"Climate-Smart" Seeds: Race, Science, and Security in the Global Green Revolution

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Aaron Eddens

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List of Abbreviations

AATF	African Agricultural Technology Foundation
ACRE	Agriculture and Climate Risk Enterprise
BMGF	Bill and Melinda Gates Foundation
Bt	*Bacillus thuringiensis*
CIMMYT	International Maize and Wheat Improvement Center (Spanish Acronym)
GFSS	U.S. Government Global Food Security Strategy 2017-2021
GM	Genetically Modified
GMO	Genetically Modified Organism
IP	Intellectual Property
IPR	Intellectual Property Rights
IRRI	International Rice Research Institute
MAP	Mexican Agriculture Program
MLN	Maize Lethal Necrosis
NIC	National Intelligence Council (U.S.)
SAA	Sasakawa Africa Association
SSA	Sub-Saharan Africa
UN FAO	Food and Agriculture Organization of the United Nations
USAID	United States Agency for International Development
WEMA	Water Efficient Maize for Africa

Introduction

In October of 2009, Bill Gates, the Microsoft founder and co-chair of the Bill and Melinda Gates Foundation, gave the keynote address at the World Food Prize Conference in Des Moines, Iowa. At the time, the venue—an annual gathering of hundreds of the most influential people in international agricultural development—seemed an unlikely locale for a speech from the world's most famous techie and billionaire philanthropist.[1] As Gates took to the podium in front of the jam-packed ballroom of Des Moines' downtown Marriott, he told the audience that he and Melinda had recently become passionate about improving the lives of poor farmers in the Global South. Because they were new to the subject, he explained, they had been inviting various experts to their Foundation to teach them about global agriculture. In all of these conversations, he recounted, they kept hearing about one person: Norman Borlaug.

They learned how Borlaug had worked in a Rockefeller Foundation agricultural program in Mexico in the 1960s, where he developed a high-yielding variety of wheat that became central to American-led development projects across Asia and Latin America known as the Green Revolution. Borlaug's "miracle wheat" catalyzed record-setting yields across India and Pakistan, refuting Neo-Malthusian doomsayers that had

[1] Bill Gates, "Support for the World's Poorest Farmers" (World Food Prize, October 15, 2009), https://www.worldfoodprize.org/documents/filelibrary/images/borlaug_dialogue/2009_speake/transcripts/2009BorlaugDialogueGatesbrief_65B2AF6BB5B25.pdf. During the 2017 World Food Prize, the event's MC, former U.S. Ambassador and current director of the World Food Prize Foundation, Kenneth Quinn told the conference attendees that before Gates' 2009 appearance in Des Moines, then director of the Gates Foundation's Agricultural Development program, Raj Shah, had called Quinn on the phone and insisted that Gates wanted to announce his "big initiative for Africa" at the annual conference. Author field notes.

warned of famines across Asia and earning Borlaug a Nobel Peace Prize. Summarizing his legacy, Gates said that Borlaug's Green Revolution had "helped divert famine, save hundreds and millions of lives, and lift whole countries out of poverty." This story was well known amongst Gates' audience. Indeed, Borlaug had founded the World Food Prize and his legacy is frequently celebrated at the event.[2] Had he not died just before the 2009 conference, he would have been eagerly listening to Gates from his normal front-row seat. Yet as Gates memorialized the conference's central figure, he stressed that Borlaug's work was unfinished. Though Gates called the Green Revolution "one of the great achievements of the 20th century," he argued that it had failed on one crucial front: "it didn't go to Africa."

Describing Africa as woefully behind other continents in terms of per capita crop yields, Gates declared that the time was ripe for a Green Revolution on the continent—an effort his Foundation would support through a suite of new grants. This Revolution, he argued, would focus on the needs of the world's "smallholder farmers," the millions of farmers that toil on small plots of land and are largely disconnected from international commodity markets. With climate change making the plight of smallholders increasingly vulnerable, Gates insisted that Western agricultural technologies like genetically modified organisms (GMOs) would play a crucial role in the new Green Revolution—and announced that the Gates Foundation would fund efforts to introduce drought-tolerant, GM crops to Africa's smallholders.

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[2] Borlaug founded the World Food Prize in 1986, with the stated intention of developing a kind of Nobel Prize for food and agriculture. The $250,000 annual award is given each year during a ceremony at the Iowa State Capitol. Leon F Hesser, *The Man Who Fed the World: Nobel Peace Prize Laureate Norman Borlaug and His Battle to End World Hunger: An Authorized Biography* (Dallas, Texas: Durban House, 2006), 137.

But, Gates warned, this mission faced a tremendous challenge: overcoming the opposition of Westerners that opposed GMOs because of health or environmental concerns. The normally mild-mannered Gates denounced biotech opponents with uncharacteristic zeal:[3]

> They've tried to restrict the potential use of biotechnology in Sub-Saharan Africa without regard to how much hunger and poverty might be reduced by it or what the farmers themselves might want. Some voices are instantly hostile to any emphasis on productivity. They act as if there's no emergency—even though, in the poorest, hungriest places on Earth, population is growing faster than productivity and the climate is changing.

This line of critique had long circulated at the World Food Prize. Since the introduction of GMOs in commercial agriculture in the 1990s, agribusiness and development officials from the U.S. have argued that poor farmers in the global South might benefit from biotech crops, if only "privileged" environmentalists in the global North would get out of the way. Citing widespread consumer opposition to GMOs in Europe as influencing the regulatory environment across Africa (where only a handful of countries permit GM agriculture), biotech advocates argue that Africa has been "starved for science."[4] In the last decade of his life, Borlaug himself penned a series of editorials that condemned those he called "anti-science zealots" for keeping GMOs out of the hands of poor farmers in Africa.[5] Hearing the world's richest man—and co-chair of the most influential global philanthropy—echo Borlaug brought a palpable sense of excitement to the Des

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[3] Tom Philpott, "Bill Gates Reveals Support for GMO Ag," *Grist* (blog), October 22, 2009, https://grist.org/article/2009-10-21-bill-gates-reveals-support-for-gmo-ag/.

[4] Robert L. Paarlberg, *Starved for Science: How Biotechnology Is Being Kept out of Africa* (Cambridge, Mass.: Harvard Univ. Press, 2009). For an overview of Monsanto's longstanding, but decidedly less-than-successful efforts to brand its GM crops "pro-poor," see Dominic Glover, "The Corporate Shaping of GM Crops as a Technology for the Poor," *The Journal of Peasant Studies* 37, no. 1 (January 2010): 67–90, https://doi.org/10.1080/03066150903498754.

[5] See Chapter One for more on Borlaug's pro-biotech editorials.

Moines crowd. As Gates concluded his remarks, the audience erupted into a "spontaneous standing ovation" the likes of which had never been seen in the Conference's 25 year history.[6]

Gates' speech gestures to a history of "feeding the world" with American scientific heroism—and points to the future with both urgency and technological optimism. Yet it was about much more than this. As I show in this dissertation, Gates' arguments raise a broader set of questions concerning the politics of knowledge—how does knowledge become authoritative? Who owns it? Who receives it? And who is viewed as a threat to it? While the picture of the Green Revolution that Gates paints is decidedly more complicated—in short, the Green Revolution might have increased food supply, but hunger and poverty persist in the countries in which it was most active, largely because of economic inequalities—the story of the Revolution as a triumph of Western science over Third World poverty and famine has remained remarkably durable across a range of university, government, industry, and NGO circles. Indeed, despite substantial critiques of the Green Revolution from scholars and civil society groups, its power as a narrative persists. Gates' speech is part of a broader resurgence of the Green Revolution narrative in mainstream development discourse, as the Borlaug story drives calls to transform agricultural across Africa.[7] What is it about the story of Borlaug and the Green Revolution that is so compelling for Gates and other architects of the "new" Green Revolution?

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[6] Ambassador Quinn recalled Gates' speech prompting an unprecedented ovation during the 2016 World Food Prize. In 2017, Quinn notes that Gates' address had been *the* moment of his nearly 20 years hosting the conference. Author field notes.

[7] Nick Cullather, *The Hungry World: America's Cold War Battle against Poverty in Asia* (Cambridge, Mass.: Harvard Univ. Press, 2013) ch. 10.

This dissertation pursues this line of inquiry by offering an intellectual genealogy of the Green Revolution. By using "genealogy" here, I am following a methodological approach outlined by Michel Foucault that calls for rigorous attention to history that remains non-teleological and non-positivist.[8] Vinay Gidwani defines this approach as "a geography and a history…where analysis proceeds not from the certitude of given categories but instead takes as its philosophical task to ask how those categories acquired their givenness and with what consequences."[9] In this vein, I excavate the ideas that underpin the Green Revolution—from its roots in Borlaug's program in Mexico in the 1940s and 1950s through its Cold War era international expansion to today's burgeoning African Green Revolution. Rather than attempt to provide a comprehensive account of the Green Revolution, I offer a set of analytical snapshots around key themes that I argue are essential to understanding the Green Revolution's historical present—as both ongoing development project and commonsense knowledge about past and future of agricultural development. Though scholars have critiqued the Green Revolution in terms of its ties to U.S. foreign policy, its exacerbation of rural class divisions, and its toxic burdens for people and environment, relatively little scholarship interrogates the Green Revolution as a case study for understanding broader questions about the entanglements of race, knowledge, and power.[10] Viewed this way, Gates' remarks in Des

[8] Michel Foucault, "Nietzsche, Genealogy, History," in *The Foucault Reader*, ed. Paul Rabinow (New York: Pantheon, 1984), 76–100. Michel Foucault, "Truth and Power," in *The Foucault Reader*, ed. Paul Rabinow (New York: Pantheon, 1984), 51–75.
[9] Vinay K. Gidwani, *Capital, Interrupted: Agrarian Development and the Politics of Work in India* (Minneapolis, MN: University of Minnesota Press, 2008), xvii.
[10] There is a rich historical and social scientific literature on the Green Revolution. Raj Patel gives a thorough synthesis of much of this work. See: Raj Patel, "The Long Green Revolution," *Journal of Peasant Studies* 40, no. 1 (January 2013): 1–63, https://doi.org/10.1080/03066150.2012.719224. Certainly, scholars of the Green Revolution have attended to issues of race. I extend this conversation by examining the politics of

Moines raise a different set of questions. How are particular geographies constituted as sites of "emergency"? How might contemporary efforts to introduce Western technologies to smallholder farmers in Africa reproduce longstanding racial logics that dehumanize non-Western Others as "not-yet" developed*?* And how do contemporary discourses around food security and climate change rewrite a much older script about poverty, hunger, and security? Before expanding upon the theoretical and methodological tools I use to pursue these questions, I first provide further context through a closer look at the Green Revolution.

What was/is the Green Revolution?

The Green Revolution is the most well known success story in the international agricultural development community. The common narrative describes a Cold War-era effort led by the Rockefeller and Ford Foundations and the U.S. Government to increase crop yields across much of Asia and Latin America. This "first" Green Revolution drastically increased yields of staple crops, especially rice and wheat, and was heralded as a victory against impending famines predicted by Neo-Malthusians concerned about

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knowledge in the Green Revolution *vis-à-vis* race. For scholarship that engages questions of race and the Green Revolution, see especially: Bruce H. Jennings, *Foundations of International Agricultural Research: Science and Politics in Mexican Agriculture*, Westview Special Studies in Agriculture Science and Policy (Boulder: Westview Press, 1988); Angus Lindsay Wright, *The Death of Ramón González: The Modern Agricultural Dilemma*, Rev. ed (Austin: University of Texas Press, 2005); Chris J. Shepherd, "Imperial Science: The Rockefeller Foundation and Agricultural Science in Peru, 1940–1960," *Science as Culture* 14, no. 2 (2005): 113–137; Arturo Escobar, *Encountering Development: The Making and Unmaking of the Third World* (Princeton, N.J: Princeton University Press, 2012); and, more recently, an excellent article which I draw on further in this introduction, Orlando R. Serrano Jr., "Repackaging Plantation Relations: Green Revolution Technologies, Agriculture, and the Remaking of the Américas," *Occasion* 8 (August 31, 2015), https://arcade.stanford.edu/occasion_issue/race-space-scale.

the so-called "population bomb."[11] As John Perkins has shown, American Cold War geopolitics were central to the Green Revolution. Perkins argues that from the earliest Green Revolution project, Borlaug's Mexican Agriculture Program, American scientists adopted an analytical framework that was fundamentally imperialist.[12] Though the Rockefeller Foundation leadership might not have been overtly imperialist, Perkins shows how concerns about national security, and strategic resources in terms of World War II and then the Cold War were central to the framing of the project. Beginning with President Truman's oft-quoted "Point Four" speech in 1949, which first declared "development" in the Third World as a priority of U.S. foreign policy, Perkins shows how the intellectual thought leaders of the Green Revolution explicitly aimed to develop agricultural technologies in the Third World as a way to thwart communism. The agricultural development programs authorized under Point Four established the national security arguments that would undergird Green Revolution projects, linking "greater production" to "prosperity and peace."

