stores for seed corn to replant their fields.[83] Nevertheless, Quist and Chapela found contaminated maize on farms that had never planted store-bought seed.[84]

Almost thirty Oaxacan leaders from twenty-one Indigenous and peasant communities—primarily from the Ixtlán district, but with representation throughout the state[85]—filed a petition in 2002 with the Commission for Environmental Cooperation (CEC), a trinational agency established under NAFTA. Some ninety experts and organizations also wrote letters calling for the CEC to analyze the facts and weigh in on the controversy. Dr. José Sarakhán, an illustrious biologist who in 1992 had founded the National Commission for Knowledge and Use of Biodiversity (CONABIO) and later served as chancellor of Mexico's National Autonomous University (UNAM), chaired the CEC investigation.

While the official study was underway, a coalition of Mexican NGOs used commercial test kits and found evidence that StarLink, among other transgenes, had crossed into Mexican subsistence maize fields.[86] Biologists from UNAM collaborated with 138 Indigenous and peasant communities across nine states to test two thousand maize plants; in 2003 these tests again found multiple types of contamination (and again including the allergenic StarLink).[87] The scientists presented the results directly to civil society groups converging at the second "Forum in Defense of Maize." One Zapotec leader from Oaxaca, Aldo González, responded, "What has taken our indigenous people thousands of years to develop, today

the industries that do business with life can destroy in little time."[88] In another riveting speech at the third Forum in 2004, Gonzalez reminded the crowd, "We are heirs to a great treasure that is not measured in money and that they want to take away from us. This is no time to beg for alms from the aggressor."[89]

The 2004 CEC report assembled an impressive portfolio of agricultural, environmental, economic, and cultural experts as coauthors, advisory group reviewers, and external reviewers. Unusual for that time in its use of phrases like "political autonomy" of Indigenous peoples, the report erred on the side of precautionary risk assessment, given the deep cultural and spiritual value of maize in Mexico.[90] Sarakhán's team concluded that GM contamination was a threat to maize diversity and recommended that Mexico should: maintain its moratorium on GM corn; proactively label or mill imported corn; educate farmers about not "deliberately or inadvertently" planting imported seed; create a program by which farmers could submit saved seeds for testing; and invest more into conservation of maize diversity in situ.[91] The CEC team submitted its investigation to *Nature* to vouch for Quist and Chapela's work, but the journal's editors rejected the study on "technical grounds."[92] However, by 2007 another ten studies reconfirmed widespread contamination. Due to English-language barriers, however, only three have entered into the "peer-reviewed" literature.[93]

UC Davis professor George Dyer led another study that sampled 1,765 households in eighty localities in fourteen of Mexico's thirty-one states, and paradoxically Dyer found that Mexico's most heavily Indigenous southern states had the highest rates of contamination.[94] These revelations suggested that transgenes can travel more than seed corporations had been willing to admit, whether through pollen dispersal or, more likely, via seeds carried from place to place and outside the radar of regulation.[95] Such contamination can be difficult to monitor or eliminate because transgenes are not always phenotypically expressed.[96] While most studies of maize contamination have focused on pollen, maize seeds can be purposefully leaked from experimental plots in counties with high indexes of corruption or, more innocently, accompany human migration.[97] Between 1997 and 2001, at least 0.5 percent of Mexican seasonal or temporary migrants to the

United States admitted to bringing corn seeds home with them.[98] They likely did so because small farmers traditionally exchange and mix seeds to strengthen their vigor and diversity.

Administrators for the global maize seed bank housed at CIMMYT temporarily halted the collection of maize varieties from Oaxaca, but then distanced the organization from the furor and downplayed the consequences of contamination, saying, "It's just one [new] gene among 50,000 to 60,000 [maize] genes."[99] CIMMYT's founder and Nobel laureate, Norman Borlaug, minced fewer words, arguing that the "utopian idealists worried about contamination of the old with the new" are "completely idiotic."[100] Throughout Mexico's saga, CIMMYT continued its own biotech research program, including field tests of GM wheat starting in 2008.[101] CIMMYT's blasé response is worrisome, considering Mexico's maize accessions constitute a third of the global collection and they are frequently shared with corporations and researchers around the world.[102]

Mastering all these technical details and biotechnology trends was Silvia Ribeiro, a bilingual Mexico City–based journalist and intellectual. Through a regular newspaper column in *La Jornada*, Ribeiro kept GMOs in the public eye for decades while also amplifying the voices of Indigenous critics.[103] As an analyst for the nonprofit Erosion, Technology, and Concentration Group (ETC; formerly RAFI, the Rural Advancement Foundation International), Ribeiro and ETC's founder (and Right Livelihood awardee) Pat Mooney presented Mexico's contamination saga to the international food movement at Via Campesina meetings, at the World Social Forum, and at other social movement convergences. Unlike the often-preachy anti-GMO literature, their soothsayer communiques deliver delightful repartee, including phrases like "genetic roulette," "pardon my patent," "coming detractions," "transgenic trade agreement," and "dignified science" (the latter in reference to Indigenous knowledge).[104] They vividly nicknamed Monsanto's propriety technology to sterilize plant progeny as a "Terminator" threat—a phrase that went viral among food movements and almost single-handedly quashed this threat. The ETC Group restores one's faith that a small group of thoughtful, committed people can indeed change the world.

UNDIGNIFIED POLICY

Too many others are corruptible. Just as GM foods fell in the fuzzy lines separating the US EPA, the FDA, and the USDA, Mexico's regulatory response to GM technology fell through similar bureaucratic cracks.[105] Despite the dignified science behind the CEC report, other officials within the Ministry of Environment and Natural Resources decided to lift the GM crop moratorium on August 13, 2002, and began preparing guidelines for experimental permits. Under pressure from a consortium of biotechnology corporations called AGROBIO, the Ministries of Environment, Commerce, and Health embraced GMOs and even approved the use of Monsanto's bovine growth hormone (rBST) four years before it was approved for use in the United States.[106]

Despite having signed the 2003 Accord for the Countryside, the Mexican Congress approved that same year the Biosecurity Law for Genetically Modified Organisms without public consultation or debate.[107] Greenpeace-Mexico dubbed the biosecurity bill a "Monsanto Law"—an epithet that would eventually circumnavigate the world and reappear in Guatemala's discourse, when a similar law slipped through its legislature in 2014. One serious loophole in the Biosecurity Law was that the size of "field tests" was never defined, so agribusiness could grow commercial quantities on "experimental" plots if they wanted.[108] By 2013 Mexico was growing more GM crops than any European country except Spain.[109]

Like in the United States, where Monsanto maintains a revolving door with the leadership of the USDA and the EPA, many key Mexican regulatory posts—for example, the director of the State Board of Maize—were occupied by former Monsanto executives.[110] Then secretary of economy Bruno Ferrari, who previously directed Seminis-Mexico (which was sold to Monsanto), repaid his former employer by arranging a personal meeting between President Felipe Calderón and Monsanto's CEO Hugh Grant at the World Economic Forum in Davos, Switzerland, in 2009.[111] Shortly thereafter, Calderón's administration ended Mexico's moratorium on GM corn and welcomed other GM crops (cotton, soy). As though nature her-

self mourned this policy shift, that same year three-quarters of monarch butterflies died in their migration home to Mexico.[112]

Confirming that Monsanto was in cahoots with the political establishment, the Mexican delegate to the tenth Convention on Biological Diversity conference in Japan in 2010 attempted (unsuccessfully) to break the voluntary global moratorium on Terminator technology.[113] In 2011 Monsanto and Pioneer (which was acquired by DuPont and later merged into Dow-DuPont) applied to plant 1.4 million hectares of GM corn in Sinaloa and 1 million in Tamaulipas—an extension larger than El Salvador.[114]

Mexican courts initially rejected the first lawsuits that Greenpeace and other environmental and peasant associations filed against these permits. The lead plaintiff Dr. Adelita San Vicente formed a coalition of environmental lawyers, twenty civil groups, and fifty-three citizens and scientists filed a "collective demand" (akin to what in the United States would be called a "class action lawsuit") in 2013 against the Ministries of Agriculture and Environment for having rubber-stamped GM crop permits (they had approved 283 of 327 requests).[115] Citing the precautionary principle *in dubio pro natura* (when in doubt, favor nature), a Mexico City (D.F.) court judge, Marroquín Zaleta, agreed and suspended all permits for GM field trials.[116] When corporate biotech lawyers appealed Marroquín Zaleta's decision, another seventy-eight high-profile chefs joined the struggle, including Mexico's Enrique Olvera, chef and owner of the acclaimed Pujol restaurant, which is ranked in the top twenty restaurants worldwide.[117]

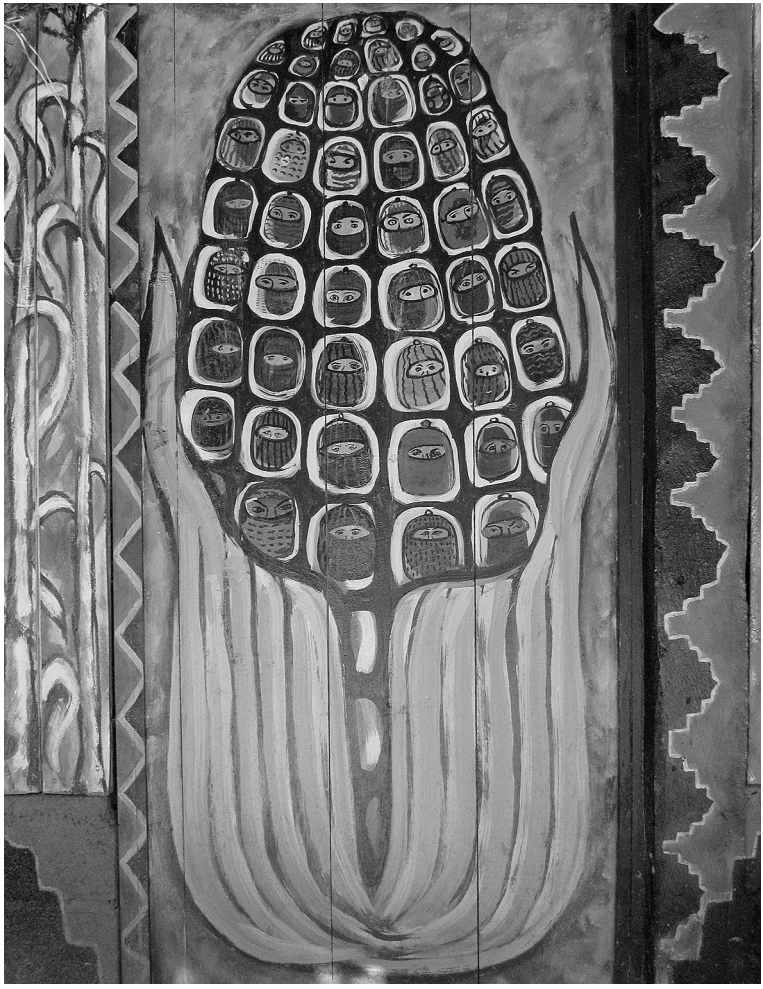
Although the Mexican state treated northern Mexico as a safe growing region for GM crops, that region has unique landraces developed over centuries through ethnocultural selections for cuisine, forage, and construction.[118] With strong Indigenous representation from Mexico's northern peoples, the National Indigenous Congress (CNI) denounced the existential threat of GMOs in their territories. As Pedro Turuseachi (Tarahumara, original people of present-day state of Chihuahua) wrote, "With [maize], we are born, we grow, we die. . . . The contamination of our seed is an attack to the heart of Indian communities."[119] Wixárika elders note, "Only among all of us do we know everything" (*Sólo entre todos sabemos todo*)[120]—an

insight that reflects a deep Indigenous respect for plurality, which also has been a core tenet of the Zapatista movement in southern Mexico.

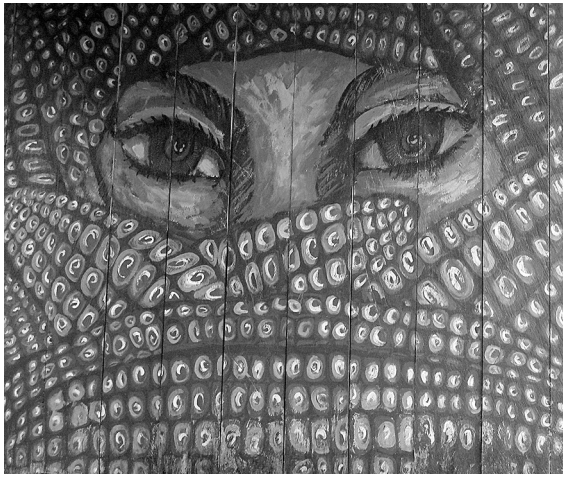
ZAPATISTA MAIZE

Although prior to NAFTA the Mexican state was aware of the growing National Zapatista Liberation Army (ELZN) that was amassing in the southeast, government officials remained mum about it so as not to jeopardize trade negotiations. Even so, the Zapatista uprising in Chiapas on NAFTA's implementation day of January 1, 1994, took officials by surprise. Demonstrating their hallmark flair for public relations, the Zapatistas kidnapped a former governor that day and placed him on trial; rather than shooting him, they sentenced him to a life term of "hard peasant labor," but soon released him to Bishop Samuel Ruiz who negotiated a truce. Early Zapatista declarations notably demanded equal access to Green Revolution technologies, but within a couple of years the guerrilla movement dropped these demands.[121] Although the Mexican state agreed to improve public services in the 1996 San Andrés Accords, by the turn of the millennium the Zapatistas realized that the "bad government" would never fulfill its promises.

This marked a transition toward a strategy of internal self-reliance on community governance, healthcare, education, and especially agriculture. Zapatista territory returned to pre-NAFTA maize acreage by 2007.[122] Another important transition came in 2003, when the EZLN demilitarized its autonomous municipalities and passed decisions to civilian-run "councils of good government." After some forty thousand Zapatistas seized five Chiapan cities by surprise on December 21, 2012 (at the end of the thirteenth Maya baktun) — using a silent, peaceful march to demonstrate their growth and unity — their spokesperson, Subcommander Marcos, wrote, "Did you hear it? It is the sound of your world collapsing. It is that of ours rising anew."[123] In September 2019 the Zapatistas announced that eleven more zones (known as *caracoles*, or "snail shells") had voluntarily joined their autonomous territory, making essentially half of Chiapas a land where "the people rule, and the government obeys." Still flourishing three decades later



▲ FIGURE 8. *Rebel Kernels*, EZLN. Photo by Lindsay Naylor.



► FIGURE 9. *Maize Mask*, EZLN. Photo by Lindsay Naylor.

FIGURE 10. *Somos Raíz,* EZLN. Photo by Diana Taylor.

despite paramilitary repression, the movement now represents a thousand communities in thirty-one autonomous municipalities.[124]

Maize is a potent cultural symbol of the movement. Zapatista artwork often features rebels as a collectivity of maize kernels, maize as mask, Zapatista soldiers growing from stalks of maize, or rainbow maize colors as an illustration of the philosophy of "unity within diversity." In one of Marcos's more famous essays against the "fourth [neoliberal] world war," he noted: "Groups of protesters, *kernels of rebels*, are forming throughout the planet. The empire of financiers with full pockets confronts the rebellion of pockets of resistance. Yes, pockets. Of all sizes, of different colours, of varying shapes."[125] Using Monsanto as a foil, the Zapatistas launched the Mother Seeds in Resistance campaign in 2002 (immediately after the Oaxaca scandal) and declared Zapatista territory to be "GMO free"—a task easier said than done.

Prior to the rebellion, Chiapan villages had lost significant maize diversity and were mostly planting white varieties amid heavy agrochemical use.[126] The San Diego–based nonprofit Schools for Chiapas worked with them to create a joint program of seed conservation and maize testing for GM sequences (2001–4). Communities politely collaborated with an ex situ seed bank but then abandoned it once the foreigners left, because the concept of "banking" was anathema for Zapatistas. In three years the project managed to save only 61 varieties, while an estimated 280 unique cultivars grow in Zapatista milpas. The Zapatistas began developing in situ experimental plots to identify native maizes better suited for climate change. Over time the Zapatista communities began to cultivate three to five colored varieties.[127] Even though many Zapatista farmers still use herbicides to save labor, they are now trying to reduce the use of agrochemicals both in maize and in coffee systems, arguing that within Maya cosmology, "organic is what our grandparents did."[128] Also reflecting the adaptive resilience of the rebellion, Zapatista communities have improvised a stylized new Maya altar ceremony to bless their seeds before planting.[129]

Enmeshing biotechnology debates into Maya cosmology and autonomy, Zapatista educators have characterized GMOs as being something like an infection or plague introduced by foreign invaders, rallying farmers to join in conducting thousands of field tests for contamination.[130] Wherever GM strains are detected in their native maize fields, Zapatista farmers pull the crop and receive support to buy tortilla flour until the next maize season. Because this flour likely contains GM corn imported from the United States, science studies scholar Marisa Brandt insightfully noted, "This policy sets the Zapatista anti-GM movement distinctly apart from consumer-based anti-GM movements wherein concerns over their unknown health risks take center stage."[131] To finance the testing program, the Schools for Chiapas nonprofit shares Zapatista maize seeds with small donors and recommends they be sown with "much water, rich soil, plus dignity, democracy, justice, and especially revolutionary love!" In turn, small donors must promise to "never patent nor abuse the genetic material or life force of this seed."[132]

HONEYCOMBING THROUGH THE COURTS

Another Mexican region with a long history of armed resistance and autonomy inspired other strategies that halted a national onslaught of GM crop permits. The Yucatán Peninsula is divided into the three states of Yucatán, Campeche, and Quintana Roo, with a majority population that is of Maya descent. Maya activists and journalists like Bernardo Camaal have self-consciously compared their contemporary resistance to Monsanto to the long nineteenth-century Caste War Rebellion (1847–1901) against sugar and henequen planters who encroached upon Yucatec Maya milpas. From a town renamed Chan Santa Cruz, Maya rebels established autonomous rule for half the nineteenth century over a 150-mile swath of Quintana Roo stretching from the resort town of Tulum to Bacalar, which became one of the contemporary plaintiffs against GM crops. These Yucatec Maya rebels followed divine signs, like a "talking" cross that was a syncretic blend of Catholicism and maize iconography.[133] Even after the Porfiriato dictatorship quashed their rebellion, some insurgents retreated to rainforest hamlets and continued to expel all non-Maya people who attempted to enter these areas well into the twentieth century.

Throughout the region today, Maya people work in sustainable timber, tourism, and agriculture, as well as the pre-Columbian tradition of beekeeping.[134] The region's forty thousand beekeepers, 90 percent of whom are Maya, are organized into 162 cooperatives (mostly in Campeche but covering all three Yucatec states).[135] These collectives cultivate commercial honey from domesticated European bees (*Apis mellifera*) for export to Europe, but have also conserved a stingless bee that is unique to the region, *Melipona beecheii*, for ritual and special culinary uses and other high-end markets. After more aggressive "Africanized" bees infected European honeybees in the late 1980s, Maya men moved their apiaries away from their villages. Maya women then assumed more responsibility and took cultural pride in cultivating the *Melipona* bees in tree trunks closer to home.[136] Between the two types of production, Mexico is the world's sixth-largest producer of honey—40 percent of which comes from the Yucatán Peninsula.[137]

In a strange cultural twist, people encroaching on Maya land today are a conservative sect of Old German–speaking Mennonites who had fled cartel violence in northern Mexico and settled in the Yucatán region in the 1980s. Numbering about ten thousand settlers, they live in twenty-two colonies that lease or buy Maya ejido land in addition to federal land concessions.[138] In the Yucatán, as throughout Latin America, Mennonites have deforested and plowed large tracts of Indigenous territories in Paraguay, Peru, Bolivia, Colombia, Belize, and beyond. In 2012 the Mexican government awarded Monsanto a permit to commercialize Roundup Ready soy on almost 225,000 hectares, a quarter of which was in the Yucatán Peninsula.[139] As Monsanto's best new clients, the Mennonites centered their production in Holpechen, Campeche, where some twenty-five thousand Maya families practice beekeeping. The very next year aerial herbicide spraying killed at least fifteen hundred hives, an estimated loss of 10 million pesos, roughly $786,000.[140] By 2014 four-fifths of Holpechen's cultivated land had been converted to GM soy.

In response, one Holpechen "Meliponera," Leydy Pech, organized a coalition of Indigenous beekeepers, scientists, and environmentalists into a group called Ma OGM, meaning in Yucateco and Spanish "No GMOs." Ma OGM filed a lawsuit against the Mexican government based on International Labor Organization Convention 169 (ratified by Mexico in 1990), which requires "prior, informed consent" of Indigenous communities for development projects. Pech recruited scientists from the Autonomous University of Campeche, who found definitive proof that GM soy pollen was contaminating local honey production. This jeopardized the export of $70 million of otherwise organic honey to the EU (representing 40–70 percent of household income for the beekeepers). Beekeepers lost around a quarter of their income when forced to redirect sales to the nonorganic US market. The Campeche toxicologists also tested Pech's hometown water supply and residents' urine and found significant levels of glyphosate herbicide in both. With this evidence, Pech organized concurrent protests in seven ancient Maya sites across the Yucatán.[141] Mexico's Supreme Court heard her lawsuit in November 2015 and unanimously ruled that the permits for GM soybean violated principles of Indigenous consultation. A Monsanto lawyer remarked that he couldn't believe that "this little woman" beat

them.[142] This "sweet" story reverberated around the world, and Pech won the prestigious Goldman Environmental Prize in 2020.

Another less internationally known but just as legally consequential case was an injunction filed by Bacalar's Regional Maya Council in Quintana Roo (the center of the Caste Rebellion) challenging the constitutionality of Mexico's 2005 Biosecurity Law.[143] Then, in the adjacent state of Yucatán, home to about eleven thousand beekeepers, a scholar-turned-planner from the Ministry of Urban Development and Environment declared his state a GMO-free zone, aiming to protect its unique karstic underground water reserves. Tourists flock to this region for its stunning sunken wells, known as *cenotes*, leading urban tourism business owners to join as unusual political allies.[144] The UN Development Programme, honey companies, eight different universities, and at least thirty-six nonprofits also aligned with the struggle.[145] It was truly a joint effort, giving rise to a new coalition in 2019 called the Kabnáalo'on Maya Alliance for Yucatán's Bees, to address the broader threat of pesticides from other crops.[146]

In 2017 the Mexican Food and Agricultural Service revoked Roundup Ready soy permits in all seven states and penalized Bayer-Monsanto for the first time.[147] Despite this series of court victories, GM soy plantings mysteriously continue, leaving activists to speculate on the source of the seeds.[148] Given the Mexican government's refusal to enforce the ban on GM soy, activists began ongoing discussions for local enforcement mechanisms.[149]

Writ large, the anti-GM organizing in the Yucatán helped revive latent Maya governance structures, alongside and within complex coalitions of national peasant organizations, beekeeping associations, environmental nonprofits, scientists, journalists, business elites, and human rights organizations.[150] Before organizing against GM crops, only a small group of politicized, educated, or organized leaders identified with a collective Maya identity. Despite speaking fluent Yucateco, most Maya peoples in the region identified as mestizo or simply as members of their regional townships. In the process of mobilizing against Monsanto, however, a new sense of pan-Maya identity blossomed and inspired the next Indigenous generation to pursue legal and scientific careers in support of Mexico's unfolding agroecological revolution.[151]

DIGNIFIED SCIENCE

Mexican food and farming movements clearly gained traction when they enlisted sympathetic scientists to provide the hard data needed to inform policy.[152] Leading the laboratory resistance was Mexican science laureate Dr. Elena Alvarez-Buylla. A molecular geneticist from an elite family of scientists, she earned her doctoral degree at UC Berkeley in 1992. A decade later she led the UNAM team that had confirmed Chapela's findings, and then went on to organize Mexico's Union of Scientists Committed to Society (UCCS) in 2006.[153]

Alvarez-Buylla then supported a high-profile study of the presence of GM corn in the food supply.[154] Her team hypothesized that random samples of Mexican food ought to have low rates of GM contamination since Mexico had reinstituted a moratorium on planting GM corn, and yellow corn imports supposedly only went toward animal feed and industrial uses. They found the opposite. A shocking 82 percent of 367 Mexican food samples contained GM sequences—mostly the genetic marker NK603 associated with Roundup Ready crops. Tortillas had a 90 percent contamination rate! Even hand-nixtamalized "artisanal" tortillas tested 18.5 percent positive for recombinant sequences. Half the snack foods labeled "GMO-free" had transgenic markers. Twenty-eight percent of food samples that tested positive for GM strains also contained measurable glyphosate residues. A later 2021 study of ninety-five children in Jalisco found that 100 percent had glyphosate in their urine, including children not involved in agriculture.[155]

These studies ripped through the national media, marshaling broad public support for regulation. As a prescient 2004 Oaxacan declaration noted, "[Maize] is the heart of rural life, *and* an important ingredient of the city . . . [it] summarises our past, defines our present, and provides the basis for our common future."[156] The No Maize, No Country coalition (established in 2007) remobilized, urging the government to mill corn imports at the border (as many African countries do), to post warning labels against planting imported corn, and to establish monitoring programs to detect field contamination more systematically.[157] Prior to this moment,

Mexico had relied on expensive PCR testing, but the Zapatistas showed how inexpensively farmers could test for contamination.[158]

Then something extraordinary happened. After the left-center party Morena (Movement for National Renewal) swept into office by a landslide, President Andrés Manuel López Obrador (2018–24) made good on his promise to revitalize Mexican agriculture and to protect "native maize, milpas, bio-cultural wealth, farming communities, gastronomic heritage and the health of Mexicans."[159] True to his campaign promises to create a Plan de Ayala XXI (with a hat tip to Emiliano Zapata), in August 2019 López Obrador announced that Mexico would no longer use glyphosate (Roundup) in governmental programs and would stop all imports of the chemical within four years. He also directed regulators to lead a comprehensive reform of the country's pesticide inventory, which includes a disturbing number of chemicals already banned in the United States but legally exported by US corporations to the Global South.[160]

To backstop the science, López Obrador appointed Alvarez-Buylla as the first woman to lead CONACYT (the National Council of Science and Technology), which she renamed CONAHCYT, to acknowledge the role of the humanities. President López Obrador also appointed an illustrious but dissident agroecologist Víctor Manuel Toledo as secretary of environment. As a scholar, Toledo was part of a school of Mexican agroecologists inspired by Efraím Hernández Xolocotzi.[161] Toledo was famous for having proposed, as early as 1992, a genuine *diálogo de saberes* (dialogue of knowledge) with peasants and Indigenous peoples, a phrase later embraced by Via Campesina.[162] During his first week in office, Toledo invited one of the No Maize, No Country key leaders and legal representative, Adelita San Vicente Tello (also an agronomist by training), to serve as director of goods and natural resources within the Environment Ministry to create the very regulations that López Obrador had promised.[163] Another No Maize, No Country leader, Víctor Suarez, became undersecretary of food self-sufficiency, a new position within the Agriculture Ministry. In addition to blocking glyphosate imports (which equaled 67,000 tons in 2019), Toledo laid out a broader plan not just to prohibit eighty pesticides outlawed in other countries, but

also to clean up Mexico's pesticide-filled and factory-polluted rivers, ban fracking, and tackle climate crises.[164]

Toledo's bold reforms unfortunately met with resistance from others in López Obrador's "hybrid" government of leftists and neoliberals.[165] Billionaire Alfonso Romo, the great-great-nephew of Francisco Madero (betrayer of Emiliano Zapata), was at time the president's chief of staff. Originally making his fortune in tobacco, Romo had expanded into agricultural biotech and once commented to the press, "Seeds are software." Romo's firm, Pulsar Group, operated an all-seasons biotech laboratory in Tapachula, Chiapas, which benefited from the privatization of ejido lands.[166] In collaboration with Monsanto, Romo's company tried to create a Roundup Ready lettuce, and the relationship between the corporations blossomed. In 2005 Monsanto paid Romo $1.4 billion for his seed company, Seminis, which at one point controlled one-fifth of the world's seed market.[167] Romo also holds enormous private land holdings in Yucatán and founded the company Enerall to bottle aquifer water.[168] Not surprisingly, Romo was quoted in a 2020 news cycle criticizing Yucatec Maya agriculture as unproductive and "worth nothing" (*no vale nada*).[169]

Prior to his appointment as environment secretary, Víctor Toledo had published withering editorials eviscerating Romo as a corporate-brained wolf in sheep's clothing hiding within the administration and lambasting one of Romo's pet projects, a Disney-esque "Maya Train" that would enrich corporate tourism in the Yucatán.[170] Then in August 2020 someone leaked comments from a private meeting in which Toledo criticized "brutal" internal contradictions within the cabinet. Shortly thereafter, on August 14, 2020, unknown goons emptied bags of a mysterious powdered chemical onto Toledo's home patio. Toledo resigned weeks later, due to "stress-induced" health problems[171]—a hardly credible excuse for an almost superhuman scholar who has published eighteen books and almost two hundred articles while being actively engaged in social movements and time-consuming leadership positions.

Despite Toledo's departure, López Obrador clarified that he would move forward with the glyphosate ban and other agrochemical regulations that were already set into motion. On New Year's Eve 2020, López Obrador

formalized his promises with a decree to ban GM corn and phase out both glyphosate and US corn imports by 2024. He tasked Mexican agencies to develop methods for boosting maize productivity to meet the reasonable goal to "produce in Mexico what we consume."[172] Cleverly, Mexico's presidential decree did not call for a ban on all US corn per se, only low-quality GM-corn imports.[173] Just as Mexican farmers had been expected to adapt after NAFTA had gutted corn prices by 70 percent, US farmers could adapt to these new market conditions.[174] Instead they hollered all kinds of hypocrisies and hyperbole. One Nebraska lobbyist, for example, complained that returning to conventional hybrids "would be like getting rid of electricity and going back to candles."[175]

NORTH AMERICA V. MEXICO

Within a week of the Mexican presidential announcement, the US Embassy's GAIN employees published a translation and critique of the decree. They have continued to provide detailed reports of harvest trends and export opportunities in the hope that Mexico cannot reach its 2024 goal to be self-sufficient in maize production and that the United States can continue to dump one-quarter of its surplus corn exports on Mexico.[176] Chris Novack, president of the agribusiness industry group CropLife, immediately sent a letter to US Trade Representative Robert Lighthizer, complaining that Toledo's decree was "incompatible" with the USMCA. CropLife also commissioned a "Chicken Little" report that used faulty modeling to warn that Mexico's economy would collapse without US corn dumping.[177] Helping CropLife from within the EPA was a Trump-appointed lawyer who rallied others in the agency to think "how we could use USMCA to work through these issues." A journalist privy to those documents reported that CropLife executives worried the ban on glyphosate would encourage other countries to follow suit and possibly place limits on other pesticides or lower permissible level of pesticide residues on foods.[178]

Meanwhile, Bayer-Monsanto's regional director, Laura Tamayo, filed some seventeen legal challenges in Mexico via a front group called the National Farm Council. So far the Mexican courts have rejected all but one

of them, but Bayer and other corporations continue to plead the courts for injunctions. Foreign biotech corporations have also continued flooding the Ministry of Agriculture with experimental permit applications.[179]

The National Corn Growers Association piled on more pressure. Founded in 1957, this $22 million trade association (which enjoys 501c5 status) represents some forty thousand dues-paying members (less than a tenth of the estimated three hundred thousand US farmers who grow corn). Its stated purpose on tax filings is "to create and increase opportunities for corn growers as we seek to sustainably feed and fuel a growing world."[180] The association sponsors harvest yield contests but also works to open new markets for the fifteen billion bushels of chemically pampered corn that is grown each year in the American Midwest. The association vociferously complained that the loss of the Mexican market would cause farmers to lose $73.8 billion over ten years. However, to put that $7.4 billion annual figure in perspective, in 2020 the United States gave corn growers $9 billion in subsidies (via commodity protection, disaster relief, conservation, subsidized insurance, and more) to *over*produce.[181]

In October 2021 Mexico's minister of agriculture, Víctor Villalobos, assured US emissaries that the decree would not affect yellow corn for feed and industrial uses. But by November 2022, tensions persisted, leading López Obrador to clarify that his policy would, in fact, apply to yellow dent corn for feed but could exempt more processed foods like cooking oil. In December 2023 Mexican negotiators offered an olive branch to extend the implementation deadline to 2025 and reiterated that Mexico was not refusing to trade. They would be perfectly willing to import non-GM corn from the United States, or any other country. With ample time to adjust, Mexico presented to its northern neighbor a golden opportunity to reform its distorted subsidy system.

The United States nevertheless filed a trade challenge in August 2023. Secretary of Agriculture Tom "Mr. Monsanto" Vilsack blustered that Mexico's new precautionary policies were "not grounded in science."[182] He appointed Doug McKalip as the USTR official. Following his boss's lead and ignoring his own country's case law (which has awarded billions to plaintiffs for lymphomas from Roundup exposure), McKalip is now demanding

that Mexico "prove" the science behind its ban.[183] Yet, even Bayer-Monsanto's own headquarters country, Germany, decided to ban glyphosate by 2024.[184] As I was concluding the writing of this book, the entire EU was also fiercely debating whether or not to renew glyphosate's registration.

