



## WEEDY FINANCE: Weather Insurance and Parametric Life on Unstable Grounds

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Despite relentless storms precipitated by the 2018 El Niño weather pattern, by late October the sesame planted on small commercial farms across northern Paraguay had begun to germinate. On a parcel managed by agronomists at the regional Centro de Investigación Regional (CIR; Regional Experimental Center) in the state of San Pedro, Raúl staked out meter-wide gridlines covering about a quarter of the 0.6-hectare plot of sesame. They were experimenting with various combinations of agrochemicals: fertilizers, weed killers, and pesticides. The fragile seedlings needed all the help they could get. Walking between the rows and stepping carefully over the gridlines staked out with string, Raúl inspected the plants with pride. He explained that in the previous year, the first two attempts had failed as grub infestations decimated the crop. Repeated planting and expensive chemicals had cost the CIR dearly; the budget overrun was nearly a third higher than the line of agricultural credit that the cooperative automatically approved for small-scale sesame growers. This experiment registered an attempt to understand the effects of evermore extreme weather, which seemed to encourage pernicious plants and pests while leaving the sesame weak and unhealthy.

The orderly, chemical-soaked grid squares on the experimental station stood in stark contrast to the overgrown hectare of land (*chacra*) in a nearby village where

I had been working with Don Wilfrido, a seventy-nine-year-old sesame farmer and member of the agricultural cooperative affiliated with the CIR. His parcel was covered in weeds and straw and dried plants. After ten years of farming niche cereals for the export market, Wilfrido had nearly given up on sesame. He recalled marching into the cooperative and announcing, “*Soy viejo y cansado* [I’m old and I’m tired]. I can’t do this anymore; I’d like to rest.” On hearing that, the manager of the cooperative rushed out of his office: “Quick! Get this man approved for credit. He’ll have to retain his membership if he borrows—you can’t leave, Don Wilfrido!” So, Wilfrido returned to his farm with burgeoning debt and an overgrown parcel to deal with. He hitched up his old plough horse to the wood beam studded with rebar and crisscrossed the parcel to flatten the weeds and prepare the field for planting. Wilfrido grumbled that the less labor-intensive strategy of disking the soil with a tractor (as the agronomists had done at the CIR) made it look tidier, but noted that it simply turned the weeds under, which later played havoc with the root systems of the sesame seedlings. Underlying his folk wisdom gleaned from years of farming was the reality that his impoverished rural town did not have access to a municipal tractor. An old man and his old horse, aptly named Kavaju Tuja (“Old Horse” in Paraguay’s Guaraní language), had to deal with the *malezas*, *yuyos*, and *capi’i* (weeds) as best they could.<sup>1</sup>

The contrast between the two farms is but one instance of the inequalities in capital and expertise that stratify rural Paraguay. However, global climate science and financial systems bring them together in an unexpected way. An additional, intangible grid overlaid both the orderly CIR and Wilfrido’s weedy parcel. Advances in data science and technology are creating new opportunities for insurance (Singer 2019). The agronomists and Wilfrido had purchased a novel type of crop coverage that triggers a claim if remote sensing data measures certain weather conditions. This specialized “index-based agricultural insurance” (IBAI) differs rather markedly from the more familiar so-called index funds of contemporary finance, which are engineered to mimic the composition and performance of a market index like the Dow Jones Industrial Average. Instead, agricultural index insurance is oriented toward climate science: the predictive models of agrometeorology that synthesize temperature, rainfall, wind, and ground moisture, among other data, which all have a bearing on crop health. The key to these policies is the “parameter,” also often leading to another name in use, parametric insurance. When a key hazard variable exceeds a predetermined threshold (Figueiredo et al. 2018) and the value of the underlying weather index causes the insurance to “trigger” (*gatillar*, *disparar*), farmers automatically receive a payout. If certain conditions

are met—say, too hot and too dry for too long—the “hydrological stress index” (*estrés hídrica*) pushes into the red, the parameter is triggered, and the insurance company will pay all the farmers within the grid-square on the map. Conversely, if the remote sensing data indicates that everything is fine, no payout occurs even if on the ground the sesame perishes from adverse growing conditions (see [Johnson 2013b](#); [Clapp and Isakson 2018](#)). Parametric policies constitute insurance in the traditional sense that they *pool* risk among farmers who buy into the scheme, and *transfer* their myriad personal and agrarian risks to impersonal financial markets. But in another sense, they depart from conventional insurance contracts, as they do not indemnify losses ([Kar 2017](#))—they are a weather hedge rather than crop insurance. Thus, critical insurance studies have argued that parametric insurance acts less like an insurance scheme that depends on an adjuster evaluating casualty claims (*siniestros*) for verified crop losses, and more like a weather derivative ([Esunge and Njong 2020](#)). The contracts are written on a climate model and decoupled from actual farms and fields, as the plants themselves become dematerialized into abstract biomass.

Today, weather-indexed insurance is gaining popularity within international development policy, particularly in the Pacific and the Caribbean, as intensifying hurricanes and cyclones lash both regions. Governments now rely on insurance facilities for catastrophe bonds to finance disaster recovery ([Johnson 2013a](#); [Z. Taylor and Weinkle 2020](#)). Meanwhile, at the local level, aid organizations have peddled microinsurance IBAI policies for agricultural products as diverse as cattle ([Bernards 2018](#)) and teff ([Peterson 2012](#)). While parametric insurance remains relatively niche, the wider market for weather derivatives was valued at US\$32 billion in 2007–2008 ([Randalls 2010](#), 712).

Through parametric triggers, weather offered up opportunities for extracting value and profits in an increasingly troubled climate. All three subjects—agronomists, Wilfrido, and financial brokers, albeit in profoundly unequal ways—were reassessing the empirical grounds for those experiments. “Turbulence” is financialized ([Cooper 2010](#)) by a chain of local agricultural cooperatives, insurance agents, brokers, and global reinsurance funds. The weather index and its hazard variable become a proxy for crop yield, calibrated to a model of normal climatic conditions expected to make sesame thrive. While the expansion of speculative finance into new zones of risk is hardly novel, I was surprised to find that parametric insurance depended not so much on healthy sesame as on the pests that thrived among the profitable plants. As I will go on to show, weeds articulated across multiple grids: the meticulously ordered experimental station, the genealogical and intimacy grids

(Povinelli 2002) that matched up financial products with familial obligation on Wilfrido's parcel, and the satellite grid that aggregated data about weather patterns that would make pests thrive.