Building upon Perkins, Nick Cullather's *The Hungry World* provides a compelling analysis of the Green Revolution's diplomatic policy milieu. Cullather shows how U.S. experts applied different iterations of "modernization theory" in their efforts to fight the spread of communism through controlling food production throughout the Global South. Though never a coherent doctrine, "modernization theory" emerged as a key political tool for development planners in the post-WWII U.S. Supported by high-level public and private research institutions, social scientists and

[11] Paul Ehrlich, *The Population Bomb* (New York: Ballentine, 1968).
[12] John H. Perkins, *Geopolitics and the Green Revolution: Wheat, Genes, and the Cold War* (New York: Oxford University Press, 1997), 105.

economists developed theories about "transition societies" and means by which the rural, traditional, and culturally "backward" societies could become modern. Though modernizers held various approaches for this project, they united in three ways: first, they held that the West, and the U.S. in particular, was the "modern" society against which "traditional" societies could be compared; second, they argued that "transitional," or not-yet modern populations were key strategic targets for development because they were going to be modernized by either capitalist or communist efforts; and third, their theories defined modernization as both a social and technical process, involving cultural changes and adoptions of Western science, technologies, and, importantly, markets.

Cullather emphasizes that contemporary arguments for extending the Green Revolution into Africa involve a "careful rewriting of the history" of the original Green Revolution. He points to important ironies surrounding the memory of the first Green Revolution: notably, the countries at the heart of the Green Revolution have experienced drastic economic inequality and, while they continue to produce large amounts of grain, are among the most undernourished regions in the world. In addition, he argues that while popular narratives about the gains of the Green Revolution tend to discuss it in terms of a moral and technological endeavor, its "success" was in fact largely due to efforts working through the state. (When asked whether he considered himself a technician, Borlaug answered "No. We move governments.")[13] Because of these two ironies, Cullather questions why current Green Revolutionaries choose to invoke the development of the 1960s and 1970s at all. At the same time, he argues that the claims of "GR2.0" sound familiar: hunger can be solved by technology, divorced from politics;

[13] Cullather, *The Hungry World,* 267.

Africa's poor and hungry will "transform" into modern societies and economies; and, where earlier developers linked fighting hunger with containing communism, social instability and food scarcity are now coupled with threats of failed states and terrorism.

Synthesizing the work of Perkins, Cullather, and others, Raj Patel outlines a comparative approach for researching what he calls "the long Green Revolution."[14] Patel takes a political economy framework and argues that the Green Revolution history that began in Mexico in the 1940s and soon expanded to Columbia, the Philippines, India, and Pakistan (among many other countries) should be understood in terms of successive cycles of capital accumulation. This analysis "illuminates commonalities in past and present Green Revolutions, including their bases in class struggles and crises of accumulation, modes of governance—particularly in the links between governments and philanthropic institutions—and in the institutions through which truths about agricultural change were produced and became known."[15] Patel surveys a range of historical and social scientific scholarship to dismantle several of the Green Revolution's central success claims. He shows how, though the Revolution did indeed produce more food, its gains were highly unequal, with wealthy farmers benefitting at the expense of larger numbers of peasant farmers. However, as Patel shows, despite substantial critiques from historians and social scientists, "the Green Revolution is, among a certain development establishment, still *known* to have succeeded."[16] Drawing on Foucault, Patel calls for interrogating the means by which the Green Revolution—understood as an ongoing project of both expansion of capitalist agriculture and a particular kind of development

[14] Patel, "The Long Green Revolution."
[15] *ibid.* 1.
[16] *ibid.,* 24-25.

knowledge—gains and maintains legitimacy. Patel's work emphasizes the centrality of knowledge in the ongoing Green Revolution, raising questions about how its powerful success narrative persists despite critiques.[17]

I pursue a research trajectory in line with Patel's call for work that illuminates the means by which the Green Revolution builds legitimacy. In particular, I extend Patel's attention to the politics of knowledge in the "long Green Revolution" by examining the ways in which the prevailing knowledge about the Green Revolution is inextricable from racial logics. Whereas Patel and others have examined the entanglements of Green Revolution policies, Cold War geopolitics, and capitalist expansion, the scholarship on the Revolution has not adequately connected questions of race and ethnicity to questions of political economy. Patel's thorough treatment of the "long" Green Revolution, while insightful for pointing out how the Revolution has progressed through cycles of capital and different moments of accumulation, does not theorize how racialized thinking propelled much Green Revolution "development." Likewise, Jack Kloppenburg's generative critique of the American hybrid maize industry as primitive accumulation does not mark this accumulation as moving *through* and in concert with productions of racialized difference. This dissertation insists that we need to start foregrounding race and racialization in our analysis of the Green Revolution. Failing to do so runs the risk of naturalizing the kinds of ideas about racial difference that have legitimated the Revolution, in which Western, mostly white people

[17] *ibid.,* 4. As Patel points out, the "New Green Revolution" requires a periodization of the green revolution that insists that it is both a "done deal" and a success. "But if the Green Revolution is still unfolding" he argues, "and if its results have been ambiguous…then the foundational knowledge required to refashion the Green Revolution project requires continuous and ongoing work to legitimize the actions carried out in its name."

our deemed experts and non-Western (mostly non-white) people are devalued as incapable of possessing the knowledge, land, and resources upon which "development" is built.

Racialization, racial capitalism, and the long Green Revolution's slow violence

Following critical race theorists, this dissertation understands race as an historically contingent, malleable modality of power that delineates bodily-based notions of hierarchy and social structures. In his definition of race, Nikhil Pal Singh outlines five key points that are worth quoting at length:

> 1) Race is a modern category that marks the (on-going) production of socially significant stigma *against* prevailing norms of human (species) universalism. 2) Race is a complex assemblage that links (what is thought to be) empirically observable, embodied difference to (what is thought to be) knowable deficiency of morality, capability and intelligence located in the 'spiritual' interior of individuals and groups. 3) Commonsense about what race is changes over time and across space; races are plural, heterogeneous and historically produced and are operationalized at different scales and across national borders. 4) The unchanging core and purpose of race is to naturalize social hierarchy. 5) Race is inseparable from the production of public threat and the periodic exercise of state sanctioned violence that responds to that threat.[18]

Singh's definition points to the importance of thinking through how race as a category is put to use—what race does. Though "race" is a social construction (at the biological level, as anthropologists and critical race scholars have shown, there are no "races"), it remains a powerful determinant of social status.[19] As a concept, race naturalizes and

[18] Nikhil Pal Singh, "A Note on Race and the Left," Social Text, July 31, 2015, https://socialtextjournal.org/a-note-on-race-and-the-left/.

[19] For a concise, witty examination of the perpetuation of biological determinism in conceptions of race—and critical debunking of the idea that race is biological, see: Jonathan Marks, *Is Science Racist?*, Debating Race (Malden, MA: Polity, 2017). "Race is not the discovery of

solidifies social inequalities, and, as Ruth Wilson Gilmore argues, one's exposure to violence and premature death.[20] This attention to the work that "race does," is useful for thinking through the dynamism of race as a social category. Scholars use the term *racialization* to describe the process by which race is used to convey meaning and value, and attach it to bodies, practices, and identities. As Daniel Martinez HoSang and Oneka LaBennett write: "In contrast to static understandings of race as a universal category of analysis, racialization names a process that produces race within particular social and political conjunctures."[21] Racialization is a useful analytic through which to examine how Green Revolution projects shape imaginaries and productions of racial difference.

Singh's multi-faceted definition of race also emphasizes the power of racial narratives. "Race," Singh writes, "is a modality of group domination and oppression. Yet it requires a public story (whether biological, sociological, anthropological, or historical) explaining how and why such domination and oppression is justifiable and reasonable."[22] Race is, in short, what our stories about race tell us it is. Following Singh and other critical race scholars, this dissertation examines science and technology as key means through which racial stories are written and rewritten. Ruha Benjamin has recently written about the importance of theorizing how science and technology serve as

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difference," Marks writes; "it is the imposition of difference. Race is powerful and real, yet nevertheless an empirical biological falsehood" (128).

[20] Ruth Wilson Gilmore, *Golden Gulag: Prisons, Surplus, Crisis, and Opposition in Globalizing California* (Berkeley: University of California Press, 2007).

[21] Daniel Martinez HoSang and Oneka LaBennett, "Racialization," in *Keywords for American Cultural Studies*, ed. Bruce Burgett and Glenn Hendler, Second Edition (New York: New York University Press, 2014), 212.

[22] Singh, "A Note on Race."

conduits for reproducing racial inequalities.[23] She argues that race comes to matter through ideas about human difference, and that these ideas, in turn, are often legitimized through science and technology. Building upon Benjamin's work, I analyze the links between agricultural science and technology and racial logics that "fix" particular people as inherently underdeveloped.[24] One of this dissertation's central aims, then, is to unpack how the "public stories" that circulate around the Green Revolution reproduce racial logics. This includes attending to how particular tropes—technological "frontiers," poor farmers lacking modern technologies, and vulnerable people and places deemed in need of securitization—are rooted in narratives about race. Importantly, these racial narratives are also shaped through gender.[25] Whether through ideas about white, masculine figures venturing into the frontier or the figure of the "Third World" women as the face of today's entrepreneurial development, gender is central to Green Revolution discourses.[26]

Descriptions of literal and figurative frontiers have undergirded projects throughout the long Green Revolution—from American scientists venturing out into Mexico's "hinterlands" in search of indigenous maize in the 1940s to today's efforts to

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[23] Ruha Benjamin, "Innovating Inequity: If Race Is a Technology, Postracialism Is the Genius Bar," *Ethnic and Racial Studies* 39, no. 13 (October 20, 2016): 2227–34, https://doi.org/10.1080/01419870.2016.1202423.

[24] Ruha Benjamin, "Catching Our Breath: Critical Race STS and the Carceral Imagination," *Engaging Science, Technology, and Society* 2 (July 1, 2016): 145, https://doi.org/10.17351/ests2016.70.

[25] Jack Halberstam defines gender as "a marker of social difference, a bodily performance of normativity and the challenges made to it. [Gender] names a social relation that subjects often experience as organic, ingrained, 'real,' invisible, and immutable; it also names a primary mode of oppression that sorts human bodies into binary categories in order to assign labor, responsibilities, moral attributes, and emotional styles." See: Jack Halberstam, "Gender," in *Keywords for American Cultural Studies*, ed. Bruce Burgett and Glenn Hendler, Second Edition (New York: New York University Press, 2014), 117.

[26] On the feminized subject of development in contemporary "poverty capital," see: Ananya Roy, "Subjects of Risk: Technologies of Gender in the Making of Millennial Modernity," *Public Culture* 24, no. 1 66 (2012): 131–56, https://doi.org/10.1215/08992363-1498001.

expand biotech agriculture into the "final frontier" of Africa. As Greg Grandin shows, the frontier has been a central metaphor for shaping America and Americanism.[27] Grandin traces how settler colonialism and Westward expansion produced a uniquely American conception of frontier, one that evolved from being synonymous with "boundary" to signify a kind of mythology that was both geographical and cultural. It was this connotation of frontier that would drive historian Fredrick Jackson Turner's famed 1893 "frontier thesis," which Grandin summarizes as declaring that "America's vast, open west created the conditions for an unprecedented expansion of the ideal of political equality, an ideal based on a sense that the frontier would go on forever."[28] In an important rereading of Turner, Grandin emphasizes that the influence of Turner's thesis has much to do with the ways in which it overwrites America's fundamental contradictions—that expansion of "freedom" rested on the back of slavery and a racist, genocidal settler colonialism. Contrasting Turner's "muted" tones and "restrained individualism" to the more overtly racist arguments of Theodore Roosevelt, who often remarked upon the ordained right of white settlers to dispossess indigenous people of their land, Grandin shows how Turner's frontier thesis became a kind of de-racialized "manifest destiny," (which maintained that Anglo-Saxon expansion across the American West was Providentially-ordained). [29] In the years following Turner's thesis, "White supremacy continued," Grandin writes,

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[27] Greg Grandin, *The End of the Myth: From the Frontier to the Wall in the Mind of America* (New York: Metropolitan Books, Henry Holt and Company, 2019).
[28] *ibid.,* 117.
[29] *ibid.,* 119. Grandin quotes Roosevelt: "The settler and pioneer have at bottom had justice on their side: this great continent could not have been kept as nothing but a game preserve for squalid savages," Roosevelt wrote in 1889.