Even so, Mexico's research council, CONAHCYT, convened biologists, toxicologists, oncologists, geneticists, and other renowned scientists from around the world to reassemble that proof.[185] They quickly organized a database of 331 (at last count) peer-reviewed scientific articles on glyphosate's known health harms, with summaries translated into Spanish.[186] Alvarez-Buylla also mounted a two-year study on the effects of GM-food diets on farm animals (not laboratory rats).[187] This is cutting-edge science that was left "undone" in the United States when the FDA declared, without evidence, that genetically modified food was ipso facto "substantially equivalent" to conventional crops.[188] As Mexican scientists emphasize, even if residual amounts of glyphosate on GM foods have no effect on people eating a standard US diet, the risk-benefit equation will be different for Mexicans who consume 53 percent of their calories from maize as a whole food.[189]

Making clear that its new pro-health maize policies apply to all trade partners, Mexico presented its new quality guidelines to the World Trade Organization in July 2023.[190] It also graciously invited the United States to form a joint scientific panel to investigate how Bt or Roundup residues may be causing health harm by altering the human microbiome, but US officials declined.[191] In late 2023 the United States filed a formal challenge against Mexico's "Tortilla Corn Ban" to the USMCA secretariat. Other than a couple of 2021–22 articles about climate change and agriculture, almost all other scientific articles cited by the United States predate the first Roundup cancer trials in California and the new associated science on the carcinogenicity of glyphosate that snowballed thereafter. Instead, the US submission largely relies on non-peer-reviewed pieces and industry documents representing pro-GMO interests, including opinion columns by Norman Borlaug.[192] Even after Dow Chemical used NAFTA's mechanisms to challenge Canada's science-based decision to ban 2,4-D and other home-use herbicides, Canadian officials deplorably joined the

US in questioning Mexico's dignified science. Although Canada does not export corn to Mexico, they submitted a brief in support of the US based on subclauses in the "Sanitary and Phytosanitary Measures" chapter of the 2020 trinational trade agreement.[193]

In stark contrast to these two legalistic briefs, Mexico's nearly two-hundred-page rebuttal brims with novel cultural, toxicological, and agricultural arguments. With 360 citations, it incorporates exceptional new research on how extensively GM traits have transgressed into native Mexican maize; the cultural, agronomic, and climatic value of Mexico's maize diversity; the failure of US agencies to exert proper regulatory oversight on agritech corporations; and the disproportionate risks of Bt toxins and glyphosate residues for Mexicans who consume maize as a dietary staple.[194] Ten nongovernmental organizations from all three nations submitted a treasure trove of shorter supplementary briefs in support of Mexico's food sovereignty and right to exert a precautionary principle for public health.[195]

How the trade panel will rule in November 2024 is anyone's guess. Selected from the tiny number of legal experts in international trade disputes, these arbitration panels are notoriously unpredictable. Just three people will decide a case that will supersede national democratic laws, with profound consequences for all of humanity. The United States appointed Hugo Perezcano Díaz, while Mexico appointed Jean E. Kalicki. By lottery, Swiss lawyer Christian Häberli was named the "neutral" panel chair.[196] Having once led the WTO's Committee on Agriculture, Häberli now serves as an academic fellow with the World Trade Institute, with expertise in climate change mitigation, food security, agriculture, trade, development, and dispute settlements.[197] Should the United States prevail, it could withhold preferential tariffs worth the "lost" revenue.[198] Should the United States lose, Vilsack preemptively allocated $1.2 billion to the Commodity Credit Corporation to help his corporate corn farm friends secure new export markets in Asia and Africa.[199] Regardless of the outcome of this dispute, trade is a voluntary act. No country can be obligated to accept commodities it already produces.[200] Mexico has set into motion critical reforms to boost its national production and conserve its native maize diversity.

A FOURTH FOOD REGIME

How, exactly, will Mexico make up its maize shortfall? That glass is surprisingly more than half full. Despite NAFTA's assaults, three-quarters of remaining Mexican farmers still save seed, and two-thirds of those conserve native landraces.[201] Maize still occupies half of Mexico's cropland, and nine-tenths of Mexico's maize fields are smaller than five hectares.[202] Beyond satisfying their own needs, small farmers sell significant surplus through local markets.[203] A third of Mexico continues to live in the rural areas, making homemade nixtamal with their own slaked maize. Why? Because native maize makes better quality tortillas.[204]

Recall that Mexico imported virtually no corn before the signing of NAFTA. Within two years, however, the country was importing 5 million tons, and by 2021 nearly 18 million tons.[205] Most of that, however, is yellow corn feed for Mexico's growing demand for meat and processed foods. Through milpa surplus and production from large Sinaloan farms, Mexico remains almost self-sufficient for white maize. Antonio Turrent, another distinguished member of the Union of Scientists Committed to Society, has long argued that by better supporting small farms in southeast Mexico, the country could easily triple its production using only its own landraces and state-developed hybrids (which cost one-third less than GM corn seed).[206]

To replace the 10 million tons of yellow corn imports, Mexico's Agriculture Ministry is pursuing a two-prong strategy to promote alternative feedstock, like cassava and beets, while also developing new improved dent varieties adapted to Mexican conditions.[207] A Chapingo-trained agronomist known for his understanding of agricultural economics, Agriculture Undersecretary Víctor Suarez has formulated a pragmatic transitional plan to boost production in the short term, using nationally produced fertilizer, while developing agroecological extension programs to eventually phase out fertilizers by replenishing soil fertility. From previous experiments when he directed a nonprofit called ANEC, which supports marketing for sixty thousand rural producers, Suarez has shown that farmers who inoculate their soils with good microbes can increase their maize production by 30 percent and reduce their production costs by 30 percent, and therefore

make 60 percent more profit.[208] To expand such lessons, through his new authority as undersecretary, Suarez has launched an impressive forty-two hundred state field schools in eight hundred municipalities across 90 percent of Mexico.

Suarez has also overhauled the subsidy structure to support two million smallholders, especially those in previously neglected Indigenous-majority states in southern Mexico. From the scandalous 12 percent of subsidies distributed to Indigenous farmers under previous neoliberal governments, smallholders now represent 84 percent of beneficiaries.[209] The next challenge is to make irrigation more accessible to small farmers, which alone could increase maize production another 43 percent.[210] Others have suggested investing in programs that can link traditional maize producers with urban markets and restaurants that appreciate heirloom varieties.[211] Last, but not least, the state has committed to buying from smallholders at least 15 percent of their maize harvest for a new strategic storage reserve. The idea is to decouple Mexico's higher-quality white maize production from the Chicago Board of Trade, to prevent corporate grain traders from undercutting commercial maize producers during the harvest glut, as they have done since NAFTA began.

This multipronged strategy appears to be working. In 2023 Mexico imported 85 percent less white corn.[212] In June 2023 Mexican regulators also raised the white corn import tariff to 50 percent. Replacing yellow feed corn will take more time, so regulators extended that deadline to 2025. Even so, Mexico is leading the world into a new agroecological era—perhaps even a fourth food regime—that recenters maize in its national identity and supports climate resilience. To that end, right before the COVID crisis, the Mexican Senate unanimously passed a law to foment and protect native maize.[213]

MANY WORLDS OF MAIZE

Like the cultural diversity that sustains Mexican maize, this extraordinary political transition was made possible by a tapestry of multiple players, shifting locales, tenacious peasant and Indigenous organizations, formi-

dable intellectuals, oddball allies, radical environmental groups, and even "interspecies alliances" with monarchs and *Melipona* bees.[214] Although some have criticized how scientific debates about contamination privileged the voices of those with biotechnology expertise over the livelihood concerns of peasants and Indigenous peoples, Mexican scientists provided critical evidence that was "legible" to the state and developed cutting-edge methodologies for continued monitoring of genetic seed pollution.[215] Even so, Indigenous and peasant leaders have been the moral force behind this movement, from hosting "maize fairs" to hunger strikes in Mexico City.[216] Throughout the struggle, a small group of committed and coordinated organizations have shared their respective grains of talent in legal, organizational, scientific, and analytical activism and tolerance for each other's radical-to-centrist missions. Together they welcomed the Mexican state as a sturdy cob to support their kernels of resistance.[217]

As the brilliant Silvia Ribeiro has reflected in one of her newspaper editorials in *La Jornada*, transnational corporations are like the soulless "men of wood" rejected by the Maya gods as described in the *Popol Vuh*. In contrast, the grassroots Indigenous coalitions against GM corn "are [like] knots in the fabric of daily acts that strengthen resistance to transgenics from the local level day by day, integrating this issue with many others." Organizing against "the men of wood . . . the people of [maize] weave."[218]

In the plaited dialogues described in this chapter, Mexico's "many worlds" realized that what made their maize vulnerable to contamination was "a series of national and international economic and political factors (free-trade agreements, massive migration, cultural and food erosion, urban and rural poverty, etc.)" and, therefore, "they could only defend maize by defending the wholeness of peasant and indigenous life."[219] Following nearly a hundred years of Mexican policies that discriminated against subsistence farming, this anti-GMO movement has reinvigorated a sense of cultural pride in the milpa. Although foreign agricultural interests immiserated the Mexican countryside, a more dignified rural future awaits.

As ANEC's new director, Leticia López Zepeda, emphasizes, food sov-

ereignty "means we get to determine where, when and how we source our food and how we feed our people. And that can be from trade. That's a choice—how much trade, how much domestic production—a sovereign choice that Mexico should get to make."[220] Celebrating their renewed commitment to food sovereignty, Mexican state agencies and allied coalitions and nonprofits organized a flurry of conferences and events for National Maize Day on September 29, 2023. Five hundred years after Pedro Alvarado marched through Oaxaca on his way to invade Guatemala, the Mexican government hosted another international conference in Oaxaca City titled "Self Sufficiency and Agroecology in a Multipolar World," to which they invited committed scientists and food sovereignty leaders throughout the Americas, including Guatemalan friends, whose David and Goliath story continues next.

SIX

Guatemala and Goliath

Across its varied terrain—from fertile coastal plains to swamps, deserts, rainforests, cloud forests, mountain plateaus, terraced hillsides, and even deserts—tiny Guatemala is custodian to an amazing one-tenth of the world's maize diversity. Less auspiciously, Guatemala ranks in the bottom one-tenth (125 out of 152 countries) according to an economic inequality index. Just 1 percent of the population controls half Guatemala's financial wealth.[1] Because an oligarchy that racially identifies as "white" controls the government and the military of this majority-Indigenous country, Guatemala is essentially an apartheid state. Although the country has rich agricultural soils naturally fertilized by volcanic ash, the wealthiest 2 percent hoard 57 percent of the land, while 92 percent of farming families subsist on just 22 percent.[2] Compared to the rest of Latin America, Guatemala has the lowest ratio of public agricultural research to GDP.[3] The last time the Guatemalan Congress passed a law to support the production of basic grains was 1974.[4]

Although 60 percent of the population (overwhelmingly Maya) devotes itself to agriculture, Guatemala is the most chronically malnourished country in Latin America and ranks sixth in the world for childhood hunger.[5] Despite having one of the healthiest staple diets in the world, a mind-boggling one in every two Guatemalan children (and 61 percent of Maya children) suffers from malnutrition. This hunger is a structural consequence of grotesquely inequitable land distribution, but also other US interventions that have enriched transnational corporations.

As retired general Smedley D. Butler noted in a 1933 speech, he spent most of his time in military service "being a high-class muscle-man for

Big Business." Butler eventually concluded, "I was a racketeer, a gangster for capitalism." In addition to supporting US oil interests in Mexico, he admitted, "I helped in the raping of half a dozen Central American republics for the benefits of Wall Street" in the early twentieth century.[6] After the CIA orchestrated a coup on behalf of United Fruit profits, Guatemala's Green Revolution unfolded under a US-supported military dictatorship and a thirty-six-year genocidal war (see chapter 3). "Gene guns" are really just the newest tool of a century of US gunboat diplomacy in the service of private corporate interests.[7] Guatemala does not have a seed gene problem. It has a greed problem.

Despite all the horrors the Guatemalan people have endured from US intervention, for a quarter of a century this tiny country held out against GM crops and then humiliated Monsanto in a 2014 legislative upset. Until 2021 it remained among the two dozen countries in the world (mostly now European) that had banned GM crops entirely. With an annual budget of about $9 billion serving 17.6 million citizens, Guatemala's entire government apparatus equated to just over half of Monsanto's annual revenues before it merged with Bayer.

While Guatemala was grappling with COVID, a GM Goliath—pumped up on trade pact steroids and coached by US racketeers—returned via Guatemala's back door (literally its southern border). Working from a fortified bunker in Guatemala's most luxurious neighborhood, Goliath's goons in the US Embassy monitor Guatemala's maize harvests for opportunities for US corporations to fill their piggybanks ("piggy" being the operative word). Agricultural attachés openly ruminate in US FAS reports on how to impose GM corn on a country that had firmly rejected it thrice over through mass civil disobedience. This chapter recounts how those Maya-led mobilizations to defend maize evolved into an anticorruption movement that won the presidency and helped rebirth Guatemalan democracy.

EARLY SCANDALS

Because Mexico and Central America enjoy a temperate, year-round growing season, many biotech companies have operated field labs or developed

partnerships with local companies located there (like Monsanto's partnership with Alfonso Romo). In Guatemala the key player is Semillas Cristiani Burkard S.A. (SCB Inc.). Founded in 1966 by Antonio Cristiani, the brother of President Alfredo Cristiani (1989–94), SCB was originally a Salvadoran firm that relocated to Guatemala in 1980 amid civil wars.[8] SCB thereafter benefited from its access to Guatemala's Green Revolution–era seed bank, producing hybrids that are resold in twelve countries throughout Latin America and the Caribbean.

When SCB requested a permit in 1998 to trial Monsanto's YieldGard corn in Guatemala, this triggered the Guatemalan Ministry of Agriculture and Livestock (Agriculture Ministry henceforth) to update its seed regulation for the first time since 1960.[9] Through an administrative decree (36–1998) and internal bylaw (278–1998), the Agriculture Ministry created a new Unit of Norms and Regulations charged with reviewing requests for GMO research, but then it suspended all commercial GM crop approvals until the Guatemalan Congress could pass a formal seed law.[10] The stipulated fine for any biotech research violations was laughable: ranging from just $1,300 to $3,200.

Monsanto reportedly partnered with SCB for another field test in 2000, but then abandoned the work due to uncertainty about the Guatemalan regulatory field.[11] SCB continued its own experimentation and announced in 2007 that it would launch a GM corn for commercial sale by 2012. The results must have been promising enough to pique the interests of Monsanto executives. After acquiring the Mexican-based Seminis in 2005, Monsanto bought SCB in June 2008 for $135 million.[12] A Monsanto vice president noted to the press: "This acquisition, which solidifies Monsanto's position as the leading corn seed provider in the Latin and Central American regions, will enable our companies to provide new and innovative higher-yielding corn seed offerings to farmers."[13] Through SCB, Monsanto launched sales of its GM crops and herbicides to other Central American countries, particularly in Honduras. Monsanto executives even threatened to relocate the company's regional headquarters from Guatemala City to Tegucigalpa were Guatemala not to loosen its restrictions on GM crops.[14]

Although GMO testing was then rare and limited to ELISA assays of

food aid, every experiment revealed contamination. Although most environmental organizations in Guatemala are focused on park management, one Guatemala City–based NGO, Madre Selva, began watchdogging the issue. The organization tested sacks of food aid donated by the World Food Program in 1998 to a village in eastern Guatemala and found three types of GM corn contamination: Liberty Link (produced by Aventis and Monsanto), BtXtra (Dekalb-Monsanto), and Roundup Ready (Monsanto).[15] Four years later another nonprofit, Friends of the Earth (FOE), found GM strains in supplements destined for pregnant women and schoolchildren in Guatemala and Bolivia.[16] FOE tested another seventy-seven food aid samples in 2004 and found that 80 percent contained GM strains banned for consumption in the United States and the European Union, including the infamous StarLink.[17] The Guatemalan organization Ceiba, directed by agronomist Mario Godinez, continued testing in 2006 and found the presence of other GM strains—Roundup Ready, Herculex, Liberty Link, and Yieldgard—in food aid given to villages in three regions with endemic teosinte, including San Mateo Ixtatán in Huehuetenango.[18]

In 2007 another newly formed network to support food sovereignty, REDSAG, organized a high-profile press conference about GM strains found in a blend of soy and corn Vitacereal that had been distributed to combat malnutrition in regions with unique maize diversity.[19] REDSAG's former director Ronnie Palacios presciently commented to the press, "When all the corn in the United States is contaminated, Guatemala may be the only country left able to maintain this biodiversity [unless contaminated by food aid]."[20]

Angered by these scandals, Maya organizations and other citizen groups began forming "knowledge alliances" to educate themselves and their networks about the agronomic, social, and ecological risks of GMO technology.[21] Many were involved in regional networks with Mexican organizations fighting the Puebla to Panamá Plan, so they heard about the Oaxaca contamination scandals. Guatemala's four regional peasant federations are also member organizations of Via Campesina, so they also knew of Percy Schmeiser's case. In 2005 the Committee of Peasant Unity organized an eighty-mile march against GMOs. At a 2007 intercontinental meeting of

Indigenous peoples of the Americas (Abya Yala) held in Iximché, Guatemala, attendees called upon all peoples to join in this struggle against GMOs in order to "guarantee our future."[22]

Because Guatemala has never invested in establishing a state laboratory with the PCR technology to test field maize, no one knows where curious farmers may have planted contaminated food aid or GM seed smuggled from Honduras, but they likely did and contaminated native maizes. Since 2010, I have heard frequent reports from confidants about GM corn being planted in Petén and other parts of the lowlands. With research assistance from a maize broker, we investigated some of these claims in 2010 and concluded that in most cases people were confusing ICTA's new high-protein hybrids ("improved varieties") with GM corn. Nevertheless, farmers mentioned very specific technical names during research interviews, such as Bt 11, Mon-810, NK-603, and even StarLink.

We did track down one credible case in northwest Guatemala, where substantial amounts of Mexican maize are smuggled across the border at Ingieneros.[23] People from three villages reported that in 2007, a Mexican merchant had sold twenty-kilogram bags of presumed GM corn seed to several farmers. Although the cost was two to three times that of hybrid corn seed, the merchant assured the farmers the seeds would pay for themselves with higher yields. In the first season the alleged GM seed in fact yielded seventy to eighty quintals per *manzana* (a local land measurement equal to 1.7 acres), which is twice the average. The next season, however, the yield decreased to fifty quintals, and the farmers observed worrisome changes in maize plants in nearby fields (thicker stalks, narrower leaves, shorter cobs), plus strange rashes in children who ate the harvest. Mixing the purported GM corn with the hybrid corn they normally cultivate (HB-83), the Guatemalan farmers sold it back to middlemen-truckers returning to Mexico. Although the individuals in this particular case appear not to have acted with malicious intent, those genes likely cross-pollinated and continue to circulate in Guatemalan maize fields.[24]

TROJAN HORSES

Despite growing awareness and opposition to GMOs, the US Embassy's annual GAIN reports lamented that Guatemala's GMO regulations remained in limbo. As an intellectual exercise in "corporate mentality" and "seeing like a seed company," in the early 2010s I spent time sifting through the GAIN reports looking for clues to how biotech corporations make decisions about investment climate.[25] As a progressive person I often argue for stricter regulations. For Guatemala, however, the unpredictability and inertia of its colonial-inherited bureaucracies seems to have indirectly protected maize farmers from GM corn.

In a country with one of the highest indexes of corruption in the world, and where bribery is rarely prosecuted, uncertain regulation was actually more protective than a little regulation. Another agronomist reached the same conclusion, commenting to a fellow researcher, "There are organizations proposing laws, but I'm very skeptical in a state like ours in Guatemala, that law is the solution to the problem because the laws are always ambiguous. Having a law, what it does is open the door [for GMOs]. So, I'd prefer they continue to delay eventual legislation because, how things are now, they're [GMOs] prohibited."[26] Just as the opacity of local vernacular cultural practices can parry state intrusion, the opacity of Guatemala's administrative processes has indirectly repelled foreign corporations.[27]

Unfortunately, the United Nations Environmental Programme and the World Bank's Global Environmental Facility sponsored three projects to clarify and "harmonize" biosafety frameworks. However well intentioned, these projects uprooted the GM crop debates from the socioeconomic realities and concerns of the countryside and transplanted them to "technical" conversations in carpeted hotel meeting rooms. By standardizing regulation, the organizations made Guatemala "legible" and vulnerable to repeated attempts to legalize GM corn (see the time line in table 4).

Before Guatemala signed the UN Cartagena Protocol in October 2004, UNEP/GEF organized the first two-year project (November 2002–July 2004) to help Guatemala develop its initial biosecurity policy. At that time Guatemala did not yet have a functioning Ministry of Environment, so the

TABLE 4. Time line of key events, repeated threats, and legislation in Guatemala

Year	*Event*
2001	Nonprofits tested food aid and found StarLink genes
2005	Cartagena Protocol (ratified in 2003) took effect in Guatemala, with CONAP as the focal point
2007	Biotech industry, with US embassy assistance, formed an Intersectoral Technical Commission with no representation from civil society
2011	Ministry of Culture declared maize a natural cultural patrimony
2014	Monsanto Law 1.0, the Law for the Protection of New Plant Varieties passed, then was repealed
2015	Activists scuttled a National Regulation for Biosecurity of Living Modified Organisms (nicknamed the Monsanto Bylaw) proposed by the Agriculture Ministry
2015	Mass civil disobedience removed President Otto Pérez Molina from office on corruption charges
2019	Ministry of Economy proposed a customs resolution (no. 60-2019) for which the Agriculture Ministry established *another* oversight commission called the Technical Committee for Agricultural Biosecurity of Guatemala (CTBAG)
2020	Maya lawyers and ancestral authorities presented arguments at a public hearing of the Constitutional Court regarding customs regulation (postponed twice)
2021	Constitutional Court upheld the customs regulation
2023	A congressional committee reviewed another Law for Protection of Plant Varieties, aka the Monsanto Law 2.0
2023	Dr. Bernardo Arévalo was elected president by a landslide (August)
2023	Ancestral authorities led strike and protests (starting October 2) to defend the election and denounce Monsanto Law 2.0
2024	Arévalo was inaugurated (after a tumultuous day, late in the evening on January 14)
2024	A Maya Congresswoman formally introduced counterlegislation no. 6086, Law for Biodiversity and Ancestral Knowledge

national park service CONAP (National Council of Protected Areas) created a Technical Office for Biodiversity to serve as the UN focal point.[28] The project organized a National Committee for Biosafety Coordination (CNCB), composed of government officials from various institutions, academics, and other "specialists"—with only two representatives invited from one of Guatemala's four major peasant coalitions. Through twenty consultative workshops this committee drafted a national framework for biosafety and a proposal to Congress for a national biosafety law that was critiqued from the right for not being sufficiently "scientific" and from the left for not being sufficiently inclusive.[29] In the middle, politicians were annoyed they had not been invited to help draft the legislation. The proposed biosafety legislation died in congressional committee.

The designers of a second UNEP/GEF project funded in 2010 observed, "Although import, planting and/or use of [GMOs] are not fully regulated, neither are they out rightly prohibited."[30] They advised project technicians simply to circumnavigate the democratic process, arguing that "biosafety guidelines can be drafted and implemented even in the absence of official regulation."[31] The only mention of maize or Indigenous people in this forty-page planning document was a single sentence in an annex: "The country's indigenous peoples revere maize, as did their ancestors, as a seed that symbolizes life and rebirth."

To somehow prove that GMO technology could happily coexist with Guatemala's agrodiversity, the team directed project funds to CONAP to create a digital atlas of Guatemala's general biodiversity.[32] Devoting the same number of pages to maize as to rare wild fruits, the slipshod atlas provided no new information about Guatemala's two unique teosinte species and just recited gringo studies of maize from the 1940s and 1950s.[33] By 2022 the atlas had disappeared from the internet entirely.

A third UNEP/GEF project (2020–21) ostensibly aimed to help Guatemala draft legislation to implement the Kuala Lumpur addendum to the Cartagena Protocol, by defining sanctions for people or corporations violating Guatemala's (still nonexistent) GMO regulations. Otherwise, based on Guatemala's 1973 Penal Code, Article 347A, the most a corporation could be fined for contaminating the environment or harming biodiversity

would be between $39 and $645 (if the perpetrator were an individual) or $26 to $193 (if it was a business plan).[34] To prove contamination would be difficult. As of 2009 Guatemala only had fifteen biotech PhD-credentialed scientists and only one private lab with the potential for testing genetic engineering in plants.[35] Despite repeated budget allocations across these three projects to establish state-led PCR testing, by 2023 Guatemala still did not have a single certified laboratory that could (or would) test maize samples for GMO contamination.

The budget for a third project proposal, which relied on a 1958 map locating unique endemic maize landraces throughout the entire country, inexplicably tossed money to CONAP to turn one small area of highland Huehuetenango into a GMO-free zone and leave the rest of Guatemala as a sacrifice zone to GM corn. Deep in that document's appendixes, one of the World Bank/GEF's internal reviewers questioned the rationale for cherry-picking Huehuetenango and pointed out another elephant in the room: "The project needs to explain whether or not there is a request for the use of GM-Maize [*sic*] in Guatemala and how the existing provisions will respond to such request. Please review the status of GM-Maize in Mexico (top of page 12). It is the understanding of the GEF that GM-Maize is currently banned in Mexico."[36] Although the query went unanswered, GEF leaders nevertheless rubber-stamped the proposal.

When I contacted them in 2022 to ask about Indigenous consultation, all the previous GEF managers involved had moved on, so no one could be held accountable. In reading these hundred-page proposals with elaborate charts and frameworks, only one report notes in tiny print in a "risk log" table, "Biosafety is a polarized and sensitive issue that might produce institutional/social conflicts."[37] One would never guess from these project documents that in 2014 mass civil disobedience had reversed a congressional attempt to legalize GM crops.

While these three GEF projects bumbled along under the park service's authority, biotech proponents regrouped to put the more friendly Ministries of Agriculture and Economy in control of GMO policy. The US Embassy put this institutional shift into motion through a counter-workshop in 2005, which included representatives from the private sector, including

Antonio Cristiani from SCB and Manuel Rivas of Monsanto. The tone was so pro-biotech that CONAP representatives left in protest on the first day.[38] As an observer of this meeting as a doctoral researcher, James Klepek notes although "science" was the excuse for excluding Indigenous peoples, the meeting had little technical discussion and was more of a "performance of expertise."[39] Biotech proponents argued that Guatemala's laws should just mimic US regulations, though one Guatemalan confided privately to Klepek, "How then is the US supposed to make recommendations in a country that has a complete lack of infrastructure to manage the risks of agricultural biotechnology? . . . The economic interests driving the biotechnology agenda and promoting a US-style regulatory system do not have the best interests of Guatemala in mind."[40] Another private sector representative bluntly suggested circumventing the Guatemalan government entirely: "In my opinion, it is easier to ask for forgiveness than permission. We need to develop the technology through the private sector and in the next two to three months, create a cooperative growing GM corn. Then the UNEP-GEF program will not be relevant."[41]

Out of this particular meeting, pro-GMO interests formed the Intersectoral Technical Commission on Biotechnology, coordinated by Guatemala's business-friendly National Council on Science and Technology (CONCYT). CONAP was removed from the equation. Eight of the twenty members came from the private sector—again, with zero representation from popular or Indigenous organizations. The USDA-FAS program bedazzled the group with luxurious fellowships, exchanges, training programs, and talking points on intellectual property and patents.[42] With this commission's blessing, the Agriculture Ministry broke Guatemala's tacit GM ban by publishing an internal decree (no. 386) in 2006 to allow for field research and commercial production of GM seeds for export. The US Embassy soon reported with glee that the Agriculture Ministry had approved field trials of both the YieldGard gene to control against *Lepidopteron* species corn borers and the glufosinate-resistant Liberty gene for cotton production.[43] Another trial was approved in 2010–11 for a GM corn varietal that had already been commercialized in Honduras.[44] None, thankfully, were executed.

Tracking all these stepwise regulatory changes, I concluded a 2014 re-

search article with these words: "If by manipulation of the vulnerabilities discussed in this paper, Monsanto or another corporation should acquire permission to distribute or sell GM [corn] in Guatemala, beware: for millennia, the country's majority Maya population has regarded maize as a sacred symbol of their lifeways and culture . . . and the desecration of maize would be also symbolic of a deeply remembered history of colonialism. Corn prices, corn seed, corn markets are issues around which thousands of Guatemalans—from both the political right and the left—can mobilize against the injustices they perceive from neoliberalism writ large."[45] Little did I imagine that just six months later Monsanto would appear to be orchestrating a bald attempt to legalize GM crops, contrary to the peoples' will. The manipulative timing and audacity of the 2014 Monsanto Law and the ferocity of its opposition took me and all of Guatemala by surprise.

MONSANTO LAW 1.0

In 2011 the Guatemalan Congress reviewed a draft law that would have displaced CONAP as the country's biosafety focal point and permanently shifted GMO regulatory authority to three other government ministries: Agriculture, Environment, and Health.[46] Private sector representatives, including Monsanto, participated in those hearings, but Indigenous and environmental organizations were once again excluded.[47] For unknown reasons the law was tabled. The Patriot Party then reintroduced a less-detailed version in June 2014 while the public was distracted by the soccer World Cup (held June 13–July 14). To smooth its passage, this bill was linked to $65 million in road contracts unrelated to seeds. Although no smoking gun has been found to link Monsanto to the law's text, the Dominican Republic passed a strikingly similar bill in May 2014, suggesting that external actors may have drafted both.

Called the Law for the Protection of New Plant Varieties (Legislative Decree 19–2014), it passed by only one vote. After being signed by President Otto Pérez Molina, the law entered the official record on June 26, 2014, with implementation scheduled to commence ninety days hence.[48] The law would have allowed breeders initially to patent fifteen undetermined

species and genera as chosen by the Agriculture Ministry, but within ten years it would apply to all plant species and genera.[49] The stipulated patent period was, notably, five years longer than in other countries (twenty-five years for trees and vines and twenty for other plant species). The most controversial provision was Article 51, which authorized harsh sanctions for patent violators, including prison terms of one to four years and monetary fines of up to US$1,300 (the salary equivalent for small farmers of seven months' hard agricultural labor).

Not until late July, after the World Cup, did social movements hear about the new law. As dissidents once had done in Mexico about similar legislation, they dubbed it the "Monsanto Law." The first press release came July 30, 2014. Videos circulated on social media about a Colombian group that had burned GM seeds to object to another similar law. A small group of foodies staged a protest in Guatemala City.[50]

Soon thereafter, op-eds began to appear in all the daily newspapers. By virtue of class connections and perceived expertise, journalists first interviewed agronomists and environmentalists about the law. What seemed to anger the agronomists was foreign imperialism orchestrated by invisible trade bureaucrats. They took umbrage with gringo economic monopoly, not agribusiness per se. Such critiques clearly went beyond mere annoyance at not having been consulted in drafting the bill (although that certainly affected the opinions of some), but also reflected a genuine concern among agronomists about national food sovereignty and the "looting" of traditional farmer varieties.[51]

On August 5 the College of Agronomic Engineers announced its formal opposition to the law and the college's president, Alvaro Amilcar Folgar, explained the association would also be filing legal appeals, because "the law was approved under the auspices of the DR-CAFTA, but they didn't consider that Guatemala has subscribed to other commitments to safeguard the country's natural patrimony and we cannot allow someone to patent it."[52] The agronomy college's elected secretary, Professor Mario Godinez, cited previous cases of biopiracy in which corporations had failed to share royalties.[53] Francisco Vásquez, another agronomist with an advanced law degree, denounced the criminalization of seed-saving.[54] Dr. Samuel Reyes,

the assistant dean of Galileo University's School of Science, Technology and Industry, pointed out that cross-pollination might lead to legal claims against peasants.[55] Interviewed many times in the press, Reyes emphasized how the law would lead Guatemala to become economically dependent on transnational agribusiness. The dean of the School of Agronomy at Guatemala's national public university, San Carlos (USAC) noted that the law defined the rights of breeders and discoverers but specified nothing about producers and consumers.[56] Then, on August 22, the director of Guatemala's parastatal Science and Technology Research Institute (ICTA) clinched the nationalist discourse against the law when he warned that his agency had never patented any of its 148 improved seeds, including 11 hybrid and 35 open-pollinating corn varieties, such as a high-protein corn strain his institute had bred from a natural mutation of Peruvian maize discovered in 1964 at Purdue University.[57] Therefore, all these state-funded seeds could be vulnerable to foreign patenting.[58]

Anger about the Monsanto Law exploded across social media. One petition quickly gathered 27,438 signatures. Behind the scenes, Indigenous and peasant groups were initiating legal cases but also planning mass demonstrations, the likes of which Guatemala had never seen either in scope or diversity. While the peasant and environmental sectors in Guatemala are often at odds, in this instance a mutual hatred of Monsanto and previous peace-era relationships helped key individuals and nonprofits quickly form coalitions against the seed law. The food sovereignty network REDSAG, plus other preexisting Maya and peasant networks and sympathetic academics, all played critical connective roles.[59] As Daniel Pascual, spokesperson of the Committee on Peasant Unity (CUC) eloquently explained during a press conference on August 19, the Monsanto Law was one of a series of laws aimed at privatizing water, land, plants, and ancestral knowledge, all of which had to be rejected and resisted with mass mobilization.[60]

This made for a powerfully diverse coalition of strange bedfellows that included peasant federations, health workers, biologists, Maya spiritual leaders, environmentalists, Pentecostals (who regard Monsanto as an Antichrist), opportunistic politicians, college students, middle-class workers (like Josita, a secretary for a sugar cane corporation who resented being

"human experiments for foreigners"), and even foodies from Guatemala City's oligarchy. For Guatemala's Indigenous majority, the law was simply anathema. While a few pointed to consumer health concerns, by far most critiques were either founded on cultural or economic concepts. My own qualitative accounting of all public comments in national news articles over two days revealed that ninety-nine out of one hundred were against the law; the one undecided voice wanted to read the law more carefully before commenting.