The purpose of this article is to develop an account of how Paraguayan practices of weed management engage financial forms and to show how weediness (rather than crops) marks out the grounds through which weather insurance becomes imbued with value. And since insurance is not the only register of peril in agrarian settings, I sketch out a series of concerns about weeds as an entry point and helpful heuristic for multiple overlapping kinds of speculation in a multispecies, capitalist, and troubled landscape.<sup>2</sup>

Commentators have widely observed that weeds are good at revealing a variety of social phenomena: the proper ordering of human landscapes (Robbins 2012; Twigg 2017), enclosure and capitalist accumulation (van Dooren 2012), the temporal promise and disappointment of modernization (Carse 2019; Hetherington 2019b), environmental crisis and its particular abandonments (Tsing 2015a; Myers 2019), and so on. It might be argued, following the logic and language of certain anthropological approaches to global capitalism, that weedy landscapes are ripe with alternatives. They emerge “between subsistence and the market, between cultured nature and natured culture, between the one-way path to progress and the space on the side of the road,” (Jones 2019, 6). “Weeds complicate the temporalities of growth and decay, they live in the interstices between environment and infrastructure, and they are both unwanted (by definition), and the sign of life's future” (Hetherington 2019b, 9). The relative valuation of “wild seed, domesticated seed” (van Dooren 2012, 27) has recast human/crop relationships as “companion species [that] enact a world in which people and plants *emerge*, always already entangled with each other.” There is an implied sympathy with weeds as a lively and resilient form of life that can thrive in ruins—economic, environmental, anthropogenic (Tsing 2015b; Myers 2019). Weeds make compelling antiheroes and agents of resistance, offering hope in a blasted landscape (Berrigan 2012; Kirksey 2015), even if they are difficult companion species with which to live. To paraphrase Natalia Cecire's framing of the related mycological turn,<sup>3</sup> they promise to rescue capitalism in an eco-friendly “weedy fix” that is both alternative and generative. But how did the multiple, overlapping speculative grids—weather models, the aesthetics of the modern farm, and a grid of reciprocal kinship connections that let an old man live his life—contend with the weeds?

What intrigues me about how weediness registers within financial practices such as weather insurance is how it triggers an inversion of expected sources of

value and profit. That is, weeds are complications in agrarian settings that thrive in precisely the conditions marked as catastrophes by parametric hazard variables, conditions in which sesame can no longer survive. Weedy finance as a site and an analytic attunes us to the sheer thorniness of those hazard variables, the simultaneous promise and threat of weedy generativity to the climate-risk models on which they are engineered, and the resilience the insurance industry hopes to create for itself by adapting to those pests. This figure/ground reversal calls for a creative redeployment of the processes of “capture and conversion” (Bear et al. 2015) or “translation” (Farquhar and Kelly 2013; Tsing 2013, 23) that feminist anthropologists identify as the mechanism by which capitalist social relations “are generated out of divergent life projects” (Bear et al. 2015). Unlike the re-valuation of purportedly native plants or diversified ecosystems as “vital vegetalities” (Chudakova 2017, 342), certain plants remain the target of weeding even as they are incorporated into financial practices like measuring the weather and modeling crop health. Thus, I am not appealing to commodification through purification that uses and obviates noncapitalist social relations (Tsing 2013), much less seeking to decenter the human and reclassify weeds in a taxonomy of performative capitalist devices (Lee and Martin 2016). To get a handle on the nexus of how weather and markets are valued, we need to consider how speculative financial practices themselves might also constitute collective ecological acts.<sup>4</sup>

Weedy finance depends on cultivating particular *grounds*: the grid-square on a satellite map, a parcel of sesame, a four-meter-square weather station, or a grid of genealogical descent. Weather insurance seeks those grounds through specific parameters—that is, hazard variables in a weather model set to trigger at a predetermined threshold (Figueiredo et al. 2018). Against the binary predictions of loss triggered by parametric variables, the expansive interdependencies of Wilfrido’s human and nonhuman kin prove especially poignant. How might life be imagined other than through the parameterization of insurance models—variables that become ever more speculative in a turbulent climate? Tracing insurance agents’ ongoing effort to know and inhabit their own grounds reveals once again the importance of kinship as the alternatively generative institution and site of pooled risk. These are relations relentlessly parameterized and enclosed: rendered into contract and credit, fields laid barren, absent children sent to migrate. Not by accident do kin-based interdependencies—including human-plant life cycles—suffer and respond when finance fails in its own mutual and ecological obligations, or when those mutual obligations benefit profit, not people. I end by suggesting that actually dwelling in these weedy grounds offers an opportunity for some speculative

practices of my own. An anthropological imaginary might posit “weedy finance” as a critical standpoint and set of political claims for casting climate-based finance as one of the lively systems that can and should be intentionally and selectively weeded out.

### CLIMATE

Weeds and finance are both closely associated with expansion. Weeds “invade” pioneer habitats (De Wet and Harlan 1975, 100), and archaeological research indicates that their evolutionary copresence with crops contributed to complex histories of the re-domestication of key cultivates as agricultural landscapes expanded and receded (Langlie et al. 2014, 1604). As complications in agrarian settings, weeds are not simply metaphors—they are quite literally the evolutionary consequence of long-term cohabitation in space, and they sprout up in all domesticated landscapes. Finance is likewise associated with pioneer habitats, including “salvage accumulation” that constantly seeks “edges” to occupy (Tsing 2015b).

It is telling, then, that this essay germinated as I straddled a grid of string, feeling the claustrophobia of being hemmed in on all sides. Raúl shouted instructions indicating a scoop-full of chemicals here or there or over there, ticking squares off the graph-paper map affixed to his clipboard. The embodied experience of mincing steps, pulling gridlines taut, and measuring out grams seemed at odds with these expansionary logics of weeds and finance, exemplified in the remote and capacious work of satellites overlaying these grids across undifferentiated biomass—efforts that were, curiously enough, indifferent to the plants that grew there.