> keeping the beat moving forward in Jim Crow, in lynchings, in anti-miscegenation, exclusion, and 'second-class citizen' laws, and in the racism of the ruling class, including President Woodrow Wilson's ongoing arias to 'wholesome blood.' But Turner's soothing processional became the official public anthem of a nation moving out in the world, not as a conquering race, much less a woodland Germanic tribe, but in the name of humanity."[30]

It would be this notion of the frontier as an extension of humanitarian freedoms that would undergird the Post-World War II "development" project, as Truman called for expanding American scientific prowess and free market capitalism to Third World frontiers.[31]

As Grandin points out, to discuss the frontier is also always to discuss capitalism. Raj Patel and Jason W. Moore argue that understanding capitalism demands coming to terms with the frontier. "A frontier," they write, is a site where crises encourage new strategies for profit." Explaining how the frontier is integral to the development of capitalism, Patel and Moore write: "Capitalism not only *has* frontiers; it exists only *through* frontiers, expanding from one place to the next, transforming socialecological relations, producing more and more kinds of goods and services that circulate through an

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[30] *ibid.,* 129.

[31] *ibid.,* 197. Grandin cites Nelson Rockefeller, "who had served as Roosevelt's and Truman's top Latin American envoy," as a key promoter of this vision. Grandin quotes Roosevelt's appeal to the House Foreign Affairs Committee in 1951: "With the closing of our own frontiers," Rockefeller argued, "there is hope that other frontiers still exist in the world." Grandin writes: "Postwar internationalism—the opening of the global economy under U.S. leadership—could be a new frontier, Rockefeller told Congress, allowing the next generation an opportunity to be ambitious and to believe itself good, to see no daylight between the pursuit of self-interest and the pursuit of a better world." Perkins also points to Rockefeller as an influential figure in shaping both the early Green Revolution and Truman's Point Four program. "It is overstating the case to credit Nelson Rockefeller with originating Point Four," Perkins writes, "but his various roles in and out of Washington catalyzed the formation of a new type of foreign policy, aimed at creating national security through a partnership between American government and capitalism" (149). See: Perkins, *Geopolitics and the Green Revolution,* 106 and 148-150.

expanding series of exchanges." [32] This definition is helpful for thinking about the Green Revolution, in that it emphasizes the need to analyze particular power dynamics along the Revolution's expanding frontiers. For both its critics and proponents, the Green Revolution is a story about capitalist agriculture expanding through newly developed frontiers. Yet the question of how racialized thinking and practice is embedded in this expansionary project has been relatively unexamined. Jodi Melamed's discussion of *racial capitalism* is especially useful for thinking through the ways in which capitalism's frontiers are always already racialized.[33] Drawing on Cedric Robinson's foundational work, Melamed argues that capital needs to separate people into categories of difference in order to extract value from people deemed less valuable. This is how capitalism feeds upon and, in turn, produces racism. But simply saying that capitalism is racial does not go far enough. As Laura Pulido argues, we need to understand the mechanisms through which capital becomes racialized and moves through racial differentiation.[34] Pulido outlines two processes fundamental to racial capitalism: the production of social difference and the devaluation of non-white bodies. Value is central to capitalism. But value depends upon the creation of social difference in order to locate sites of extraction and accumulation. Pulido quotes Melamed's argument about how capital depends upon movement and how the circuits of that movement are marked by social difference, which depends upon race. The second key fact is the devaluation of non-white bodies.

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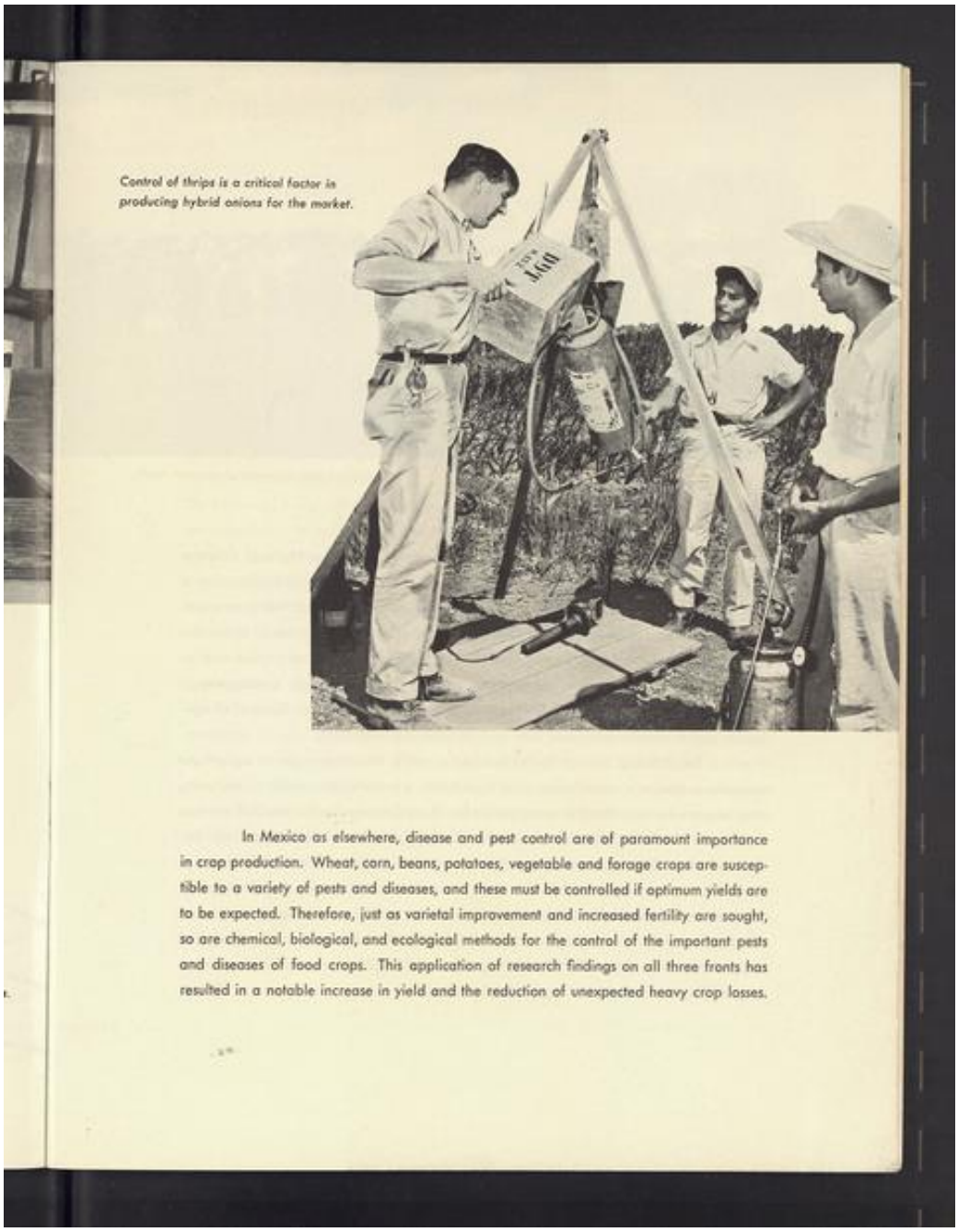
[32] Raj Patel and Jason W Moore, *A History of the World in Seven Cheap Things: A Guide to Capitalism, Nature, and the Future of the Planet* (Berkeley, CA: University of California Press, 2018), 18-19.
[33] Jodi Melamed, "Racial Capitalism," *Critical Ethnic Studies* 1, no. 1 (2015): 76, https://doi.org/10.5749/jcritethnstud.1.1.0076.
[34] Laura Pulido, "Geographies of Race and Ethnicity II: Environmental Racism, Racial Capitalism and State-Sanctioned Violence," *Progress in Human Geography*, May 13, 2016, 030913251664649, https://doi.org/10.1177/0309132516646495.

Pulido shows how environmental racism has privileged white bodies and made non-white bodies vulnerable to environmental toxicity and premature death. This is not an aberration of the system, she makes clear, but a function of it.[35] "Environmental racism," she argues, "is constitutive of racial capitalism."

A brief snapshot of one of the Green Revolution's more detrimental legacies illustrates how the Revolution's capitalism was decidedly racialized. The first operational program of the Green Revolution was the Rockefeller Foundation-funded Mexican Agriculture Program (MAP) in the 1940s and 1950s. A partnership with the Mexican government, the MAP became the project upon which later Rockefeller and Ford Foundation programs across Asia and Latin America were modeled. And it was at the MAP that Borlaug would develop his "miracle wheat" variety that would go on to be distributed across India and Pakistan in the 1960s. But the MAPs legacy can also be read as one of a more subtle history of racialized violence. An image from a 1956 Rockefeller Foundation pamphlet promoting its agricultural development program offers a glimpse into this lesser known history (Figure 1). The photograph depicts a white man lifting a box emblazoned with the acronym "DDT," pouring the chemical into a metal canister fitted with backpack straps. Two darker-skinned men, presumably workers or interns at the Mexican Agriculture Program, stand and watch, one holding the straps of his backpack pesticide-dispenser. None of the men wear protective gloves or masks. But the photo makes clear who will be spraying the DDT in the fields. The text below the picture reads: "In Mexico as elsewhere, disease and pest control are of paramount

[35] Pulido cites David Pellow's argument that "Modern market economies are supposed to produce social inequalities and environmental inequalities." David N. Pellow, *Resisting Global Toxics: Transnational Movements for Environmental Justice* (Cambridge, Mass: MIT Press, 2007), 17.



Control of thrips is a critical factor in producing hybrid onions for the market.

In Mexico as elsewhere, disease and pest control are of paramount importance in crop production. Wheat, corn, beans, potatoes, vegetable and forage crops are susceptible to a variety of pests and diseases, and these must be controlled if optimum yields are to be expected. Therefore, just as varietal improvement and increased fertility are sought, so are chemical, biological, and ecological methods for the control of the important pests and diseases of food crops. This application of research findings on all three fronts has resulted in a notable increase in yield and the reduction of unexpected heavy crop losses.

Figure 1. "Control of strips is a critical factor in producing hybrid onions for the market" from J.G. Harrar's 1956 Rockefeller Foundation pamphlet, "The Agricultural Program of The Rockefeller Foundation." University of Minnesota Archives.

importance in crop production." It describes how research on agricultural chemicals were integral to the MAP, and how research in chemical control of pests had "resulted in

a notable increase in yield and the reduction of unexpectedly heavy crop losses." Thus value in the form of the increase in the production of commodities was directly linked to the application of DDT, at the time a widely used agrichemical, but one that would eventually become banned in many countries around the world. As David Kinkela shows in his history *DDT and The American Century,* the chemical came to represent a particular approach to controlling nature, one that Rachel Carson critiqued in her bestselling 1962 book, *Silent Spring.*[36] After winning the Nobel Peace Prize for his wheat-breeding project, Borlaug was outspoken about the need to use DDT in developing countries. He denounced Carson's book as "anti-science" hysteria and thought that it would lead to the banning of beneficial agricultural chemicals. But Borlaug's hubris failed to recognize the potential consequences of DDT.