From the wealthy conservation sector came denunciations by the preexisting National Alliance for Biodiversity Protection in Guatemala and ASOREMA (National Association of Natural Resource and Environmental Non-Governmental Organizations) whose leader, Marco Vinicio Cerezo, the son of former Guatemalan president Marco Vinicio Cerezo Arévalo (1986–91), warned that the Monsanto Law would have "nefarious consequences."[61] Another former president, Jorge Serrano Elías, started a YouTube campaign against it. Other members of the oligarchy pointed out how the law might allow foreign entities to patent any orchid, Guatemala's national plant, whose cultivation is an elite hobby.[62] Whether from genuine appreciation of maize or in anticipation of associated tourism profits, earlier that year the Ministry of Culture and Sports—hardly a radical institution—had decreed maize as an intangible cultural heritage of the nation.[63]

With political pressure building from all sides, by August 22 a few politicians suggested mild amendments to specify that the law did not apply to traditional crops and to remove the controversial prison sentences. However, even the bill's original author, ex-congressman Mariano Rayo, suggested it ought to be repealed until the Agriculture Ministry could properly consult with scientists and present a clearer regulatory framework.[64] Nonetheless, the leader of the Patriot Party's majority congressional bloc emphasized to the press, "We will not support abolishing the law," while another party leader asked for public patience and trust while they "dialogued" with their internal congressional committees for Agriculture and Economy about possible changes.[65] Agronomy professor Mario Godinez warned congressional representatives that it was already too late for

amendments; the people were furious, and anyone voting for a compromise would be voted out.[66]

A genuine cross section of Guatemala joined demonstrations that erupted Tuesday, August 26. While rural coalitions often turn out by the thousands in solidarity regarding national issues, urban people had rarely, if ever, mobilized reciprocally on behalf of rural Indigenous issues.[67] In this instance, they did. University agronomy students walked from the Constitutional Court to Congress and blocked a major Guatemala City artery, Petapa Avenue, for two hours. While lawyers for the Indigenous & Peasant Union Movement (MSICG) presented an appeal to the Constitutional Court (the country's highest jurisdiction), a group rallied outside, carrying signs that read: "I am a man of maize of Guatemala, not Monsanto" and "We are the sons and daughters of maize, not of Monsanto." Signs incorporated nationalist rhymes like "Our Maize, Our Country" (Nuestro maíz, nuestro país). Others alluded to the *Popol Vuh*, like "I am Maya! My blood, my bones, my muscles, my hair are made of maize! No to Law 19–2014!" Peasants in straw hats marched alongside foodies carrying stainless steel water bottles. Beyond the usual skull and crossbones and devil images typically witnessed at anti-Monsanto rallies worldwide, Maya women and men carried native maize props—dried stalks being wielded like rifles; cobs strung together like an ammunition belt or bandolier; red, black, and yellow ears brandished like batons.

To give some context for the courage required to attend this demonstration, former army general Otto Pérez Molina (or simply "Otto," as the Guatemalan public usually refers to him) was then Guatemala's president. Like previous Guatemalan dictators, the US military had trained Otto in torture techniques at the Fort Benning School of the Americas as a cadet in 1969 and again as an officer in 1985. Otto rose to command the army in one of the worst regions of human rights atrocities and civilian massacres during the country's civil war. Rewarded for his crimes against humanity, he was promoted to head of military intelligence. Through that position he orchestrated the assassination of Guatemala's Bishop Juan José Gerardi in 1998, just days after the Catholic Church released its truth commission

FIGURE 11. Maize bandolier, 2014. Photo by Ricard Busquets.

report.[68] Elected in 2011 to be president of Guatemala with a hardfisted campaign platform to fight drug crime, Otto instead regularly declared martial law to repress community protests against oil and mining concessions. Under his watch, police had gunned down and murdered at least seven Maya protestors who had blocked the Pan American Highway over electrical price hikes. And just four months before the Monsanto Law uprising, he sent four thousand troops to brutally repress Indigenous communities fighting mines in their territory. As the furor over the Monsanto Law unfolded, Otto made clear to the press that he supported the plant patent law for maintaining trade relations with the United States.

Despite a looming threat from Otto, courageous demonstrators organized a torrent of press conferences over the next ten days. Said key spokesperson Lolita Chavez of the Maya Peoples Council: "This is a frontal attack on our people, because it is a frontal attack on seeds, and if they attack seeds like maize, beans, and others, they are attacking our lives and territories."[69] Dozens of other social media posts and testimony to the

FIGURE 12. "Monsanto kills," 2014. Photo by Ricard Busquets.

FIGURE 13. Rally in Guatemala City, 2014. Photo by Ricard Busquets.

press began with a phrase "The law is an attack," which, in Guatemala, strongly evokes the genocidal civil war. Others described the government's actions as an attempt to criminalize Maya culture and threaten the right to assembly. A powerful network of civil war widows called the law "racist" and "dehumanizing" and called upon "the men and women of maize to use their inalienable right to peaceful resistance and act collectively to defend [all the foods of the milpa from] transnational corporations."[70] Comments from Q'eqchi' Maya people in news articles regularly alluded to political violence, as in "*naq nake'xyiib junaq li chaqrab' cho'qre xkamsinkil laj awinel ixim*" (when they made this law for murdering the people of maize). One Kaqchikel columnist described the agro industry's tactical mission to expropriate collective patrimony for profit as "alimentary genocide."[71]

A columnist for Guatemala's most-read newspaper foresaw that "violent scenes of police surrounding a maize farm to scorch and arrest the responsible peasants or the burning of tons of beans because of patent problems is not far from the imaginable."[72] Hector Tiul, a Q'eqchi' man from Alta Verapaz, was one of hundreds who commented on news coverage. He declared that he and other Indigenous people would rise up, saying: "This is what we call death and destruction since the only objective of this so-called Monsanto Law is to poison the people so that the rich can take our lands . . . so that their children grow healthy and free while they kill ours."[73]

In late August, Guatemala's judicial system emitted conflicting rulings about whether and how to resume a stalled trial against former dictator Efraín Ríos Montt for genocide. Despite the timidity of the higher courts to prosecute war crimes, the Constitutional Court's ruling on the Monsanto Law was unequivocable. Using a technicality about the road construction funds that had been tacked onto the bill to win votes, on August 29 this court temporarily suspended implementation of the Monsanto Law. Demonstrators continued insisting the law be repealed entirely.

The schoolteachers' union held a protest. Another workshop in Guatemala's second largest city, Quetzaltenango, rallied people in that highland area. The weightiest factor, however, was undoubtedly the spontaneous mobilization of seventy community mayors from the western highland department of Sololá, where 96 percent of the population are either

Kaqchikel, Tz'utujil, or K'iche' Maya. On Sunday, August 31, the mayors held a series of teach-ins and town hall consultations to analyze the law collectively. As one leader noted, "We cannot live without our [maize]. It makes up all of our lives. We consume it for our food, we sell it, it is us."[74] Many elders were said to have shed tears about the desecration of maize, recounting memories of how the army had razed their subsistence crops as a genocidal tactic during the civil war.[75] These ancestral authorities urged communities to join protests that would block intersections to Guatemala City. Word spread nationwide that the time had come to move mountains.

On Tuesday, September 2 (13 *Ajaw*, 13.0.1.13.0, an almost palindromic date in the Maya calendar, a day to face the mightiest challenges), an estimated 120,000 people (in a country of only 14 million people) halted traffic along the Pan American Highway for eight hours. In Sololá alone an estimated 30,000 converged.[76] To the north, Q'eqchi' groups blocked another major highway that is a shipping gateway to the Petén lowlands. A third group from another highland department, Totonicapán, held vigil in front of the National Congress building in Guatemala City. With a bit of vaudevillian comedy, they lobbed tomatoes at representatives and shouted, "We don't have a salary . . . we won't go home for the weekend, and neither will you!" Protestors remained steadfast until congressional representatives promised later that evening to reopen debate on the law in a three-day session.[77]

Meanwhile, *cibernautas* (netizens) from a Guatemalan branch of the famous hacking group Anonymous shut down multiple government websites, including those of the Superintendent of Taxation Administration, the Constitutional Court, the National Police, and the Ministry of Finance. Anonymous's Facebook page and Twitter feed instructed volunteers to "Keep firing!" ("*Sigan disparando!*") but also to take precaution, as less-experienced hackers appeared to be joining the attacks. In a video that went viral, a Guy Fawkes–masked figure threatened more internet chaos in muffled, but obviously Guatemalan-accented Spanish.[78] One hacker said, "The people must not fear their rules, but the rules must fear the people."

In a final crescendo, Maya communities from all corners of Guatemala held all-night vigils, and many composed petitions that their leaders would

▲ FIGURE 14. The Pan-American Highway brought to a standstill, 2014. Photo by Jeff Abbott.

► FIGURE 15. "Our maize is intangible patrimony," 2014. Photo by Jeff Abbott.

travel ten to twelve hours overland in order to hand-deliver to Congress. There were multiple assemblies across Q'eqchi' territory in Verapaz; a doctoral researcher observed one in Lanquín, while Maya photojournalist Cristina Chiquin reported that Q'anjob'al, Chuj, Akateka, and Popti communities throughout Huehuetenango held vigils.[79] Schoolchildren joined on social media.

Under this intense public and media criticism, the Guatemalan legislature convened an emergency session to repeal the law on September 4, 2014, three weeks before it was scheduled to take effect. The two major political parties, Patriot and Leader, reversed their support with unprecedented apologies. In an almost reverse mirror image of the prior aye votes, 117 voted to repeal, with 38 abstentions and just 3 votes to uphold the law. Repeal of the Monsanto Law fell on • • *Iq* (2 Wind), a Maya day of healing appropriate for rituals to purge illness from the body. Against long odds, naysayers, and decades of political impunity that have reinforced fatalistic views about the unchanging status quo, an unlikely set of allies forced the Guatemalan Congress to call Monsanto's bluff.

One of the best celebratory reflections was a column about how the "Lord of Corn [Monsanto] does not respond to prayers, only money."[80] It pointed to the absurdity of how corporations claim legal personhood, yet they have no morality, no senses, no taste. Indeed, I thought Monsanto knows nothing of the milpa delicacy of fried corn turnovers (empanadas) stuffed with *tziquinché*, a mushroom that grows wild on tree stumps in organic maize fields fertilized by ash. Corporations can neither savor squash seed sauces (*pepian*) from millennial-old recipes centered on the first plant to be domesticated in Mesoamerica, nor relish the juicy squirt of ripened pineapples cropped alongside maize fields. They cannot experience the village joy of sharing freshly harvested corn-on-the-cob maize drinks with any neighbor that visits until everyone has a bellyache. Nor can they understand the contentment of eating comfort foods like tortillas with eggs and beans that millions of satisfied Guatemalans undoubtedly ate on the eve of September 4, 2014.

However tenuous, the victory over Monsanto in Guatemala instilled many people with hope, civic and national pride, and the possible re-

birth of their democracy. Flags were among the most surprising symbols in celebratory posts after the repeal. As Poqomchi' columnist Kajkoj Ba Tiul wrote, "What made the people go out into the streets and roads to demonstrate their displeasure, because their sacred corn was to be given to Monsanto, is a sign that gradually people are taking their *dignity* and are expressing that the authorities are not those who [really] rule, but who obey; they are not who decide, but who must respond to what the people want."[81] After centuries of dictatorship and corruption, the people, united, had defeated an odious law.

Four days after the repeal, Monsanto responded with an ominously worded press release, titled "Statement on Guatemala," which said: "They have even named it the 'Monsanto Law,' implying that Monsanto has been its principal promoter and beneficiary. We are not. We have always respected the independence of the legislative process of the Congress of the Republic of Guatemala."[82] The corporation nevertheless made known that it had immediately communicated with the international seed breeders' convention (UPOV) about next steps. The struggle was not over yet.

SUSTAINING THE PRESSURE

In the long struggle to reverse five centuries of colonialism, Guatemalan social movements never rest. Said Miguel Olcot, a community leader from the highlands, "The victory against the Monsanto law was not the end. It was the beginning."[83] When a rare victory such as this occurs, as underdogs they understand the imperative to press forward with renewed collective energy to push for the deeper systemic reforms for decolonization. True to pattern, rural and Indigenous organizations reassembled two weeks later, on September 17, to condemn a series of other "neoliberal laws that threaten life"—over mining, telecommunication monopolies, and more.[84] An astute few noted that social movements really needed to call for de-ratifying the DR-CAFTA as the root cause of so many ills. Organizers mounted fifty decentralized demonstrations across Guatemala, calling for a legislative slurry to support small farmers, including protections for community radio stations, defense of sacred places, and, above all, passage

of a long-awaited Integrated Rural Development Law first drafted in 2009. Congress, however, returned to its old ways and familiar allegiances, and the rural development law failed to win passage. To date, Guatemala has yet to fulfill the many obligations to the countryside promised in the 1996 Peace Accords.[85]

As if the Monsanto Law uprising had never occurred, six months later President Pérez Molina's administration directed the Agriculture Ministry, through executive order no. 207, to move forward with an internal ministerial policy to deregulate GM crops, independent of congressional action. Dissident Byron Garoz, a professor and leader of the Rural Studies Collective (CER-Ixim), played a pivotal role in alerting the public, and social movements swiftly remobilized. In a torrent of press releases and communiqués to their members, Indigenous and peasant networks rejected the proposed ministerial policy. Anonymous Guatemala decried it as the "Monsanto Law in disguise." Reminding their followers that GM crops are "just a tool to loot [Indigenous] territory," the REDSAG food sovereignty network paused a campaign for educating Indigenous youth about the health hazards of junk food and organized an urgent workshop. Participants posed for photos holding homemade banners that declared, "We cannot allow policies that devour and destroy what is ours."

No one imagined that two months later a corruption scandal would rock the country. Alliances established during the Monsanto battle snowballed into a broader clamor for justice, democracy, and structural transformation not witnessed for sixty years in Guatemala. The people, united, again won the impossible: they compelled a right-wing congress to rescind presidential immunity, thereby sending a genocidal figure to jail.

OTTO *AL BOTE*, "TO THE SLAMMER"

In April 2015 the United Nations International Commission Against Impunity (CICIG) surprised the nation with revelations that a customs mafia going by the name La Línea (the telephone line) had infested the highest levels of Guatemala's presidential administration and bilked the Guatemalan public of no less than $130 million in annual customs tax revenue.

Dozens of government officials and staffers were arrested, including the head of the Bank of Guatemala itself—and rumors swirled about the involvement of the vice president, Roxana Baldetti. Initially led by students under the hashtag #RenunciaYa (Resign already), middle-class families also joined street protests. Mass demonstrations quickly spread throughout the country, again transcending the usual class, age, ethnic, and geographic divides that otherwise structure Guatemalan politics. Similar social media feeds, key connective individuals, and networks (Anonymous Guatemala and others) sprang back into action. Three weeks of relentless rallies led to Baldetti's resignation, prosecution, and eventual imprisonment.

Suspicion then shifted to President Otto Pérez Molina himself. Weekend demonstrations continued. Wiretaps that the United Nations released on August 21, 2015, definitively linked Otto to the crime gang and fueled public indignation. Fed up with corruption and secrecy, protestors immediately demanded his resignation. A hundred thousand people converged on the Guatemala City center during a national strike on August 27, 2015, and rural communities blocked a half dozen highways. Children, office workers, doctors, merchants, and teachers alike came together under rainstorms to wave their sky-blue national flags and sing their national anthem with earnest dignity.

While urbanites condemned Otto for robbing public coffers, Maya organizations remembered his role in the genocide. An image of four elderly Maya women giggling behind a slightly vulgar placard saying, "*Otto, cerote, te vas a ir al bote*" (Otto [expletive for turd], you're headed for the slammer) went viral and became a street chant. In a historic press conference on September 1, whose convergence is likely never to be repeated, the ultraconservative Chamber of Commerce united with peasant organizations, the public university, and human rights organizations to call for his resignation.

With Otto still refusing to relinquish power, citizens spilled into the streets in crowds so congested that Congressional representatives could not enter their building. Uniting with police (another first), protestors formed human chains on September 1 to escort legislators into Congress. Some carried eggs and signs signaling their legislators to "have the balls" and

vote Otto out. The streets erupted in jubilation when a messenger rushed to Congress's front door to announce that Otto's own Patriot Party voted to rescind his presidential immunity with one month left in office. A very courageous judge issued orders for Otto's arrest on September 2, 2015. Exactly a year after the Monsanto Law repeal, Otto's corruption trial began.

Although Otto Pérez Molina's leadership role in the Guatemalan genocide as "Major Tito" has yet to be prosecuted, he was eventually sentenced to sixteen years for racketeering.[86] He spent nine years in military prison and continues under house arrest. Despite six decades of US intervention, a brutal thirty-six-year civil war, and encrusted narco violence, Otto's downfall showed that the dream of democracy—however tattered—can be reborn in the unlikeliest of places. Out of connections formed through these mobilizations, a small group of academics and professionals established a new political party they symbolically named "Seed Movement." This was merely an opening gambit in a much longer struggle.

FROM THE SHADOWS

After Otto's arrest in 2015, a social movement alliance attempted to organize a plurinational assembly to rewrite the constitution, but with presidential elections just a month away, there simply was not enough time to remobilize the populace. Guatemalan voters were left to choose between a business elite with ties to the narcos (who eventually spent time in a Florida penitentiary for this) and a racist television reality show comedian, Jimmy Morales (aka "Guatemala's Trump"). The latter won. Morales was a Manchurian candidate with no political experience but clear ties to the military. He campaigned on a populist slogan that he was "not a criminal, not a crook." It soon became clear that he was both.

Guatemalans again held a national strike on September 20, 2017, in which hundreds of children participated. Citizens regularly took to the plazas to demand Morales's resignation. When rumors circulated that the UN's CICIG had evidence against Morales's brother, son, and possibly Morales himself, Morales evicted CICIG's leader and ended the UN anticorruption mission. To maintain support from the US Embassy, Morales

ingratiated himself to Donald Trump—his gringo alter ego—by becoming the second country to support Trump's relocation of the US Embassy in Israel to Jerusalem.[87]

Guatemala's next presidential race in 2019 was an equally dismal choice between two apparently corrupt elites. Guatemalans manifested their dissatisfaction through the lowest voter turnout since "democratic" elections resumed after the civil war. Although Alejandro Giammattei won, protests against his administration became so commonplace that popular movements simply referred to them in shorthand by the date (e.g., #20S for September twentieth). Giammattei nevertheless stacked the courts with sycophant judges. With no international monitoring, corruption ran rampant everywhere. Guatemalans began referring to their elected officials as the "corrupt pact" (*pacto de corruptos*). During the COVID-19 pandemic, hospitals lacked even basic provisions. Promised vaccines never arrived.

Besides corruption, social movements in Guatemala also confront "privatization, free trade, austerity, resource extraction, land grabs, kleptocracy, impunity, crime, narco-trafficking . . . unprecedented violence . . . unemployment, abandonment, collapsing subsistence, natural disasters, and environmental destruction."[88] It is almost impossible to solve these problems when graft runs rampant. Guatemala's private oligarchs are known to reward government and military officers with special perks and cash bonuses known as *dobletes*.[89] An analyst for the investigative media outlet *Insight Crime* noted, "It is not surprising, therefore, that said ministers are always available via phone, or in person, for those who are really paying their salary and that these ministers make fulfilling their patrons' request a high priority."[90] Such shadowy vested interest appeared to be behind another attempted "Monsanto Regulation" abetted by the US Embassy.

SMUGGLED THROUGH CUSTOMS

The USDA maintains a bureau of well-informed analysts in its Foreign Agricultural Service (FAS) who have blatantly used their research power to identify cracks and loopholes in Guatemalan law by which foreign agribusiness corporations could introduce GM crops to Guatemala. As

the brilliant Indian author Arundhati Roy once quipped about neoliberal corporate power, "This time around the colonizer doesn't even need a token white presence in the colonies. The CEOs and their men don't need to go to the trouble of tramping through the tropics risking malaria, diarrhoea, sunstroke and an early death. They don't have to maintain an army or a police force, or worry about insurrections and mutinies. They can have their colonies and an easy conscience. 'Creating a good investment climate' is the new euphemism for Third World repression."[91] In Guatemala, corporations can certainly rely on the US State Department for the intel they need.

US attachés and analysts pretended that the 2014 uprising against the Monsanto Law never happened. Their embassy reports confirm my hunch that the inertia of Guatemala's bureaucracy—for better or worse—has indirectly protected the country from the corporate seed industry. For example, even though Pioneer won permission to test Herculex corn in-country, paperwork proceeded so slowly that the company withdrew the trial after three months of fieldwork.[92] Written by the same FAS analyst, her mopey annual reports seemed virtually copied and pasted from one year to another. They are filled with racist lines about the ignorance of Indigenous seed sovereignty movements. In 2017, however, her reports suddenly shifted tenor, celebrating "a final solution": they would turn border customs procedures against Indigenous customs.[93]

Bowing to US pressure, Honduras had long before legalized GM crops. Since Guatemala held an obscure customs agreement with Honduras, the FAS analyst suggested that "to avoid 'illegal' transit of seeds, government authorities negotiated a unified and harmonized regulation that would allow both countries to comply with regional integration and compliance with international commitments."[94] While the US government was compelling Guatemala to block migrant caravans from attempting to pass the Guatemala-Honduras border, it was at the same time pressing for customs "harmonization" so that illegal GM seeds might cross that same border unobstructed.

For all the talk about "harmonizing" procedures, very different agencies were invited to the table. Honduras authorized its health authority, SENASA

(National Service for Agrifood Health and Safety) to manage GMOs while Guatemala's more progressive Ministry of Health and its Directorate for Consumer Attention and Assistance were excluded from these negotiations. Albeit a customs agreement, no plans were made to establish a border laboratory to test for GMOs, nor for Guatemala's tax authority (SAT) to monitor or track shipments.[95]

Here's how the scheme unfolded. Guatemala and Honduras sent a draft regulation to the World Trade Organization in 2018 which ipso facto reassigned the Guatemalan Ministries of Agriculture and Economy to become the default "national competent authorities" on GM crops. On the heels of its own GEF/UNEP Trojan "biosafety" project, El Salvador then joined the Honduras-Guatemala customs agreement.[96] In March 2019 representatives from these three Central American countries signed "technical rule" RT65.06.01:18, which required each government to organize a regulatory facade for approving old and new forms of plant gene editing (the newer technology is CRISPR, euphemistically known as "precision biotechnology"). Prior to the October 1, 2019, deadline, Guatemala's Agriculture Ministry released an internal regulation to establish a permanent Technical Committee of Agricultural Biotechnology (CTBAG) composed of five Agriculture Ministry functionaries, four people from the "academic sector" (with three voices from institutions known to support biotech diluting the one public university representative), and two lobbyists from the Chamber of Agriculture and the Association of Seed Sellers—and, of course, no representation from Indigenous people.

The FAS analyst was clearly thrilled that this technical committee structure would likely dilute the pesky influence of public university scholars known to "oppose biotechnology," while also excluding "human rights activists, indigenous groups, and some small farmers."[97] She rationalized sidelining CONAP's prior established authority as the Cartagena Protocol focal point by arguing that its role was and is purely secretarial: "Although CONAP *coordinates* the regulatory efforts on [GMOs], the ministries keep their corresponding regulatory mandate, as CONAP is not a regulatory authority on agriculture, environment or health."[98] While CONAP might retain its mandate over GMOs inside protected areas, she argued, the Ag-

riculture Ministry should be the rightful authority regarding the rest of Guatemala—as though genes know where a park begins or ends.[99] She also assured biotech investors that "indigenous communities' consultation process" would be an easy process "embedded in the operative manual of the Ministry of Agriculture"—a link that, of course, dead-ends on the internet. No such regulation can be found.

To have a seat at this CTBAG table, the rules stated, committee members had to hold a university degree, possess a technical or scientific background, have knowledge of biotechnology, and pay dues to a professional association.[100] Nonpublic meetings were to be held at the Agriculture Ministry offices every two months, in order for it to be able to review and approve within 270 days any application for a commercial GM crop.[101] According to cryptic "workplans" available on the internet, the COVID pandemic disoriented the committee in 2020, but by 2021 it had begun lobbying for Guatemala to celebrate a "National Day for Biotechnology."[102] Leading this customs coup was Guatemala's Ministry of Economy—an entity that hitherto had never participated in biosafety fora but which is known to follow the dictates of the oligarchy's most powerful trade association, the Coordinating Committee of Agricultural, Commercial, Industrial and Finance Associations (CACIF). Corporate America rejoiced. CropLife International gloated that at long last Central America would follow Honduras's "vanguard" leadership.[103]

The FAS analyst cheerily dismissed worries about the contamination of native maize—speculating that GM crops would likely only be planted in lowland regions.[104] Even if that were true, Guatemala has an endangered, endemic teosinte, *Zea luxurians*, that grows in the lowland border region with Honduras in the departments of Jutiapa, Jalapa, and Chiquimula. To greenwash this magical thinking that GM corn genes grown in the lowlands would not contaminate highland native maizes, the World Bank's GEF threw $1.4 million at all the ministries involved in this customs coup. Whether the World Bank project managers were simply ignorant, lazy, or corporate conspirators, this third GEF project sounded suspiciously like an FAS report by the same US embassy attaché, Karla Tay.[105] Seemingly pulling facts from thin air, the World Bank consultant who designed the

project rationalized that since women are prone to nutritional deficiencies while pregnant or breastfeeding, "GMOs could potentially help reduce their malnutrition problems."[106] The project also clearly violated several internal World Bank directives for consultative processes with Indigenous peoples.

THE CUSTOMS COUP DE GRÂCE

After the Ministry of Economy published the customs regulation that had de facto legalized GMOs through Guatemala's geographical back door, Indigenous groups immediately responded during a public comment period. REDSAG and others argued that the regulation threatened Guatemala's agrodiversity. When the ministry ignored their comments, on September 20, 2019, a newly established legal guild for and by Indigenous peoples (Bufete para Pueblos Indígenas) filed a cease and desist (*amparo*) challenge with the Supreme Court. Lead attorney Juan Castro argued the Agriculture Ministry could not simply name itself as "national competent authority" because the Maya people of *Iximulew* (invoking a Kaqchikel term for Guatemala as "land of maize") are the real owners and stewards of their traditional knowledge, as stated in the Convention of Biological Diversity and many other international human rights conventions.

Professor Byron Garoz organized a teach-in at the public university on October 8, 2019. Later that month he and I established a Facebook group named "Reglamento Monsanto" (the "Monsanto Regulation"). That first day we added 5 people; by the end of the next day 108 had joined, and within a week 211. Later renamed Monsanto Law 2.0, this online group has remained a space for cross-organizational sharing of information during and after the pandemic. A score of Indigenous and peasant networks held a press conference on November 20, 2019. On January 15, 2020, the Supreme Court ordered a provisional halt to implementation of the customs regulation and elevated the case to the higher Constitutional Court for a final decision. The National Alliance to Protect Biodiversity (ANAPROB) and REDSAG held more press conferences, radio shows, and workshops and added more social media posts to help explain to the public that the

new acronym in this customs agreement—LMOs or "living modified organisms"—is just a euphemism for GMOs, better known in Guatemalan Spanish as "transgenics."

Many Maya ancestral authorities traveled to Guatemala City for the Constitutional Court's public hearing, scheduled for February 27, 2020, but inexplicably canceled that morning at 9:20 a.m. and delayed until March 24. In the interim, the world locked down. The court rescheduled the hearing for August 6, 2020—but again canceled it the day before, due to "technical difficulties." Outside the building, leaders expressed their indignation, using allusions to the civil war: "It's an attack against our original peoples. The big businesses that are behind this agreement have purely mercantile interests. They don't care about human rights violations to the original peoples—as they disappear our seeds, as well as our medicinal plants that are so important to Maya peoples' lives."

Domingo Quino, leader of the powerful Alliance of Ancestral [Maya] Authorities of Sololá, stated, "In trying to exterminate our maize, they are trying by all means to exterminate the original peoples in Guatemala." In transcribing these press conferences, I was struck by the comments of another leader who stated, "Genetic modification doesn't just hurt the maize, but it hurts our health too." He clearly foregrounded the harm to maize *before* mentioning the personal health effects that dominate the Euro-American food movement. Protest banners hung outside the court also contained incisive agroecological principles: "To authorize transgenics is to leave our maize in the hands of mega corporations whose purpose is the right to property over seeds and the sale of agrotoxics." And, "The best defense against pests is a diverse agrosystem. To accept transgenics is to implement homogenous maize, vulnerability to pests and diseases, and dependency to agro-poisons that contaminate our soils and water."

At long last, the Constitutional Court heard comments on August 11, 2020. Civil society mounted a blitz of memes. Risking their own health in the middle of a pandemic, elderly Indigenous ancestral authorities traveled from all parts of the country to attend the hearing. Sent to a separate room away from the justices, the sound system failed repeatedly. On what otherwise should have been a celebratory National Day of Maize (August 13),

FIGURE 16. Maya ancestral authorities and lawyers in virtual public comment session before the Constitutional Court, 2020. Photo courtesy of the Bufete para Pueblos Indígenas.

social organizations expressed distress about the anticipated court ruling. Indeed, on January 29, 2021, the Constitutional Court dismissed the Maya lawyers' appeal and the customs regulation became another fait accompli. The FAS analyst gloated in her next report, "The rule is fully in place as the Supreme Court and the Court of Constitution have both confirmed its legality after activist opposition."[107]

A week later, in a rare joint appearance, representatives of all of Guatemala's Indigenous peoples—Maya, Xinka, and Garifuna—denounced the ruling while symbolically sitting behind a copy of the *Popol Vuh*. On March 25, unknown assailants ransacked the Maya lawyers' office, stealing computers that apparently did not have backups. As always, when faced with setbacks, wise Maya organizers shift to the long game. By May 2022 they had coordinated a broad movement to lobby the Guatemalan Congress to approve the Law for Biodiversity and Ancestral Knowledge. If this bill (no. 6086) to comprehensively protect Indigenous traditional knowledge is ever approved, it would allow creation of a registry of collective patri-

mony—from medicinal plants to music to seeds to Maya weaving designs (often stolen by the tourist industry).

The pandemic, unfortunately, dragged on. Unknown numbers of elders (and the wisdom they carry) perished, and other leaders were disabled by Long COVID. Corruption ran rampant. Hospitals were empty. Tourism collapsed and donors left. Although the GM corn customs coup was an outrage, social movements were simultaneously dealing with pandemic destitution, martial law, a countrywide extractive assault on Indigenous territories (via mines, dams, and plantations), criminalization of social movements, imprisonment of journalists, and more. A relatively small number of heroic but overtaxed leaders juggle all these threats with aging computers, poor internet connections, a decrepit public transportation system, and shoestring budgets. But social media continues. For all their commercial faults in the United States, Facebook, Twitter, and WhatsApp in Guatemala have become vibrant tools for coordination and popular education for the long game of decolonization.

FROM THE TERRITORIES

For whatever reason, social unrest in Guatemala always seems to crescendo in the month of September. Once again, a September 4th brought mass protests in 2022 about the rising cost of living. The grassroots organizations leading the hard work of food sovereignty—focused on saving seed and revitalizing polycultural cropping systems—have found new audiences. In a country where agricultural work was once associated with poverty, hip millennials have rediscovered gardening with new respect for Indigenous wisdom. As an example of Maya-led agroecology, in one town outside of Chimaltenango, San Juan Comalapa, 10 percent of the community has switched to organic methods, and the town's leaders have begun challenging Green Revolution propaganda with their own experimental plots, comparing ICTA's hybrid seed (20-cm cobs) with their own (30 cm).[108]

With a tiny staff and small donations from European churches, REDSAG manages a network of sixty organizations using a sophisticated social media strategy about seed fairs, youth conferences, and field tours they organize

throughout the country. With the same tests kits used by the Zapatistas, they began testing for contamination among member organizations (results forthcoming). Other movements fighting extractive industries "from the territories" have also begun testing water for pesticides and heavy metals.[109] At long last, from the grassroots they are amassing the scientific data in defense of maize that has been long available in Mexico but utterly missing in Guatemala.