Farmers, meanwhile, were anything but indifferent to the “plant matters” (Chudakova 2017, 342) of their parcels: crops and weeds. In fact, they refer to the uncultivated peripheral zones bordering fields as *yuyales*, weedscapes. Agrarian political economy has long observed that agriculture is performative (Richards 1993), such that farmers’ work is not merely economic activity but also performs quotidian roles and scripts directed toward different kinds of audiences (Flachs 2019, 49). For instance, Indian cotton farmers deployed discourses of “a good yield” to normalize farm labor in a context of deeply ambivalent and ambiguous returns, becoming “the performance that remains possible for farmers seeking profits and recognition from their agriculture” (Flachs 2019, 55) in a baffling and uncertain market for genetically modified (GMO) seeds. During fieldwork I conducted from 2017 to 2019 in rural San Pedro, the degree to which sesame farmers and the agronomists who worked at agricultural cooperatives saw themselves as part of



**Figure 1.** Agronomists at the Regional Experimental Center test chemicals on their demonstration parcel. The hectare of sesame was also covered by a parametric insurance policy.  
Photo by Caroline E. Schuster.

the developmental success story of weed-free modern agribusiness informed their rural identity: agriculture’s performative nature must also consider “the neoliberal stages on which this performance occurs” (Flachs 2019, 57). Monitoring and managing weeds made for key aspects of this performance.

Cultural and human ecologists have conducted vital work “showing how environmental perturbation is negotiated” (Batterbury 1996, 2008, 64) in dynamic tension between climate knowledge passed intergenerationally and through social networks and substantially different assessments by scientific experts. Given the careful attention by farmers to weed-crop relations, and the fact that it was the grid on which the insurance product was engineered, I felt taken aback by the repeated failures of the insurance company to deliver on its own technologically sophisticated promises and expertise. By the fourth time the insurance company, which I call InsurTech, canceled a scheduled visit to rural San Pedro, Raúl and his colleagues were quite vexed. The visit was important because the InsurTech team was meant to perform software updates, maintenance, and alignment of the company’s weather stations. Twenty-five of these are scattered throughout the southern part of the state. They were built with funding from multinational aid agencies—the Inter-American Development Bank, its capital fund FOMIN, and

Australian Aid. Together with satellite maps, the meteorological data from the weather stations informed the hydrological stress index that constituted the basis for InsurTech's parametric microinsurance product. Critical insurance studies have characterized parametric insurance as an "overly technical approach to risk management" (M. Taylor 2016, 237). The farmers who aspired to performances of modern agribusiness found it disconcerting that InsurTech did not appear to be particularly concerned about maintaining the infrastructure for their high-tech weather index or collecting data from their stations.

While commodities futures markets have long undergone seasonal adjustments, the market for financial products that enable companies to trade on weather indices emerged in the 1990s, pioneered by energy companies such as Enron and Koch Industries. Weather had been instrumentalized for a variety of purposes long before the advent of derivatives markets. James R. Fleming (2005, 176) chronicles the linked histories of scientific instruments and militarism, noting,

The US Army Signal Service, established as a special military unit during the Civil War, continued its military mission into peacetime as a national weather service and intelligence gathering agency. From 1870 to 1880 . . . the Corps pursued with a vengeance stormy weather, striking workers, renegade Indians, and other threats to domestic tranquility.

By the 1940s, commercial applications for meteorology began to emerge, especially for aviation. As meteorology professionalized worldwide in the twentieth century, a market for financial products and services emerged using public data from the National Weather Service (NWS) and its umbrella agency, the U.S. National Oceanic and Atmospheric Administration (NOAA). To mediate the intense rivalry between public and private-sector meteorologists—epitomized by the all-out warfare led by AccuWeather (founded in 1962) against the NWS<sup>5</sup>—both the United States and the United Kingdom established regulatory frameworks that separated out meteorology for public and commercial interests. The explosion of commercial forecasting (Fine 2009) allowed companies to trade on weather indices and hedge against weather-sensitive costs.

The boom came in the 1990s, as Samuel Randalls (2010, 712) notes: "Consequently, the new weather product became derivatives (rather than insurance), because energy companies could more readily adopt financial products than the more heavily regulated and licensed insurance products. This also meant that weather derivatives paid out as soon as the weather parameter was triggered in the con-



tract, regardless of whether damage occurred or not.” This “geomoney” is based on a series of conversions that are “imagined and storied as able to capture and harness the vagaries of the so-called natural world and transform the associated risks into financial instruments ready for circulation” (Pryke 2007, 578). Markets for weather-indexed financial products de-couple weather from the everyday experience of crop health and failure in rural settings by “re-territorializing it within the abstract space of globally diversified weather portfolios” (Pryke 2007, 585). Meteorology itself constituted a key technology of globalization—that is, of understanding planetary processes and generating the infrastructures to engage them with “world-scale institutional-technological complexes” (Edwards 2006, 239).

In Paraguay, as with many development settings of “financial inclusion,” parametric insurance is the first formal “risk pooling and transfer product”—that is, insurance—available as a stand-alone financial service for the rural poor (Johnson 2013b, 2663–64). The commoditization of risk is far from new in the Paraguayan countryside; commercial microfinance has already saturated rural households, and many of these loans carry debt-cancellation and life insurance policies (Schuster 2015, 2016; Kar 2017). Yet insurance remains quite limited. The markets for private health insurance, motor vehicle insurance, and life insurance make for a tiny proportion of financial services, which are geared mostly to credit. Indeed, scholars of biopolitics cast insurance cover as a defining feature in stabilizing the developing world as an object of intervention and regulation. “Developed life is supported and compensated through a range of social and private insurance-based benefits and bureaucracies. . . . In contrast . . . surplus non-insured life is the subject of development, while . . . self-reliance is its biopolitical object” (Duffield 2007, ix). In development-oriented microinsurance, self-reliance—re-branded as *resilience* in the age of climate catastrophes and pandemics—is newly subject to financialization, as self-reliance is no longer an object of intervention but a new zone of risk. In a world of extinction and extreme warming, planetary parameters of human survivability are devolved and privatized as they are relocated onto farms such as Wilfrido’s.<sup>6</sup>

## CONTROL

I first tuned my ethnographic senses to this convergence of weeds and finance on the streets of Asunción. In the well-heeled suburbs of Paraguay’s capital city, stenciled graffiti protested Monsanto agrochemicals, or *agrotóxicos*, “agrottoxins,” as activists and critics of industrialized plantation agriculture call them. Yet in a year of fieldwork in rural northern Paraguay, nobody ever expressed outrage

or distress at *agrotóxicos*. Quite to the contrary, agronomists prefer to use the term *agricultural defenses* (*defensores agrícolas*) when referring to all types of chemical products for use on farms. And farmers had a complex relationship with Monsanto's flagship weed killer, Glyphosate, tied to their ambivalence about the costs of all agricultural inputs, from hiring field hands to buying fertilizers or seeds. The struggles over chemicals, weeds, and weed management, though, proceeded along another vector—one that cannot be so neatly summed up in a slogan like “we are expelling Monsanto [ñamosẽke Monsanto].” Tellingly, the graffiti stenciled next to the Monsanto Jolly-Roger was a heavily stylized ATM machine promising informal lending with no credit check from Paraguay's Equifax-owned credit ratings service (Schuster 2014). Taken together, they are a study of stylized capitalist ecologies, and the promise and limits of growth.