Carson's book famously begins by describing a "silent spring," in which birds have all but disappeared because of the widespread use of DDT. But it was not only birds that were poisoned by the toxic chemical. People of color that worked in agricultural fields, often without protective gear, as this photo depicts, were likely to have long-term health effects from the chemical. In this way, the Green Revolution's "slow violence" to use Rob Nixon's phrase from his theorization of the temporality of environmental damage, depends upon the devaluation of non-white bodies.[37] Though the long-term damage of DDT was not known to the white scientists using the chemical at the time, we might ask how emerging concerns about the chemical's toxicity intersected

[36] David Kinkela, *DDT and the American Century: Global Health, Environmental Politics, and the Pesticide That Changed the World* (Chapel Hill: University of North Carolina Press, 2013).
[37] Rob Nixon, *Slow Violence and the Environmentalism of the Poor* (Cambridge, Mass.: Harvard Univ. Press, 2013).

with the devaluation of non-white and indigenous bodies.[38] Viewed this way, the Green Revolution becomes a story of slow violence meted out on non-white bodies. While certainly white people suffered from the health and environmental effects of DDT, non-white people disproportionately experienced the deadly chemical's toxic effects. Drawing on the work of David Carey Jr. and Daniel Faber, Orlando R. Serrano Jr. describes how small farmers and poor workers—often indigenous people—have borne the brunt of the Green Revolution's pesticide toxicity.[39] Farm workers in Central America were exposed to persistent and toxic chemicals in countless ways—from spraying the chemicals to eating food while the chemicals were still on their hands to "pesticide drift" blowing into their homes. Citing evidence from Central America (where many of the Green Revolution projects begun in Mexico expanded after the MAP), Serrano Jr. states writes, "[d]uring the 1960s and 1970s, Honduras and Nicaragua were the world leaders in per capita illness and death from pesticide poisoning."[40] Serrano Jr. details how the slow violence materializes in the bodies of people of color, noting that "[o]f the twenty-five most popular agrochemicals used during the [Green Revolution], nine-teen are carcinogenic and persistent, with long-term effects likely to continue to accrue for quite some time."[41] In the early 1990s, DDT was found in the fatty tissue of Nicaraguans and Guatemalans at a higher rate than anywhere else in the world.[42] Rural

[38] Angus Wright's *The Death of Ramon Gonzalez* details the violence borne out upon indigenous Mexicans as a result of the introduction of toxic agri-chemicals.
[39] Daniel Faber, "Imperialism, Revolution, and the Ecological Crisis in Central America," *Latin American Perspectives* 19, no. 1 (1992):
[40] Serrano Jr., "Repackaging Plantation Relations," 10.
[41] *ibid.,* 11.
[42] James Faber, "Imperialism, Revolution, and the Ecological Crisis in Central America," *Latin American Perspectives* 19, no. 1 (1992), cited in Serrano Jr., "Repackaging Plantation Relations," 10.

farmers in both countries are largely indigenous. It is no accident that this high concentration of the most toxic violence of the "long" Green Revolution is meted out on the bodies of indigenous farmers. Racialized constructions of indigenous bodies—devaluation on account of their being both non-white and indigenous—was fundamental to the legitimization, silencing, and continuation of this violence. It is also bears mentioning that for American chemical companies, the sale of DDT in the newly opening markets as a result of projects like the MAP proved highly profitable. We can think about the expansion of DDT and American agribusiness companies throughout Latin America in terms of Pulido's description of racial capitalism. The value captured by the American agribusiness and chemical companies rested upon the differentiation of white and non-white bodies depicted in the image of the American scientists pouring DDT into the backpack dispenser of the Mexican men.[43]

As I show in this dissertation, the Green Revolution appropriated indigenous varieties of Mexican maize and dispossessed indigenous people of their seeds and livelihoods.[44] While their maize varieties were claimed by the white scientists leading Green Revolution projects—and, in concert, American seed companies—indigenous people continue to suffer the consequences of an agricultural production system *built*

[43] As Mireya Loza details, another instance in which non-white people were subjected to indiscriminate exposure to DDT was through the Bracero Program, an agreement between the U.S. and Mexico that sent thousands of Mexican men to work in mostly agricultural jobs in the U.S. between 1942-1964. "Braceros," as the men came to be known, were sprayed with DDT before entering the U.S. Mireya Loza, *Defiant Braceros: How Migrant Workers Fought for Racial, Sexual, and Political Freedom*, The David J. Weber Series in the New Borderlands History (Chapel Hill: The University of North Carolina Press, 2016).

[44] Elizabeth M. Fitting, *The Struggle for Maize: Campesinos, Workers, and Transgenic Corn in the Mexican Countryside* (Durham, NC: Duke University Press, 2011).

upon the devaluation of their bodies.[45] Again, as Pulido reminds us, this is not incidental, but integral to racial capitalism. Looking at Mexico as the epicenter of the Green Revolution, and thus centering the dispossession of indigenous maize and the related slow violence of capitalist industrial agriculture, elucidates how the "long" Revolution depends upon the ongoing *racialized* moment of primitive accumulation.

Today the long Green Revolution's frontier is to be found in Africa. Across development and industry literature, Africa is described as a kind of "final frontier" for hybrid and genetically modified crops. An official I interviewed at the Bill and Melinda Gates Foundation pointed out that multinational seed companies like Monsanto and DuPont Pioneer had "rediscovered Africa."[46] And, as just one example amongst many, the cover of a book on agricultural biotechnology across the continent declares it "biotech's final frontier."[47] As Gates invoked in his speech in Des Moines, this expansionary project is often framed in terms of a solution to the climate change "emergency" across the continent. Indeed, from widespread drought to increased flooding, climate change is already wreaking havoc in many African countries. The Intergovernmental Panel on Climate Change warns that African countries are already facing tremendous social and environmental impacts from climate change, and most assessments point out that climate change constitutes a "looming crisis" for the

[45] Seth M. Holmes, *Fresh Fruit, Broken Bodies: Migrant Farmworkers in the United States* (Berkeley: University of California Press, 2013).
[46] Author Interview, Bill and Melinda Gates Foundation, July 22, 2015.
[47] Margaret Karembu, Faith Nguthi, and Ismail Abdel-Hamid, "Biotech Crops in Africa: The Final Frontier" (The International Service for the Acquisition of Agri-biotech Applications (ISAAA), 2009).

continent.[48] Against this backdrop, the most powerful institutions shaping development policy, from the Gates Foundation to the World Bank to the Food and Agriculture Organization of the United Nations, call for more "Climate-smart agriculture" in Africa. Yet the question of whether "climate-smart" agriculture will address historical asymmetries of power or deepen technological and market-focused approaches that further entrench social inequalities remains.[49]

Pulido's work is useful for examining the power relations of "climate-smart" agriculture. In a recent essay, she makes the case for considering the "Anthropocene"—the concept that humans have become a geological force on earth, defining a new epoch—as a racial process. "Certainly [the Anthropocene] is not solely a racial process," Pulido writes, "but [race] has played an important role in both producing it and in determining who lives and dies."[50] Pulido cites the inverse relationship between the countries that have contributed the most to greenhouse gas emissions and those in which people are most likely to die from the effects of climate change (the U.S. and Western Europe have contributed the most fuel to the climate change fire, but Americans and Europeans are least likely to die in the flames; the opposite is true for many countries in the Global South). This racialized "differential vulnerability," Pulido argues, is no

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[48] Christopher B. Field, Vicente R. Barros, and Intergovernmental Panel on Climate Change, eds., *Climate Change 2014: Impacts, Adaptation, and Vulnerability: Working Group II Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (New York, NY: Cambridge University Press, 2014); Jeffrey Gettleman, "Loss of Fertile Land Fuels 'Looming Crisis' Across Africa," *The New York Times*, July 29, 2017, sec. World, https://www.nytimes.com/2017/07/29/world/africa/africa-climate-change-kenya-land-disputes.html.

[49] Jennifer Clapp, Peter Newell, and Zoe W. Brent, "The Global Political Economy of Climate Change, Agriculture and Food Systems," *The Journal of Peasant Studies* 45, no. 1 (January 2, 2018): 80–88, https://doi.org/10.1080/03066150.2017.1381602.

[50] Laura Pulido, "Racism and the Anthropocene," in *Future Remains: A Cabinet of Curiosities for the Anthropocene*, ed. Gregg Mitman, Marco Armiero, and Robert S. Emmett (Chicago: University Of Chicago Press, 2018), 117.

accident of geography. Rather, it has been shaped through deep historical processes and different forms of racism, ranging from more overt ideologies of white supremacy to more insidious racisms that Pulido calls "evasion and indifference"—avoiding discussing histories of racism and being indifferent to harsh global, racial inequalities between North and South, white and non-white.[51] While Western-led efforts to generate a Green Revolution for Africa certainly seem to counteract *indifference* to non-white people on the frontlines of climate change, we might ask how the discourse about saving Africa from the crises of climate change operates as an *evasion* of more critical, historical engagements with histories of racism. Building on Pulido's call to "see" race in the Anthropocene, this dissertation develops modes of analysis that challenge prevailing development narratives that evade discussions of race and racism. While not claiming that racialized thinking is static or unitary throughout the Green Revolution, I argue that we can find common narratives and practices that tie together racial projects across the Revolution's history. As climate change "changes everything" regarding what the future of agricultural development might look like, we must account for the ways in which "climate-smart" agriculture extends legacies of racialized inequalities.[52] To explain how this dissertation aims to do this, the next section describes my methodological approach.

Methods

[51] *ibid.,* 118-122.
[52] Naomi Klein, *This Changes Everything: Capitalism vs. the Climate* (New York: Simon & Schuster, 2014).

I utilize four primary methods: archival research on the records of the early Green Revolution; interview-based research with scientists and officials working on contemporary Green Revolution projects in Africa; participant observation at the annual World Food Prize Conference in Des Moines, Iowa; and textual analysis of written and visual materials from a range of sources related to the new Green Revolution. Here I provide a brief discussion of each method, in turn.

Archival Research

Building on the work of Patel on other critical scholars of the Green Revolution, my research foreground the politics of knowledge in the Green Revolution. This demands close attention to the history of the Green Revolution *and* the historical narrative that has built up around it in development discourse. Attending to both of these means critically engaging with the history upon which contemporary Green Revolution for Africa projects build. To pursue this line of inquiry, I examined the archival records of earlier Green Revolution projects. The Rockefeller Foundation and Ford Foundation were the primary drivers of the earliest Green Revolution projects.[53] I took two, weeklong trips to the Rockefeller Archive Center (RAC) in Tarrytown, New York. The RAC holds extensive records of both the Rockefeller and Ford Foundation agricultural development projects, including annual reports from particular country locations, officer diaries from project leadership, field reports, and correspondence between Foundation leadership and officials working "on the ground" in particular locations. The Rockefeller Foundation, in particular, had a culture of documentation, and kept extensive records on

[53] Perkins, *Geopolitics and the Green Revolution*.

almost every aspect of their philanthropic projects.[54] The Foundation conducted oral histories with many key officials from its agriculture program, which proved to be particularly useful sources for me. These histories provided narratives about the projects that went beyond some of the bureaucratic minutiae and offered insights into how different officials thought about their work. In addition, the Foundation also sent members of its agricultural program on "survey trips," which involved trips across countries that were either prospective locations for development projects or where projects were already operating. The extensive reports from these survey trips also proved especially useful.

I complemented my research at the RAC with several weeks of research in the Norman Borlaug and E.C. Stakman Papers in the University of Minnesota Archives. As mentioned, Borlaug is the most notable figure in the Green Revolution. His legacy has helped cement him as the Revolution's "brand hero"—he is frequently cited in development literature and the success story of the Green Revolution largely revolves around the Borlaug story.[55] Gaining a sense of Borlaug's story was thus key to my project. Reading extensively in his archives, including surveying his oral history, various biographies and biographical portrayals written about him, and his public speeches given at academic and professional conferences yielded insights into both the particularities of Borlaug's work and the different stories about Borlaug that have contributed to the overarching hero narrative about his life's work. I also spent time reading the records of

[54] One of the archivists I worked with told me about the Rockefeller Foundation's internal culture of archiving everything.
[55] James Sumberg, Dennis Keeney, and Benedict Dempsey, "Public Agronomy: Norman Borlaug as 'Brand Hero' for the Green Revolution," *Journal of Development Studies* 48, no. 11 (November 2012): 1587–1600, https://doi.org/10.1080/00220388.2012.713470.

E.C. Stakman. Stakman was Borlaug's Ph.D. advisor and a senior advisor to the Rockefeller Foundation during the formative years of their early Green Revolution projects. He was a member of the Foundation's "Board of Agricultural Consultants," which charted the overall direction and recommended funding priorities for its international agricultural program. As such, he was a key figure in shaping the Rockefeller Foundation's approach to agricultural development.

Interview-based Research

In order to understand some of the dynamics of the broader Green Revolution for Africa project, I interviewed a range of officials involved in one flagship project, the Gates Foundation and U.S. Agency for International Development (USAID)-funded "Water Efficient Maize for Africa" (WEMA). I was fortunate to get access to officials from many of the most important institutions involved in the projects, including the Bill and Melinda Gates Foundation, Monsanto, and the African Agricultural Technology Foundation in Nairobi, Kenya. I conducted purposive interviews, seeking out informants that could talk to me about their unique experiences and institutional role within the broader project. I presented my research questions primarily in terms of the questions arising from the public-private partnership aspect of WEMA and related projects. I would often say that I was interested in the "politics" of these projects, to try and convey to my interviewees that I was researching the project in terms of a broader context. Many of my interviewees were unfamiliar with American Studies, so my disciplinary affiliation did not seem to signal much. Though I was asking questions along what was at the time, and has continued to be, a contentious subject—namely, the relationship

between corporate profit making and expansion of biotech agriculture and the public sector mission of delivering socially beneficial "public goods"— I found that my informants were quite willing to share their perspectives. I know from firsthand recollections from fellow researchers that gaining access to some of the institutions I visited was difficult; one social scientist I met was refused interviews after their work was deemed too politically charged.