If food sovereignty is the aspirational noun, agroecology is the practical path.[110] "[Agroecology] is cosmovision and it is resistance."[111] Agroecology also connects food sovereignty to a deeper defense of Indigenous territory and decolonization processes. According to anthropological ally Nicholas Copeland, agroecology represents a "proactive practice of reclamation and restoration of land through indigenous knowledge within a territorial frame."[112] This broader Indigenous "defense of territory" goes beyond the economic to include the rights of nature, especially seeds as living entities. As Maya lawyer Juan Castro commented on a September 2023 radio program I transcribed, "Humanity is no longer the center of attention or the center of life. Humans are one living entity among all the diversity on the planet." Defending the common good of seeds is one catalytic method for rebuilding social and ecological commons.[113] Seeds have a particular charisma, but, as Copeland notes, the drier topics of state accountability, redistributive agrarian reform, and respect for Indigenous governance of territory are also fundamental to food sovereignty.[114]

Just as the concept of food sovereignty weaves together local and global organizing, Guatemala's new "defense of territory" discourse is a response to top-down geopolitical restructuring (market-assisted land policies, extractive concessions, megaprojects without consultation) but also bottom-up Indigenous resurgence. Prior to defense of territory, Indigenous peoples aspired to "integrated rural development," which served as a coded phrase for state promises made in the 1996 Peace Accords. Decades later, many people have given up that the Guatemalan government will ever implement those accords. Like the Zapatistas, they have moved forward to govern their own territories with dignity through traditionally elected community leaders, whom they call "ancestral authorities." As one street

protest sign against the Monsanto Law 2.0 noted, "We don't ask anything of the state only not to meddle with what is most sacred to the people. We demand that they respect our millennial practices for survival."[115]

MONSANTO LAW 2.0

Something fundamental is shifting in Guatemala. The academics and professionals who formed the new Seed Movement political party following Otto Pérez Molina's imprisonment ran a shoestring presidential campaign against corruption in 2023. No one ever imagined they could win against entrenched and deep-pocketed political parties. But the Guatemalan public had had enough. In August 2023 they elected president, by a landslide, the Seed party's center-left leader, Dr. Bernardo Arévalo, who happens to be the son of President Juan José Arévalo, who led the October 1944 democratic revolution. Before Arévalo's anticipated electoral victory in August 2023, I was in Guatemala and the populace was humming with hope. After the election, many friends and acquaintances pinned a seed emoticon to their social media posts. But the kleptocracy was determined to hold on to power. Guatemala has a painfully long five-month transition period between elections and inauguration. In that interregnum many outgoing Congress members made clear they were open to accepting bribes.

At the end of July 2023, the outgoing Congress's agricultural, ranching, and fisheries commission introduced a new "Law for the Breeder Protections of Plant Varieties," which would lead Guatemala to sign onto the radically pro-corporate convention, the International Union for the Protection of New Varieties of Plants (UPOV 1991). This time social movements immediately caught wind of this legislative surprise. The "Monsanto Regulation" Facebook group renamed itself "Monsanto Law 2.0." REDSAG, CerIxim, the progressive agronomists, the legal guild by/for Indigenous peoples, newspaper columnists, political cartoonists, the tiny number of leftists in Congress, and others sprang into action.

It is essentially the same law as the 2014 Monsanto Law 1.0, but with more draconian fines for patent violations: four years imprisonment and $50,000–$100,000 fines. In a tacit acknowledgment of its foreign intellec-

FIGURE 17. Youth rally against Monsanto Law 2.0, 2023.

tual authors, yes, the bill listed the penalties in US dollars. It also authorized the Agriculture Ministry to create a registry to support international plant breeders and enforce their patents. Even more amazing, the Agriculture Ministry had already prepared a bylaw to enforce the law (a procedure in Guatemala that can take years, if ever, to accomplish). It seems as though this plot was clearly planned. In another session, on August 26, Congress's agricultural commission invited the trade group AgExport to testify in support of the law, but blocked Maya elders and organizers from speaking. When Indigenous organizations filed a legal appeal on September 29, demanding the right to speak, Congressional guards denied them entry into the hearing until a sympathetic representative escorted the group in. It was the same old pattern: exclusion, disrespect, and neocolonial business as usual.

Having apparently learned nothing from the long series of September uprisings, Guatemala's attorney general, Consuelo Porras, and other corrupt officials made moves in September 2023 to invalidate the presidential election—even breaking into the Supreme Electoral Tribunal offices to steal ballot boxes. At the end of September, REDSAG and the Ancestral Authorities of Iximuleuw issued a press release demanding that the government "respect [our] ancestral food systems" and use the precautionary principle to guarantee that people have a right to "health, a healthy environment, adequate food, free of toxics and genetic alterations."[116]

In response to both threats—to maize seeds and the Seed Movement's presidential victory—K'iche' Maya ancestral authorities from Totonicapán's "48 Cantones" issued a call to Guatemalans to block roads on October 2, 2023, and to continue indefinitely until a peaceful political transition was ensured. In that press release they asked for the election results to be respected, but also for Congress to reject Monsanto Law 2.0 and two other odious bills (one renewing petroleum concessions to a company that had not paid adequate royalties and another granting immunity to military officials). The 48 Cantones are famous for their pre-Columbian governance structure, which manages communal forests among other secular and spiritual responsibilities. These ancestral authorities are truly servants to the people, as every community leader serves a year without pay. Through agile coordination, the Xinka Parliament, the powerful mayors of Sololá, and others joined the 48 Cantones and began a rotating Indigenous occupation outside the Public Ministry.

To their surprise, cityfolk joined with them and donated provisions. Migrants from around the world staged parallel demonstrations of solidarity. Universities closed and students spilled into the streets and blocked the highway circling Guatemala City. Market vendors donated food and went on strike. Nuns joined the marches and priests offered mass on the front lines. Anonymous Guatemala took down an impressive number of government web pages. Over the month of October, road blockages spontaneously grew to more than a hundred points around the country. The barricades became spaces of ceremony, music, joy, guerrilla theater, film festivals, bingo games (with cards showing corrupt officials), and

spontaneous dancing, both traditional and modern. The generosity of strangers and the dignity of the protestors showed immense hope for a better Guatemala.

Although the primary focus of these protests was to respect the elections, they were also spaces for education and reflection about the Monsanto Law 2.0. More than seventy groups signed onto a declaration against the law on October 16. As one Sololá leader noted, "We already know the consequences these [GM] seeds bring." Signs from the barricades expressed, "We'll sell Consuelo Porras [the corrupt attorney general], but not our seeds" and "Ancestral seeds are sustenance for the peoples, not a commodity for capitalism." Wrote another newspaper columnist, "Seeds are sacred for Maya peoples, but they are also sacred to any cultural group that respects life."[117]

FIGURE 18. "No to the Monsanto Law 2.0," 2023. Courtesy of REDSAG.

Day after day, more people participated. Youth on motorcycles peacefully routed riot police. Despite crackdowns to remove blockades in wealthy Guatemala City neighborhoods, the protests continued for 105 days. This symbolic number was hardly coincidental. It is the difference between the Maya *tzolk'in* calendar of 260 days (thirteen cycles of twenty days) and the solar calendar. That period also represents the average growing season for maize at certain Guatemalan altitudes. Despite the sacrifices involved for extremely poor people to leave their jobs and farms to protest for three and a half months, these united Maya and other citizen movements routed a coup and harvested democracy.

Although the primary focus of these protests was to support the elections, Maya authorities never forgot that the Monsanto Law 2.0 was a co-trigger. More than seventy groups signed onto a declaration on October 16 against the legislation being discussed in Congress to legalize GMOs. REDSAG and the Maya lawyers' guild filed a preemptive motion against the bill on November 24, 2023 (3 *Tz'i'*, 3 Dog, an auspicious day in the Maya calendar for legal justice). They did so in coordination with Maya food sovereignty leaders who were celebrating a seed fair outside the Constitutional Court. With a highly disproportionate show of force, riot police intimidated and removed the seed protectors/protestors (fig. 19), but the court accepted the motion.

How shall I draw this chapter to an end when the outcome remains unknown? Mostly I want to ask what degree of avarice motivates corporate executives to try over and over and over to legalize GMOs in a country that has firmly rejected them? How can corporate sycophants propose the criminalization of seed saving when one in two Guatemalan children already go to sleep hungry? To be sure, Maya people have one of the healthiest plant-based subsistence diets in the world. But, as Kaqchikel scholar Sandra Xinico has observed, "The system is eating away our life."[118] Permitting GMOs for large-scale industrial farming on the plantations of the 1 percent will do nothing to resolve chronic hunger or support climate change adaptation in vulnerable Maya communities. Indigenous peoples

FIGURE 19. Seed fair encircled by riot police, 2023. Courtesy of REDSAG.

FIGURE 20. Ancestral authorities filing legal motion, 2023. Courtesy of REDSAG.

starve in Guatemala not for lack of agricultural knowledge or poor seeds, but because they lack land, good feeder roads, transparent marketing practices, and access to clean water. Being fined for planting crops involuntarily contaminated by GMOs would be the "last straw."

Much as I ended my 2014 article on Guatemala's vulnerabilities to GM corn with a predictive warning, I close this chapter with another prognostication. The Maya calendar dates back to the approximate domestication of maize as its year zero (3112 BCE in the Gregorian calendar). For a people both spiritually and practically attuned to long and complex cycles of time, the five hundredth anniversary of Pedro Alvarado's 1524 brutal invasion of Guatemala and thereafter could unleash mobilizations and demands for structural changes, the likes of which the Guatemalan oligarchy and its corporate colluders have never seen.

CONCLUSION

An Ode to the Pitchfork

Let us rise up as one, let no one be left behind, let there be neither one nor two of us, but all of us together.
—*Popol Vuh*

Roll a ball, twirl, slap, pat, then palm onto the clay griddle, and flip twice. . . . Wanting to learn to be a good guest and genuinely be helpful to the village women with their chores while we talked about my 1995 undergrad thesis research, I knew I should learn to make a proper tortilla. For months my village hosts had discreetly fed my misshapen tortillas to the dogs. Then one morning I formed a perfectly even and thin rounded circle. Having more-calloused fingers, the heat of the firewood hearth no longer bothered me, and I turned over the tortilla for its third toast. It puffed into a perfectly ballooned tortilla. My host and dearest friend, María Ramírez from Atelesdale, exclaimed with delight that my tortillas were finally inflating.

No one else in the house used tableware; they deftly scooped beans and other condiments with a tortilla itself. María kept one random fork and spoon in the house for my poor foreign table manners. One day, though, and without realizing it, I ate my bowl of beans with only tortillas as utensils. María noticed my new social grace and expressed her pride that I no longer ate like a gringa, with a fork.

It strikes me as a bit ironic that a decade later, the fork became the discursive centerpiece of the US food movement: Farm-to-fork. Vote with your fork. Fork festivals. Rather than funneling our frustrations with the food system into street protests, we began eating funnel cakes in farmers' markets on permitted streets. Amid this metaphoric craze for tableware,

the food movement surrendered its more powerful tool and symbol of agrarian revolt: the pitchfork.

Believing that "forktivism" alone will bring sustainability and justice, the North American food movement seems to have forgotten one of its greatest regulatory victories: the international preemptive defeat of GM wheat. Monsanto is not a corporation that typically bows to the pressure of its critics. Yet, despite having invested millions in R&D and four years seeking regulatory approval for Roundup Ready wheat, in May 2004 Monsanto unexpectedly withdrew it from the market after facing an unusual union of pitchforks and forks. As a spokesperson for the National Farmers Union of Canada noted, "I think it got sort of neck-snapping attention from government and Monsanto and everybody else because they were really surprised by the diversity of the resistance to this stuff."[1]

In the process, northern farmers realized how fragile their international marketing contracts were and that even small disruptions between production costs and sales could endanger their survival. Although the US food movement has romanticized local markets and demonized trade, in this instance, the global marketplace was the catalyst for food justice regarding GM wheat. Because this pre-emptive removal of a GM crop was such a remarkable lesson in *thinking* locally but *acting* globally, a brief review of that case will help in understanding the broader lessons from Mexico's and Guatemala's respective and collective resistance to Monsanto, including trickster ways of reimagining weeds in polycropped systems.

THE REMARKABLE GM WHEAT DEFEAT

My interest in how biotech crops affect farmer livelihoods sprouted from that windy day trip to Don Pablo's milpa and my first conversation in Q'eqchi' about the threat of GM corn to Mesoamerican milperos.[2] Half a continent away, on that same day in February 2004, producer resistance was brewing against Monsanto in the unlikeliest of places: the Canadian and US Great Plains. Although biotech advocates like to paint GM crops as unstoppable and almost inevitable for North American agriculture,

even the most industrialized farmers were once able to summon collective "growing resistance" to GMOs and harness consumer interests in support of their own.[3]

A series of bad news stories about GMOs created a fertile context for this farmer rebellion. The StarLink scandal had raised alarm bells about how fast and far that dangerous GM varieties could infiltrate the global food supply. Percy Schmeiser's much publicized trial in Saskatchewan—after GM canola seeds had blown into a ditch on his property line—raised awareness among regional farmers that "Monsanto was nothing short of a bully, willing to force its agenda to the detriment of even its own customers."[4] As Todd Leake, a North Dakota wheat farmer, recounted, "All they need to do is accuse you and take you to court. They have an endless supply of money. The plan is to intimidate you and break you."[5] To be exact: Monsanto at that time employed seventy-five lawyers with a budget of $10 million for the sole purpose of prosecuting farmers for patent infringement.[6] Collecting millions in secret arbitration, the lawyers' efforts became a self-financing swindle.[7]

Even though GM canola and GM corn had already swept through the Great Plains, wheat was another matter. GMO proponents tend to paint their opponents as "anti-science," but these plains wheat farmers happily embraced hybrids and other GM crops. Nevertheless, they saw Roundup Ready wheat for what it was: an excuse to sell more herbicides, not to help farmers.[8] As a Saskatchewan farmer noted, "There are enough chemicals out there for wheat now to keep a nice clean field; I don't know why you'd want a field of Roundup Ready wheat."[9] They were not ideologically opposed to GM crops; rather, Monsanto's GM wheat failed on agronomic grounds:

- Wheat is less vulnerable to weeds than other GM crops (canola, soy, corn).
- Farmers were aware that blanket spraying of Roundup can create superweeds.
- Combines always scatter wheat seeds—creating a possible scenario in which any herbicide-resistant wheat could become a weed to a higher-value crop, such as canola, in a no-till field rotation.[10]

- Farmers had their own wheat seed-saving networks and knew these exchanges enhanced vigor.[11]
- Wheat is a staple food for some two billion people.
- Wheat is also used to make a consecrated food; the concept of breaking bread has cultural and religious significance to more than one major world religion.[12]

In January 2001 wheat farmers converged in their pickup trucks in Bismarck, North Dakota, for a state assembly committee meeting. Monsanto's lobbyist had prepared talking points to counter the expected consumer "Frankenfood" critiques, but he was utterly unprepared for *farmer* opposition. A bipartisan committee unanimously recommended a moratorium on GM wheat, and the North Dakota House of Representatives quickly passed it.[13] Before the North Dakota Senate could approve the ban, however, Monsanto loyalists within the George W. Bush administration intervened. Farmers nonetheless kept up the pressure. With savvy political theater, during the 2003 state legislative session they distributed bags of wheat containing a smattering of painted seeds to emphasize demonstrate how easily grain elevators could be contaminated. Fears over mad cow disease had already raised EU hackles concerning the safety of North American food imports in general. The North Dakota farmers therefore applied for passports and began connecting with their foreign buyers.[14]

Across the border, the Canadian Wheat Board became an unexpected ally for the prairie farmers. After surveying their constituents, the board realized farmers were most worried about fungal blight and pests, not about weeds. Said one marketing consultant, "So then it got us thinking a bit more about the farmer voice and then led into the coalition work we were doing."[15] This new alliance of calloused hands and carpal tunnel wrists shifted the discussion to corporate control over agriculture. Albeit generally wary of "city folk," prairie settlers forged an unprecedented alliance with Greenpeace, the Council of Canadians, and the Canadian Health Coalition—organizations that typically engaged with the health and environment concerns of urban constituencies. Without having to

sow general doubt about GMO technology, it was the sowers themselves who secured the political victory.[16]

The same year Monsanto acquired Semillas Cristiani Burkhard in Guatemala, it also purchased WestBred, an Idaho-based wheat company.[17] Retesting the waters, Monsanto announced renewed research into GM wheat in 2009. Economic analysts for one trade group warned that if North American wheat farms lost foreign markets, US wheat prices could plummet by 40 percent.[18] Were Canada to permit GM wheat, Japan made clear that it would source wheat elsewhere, a double blow to Canadian farmers who had just lost the EU flax market due to contamination from an illegal GM flax variety not approved for commercialization.[19] The coalition of fifteen groups that had won Monsanto's 2004 voluntary withdrawal of GM wheat sprung back into action. Eventually 233 consumer, environmental, and farmer groups from twenty-six countries signed onto the pledge called Definitive Global Rejection of GM Wheat.[20]

Two decades later Monsanto has yet to commercialize an herbicide-resistant GM wheat strain, although some smaller biotech firms are now testing a reduced-gluten wheat in Spain, and Argentina approved a drought-tolerant GM wheat in 2000. Monsanto ostensibly corked the GM wheat genie bottle in 2004. But contamination remained a problem since the company had field-tested GM wheat on farms across sixteen states—sometimes on leased land, leaving neighboring farms unaware of the experiments.[21] The USDA discovered unapproved Roundup-resistant wheat in Oregon in 2013, in Montana in 2014, and in Washington in 2016, and the Canadian Food Inspection Agency found it in Alberta in 2018.[22] *Forbes*, hardly a radical magazine, noted that from an export perspective, "this could be bad. Very bad."[23] After the Oregon scandal, Japan and Korea immediately suspended purchases from other US wheat farmers.

Given this history, one might hope that North American farmers and farm associations would be equally outraged when Mesoamericans discovered contamination of their own sacred grain, but the US National Corn Growers Association urged the US Trade Representative to leverage the "new NAFTA" in order to continue dumping the most subsidized crop in history at below-market prices on the very country where maize

was originally domesticated. Despite having proactively protected its own wheat farmers from Monsanto, Canada joined onto the US trade complaint against Mexico in 2023. While US foodies CHOMP (choosing health on my plate) on idealized "local" foods, they have passively allowed corporate interests to bully farmers in the Global South to adopt GM seeds.

FERTILE RESISTANCE

Given that Roundup now trespasses in almost everyone's blood on the planet, these are life-and-death matters for both rich nations and poor nations.[24] Whether in the Global North or South, genetic pollution cannot be easily contained because transgenes leak across borders. The uneven and contested rollout of GM corn in Mesoamerica followed the classic colonial pattern of divide and conquer. Though they speak of "harmonization," contemporary trade agreements almost always result in a regulatory race to the bottom. Corporations tend to market their products in whatever country holds the weakest regulatory structures and demand that neighboring countries follow suit. Shadowy biotech proponents deliberately pitted Honduras's more easily co-opted regulatory structures against Guatemala's.

Or, with a genie-out-of the-bottle strategy, they "accidentally" allow seeds to travel across unpermitted places in the hope that once contamination is widespread, states will give up trying to impose any sort of regulation. Even though Guatemala has never formally approved GMOs, in 2023 I heard multiple reports of "Pantek corn" coming from Honduras and being planted illegally in Petén. (Pantek is a glyphosate formula.) In the years that a neoliberal Mexican state was awarding experimental GM crop permits, I also heard reports of GM-contaminated corn being traded from Mexico to Guatemala across a similarly porous national border.[25] According to unfolding research in Chiapas, that situation may now be reversed, with GM corn now entering Mexico from Guatemala via Tabasco.[26]

Despite these interdependencies, Guatemala's 2014 uprising was rarely if ever discussed in Mexico, and Mexico's recent policy reversal on GM corn was largely unknown in Guatemala. I hope one small contribution of this book will be to catalyze more conversations, camaraderie, and common

knowledge across those borders. Just as the best agroecology programs connect farmers to farmers (campesino-a-campesino) for peer learning, so too should transnational scholarship foster horizontal connections to combat vertical, supranational corporate threats. Comparative public-interest scholars have a special responsibility to proactively move and translate across borders information about mutual threats. It was, therefore, a fulfilling moment when REDSAG published a tribute to its new Mexican acquaintances from the No Maize, No Country movement on their 2023 National Maize Day (September 29), by saying:

> We salute the resistance and forceful action you have carried out in defense of food sovereignty, native seeds and maize in all its diversity. For more than 15 years you have mobilized consciences and efforts to prevent the global agri-food system driven by transnational seed and agrochemical companies from appropriating and destroying the ways of feeding the peasant communities that inhabit Mexican territory. Your important achievement in defense of food sovereignty [include]: . . . a national public policy that prohibits the planting of transgenic corn, that prohibits the use of transgenic corn for human consumption, and that prohibits the use of other harmful pesticides . . . Mexico and Central America share countless cultural elements associated with food, health, worldview, economy and spirituality. Therefore, the defense of life in Mexico also represents the defense of life for the rest of the Mesoamerican region. For this reason, [from Iximuleuw], we celebrate with you on Mexico's Maize Day [in the] continued struggle and protest in defense of life, Mother Earth, sacred maize and of the ancient legacy of its people. (Personal communication)

Multi-scalar movements that are able to go beyond predictable allies and borders are often the most disruptive. Futurist Pat Mooney estimates that if either a quarter of the population embraces a new idea or 3–4 percent show up to street protests, it is enough to create "a sufficient tipping point for profound change."[27] Surely if tens of thousands of Guatemalans were willing to risk brutal police or military crackdowns to win repeal of

Monsanto Law 1.0 and prevent passage of Monsanto Law 2.0, those of us living in the Global North might venture more often to take over streets where we can more easily exercise democratic freedoms.

Although propelled by Indigenous leaders, Mesoamerican movements against GM corn have blossomed to become cross-class, cross-professional, cross-cultural, and more recently cross-national alliances. In the face of defeat, national movements are playing the long game, including devising electoral strategies to secure the weight, mass, and power of the state to regulate the corporations threatening ancestral agriculture. What is remarkable about Mexican opposition to Monsanto et al. is that the state itself is now supporting food sovereignty and has appointed dissidents to lead that process. In Guatemala, Indigenous leaders tend to locate the "sovereign" part of food sovereignty within their own autonomous territorial governance, not at the level of the state.[28] Now that the victorious Seed Movement candidate, Dr. Bernardo Arévalo, rightfully assumed the presidency in January 2024, Guatemala may be able to replace its de facto ban on GMOs to a de jure one as well. Mexico's newest (and first woman) president, Dr. Claudia Sheinbaum, elected June 2, 2024, is expected to carry forward her predecessor's platform of food sovereignty.

Although alliances among the strange bedfellows who constitute the diverse food movements in both countries may be imperfect, "these spaces for dialogue may at least hold the door ajar for stronger alliances to be built and ideas to spread and grow."[29] Their collective resistance to GMOs is clearly fertile. In both countries it has inspired the revitalization of smallholder agriculture, seed saving, and revival of traditional practices, but also hard-hitting agronomic research into the wicked problem of how to step off the agrochemical treadmill while simultaneously adapting to climate change. Although social movements tend to more easily articulate what they are *against* than to frame what they are *for*, in both Mexico and Guatemala the maize defense movements have deftly pivoted from protest to proposal ("*de protesta a propuesta*"). Semillas de Vida in Mexico and REDSAG in Guatemala, among many, many other organizations, are bringing back time-tested polycropping systems, home gardens, and other alternatives to both the Green and gene revolutions. They are also showing

how the food movement can socially reflect the polycultures it espouses: ecologically superior and more resilient on the margins.[30]

However, a harsh reality is that chemical cropping, especially using fertilizers, is addictive. For small farmers the risk of going off them "cold turkey" is tremendous.[31] The task of weaning off agrochemicals should not be left on the shoulders of small producers (often women) to train themselves and work harder. Agroecology discourse often celebrates Indigenous women as "bearers of culture, defenders of nature, managers of home economies and gardens, and invisible subsistence providers."[32] Mesoamerican women have also worked tirelessly to conserve maize-based gastronomies through colonial and corporate horrors. But romantically saddling Mesoamerican women with responsibility, alone, to save the system is somewhat akin to saddling women in the Global North with label reading and defensive consumerism. Thankfully, the Mexican state is using its influence to investigate gender-neutral pathways out of chemical-intensive agriculture and toward agroecological intensification.

We know from the experience of the Victory gardens of World War II—which were providing around 40 percent of the US vegetable supply by 1944—how productive small and even micro agriculture can be. We also know that pre-Columbian agriculture was once far more intensive than milpa systems alone. Ancient farmers practiced terracing, arboriculture, floodwater fertilization, irrigation, and even wetlands cultivation, all of which can be revitalized.[33] Mesoamerican farmers likely shifted to the more land-extensive milpa system because doing so required less daily labor, a necessary survival technique after the genocidal Spanish invasion led to population collapse. The density of ruins of vast ancient Mesoamerican cities are more than enough evidence that this region can support more intensive agriculture and higher yields.

Any reintensification, however, will require seed diversity to make the most of all agroecological niches. Thus Native American movements for "land back" are also astutely calling for "seeds back"—which Mohawk farmer-activist Rowen White describes as a process of "rematriation."[34] With one heartening story after another, North American tribes are recovering seeds lost during forced relocations and gifting them through

FIGURE 21. The larger tepary bean was grown in a slightly wetter environment than the smaller desert-grown bean, 2016.

Native networks, just as maize originally spread through the Americas. For example, the Cherokee Nation became the first Native American government to contribute seeds to the Global Seed Vault located in Norway, but they also sponsor a seed garden to distribute seeds free to all enrolled tribal members across the United States.[35]

Maize's extraordinary dispersal through the Americas is a testament to archaic gift economies that carried and traded seeds across long distances.[36] A troubled seed in one context might grow prodigiously in another. To give one illustration, at a Native American tending garden founded at Marin Community College in California by Melissa Nelson and her nonprofit, The Cultural Conservancy, her team improvisationally planted some tepary beans (*Phaseolus acutifolius*) stewarded by the Tohono O'odham Nation. These beans are higher in protein and fiber than other beans. With just coastal fog and a little irrigation, those desert seeds plumped up two times their normal size (fig. 21), tantalizing the imagination about how

more structural support for Native seed exchanges could offer many other solutions for climate change.

RECIPES FOR RADICALS

As the anthropologist Paul Richards once famously argued, small-farmer agriculture has always been inherently improvisational.[37] Although Saul Alinsky's eleven "rules for radicals" remain golden (especially: Power is not only what you have, but what an opponent thinks you have), I tend to imagine social resistance as a set of improvisational recipes rather than a firm set of rules.[38] Skilled cooks can throw together something delicious with odds and ends. Likewise, dissidents can improvise with the time, weather, people, and seeds of ideas available, employing what Gramscian scholars might call "conjunctural analysis." As food scholar Raj Patel emphasizes, "We all make our politics with the tools we have at hand."[39] Activists must constantly scan trends and news for spaces into which they can gain a foothold ("room for maneuver"). *Carpe contextus!* We must seize the context to cook up alternatives in the here and now.

Yet, within "progressive" thinking lies a teleological tendency to envision social change in a distant or utopian future, using new language and social relations.[40] This ignores resilient alternatives that have already weathered the centuries. Even the most vanguard of revolutionaries, Karl Marx, appeared to have been unraveling his own telos shortly before his death. Apparently Marx was avidly reading Lewis Henry Morgan's ethnographies about the Haudenosaunee Confederacy and their maize systems. In what are called his "ethnological notebooks," Marx realized that a living alternative to capitalism already existed within Indigenous economies. As poet-historian Franklin Rosemont wryly noted, "Anyone capable of making Karl Marx, at the age of 63, abandon his previous opinions, is worthy of more than passing interest."[41] Had Marx lived to publish this work, world history surely would have unfolded quite differently. Leftists might have sooner learned to value the more formidable resistance that anthropologist Marc Edelman argues "draws from a deep, historical reservoir of moral

economic sensibilities as well as on old protest repertoires and agrarian discourses [against the state]."[42]

Although of course we need to unravel the deeper injustices enmeshed with modern capitalism, there is a lot we can do in the here and now to prevent corporate power from running further amuck. During what Philip McMichael characterizes as a "third" food regime, a small cabal of agribusiness corporations have taken advantage of trade perks and loopholes. But all of these legal shenanigans can be reversed.[43] In that same time period, the Zapatistas have rebuilt their traditional maize economy while defending their territory from paramilitaries. Now that the Mexican state itself has pledged to reinvigorate small farming systems, corporations finally face an adversary their same size.

Decolonization and decorporatization are related, but not synonymous. I, therefore, advise my students if they want to make a difference, they should master a (neigh)boring topic about corporate power. Trade agreements, patent laws, customs procedures, farm bills, foreign aid, and toxicology are among the "boring" topics I have discussed in this book, since the devil is always in the details. Through lawsuits, shareholder activism, letter writing, public records requests, and other civic tools, ordinary people can shift mountains.[44] If a few more people tenaciously learned some of the dry codes that corporate criminals manipulate for profit, the world could be transformed, because as environmental historian Richard White notes, "in a modern state much real power is suffused with boredom . . . [which] works for bureaucracies and corporations as smell works for a skunk. It keeps danger away. . . . Power does not have to be exercised behind the scenes. It can be open. The audience is asleep. The modern world is forged amidst our inattention."[45]

Although capitalism writ large may be difficult to overthrow, citizens are connecting across borders—under new political imaginaries, and with unusual bedfellows of north-south, east-west, and right-left alliances—to figure out the details of how to decorporatize. These range from tribal trade networks; worker-owned cooperatives; small businesses in the informal economy; planned communities; homesteading; slow food; local

currencies; other feminist modes of production that value precapitalist ethics of household economy and reproductive labor; and, above all, food sovereignty.

In the case of the anti-GMO movement, many Christian homemakers who want to be more "natural" are among the most outspoken voices. Although they might not ever agree on prayer in schools, Bible-devoted capitalists are often as troubled as urban foodies about how scientists "play God" with seeds. In fact, poll after poll shows that Republicans want GMO labels as much as Democrats.[46] As Ralph Nader argues, when people and politicians move past abstractions into concrete details, both the right and left can find many points of convergence and form temporary alliances of convenience to counter corporate excess.[47] Some of these may be procedural—for example, abandoning Fast Track ratification time lines to reassert Congressional authority over trade; or holding the Pentagon to the same auditing standards as any other part of so-called Big Government. Other common denominators may be focused on principles of democracy and fairness. Preppers might also appreciate the pride and security that a Maya woman feels living "off grid" with a bin full of maize, protected from the fickleness of financial markets.

When organizing for justice, insiders (including academics) can and should do more to connect with social movements on the streets. As anthropologist Nicholas Copeland once tweeted, "It's like, if we've given up on movements for political power and social transformation, let's turn our private spaces into nonstop ritual enactments of radicality. And while we're at it let's just eat each other alive inside the Academy over minute squabbles. And call it radical politics. And never look outside the tower." The left tends to criticize each other about insider-outsider tactics. However, history shows that people committing civil disobedience on the outside can make progressive ideas on the inside seem reasonable. For instance, the most radical suffragettes who chained themselves to the White House fence made their comrades lobbying inside state legislatures seem more sensible and ladylike.

On the other hand, insider sympathizers can help outsiders understand the legal mazes and other boring tools their institutions use to keep ac-

tivists at bay. Although social movements often disdain "sell-outs," time and again, many "insiders" are often personally more progressive than their employers. When insiders summon the courage and connections to become whistleblowers, these mutineers invariably move mountains. Take the 2014 case of Guatemala and Goliath: the allyship of Green Revolution agronomists and other insider elites helped protect Maya mobilizations from the usual government crackdowns. Therefore, rather than seeking ideological purity on all social issues in vogue, we could just accept the contributions that strange bedfellows are willing to make about one issue at a time. If every person "Did his/her bit," as the British World War II slogan went, together we could chip away at corporate perks and privileges.

History shows that Davids regularly beat Goliaths. Reflecting on the essential elements of Davidian victories, Malcolm Gladwell surmises that underdogs often win by being unpredictable—using speed and surprise to compensate for their opponents' outsized strength.[48] Davids must play a different and unexpected game. This often happens naturally. The experience of being an underdog transforms people. By necessity they develop new tools. And when underdogs have nothing else to lose, they become formidable sources of change. As Ralph Nader observes, "People, families, and communities can only take so much abuse before they rise up to resist."[49] The same qualities that appear to give Goliaths the better odds are often those Goliaths' greatest weaknesses. As the saying goes, the bigger they are, the harder they fall.