Figure 2. The toxic Jolly-Roger is captioned “we are expelling Monsanto” in Guaraní (left). A stylized ATM machine includes a phone number to request informal credit (right).

Photos by Caroline E. Schuster.

The appalling success of Glyphosate in killing all plant life that has not been engineered to survive its toxins (Robbins 2012) describes a moment of agribiopolitics (Hetherington 2020): agrarian labor has always selectively eradicated some forms of life so as to cultivate others. As Kregg Hetherington (2019a, 42) notes, Paraguay's “long Green Revolution [can be read] as a slow process of intensification of killing and a concentration of labor and death in new forms of property.” Much more can be said about the governance of human and plant health through mobilizations of the state in San Pedro, Paraguay. The imperative to use agrochemicals to eradicate weeds from sesame fields is one piece of the puzzle. Today, informal intermediaries (*acopiadores*) and formal agricultural cooperatives connect family

farms such as Wilfrido's to local markets for agricultural inputs like chemicals and the global export market, primarily in Japan. Early on in developing parametric insurance for sesame growers, InsurTech had forged a working relationship with the peak body of local agricultural cooperatives and worked closely with one local association that I call Multiactiva, which also managed the CIR experimental station. In fact, the CIR was also covered by a parametric sesame policy. For some cooperatives such as Multiactiva, buying InsurTech's crop insurance was mandatory financial cover for any farmer taking out a loan for sesame-related farm inputs and anyone who expected to sell sesame back to the cooperative at the end of the harvest cycle.

The arrival of sesame in rural Paraguay was not orchestrated by state-led agrarian reform, but rather through a bilateral aid arrangement. The United States Agency for International Development (USAID) saw sesame and other niche cereals as a promising commercial cash crop that could boost farm income in poor rural communities. The first major report appeared under the aegis of the USAID-supported Paraguay Vende, or Paraguay Sells, program in 2009, documenting the efforts to create partnerships with private businesses with the objective of offering technical assistance and support for sesame production. The report noted that although sesame requires minimal or zero levels of agrochemicals, "the success of sesame is based precisely on the greater presence of intermediary businesses, such that sesame constituted a frontier of expansion [*terreno de incursion*] of a new generation of agricultural enterprises" (USAID 2009, 15). Pioneering companies such as Shirosawa, with connections to Paraguay's Japanese colonies (Kohlhepp 1984), experimented with ultra-low-input production by subcontracting to campesinos who used traditional farming methods like horse-drawn seed drills and manual harvest with machetes. A new financing model that enhanced the role of intermediaries as both suppliers of farm inputs and as buyers and exporters meant that Shirosawa could distribute risk across many farms. At the peak of sesame production in 2004–2005, the Ministry of Agriculture census recorded 37,540 hectares planted in San Pedro Department, up from 6,800 in 2000–2001.

Commercial sesame, then, is too niche to precipitate plantation monocropping. Yet the many small farms that embraced the "sesame craze," as one agricultural extensionist described it, found themselves enmeshed in an expanding network of agribusinesses that commercialized all aspects of production, from fertilizer to final sale. This in turn led both farmers and the agricultural experts they relied on to grow these unfamiliar plant species to embrace the aesthetics and techniques of commercial farms, epitomized by chemically cleared, weed-free

fields. The desire for and performance of modern farming was a central concern when I discussed the fourth cancellation by the InsurTech maintenance team tasked with repairing the company's weather stations with the CIR's agronomists. Abilio, an agricultural technician who worked for Multiactiva as a sesame specialist and sometimes planted sesame on his own farm, was not impressed. "They had better come soon; the station is full of *malezas*, it's full of weeds," he said.

When the topic of weeds in the weather station came up, the team of agronomists were sitting in a small patch of shade taking a break from working at CIR, which also functioned as a "demonstration parcel" (*parcela demostrativa*) for farming best practices. We had just recently sprayed the 0.6-hectare parcel of sesame with a mix of Glyphosate and insecticide to protect the germinating seeds and keep them from being choked back by *malezas*. Their crop was sold on as organic sesame, but the Ministry of Agriculture does not specify a list of approved or banned chemicals. The regulatory framework for Paraguayan organics, codified in the 2008 Law No. 3481 for Development and Control of Organic Production, delegates oversight to a byzantine "coordination" among three agencies that separately "establish internal methods and procedures" ([National Congress of Paraguay 2008](#), Article 12), without centrally available approved lists of organic products.<sup>7</sup> Agronomists like Raúl and Abilio depended almost entirely on extensionists from USAID and from big exporters like Shirotsawa who had their own in-house testing facilities to determine whether the sesame was contaminated. Like the parametric insurance, they were mostly concerned with "triggers" and limits linked to binary logics of losses—that is, testing regimes that would detect unacceptable levels of residual chemicals in the final export products. Organic certification, then, was a question of time, in much the same way that the coverage cycle of the weather index engineers itself to the life course of sesame and its parameterization through chemical contamination or hydrological stress. Organic sesame exemplifies parametric life. For agronomists, plant life began at germination, which also began a chemical life course linked to a series of habitually used products. In this case, most of the chemicals washed away in the rain that came just hours later—it was one of the many failed speculative experiments of weedy finance.

Abilio's comment about the station being *lleno de malezas*, full of weeds, suggested it was an affront to all the technical knowledge about modern farm management that he was trying to bring to his clients at the cooperative and put into practice at the CIR. Amalia, a human ecologist also working for Multiactiva, was seated in the shade with us—she had a station on her own land. Hearing that InsurTech might send a team the following week, Amalia fretted aloud about

whether she'd be able clean up the enclosure before they arrived, not wanting to *pasar vergüenza*, “suffer embarrassment” when they came to do maintenance. Like Abilio, Amalia also worried about the *maleza*, but for her performance of a tidy and orderly farm. It is in this sense that the “Anthropocene is weedy,” complicating narratives of decline and progress: “Not only because out-of-place plants grow up in the cracks of old mortar and cling to the bottom of tankers, but because it profoundly complicates the categories of life on which social science has for so long depended” (Hetherington 2019b, 9). When the conventional separation of biology and culture no longer holds, the specificity of financial (human socioeconomic) life and plant (domesticated chemically resistant) life are put in doubt.