The fact that my work was not read as "too critical" could be due to several factors. First, in asking questions about public-private partnerships, I presented my line of inquiry in terms that might be read as more "neutral" by some of my informants. Second, as a white male researcher from a well-known university, I might have been more likely to be read as "safe." This is not meant to suggest that my interviewees would have deemed someone with a different positionality than mine "unsafe," or that they would not want to speak to that person, but to ponder the extent to which my whiteness and masculinity might *not* have raised questions about my agenda. Third, I benefitted from being a graduate student. Many of my interviewees had been through graduate school themselves, even if their work had been in the sciences, and thus seemed willing to want to offer some of their time to "help" out with my research. Relatedly, many of my interviewees had positive associations with my university, which, by chance, happens to be the alma matter of Norman Borlaug and continues to be one of the leading agricultural research institutes in the U.S. Several times interviewees would ask me about a particular person or if I was in agriculture, and I would explain that I was "actually in the humanities," which also did not elicit many responses. A fourth reason that I might have had such good access was that the organizations I

interviewed were actively working to promote their public image. This applied especially to Monsanto, a company with a decidedly poor public relations history. Based upon comments with several of my Monsanto informants, it became clear that they were very interested in sharing the "good" side of the much-maligned company with someone that might write their story along a different line than the "evil Empire" trope common amongst its critics. A fifth, and related reason my access might have been good was that I was fortunate to make a good impression on a contact from Monsanto. Through cold-emailing one of the WEMA officials listed on the website, I was put into contact with a key person from the project. This official was not only helpful in getting me several interviews at Monsanto, but provided introductions to people at both the Gates Foundation in Seattle and the African Agricultural Technology Foundation in Nairobi. In several email introductions to additional interviewees, this official recommended people speak with me, suggesting that my "research approach is thorough, rigorous, well grounded and could be a valuable academic documentation of the WEMA project at a well regarded university in the U.S." Of course, different officials I interviewed treated me with varying degrees of curiosity and/or suspicion. When some heard that I was "taking a social science angle," as I sometimes put it, they visibly become more reticent. Still, my overall experience throughout my interviews was that people were highly interested in speaking to me about their work and opinions regarding the projects.

Participant Observation at World Food Prize

I conducted a number of interviews at the World Food Prize Ceremony and Norman E. Borlaug International Symposium, or "Borlaug Dialogue," events held each

October in Des Moines, Iowa. I attended this annual conference for four subsequent years (2014-2017). The conference brings together hundreds of the most influential people in international agricultural development, many of whom work on contemporary Green Revolution for Africa projects. It provides a unique opportunity to observe the dominant discourses circulating in this particular community, attend side events devoted to particular topics (such as public-private partnerships, digital technologies in agriculture, or communicating the benefits of agricultural biotechnologies) and conduct interviews. The first time I went, I interviewed and met several officials working on WEMA and related projects. I was able to follow up on these interviews and gain further access after sharing that I had met them or one of their colleagues "at the World Food Prize." I rely on participant observation from the World Food Prize throughout the dissertation. More than any other event, it epitomizes the celebration of the Green Revolution "success story"—the triumph of Western science over Malthusian chaos. It also shows how the Green Revolution and Norman Borlaug story have become a kind of "living history" that confirms key truths shared across the development community—ranging from U.S. State Department officials to World Bank leadership to CEOs of companies like Monsanto, DuPont Pioneer, and Cargill. As I show throughout, these developmental truths are rooted in racialized understandings of poverty, development, and security.

Textual analysis of written and visual materials

The final method I employ in this dissertation is textual and visual analysis. Throughout my research, I encountered numerous "texts" that presented information

about my subject matter, be it specific texts about the WEMA project, promotional pamphlets and annual reports from development organizations, or media coverage of WEMA and other Green Revolution projects. All of these formed part of my own "project archive," and were curated alongside my interview and archival material to form my data.[56] I analyze these supplementary materials in order to both broaden the historical and cultural context in which I situate WEMA and the New Green Revolution and to further theorize how these agricultural development projects relate to wider political and social contexts. Since I am interested in understanding how Western-led projects "for Africa" are constituted in, and, as Achille Mbembe would have it, for, Western subjects, studying written and visual representations of these projects as they circulate in the West is essential.[57] In bringing in different "texts" that are representative of how projects like WEMA circulate more widely—be it a photograph from the Bill and Melinda Gates Foundation Visitor Center or a documentary film about agricultural biotechnology—I theorize how depictions of the Green Revolution for Africa invite Western subjects to craft their own identities through imagined encounters with poor people in the "developing world."

Chapter Outline

Chapter one expands upon the connective threads with which I began, between Norman Borlaug and Bill Gates. Entitled, "'Borlaug 101': Race as Technology in the Green Revolution" the chapter analyzes Borlaug's public statements about the urgency

[56] "Project archive" is a term from Philip Joseph Deloria and Alexander I. Olson, *American Studies: A User's Guide* (Oakland, California: University of California Press, 2017).
[57] Achille Mbembe, *On the Postcolony* (Berkeley, CA: University of California Press, 2001).

of expanding the Green Revolution and the looming danger of unchecked human population growth alongside Bill Gates' more recent calls for a "new" Green Revolution in Africa. Though Borlaug and Gates became spokespersons for the Green Revolution in different geopolitical and economic landscapes, I argue that their arguments share racialized framings of hunger, poverty, and security. I show how Borlaug's Neo-Malthusian racialized constructions of Third World instability are re-articulated in Gates' more subtle, "post-racial" discourse. Drawing on scholars that theorize race in terms of the work that race does—the way it is used and becomes productive as a "technology"—I argue that both Borlaug and Gates demonstrate how race is a key tool with which the ideas and practices of the ongoing Green Revolution are built.

In Chapter two, "'The landraces are in the Hybrids': the Green Revolution's seeds of dispossession," I show how American agricultural scientists working in Mexico in the 1940s used ideas about the racial inferiority of indigenous people to justify their efforts to collect indigenous varieties of maize from throughout the country—and distribute them to U.S. seed companies. This racial hierarchy, I argue, undergirded subsequent Green Revolution programs. Indigenous maize provided the genetic backbone for American Cold War-era efforts to introduce "modern" crops to "traditional" farmers across Asia and Latin America. Projects like WEMA build directly on this legacy, as they incorporate Mexican landraces into hybrid maize bred for smallholder farmers across Africa.

Chapter three, "Seeing Like a Seed Company," turns to an analysis of WEMA, a public private partnership between the agricultural biotechnology company, Monsanto, and the world's largest public sector maize development institution. Because the project

is built around introducing Monsanto's proprietary biotech traits in countries that don't have regulatory systems for agricultural biotechnology, it involves a range of "capacity building" efforts to train scientists, seed companies, and even government regulators to work with biotech crops. Drawing on over 50 interviews with WEMA officials, I analyze how these capacity building efforts reorient public sector officials toward the profit motive. The chapter also theorizes how the expansion of private property in agricultural biotechnology extends a longer lineage of an "improvement" logic, in which development is coupled with the expansion of private property. Building on scholarship at the intersection of legal and critical race studies, I situate WEMA—and the broader push to expand biotech crops across the "final frontier" of untapped markets in Africa—within a genealogy of colonial and racial ideas about improvement and private property.

Chapter four, "Securitizing Smallholder Farmers on the Frontier of Climate Change," examines weather based index insurance—a financial technology being developed alongside GM drought tolerant seeds as a tool for managing the "climate risk" faced by smallholder farmers. Index insurance is part of a budding "smallholder finance" sector, in which microfinance institutions, development banks, and insurance companies are developing financial tools that link smallholder farmers to global finance markets. I examine index insurance projects alongside recent texts from the U.S. security state and U.S. global food security policy, tracing parallels between arguments for financialized agricultural development and an emerging "food security as national security" framework. Building on scholarship that places neoliberal financialization in the context of longer histories of racial capitalism, I argue that the narratives driving the index insurance/national security/food security nexus reproduce racial hierarchies that

locate particular people and geographies as sites for a kind of extractive investment that financializes ever greater pools of "climate risk."

In the conclusion, I turn to the question of how new Green Revolution projects at the intersection of Western humanitarianism, the expansion of capitalist agriculture, and the transformation of the U.S. development/security apparatus in an era of climate change circulate in Western discourses. Through a reading of a recent documentary film, *Food Evolution*, I show how today's Green Revolution becomes a tool with which Western liberals might shape their sense of identity. Returning to themes of racialization explored throughout the dissertation's chapters, I show how race is a key analytic for understanding the relations between Western subjects and the real and imagined beneficiaries of the Green Revolution for Africa. I argue that socially just approaches to agricultural development and climate change adaptation will demand reckoning with how racialized global inequalities continue to be reproduced in the ways the Green Revolution is conceived and operationalized.

1. "Borlaug 101": Race as Technology in the Green Revolution

Norman Borlaug is said to have died with one regret. His granddaughter, Julie Borlaug, tells how the famous American plant scientist—who had recently become only the fifth person to receive the Nobel Peace Prize, U.S. Congressional Medal of Honor, and U.S. Presidential Medal of Freedom—was consumed with thoughts of failure in his final days.[58] As the younger Borlaug recalls: "Well, he was told he had three days left to live. And he didn't speak all day. And then we finally asked what we could do. Did he want to call his family? What did he need? And he said: 'Africa. I failed Africa. I never brought a Green Revolution to Africa and I need five more years to try do that.'"[59] Despite his family's efforts to console the dying scientist, he remained fixated on this failure. Indeed, as the story goes, his last conversation was about continuing a project funded by his Africa-based Foundation, which was developing a handheld tool farmers could use to measure nitrogen levels in their soil. With his last breath, Borlaug left his family with a simple instruction: "take it to the farmer."

[58] "WFP Founder Norman Borlaug Receives America's Highest Civilian Honor," World Food Prize, accessed May 14, 2019. https://www.worldfoodprize.org/index.cfm/87428/40024/wfp_founder_norman_borlaug_receives_americas_highest_civilian_honor.

[59] The younger Borlaug describes assuring her dying Grandfather that had already done enough to catalyze a Green Revolution in Africa—through training and mentoring "thousands" of people that would continue his legacy. She assured him that his legacy would continue and that he had already "inspired" so many people "in Africa" to "take up the charge." See: Geoffrey Onditi, "Saturday Morning Interview (Julie Borlaug) KBC," YouTube, September 19, 2016, https://www.youtube.com/watch?v=V0FZWofCfEs.

Soon after his death in 2009, Borlaug's dying lament and commandment began to anchor a wider narrative about the Green Revolution and Africa.[60] Western philanthropists, development officials, and agribusiness CEOs invoked Borlaug's unfinished mission in their calls for a Green Revolution in Africa. The new Green Revolution's most recognizable backer, Bill Gates, argued that Borlaug's Revolution "hadn't reached Africa" when he unveiled a suite of Gates Foundation grants aimed at transforming agriculture across the continent. In the time since, as Gates and other Western donors have spent billions of dollars under the banner of the "Green Revolution for Africa," the most influential figures in international development have echoed Gates. Officials such as U.S. Secretary of State, John Kerry, World Bank President, Jim Yong Kim, and the Head of the African Development Bank, Akinwumi Adesina have sung Borlaug's praises while arguing that his greatest mission—bringing a Green Revolution to Africa—remains unfulfilled.[61]

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[60] Indeed, the final words and dying regret are often repeated together. Kenneth Quinn, the former U.S. Ambassador to Cambodia and President of the World Food Prize Foundation since 2000, tells a slightly different version of Borlaug's deathbed declarations than Julie Borlaug. In a 2013 tribute to Borlaug, Quinn writes: "Dr. Borlaug's last words were 'Take it to the farmer.' Just before that, he said, 'I have a problem: Africa,' referring to his unfulfilled goal of bringing enhanced agricultural production to that continent." Just as in Julie Borlaug's version of the story, the combination of Borlaug's failure or "problem," with his commandment reinforces the position of Africa as that of being "not-yet" redeemed by the hero scientist. Ambassador Kenneth M. Quinn, Kenneth Quinn, "Quinn: A Tribute to Norman Borlaug on the Fourth Anniversary of His Death," accessed May 14, 2019, https://www.worldfoodprize.org/index.cfm/87428/40197/quinn_a_tribute_to_norman_borlaug_on_the_fourth_anniversary_of_his_death.