The name "Monsanto" has come to serve as a symbolic foil for global food movements, but in doing so Monsanto's critics may have inadvertently endowed it with more power (and omnipotence) than it actually has. Granted, even before it was purchased by Bayer, Monsanto had net sales of roughly $14 billion, making its budget larger than that of every Central American country. It has acted as a legal bully, yes, but the chemically addicted seeds it hawks do not actually perform better than diverse local varieties.[50] More efficacious than a thousand food labels, Dewayne Lee Johnson's first successful lawsuit against Roundup inspired many more institutions—even nation-states—to ban it. The house of cards began to crumble. Despite attempts to spin off liabilities from chemical divisions,

the courts are beginning to hold Bayer-Monsanto and other corporate Goliaths accountable for their crimes.[51] Through so many mergers, Bayer-Monsanto has become more of a lumbering multifooted Goliath with multiple Achilles heels. When measured only by caloric output, and not subtracting chemical inputs, GM monocrops beat a Mesoamerican milpa. But when factoring in nutrition, climate resilience, medicine, and cultural value, there is no comparison.

GREENS, GREENS, NOTHING BUT GREENS

Despite its claims to "feeding the world," the biotech industry has done excruciatingly little to improve cultivars essential for food security, much less climate resilience in the Global South. One supposed exception was "golden rice," which biotech proponents ballyhooed as evidence of their altruism. With funding from the Rockefeller Foundation, some thirty biotech companies set aside patents to help engineer a rice that produces beta carotene, which they claimed would save half a million children from blindness induced by a vitamin A deficiency. Here I agree with Michael Pollan that the intent behind golden rice was to "win an argument rather than solve a public-health problem."[52] Years before it would ever be ready for market, proponents hyped their golden rice experiments to the media as evidence of their benevolence, while accusing their critics of "mass murder on a high scale"—even suggesting that Greenpeace be tried at the Hague for crimes against humanity.[53]

However, GMO opponents rightly note that a child would have to eat two pounds of GM golden rice *every day* to meet the daily recommendations for vitamin A. Moreover, to actually make the vitamin A bioavailable, the golden rice must be cooked with oil, something that malnourished families may not have.[54] The foundation's initiative was "blind" to other solutions, like fortifying any other staple, such as sugar, with vitamin A.[55] Besides, a half ounce of weeds or greens harvested for free from the *side* of a golden rice field would provide more nutrients than the golden rice crop itself.[56] So, "Why pick an expensive, high-tech approach—costing millions of dollars and decades of work, with no guarantee that people will

accept and eat orange-colored rice—rather than low-tech, simple solutions that could work right now? Again, there seems to be an obsession with technical, silver-bullet solutions, where a simple approach might be more effective."[57] Researchers at my university are similarly trying to create a GM corn with more lysine—an amino acid naturally low in maize[58]—but why? Amaranth can grow free in any milpa, and when it is ground into maize dough, contributes more lysine to tortillas than even eggs, a lysine champ.

MONTEZUMA'S REVENGE

Amaranth is perhaps Montezuma's ultimate revenge and Monsanto's interspecies nemesis.[59] The "superweed" resistant to Roundup is Palmer amaranth, *Amaranthus palmeri*, nicknamed "pigweed," which agribusiness characterizes as diabolical, money-robbing, and monstrous—thereby justifying chemical warfare to eradicate it.[60] Prior to colonization in North America, amaranth never was a pest, since deep-rooted grasses covered the prairies. When white colonists broke sod, however, amaranth seized these open spaces.[61] Like the invasive kudzu that plagues the Deep South, Palmer amaranth grows two to three inches a day in the Midwest.[62] It has also spread to Argentina (one theory is that it hitchhiked on used farm equipment). On social media, posts can be seen for making "amaranth grenades" (seed balls) to sabotage GM crops.[63]

Native to Mexico and Central America, other species of amaranth were a major tribute crop for the Aztecs, since the dried seeds could be stored for up to twenty years.[64] The Aztecs called it *huauhtli* and reportedly produced fifteen to twenty thousand tons of amaranth seed a year. The Spanish derogatorily called it *bledo*—a term still used colloquially today to mean "not giving a damn." Modern taxonomists borrowed the English genus name from the Greek *amarantos*, meaning "never fading" in reference to its reddish leaves.[65] It appeared in gourmet Aztec tamales ground along with maize flour, plus sauces from its leaves. For strength, breastfeeding mothers and travelers drank a gruel from popped and ground seeds.[66] Spanish conquerors, however, declared amaranth a heathen plant because the Aztecs made ceremonial idols of amaranth (mixing it with blood and

honey), which they consumed at festivals for the sun god Huitzilopochtli. Spanish priests perceived this as sacrilege to the Christian Eucharist.[67]

Despite Spanish prohibitions, farmers quietly conserved amaranth in their milpas and chinampas (gardens on lake sediments). In 1950 geographer Carl Sauer wrote, "The crop is practically unknown to everyone except to Indians who grow it."[68] In the "Columbian exchange," amaranth also accidentally traveled the world and adapted, along with maize, into Asian and African cropping systems.[69] In the Caribbean it is called *callaloo*, and in India *rajgira* ("king seed") or *ramdana* ("seed sent by God"). Even in New York City it adorns sidewalk tree beds.[70] Tribes of the US Southwest also integrated amaranth into their cuisine; the Zuni people have a famous recipe for steaming it into balls with blue maize dough.

A couple from the Rodale Institute who came across amaranth in the Mexican Tehuacán valley were so enamored by its nutritional potential that they created a nonprofit for its revitalization. Amaranth supplementation can bring malnutritioned children back to health within six months.[71] The National Academy of Sciences published a 1984 report singing its praises.[72] And Mexico's contemporary harvest has rebounded to five thousand tons.[73] Amaranth's revival is a splendid example of latent resistance or biocultural memory from what anthropologist Guillermo Bonfil Batalla calls the "deep Mexico."[74] Beyond the "happy treats" (*alegría*) that Mexican street vendors make from popped amaranth with honey or molasses, many nonprofit programs and chefs are reintroducing amaranth as a savory staple.

Like maize, amaranth is a C_4 plant, so it can sequester atmospheric carbon at higher rates than other crops. Like maize it thrives from sea level to alpine environments. All parts are edible. Its large leaves can be sautéed as greens or eaten fresh, and the stalk serves as fodder for pigs, ergo, the pigweed nickname. Being high in folic acid, it can serve as a natural prenatal vitamin.[75] Also high in an immune-boosting blend of lysine, zinc, copper, selenium, and magnesium, it can be anti-viral. Amaranth may help heal heart disease by lowering cholesterol, ironically helping to cure a medical condition caused by eating too much corn-fed beef.[76] With 16 percent protein, the grain itself contains twice as much protein and seven times more fiber than rice; and it provides ten times more calcium and 30

percent more protein than wheat.[77] It can produce a high-quality oil that is high in a special vitamin E (squalene) touted in many beauty moisturizers (and that would otherwise be harvested from sharks).[78] Last, but not least, it is drought-hardy and thrives during the *canícula*, a dry month within the Mesoamerican rainy season.[79]

In the current craze for revitalizing native foods like amaranth, an incredible number of other Indigenous cultivars have earned new fame, not only as climate-friendly crops but also as gluten-free grains or "superfoods." To heal the diseases of capitalism's cancer stage, many people are returning to acaí, chía, chocolate, wild rice, quinoa, maca root, and more.[80] GMO corporations, by contrast, have tried to healthwash their reputations by claiming they will invent new extra-nutritious plants and grains. Even if they could do this, it would be yet another technical fix to a problem created by the technology itself. "Instead of addressing a world of toxins and pollutants that lead to cancer . . . [they] engineer an indigo tomato to fight cancer."[81] Why not just conserve and share blue maize varieties that have just as many healing phytonutrients for diabetes, obesity, and inflammation?[82] Or just consume the weeds that herbicides aim to eradicate from GM crop monocultures?

WEEDS

What's in a name? That which some people call a weed may be considered by other cultures as an edible green that is medicinal, nutritious, and delicious. Pointing out that the concept of "weed" exists in the eye of the beholder, Q'eqchi' peasant leader Sebastián Cux recently texted me, "Maleza es lo que genera Monsanto," meaning "weeds are a concept generated by Monsanto." To him and his people, greens/weeds are food and pharmacy because they have developed unique phytonutrients to survive in harsh environments. Derived from teosinte, maize once was itself technically a weed, but it was domesticated with cultural wisdom through the ages by Sebastián's ancestors to become a human companion.

Weeds are the antithesis of a corporate crop, as they produce prodigious free seeds. Weeds are also a quintessential underdog. By definition, weeds

sprout where they are not supposed to be—much like Mary Douglas's classic anthropological definition of pollution as "matter out of place."[83] Any plant can be made into a "weed."[84] At least forty-eight weeds are now resistant to Roundup.[85] Some "superweeds" have even developed a systemic tolerance to most herbicides. No matter how many herbicide-resistant genes the mad scientists might stack into seeds, new weeds will grow. Rather than blitzing them with more and more herbicides, however, perhaps we might look at weeds differently.[86] As we know from milkweed and monarchs, many of these so-called weeds are crucial to pollinators.

The ultimate "weed" is industrial hemp, which is a nonpsychotropic variety of *Cannabis sativa*. If cultivated on a greater scale, hemp could solve a number of fiber and fuel problems. Hemp is bee-friendly, water-efficient, soil-enhancing, and habitat-producing, and can even remediate toxic soils. It has three times the tensile strength of cotton and is naturally antimicrobial. Hemp can be manufactured into fabric, concrete, paper, biofuel, CBD medicine, fiberboard, bioplastic, and more. An acre of hemp can produce 640 gallons of ethanol, compared to only 340 for corn.[87] So, why in the world are we growing corn that requires 10 calories of petrochemicals to "produce" 1 calorie of ethanol? The sole beneficiaries of ethanol policy are corporations and the politicians in their thrall.[88]

When campaigning for president, Ralph Nader spoke often about hemp. Once the 2018 Farm Bill finally (re)legalized hemp, his vice presidential running mate, Winona LaDuke (Anishinaabe), began cultivating it, alongside other projects to build a post-petroleum Indigenous economy through the White Earth Recovery Project. As LaDuke puts it, "The hemp economy needs to be led by people who look like you and me. The mess we're in was created by a bunch of rich white dudes, either in corporations or in the government."[89] Rather than seeing hemp just as a new bonanza cash crop, she and tribal leaders are envisioning how to use it to build a genuine circular economy. Winona's Hemp and Heritage Farm runs entirely on animal and human power. The Oneida Tribe (in occupied Wisconsin) has invested in hempcrete, the Sisseton Tribe in hemp fiber, Diné weavers are integrating hemp into their artistry, and the Eastern Band of Cherokee Indians and others are investing in medical cannabis on sovereign tribal

lands. All these developments are being chronicled by a Nimiipuu (Nez Perce) family in a new magazine called *Tribal Hemp and Cannabis*.[90]

Although hemp does not have enough tetrahydrocannabinol (THC) to be psychotropic, it does produce cannabidiol (CBD), which boasts healing properties for treating insomnia, pain, chemotherapy nausea, anxiety, depression, diabetes, epilepsy and other neurogenerative diseases, and arthritis. Besides helping to balance neurotransmitters, it has been shown to reduce inflammation in the body, so it inherently helps to fight cancer and many other ailments, since tumors require inflammation to grow.[91]

Hemp is not the only healing weed. Having spent years curing myself of more than one cancer or chronic illness, I have learned a lot about herbal medicine.[92] At some point I began to notice an ironic pattern: weeds can cure the very ailments caused by the herbicide meant to blitz the weeds. As the great Native American botanist Robin Kimmerer has remarked, if we hold kinship with plants and ask them patiently as friends what medicines they hold, they will reveal their secrets to us.[93] In Mesoamerica, healers speak of a "law of signs."[94] Plants that harm often have within them the medicine to heal the injury—for example, the Guatemalan broom palm (*Cryosophila stauracantha*) has a gauze-like material inside that can staunch wounds caused by the tree's spiny trunk. Other weeds heal health problems caused or worsened by toxicity.[95]

As healers, fighters, and survivors, weeds make a great metaphor for mobilization. As food scholar Harriet Friedmann once wrote, "Appear everywhere like plants breaking through the cracks in the asphalt!"[96] Weeds take advantage of ruptures and thrive in marginal areas with extreme temperatures or low precipitation. For these reasons they often have much higher rates of phytochemicals. Every backyard is truly a pharmacy. I say, if you can't beat them, eat them.

Take the case of another weed that became resistant to Roundup in just eight years, mare's tail (*Hippuris tetraphylla*). It produces two hundred thousand seeds per plant and has edible shoots and leaves.[97] Within this rebellious weed are chemicals that specifically decrease inflammation in the intestines and thereby heal the disruption of the microbiome possibly caused by chemicals like Roundup. Likewise, stinging nettle (*Urtica dioica*)

can sooth allergic responses caused by microbiome disruption. From the idiomatic expression "to grasp the nettle" (meaning to act boldly), nettles could be a bold alternative to fertilizers. In addition to being a good source of vitamin K, nettles are high in nitrogen, so they can be composted into liquid fertilizer for maize itself.

Fallowed milpas are also filled with medicinal mushrooms. Consider a favorite delicacy in Maya cuisine *tziquinché* (*Schizophyllum commune*), a gilled mushroom which has strong antibacterial and antifungal properties that can address bad gut bacteria. These mushrooms can also decompose biofuel waste, so, like LaDuke's hemp, tziquinché could be part of a post-petroleum economy.

Or take the case of clover. For decades it was included in lawn seed mixes, but then Dow Chemical convinced the middle class they needed to eradicate clover patches to get pristine lawns by spraying 2,4-D, a potent endocrine disruptor. One of the clovers (*Trifolium pratense*) that 2,4-D kills ironically has many healing estrogenic properties and can be used to treat a range of gynecological conditions, from infertility to side effects of menopause.

Dandelions (*Taraxacum officinale*) are another wonderful example of a good lawn weed wrongly demonized by chemical companies, since dandelion roots loosen compacted soil to make way for earthworms.[98] Ancient Chinese medicine classified dandelion as a blood tonic. By the eleventh century, Arabic cultures were using it for liver troubles. Once called "fairy clocks" in premodern Europe, the English name for the plant came from the French *dents de lion* (lion's teeth). In Europe it was prized as a diuretic for kidney problems as well as digestive issues. The Pilgrims apparently brought dandelion seeds on the *Mayflower* as a desired cultivar. Native American tribes were already using dandelion as both food and medicine, and one Ojibwe legend tells of how the wind fell in love with the dandelion maiden.[99] Europeans blow dandelions for wishes upon a star because they resemble all three celestial bodies: a yellow flower (sun) and a white puff (moon) that can be dispersed through the air to create the night sky (stars).

I first learned of dandelion as a cure for lymphoma, as the root induces apoptosis (cell death) in tumor cells. Like chicory, the roasted roots make

a "dandy" coffee alternative, which is also a source of a prebiotic called inulin that enhances gut health. Dandelion has other surprising industrial uses. Oklahoma extension scientists have found that dandelion flowers release ethylene, helping fruit to ripen. The Soviet Union farmed dandelion as a natural source of rubber, which is heavier than the version derived from tropical rubber trees.[100] Tire companies are reportedly looking into using dandelion to replace the seven gallons of oil needed to make one synthetic tire. Another farm weed, morning glory, also produces a rubber that ancient Mesoamerican cultures used for sports balls. The final kicker? Dandelion has great potential for producing ethanol.[101] This I mention, once again, to point out the absurdity that farmers are caught in a cycle of blitzing a weed to produce corn ethanol at an overall energy loss that could just be manufactured from the weed itself.

A skeptic might note that these are fun anecdotes to learn, but how should we contend with weeds that can overtake crops? In small farming systems, mulches, polycrops, or cover crops perform that function. My favorite example from Guatemala is a "magic" velvet bean, *Mucuna pruriens*, that helps maize grow like Jack's beanstalk and could defeat the agritech giants. Originally from India, where is it known as *cowitch*, it was introduced to Guatemala by the United Fruit Company in the 1920s as forage for plantation animals. Banana workers began integrating it into their own subsistence plots as a green mulch to chop and compost in place before planting the second dry season milpa, called *saqiwaj* in Q'eqchi' Mayan.[102] The velvet bean spontaneously spread to nearby Q'eqchi' communities, who called it "horse bean" (*kenq' kawaay*) or in Spanish simply "fertilizer bean" (*frijol de abono*). Although it is not edible like the black bean (*Phaseolus vulgaris*), Q'eqchi' women sometimes toast these beans for a cheery coffee substitute, hence its nickname, "Nescafé."[103] Because growing it can cut fallow time in a swidden system by more than half, the velvet bean spread by word of mouth into Oaxaca, Chiapas, and Veracruz in Mexico by the 1950s.[104] When German aid agencies launched a major project to promote velvet bean mulching in Petén, Guatemala, they were surprised to discover the targeted communities had already been using it for decades.[105]

In addition to adding nitrogen to the soil, the velvet bean smothers weeds before they can sprout, so farmers can avoid spraying paraquat, a cheap but extremely dangerous herbicide commercialized by Syngenta that is banned in most countries of the European Union but continues to be exported to impoverished countries elsewhere.[106] Paraquat often damages the eyes of its applicators and can also cause severe digestive reactions (vomiting, pain, diarrhea).[107] Because it is so toxic, paraquat became the preferred poison for the estimated three hundred thousand indebted Indian farmers who have committed suicide after Monsanto's GM cotton failed to live up to its marketing hype.[108] Paraquat also turned cannabis weed into "killer weed" in the 1980s, when the DEA used the chemical to eradicate marijuana fields in the United States and Mexico. With mounting evidence that paraquat may cause Parkinson's disease, California lawyers are now also mounting class action lawsuits.[109]

The irony? This velvet bean has high concentrations (7 percent) of L-dopa. Nutraceutical companies sell it for dopamine-mediated depression and other nervous conditions, including Parkinson's. When my mentor was diagnosed with leukemia, I pored over PubMed literature for complementary herbal treatments and discovered that *Mucuna* is proving effective for leukemia.[110] Some say it is an aphrodisiac and can improve male fertility. Beyond increasing testosterone, it helps build muscle strength. Taken prophylactically in Asian and African countries as an anti-venom, it also is effective against infamously deadly cobra bites.

Almost all the aforementioned herbs are anti-inflammatory, so inherently they help prevent cancer.[111] DNA mutations may spark cancer, but inflammation fuels cancer's fire. As tumors grow they create their own inflammatory environments.[112] The art of oncology is dosing enough poisons to get ahead of the tumors without killing the patient. However, this kind of brutal chemotherapy also causes whole-body inflammation. When oncologists fail to help patients detox during and after treatment, cancers often come roaring back.

Bombarding cancer patients with chemicals is really the same militarized logic of bombarding all bugs in agriculture or blitzing all weeds from a field.[113] The Green Revolution talked farmers into buying ammonia

from old weapons munition plants, herbicides from war defoliants, pesticides from nerve gases, and irradiated seeds. While funding much of this research, the Rockefeller Foundation also heavily donated to medical research for developing chemotherapy drugs from petrochemicals.[114] In addition to the many pesticides and herbicides that came from chemical weapons developed during the world wars, the first chemotherapy drug used to treat lymphomas and leukemias was derived from mustard gas. Oncology "pioneer" Cornelius Rhoads helped the US Army develop chemical weapons during World War II.[115] These were not coincidences, but business plans to make other use of industrial waste.[116] Almost all the major agrochemical corporations also produce chemotherapy drugs in their pharmaceutical wings. It seems double profit can be made both by giving you cancer and then by healing you.

Although I am grateful to be alive, chemotherapy broke my health and left me vulnerable to other infections. Herbal "weed" friends like *Mucuna*, nettles, and dandelion have figured in both my recovery from cancer treatment and Long COVID inflammation. Having struggled to write this book through too many years of illness, I have pondered how neoliberalism never lets us rest. Even when terribly sick, I internalized demands to remain "productive." Yet, all beings must rest to heal, including the land, and thus I have only one more Davidian story to tell before I rest my case.

ANTS, ABUNDANCE, AUTONOMY

In the *Popol Vuh* the Maya gods created humans out of maize. However, the detail of how the gods themselves discovered maize must be gleaned from oral history, since zealous colonial priests burned the original hieroglyphic *Popol Vuh*, along with all other Maya codices, in their Inquisitorial bonfires. Mesoamerican peoples nevertheless kept the story alive in many languages, and not just K'iche'. Like the circular structure of the *Popol Vuh*, they show how the way forward is the way back through the time-honored wisdom of elders.

In the Q'eqchi' version of the creation story that friends shared with me in village after village, maize came from Paxil, one of the thirteen sacred

mountains in the Q'eqchi' highlands. (Paxil is also known as *Qawa' Ixim*, or Don/Mister Maize.)[117] Sebastián Cux texted me last year: "Pilgrims [still] travel to [Qawa' Ixim in] Tactic, Verapaz, to perform ceremonies of thanksgiving for the sacred maize that we eat day by day and, at the same time, to petition the mountain so that our [heirloom] maize never disappears and gives life to the people and animals who consume it." Mount Paxil not only gave the Q'eqchi' people maize, but also cacao. In Q'eqchi' planting practices cacao is mixed into bags of maize seed to "cool" their heat before entering the earth. On the day of the planting, four elder women froth a black cacao drink to be served to the men when they arrive for lunch. Then everyone shares a feast of turkey soup spiced with milpa greens and annatto. Planting days are a celebration of the milpa's abundance.

Different Maya groups tell variants of this story, in which the animal is an opossum, rabbit, armadillo, or a fox.[118] I paraphrased a version related to me by Mrs. Margarita Pop and translated by Juan Pop of Jaguarville, Belize. It stars an agouti (*Dasyprocta punctata*):

> They say it was the leaf cutter ants who found the maize through a crack (*paxil*) in the mountain and began to carry it back to their nests. The agouti (*aaqam*) discovered the ants' path and began to take the maize from them to eat it all day long. That night back in the cave, the agouti farted in his sleep. The other animals asked themselves, "Whose fart stinks so much?" The agouti stayed quiet.
>
> The next day, the agouti followed the ants again. That evening he returned to the cave to sleep and once again began farting. The other animals figured out who was so stinky and demanded to know, "What are you finding to eat?" "Oh nothing," he replied. So, they surreptitiously followed him to the mountain the next day and discovered his secret.
>
> Wanting more maize than the ants could carry, the animals recruited the thunder gods to help them open the mountain to reveal the stash. The juvenile thunder gods disrespectfully pushed the

elder thunder away and boasted they could better blast the mountain with their youthful strength. The young men threw bolt after bolt until they were exhausted. Completely spent, they went back to the old thunder god and asked, "Could you please do us a favor to help us blast the mountain?" The old thunder god hedged. "Well, I don't know . . . I won't be able to because, as you pointed out, I'm old and frail."

But he eventually agreed and enlisted a woodpecker to go up the mountain and start pecking. He told the bird, "When you find the thinnest part, you should begin pecking very fast. It will make a sound like a bell. When you find it, you should jump out of the way and then I'll blast the mountain with my lightning."

Then with one blow, the elder god broke open the mountain, but, alas, the woodpecker did not escape in time. So, the heat of the blast painted the woodpecker's crown red. The lightning also burnt the maize into its different colors (white, yellow, red, and black).[119]

Corporations such as Monsanto are like the farting agouti in this story, who selfishly appropriates the long collective labor of maize domestication and tries to hoard it from the other animals, until they trick him and take back the maize as collective heritage. Besides being a delightful tale explaining how the hues of maize came about, it reminds us to take seriously the weight and strength of "old-fashioned" resistance.

What I also love and what Nobel laureate Miguel Angel Asturias appreciated about this story is the image of maize being carried by the ants. In an epilogue incorporated into a reprint of his literary masterpiece *Men of Maize*, Asturias wrote: "Wealth of men, wealth of women, to have many children. Old folk, young folk, men and women, they all become ants after the harvest, to carry home the maize: ants, ants, ants, ants."[120] On the backs of ants, sacred maize crosses between the natural and human cosmos—reflecting the nearly ten thousand years of coevolution between maize and the peoples of Mesoamerica.

Corporate agribusiness has threatened the People of Maize with a trade

avalanche of mountains of machine-cultivated corn. However, in classic Maya fashion, perhaps there will be another trickster ending to this story . . . and the peoples who gifted maize to the world shall keep their seeds safe from the corporate cartels by becoming like ants, ants, ants, ants, carrying seeds back into the hills of autonomy.

Notes

PREFACE

1 Maintenance can be dangerous for the few families that own their own mini home silos. These require the insertion of a phosphine or phosphamine pill, which releases poisonous vapors and which can also cause accidental deaths if not handled properly.

2 Grandia, "Toxic Tropics."

3 Grandia, *Tz'aptz'ooqeb'*; Grandia, *Enclosed.*

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5 Plymale, *A Chemical Reaction*.

6 Government of Canada, "Questions and Answers."

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29 Gillezeau et al., "The Evidence of Human Exposure."
30 Malkan, "Glyphosate." After reading these FAQs on glyphosate, consumers who want to lose weight are probably wiser to count chemicals than count calories.
31 Casassus, "EU Allows Use." However, in its November 2023 ruling, the EU notably banned the use of glyphosate as a preharvest desiccant. In April 2024, German ministers bucked the EU and approved additional restrictions on glyphosate. Chambers, "German Cabinet."
32 This was a century before Hindu scholars independently invented zero. Europeans never developed a zero, but around 1200 AD appropriated it via the Italian mathematician Fibonacci, who had learned it from Arab intellectuals who, in turn, had learned it from India.

INTRODUCTION

1 B'otz left Guatemala ostensibly to cure his late first wife's illness with the help of a Belizean healer, but reading between the lines of his varying migration stories, it is clear he fled Guatemala's military repression during the civil war.
2 In Q'eqchi', fresh maize-on-the-cob is called *rax hal*, or "green" corn.

3 Evans and Glass, "Why California Must End the Use."

4 Martínez-Torres and Rosset, "La Vía Campesina"; Patel, *Stuffed and Starved*; Rosset, *Food Is Different*.

5 Via Campesina, "It's Time to Globalize Solidarity."

6 Solnit, *Hope in the Dark*, 52–53.

7 Martínez-Torres and Rosset, "La Vía Campesina."

8 Pollan, "The Way We Live Now."

9 Foley, "It's Time to Rethink."

10 As a former board member of Ralston Purina, Earl "Rusty" Butz created a corporate advisory committee that was controversial then but now seems quaint, compared to how cozy agribusiness is with a revolving door into the USDA, the FDA, and the EPA. Tricky as Nixon, Butz later went to prison for tax evasion. James Risser and George Anthan, "Why They Love Earl Butz," *New York Times*, June 13, 1976, https://www.nytimes.com/1976/06/13/archives/why-they-love-earl-butz-prosperous-farmers-see-him-as-the-greatest.html.

11 Pollan, *The Omnivore's Dilemma*, 52.

12 Grist, "Special Series on Food and Farming"; Risser and Anthan, "Why They Love Earl Butz."

13 Although Europe has better protected its small farming sector, this region still loses thousands of farms annually. Holt-Giménez, Patel, and Shattuck, *Food Rebellions!*, 61, 66.

14 Canby, "Retreat to Subsistence."

15 Pollan, *The Omnivore's Dilemma*.

16 Between 2006 and 2011, US farmers added an additional 13 million acres to corn production. Almost half this new acreage was converted from other edible grains—wheat (2.9 million), oat (1.7 million), and sorghum (1 million). Foley, "It's Time to Rethink," 5–6.

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18 Pollan, *The Omnivore's Dilemma*, 19.

19 Through C-4 photosynthesis, maize converts carbon dioxide into a heavier isotope (called carbon 13 or C-13) more efficiently than other plants. Kimmerer, "Corn Tastes Better on an Honor System."

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21 Foley, "It's Time to Rethink."

22 Holt-Giménez, Patel, and Shattuck, *Food Rebellions!*, 68.

23 Duffy and Popkin, "High-Fructose Corn Syrup," 1725S.

24 Alkon, "Food Justice."

25 Pollan also created an astounding demand for grass-fed beef. Alvin Powell, "Chance of Sun in Michael Pollan's Climate Forecast," *Harvard Gazette*, November 2, 2021, https://news.harvard.edu/gazette/story/2021/11/chance-of-sun-in-michael-pollans-climate-forecast/.

26 All six signatories to the 2006 DR-CAFTA agreed to reduce tariffs on corn products like HFCS within fifteen years. Clearly seeing this as a boon to exports, the Corn Refiners Association (CRA) lobbied for passage of the DR-CAFTA and supported the agreement. CRS, *Agriculture in the DR-CAFTA*. See also Zahniser et al., *The Growing Corn Economies*; USDA FAS, "US Exports of Corn-Based Products."

27 Pollan, *The Omnivore's Dilemma*, 26.

28 Pollan, "Overabundance of Corn."

29 Pollan, *The Omnivore's Dilemma*, 22, 41.

30 Rather than praising traditional diets for centering plants, Pollan credits Thomas Jefferson for recommending "a mostly plant-based diet that uses meat chiefly as a 'flavor principle.'" Pollan, *Food Rules*, 95.

31 Lavin, *Eating Anxiety*.

32 Bain and Dandachi, "Governing GMOs"; Alkon and Agyeman, "Introduction," 2; Guthman, "'If Only They Knew.'"

33 Cox, "New Dating App."

34 DeLind, "Are Local Food?," 276.

35 Hall, "Toward a Queer Crip Feminist Politics"; Lynch and Giles, "Let Them Eat Organic Cake."

36 Hermione Hoby, "Michael Pollan: 'I'm Uncomfortable with the Foodie Label,'" *The Guardian*, February 21, 2016, 3, https://www.theguardian.com/lifeandstyle/2016/feb/21/michael-pollan-uncomfortable-with-foodie-label-cooked-netflix.

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39 Ruskin, "Seedy Business"; Calabrese, "Caveat Emptor!"; Otero, "Blaming the Victim?"

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41 Michael Pollan, "The Great Yellow Hope," *New York Times*, May 24, 2006, https://michaelpollan.com/articles-archive/the-great-yellow-hope/.

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44 Lavin, *Eating Anxiety*.

45 Lavin, *Eating Anxiety*.

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52 Marya and Patel, *Inflamed*, 34.

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55 McWilliams, *Just Food*, 25–26.

56 McWilliams, *Just Food*, 29.

57 McWilliams, *Just Food*, 127.

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59 McWilliams, *Just Food*, 121.
60 McWilliams, *Just Food*, 124.
61 Kauffman, *Hippie Food*.
62 Peralta, "[De]Stabilizing," 91.
63 DeLind, "Are Local Food?"; Derkatch and Spoel, "Public Health Promotion of 'Local Food.'"
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68 Mitchell, "Localwashing."
69 Bartolovich, "A Natural History."
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71 Szasz, *Shopping Our Way to Safety*, 195; Nader, *The Energy Reader*.
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73 Solnit, "Big Oil Coined."
74 Stone, *The Agricultural Dilemma*.
75 Ritchie, "Half of the World's Habitable Land."
76 Kornhuber et al., "Risks of Synchronized Low Yields."
77 Garland and Curry, "Turning Promise into Practice," 1; Bruns, "Southern Corn Leaf Blight."
78 This crisis set the stage for Earl Butz's policy change to encourage farmers to plant more corn.
79 Canby, "Retreat to Subsistence"; Garland and Curry, "Turning Promise into Practice." Merriam-Webster's online dictionary defines *landrace* as "a local variety of a species of plant or animal that has distinctive characteristics aris-

ing from development and adaptation over time to conditions of a localized geographic region and that typically displays greater genetic diversity than types subjected to formal breeding practices."

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81 Smith et al., "Global Dependence."

82 Bruns, "Southern Corn Leaf Blight," 1223.

83 Dowd-Uribe, "GMOs and Poverty," 135; Shiva, "Pests, Pesticides and Propaganda."

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134 Solnit, *Hope in the Dark*, xiv.

135 Solnit, *Hope in the Dark*, 11.

136 Monsanto's previous CEO, Hugh Grant, said his one regret from his executive tenure was that he did not spend the $20 million needed to change the name of the company. Specter, "Seeds of Doubt."

1. MAIZE FUTURES

1 Vandermeer and Perfecto, *Breakfast of Biodiversity*.

2 The pandemic shuttered the Chicago trading pits, so today this trader may be spending his days sitting at a computer. But the New York Stock Exchange still has live trading.

3 Patel, *Stuffed and Starved*, 8.

4 Rosset, "Social Movements, Agroecology, and Food Sovereignty"; Borras, "Politically Engaged," 452; Borras, "La Via Campesina."

5 Borras, "Politically Engaged," 449.

6 Clapp, *Food*; Friedmann, "The Political Economy of Food," 30.

7 McMichael, *Food Regimes and Agrarian Questions*, 9.

8 McMichael, *Food Regimes and Agrarian Questions*, 11.

9 To sum up the vast food studies literature, some authors show how a particular food changed history, while others describe how historical processes changed a food. See Roseberry, "The Rise of Yuppie Coffees."