### HARVEST

To understand the success of these weed-infested enclosures as an insurance infrastructure even as they failed as a local performance of modern farming, I had to attune to the rhythms and cycles of policy coverage and premiums rather than the agricultural cycles of sesame. InsurTech negotiates the premiums for its insurance on the global reinsurance market through a broker, who seeks an underwriter for the insurance product. The key to all of this is so-called risk transfer (Barnett, Barrett, and Skees 2008; Peterson 2012; Johnson 2013b; M. Taylor 2016; Aguiton 2019). A local insurance company would have to hold massive cash reserves (far more than it received in premium payments) to cover its exposure—a scenario in which catastrophe strikes and all the policies trigger at once. So, the company resorts to larger pools of capital on global markets, transferring risk to big players like SwissRe, MunichRe, Berkshire Hathaway, Lloyd's, and the like through what the industry calls global reinsurance (Z. Taylor and Weinkle 2020).

Actuaries (i.e., people who price risk professionally) at these big funds look at, say, ten-year weather data in Paraguay. They agree to underwrite the catastrophe losses for InsurTech for a price determined by their loss models. Although 2018 marked only the second year that the parametric drought insurance had been offered in Paraguay, InsurTech already managed to negotiate down the premiums by about 10 percent, thereby offering coverage to sesame farmers at a lower price.<sup>8</sup> As we were waiting for farmers to gather at a local cooperative to listen to InsurTech pitch the company's sesame insurance, Alfonso, a specialist in agricultural insurance and an architect of InsurTech's index product, chatted amiably with me about the behind-the-scenes work to lower premiums. He explained that their broker was able to secure a better rate via their global reinsurance partner because their actuaries felt “convinced” (*convencidos*) by the quality of the index itself

and its forecasting of weather events based on historical data. Crucially, the model proved persuasive because, at the industry level, this was the grid on which the product was engineered. The weather stations and satellite data had calibrated a rainfall index that fit neatly within the reinsurer's own climate models; accuracy of the index meant access to global pools of capital.

Meanwhile, global reinsurers describe the "frontier" as data sourcing. In a global forum, a representative from SwissRe discussed the challenges of implementing an environmental, social, and governance (ESG) risks framework. Looking back over the past decade he recalled:

At the time we had a system in place that put heavy emphasis on expertise and manual referral processes. . . . And that just overwhelmed the team. . . . And we couldn't keep on hiring experts. So, for us the hurdle there was to realize the importance of data, the importance of automation, the importance of integrating the process [*sic*] into the underwriting process.

In material terms, this meant that data sourcing—including the manual referral process and development of expertise—was outsourced to local partners such as InsurTech.

A key speculative register, then, is climate data and its integration into the underwriting process. As insurance agents scrambled to define the limits of survivability for sesame plants by gridding out ever more precise maps of weather and crop health, these unstable grounds left InsurTech in a curious position. The weather stations proved crucial before the coverage began (and before rainfall actually mattered for the farmers looked after by Abilio and Amalia), when the insurer was negotiating premiums through their broker. But in a year when El Niño was washing away the tiny seedlings on sesame farms, drowning the fields under downpours, and threatening to bog down the tractors that would come to disk the soil and prepare for a second attempt at planting, InsurTech could be confident that the parameter (drought!) was in no danger of triggering. They could wait out the bad weather before sending in the team to fix the stations. Climate models can be reified in a way that permits speculative instruments like derivatives, but bad weather is just bad luck.

When the team from InsurTech finally made it out to perform maintenance, they didn't actually have time to knock back the weeds as Abilio and Amalia had hoped. The weed whacker [*desmalezadora*] and backpack sprayers remained forgotten in the bed of the company truck. As the IT specialist plugged in his laptop and

started to run diagnostics, Nelson, the project lead from InsurTech, explained that they had briefly considered paving over the enclosures, as this would require less upkeep and would “look better.” But the equipment manufacturer had cautioned them that this would disrupt the temperature readings due to reflected heat off the hot cement, and “interfere with the data, with the sensors.” The stations required about the same amount of plant matter as the surrounding fields for the sensors to read correctly, Nelson explained. Efforts by farmers such as Amalia to clear the enclosures and manage the weeds actually biased the temperature readings from the stations.



**Figure 3. Weed-infested weather station owned and operated by InsurTech.**  
Photo by Caroline E. Schuster.

Standing just outside the locked gate of the four-meter square enclosure, Nelson explained that the weather stations had a data storage capacity of six months of readings. If the team failed to connect remotely, the data would have to be downloaded onsite and the signal adjusted through a manual update. “But normally maintenance is done from Asunción; we do it from the office. We came with the team to also see the state of the vegetation, shall we say. What’s inside the enclosure. In some cases, we have cases where there are lots—lots of weeds [*mucha*

*maleza*]. In this case, for example, it's intermediate. That doesn't yet merit any cutting." Walking around the enclosure and pointing to the equipment lodged within, Nelson noted, "what you see here, you will see in all twenty-five. All of them. Here we standardized everything, from the dimensions of the perimeter fence, the distance, the altitude of the arm, the tension wires. They are all identical." This also meant homogenous plant growth within the enclosures. The quest for exquisitely calibrated parameters generated parametric life: standardized weeds, conceived as biomass. He even described how a single contractor had installed all the fencing to guarantee uniform dimensions, type of wood, depth of posts, and the like. *Bien estandardizado*, "well standardized." This was all the basis of finely tuned hazard variables and their triggers; weeds were internal to the parameters.

Danny, the IT specialist subcontracted to InsurTech, set about updating the firmware on the station, his laptop propped up on a milk crate, wires snaking out into the grass and climbing up the pole into the equipment box. Nelson, meanwhile, charted the long-term goals of InsurTech, and their aspirations for weather derivatives.

The idea is that we will continue, and we want to risk—risk, I'm saying! [laughing]—or, well, yes, risk. Risk doing another—of extending the model to give coverage to other risks. Which would be excess moisture. So, we would go for the two extremes. One for hydric stress, the other for excess moisture. It is another recurring risk too. In fact, just this year it is giving us that, right? We could say, if we were to have had this—but of course if we had known, obviously, we would have changed.