[61] U.S. Secretary of State John Kerry repeated the narrative to African heads of state at a U.S. Africa summit in Washington D.C. in 2014. See: John Kerry, "Remarks at a Working Session on Resilience and Food Security in a Changing Climate," U.S. State Department, August 4, 2014, https://20092017.state.gov/secretary/remarks/2014/08/230219.htm. At the 2016 World Food Prize Conference (WFP), World Bank President Jim Yong Kim stressed that Borlaug had been unique in his commitment to applying the tools of science to pressing humanitarian concerns. At the 2017 WFP, African Development Bank President and World Food Prize Laureate Akinwumi Ayodeji Adesina emphasized Borlaug's failed mission in Africa. Agribusiness CEOs from companies like Bayer and DowDuPont frequently invoke the Borlaug story—and Borlaug's

Despite the uptake of the Green-Revolution-missed-Africa narrative, it is important to note that its fundamental premises are historically inaccurate. To say that the Green Revolution "stopped at Africa" (as the Rockefeller Foundation declared in its 2006 pamphlet *Africa's Turn: a New Green Revolution for the 21st Century*) ignores decades of Western development efforts across the continent in the postcolonial era. Between 1980 and 2005, the World Bank-funded international agricultural research institutions "invested 40-45% of their $350 million/yr budget in Africa."[62] Borlaug himself led a development project since the 1980s in several African countries.[63] Inarguably, the large-scale state-led development projects synonymous with the Green Revolution, such as those in India and China, did not happen in African countries. Yet the reasons why are more complicated than the Borlaug story suggests.[64] They have to do with lack of government support for state-led agricultural development, the effects of structural adjustment policies, and the ways in which hybrid seed packages designed to appeal to large numbers of farmers were inappropriate for the diversity of social and ecological agricultural systems across sub-Saharan Africa. Nonetheless, the dominant narrative in mainstream development circles is that Africa remained "untouched" by

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commandment to "take it to the farmer"—in calls to expand seed and biotechnology markets across Africa. WFP citations are from author field notes and transcripts of conference program, available at https://www.worldfoodprize.org/index.cfm?nodeID=87431&audienceID=1.

[62] Eric Holt-Giménez and Peter Rosset, "Ten Reasons Why the Rockefeller and the Bill and Melinda Gates Foundations' Alliance for Another Green Revolution Will Not Solve the Problems of Poverty and Hunger in Sub- Saharan Africa," *Food First*, no. Policy Brief 12 (October 2006): 12. Raj Patel offers further analysis of the shortcomings of the "Green Revolution" bypassed Africa narrative, pointing out that since the 1990s, "Africa has been the continent toward which the largest slice of the [CGIAR] budget has been directed." See Patel, "The Long Green Revolution," 33.

[63] Gregg Easterbrook, "Forgotten Benefactor of Humanity," The Atlantic, January 1, 1997, https://www.theatlantic.com/magazine/archive/1997/01/forgotten-benefactor-of-humanity/306101/.

[64] Patel, "The Long Green Revolution," 33.

large-scale Western-led agricultural development during the 1960s and 1970s. This is far from the only historical revisionism surrounding the Green Revolution. As Nick Cullather has shown, the dominant narrative of the Green Revolution, revolving around the Borlaug story of staving off famine in the Third World with American ingenuity, omits much of the geopolitical complexities of the Green Revolution.[65] Cullather demonstrates how Borlaug distilled the Green Revolution into a kind of "capsule narrative," and how this story has proven useful for a new generation of Green Revolutionaries mobilizing around extending American-led agricultural development in Africa. Others have shown how simplified accounts of the Green Revolution construct Borlaug as a kind of "brand hero" figure.[66] This hero narrative (demonstrated in frequently repeated descriptions of Borlaug as "the man who saved a billion lives") overshadows more critical appraisals of the Green Revolution, such as those that take into account issues of environmental damage, pesticide poisoning, concentration of rural wealth and increased migration, and the persistence of hunger inequalities in many of the countries where the Revolution occurred.[67]

In this chapter, I am less interested in outlining the historical revisions of the Borlaug narrative than in making a case for why it might persist. I suggest that understanding the narrative's endurance demands more attention to the way the Borlaug hero story articulates with ideas about Africa as an unreached frontier. Encapsulated by Borlaug's infamous last words and related last regret, constructions of Africa as frontier

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[65] Cullather, *The Hungry World*.
[66] Sumberg, Keeney, and Dempsey, "Public Agronomy."
[67] For critical appraisals of the Green Revolution, see especially Patel's thorough overview of the literature in his "The Long Green Revolution." On the Green Revolution as cause of mass rural-to-urban migration, leading to mega-cities in the Global South, see Mike Davis, *Planet of Slums* (London: Verso, 2017).

undergird policy arguments about expanding Western agricultural development across the continent. These constructions build upon a long history of Westerners imagining Africa as a unique, singular place—geographically and historically separate from the West. As postcolonial theorist Achille Mbembe argues: "it is in relation to Africa that the notion of 'absolute others' has been taken farthest…"[68] Mbembe theorizes how Africa has always been central to Western liberal discourse about itself. There is, therefore, "hardly ever any discourse about Africa for itself."[69] From poverty discourses to visual imagery about famine relief to the pages of *National Geographic*, there is a well-mapped archive of images, narratives, and ideas in which Africa is a metonym for poverty, suffering, and absolute difference.[70] These depictions invariably draw attention to the otherness of the African, black body. As Kaiama Glover reminds us, the circulation of images of in the West of impoverished black bodies reproduces imaginaries about absolute differences between "us" and "them." In this way, geographical constructions of Africa as a unique, separate continent are inextricable from constructions of racialized bodies. In order to make these connections more visible, this chapter asks how race operates as a technology in Green Revolution discourse. In describing race as a technology, I am drawing on media scholars that use the formulation of race as technology to emphasize that race is malleable and, like technology, is made to do particular kinds of work in the world. As Wendy Chun writes,

[68] Mbembe, *On the Postcolony,* 2.
[69] *ibid.,* 3. Mbembe argues that "More than any other region, Africa thus stands out as the supreme receptacle of the West's obsession with, and circular discourse about, the facts of 'absence,' 'lack," and 'non-being,' of identity and difference, of negativeness—in short, of nothingness" (4).
[70] Kaiama L. Glover, "'Flesh Like One's Own': Benign Denials of Legitimate Complaint," *Public Culture* 29, no. 2 (82) (May 1, 2017): 235–60, https://doi.org/10.1215/08992363-3749045; Catherine Lutz and Jane Lou Collins, *Reading National Geographic* (Chicago: University of Chicago Press, 1993).

the analytic of "race as technology shifts the focus from the what of race to the how of race, from knowing race to doing race by emphasizing the similarities between race and technology."[71] Thinking through race as technology "moves race from an object to a technique."[72] Importantly, it "displaces ontological questions of race—debates over what race really is and is not, focused on discerning the difference between ideology and truth—with ethical ones: what relations does race set up?"[73]

This relational understanding of race is especially useful for considering how whiteness operates in and through Green Revolution discourse. By whiteness, I mean "the constellation of identities, processes, and practices that systematically privilege white people and reproduce white domination."[74] Though scholars have examined the Green Revolution in terms of Western development operating through racialized discourses of inferior, underdeveloped Others, less attention has been directed to the ways that the Green Revolution reproduces whiteness.[75] This chapter argues that understanding the persistence of the Borlaug hero story—and the wider Green Revolution success story that it buttresses—demands attending to the ways in which Borlaug's arguments were rooted in and reproductive of whiteness. Throughout his life, Borlaug fervently argued for the urgent need to bring Western agricultural technology to

[71] Wendy Hui Kyong Chun, "Introduction: Race and/as Technology; or, How to Do Things to Race," *Camera Obscura: Feminism, Culture, and Media Studies* 24, no. 1 (70) (May 1, 2009): 7–35, https://doi.org/10.1215/02705346-2008-013.
[72] *ibid.,* 27.
[73] *ibid.,* 28.
[74] Perry Perry, "White," in *Keywords for American Cultural Studies*, ed. Bruce Burgett and Glenn Hendler, Second Edition (New York: New York University Press, 2014), https://keywords.nyupress.org/american-cultural-studies/.
[75] Shepherd, "Imperial Science."; Wright, *The Death of Ramón González*.

the "hundreds and millions of miserably poor people" people in the Third World.[76] He made this case from an assumed position of universality, often extolling the cause of the Green Revolution as one for "mankind." Borlaug's assumed subject position, from which he demarcated the progress of people deemed "underdeveloped" from an "unmarked" subject position, performs the kind of ideological work through which whiteness maintains power.[77] I read both Borlaug's longstanding arguments about the urgency of staving off Malthusian population threats with Western technology and the memorialization of Borlaug as a saint-like hero in terms of whiteness. Other scholars have pointed out how the Green Revolution operates as a kind of "truth regime": in development circles, it's heralded as an untarnished "success" despite substantial criticisms from historians and social scientists. As Patel writes, the Green Revolution is still widely "known" to have been a success.[78] This chapter extends this critique by asking how whiteness is integral to the processes by which the Green Revolution gains and maintains legitimacy.

Unpacking the Borlaug story in terms of whiteness sheds light on how Borlaug's story has been mobilized in support of Green Revolution 2.0. In terms of both the massive amounts of money spent by his Foundation and his role as a public figure, Bill Gates has become a central figure in the revamped Green Revolution. Gates claims to have learned much of what he knows about agricultural development from hearing about Borlaug. This chapter argues that we need to trace the continuities between Gates and Borlaug. Though Gates and company are surely rewriting some of the Revolution's

[76] Borlaug, Norman E. "Ending World Hunger. The Promise of Biotechnology and the Threat of Antiscience Zealotry." *Plant Physiology* 124, no. 2 (October 1, 2000): 487.
[77] Richard Dyer, *White* (London; New York: Routledge, 1997).
[78] Patel, "The Long Green Revolution," 13-14.

central tenants, especially around the role of the state and the emphasis on smallholder farmers, they re-articulate the Green Revolution's racial technologies in their mappings of poverty, security, and future threats. I show how Borlaug's more overt racialization of non-white bodies as a threat to the West is reworked to fit a *postracial* script for today's Green Revolution. The Gates Foundation frames its arguments about the urgency of delivering a Green Revolution across Africa in de-racialized terms, meaning it makes the issue not about racial difference per se—not about supposed innate differences between people. At the same time, it constructs its rationale for development programs in terms that are decidedly racialized. Though the uses of race are more subtle in Gates' calls for expanding the Green Revolution in Africa, the fundamental arguments, like Borlaug's a generation before, rest upon racialized logics of poverty, scarcity, and development.

I begin by outlining Borlaug's views on development, population, and scarcity—views that were remarkably similar throughout his life—drawing in particular on his 1970 Nobel Prize lecture, which solidified his position as an authority on matters of agricultural development and population growth. I connect Borlaug's remarks at the Nobel Ceremony to arguments he made thirty years later, in the last decade of his life, about the need to expand the Green Revolution into Africa. In both cases, I show how Borlaug exhibited a Neo-Malthusian perspective, rooted in a racial historicism that positioned particular (non-white) people and "Third World" places in terms of a continuum of development, needing to "catch up" to Western modernity. I also show how Borlaug's arguments demonstrate a white subjectivity, in terms of their assumed

universality and adoption of what Donna Haraway calls the "view from nowhere."[79] I then take up the ways in which the Borlaug story has catalyzed the Green Revolution for Africa. Comparing Bill Gates' arguments about the Green Revolution to Borlaug's, I show how Gates reiterates the salvationary promise of Borlaug's call to "take it to the farmer," opening up new technological and geographical frontiers for today's Green Revolution. Revived to fit a more post-racial script for a new Green Revolution, the Borlaug hero narrative fits the mandates of philanthrocapitalism, as it is used to construct new racialized populations in which to invest. In the chapter's conclusion, I turn to participant observation from my research at the Gates Foundation, to consider what I call the "pedagogies of poverty" at the Foundation's Visitor Center.

"The prophet of wheat"

Borlaug's role as a public spokesperson largely began in 1970, when he won the Nobel Peace Prize. While his efforts to introduce high-yielding varieties of wheat to India and Pakistan in the late 1960s had made a name for Borlaug in the development and government agencies coalescing around the emerging Green Revolution, it was the Peace Prize that cemented his position as a public authority. Nick Cullather has shown how the speech distilled the complexities of the Green Revolution into a kind of capsule narrative about Western technology staving off Malthusian famine.[80] But the lecture also marked an important moment in the development of the Green Revolution's central hero narrative around Borlaug. As Borlaug reduced the Green Revolution to a morality tale

[79] Donna Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991).
[80] Cullather, *The Hungry World.*

about the urgency to bring Western agricultural technologies to the vast, expanding numbers of underprivileged people in the developing world, he honed a prophetic voice that he would continue to use in his new role as Green Revolution spokesperson. Borlaug has been called a saint, a miracle-worker, and the "father of the Green Revolution."[81] We might also consider Borlaug's role as the Green Revolution's central prophet.[82] Though "prophet" is often colloquially understood as someone who predicts

[81] These tropes are ubiquitous in agribusiness and development circles, and extend to popular press coverage of Borlaug as well. The front-page *New York Times* obituary noted that Borlaug was "widely described as the father of the broad agricultural movement called the Green Revolution." The *Times* described Borlaug as "the plant scientist who did more than anyone else in the 20th century to teach the world to feed itself…whose work was credited with saving hundreds of millions of lives." See: Justin Gillis, "Norman Borlaug, Father of a Crop Revolution, Dies at 95," *The New York Times*, September 13, 2009, sec. Energy & Environment, https://www.nytimes.com/2009/09/14/business/energy-environment/14borlaug.html.; At the 2014 unveiling of a Borlaug statue in the U.S. Capitol, House Speaker John Boehner quipped that "it will be awfully nice to have a miracle worker around here." "Norman Borlaug Statue Unveiled at US Capitol," accessed May 15, 2019, https://www.mprnews.org/story/2014/03/25/news/borlaug-statue.; This "miracle worker" trope has even appeared in popular culture references to Borlaug. As Nick Cullather details, a 2000 episode of the popular primetime TV show, *The West Wing,* featured the U.S. President (played by Martin Sheen) explaining at a press conference: "there are people who make miracles in the world. One of them lives right here in the U.S."—before recounting the popular narrative of Borlaug "saving India" from famine with his miracle wheat. See Nick Cullather, "Miracles of Modernization: The Green Revolution and the Apotheosis of Technology," *Diplomatic History* 28, no. 2 (2004): 227–254. For a general overview (and critique) of the Borlaug hagiography, see Sumberg et al., "Norman Borlaug as 'Brand Hero.'"