10 Warman, *Corn and Capitalism*.

11 Mies, *Patriarchy and Accumulation*.

12 Clapp, *Food*.

13 Mintz, *Sweetness and Power*.

14 Marya and Patel, *Inflamed*, 137.

15 Marya and Patel, *Inflamed*, 137.

16 Fitzgerald and Petrick, "In Good Taste." At UC Davis I teach one course called "Corporate Colonialism" to show that corporate power has not only been detrimental to Indigenous peoples, but to everyone else as well, including citizens of rich nations.

17 Coe, *America's First Cuisines*; Mintz, "Food Patterns in Agrarian Societies."

18 Marx, *Capital*.

19 Mintz, *Sweetness and Power*, 180.

20 Marya and Patel, *Inflamed*.

21 Mintz, *Sweetness and Power*, 149.

22 Lavin, *Eating Anxiety*, xv.

23 A Chicago slaughterhouse reportedly inspired Henry Ford to design his auto assembly line. In turn, Fordist principles were applied to food processing, which dramatically increased the consumption of meat and processed foods. Pritchard, "Food Regimes"; McMichael, "Political Economy"; Ruttan, *United States Development Assistance Policy*, chap. 3.
24 Stone, *The Agricultural Dilemma*, 168; Bartolovich, "A Natural History."
25 Stone, *The Agricultural Dilemma*, 169.
26 Holt-Giménez, Patel, and Shattuck, *Food Rebellions!*, 72.
27 Clapp, *Food*, 34.
28 McMichael, *Food Regimes and Agrarian Questions*.
29 Hiatt, *A Game as Old as Empire*; Isakson, "Maize Diversity."
30 Holt-Giménez, Patel, and Shattuck, *Food Rebellions!*, 88.
31 McMichael, "Political Economy," 63.
32 Clapp and Isakson, "Risky Returns," 437. The Stop Land Grabs coalition, for example, started an impressive campaign to demand that the TIAA-CREF pension fund to which many professors belong divest from land acquisitions and palm oil.
33 Murphy, Burch, and Clapp, "Cereal Secrets."
34 Mighty Earth, "Cargill."
35 Cargill, "A History of Nourishing the World."
36 Mighty Earth, "Cargill."
37 Cargill, "A History of Nourishing the World."
38 Cargill, "A History of Nourishing the World."
39 Public Citizen, "Cargill vs. Mexico."
40 Mighty Earth, "Cargill."
41 Patel, *The Value of Nothing*.
42 McMichael, *Food Regimes and Agrarian Questions*.
43 McMichael, *Food Regimes and Agrarian Questions*, 1.
44 UNCTAD, "Wake Up Before It Is Too Late."
45 Such transitions are never without struggle. As Marx put it, "Force is the midwife of every old society which is pregnant with a new one" (*Capital*, 916).
46 Marya and Patel, *Inflamed*, 34.
47 Patel and Moore, *A History of the World.*
48 Harvard University, "Obesity Prevention Source."
49 Patel, *Stuffed and Starved*, 8.
50 Otero et al., "Food Security"; Bodley, *Victims of Progress*.
51 Ferguson, *Global Shadows*.
52 Dowler, "Thousands of Tonnes."

53 Weir and Schapiro, *Circle of Poison*. Pesticide formulation has shifted from North America to overseas, especially to China, creating more complex pathways of circulation. Shattuck, "Generic, Growing, Green?"; Galt, "Beyond the Circle of Poison." Nevertheless, the United States and Europe still host the headquarters of most transnational corporations that profit from poison. Mesoamerica suffers disproportionately from these chemical circuits, such that a dialectical analysis still seems appropriate.

54 Copeland, "Mayan Imaginaries of Democracy"; Grandia, "Poisonous Exports"; Galt, *Food Systems*.

55 Wright, *The Death of Ramón González*.

56 Holmes, *Fresh Fruit, Broken Bodies*.

57 Menchú, *I, Rigoberta Menchu*.

58 Fischer and Benson, *Broccoli and Desire*; Dowdall and Klotz, *Pesticides and Global Health*.

59 Schlesinger and Kinzer, *Bitter Fruit*.

60 Butler, *War Is a Racket*.

61 Chayanov, *The Theory of Peasant Economy;* Scott, *The Moral Economy*.

62 Chayanov's other key insight was that the economic differentiation of the countryside is not permanent, but fluidly follows the life cycle of peasant families. The most prosperous families are those who can command the labor of youth and unmarried children.

63 Ray, *The Seed Underground*.

64 Nigh, "Agriculture in the Information Age."

65 Stone, *The Agricultural Dilemma*.

66 Edelman and Wolford, "Introduction." Peasant and agrarian studies became a covert way for anthropologists to discuss questions of political economy and distribution during an anticommunist period in history. In these debates, the formalists argued peasants are perfectly rational; substantivists counterargued that small-scale horticultural societies are kin- and family-based systems with their own cultural logics. Wolf, *Peasants*; Scott, *The Moral Economy of the Peasant*.

67 Edelman and Borras, *Political Dynamics*, 6.

68 Kearney, *Reconceptualizing the Peasantry*; Edelman, *Peasants Against Globalization*.

69 Edelman and Borras, *Political Dynamics*, 1.

70 Altieri, *Genetic Engineering in Agriculture*, 1; ETC Group, "Small Scale Farmers"; Handy, *Tiny Engines of Abundance*; CEMDA, *Report*.

71 Altieri and Toledo, "The Agroecological Revolution."

72 Holt-Giménez, Patel, and Shattuck, *Food Rebellions!*, 116.
73 Stone, *The Agricultural Dilemma*, 56.
74 FAO, UNDP, and UNEP, "A Multi-Billion-Dollar Opportunity."
75 Montenegro de Wit, "Can Agroecology?"
76 Figueroa-Helland, Thomas, and Pérez Aguilera, "Decolonizing Food Systems."
77 Figueroa-Helland, Thomas, and Pérez Aguilera, "Decolonizing Food Systems," 11.
78 Polanyi, *The Great Transformation*.
79 After Rigoberta Menchú symbolically won the 1992 Nobel Prize as both an Indigenous woman and a rural organizer, many peasant organizations began to celebrate their cultural alterity. Both Rigoberta and her father, Vicente Menchú, were organizers for the Peasant Unity Committee (CUC), which is one of Guatemala's four organization members of Via Campesina. (Via Campesina allows member organizations to participate vertically without needing to form national umbrella organizations.)
80 Martínez-Torres and Rosset, "La Vía Campesina."
81 Edelman and Borras, *Political Dynamics*, 97.
82 Thus began Via Campesina's love-hate relationship with the allied NGOs that initially controlled the means of transnational organizing (faxes, computers, reliable telephone lines). Edelman and Borras, *Political Dynamics*, 106. As this global peasant network matured in the early 2000s and the cost of telecommunications plummeted, Via Campesina leaders deftly denied NGOs the privilege of continuing to speak *for* them. Martínez-Torres and Rosset, "La Vía Campesina"; Desmarais, "Peasants Speak."
83 Edelman and Borras, *Political Dynamics*; the "rooted cosmopolitans" insight is from Borras, "La Via Campesina."
84 See also Varese, "Think Globally."
85 Edelman and Borras, *Political Dynamics*, 131; Mooney et al., *A Long Food Movement*.
86 Martínez-Torres and Rosset, "La Vía Campesina," 160.
87 Over the last century the percentage of the US population that farms fell from 41 percent to less than 2; over that same period settler farmers have lost 94 percent of their seed diversity. Ray, *The Seed Underground*, 6, 17. Others, however, contest the precision of such figures. Khoury et al., "Crop Genetic Erosion."
88 Martínez-Torres and Rosset, "La Vía Campesina."
89 Although a third of global peasants live in China, neither they nor the

post-collectivized peasants of the former Soviet Union have joined Via Campesina's solidarity network. Intriguingly, all these nations share interconnected histories of maize. China slightly trails the United States in corn production.

90 Borras, "La Via Campesina," 5.

91 Patel, *Stuffed and Starved*, 16.

92 Desmarais, "Peasants Speak," 108.

93 Martínez-Torres and Rosset, "La Vía Campesina."

94 Borras, "La Via Campesina," 4.

95 Borras, "La Via Campesina," 4; Martínez-Torres and Rosset, "Diálogo de Saberes."

96 Desmarais, "Peasants Speak," 98.

97 Martínez-Torres and Rosset, "Diálogo de Saberes"; Edelman and Wolford, "Introduction."

98 Edelman and Borras, *Political Dynamics*, 72.

99 Edelman and Borras, *Political Dynamics*, 141.

100 The GMO threat to peasants was already clearly articulated in the coalition's declarations against the WTO before the 1999 tribunal in Seattle, which is as far back as the coalition's website collects historic posts.

101 Martínez-Torres and Rosset, "Diálogo de Saberes," 983; CEMDA, *Report*.

102 Shattuck, Schiavoni, and VanGelder, "Translating the Politics."

103 Bjork-James, Checker, and Edelman, "Transnational Social Movements," 592; Trauger, *We Want Land to Live*, 23.

104 Edelman, "The Next Stage."

105 Anderson, *Imagined Communities*; Alfred, "Sovereignty."

106 Desmarais, "Peasants Speak."

107 Shattuck, Schiavoni, and VanGelder, "Translating the Politics," 429.

108 Via Campesina, *Nyéléni Newsletter*, 3.

109 Bjork-James, Checker, and Edelman, "Transnational Social Movements," 596; Edelman and Borras, *Political Dynamics*.

110 Edelman and Borras, *Political Dynamics*, 131.

111 Edelman and Borras, *Political Dynamics*; Shattuck, Schiavoni, and VanGelder, "Translating the Politics"; Borras, "Politically Engaged."

112 Edelman and Wolford, "Introduction," 962.

113 Borras, "Politically Engaged," 464.

114 Martínez-Torres and Rosset, "Diálogo de Saberes."

115 Prince Charles, "Prince Charles Reflects on the Reith Lectures," *The Guard-*

ian, May 17, 2000, 3, https://www.theguardian.com/world/2000/may/18/religion.uk. King Charles also apparently displays in his home a bust of anti-GMO and seed activist Dr. Vandana Shiva. Specter, "Seeds of Doubt."

116 Wittman, Desmarais, and Wiebe, *Food Sovereignty*.

117 Müller, "Introduction."

118 Kloppenburg, *First the Seed*.

119 Grey and Patel, "Food Sovereignty as Decolonization."

120 Hoover, "You Can't Say You're Sovereign," 31.

121 Manuel, "Indigenous Brief to WTO."

122 Grey and Patel, "Food Sovereignty as Decolonization."

123 Doukas, *Worked Over*; Smythe, "The Rise of the Corporation."

124 Oglesby, "Corporate Citizenship?"

125 Achbar and Abbott, *The Corporation*.

126 Achbar and Abbott, *The Corporation*.

127 Holt-Giménez and Shattuck, "Food Crises, Food Regimes"; Pechlaner, *Corporate Crops*.

128 Cosier, "For Thousands of Years."

129 Murphy, Burch, and Clapp, "Cereal Secrets," 7.

130 Naik et al., "Corporate Capture of FAO."

131 Kinzer, *Overthrow*; Schlesinger and Kinzer, *Bitter Fruit*; Butler, *War Is a Racket*.

132 Shiva, Barker, and Lockhart, "The GMO Emperor Has No Clothes," 43.

133 Mattei and Nader, *Plunder*.

134 Klein, *The Shock Doctrine*.

135 Industrial food processors are likewise killing their own customers. Mark Bittman, "Parasites, Killing Their Host: The Food Industry's Solution to Obesity," *New York Times*, June 18, 2014, https://www.nytimes.com/2014/06/18/opinion/mark-bittmanthe-food-industrys-solution-to-obesity.html.

136 Bayer-Monsanto, "Crop Science"; Schiffman, "Life in the Rural Police State."

137 Müller, "Introduction."

138 As a condition of the merger Bayer had to spin off some lines, which were sold to BASF.

139 Strömberg and Howard, "Recent Changes."

140 Sumpter, "The Growing Monopoly."

141 Because so many health effects are delayed or transgenerational (epigenetic), the three evil stepsisters may have pushed the full cost of this pollution onto future generations.

142 Berne Declaration, "Agropoly"; Falkner, "The Troubled Birth," 229.
143 Levidow, "Democratizing Technology," 223; Elmore, *Seed Money*.
144 Klepek, "Selling Guatemala's Next Green Revolution."
145 Canby, "Retreat to Subsistence."
146 US FDA, "GMO Crops, Animal Food, and Beyond."
147 Sumpter, "The Growing Monopoly," 649.
148 Ruskin, "Seedy Business."
149 Acedo, "Mexico Celebrates."
150 Robin, *The World According to Monsanto*.
151 Gillam, *Whitewash*; Gillam, *The Monsanto Papers*.
152 Tweedale, "Hero or Villain?"
153 Most toxicology studies on Roundup were the standard three months long, but Gilles-Éric Séralini and Jéromeq Douzelet fed their mice for two years, which for mice would be middle age. Seralini and Douzelet, *The Monsanto Papers*.
154 Acedo, "Mexico's GMO Corn Ban."
155 Antoniou et al., *Roundup and Birth Defects*; Robin, *The World According to Monsanto*.
156 Schapiro, "Toxic Inaction."
157 Benbrook, "How Did the US EPA and IARC?"
158 As the judgments piled up, many towns, communities, school districts, state agencies, and my own UC system symbolically banned Roundup but, unfortunately, without the additional scrutiny of the health effects of alternate products. In most cases the regrettable alternative has been Dow Chemical's 2,4-D.
159 Stempel, "Bayer Reaches $6.9 Million Settlement."
160 Elmore, *Seed Money*, 8.
161 Upholt, "A Killing Season."
162 Johnathon Hettinger, "US Court Bans Three Weedkillers and Finds EPA Broke Law in Approval Process," *The Guardian*, Februrary 7, 2024, https://www.theguardian.com/environment/2024/feb/07/us-weedkiller-ban-dicamba-epa.
163 Donley, "National Institutes of Health Study."
164 Chronister et al., "Urinary Glyphosate."
165 IARC, *DDT, Lindane, and 2,4-D*.
166 CFS, "EPA Failed to Protect."
167 Held, "New Evidence."

168 Cohen, "To Feed Its 1.4 Billion."
169 Novartis, in turn, was the product of an earlier merger of Funk Seeds (one of the original US hybrid corn producers) and Ciba-Geigy.
170 Aviv, "A Valuable Reputation."
171 Naidenko and Lunder, "Atrazine." According to EPA water regulations, atrazine is 230 times more toxic than glyphosate. Specter, "Seeds of Doubt."
172 Carey Gillam and Aliya Uteuova, "Secret Files Suggest Chemical Giant Feared Weedkiller's Link to Parkinson's Disease," *The Guardian*, October 20, 2022, https://www.theguardian.com/us-news/2022/oct/20/syngenta-weedkiller-pesticide-parkinsons-disease-paraquat-documents.
173 Imhoff, *The Farm Bill*.
174 Andrew Pollack, "US Approves Corn Modified for Ethanol," *New York Times*, February 11, 2011, https://www.nytimes.com/2011/02/12/business/12corn.html?_r=4.
175 Ecowatch, "GMO-Ethanol Corn."
176 Jennifer Clapp, "Monsanto, Dow, Syngenta: Rush for Mega-mergers Puts Food Security at Risk," *The Guardian*, May 5, 2016, https://www.theguardian.com/sustainable-business/2016/may/05/monsanto-dow-syngenta-rush-for-mega-mergers-puts-food-security-at-risk.
177 Begemann, "Syngenta Releases Acuron."
178 Howard, *Concentration and Power*.
179 Phys.org, "China Shifting GM Policy."
180 Cohen, "To Feed Its 1.4 Billion."
181 Werner, Shattuck, and Galt, "While Debate Rages," 1.
182 Phys.org, "China Shifting GM Policy."
183 Cohen, "To Feed Its 1.4 Billion."
184 "China to Approve First GMO Corn."
185 Kloppenburg, Calderón, and Ané, "The Nagoya Protocol."
186 Bellon et al., "Evolutionary and Food Supply Implications."
187 Curry, *Endangered Maize*.
188 Soto Laveaga, "The Socialist Origins."
189 Curry, *Endangered Maize*, 90; Curry, "Taxonomy, Race Science."
190 Curry, "Taxonomy, Race Science," 15.
191 Curry, *Endangered Maize*.
192 Curry, *Endangered Maize*, 223, 122.
193 Khoury et al., "Crop Genetic Erosion."
194 Curry, "The History of Seed Banking," 671.

195 Curry, "The History of Seed Banking."
196 Damian Carrington, "Arctic Stronghold of World's Weeds Flooded after Permafrost Melts," *The Guardian*, May 19, 2017, https://www.theguardian.com/environment/2017/may/19/arctic-stronghold-of-worlds-seeds-flooded-after-permafrost-melts. Syrians very nearly sacked another global seed vault in Abu Ghraib, Iraq, which stores fifteen hundred varieties of desert-adapted species adapted over ten thousand years in the Fertile Crescent. Schapiro, *Seeds of Resistance*, 93.
197 Figueroa-Helland, Thomas, and Pérez Aguilera, "Decolonizing Food Systems"; Montenegro de Wit, "Banking on Wild Relatives."
198 Morales, "Agroecological Feminism."
199 Fenzi et al., "Community Seed Network."
200 Bellon et al., "Evolutionary and Food Supply Implications."
201 Bellon et al., "Evolutionary and Food Supply Implications."
202 Fenzi and Couix, "Growing Maize Landraces."
203 Ruckstuhl et al., "Introduction," 3.

2. SACRED MAIZE, STALWART MAIZE

1 Hastorf and Johannessen, "Becoming Corn-Eaters."
2 Sánchez G. et al., "Three New Teosintes."
3 Iltis was also ahead of his discipline, using trenchant critiques of the continued colonial habits of collecting plants without reciprocal specimen deposits to local herbaria. Iltis, "From Teosinte to Maize."
4 Doebley, "The Genetics of Maize Evolution."
5 Warman, *Corn and Capitalism*.
6 Matsuoka et al., "A Single Domestication for Maize."
7 Yang et al., "Two Teosintes." On the same day that Ross-Ibarra's team article was released in *Science*, Sololá was preparing to elect a new cycle of ancestral authorities. The US joined the right side of history by placing Guatemala's ex-president Giammattei's presumed lover on the sanctioned *Magnitsky* list for his role in bribery and vaccine kickback schemes. This allowed US officials to freeze his foreign bank assets and block visa entry.
8 Blake, *Maize for the Gods*.
9 Boutard, *Beautiful Corn*.
10 Kennett et al., "South-to-North Migration."
11 Keme and Coon, "For Abiayala to Live."

12 Azurdia, "Agrobiodiversidad de Guatemala."
13 Carroll, "Tracking the Ancestry of Corn Back 9,000 Years," *New York Times*, May 24, 2010, https://www.nytimes.com/2010/05/25/science/25creature.html; Doebley, "Mapping the Genes that Made Maize."
14 Nadal, *Corn in NAFTA*.
15 Isakson, "Market Provisioning," 1445; Wang et al., "The Interplay of Demography."
16 Johannessen, "Domestication Process of Maize"; Montenegro de Wit, "Banking on Wild Relatives"; Bellon et al., "Beyond Subsistence."
17 Sánchez G. et al., "Three New Teosintes."
18 Wilkes, "A Modest Proposal," 55. Teosinte was once abundant enough for Friar Bernardino de Sahagún to mention it in his 1570 book about New Spain; he called it *cocopi*. Sánchez G. et al., "Three New Teosintes," 1538.
19 Sánchez Gonzalez et al., "Ecogeography of Teosinte."
20 Email communication with Jeffrey Ross-Ibarra, 2019.
21 Wilkes, "A Modest Proposal," 53.
22 Wilkes, "A Modest Proposal."
23 Nagarajan, "New Greenhouse Honors Scientist."
24 Text communication with Nicholas Copeland, 2023.
25 Van den Akker, "Madre Milpa"; Montejo and Lampbell, "The Origin of Corn."
26 Anaya, *The First Tortilla*.
27 Blake, *Maize for the Gods*.
28 White, "Planting Sacred Seeds."
29 Menchú, *I, Rigoberta Menchu*, 12.
30 Johannessen and Hastorf, *Corn and Culture*.
31 WhatsApp communication with Sebastián Cux, November 16, 2023.
32 Blake, *Maize for the Gods*.
33 Boutard, *Beautiful Corn*.
34 Kennett et al., "High-Precision Chronology."
35 Brown, "Glottochronology.
36 Balick, *People, Plants, and Culture*.
37 Forbes, "The Urban Tradition."
38 Blake, *Maize for the Gods*.
39 Blake, *Maize for the Gods*; Santos Baca and Sousa e Berruezo, "Maize and the World Market."
40 Galinat, "Maize."

41 Montenegro de Wit, "Banking on Wild Relatives," 5.
42 Cosier, "For Thousands of Years," 7.
43 Neruda, *Selected Odes*, 333.
44 Altieri and Toledo, "The Agroecological Revolution"; Montenegro de Wit, "Can Agroecology?"
45 Chassé, "'Produce More to Live Better.'"
46 Kruse-Peeples, "The Story of Glass Gem Corn."
47 Galinat, "Maize."
48 Nabhan, *Enduring Seeds*.
49 Grandia, "Modified Landscapes."
50 Warman, *Corn and Capitalism*.
51 Boutard, *Beautiful Corn*.
52 Linda Townsend, "Why Sweet Corn Should Be Designated New York's Official State Vegetable," *The Citizen* (Auburn, NY), May 10, 2016, https://auburnpub.com/news/local/townsend-why-sweet-corn-should-be-designated-new-york.
53 Callie, "Is Your Sweet Corn Naked?"
54 Boutard, *Beautiful Corn*.
55 Reina, "Milpas and Milperos.
56 Curry, "Taxonomy, Race Science."
57 Kimmerer, "Corn Tastes Better."
58 Mesoamerican squashes are a bit different in form and function from North American pumpkins, which are grown for their carbohydrates and storability. Mesoamerican squashes are mostly grown for their blossoms and runners (relished in soups) and have been selected to produce an abundance of seeds for making protein-rich sauces (or moles, from the Nahuatl *mōlli*).
59 Although maize produces more calories per seed planted, manioc (also known as cassava) provides more carbohydrates per acre.
60 Grandia, *The Wealth Report*.
61 Rodríguez, "El Conocimiento Tradicional."
62 Fuentes López et al., *Maiz para Guatemala*.
63 Mann, *1491*.
64 Crosby, *The Columbian Exchange*.
65 Steinberg and Taylor, "The Impact of Political Turmoil."
66 United Mexican States, "Mexico: Measures," 13–14.
67 Blake, *Maize for the Gods*.
68 Nadal, *The Environmental and Social Impacts*, 104.

69 Rodríguez, *Our Sacred Maíz*.
70 Van Akkeren, "Authors of the Popol Wuj."
71 Christenson, *Popol Vuh*; Montejo and Garay, *Popol Vuh*.
72 They also told wonderful Maya adaptations of the fairy tale of Hansel and Gretel, in which the two siblings cook the witch into tamales. Grandia, *Stories from the Sarstoon Temash*.
73 Stross, "Maize in Word and Image."
74 Rodríguez, *Our Sacred Maíz*.
75 Morton, *Tortillas*.
76 Isakson, "Market Provisioning," 1449.
77 Rodríguez, *Our Sacred Maíz*.
78 Email with Jessa Rae Growing Thunder, 2023.
79 Deloria, *Red Earth, White Lies*.
80 Blake, *Maize for the Gods*.
81 Johnson, *Tomatoes, Potatoes*.
82 Galinat, "Maize."
83 Warman, *Corn and Capitalism*.
84 Pilcher, *Planet Taco*, 28.
85 Coe, *America's First Cuisines*.
86 Rodríguez, *Our Sacred Maíz*. For the botanically curious, male flowers are in the tassel and female flowers appear lower in clusters that mature into cobs after pollination. Each silk that is pollinated becomes a kernel.
87 Fussell, *The Story of Corn*; Coe, *America's First Cuisines*.
88 Coe, *America's First Cuisines*.
89 Gálvez, *Eating NAFTA*.
90 Grandia, "From Dawn 'til Dawn."
91 In remote villages, where typically no one has the capital needed to start a mill, women often organize collective projects with nonprofit organizations to establish cooperative mills.
92 Maize drinks or "atoles" require a third grinding.
93 Blake, *Maize for the Gods*; Clampitt, *Maize*.
94 Johannessen, "Domestication Process."
95 Keleman, Hellin, and Bellon, "Maize Diversity."
96 Blake, *Maize for the Gods*.
97 Guzzon et al., "Conservation and Use." This is important, because although GM corn boosters claim Bt corn is needed to reduce aflatoxins, nixtamalization already does this for free.

98 The exception to this was South America, where maize is more commonly used to make beer, a process that does not employ nixtamalization (Blake, *Maize for the Gods*, 185). The Andes, however, were another great Valvilov center of plant domestication for protein-filled potatoes, the other great staple the Americas provided to the world, as well as "superfood" quinoas; therefore, the protein advantages of nixtamalized maize were less important there.

99 Boutard, *Beautiful Corn*.

100 Boutard, *Beautiful Corn*.

101 Blake, *Maize for the Gods*.

102 Grandia, *Enclosed*.

103 Boutard, *Beautiful Corn*.

104 Morton, *Tortillas*.

105 Kirby Vickery, "Aztec Maize," *Manzanillo (Mexico) Sun*, May 1, 2023, https://www.manzanillosun.com/aztec-maize/.

106 Morton, *Tortillas*.

107 Coe, *America's First Cuisines*.

108 Grandia, *From the Q'eqchi' Kitchen*.

109 Coe, *America's First Cuisines*.

110 Warman, *Corn and Capitalism*.

111 Coe, *America's First Cuisines*.

112 Gálvez, *Eating NAFTA*.

113 Calvo and Esquibel, *Decolonize Your Diet*.

114 Rodríguez, *Our Sacred Maíz*, 16.

115 Hatse and De Ceuster, *Prácticas Agrosilvestres Q'eqchi'es*, 19.

116 Hernández Rodríguez, "Seed Sovereignty," 986.

117 Hatse and De Ceuster, *Cosmovisión y Espiritualidad*, 18; Grandia, *The Wealth Report*.

118 Wolf, *Sons of the Shaking Earth*.

119 Morton, *Tortillas*.

120 Bonfil Batalla, *México Profundo*.

121 In addition to maize, several other American foods and medicines provisioned colonial armies and fundamentally shaped world history—including *chicona* bark (for quinine, which enabled colonizers to stay alive in the tropics), rubber, henequen, chocolate, cochineal, and cotton; Warman, *Corn and Capitalism*.

122 CEMDA, *Report*, 17.

123 Warman, *Corn and Capitalism*, 37.
124 Coe, *America's First Cuisines*, 15.
125 Clampitt, *Maize*, 10.
126 Warman, *Corn and Capitalism*.
127 Coe, *America's First Cuisines*.
128 Warman, *Corn and Capitalism*, xiii.
129 Guzzon et al., "Conservation and Use," 2.
130 Kopp, "The World's 6 Biggest Corn Producers."
131 Warman, *Corn and Capitalism*.
132 Warman, *Corn and Capitalism*; Pollan, *Omnivore's Dilemma*.
133 Warman, *Corn and Capitalism*.
134 Boutard, *Beautiful Corn*.
135 Warman, *Corn and Capitalism*.
136 Clampitt, *Maize*.
137 Warman, *Corn and Capitalism*.
138 Because maize was already associated with the peasantry and poverty, physicians initially thought pellagra was contagious. To show it was not, Dr. Joseph Goldberger, a scientist with the organization that evolved into the National Institutes of Health, audaciously injected himself with blood from pellagra patients. Although the niacin connection to pellagra was not fully understood until 1937, Goldberger had a hunch in 1920 that pellagra was just an expression of nutritional deficiency that could be cured with brewer's yeast or beans. See Warman, *Corn and Capitalism*; and Squibb et al., "A Comparison."
139 Boutard, *Beautiful Corn*.
140 Boutard, *Beautiful Corn*, 3.
141 Depending on how large the group is, men team up 2 by 2, 3 by 3, or 4 by 4. To play the b'uluk game, someone will place any number of maize kernels in a row; it could be 21, 25, 35, 40—however long they wish the game to last. Each player finds five unique sticks or leaves and gathers them on his respective side of the maize kernel line. Someone marks the back side black of four large maize kernels which serve as "dice." In turn, each player throws the "dice." Depending on how many kernels land with the painted black side up, the player can advance one stick that many spaces. If the player throws maize dice and they all land with the black side down and the white/yellow side up, then he may advance an extra space (for a total of five). Whenever a player lands exactly on the same space of a player from the opposing team, he captures that stick.

142 Grandia, *The Wealth Report*.
143 Taussig, "The Genesis of Capitalism."
144 Galeano, *Guatemala*, 25.
145 Carey, "Guatemala's Green Revolution."
146 Fitting, *The Struggle for Maize*.
147 Bellon et al., "Evolutionary and Food Supply," 2.
148 Ribeiro, "The Day the Sun Dies," 7.
149 Teosinte produces a similar gel. It seems Indigenous farmers must have purposefully introgressed this trait via pollen flow between maize and its wild progenitor in order to create olotón.
150 Pskowski, "Indigenous Maize?"
151 Kloppenburg, Calderón, and Ané, "The Nagoya Protocol."
152 CEC, *Maize and Biodiversity*, 4.
153 Kloppenburg, Calderón, and Ané, "The Nagoya Protocol."
154 Howard, *Concentration and Power*.
155 Kloppenburg, Calderón, and Ané, "The Nagoya Protocol," 8; Van Deynze et al., "Nitrogen Fixation."
156 Kloppenburg, Calderón, and Ané, "The Nagoya Protocol."
157 Kloppenburg, Calderón, and Ané, "The Nagoya Protocol," 8.
158 Kloppenburg, Calderón, and Ané, "The Nagoya Protocol," 9.
159 Pskowski, "Indigenous Maize?"
160 Kloppenburg, Calderón, and Ané, "The Nagoya Protocol."
161 Pskowski, "Indigenous Maize?"
162 Monstross, "UC Davis Researchers," 3.
163 Pskowski, "Indigenous Maize?"; Kloppenburg, Calderón, and Ané, "The Nagoya Protocol," 4.
164 Bretting, Goodman, and Stuber, "Isozymatic Variation."
165 Turrent Fernández and Calderón, "Fijación Biológica."
166 Kloppenburg, Calderón, and Ané, "The Nagoya Protocol," 10.
167 Daley, "The Corn of the Future"; Van Deynze et al., "Nitrogen Fixation."
168 Van Deynze et al., "Nitrogen Fixation."
169 Daley, "The Corn of the Future."
170 Kloppenburg, Calderón, and Ané, "The Nagoya Protocol," 10.
171 Yong, "The Wonder Plant."
172 Whyte, "Indigenous Food Sovereignty," 464.
173 Whyte, "Food Justice."
174 Corntassel and Bryce, "Practicing Sustainable Self-Determination."

1 Richards, "Cultivation?"
2 Weatherford, *Indian Givers*, 61.
3 Pollan, *The Botany of Desire*, 206.
4 "Backup" seed banking mimicked the military logic of "backup command sites" in anticipation of nuclear war. Curry, "The History of Seed Banking."
5 Kloppenburg, *First the Seed*.
6 Alkon and Agyeman, "Introduction."
7 Kloppenburg, *First the Seed*, 117–18.
8 Dowie, *American Foundations*, 109.
9 encyclopedia.com, "Henry Wallace."
10 Incite!, *The Revolution Will Not Be Funded*.
11 Warman, *Corn and Capitalism*, 185. Like the name "Xerox" for photocopies, the umbrella term "hi-bred" or "hybrid" became synonymous with any plant or animal that was crossbred for superior progeny. Bruns, "Southern Corn Leaf Blight," 1219.
12 Kirkendall, "Henry A. Wallace Remembered."
13 Ruttan, *United States Development Assistance Policy*.
14 Olsson, *Agrarian Crossings*.
15 Perkins, *Geopolitics and the Green Revolution*, 107–8.
16 Olsson, *Agrarian Crossings*.
17 Perkins, "The Rockefeller Foundation." The Mexican OSS should not be confused with the US CIA's antecedent, the Office of Strategic Services.
18 Olsson, *Agrarian Crossings*.
19 Wellhausen et al., *Races of Maize*.
20 Mangelsdorf and Cameron, "Western Guatemala"; Anderson, "Field Studies of Guatemalan Maize"; Stadelman, "Maize Cultivation."
21 Steinberg and Taylor, "The Impact of Political Turmoil," 344.
22 Méndez Cota, *Disrupting Maize*; Curry, *Endangered Maize*.
23 Curry, "Taxonomy, Race Science," 14.
24 These open-pollinated varieties (OPVs) were technically (and confusingly) termed "synthetics." OPV seeds were naturally grown, but involved less inbreeding than hybrids. Olsson, *Agrarian Crossings*; Matchett, "At Odds over Inbreeding"; Smith et al., "Global Dependence."
25 Olsson, *Agrarian Crossings*.
26 Olsson, *Agrarian Crossings*.