He was self-reflexive about mobilizing the language of risk to describe his own work, entailing the financial risks with climate risks. And he framed his work in a speculative register (*si hubiesemos tenido*), speaking in the subjunctive tense to assess the woulds/coulds of his scenarios. Given that the sky was already darkening with clouds, those entailments were hard to miss. However, Nelson turned the situation around to recast the risks of climatic uncertainty as an opportunity on two counts. First, he noted that they were working toward a model that would "mature" over time by incorporating other risks, other coverage, other crops. Second, the excess rainfall was improving the "statistical rigor" for the index. Nelson concluded:

N: The study is advancing with the agroclimatologist. He, what he is wanting is, this year is really good for him to be able to characterize . . .



C: Yes, because this would be a twenty-year or a fifty-year event?

N: Exactly. And to be able to incorporate this and see in what form we can take this to an index, like we did with hydric stress. And then this index, to see how to incorporate it into the coverage model of the insurance. And well, there we are. And this is all part of the work [laughing].

C: An important part.

N: Yes, yes. And to offer basic information and supports the model of micro-insurance. The data is also shared with the cooperatives, with the producers so that they can take decisions about their crops, and in the meantime [*y de paso también*] to capture these data is important at the level of agroclimatology to make comparisons of any deviation [*desviación*] that there might be with respect to what the satellites are reporting. Because the index model is constructed through satellite data. This is a form of calibrating the model.

The academic meteorologist who had consulted for InsurTech and helped build and calibrate the hydrological stress index was thrilled to have the weather data from this El Niño year. The season's catastrophic rainfall would provide valuable data about weather disasters and improve the model sensitivity for the coming year, when the company hoped to expand coverage to include excess rain as well as drought. For the insurer, the catastrophic rain itself offered a resource to more effectively price risk in the future, even as it washed away crops and threatened its own stations. This dynamic tension was constitutive of InsurTech's own forecasting models, and the resilience of its own product.

Nelson's assessment of the resilience of his company's weather model shifts the grounds for accumulation in an age of amplified environmental risk. Simply put, the bottom line, quarterly profits, extracting premiums from the productivity of small farmers—these do not make for the animating logics of InsurTech. The weather derivatives relied on subsidized seed funding from multinational aid agencies, and the small team led by Nelson understood that the market for policies sold to fewer than five hundred sesame farmers hardly justified the expenses his team put into marketing the product, looking after the weather stations, liaising with the agroclimatologist, and so on. Parametric microinsurance would probably never be profitable for the insurance company, even once it "matured." Locking the gate behind him and packing the equipment into the truck, Nelson concluded with a modest assessment. "We were learning from the whole process, which we were doing with the producers themselves. So, we were trialing it too [*ensayando también*], learning from them, and from our own work [*de nuestro mismo trabajo*].

A process of ‘feedback’ from our own work.”<sup>9</sup> Weedy finance tracked a shift in what it means to be an expert farmer, away from land management and its intimate attention to the interactions between certain plants, pathogens, weather, and chemicals. Instead, standardized weeds moved agrarian labor toward the digital mastery of laptops, telecoms, and remote sensing. These latter were calibrated to the far sight of climate and investment, not the imminent agricultural lifecycles of plants and people.

Weedy parameters are not innocent. In a global insurance forum titled “Sustainability Leadership in Insurance,” co-convened by the UN Environment Programme’s Principles for Sustainable Insurance Initiative (PSI) and SwissRe, the risk-assessment capacity of the insurer was framed as a public good. A spokesperson for the regulatory sector explained:

It is actually *the* job or the dedicated experience and knowledge of insurers to put a price on risk. . . . And these can send very strong signals to the outside world about whether risks are too high or extremely high. It may be also not insurable anymore. And with this strong signaling, through their contractual terms and through their premium, insurers can actually promote risk prevention behavior.

The capacity to define the ever-shrinking grounds of parametric life through climate-based redlining is sold back to the public as a social good.

### RESILIENCE

Meanwhile the cycles of rain, weeds, and finance were not so easily held apart for members of Multiactiva such as Wilfrido, the farmer who has planted sesame for at least a decade. After a series of storm systems pummeled the region, I was relieved that the sesame had sprouted just fine. However, weeds thrived in the damp, overcast weather, threatening to choke out the seedlings and overrun the parcel. Walking through the field and inspecting the newly germinated sesame, Abilio and Raúl instructed Wilfrido that while the forecast was good for his fields, he urgently needed to clean up the parcel and get rid of the weeds.<sup>10</sup> Since chemical weed killers had proven ineffective in the rain based on their own experience from the demonstration parcel, they advised Wilfrido to withdraw US\$100 from his savings account at Multiactiva to pay personnel to help clear the fields. This was about four times as much as his insurance premium and one-third of the payout, should drought trigger the parameter. Hired help was urgent because Wil-

frido's six adult children had all migrated out of the rural sesame belt, and most of them now lived in Argentina. In fact, the reason Wilfrido was so open to a duo of women anthropologists—my field assistant, Rocío, and me—helping as field hands was that his daughters, who had customarily worked the fields with him, were absent. Though he grumbled about the expense of hiring more personnel, Wilfrido also hesitated to use weed killers on the organic sesame crop. Along with several other farmers in the area, he'd had a calamitous experience with chemical drying agents (*secante*, commonly used on soy) for his chia crops a few years ago. These agrochemicals had been specifically endorsed by the cooperative's agronomists, but they triggered contamination when the chia was tested for export. The disaster left him deeply in debt to the cooperative.

During a break from working in the fields one afternoon, Wilfrido returned to reminisce about the ruined chia crop. He began by telling us about how much he had earned in the previous cycle. Talking about the *ganancia* [income] from the good year, he said that more than \$1,000 “was left over” as profit [*sobró*] after he had paid off the debts to the cooperative. He went to the cooperative with his chia harvest the following year expecting the same profit, and when it turned out that the chemicals had ruined the crop, he had to go home and break the news to his wife, Ña Neca. He said, “Neca, *dame un beso*, give me a kiss,” when he told her how much they'd lost. As Neca wept into her handkerchief, he told her “*Así estamos—uno canta, uno llora*, that's how we are—one sings, and one cries. *Hay tiempo para llorar*, there is a time for weeping.”