[82] In *American Prophecy: Race and Redemption in American Political Culture,* George Shulman traces a genealogy of the prophetic voice, beginning with the prophets of the Hebrew Bible. Shulman characterizes "Hebrew prophecy as an *office:* Prophets are "called"—often responding only reluctantly—to a public responsibility" (3). In this office, prophets take on a particular political role, in that they speak to the collective community about their current conditions and future choices. Shulman outlines four points that define the role of the Hebrew prophet. "First, prophets are *messengers* who *announce* truths their audience is invested in denying. Addressing not an error in understanding but a partly willful blindness, they announce realities we must acknowledge if we are to flourish….Second, the office means *bearing witness,* though not in a legal sense, as prophets *testify to what they see and stand against it…* Third, prophecy is the office of *watchman* who *forewarn:* They name danger and forestall it…Fourth…prophecy is the office of *singers* who ask and answer the question, What is the meaning of our suffering? (5)" In sum, Shulman writes that no matter which mode prophets speak in, "the office of prophecy is a public vocation mediating between a community and powerful realities it does not understand or control. In each regard, prophets make claims about the circumstances and difficulties—and fateful decisions—*of the whole*; indeed, in this way they reconstitute the very 'we' they seem to

the future, the role of the prophet is better understood, as George Shulman writes, as a political figure that poses questions to a community about their collective choices. Connecting prophecy to the tradition of the prophets in the Hebrew Bible, Shulman describes prophecy as a "performance to incite audiences to self-reflection and action." More than simply a "rhetorical act, prophecy is an embodied form of symbolic action."[83] As a prophet, Borlaug both bore witness to the miraculous powers of high-yielding varieties of wheat and warned audiences about impending food supply crises brought on by human population growth. Attending to Borlaug's public pronouncements and warnings about the future yields insights into the underpinnings of the Green Revolution's central hero story, revealing some of the key discursive strategies through which it was constructed and continues to operate. In this section, I read two texts in which Borlaug adopted a prophetic voice—a 1969 "Man of the Year" biopic produced by British Independent Television and the Nobel Lecture delivered the next year. He used both of these venues to speak about the urgency of using Western agricultural science and technology to bring about a kind of spiritual awakening amongst Third World peasant farmers. This argument displayed three key themes, which Borlaug would continue to draw upon in his role of public spokesperson for the Green Revolution: a racial historicism that locates nonwhite, developing world populations at a different stage of development than white Westerners; a racialized narrative about the

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invoke as a given. In each regard, they seek to *redeem* the community they address and whose fate they commit to sharing. Prophecy is thus a performance to incite audiences to self-reflection and action. Not only a rhetorical act, prophecy is an embodied form of symbolic action…"(6). George M. Shulman, *American Prophecy: Race and Redemption in American Political Culture* (Minneapolis: University of Minnesota Press, 2008).

[83] *ibid.,* 6.

threat posed by Third World population growth; and a techno-salvationary impulse that answers that threat with the redemptive power of Western technology.

Borlaug's colleagues and biographers describe him as a driven scientist who worked long hours under often grueling field conditions with a tenacity that bordered upon obsession.[84] With the increased public recognition for the "miracle wheat" varieties he developed in Mexico that catalyzed record-breaking harvests in India and Pakistan, Borlaug found more opportunities to share his convictions with the public. As TV reporters and journalists began to seek out the path-breaking scientist, Borlaug found opportunities to share his story in terms of personal sacrifice living amongst the hardships of developing countries for the greater good of helping poor, suffering people. His first appearance on television provides a case in point. In 1969, the UK television station ATV awarded him their "Man of the Year," prize, and introduced him to the British public through a 38-minute biopic.[85] The film offers an especially useful look at how the figure of the hero-scientist was constructed, and how Borlaug himself began to "story" his own experience as a testimony for how other "hunger fighters" might devote themselves to the higher cause of feeding the world.

The film opens with a close-up of a sunlit Borlaug, donning his trademark short-brimmed fedora and standing in a wheat field in Mexico. In a few short sentences, Borlaug tells us that he "grew up on the land" in a small farm in Iowa, where he experienced the economic hardships of the Great Depression. Through these experiences, he says, he came to realize that farmers on small plots of land throughout

[84] Quoting Borlaug's Mexican Agriculture Program colleagues, biographer Leon Hesser describes Borlaug's "fanatical devotion to wheat." Hesser, *The Man Who Fed the World*.
[85] CIMMYT, "Norman Borlaug Man of the Year 1969," YouTube, May 2011, https://www.youtube.com/watch?reload=9&v=r-8HWsfntEQ.

the world needed more help, and he "dedicated his life to science, especially to food production." The film then follows Borlaug throughout his work in Mexico, showing footage of him supervising wheat experiments, eating a hurried breakfast with his wife, and attending a little league baseball practice. Throughout, Borlaug conveys that he is not interested in prizes or recognition, only in improving the lives of poor people. Viewers gain insight into this dedication through clips of interviews with women that lived closely with Borlaug: his wife and secretary. They each speak candidly about Borlaug's obsession with his work. His wife states that Borlaug's "home life and family" take a backseat to his work—a point his secretary echoes, arguing that when it comes to the "problem" of global hunger, "perhaps he reaches the point of extreme concern." In the film's interviews with Borlaug, he speaks with conviction about the poor prospects of food production across the world, and about the urgency of bringing Western agricultural technologies to what he calls "underdeveloped countries." Describing the dramatic changes in India and Pakistan's production of wheat, Borlaug talks about how the Green Revolution might spark a transformation in the psychology of rural farmers. Borlaug stresses the urgency of bringing improved seeds to countries across "Asia and Africa," where the agriculture was "extremely inefficient." As the camera captures a scene in rural Mexico, where a local folk band plays instruments while a bare-chested and barefoot indigenous man dances in the dirt, Borlaug explains:

> when you are asking primitive people to give up their traditional ways and their old methods, you are dealing with suspicion and traditions that are deep rooted. You must push them a bit if you are to help them. They are ultra-conservative and they are suspicious. You must make your demonstrations spectacular, so that the differences in yield of grain are tremendous. They are not differences of ten or twenty percent. They are differences of three or four or five hundred percent. So that a blind man can see them. When this is done, primitive people will be

> able to distinguish for himself (sic) how much is improved technology and how much is witchcraft.[86]

Here Borlaug relates a kind of conversion narrative in line with modernization theorists of the day that talked about the need for psychological transformations in the mind of peasant farmers.[87] Relying, as he often would, on biblical tropes, Borlaug invoked the story of miraculous vision, in which previously unenlightened and metaphorically "blind" people come to see the truth. "Improved technology" becomes a stand in for that which brings "primitive people" into a place of enlightened rationality. As I explore in greater depth below, Borlaug's formulation was rooted in a racialized evolutionary narrative that equated modernization with bringing civilization to "backward" people in the Third World.[88]

Borlaug tells viewers that an impending population crisis makes this salvationary mission all the more urgent. As the filmmakers ride along with Borlaug in his sedan, he shows them how he drives past the factory that produces the chemical used for birth control or "the pill." As he pulls over his car, Borlaug explains: "You see, there are two sides to this complex human problem, the one of food production and the one of population growth…both must be considered and brought into balance with the other if there is to be a better life for all of the people of the world." A fervent Borlaug insists that human reproduction must be slowed. "Today the world is densely populated, and it is growing at a monstrous and frightening rate, the one that (sic) Sir Thomas Malthus

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[86] "Norman Borlaug Man of the Year 1969."
[87] Theodore W. Schultz, *Transforming Traditional Agriculture* (New Haven, Conn.: Yale University Press, 1964).
[88] For the centrality of this civilizing narrative to post-World War II development, see especially Escobar, *Encountering Development*.

predicted that we would end up in this disaster more than 150 years ago."[89] In line with influential popular and academic voices at the time, Borlaug's views drew upon the thinking of Malthus, the British reverend and economist whose 1798 *Essay on the Principle of Population* argued that human population growth would inevitably outstrip food supply. As the Green Revolution efforts had ramped up in the 1960s, Borlaug had grown fond of narrating the Revolution's gains in terms of a triumph over the Neo-Malthusian "doomsayers" that had predicted widespread global famines.

The year after his appearance on British television, Borlaug would take these same arguments to the Nobel stage in Oslo, Norway. The day after he was granted the Peace Prize, Borlaug delivered a lengthy lecture entitled "The Green Revolution, Peace, and Humanity." Though the Green Revolution was deeply tied to U.S. national security interests, and the U.S. was at that time embroiled in a protracted war in Vietnam, Borlaug's lecture scarcely referenced contemporary issues of war and peace. Instead, he described the Green Revolution solely in terms of an age-old battle between technological advancement and what he called "the Population Monster." Near the beginning of his address, Borlaug offered a straightforward assessment of the agricultural transformations for which he was being recognized:

> The green revolution has won a temporary success in man's war against hunger and deprivation; it has given man a breathing space. If fully implemented, the revolution can provide sufficient food for sustenance during the next three

[89] The film cuts from Borlaug warning that humankind might soon go the way of the dinosaurs to stock photographs of famished children, giving British audiences a moral connection between hunger in the abstract and images of abject black and brown bodies. See James Vernon for a discussion of the historical context of Western famine imagery and photography. James Vernon, *Hunger: A Modern History* (London, England: The Belknap Press of Harvard University Press, 2007).

> decades. But the frightening power of human reproduction must also be curbed; otherwise the success of the green revolution will be ephemeral only.

Continuing, he argued that Malthus himself could not have envisioned the "grotesque concentration of human beings into the poisoned and clangorous environment of pathologically hypertrophied megalopolis." Invoking imagery of teeming masses of hungry people in overcrowded cities of the global South, he asked his Oslo audience to consider whether "human beings [could] endure the strain?"[90]

Though Borlaug's rhetorical question appealed to a universal humanity, in which all humans on the planet faced the growing threat of resource scarcity, he insisted that humanity was, in fact, starkly divided. He contrasted the "privileged world," which consisted of the "affluent, developed nations" with what he called the "forgotten world"—the "developing nations, where most of the people, comprising more than 50 percent of the total world population, live in poverty, with hunger a constant companion and fear of famine a continual menace." Though most of these people farmed, their crop yields were "near starvation level" and had been "stagnant for centuries." He depicted farmers struggling to eke out a living on "tired, worn-out" land, "depleted of plant nutrients and often eroded." This dire situation was even worse because "crop yields remain stagnant while human numbers continue to increase at frightening rates." Borlaug paints a picture in which people in "India, Pakistan, and most of the countries in

[90] This imagery built directly on the warnings of Neo-Malthusians such as Paul Ehrlich, whose bestselling 1968 book famously opened with a depiction of a "crowded slum area" in Delhi, where Ehrlich and his wife are "frightened" by numerous people all around them. "The streets seemed alive with people. People eating, people washing, people sleeping. People visiting, arguing, and screaming. People thrusting their hands through the taxi window, begging. People defecating and urinating. People clinging to buses. People herding animals. People, people, people, people." Ehrlich, *The Population Bomb*, 1.

Asia and Africa" lived, essentially, closer to the earth—wholly dependent upon the whims and vagaries of nature. Describing the masses of people living in the forgotten world in terms of being at a temporal standstill, outside the flow of historical progress, Borlaug's comments suggest that farmers in this half of the world did not have the knowledge and technology to overcome the impending Malthusian crisis they faced.