27 Santos Baca and de Sousa e Berruezo, "Maize and the World Market," 149.
28 Thomison and Geyer, *Managing "Pollen Drift."*
29 Doing this work was once a teenage rite of passage in the US Midwest.
30 Kloppenburg, *First the Seed*.
31 Boutard, *Beautiful Corn*.
32 Stone, *The Agricultural Dilemma*.
33 Adamson, "Seeking the Corn Mother," 237.
34 Stone, *The Agricultural Dilemma*.
35 Kloppenburg, *First the Seed*, 97; Klepek, "Against the Grain" (2011).
36 Isakson, "Market Provisioning."
37 Philpott, "A Brief History."
38 Mullaney, *Agricultural Revolution*.
39 Kloppenburg, *First the Seed*.
40 Kloppenburg, *First the Seed*, 5.
41 Warman, *Corn and Capitalism*, 206.
42 Kloppenburg, *First the Seed*, 118.
43 Young, *The History*.
44 Doyle, *Trespass Against Us*.
45 One of those first-generation picloram-based herbicides was field-tested at the UC Davis campus in 1964. Young, *The History*.
46 President Richard Nixon closed the biological weapons research facility at Fort Detrick in 1969, and ironically relocated the newly established National Cancer Institute there in 1971 (into the same Area A). Fort Detrick Alliance, "History of Fort Detrick"; Young, *The History*.
47 Dioxin is so deadly that just a single teaspoon could poison the water supply of a major city. It also has a long half-life, so trace amounts found in soils of more than three thousand Southeast Asian villages following the Vietnam War have caused birth defects and cancer over several generations. Ian Musgrave, "Are Toxic Dioxin Levels Lurking in Our Weed Killers? Follow Up on the Four Corners Report," *The Conversation* (Boston), July 23 2013, https://theconversation.com/are-toxic-dioxin-levels-lurking-in-our-weed-killers-follow-up-on-the-four-corners-report-16336.
48 Poison Papers B-3071, "Roundup."
49 Tweedale, "Hero or Villain."
50 Doyle, *Trespass Against Us*, 136.
51 Romero, *Economic Poisoning*.
52 Davis, "DDT and Pesticides."

53 Pisa et al., "An Update."
54 Everts, "The Nazi Origins."
55 Romero, *Economic Poisoning*, 13.
56 Davis, "DDT and Pesticides."
57 Arnold, "Consequences of DDT Exposure."
58 Grandia, "Poisonous Exports."
59 Pimentel, "Is *Silent Spring* Behind Us?"
60 Van den Bosch, *The Pesticide Conspiracy*.
61 Shiva, *The Violence of the Green Revolution*.
62 Altieri, *Genetic Engineering in Agriculture*, 2.
63 Shiva, *The Violence of the Green Revolution*.
64 Dowie, *American Foundations*; Lorek, "The Green Revolution in Latin America"; Goldman, *Imperial Nature*; Patel, "The Long Green Revolution."
65 Danaher, *50 Years Is Enough*, 9. After his term as secretary of defense during the Vietnam War, McNamara became president of the World Bank. For him, all these posts were both practically and ideologically aligned; indeed, he was famous for remarking that "running any large organization is the same, whether it's the Ford Motor Corporation, the Catholic Church, or the Department of Defense."
66 Curry, "The History of Seed Banking."
67 Soviet cereals were also introduced to Guatemala. Méndez Rojas, "Maize and the Green Revolution," 139.
68 Klepek, "Against the Grain" (2011).
69 Carey, "Guatemala's Green Revolution"; Chassé, "'Produce More to Live Better'"; Copeland, "Greening the Counterinsurgency"; Grandia, "Poisonous Exports"; Isakson, "Maize Diversity"; Wingert, *Feed the Future Initiative*.
70 In the highland communities where he worked, Isakson found that two-thirds of small farmers engage in seed exchanges, mostly within families. Isakson, "Market Provisioning."
71 Falla, "Hacia la Revolución Verde."
72 Klepek, "Against the Grain" (2011).
73 Falla, "Hacia la Revolución Verde."
74 To be sure, Guatemalans use half the amount of fertilizer relative to Mexico, and of course significantly less than the United States.
75 Roosevelt, "The Chemical Bomb"; de Campos and Olszyna-Maryzs, "Contamination of Human Milk."
76 Copeland, "Mayan Imaginaries of Democracy," 312.

77 Grandia, "Raw Hides."
78 Grandia, *Enclosed*.
79 ICTA, "ICTA Desde 1972."
80 Isakson, "Market Provisioning."
81 John Russell, "Guatemala—The Tiger of Ixcán and His Evangelical Sons," *Guatemala Chronicle*, September 16, 2015, https://guatemalachronicle.wordpress.com/2015/09/16/guatemala-the-tiger-of-ixcan-his-evangelical-sons/; Colby and Dennett, *Thy Will*.
82 In a moment of déja-vu, during the 2014 trial of former president Ríos Montt for crimes against humanity, the Guatemalan government offered fertilizer to Maya peasants who were willing to attend a rally in support of the dictator on trial. Many instead joined a counter-rally, photos of which went viral on social media showing signs saying, "I prefer not to receive fertilizer to deny the genocide."
83 CJA, "Guatemala."
84 Peckenham, "Bullets and Beans."
85 A quintal represents one hundred pounds. Isakson, "Maize Diversity"; Sigüenza Ramírez, "El Sector Público Agrícola."
86 Sigüenza Ramírez, "El Sector Público Agrícola."
87 Handy, *Tiny Engines of Abundance*, 53.
88 Klepek, "Selling Guatemala's Next Green Revolution"; memo quoted in van Etten, "Molding Maize," 703.
89 Manz, *Paradise in Ashes*.
90 Grandia, *Enclosed*.
91 Steinberg and Taylor, "The Impact of Political Turmoil," 348.
92 Stadelman, "Maize Cultivation."
93 Alonso-Fradejas and Gauster, *Perspectivas Para la Agricultura Familiar*, 26, translation mine.
94 Grandia, "Modified Landscapes"; van Etten and de Bruin, "Regional and Local Maize"; Guzzon et al., "Conservation and Use." In Mexico as well, research teams have found that over time, farmers have "creolized" commercial varieties by selecting for adaptations to local conditions. Fenzi et al., "Community Seed Network," 342.
95 Klepek, "Selling Guatemala's Next Green Revolution."
96 Tay, *Guatemala's Corn Sector Struggles*; Zahniser et al., *The Growing Corn Economies*, 18.
97 Eduardo Smith and Rosa María Bolaños, "Transgénicos, ¿solución a la falta

de alimentos?," *Prensa Libre* (Guatemala City), October 31, 2005, http://www.prensalibre.com/economia/Transgenicos-solucion-falta-alimentos_0_113989613.html.

98 Tay, *Guatemala: Agricultural Biotechnology Annual* (2009).

99 USDA, "McKinney on Trade Mission."

100 USDA FAS, "USDA Borlaug Fellowship Program."

101 Smith and Bolaños, "Transgénicos, ¿solución a la falta de alimentos?"

102 USDA-FAS, "Cochran Fellowship Program."

103 Tay, *Guatemala: Biotechnology GE Plants and Animals*.

104 Seralini and Douzelet, *The Monsanto Papers*, 70, 80.

105 Odd GMO combinations—like scorpion poison in cabbage, pigs that glow in the dark, and goat milk that contains spider silk—set the internet aflame with a "narrow and dystopian construct of 'Frankenfood.'" Kloppenburg, *First the Seed*, 352.

106 Soleri et al., "Understanding the Potential Impact."

107 Bain and Dandachi, "Governing GMOs."

108 Kleist, "Valentine Remembered"; Fell, "Nothing Ventured"; Dickson, "Commercialization," 6. This 1994 Calgene biotech research company was co-founded by a UC Davis professor and a venture capitalist. They set up the company shortly after the 1980 Bayh-Dole act allowed universities to form public-private enterprises using federally funded research. Some thirty other UC Davis professors were consultants to the company. This precedent helped reshape university conflict-of-interest policies about such public-private collaborations.

109 In a similar pattern, after France approved the EU's first GM crop, Bt tobacco, in 1994, a public backlash triggered other European countries to pass stringent GMO regulations.

110 Anderson and Cobb, "From the Green Revolution."

111 Kloppenburg, *First the Seed*.

112 Friedlander, "Toxic Pollen."

113 Although the two terms are often misused interchangeably, toxins refer to naturally produced poisons (by plants, animals, insects, or microorganisms), whereas toxics or toxicants are synthetically created substances that are foreign to an ecological or biological system.

114 Randy Shore, "The Herbicide Glyphosate Persists in Wild, Edible Plants: B.C. Study," *Vancouver Sun*, February 20, 2019, https://vancouversun.com/news/local-news/the-herbicide-glyphosate-persists-in-wild-edible-plants-b-c-study.

115 Altieri, *Genetic Engineering in Agriculture*, 46.
116 Altieri, *Genetic Engineering in Agriculture*, 36–41.
117 Perro and Adams, *What's Making Our Children Sick?*
118 Stone, *The Agricultural Dilemma*, 68–69.
119 Robin, *The World According to Monsanto*, 107.
120 Stone, *The Agricultural Dilemma*.
121 Huff, "How Monsanto Invaded."
122 "Seed Saving," 18.
123 Grandia, "Toxic Tropics."
124 Kloppenburg, *First the Seed*, 37.
125 Shapiro, "Democracy Now! Interviews."
126 Schiffman, "Life in the Rural Police State."
127 Broughton, "Behind a Corporate Monster."
128 Monsanto has even sued dairy farmers for simply advertising their milk as not containing rBGH (recombinant bovine growth hormone), arguing that such labels imply that rBGH is harmful. Barlett and Steele, "Monsanto's Harvest of Fear"; DeSantis, "Control through Contamination."
129 Schiffman, "Life in the Rural Police State."
130 Stone, *The Agricultural Dilemma*, 613.
131 Kloppenburg, *First the Seed*, 319.
132 Pollack, "Monsanto's Fortunes Turn Sour."
133 Robin, *The World According to Monsanto*.
134 GRAIN, "Seed Laws in Latin America."
135 Robin, *The World According to Monsanto*.
136 Beilin and Suryanarayanan, "The War between Amaranth and Soy."
137 Binimelis, Pengue, and Monterroso, "'Transgenic Treadmill.'"
138 Beilin and Suryanarayanan, "The War between Amaranth and Soy."
139 Patel, "The Long Green Revolution."
140 Howard, *Concentration and Power?*
141 Athanasiou, "The Age of Greenwashing," 12.
142 Martínez-Torres and Rosset, "Diálogo de Saberes," 991.
143 Scott, *The Moral Economy of the Peasant*.
144 Khoury et al., "Crop Genetic Erosion"; Schapiro, *Seeds of Resistance*, 51.
145 Smith et al., "Global Dependence."

FOUR LEGAL MAZE

1 Asturias, *Men of Maize*, 5–6.
2 Asturias, *Men of Maize*, 208.
3 Asturias, *Men of Maize*, 253.
4 Asturias, *Men of Maize*.
5 Coe, *America's First Cuisines*, 229.
6 Similarly in North America, once colonists no longer depended on Native American agrarian knowledge, colonizing "corn growers" murdered or forcibly resettled maize-growing tribes onto infertile reservation lands.
7 Coe, *America's First Cuisines*.
8 Scott, *Weapons of the Weak*.
9 Coe, *America's First Cuisines*, 230.
10 I draw here on Antonio Gramsci's distinction between a war of maneuver and a war of position. Gramsci, *Selection from the Prison Notebooks*.
11 Miller, "The Mexican Hacienda."
12 Gálvez, *Eating NAFTA*.
13 Chassé, "'Produce More to Live Better.'" In my fieldwork in Q'eqchi' Maya villages, elders remembered with flashes of anger how they had to self-provide hardtack tamales during months spent working for free on Ubico's road-building brigades.
14 McCreery, "'An Odious Feudalism.'"
15 McCreery, "'An Odious Feudalism.'"
16 Coatsworth, "Anotaciones Sobre la Producción."
17 Carey, "Guatemala's Green Revolution."
18 Chassé, "'Produce More to Live Better.'"
19 Carey, "Guatemala's Green Revolution," 290.
20 Chassé, "'Produce More to Live Better,'" 168.
21 Simon, *Endangered Mexico*.
22 Chassé, "'Produce More to Live Better,'" 136–37.
23 Chassé, "'Produce More to Live Better,'" 168.
24 Handy, *Tiny Engines of Abundance*, 67–68.
25 Chassé, "'Produce More to Live Better,'" 212.
26 Warman, *Corn and Capitalism*.
27 Nations and Komer, "Rainforests and the Hamburger Society."
28 In 1970 the Petén region produced just 1 percent of Guatemala's corn; by 1979, it was 10 percent; and by 2001, 17 percent of the country's corn and 25 percent

of the country's beans came from Petén. As a point of comparison, Petén then represented only 5 percent of the national population. Schwartz, "Pobreza Planeada o Accidente Histórico?," 20.

29 Grandia, "Modified Landscapes."

30 Grandia, *Enclosed*.

31 Alonso-Fradejas, "The Discursive Flexibility."

32 Solano, "Reconversión Productiva"; Konforti, "'Nosotros No Comemos Caña'"; Cámara del Agro and Agrequima, *El AGRO es Vital*.

33 Watts, *Silent Violence*.

34 Sealing, "Indigenous Peoples, Indigenous Farmers."

35 Rosset, *Food Is Different*.

36 Carlsen, *NAFTA Free Trade Myths*.

37 Imhoff, *Foodfight*, 23.

38 Richard, "Withered Milpas," 396.

39 Author calculations from Zahniser et al., *The Growing Corn Economies*.

40 Zahniser et al., *The Growing Corn Economies*, 37.

41 Goodluck, Ahtone, and Lee, "The Land-Grant Universities."

42 According to Tay's *Guatemala's Corn Sector Struggles*, 10, Guatemala has but one meter of roads per capita, compared to twenty meters in the United States. Reports such as hers provide seasonal price calendars that give foreign corporations vital information about when to dump corn on national markets.

43 Credit disparities emerged as a central NAFTA issue. US grain traders could secure lots from the US Commodity Credit Corporation at a 7 percent interest rate for three years for "foreign market development" under the Agricultural Trade Act of 1978. This was a huge advantage, when compared to the 25–30 percent in-country rates available to Mexican brokers in an inflationary peso economy. Richard, "Withered Milpas."

44 Kloppenburg, *First the Seed*.

45 Campanella, "DR-CAFTA and the Future."

46 Tay, *Guatemala's Corn Sector Struggles*, 10.

47 Witness for Peace, "Fact Sheet."

48 Tay, *Guatemala's Corn Sector Struggles*.

49 Beyond issues related to agriculture, other contentious issues in later WTO fora included forced privatization of basic services (water, telecommunications, education).

50 Simmons, *Meaningful Resistance*, 151.

51 Poitras, "Unnatural Growth," 119.
52 Baker, *Corn Meets Maize*, 50.
53 Nadal, "Corn and NAFTA"; Nadal, *Corn in NAFTA*.
54 Nadal, "Corn and NAFTA."
55 Suppan, "Mexican Corn"; Carlsen, *NAFTA Free Trade Myths*, 3.
56 The Mexican committee responsible for enforcing these tariffs was composed of officials from the Ministries of Agriculture (SAGARPA) and Economy (ME), plus representatives of flour mills, industrial food processors, corn product refiners, the livestock sector, and industrial chicken producers—but, significantly, not Indigenous people nor national maize growers. Nadal, "Corn and NAFTA." See also DeSantis, "Control through Contamination," #11640; Henriques and Patel, "NAFTA, Corn."
57 DeSantis, "Control through Contamination"; Richard, "Withered Milpas."
58 Nadal, "Corn and NAFTA."
59 Nadal, *The Environmental and Social Impacts*.
60 Zahniser et al., *The Growing Corn Economies*.
61 Suppan, "Mexican Corn."
62 Nadal, *The Environmental and Social Impacts*.
63 Judis, "Trade Secrets."
64 Gálvez, *Eating NAFTA*.
65 Nadal, *Corn in NAFTA*, 157.
66 Gonzalez and Nader, *Losing Knowledge*.
67 Fox and Haight, *Subsidizing Inequality*; Appendini, "Reconstructing the Maize Market"; Zahniser et al., *The Growing Corn Economies*, 32.
68 However, smallholders in the state of Mexico around the D.F. (Mexico City) are able to continue to produce small-scale maize by blending their agricultural work with off-farm employment. Supported by the Zapatistas, Chiapas is another exceptional stronghold of subsistence production, returning to pre-NAFTA acreage by 2007. Eakin et al., "Correlates of Maize," 80, 83; Public Citizen, "NAFTA's Legacy for Mexico."
69 Quigley, "NCGA Recognizes NAFTA Benefits."
70 Nadal, *Corn in NAFTA*.
71 Appendini, "Tracing the Maize-Tortilla Chain."
72 Gálvez, *Eating NAFTA, 99*.
73 Nevaer, "Mexico's NAFTA Generation."
74 Nevaer, "Mexico's NAFTA Generation."
75 Gálvez, *Eating NAFTA*.

76 Public opposition on the streets of Miami combined with an inside alliance of leftist governments in Venezuela, Brazil, Ecuador, and Bolivia, successfully halted the FTAA.
77 CRS, *Agriculture in the DR-CAFTA,* 5–6.
78 DeSantis, *Control through Contamination*.
79 DeSantis, *Control through Contamination*. Pinochet's Chile was the "Chicago boys" experiment in structural adjustment, privatization, and neoliberal trade regimes after the coup of Salvador Allende in 1973.
80 DeSantis, *Control through Contamination*.
81 Cáceres, "El CAFTA."
82 Morley, *Trade Liberalization under CAFTA*; Cáceres, "El CAFTA," 1; Granados and Cornejo, "Convergence in the Americas."
83 Tay, *Guatemala's Corn Sector Struggles*.
84 Cáceres, "El CAFTA," 1; Tay, *Guatemala's Corn Sector Struggles*.
85 Public Citizen, "More Information."
86 DeSantis, *Control through Contamination*; Grandia, "Unsettling."
87 Grandia, "In Their Own Words."
88 Grandia, "In Their Own Words"; Finley-Brook and Hoyt, "CAFTA Opposition."
89 Stalcup, "CAFTA Becomes Law."
90 CRS, *Agriculture in the DR-CAFTA*, 14.
91 Aistara, "Privately Public Seeds"; Pearson, "On the Trail."
92 US Dept. of State, cable, February 13, 2003.
93 The United States pressured Guatemala to approve the UPOV 1991, the Patent Cooperation Treaty, the Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the Purposes of Patent Procedure, and the Convention on the Settlement of Investment Disputes between States and Nationals of Other States (ICSID). US Dept. of State, cable, November 22, 2005. The UPOV clause was also one reason for Costa Rica's hesitation in ratifying the DR-CAFTA because critics knew it could overturn many of the country's biodiversity protections.
94 Suppan, *Analysis*.
95 Kloppenburg, *First the Seed*, 323.
96 Aistara, "Privately Public Seeds."
97 GRAIN, "Seed Laws in Latin America."
98 Granados and Cornejo, "Convergence in the Americas."
99 Villagrán, "Lo Que Debes Saber Sobre."

100 Suppan, "Food Safety and GMOs."
101 US Dept. of State, cable, March 13, 2006.
102 US Dept. of State, cable, January 11, 2006, 2 and 10.
103 The name "Chapter 11" refers to its place in the NAFTA document, not as the synonym for bankruptcy.
104 Public Citizen, "Corporations Reveal." Interested readers can track and tally cases via the UN Trade and Development website, https://investmentpolicy.unctad.org/investment-dispute-settlement.
105 Mark Engler and Nadya Martinez, "Harken v. Costa Rica," *People's Weekly World Newspaper*, May 27, 2004, https://www.bilaterals.org/?harken-v-costa-rica-us-companies.
106 Engler and Martinez, "Harken v. Costa Rica"; Liza Grandia, "Silence Is Beholden: Are Corporations Hog-Tying Conservation Groups in CAFTA Fight?," *Daily Grist,* June 5, 2005, http://www.grist.org/comments/soapbox/2005/06/02/grandia-cafta/.
107 Ricker, "Competition or Massacre?"
108 LADB, "Guatemala Losing Heritage." Put another way, a hectare of corn costs US$304 to grow in the United States due to government subsidies, but US$562 in Guatemala. LADB, "After Six Months."
109 Author calculations.
110 Tay, *Guatemala: Agricultural Biotechnology Annual* (2017).
111 Leffertt, "Region Could Suffer," 1.
112 LADB, "After Six Months."
113 Galemba, "Corn Is Food."
114 Tay, *Guatemala's Corn Sector Struggles*.
115 Vasquez, "Guatemala."
116 USDA-FAS, "Corn 2020 Export Highlights."
117 Tay, *Guatemala's Corn Sector Struggles*.
118 US Dept. of State, cable, August 1, 2007.
119 Weller, "Farmer Cooperatives."
120 Oxfam America, "Seeds of Discord."
121 Bratspies, "Myths of Voluntary Compliance"; Brechelt, *Transgénicos en Santo Domingo*; Grandia, "Modified Landscapes." See also chap. 6.
122 Bratspies, "Myths of Voluntary Compliance," 614.
123 Bratspies, "Myths of Voluntary Compliance."
124 Aventis labeled the corn with a bewildering tag, which stated: "Under this purchase agreement, customer or any user may: use this hybrid corn seed or

any non-hybrid corn seeds found herein, for the purpose of producing grain for feeding or processing." This left unclear whether "processing" referred to industrial food processing or other commercial uses. Bratspies, "Myths of Voluntary Compliance," 621.

125 DeSantis, *Control through Contamination*.

126 Bratspies, "Myths of Voluntary Compliance," 628.

127 DeSantis, *Control through Contamination*.

128 DeSantis, *Control through Contamination*.

129 Bratspies, "Myths of Voluntary Compliance," 642.

130 Bratspies, "Myths of Voluntary Compliance," 625.

131 Clapp, "Unplanned Exposure."

132 Grandia, "Modified Landscapes."

133 Mencos, "La Situación de los Transgénicos," 92. As of 2023, none of the major private laboratories I contacted offered testing for StarLink, so it is anyone's guess whether those genes continue circulating.

134 Clapp, "Illegal GMO Releases."

135 Bratspies, "Myths of Voluntary Compliance."

136 Clapp, "Illegal GMO Releases."

137 Price and Cotter, "The GM Contamination Register."

138 Ribeiro, *Maíz*. This happened in Brazil, where cultivation of contraband GM soy from Argentina (nicknamed "Maradona" after its national soccer star) became so prevalent that it threatened the integrity of Brazil's export market.

139 Klepek, "Selling Guatemala's Next Green Revolution." One biotech consultant explained this to the *Toronto Star* in 2001: "The hope of the industry is that over time the market is so flooded [with genetically modified organisms] that there's nothing you can do about it. You just sort of surrender" (ETC Group, "Fear-Reviewed Science," 2).

140 Klepek, "Against the Grain" (2011), 183.

141 Cleveland and Soleri, "Rethinking"; Mercer and Wainwright, "Gene Flow."

142 Ruiz-Marrero, "Genetic Pollution."

143 Otero, *Food for the Few*; Kimbrell and Mendelson, *Monsanto vs. US Farmers*.

144 Schwartz, "You Can't Read the TPP."

145 Palmer, "Some Secrecy Needed."

146 In 1994 Ralph Nader famously challenged any US congressional member to read the five-hundred-page World Trade Agreement before ratifying it. He offered a $10,000 donation to the charity of choice of anyone who would

sign an affidavit that he or she had read the entire document and then take a ten-question quiz on its contents. Only Colorado's Republican senator Hank Brown accepted the challenge. Although Brown had planned to vote to ratify the WTO, after reading the treaty with his own eyes, he was aghast at the contents. Nader and Wallach, "GATT, NAFTA."

147 USTR, North American Free Trade Agreement.

148 USTR, Request for Comments, 187.

149 USTR, Request for Comments, 173 and 179.

150 Hernández-López, "GMO Corn in México" (emphasis added).

151 This is one of the key principles at stake in the current dispute the USTR filed against Mexico over its phaseout of GM corn imports for tortillas.

152 Suppan, "Food Safety and GMOs," 4.

153 Hansen-Kuhn, "Mexico's Move."

154 Bernasconi-Osterwalder, "USMCA Curbs."

155 Gálvez, *Eating NAFTA*.

156 ASTA, *Strategic Plan 2021*.

157 Lydia Carey, "Lobbyists Win a Round in Fight over Protecting Farmers' Rights to Seeds," *Mexico News Daily*, July 7 2020, https://mexiconewsdaily.com/news/lobbyists-win-a-round-in-fight-over-protecting-farmers-rights-to-seeds/.

5. MANY MEXICAN WORLDS IN DEFENSE OF MAIZE

1 Lovell, Lutz, and Kramer, *Strike Fear in the Land*.

2 Sherman, "A Conqueror's Wealth."

3 Espinosa, "Ponencia Magistral."

4 Edelman, "Food Sovereignty."

5 Italian political theorist Antonio Gramsci contrasted "organic" and "traditional" intellectuals: while traditional leaders serve the ruling class's interests, organic leaders make unconventional alliances with "subaltern" (read: subordinate) groups. Grandia, "Raw Hides."

6 Montenegro de Wit, "Can Agroecology?"; Curry, "Taxonomy, Race Science"; CEMDA, *Report*; H. Wilkes, "Efraim Hernández Xolocotzi-Guzman."

7 Joseph and Buchenau, *Mexico's Once and Future Revolution*; Fitting, *The Struggle for Maize*. The modern Zapatistas chose their group's name in honor of mestizo Mexican leader Emiliano Zapata (1879–1919), who commanded the Liberation Army of the South during the Mexican Revolution. Zapata

trusted Francisco Madero's promises for agrarian reform, but when Madero took office in 1911, he sent federal troops to disperse Zapata's supporters. The original Zapatistas (mostly Nahua speakers) waged guerrilla warfare until President Venustiano Carranza recruited urban militias, known as the "Red Battalions," to quash the Zapatistas and Pancho Villa's army in the north.

8 Fitting, "Importing Corn, Exporting Labor"; Curry, *Endangered Maize*.

9 Martínez Esponda et al., *Report on the Biocultural Relevance*, 17.

10 During the Mexican Revolution, a Mexican widowed woman could take over her late husband's weapons and uniform or attach to another soldier. Some troops even had women corporals and captains, with names like "La China" from Morelos. See Morton, *Tortillas*.

11 CGIAR, *Portraits of Women Working*.

12 González, *Zapotec Science*.

13 Gálvez, *Eating NAFTA*; Peralta, "[De]Stabilizing"; Curry, "Taxonomy, Race Science." Not until the 1940s did nutritional research show that maize was as, if not more, nourishing than wheat. Santos Baca and de Sousa e Berruezo, "Maize and the World Market."

14 Ribeiro, *Maíz*, 304.

15 Antal, Baker, and Verschoor, *Maize and Biosecurity*.

16 Barkin, "The Reconstruction," 79.

17 Barkin, "The Reconstruction," 81.

18 Peralta, "[De]Stabilizing"; Fitting, *The Struggle for Maize*; Otero, *Food for the Few*; Poitras, "Unnatural Growth."

19 Patel, *Stuffed and Starved*, 58.

20 Suppan, "Mexican Corn," 3.

21 Antal, Baker, and Verschoor, *Maize and Biosecurity*, 16.

22 Fox and Haight, *Subsidizing Inequality*, 7.

23 Richard, "Withered Milpas," 396.

24 For instance, Mexico's Minister of Agriculture and his family collected $11 million pesos between 2005 and 2010. Fox and Haight, *Subsidizing Inequality*, 27.

25 Fox and Haight, *Subsidizing Inequality*, 8.

26 Fox and Haight, *Subsidizing Inequality*, 34.

27 Fox and Haight, *Subsidizing Inequality*, 14.

28 Fox and Haight, *Subsidizing Inequality*, 11.

29 Fox and Haight, *Subsidizing Inequality*, 29.

30 Fox and Haight, *Subsidizing Inequality*, 24. N.B.: The number of Indigenous languages spoken in Mexico can vary depending on how they are counted.

31 Galvan-Miyoshi, Walker, and Warf, "Land Change Regimes."
32 Lind and Barham, "The Social Life of the Tortilla"; Espinosa A., "La Guerra de la Tortilla," 73.
33 Peralta, "[De]Stabilizing."
34 Simmons, *Meaningful Resistance*, 133.
35 Gálvez, *Eating NAFTA*; LADB, "US Food Processor ADM"; DeSantis, *Control through Contamination*.
36 Espinosa A., "La Guerra de la Tortilla," 71.
37 Antal, Baker, and Verschoor, *Maize and Biosecurity*, 15; Ribeiro, *Maíz*, 92.
38 Galvan-Miyoshi, Walker, and Warf, "Land Change Regimes."
39 Richard, "Withered Milpas."
40 Nadal, *The Environmental and Social Impacts*; Keleman, García Raño, and Hellin, "Maize Diversity," 192.
41 Fox and Haight, *Subsidizing Inequality*.
42 Michelle Estrada, spring quarter 2023, class discussion Native American Studies 198, UC Davis.
43 Simmons, *Meaningful Resistance, 152*.
44 Keleman, García Raño, and Hellin, "Maize Diversity," 189.
45 Espinosa A., "La Guerra de la Tortilla," 72.
46 Simmons, *Meaningful Resistance*.
47 Antal, Baker, and Verschoor, *Maize and Biosecurity*, 79.
48 Simmons, *Meaningful Resistance*, 153.
49 Esteva and Marielle, *Sin Maíz no Hay País*.
50 Richard, "Withered Milpas"; Fox and Haight, *Subsidizing Inequality*, 37.
51 Otero, *Food for the Few*.
52 Richard, "Withered Milpas," 388.
53 Simmons, *Meaningful Resistance*, 159. PAN is the party that broke the PRI's stranglehold on power in 2000.
54 Simmons, *Meaningful Resistance*, 156.
55 Peralta, "[De]Stabilizing," 110.
56 To review: Monsanto did not launch its Roundup Ready corn line until 1998, four years after NAFTA was ratified. Hernández-López, "GMO Corn in México."
57 Antal, Baker, and Verschoor, *Maize and Biosecurity*, 4.
58 Fitting, "Importing Corn, Exporting Labor"; Nadal, *Corn in NAFTA*; Toledo, "Los Biotecnólogos."
59 Wise, *Eating Tomorrow*.
60 Wise, "High Risks, Few Rewards."
61 Fox and Haight, *Subsidizing Inequality*, 39; CGIAR, *Portraits of Women Working*.

62 CEC, *Maize and Biodiversity*.
63 Antal, Baker, and Verschoor, *Maize and Biosecurity*.
64 Rowell, "Immoral Maize," 3.
65 Soleri and Cleveland, "Farmers' Genetic Perceptions."
66 Bonneuil, Foyer, and Wynne, "Genetic Fallout."
67 Soleri and Cleveland, "Farmers' Genetic Perceptions"; González, *Zapotec Science*.
68 Nadal, *Corn in NAFTA*, 31.
69 Marie-Monique Robin, "Phantoms in the Machine: GM Corn Spreads to Mexico," *Sydney Morning Herald*, July 3, 2010, https://www.smh.com.au/world/phantoms-in-the-machine-gm-corn-spreads-to-mexico-20100702-zu3r.html.
70 Robin, "Phantoms in the Machine"; Canby, "Retreat to Subsistence"; Cleveland and Soleri, "Rethinking"; Altieri, *Genetic Engineering in Agriculture*; Dyer et al., "Dispersal of Transgenes"; Nadal, *Corn in NAFTA*; Kato-Yamakake, "Transgenic Varieties." Teosinte's growing season (June–October) and pollination season (September) still match that of maize. Nadal, *Corn in NAFTA*.
71 Quist and Ignacio Chapela, "Transgenic DNA."
72 Canby, "Retreat to Subsistence."
73 Robin, *The World According to Monsanto*; Clapp, "Illegal GMO Releases."
74 McAfee, "Corn Culture."
75 Soleri et al., "Understanding the Potential Impact."
76 Robin, *The World According to Monsanto*.
77 Gerdes, "Killing the Messenger."
78 Robin, "Phantoms in the Machine."
79 Mann, "Has GM Corn Invaded?"
80 DeSantis, *Control through Contamination*; Rowell, "Immoral Maize," 19.
81 CEC, *Maize and Biodiversity*; Fitting, "Importing Corn, Exporting Labor."
82 DeSantis, *Control through Contamination*; CEC, *Maize and Biodiversity*, 32; Ribeiro, *Maíz*, 101. By 2003 DICONSA had decided to purchase only domestic grain. Fitting, "The Political Uses of Culture"; Mercer and Wainwright, "Gene Flow," 112.
83 Nadal, *Corn in NAFTA*, 32.
84 Zarembo, "The Tale of the Mystery Corn."
85 Canby, "Retreat to Subsistence."
86 ETC Group et al., "Contamination"; Clapp, "Unplanned Exposure"; Fitting, "Risk, Regulation and Resistence."
87 Clapp, "Unplanned Exposure."