Rocío and I sat in silence, stunned by the story of agrotxin-induced tears, the co-production of two complex chemicals that flowed through the risky nexus of weedy finance on the farm. We paused, looking out at the sesame fields, and thought about speculation and losses in all their many registers. To lighten the mood, Wilfrido transported us out of the everyday dilemmas of his farm, recounting a classic rural myth from Guaraní folklore. Standing in the sesame field, he told of the Karãu bird—the story of how it was given its mournful cry. There was a time, Wilfrido told us, when a young man went out looking for medicine for his ailing mother. He happened on a festival and stayed there dancing late into the night. His friend came and told him, “Your mother is dead, you should go to her.” He responded, “No importa mi buen amigo, el baile no he de dejar, la omanóva ya omanóva, hay tiempo para llorar” (It doesn't matter friend, I won't leave the dance as the dead are dead, there's a time for weeping). And for failing to recognize his kinship obligations, he was punished by being transformed into the Karãu, the bird with the weeping song.

The turn of phrase, *hay tiempo para llorar*, repeated like a refrain, recast the story of his lost chia crop as also a moral failing of neglected kinship obligations, of disappointing his wife and failing as a husband and father. As in Guaraní myth, resilience is conceptualized as a capacity to endure the crisis and be transformed. It is a story of nonparametric alternatives to binary loss predictions. In Wilfrido's case, debt refinancing through the cooperative—which, recognizing the bad advice from the agronomists, assumed half the liability for the debts incurred for the chia crop—was the social site of resilience. Yet plants also point to the past presence of kinship, care, and generational life course. These chains of mutual care traverse the life of valued plants and overcome individual life spans, sprouting on a genealogical grid and thereby offering up a surprising inversion. For Wilfrido, weeding provided a valued and valuable site for assessing and managing the generational investments that generated both financial value and moral understandings allowing a person to live well.

Rocío and I spent a full season in 2018–2019 as farm hands on Wilfrido's farm, planting the crop, cutting the sesame, stacking it to dry, and finally threshing by hand and hauling the sacks of seeds to the cooperative in my truck. I identified intensely with Wilfrido when, at one point, he cursed his parcel: *Porquería de orgánico*—"I'm never planting this organic shit ever again." The comment came as we were picking burrs out of our clothes, out of our skin, passing around my pocketknife to pry thorns out of our hands—the parcel was completely overgrown, even after paid personnel had helped hoe between the rows. All uncovered skin was shredded by the sharp plants. In what seemed like an exercise in ethnographic masochism, I'd written down an exhaustive list of thorn variants by their local Guaraní names, all varieties of *capi'i* (weeds). Wilfrido reached over to pull some burrs out of my shirt tails, which I hadn't noticed when I sat down. "If it weren't for this *porquería de orgánico*, I'd have passed weed killer, *matatodo* ['kill everything'] over the whole parcel. *Lindo lindo lindo*, pretty pretty pretty." And once the organic sesame was harvested, he did just that. The story of how Wilfrido got his weed killer further complicated the story of the mutual incorporation of weeds and finance.

Midway through the threshing, when Wilfrido was getting ready to clear his parcel and plant maize, we visited his son, the caretaker for a six-hundred-hectare soy farm nearby. They were also planting "improved" (i.e., GMO) corn over the recently harvested soy crop. After a furtive search for an empty container, Wilfrido's son filled a fertilizer bucket with *matatodo*, surreptitiously packing it into my truck along with eighty kilos of GMO seed corn. The caution about diverting resources



Figure 4. Harvesting sesame with Wilfrido, battling the *capi'i* (weeds).  
Photo by Caroline E. Schuster.

from the soy farm was itself instructive—Wilfrido’s son explained he’d never met the owners, only the representatives from the bank that handle the finances. As far as he knew, it was a conglomerate of foreign interests that owned it, along with a much larger four-thousand-hectare property nearby. They oversaw the farm as a disembodied presence, and as such, were felt to be omnipresent, even in the empty sea of corn and soy. Given the intense surveillance of the area, the careful labeling of all company property, and the mysterious sources of agricultural inputs that would arrive unannounced, the notion that we were being covertly observed was not at all far-fetched.

For Wilfrido and his son, the diverted weed killer recalled the absent kinship obligations of faraway children who could not hoe and plough alongside their aging father. Chemicals materialized bonds of filial piety that were stretched taut by the economic realities of migration out of unprofitable rural farmland. For Wilfrido, social losses (like the absence of his family members because of migration) interact in complex ways with economic losses (such as the lack of field hands for the harvest). Rather than a threat to small farmers, Monsanto’s Glyphosate performed a sort of historical memory of proxy labor, indexing kinned hands that had, in the past, wielded machetes, or the reins of the plough horse, or the hoe. And the resil-

ient GMO corn that could be planted on top of the chemically cleared fields was a materialization of kinship projects that flowed through generational obligations of gift and sacrifice, even if it *at the same time* they were the grounds on which commodity agriculture and weather derivatives thrived.

### CONCLUSION: Exterminate

The co-emergence of finance and weeds offers new ways of talking and thinking about mutual incorporation and grounding the vital projects that allow one to live. The overgrown weather stations and climate models that project pestilent futures press us to consider *degenerative* life processes: weedy finance. The kinship ideology of generational obligation performed by weed killer, and that united rather than opposed big soy with a small family farm, does not mark a zone devoid of insurance. Quite the contrary, this self-help is precisely what the industry dubs *self-insurance*. The individual retains the risks, rather than transferring them via financial intermediation. Nelson's dream of adding other climatic excesses to the hazard variables and triggers of weather insurance proves instructive: the impossible desire to parameterize everything into binary predictions of loss, of the world constituted as insurance-in-waiting. However, for all the speculative zeal of weather insurance and its creative frontiers of climate modeling, I see it as a profound failure of imagination. This process of delimitation—of reducing broad complex processes to a narrow range of actionable parameters, of distilling loss down to binary triggers—has far-reaching implications for analytics as an intense site of cultural production and governance today, from search engine optimization to election forecasting to baseball. Parametric life depends on an expansive range of human and multispecies interdependencies, as well as on collective ecological practices. In the quest for analytics, data can identify certain patterns, including troubling forecasts of our planetary future. But by gridding the world to a limited set of expedient parameters, what generative social and human grounds do we lose in the process?

Speculative insurance instruments are probing the future, from a certain point of view. Weedy finance is sharply attuned to the emergent and irreversible reality of extreme weather. Insurance agents like Nelson sit with the queasy feeling that they are covering ever more, even as less and less sesame will grow. It was clear to me that he considered deeply how financial practices themselves might also constitute collective ecological acts, but looking through the limiting lens of speculating on hazard variables also limited his own effort to grasp their mutual obligations.