88 Ribeiro, *Maíz*, 3, translation mine.
89 Ribeiro, *Maíz*, 176, translation mine.
90 CEC, *Maize and Biodiversity*, 23.
91 CEC, *Maize and Biodiversity*, 46.
92 Rowell, "Immoral Maize," 19.
93 See Mercer and Wainwright, "Gene Flow"; Bonneuil, Foyer, and Wynne, "Genetic Fallout."
94 Dyer et al., "Dispersal of Transgenes."
95 McAfee, "Corn Culture"; Dyer et al., "Dispersal of Transgenes"; Cleveland and Soleri, "Rethinking"; Stone, *The Agricultural Dilemma*.
96 Fitting, "Risk, Regulation and Resistence"; Soleri, Cleveland, and Aragón Cuevas, "Transgenic Crops."
97 Stone, *The Agricultural Dilemma*.
98 This may be how Monsanto's YieldGard (MON810) could have entered Mexico as early as 1997. Dyer et al., "Dispersal of Transgenes," 3, citing the Mexican Rural Household Survey.
99 ETC Group, "Fear-Reviewed Science," 3.
100 Zarembo, "The Tale of the Mystery Corn."
101 Otero, *Mexico*.
102 Soleri, Cleveland, and Cuevas, "Transgenic Crops," 503; McAfee, "Corn Culture," 23.
103 Ribeiro, *Maíz*. Ribeiro provided essential counternarratives to AGROBIO, an industry association that lavishly courted Mexican journalists and government functionaries with fancy informational tours and "prizes" for articles showing a positive spin regarding GMO technology. Peralta, "[De]Stabilizing"; Antal, Baker, and Verschoor, *Maize and Biosecurity*.
104 ETC Group, "Fear-Reviewed Science"; Bazán Landeros, "Entre la Construcción Discursiva," 55.
105 Poitras, "Unnatural Growth."
106 Peralta, "[De]Stabilizing"; Antal, Baker, and Verschoor, *Maize and Biosecurity*; Poitras, "Unnatural Growth."
107 Antal, Baker, and Verschoor, *Maize and Biosecurity*.
108 Poitras, "Unnatural Growth."
109 Vargas-Parada, "GM Maize Splits Mexico," 16.
110 Ribeiro, *Maíz*, 139.
111 Ribeiro, *Maíz*, 136.
112 Ribeiro, *Maíz*, 111.

113 Ribeiro, *Maíz*, 192.
114 Ribeiro, *Maíz*, 255.
115 Hernández-López, "Racializing Trade in Corn"; Wise, *Eating Tomorrow*.
116 Ribeiro, *Maíz*, 160; Hernández-López, "Racializing Trade in Corn."
117 Quijones, "Mexican Gourmet Chefs."
118 Antal, Baker, and Verschoor, *Maize and Biosecurity*.
119 Antal, Baker, and Verschoor, *Maize and Biosecurity*, 42.
120 Ribeiro, *Maíz*, 41, translation mine.
121 Brandt, "Zapatista Corn," 881.
122 Eakin et al., "Correlates of Maize," 83.
123 EZLN, "Did You Hear It?"
124 Hernández, Perales, and Jaffee, "'Without Food,'" 241.
125 Marcos, "The Fourth World War," 282.
126 Hernández Rodríguez, Perales Rivera, and Jaffee, "Emociones."
127 Hernández, Perales, and Jaffee, "'Without Food.'"
128 Brandt, "Zapatista Corn," 894.
129 Hernández Rodríguez, "Seed Sovereignty."
130 When testing leaves, not kernels, it is possible to miss contamination that occurs during pollination, but over time GM strains might be removed from the region. Brandt, "Zapatista Corn," 890.
131 Brandt, "Zapatista Corn," 890.
132 Schools for Chiapas, "GMO-Free Zapatista Corn."
133 The sarcophagus lid of the tomb of Palenque's king, Pakal (603–683 CE), is one of the best examples from ancient Mayan artwork of maize depicted as a foliated cross.
134 Haenn, *Fields of Power*.
135 Víctor M. Toledo, "El Día Que Monsanto Infiltró a Morena," *La Jornada*, December 19, 2017, https://www.jornada.com.mx/2017/12/19/politica/016a1pol.
136 Suryanarayanan and Beilin, "Milpa-Melipona-Maya."
137 Ribeiro, *Maíz*, 145.
138 Strochlic, "An Unlikely Feud"; Suryanarayanan and Beilin, "Milpa-Melipona-Maya."
139 Tamariz, "GM Crops vs. Apiculture."
140 Ribeiro, *Maíz*, 150.
141 Tamariz, "GM Crops vs. Apiculture."
142 Goldman Environmental Foundation, "Leydy Pech."
143 Suryanarayanan and Beilin, "Milpa-Melipona-Maya."

144 Torres-Mazuera and Ramírez-Espinosa, "How a Legal Fight."
145 Tamariz, "GM Crops vs. Apiculture."
146 Bazán Landeros, "Entre la Construcción Discursiva," 17.
147 Garcia Ruiz, Knapp, and Garcia-Ruiz, "Profile of Genetically Modified Plants"; Otero, *Mexico: Agricultural Biotechnology Annual*.
148 Strochlic, "An Unlikely Feud"; Bazán Landeros, "Entre la Construcción Discursiva."
149 Torres-Mazuera and Ramírez-Espinosa, "How a Legal Fight."
150 Bonfil Batalla, *México Profundo*.
151 Torres-Mazuera and Ramírez-Espinosa, "How a Legal Fight."
152 Kinchy, *Seeds, Science, and Struggle*.
153 Wade, "Mexico's New Science"; Alvarez-Buylla and Piñeyro-Nelson, *El Maíz*.
154 González-Ortega et al., "Pervasive Presence."
155 Lozano-Kasten et al., "Seasonal Urinary Levels."
156 Antal, Baker, and Verschoor, *Maize and Biosecurity*, 41–42.
157 Clapp, "Unplanned Exposure"; Hansen-Kuhn, "Mexico's Move."
158 Bonneuil, Foyer, and Wynne, "Genetic Fallout."
159 Sean Pratt, "Mexico's GM Corn Ban Would Hit US Hard," *Western Producer*, February 4, 2021, https://www.producer.com/markets/mexicos-gm-corn-ban-would-hit-u-s-hard/.
160 Carey Gillam, "Revealed: Monsanto Owner and US Officials Pressured Mexico to Drop Glyphosate Ban," *The Guardian*, February 16, 2021, https://www.theguardian.com/business/2021/feb/16/revealed-monsanto-mexico-us-glyphosate-ban.
161 Bazán Landeros, "Entre la Construcción Discursiva."
162 Queally, "Let's Be Clear."
163 Hansen-Kuhn, "Mexico's Move."
164 Bazán Landeros, "Entre la Construcción Discursiva."
165 Bazán Landeros, "Entre la Construcción Discursiva."
166 James F. Smith, "Biotech Farmers in Chiapas Lead Peaceful Agricultural Revolution," *Los Angeles Times*, July 26, 1998, https://www.proquest.com/newspapers/biotech-farmers-chiapas-lead-peaceful/docview/421383790/se-2?accountid+14505. As a potential partner for bioprospecting, Romo briefly served as donor and board member to Conservation International—a relationship which "did not end well" according to an anonymous source.
167 Philpott, "A Small Farmer Ruminates."
168 Aristegui Noticias, "Alfonso Romo."

169 Bazán Landeros, "Entre la Construcción Discursiva," 59.
170 Toledo, "El Día Que Monsanto."
171 González, "Por Estrés."
172 Fonteyne et al., "Weed Management"; Wise, "Swimming against the Tide."
173 Wise, "Mexico to Ban Glyphosate."
174 Alexander and Sethi, "Mexico Is Phasing Out."
175 Goodman, "Corn Grower Leaders."
176 Alexander and Sethi, "Mexico Is Phasing Out."
177 Wise, "Distorting Markets."
178 Gillam, "Revealed."
179 Hernández-López, "GMO Corn in México," 103.
180 NCGA, "Mission."
181 Goodman, "Corn Grower Leaders."
182 USDA, "Statement by Secretary Vilsack."
183 Baden-Mayer, "Back to the Future."
184 Grist, "Germany to Ban."
185 CONACYT, "CONACYT Promueve Debate Internacional."
186 Government of Mexico, "Efectos Nocivos."
187 Wise, "Worlds Collide."
188 Bratspies, "Myths of Voluntary Compliance," 607.
189 CEMDA, *Report*, 39.
190 Tomson, "Mexico Embeds GM Corn Ban."
191 White & Case, "The Presidential Decree."
192 United States of America, "Mexico: Measures."
193 Canada, "Third Party."
194 United Mexican States, "Mexico: Measures."
195 Timothy Wise from the Institute for Agriculture & Trade policy has been closely tracking the panel and posted the entire trove of insightful NGO submissions in Spanish and English at https://www.iatp.org/usmca-corn-case-submissions. The small producers union, ANEC, notes how the US document belittles the Mexican scientific establishment, while ignoring how corrupt US scientific "experts" sowed doubt for decades about the health harms of cigarettes. Other briefs emphasize Indigenous rights.
196 United Mexican States "Mexico: Measures," 18.
197 World Trade Institute, "Dr. Christian Häberli."
198 White & Case, "The Presidential Decree."
199 Goodman, "Mexico."

200 CEMDA, *Report*.
201 Mercer and Perales, "Evolutionary Response"; Hernández Rodríguez, "Seed Sovereignty," 991.
202 Nadal, *Corn in NAFTA*; Galvan-Miyoshi, Walker, and Warf, "Land Change Regimes"; Espinosa A., "La Guerra de la Tortilla."
203 Bellon et al., "Beyond Subsistence."
204 Appendini and Quijada, "Consumption Strategies."
205 Wise, "Stop Cheapening."
206 Acedo, "Mexico's GMO Corn Ban."
207 González-Ortega et al., "Pervasive Presence."
208 Wise, *Eating Tomorrow*, 198.
209 Fox and Haight, *Subsidizing Inequality*, 14; Wise, "Stop Cheapening."
210 Wise, *Eating Tomorrow*, 199.
211 Bellon et al., "Beyond Subsistence."
212 Swanson, "Mexico."
213 Ribeiro, *Maíz*, 142.
214 Suryanarayanan and Beilin, "Milpa-Melipona-Maya."
215 Wainwright and Mercer, "The Dilemma of Decontamination"; Seay-Fleming, "'Biotechnologizing'?"; Scott, *Seeing Like a State*; Kinchy, *Seeds, Science, and Struggle*; Ureta et al., "A Data Mining Approach."
216 Acedo, "Mexico Celebrates."
217 Antal, Baker, and Verschoor, *Maize and Biosecurity*.
218 Ribeiro, *Maíz*, 39.
219 Ribeiro, "The Day the Sun Dies," 6–7.
220 Alexander and Sethi, "Mexico Is Phasing Out."

SIX GUATEMALA AND GOLIATH

1 Lissardy, "Por Qué La Elite Económica."
2 Winkler and Monzón, "El Potencial de Tierras," 16.
3 Wingert, *Feed the Future Initiative*.
4 Guatemala's brilliant think tank IDEAR, housed within its cooperative of cooperatives, CONGCOOP, helped introduce a legislative proposal sponsored by Rodolfo Aníbal García Hernández for an updated law in 2010 that failed to win muster. Winkler and Monzón, "El Potencial de Tierras."
5 This paradox is similar to the one that exists in California's Central Valley,

where those who harvest our "local" food themselves often go hungry (Alkon and Agyeman, "Introduction").

6 Butler, *War Is a Racket*.

7 First-generation GMOs had transpecies DNA splices inserted into crops through a virus that served as a "gene gun," in industry lingo.

8 Klepek, "Against the Grain" (2011), 171–72. Ex-president Cristiani is in exile in Italy to escape prosecution for his role in the infamous murder of six Jesuit priests in 1989.

9 This ministry is known by the acronym MAGA, but to avoid confusion with Trump's MAGA movement, herein it is referred to as the Agriculture Ministry.

10 Gálvez Villatoro, "Deficiencia en Guatemala"; Prosalus, Caritas Española, and Veterinarios Sin Fronteras, *Un Derecho Vulnerado*.

11 Klepek, "Against the Grain" (2011), 172.

12 Klepek, "Against the Grain" (2011), 30.

13 Admin, "Monsanto Company Announces."

14 Klepek, "The New Men of Maize."

15 Mencos, "La Situación"; Godinez, *Transgénicos*.

16 FOE, *Transgénicos Ilegales*.

17 Klepek, "Against the Grain" (2011), 223.

18 Mencos, "La Situación," 92.

19 Mencos, "La Situación"; Klepek, "Against the Grain" (2011), 223.

20 Klepek, "Against the Grain" (2011), 227.

21 Klepek, "Against the Grain" (2011).

22 Klepek, "Against the Grain," (2012).

23 For details on the staggering amount of maize crossing another border point with Mexico, see Galemba, "Corn Is Food."

24 Grandia, "Seeing Like a Seed Company."

25 Grandia, "Modified Landscapes," with a hat tip to Scott, *Seeing Like a State*.

26 Seay-Fleming, "Contested Imaginaries," 321.

27 Scott, *Seeing Like a State*; Scott, *The Art of NOT Being Governed*. Lessons from Guatemala's petroleum sector are instructive. After World War II, transportation obstacles and confusing regulations initially dissuaded US companies from setting up operations in Guatemala. But the revision of the petroleum code and road construction projects under military dictatorships attracted more than a dozen companies to the country by the decade's end (Solano, *Guatemala*). Likewise, after Guatemala streamlined its mining code policies

following the Peace Accords, corporate gold diggers (literally) flooded the country.

28 UNEP, *Development of Mechanisms*.

29 Azurdia, *Priorización de la Diversidad Biológica*.

30 UNEP, *Development of Mechanisms*, 11.

31 UNEP, *Development of Mechanisms*, 25.

32 UNEP, *Development of Mechanisms*, 21–22; Azurdia et al., *Atlas*.

33 Mangelsdorf and Cameron, "Western Guatemala."

34 Congreso de la República de Guatemala, Código Penal 1973; Azurdia, Ojeda, and García, "Seguridad de la Biotecnología."

35 Klepek, "Against the Grain" (2011), 156.

36 GEF, *Strengthening and Expansion*, 135.

37 GEF, *Strengthening and Expansion*, 26.

38 Klepek, "Against the Grain" (2011), 169.

39 Klepek, "Against the Grain" (2011), 193. As a Fulbright scholar, Klepek was also invited to attend a dinner at the residence of then vice president Eduardo Stein, whose daughter was one of Guatemala's few biotech scientists. In a fascinating footnote, Klepek states that one of the hired guns the Embassy invited to its workshop was a Colombian-born academic who joked that his great-grandfather was jailed in Cartagena during a civil war at the end of the nineteenth century, and that since then the family had shared a joke of hating everything relating to that city, including the Cartagena Protocol (see "Against the Grain" [2012], 46; and [2011], 191).

40 Klepek, "Against the Grain" (2011), 201.

41 Klepek, "Against the Grain" (2011), 192.

42 Klepek, "Against the Grain" (2011), 182.

43 Tay, *Guatemala: Agricultural Biotechnology Annual* (2009).

44 Tay, *Guatemala: Agricultural Biotechnology Annual* (2017), 3.

45 Grandia, "Modified Landscapes," 101.

46 Zacune, *Combatting Monsanto*.

47 Klepek, "Against the Grain" (2012).

48 Bill Barreto, "La Mano Invisible que Trazóla Ruta del TLC a la 'Ley Monsanto,'" *Plaza Publica*, August 20, 2014, http://www.plazapublica.com.gt/content/la-mano-invisible-que-trazo-la-ruta-del-tlc-la-ley-monsanto-0.

49 Carlos Alvarez, "Crece Rechazo a Ley de Obtenciones Vegetales," *Prensa Libre*, August 18, 2014, as quoted in Dow Jones Factiva database (page discontinued).

50 Author's fieldnotes 2023.

51 Rodríguez, "Una Semilla Patentada."

52 Alvarez, "Crece Rechazo."
53 Rodríguez, "Una Semilla Patentada."
54 Author's fieldnotes 2023.
55 Alvarez, "Crece Rechazo."
56 Carlos Alvarez, "Analizan Alcances de la Ley De Obtenciones Vegetales," *Prensa Libre*, August 21, 2014, http://www.prensalibre.com/noticias/politica/ley_monsanto-decreto_19-2014-ley_de_obetenciones_vegetales-analistas_0_1197480313.html (page discontinued).
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58 Beside poaching germplasm, private companies regularly recruit ICTA employees who were trained with public funding. Rodríguez, "El Conocimiento Tradicional"; Carlos Alvarez, "Semilla No Tiene Patente," *Prensa Libre* (Guatemala City), August 22, 2014, http://registrodeusuario.prensalibre.com/noticias/Nacionales-semillas-no-tienen-patente-Ley-Vegetales_0_1198080181.html.
59 Palomo, "12 Cosas Que Tienes."
60 Pascual, "Rechazan Ley."
61 Jessica Gramajo and Carlos Alvarez, "Ley Privatizaría Semillas Nativas," *Prensa Libre* (Guatemala City), August 19, 2014, http://test.prensalibre.com/noticias/comunitario/Nacionales-crece-rechazo-ley-obtenciones-vegetales-pequenos-agricultores_0_1195680423.html.
62 Barreto, "La Mano Invisible."
63 GEF, *Strengthening and Expansion*.
64 Carlos Alvarez and Jessica Gramajo, "Ley de Vegetales Traerá Conflictividad Social," *Prensa Libre* (Guatemala City), August 22, 2014, http://test.prensalibre.com/noticias/politica/ley_monsanto-decreto_19-2014-ley_de_obetenciones_vegetales-analistas_0_1197480313.html.
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66 Author's fieldnotes 2023.
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73 Reader comment to Chiquin, "NO a La Ley Monsanto."

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75 Seay-Fleming, "Contested Imaginaries."

76 Abbott, "Guatemalan Communities."

77 Abbott, "In Guatemala."

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79 Lea, "The Praxis"; Cristina Chiquin, "Derogado el Decreto 19–2014 'Ley Monsanto': La Lucha por el Maíz Hoy Planta su Semilla," *Prensa Comunitaria*, September 5, 2014, https://comunitariapress.wordpress.com/2014/09/05/derogado-el-decreto-19-2014-ley-monsanto-la-lucha-por-el-maiz-hoy-planta-su-semilla/.

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85 Abbott, "Guatemalan Communities."

86 The key evidence unveiling Otto as "Major Tito" was Francisco Goldman's book, *The Art of Political Murder*.

87 Liza Grandia, "Guatemala's Democracy Is under Assault, Again," *Los Angeles Times*, January 17, 2019, https://www.latimes.com/opinion/op-ed/la-oe-grandia-guatemala-morales-20190117-story.html.

88 Copeland, "Repudiating Corruption," 2–3.

89 Krznaric, *What the Rich Don't Tell*.

90 Gutierrez, Introduction, 9.

91 Arundhati Roy, "War Is Peace," *Outlook* (New Delhi), October 29, 2001, 180–81, http://www.outlookindia.com/article.aspx?213547.

92 Aguilar R., *Tercer Informe Nacional*.

93 Tay, *Guatemala: Agricultural Biotechnology Annual* (2017).

94 Tay, *Guatemala: Agricultural Biotechnology Annual* (2020), 6.

95 Aguilar R., *Tercer Informe Nacional*. The membership of the committee has not been published, but I found one member through LinkedIn: Isabella García Caffaro, who was a consultant to the powerful sugarcane association, CENGICAÑA, which hopes to bioengineer a variety resistant to yellow leaf virus. García Caffaro, "Technology Transfer Advisor."

96 GLP, "Central America."

97 Tay, *Guatemala's Corn Sector Struggles*, 7.

98 Tay, *Guatemala: Agricultural Biotechnology Annual* (2018), 7 (emphasis added).

99 Tay, *Guatemala: Agricultural Biotechnology Annual* (2021).

100 Tay, *Guatemala: Agricultural Biotechnology Annual* (2020), 7.

101 Agriculture Ministry, "Crear el Comité Técnico."

102 SENACYT, *Comisión Técnica Intersectorial*.

103 CropLife, "Honduras y Guatemala."

104 Tay, *Guatemala: Agricultural Biotechnology Annual* (2018), 6.

105 World Bank consultants are often known to write their reports from hotel rooms with as little investigative research or community consultation as possible (see Goldman's *Imperial Nature*). Both the Embassy reports and the World Bank GEF proposals cite studies that aflatoxins in open-pollinated maize cause stunting in children and then claim that Bt corn will reduce such molds. However, any health practitioner worth his or her salt knows that Guatemalan children suffer from stunting due to severe malnutrition and insufficient calorie intake. The root cause of this childhood hunger is agrarian inequity. Drought, poor storage, and plant stress on marginalized lands also allow toxic molds to flourish on commercial hybrid corn, especially after General/President Ríos Montt dismantled the national silo system. Native maize is more resistant to these molds, especially when stored with traditional practices; nixtamalization also naturally reduces aflatoxins. So the "silver bullet" of Bt corn is not necessary to address the problem of stunting.

106 UNEP/GEF, *Strengthening and Expansion*.

107 Tay, *Guatemala: Agricultural Biotechnology Annual* (2021), 4.

108 Heilen, Cox, and López-Ridaura, "Maize Diversity," 194.

109 No longer do social movements describe Maya regions as "the rural area," but as "the territories." *Prensa Comunitaria*, an extraordinary Indigenous and popular journalist network and now the "go to" grassroots source for current events, began using this phrase for its reporting about regional and departmental happenings.
110 Copeland, "Meeting Peasants."
111 Sigüenza Ramírez, "Agroecología en Guatemala," 229.
112 Copeland, "Linking the Defence," 31.
113 Grandia, *Enclosed*.
114 Copeland, "Linking the Defence."
115 Author download, social media, September 2023.
116 For this and other declarations and press conferences from the epic fall 2023 protests, see https://www.facebook.com/Autoridadesindigenasdeiximulew.
117 Sigüenza Ramírez, "Ley Monsanto."
118 Sandra Xinico Batz, "El Regreso de la 'Ley Monsanto,'" *Plaza Pública*, September 15, 2023, https://plazapublica.com.gt/content/el-regreso-de-la-ley-monsanto.

CONCLUSION

1 Eaton, "Getting Behind the Grain."
2 On the same day in February 2004 that we visited Don Pablo's milpa, delegates from around the world were gathered in Kuala Lumpur for a conference of parties on the Convention on Biological Diversity. Attendees began discussing a new protocol for developing rules and procedures to redress harm to biodiversity from transboundary movement of GMOs (called living modified organisms, or LMOs, in the convention). Once finalized at the next COP in Japan in October 2010, it became known as the Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress. Ninety-two countries have signed on, including Mexico and Guatemala, but no countries have yet filed for damages under the protocol. The United States, a leading country giving legal refuge to agribusiness corporations, has refused to sign, much less ratify, this international protocol.
3 Eaton, *Growing Resistance*; Alkon, "Food Justice."
4 Pechlaner, *Corporate Crops*, 108.
5 Barlow, "Seeds of Change," 75.
6 Barlow, "Seeds of Change," 74.

7 Barlett and Steele, "Monsanto's Harvest of Fear."
8 Author email communication with Emily Eaton, 2023.
9 Pechlaner, *Corporate Crops*, 104.
10 Eaton, "Getting Behind the Grain."
11 Barlow, "Seeds of Change."
12 Eaton, "Contesting the Value(s)"; Lavin, *Eating Anxiety*, xix.
13 Both chambers also passed the "Nelson bill," prohibiting seed companies from trespassing on farmers' lands to collect samples. Barlow, "Seeds of Change."
14 Barlow, "Seeds of Change."
15 Eaton, "Contesting the Value(s)," 513.
16 Magnan, "Strange Bedfellows."
17 Spiegel, "Changing Face of Wheat."
18 Canadian Biotechnology Action Network, "GM Wheat Rejected."
19 Eaton, "Let the Market Decide?"
20 Canadian Biotechnology Action Network, "GM Wheat Rejected."
21 Schultz, "Where Will Japan Get Wheat?"
22 Ingwersen, "USDA Investigates."
23 Arumugam, "Illegal Genetically Modified Wheat."
24 Grandia, "Canary Science."
25 Grandia, "Modified Landscapes"; Galemba, "Corn Is Food."
26 Author videoconference with Alma Piñeyro-Nelson and Emmanuel González-Ortega, 2023.
27 Mooney et al., *A Long Food Movement*, 48.
28 Alonso-Fradejas, "Anything But a Story Foretold."
29 Seay-Fleming, "'Biotechnologizing'?," 142.
30 Alkon and Agyeman, "Introduction."
31 Dowdall and Klotz, *Pesticides and Global Health*.
32 Copeland, "Meeting Peasants," 837.
33 Schwartz and Rolando Corzo M., "Swidden Counts"; Ford and Nigh, *The Maya Forest Garden*.
34 White, "Planting Sacred Seeds."
35 Grist, "Cherokee Nation to Disperse Rare Heirloom Seeds Beginning Feb. 3," *Cherokee Phoenix*, January 27, 2020, https://www.cherokeephoenix.org/culture/cherokee-nation-to-disperse-rare-heirloom-seeds-beginning-feb-3/article_c7e7e307-8013-5b67-a558-0842514884d1.html.
36 Mauss, *The Gift*.

37 Richards, "Cultivation?"
38 Alinsky, *Rules for Radicals*.
39 Patel, *Stuffed and Starved*, 17.
40 Mohawk, "Subsistence and Materialism."
41 Rosemont, "Karl Marx and the Iroquois."
42 Krader, *The Ethnological Notebooks*; Edelman, "Bringing the Moral Economy Back In," 341.
43 McMichael, *Food Regimes and Agrarian Questions*.
44 Nader, *Unstoppable*.
45 White, *The Organic Machine*, 64.
46 Jalonick, "Poll Finds Most Americans."
47 Nader, *Unstoppable*. The goals of ultraconservative groups sometimes align with progressive causes, albeit for different reasons. For example, though they came from opposite ends of the political spectrum as independent candidates in the 2000 presidential race, Pat Buchanan and Ralph Nader forged an unusual camaraderie in opposition to free trade agreements.
48 Gladwell, *David and Goliath*.
49 Nader, *Breaking Through Power*, 12.
50 Stone, *The Agricultural Dilemma*.
51 Corporations' stock prices are even more fragile; one bad news cycle can mean disaster. For example, two professors who moonlight as the Yes Men (political performance artists who pull pranks to provoke corporate admissions about their real business practices) once pulled a simple stunt that sent Dow's stock price plummeting by 4 percent, representing a $2 billion loss, in one day. Yes Men, "Dow Chemical." With a "Yes Woman," Professor Diana Taylor from NYU, they presented Monsanto with a similar "decision dilemma" in Mexico through a prank press release that the corporation would support a national seed vault and a digital codex of Mexico's biocultural wealth. See Taylor, *¡Presente!*
52 Pollan, "The Way We Live Now."
53 Regis, "The True Story." Of course, the number of people diagnosed annually with lymphomas and leukemias (both of which are associated with GM crop herbicides) is twice the number of those with vitamin A blindness.
54 Altieri, *Genetic Engineering in Agriculture*, 7–8.
55 Ford and Nigh, *The Maya Forest Garden*.
56 Altieri, *Genetic Engineering in Agriculture*, 10–11.
57 Foley, "GMOs, Silver Bullets."

58 Balick, *People, Plants, and Culture*.
59 Beilin and Suryanarayanan, "The War between Amaranth and Soy."
60 Bétrisey, Boisvert, and Sumberg, "Superweed Amaranth."
61 Benfer, "Foods Indigenous."
62 Kudzu (*Pueraria spp.*), incidentally, has been found to be helpful in treating some symptoms of Long COVID.
63 Beilin and Suryanarayanan, "The War between Amaranth and Soy."
64 Puente, "Why Amaranth?"
65 Malten, "Rethinking a Weed"; Benfer, "Foods Indigenous."
66 Beilin, "The World According to Amaranth."
67 Singh, "The Little Grain."
68 Beilin, "The World According to Amaranth," 155.
69 Crosby, *The Columbian Exchange*.
70 Nafici, "Weed of the Month."
71 Beilin, "The World According to Amaranth."
72 Jane Brody, "Ancient, Forgotten Plant Now 'Grain of the Future,'" *New York Times*, October 16, 1984, https://www.nytimes.com/1984/10/16/science/ancient-forgotten-plant-now-grain-of-the-future.html?pagewanted=1.
73 Puente, "Why Amaranth?"
74 Bonfil Batalla, *México Profundo*.
75 Puente, "Why Amaranth?"; Bruce, "Amaranth Revival."
76 Benfer, "Foods Indigenous."
77 Puente, "Why Amaranth?"
78 Malten, "Rethinking a Weed."
79 Beilin, "The World According to Amaranth."
80 Marya and Patel, *Inflamed*; Rose, "From the Cancer Stage."
81 Cohen, "Decolonizing the GMO Debate."
82 Zhang et al., "Relationship of Phenolic Composition."
83 Douglas, *Purity and Danger*.
84 Mabey, *Weeds*.
85 Baek et al., "Evolution of Glyphosate-Resistant Weeds."
86 Montenegro de Wit, "Banking on Wild Relatives."
87 Iowa Legislature, Testimony by Heartland Hemp.
88 Loyola, "Stop the Ethanol Madness." Bob Dole, for example, was known as "the senator from ADM" for his support of a corporation that controls a third of the corn ethanol market. Pollan, "The Great Yellow Hope."
89 Clark-Riddle, "Winona LaDuke," 6.

90 LaDuke, "Tribes Revive."
91 Hanahan and Weinberg, "Hallmarks of Cancer."
92 I am a PhD not an MD, so the usual disclaimers about "first asking your doctor before taking" apply to all these herbal anecdotes.
93 Kimmerer, *Braiding Sweetgrass*.
94 Arvigo, Epstein, and Yaquinto, *Sastun*.
95 Langwick, "A Politics of Habitability."
96 Holt-Giménez and Shattuck, "Food Crises, Food Regimes," 132.
97 Ray, *The Seed Underground*, 40.
98 Hunter, "Dandelion History."
99 Valerie Goodness, "How Far Can a Dandelion Seed Fly? Ask a Native American," *Indian Country Today*, September 18, 2018, https://indiancountrytoday.com/archive/how-far-can-a-dandelion-seed-fly-ask-a-native-american.
100 Weed Science Society, "Common Dandelion."
101 Our Herb Garden, "Dandelion History."
102 Pretty, "The Magic Bean"; Carter, *New Lands and Old Traditions*.
103 Molly Doane reports that in Mexico it is also called Nescafé (Doane, *Stealing Shining Rivers*).
104 Carter, *New Lands and Old Traditions*.
105 Author communication on May 5, 2005, with Norman B. Schwartz, who remembered seeing Q'eqchi' farmers around San Luis, Petén, planting *Mucuna* in 1974.
106 Danny Hakim, "This Pesticide Is Prohibited in Britain; Why Is It Still Being Exported?," *New York Times*, December 20, 2016, https://www.nytimes.com/2016/12/20/business/paraquat-weed-killer-pesticide.html.
107 In the Maya world *Melipona* honey is famed for curing eye problems as well as digestive issues.
108 Stone, "Agricultural Deskilling."
109 Dorsey and Ray, "Paraquat."
110 Kurokawa et al., "A Heat-Stable Extract."
111 Recognizing that many of their patients with dismal prognoses turn to plants, the premier Memorial Sloan Kettering Cancer Center—ironically endowed by the General Motors and DuPont businessmen Alfred Sloan and Charles Kettering, respectively—maintains one of the best sources of herbal science for cancer. Oncologist Keith Block's book *Life Over Cancer* is another good source.
112 Marya and Patel, *Inflamed*, 55.
113 Epstein, "The Politics of Cancer."

114 Marya and Patel, *Inflamed*, 56.

115 Though also an apparent racist (he proposed injecting Puerto Ricans with cancer cells to study the disease), this Rhoads should not be confused with the mining executive Cecil Rhodes, who colonized Zimbabwe and Zambia. Marya and Patel, *Inflamed*, 58.

116 Romero, *Economic Poisoning*.

117 This Q'eqchi' word meaning cleft or crack should not be confused with Paxil, a drug recalled by GlaxoSmithKline.

118 Thompson, "Maya Creation Myths."

119 Grandia, *Stories from the Sarstoon Temash*.

120 Asturias, *Men of Maize*, (1993 reprint), epilogue, 306. Victor Montejo (Jakaltek) relates how the animals tie up the waist of ants to get them to reveal the source. See Montejo and Lampbell, "The Origin of Corn."

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LIZA GRANDIA is a cultural anthropologist and professor in the Native American Studies Department at the University of California, Davis. She is author of *Enclosed: Conservation, Cattle, and Commerce among the Q'eqchi' Maya Lowlanders*.

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