Weed management engages financial forms and imbues those forms with value by re-conceptualizing the grounds on which they manifest. Through the financial infrastructures of global reinsurance, InsurTech has experimented with new ways of making its climate models resilient before the sesame crops were even planted. They depended instead on standardized weeds. In other words, looking for a profit motive or critiquing how premiums are extracted from campesinos will not reveal the form and effects of weedy finance. In fact, the sesame insurance will always be a losing proposition for InsurTech. Weather-proof financial products, however, were envisioned as necessary and urgent for profits to withstand climate change and its ever-changing parameters of survivability. It's a commitment to the model that matters, not the short-term profitability or even long-term colonizing of new areas of personal life with market-driven or technical sensibilities.

In closing, I suggest that Wilfrido's enthusiasm for a weed-free farm as a valued project of kinship and meaningful labor should point us back to the political possibilities of selectively weeding out and eliminating some forms of life to cultivate the interdependencies of others. Wilfrido and Nelson both envisioned a future climate inimical to crops and conducive to pests, while also questioning the forms of mutual obligation that would manifest in those futures. Their dystopian/utopian visions open the door to imagining what else might be selectively exterminated: namely, financial systems and their speculative practices. Weedy finance presses for a further inversion: I speculate that finance may be the pest that sprouts up when other vital relations are cultivated. This is an anthropological imaginary that goes beyond redistribution and core struggles over income inequality today, as it suggests nonmarket activist tactics of weeding. By grounding finance in weeds, the inversion of drawing value from the abject opens up the whole value proposition to both scrutiny and challenge. What if we could root out and exterminate weather derivatives with the same relentlessness as we do *capi'i*, weeds? Perhaps we should follow Wilfrido's lead and feel the same satisfaction with a job well done when we kill financial assets as when we put on a backpack sprayer to hose down a parcel with *matatodo*. Weedy finance generates new possibilities for extracting value from an uncertain climate, while at the same time challenging the unshakeable belief that finance can and must thrive as the dominant vital system today.

#### ABSTRACT

*Based in the agrarian worlds of commercial sesame farming in northern Paraguay, where insurance companies are now selling weather derivatives to poor farmers, this article tracks financial practices that depend less on the healthy crops and more on*

*the weeds that thrive among the profitable plants. Parametric insurance operates like a derivative and is triggered by certain weather conditions, which raises questions about the limits of survivability for human-crop relations. I sketch out a series of concerns about weeds as an entry point and helpful heuristic for multiple overlapping kinds of speculation in a multispecies, capitalist, and troubled landscape. By grid-ding the world to a limited set of expedient parameters, what generative social and human grounds do we lose in the process? A speculative anthropological imaginary might posit “weedy finance” as a critical standpoint and set of political claims for casting climate-based finance as one of the lively systems that can and should be intentionally and selectively weeded out. [financialization; parametric insurance; weather; commercial agriculture; kinship; Paraguay]*

## NOTES

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1. These are the Spanish, Paraguayan vernacular Spanish, and Guaraní terms for “weeds,” respectively.
2. The trouble with approaches that seek either to redeem or to demonize finance is that they both, in their own way, reify financial systems as homogenous and unchangeable. Instead, I suggest that ethnography has a powerful role to play in reconceptualizing speculation. As [Laura Bear \(2020, 2\)](#) has suggested, “speculation is now a widely dispersed form of paid and unpaid labour that creates surplus value.” The “means of speculation” ([Bear 2020, 3](#)) are hierarchically arranged into contracts and credit, but the amount of surplus value extracted depends on “social evaluations” and “the imagination of social difference.” In the context of IBAI, I refer to speculative finance in its highly specific material manifestation of weather derivatives, where speculation hinges on the imaginative labor of scenario planning. I am indebted to Melinda Cooper’s work on this topic ([Cooper 2010, 2015](#)). Throughout, my references to speculation are an effort to hold together the specific hazard variables built into parametric insurance contracts, the many experimental registers that characterize modern agribusiness, and the uncertainties and aspirations borne by in-between actors such as farmers, agronomists, and insurance agents. Since all of these speculative projects are highly attuned to intensifying effects of extreme weather, some actors accumulate while others are dispossessed, but we cannot predict how that will sort out in advance.
3. On “mycological promise” and its “fungal fix,” see <https://natalia.cecire.org/research/>.
4. Here I am following [Sarah Besky and Alex Blanchette \(2019\)](#) in their reimagining of the taken-for-granted relationship between human labor and nonhuman nature by specifying multispecies financial practices as a specific (though often invisible) world of work.



5. AccuWeather has long been run by the company's founder and CEO, Barry Myers, a staunch conservative skeptical of public services and government institutions. He has lobbied extensively to prevent the NWS from competing with his for-profit private forecasting business since the 1990s, despite the irony that his forecasts rely on public NWS data. The decades-long impasse reached a tipping point in 2019 when President Trump nominated Myers to head the National Oceanic and Atmospheric Administration, the federal agency in charge of weather forecasting and monitoring (Contorno 2019). The decision drew the ire of many in atmospheric sciences. Myers later withdrew his nomination following a string of controversies that emerged around his leadership of AccuWeather.
6. In biopolitical theories of "resilience," boundaries, thresholds, and parameters emerge as "crucial to the catastrophic imaginary of contemporary liberal rule" (Evans and Reid 2014, 9–13). Planetary boundaries and the "parameters of human survivability" are downscaled and offloaded into individual risk-bearing subjects, as "to be resilient is to insist upon the necessity of vigilance in relation to one's surrounding. This effectively creates micro-vigilantes of all of us as we are tasked to police our locales in a manner which complements the outsourcing logic of neoliberal governance" (Evans and Reid 2014, 16).
7. The internal regulations for these bodies establish principles for organic production separated into different phases of agricultural production, such that the "emphasis on practices and management, *whenever possible* based on cultural, biological, and mechanical methods" (SENAVE 2010; emphasis mine; see also González Gómez 2017).
8. Reduced from Gs. 145,000 to Gs. 134,000 per hectare for ninety days of coverage of the hybridized "precocious" K2 variety of sesame.
9. Nelson used the English term *feedback* here.
10. For a comprehensive analysis of *changa* day labor, particularly for *limpieza* or cleaning fields, see (Hetherington 2019a, 48–52). The freedom to choose when and how to work on other small farms, Kregg Hetherington argues, constitutes a key difference from the organization of labor for soy production.

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