Borlaug's arguments depicted rural poverty as a kind of intrinsic trait of farmers in the "developing world." This view of poverty built upon the arguments promulgated by Malthus himself. Though his empirical calculations proved inaccurate, the power of Malthus' argument proved to be in their political use, especially insofar as it reframed property relations into a moral question (as opposed to one of resource allocation).[91] In declaring "the power of population [to be] indefinitely greater than the power in the earth to produce subsistence for man," Malthus created a powerful morality tale about human poverty.[92] No longer was poverty an issue of unequal resource distribution; now it was "the poor" themselves who became morally responsible for their own poverty. As Betsy Hartmann writes, "Through his principle of population, Malthus not only made scarcity a law of nature, but naturalized the social, economic and political inequalities of his time."[93] Malthus' principle of population justified poverty as the problem of the

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[91] Kalpana Wilson, *Race, Racism and Development: Interrogating History, Discourse and Practice* (London ; New York : New York: Zed Books ; Distributed in the USA exclusively by Palgrave Macmillan, 2012).

[92] For more on the persistence of Malthusian thinking in Western development theory and policy, see:
Eric B. Ross, *The Malthus Factor: Population, Poverty, and Politics in Capitalist Development* (London ; New York : New York: Zed Books ; Distributed in the USA exclusively by St. Martin's Press, 1998). And Lyla Mehta, ed., *The Limits to Scarcity: Contesting the Politics of Allocation* (London ; Washington, DC: Earthscan, 2010).

[93] Betsy Hartman, "The Ghosts of Malthus: Narratives and Mobilizations of Scarcity in the US Political Context," in *The Limits to Scarcity*, ed. Lyla Mehta (London; Washington, DC: Earthscan, 2010), 49.

poor's insatiable appetite to consume resources—instead of a question of property distribution. Indeed, as Nicholas Hildyard argues, Malthus' *Essay* was not originally meant to be about human population per se. Rather, it was written as a defense of private property. In support of the movement across Britain to remove peasants from land held in common, Malthus

> furnished the privatization movement with a spuriously neutral, pragmatic set of arguments for promoting a new political correctness—one that denied the shared rights of everyone, however poor, to subsistence, sanctioning instead the rights of the 'deserving' over the 'underserving', with the market as arbiter of entitlements. This was the essence of the Malthusian argument—and the political goal to which 'population' was first strategically deployed.[94]

Borlaug's use of scarcity narratives can likewise be thought of in these terms, as a political strategy that narrowed the framework for evaluating global poverty and hunger—and propelled highly politicized projects forward under the guise of a moral crusade to remember the "forgotten" souls in the Third World.

This moral framework depended upon a historicism that depicted the non-Western other as needing to "catch-up" to the modern West, personified in the subject of the white, male scientist. Borlaug's historicism, in which homogenous Third World farmers across "much of Africa and Asia" need to see the light of modern industrial farming in order to spiritually awaken to modern agriculture, are rooted in ideas of what David Theo Goldberg calls racial historicism.[95] The teleology of progress, in other words, is rooted in ideas of racial difference and a perceived need for non-white, "primitive" people to evolve toward Western modernity. As Borlaug draws indirect

[94] Nicholas Hildyard, "'Scarcity' as Political Strategy: Reflections on Three Hanging Children," in *The Limites to Scarcity*, ed. Lyla Mehta (London; Washington, DC: Earthscan, 2010), 161, f.n. 30.
[95] David Theo Goldberg, *Are We All Postracial Yet?* (Malden, MA: Polity Press, 2015).

parallels between both North American indigenous people and "primitives" in Africa and Asia more broadly, he demarcates a teleology from primitive to traditional, from witchcraft to Western science. Historically, this kind of association happened through technologies of race—as white westerners used science as a "measure of man" and located underdeveloped people in the non-white populations of the colonies.[96] But we can also think about how this progression from primitive belief systems to enlightened, Western science is structured through whiteness. Not only is Borlaug embodying a white subjectivity, as he narrates the racial progress of non-white others, but this modernization discourse extends more overtly racist colonial discourses. Cloaked in the language of modernization, Borlaug's rhetoric rests upon a history of white westerners narrating the historical progression of non-white Others. As Kalpana Wilson argues, the Malthusian-infused development rhetoric that American modernization theorists adopted after World War II reworked more overt racism from the colonial era. Wilson notes that Malthus' own ideas moralized a kind of progression of human hierarchy from "savage to civilized."[97] In the "Man of the Year" biopic, Borlaug's narrative about "primitives" in "Asia and Africa" overlays shots of indigenous Mexicans practicing ostensibly "traditional" music and dance. This creates a parallel historicist narrative familiar to Western viewers, placing the indigenous person as the figure of the vanishing past, and Borlaug and his Mexican scientist colleagues as modern. As Borlaug gestured to in the film, the stakes of the impending transformation—or awakening—of the Third World

[96] Michael Adas, *Machines as the Measure of Men: Science, Technology, and Ideologies of Western Dominance*, Cornell Studies in Comparative History (Ithaca: Cornell University Press, 2014).
[97] Wilson, *Race, Racism, and Development,* 73. Wilson details how Malthus' ideas relied on hierarchies of people, in which human progress moved along a hierarchy from savages to civilization.

peasantry were indeed high. The battle for the hearts and minds of farmers in the South was a crucial front in the Cold War's geopolitics. Central to this context was a narrative in which "overpopulation" in the Third World constituted a dire threat for the West.

The threat of population: Malthusian fears, race, and security

Like many of his contemporaries, Borlaug used the language of war to describe the Western efforts to feed the so-called developing world. Quoting the first Director-General of the United Nations (UN) Food and Agriculture Organization, John Boyd Orr, Borlaug declared: "You can't build peace on empty stomachs." He argued that this warning would

> become even more meaningful in the future, as world population skyrockets and as crowding, social pressures, and stresses increase. To ignore Lord Orr's admonition would result in worldwide disorders and social chaos, for it is a fundamental biological law that when the life of living organisms is threatened by shortage of food they tend to swarm and use violence to obtain their means of sustenance.

Though population concerns had been marginal to Borlaug's early work in Mexico, "world population" had become the dominant framework through which global food supply issues were framed by the late 1960s. As Eric Ross has shown, throughout the 1960s American government and development circles, a contingent of high-level advisors, National Security figures, officials from the Rockefeller and Ford Foundation, and demographers began to equate the threat of communism with the specter of population growth in the Third World.[98] In the case of India, the Ford Foundation and U.S. Government both promoted a narrative that interpreted India's agrarian issues

[98] Ross, *The Malthus Factor.*

solely in terms of "population," rather than structural issues of unequal land distribution that had begun under British colonization. In this same vein, U.S. officials interpreted the Green Revolution's first successes in Pakistan and India in 1966 and 1967 largely in Malthusian terms: they had staved off impending famine caused by a rapidly growing population. Borlaug's Nobel speech was part of this broader narrowing of the framework for understanding the geopolitical conditions of the Green Revolution.

In framing the Green Revolution solely in terms of an abstract global food supply vs. an equally abstract global population, Borlaug also emphasized the security concerns that might result from unchecked population growth. After he asks whether humans can "endure the strain" of the teeming billions of poor and hungry, he warns his audience of the chaos that might ensue from unchecked population growth: "Abnormal stresses and strains tend to accentuate man's animal instincts and provoke irrational and socially disruptive behavior among the less stable individuals in the maddening crowd." The threat is clear: the Population Monster might metastasize beyond the borders of the forgotten world, and contaminate the larger body of mankind. Cloaking this racialized description of swarming masses of black and brown bodies in the language of science, Borlaug constructs hunger as a security issue.

Appealing to scientific rationality, Borlaug continued: "it is a fundamental biological law that when the life of living organisms is threatened by shortage of food they tend to swarm and use violence to obtain their means of sustenance." He depicts people in the Third World in terms of their "animal like" urges—not only to reproduce, but to become violent. Tropes of animality have long been central to racialization.[99]

[99] Goldberg, *Are we all postracial yet?*

Without talking about skin color, Borlaug's references to the human as animal, with the potential to become even more animal-like under the stress of hunger, are racialized descriptions of particular humans. For his privileged world audience, the threat of "social chaos" is clearly something that emerges elsewhere, in the Other world teeming with black and brown bodies. Borlaug reemphasizes the immensity of this growing threat through homogenized language that emphasized the sheer number of these potentially threatening bodies, referring to "vast underprivileged masses," and "underprivileged billions." Importantly, the kinds of arguments Borlaug made about populations threats were used to justify harsh population control programs that were administered alongside Green Revolution projects across Asia and Latin America.[100] As Wilson argues, after World War II, Western governments increasingly viewed poverty and "overpopulation" as a security threats. Racial imaginaries of threatening black and brown bodies buttressed these fears. Wilson writes:

> With anti-colonial resistance intensifying, fear increasingly permeated the discourse of overpopulation in the South, and this was reflected in a subtle change in the racialised representation of non-white populations: whereas earlier the emphasis had been on 'apathy', 'indolence', and 'fatalism', tropes which were used to justify colonial inaction in the face of famine and starvation, these same populations now began to be more often portrayed as ominously hyperactive, incessantly 'swarming', 'teeming' and 'seething'. These ideas would soon be mobilized to call for direct intervention to limit these populations.[101]

Borlaug's reference to a "biological" truth about humans naturalizes the Western fear of non-western people-as-animals. His use of tropes of "swarming" aligned with broader rhetoric about population growth in the South as a threat to the Global North. As

[100] Matthew Connelly, *Fatal Misconception: The Struggle to Control World Population* (Cambridge: Harvard University Press, 2010).
[101] Wilson, *Race, Racism and Development*, 79.

demonstrated in the "Man of the Year" biopic, Borlaug was deeply invested in the project of population management. Shortly after he gained notoriety from his Nobel Prize, he began to serve on the boards of several population control advocacy groups, and he was an active supporter of population control policy throughout his career.[102]

Not only was Borlaug drawing on racialized tropes about animalistic, violent-prone black and brown people, but he was also directing his "privileged world" audience to consider the strange, otherworldly fecundity of the "forgotten world" woman. So doing, he rendered these women's bodies highly visible, while, at the same time, depicting them in terms that emphasized their bodiliness. He directed his audience to think of Third World women *as bodies*. The fact that, for these imagined Others, starvation—that most embodied experience—was so constant and immediate reminded Borlaug's Oslo audience of absolute material differences between the "privileged" and "forgotten" world. Through the process of imagining the bodily reality of Third World hunger, Borlaug's audience could confirm ideas about their own spatial and temporal distance between themselves and poor, distant Others. As Glover writes, "insofar as Enlightenment paradigms pervade our understandings of the human, the physical body is a testament to limitation—in contradiction to the limitlessness of the mind—and is to be shunned and devalued." "There is, then," Glover continues, "something less than human

[102] Borlaug served as a board member or advisor for two different American population control/advocacy organizations: He served as the Director of Population Communications International from 1985-1994, and became a member of its International Advisory Counsel in 1995; Beginning in 1971, Borlaug also served as Director of the Population Crisis Committee (founded by William Draper in 1965), which later became "Population Action International." See: "Dr. Borlaug's CV," World Food Prize, accessed May 15, 2019, https://www.worldfoodprize.org/index.cfm?nodeID=87450&audienceID=1.

about hunger."[103] Through envisioning potentially threatening Third World bodies, Borlaug cemented a racialized and gendered boundary between the West and "the rest."[104] Adopting a prophetic voice (through biblical references, testimony, forewarning, and speaking for the collective "we"), Borlaug's speech aims to "incite audiences to self-reflection and action."[105] As he appeals to his authority as a man of science, Borlaug invites is audience to join him in the righteous "war" against hunger. The need for an "army of hunger fighters" from the West, Borlaug stresses, is made all the more urgent by the alarming threat of population outrunning food supply. Again, Borlaug the prophet warns his followers of the magnitude of the choice they face, one between embracing science or succumbing to widespread social chaos.[106]

Techno-salvationary impulse: saving souls in the forgotten world

Despite Borlaug's prophetic warnings, his message remained optimistic. Indeed, Borlaug denounced those he viewed as more pessimistic neo-Malthusians like Paul Ehrlich and the Paddock brothers (whom he referred to as "the Prophets of Doom"). Harkening the Old Testament, he argued that man—with the power of God and science—might overcome the "frightening power" of unwieldy human reproduction. Ever the techno-optimist, Borlaug was confident that the seeds of the Green Revolution could sow a transformation that would quiet the neo-Malthusian "doomsayers" of the

[103] Glover, "'Flesh like One's own,'" 247.
[104] Stuart Hall, "The West and the Rest: Discourse and Power," in *Modernity: An Introduction to Modern Societies*, ed. Stuart Hall et al. (Malden, MA: Blackwell, 1996), 184–227.
[105] Shulman, *American Prophecy,* 6.
[106] Indeed, Borlaug's speech repeatedly turns to the first person plural, thereby enrolling his audience into what he described as a growing "army of hunger fighters"—those who are faced with the choice to either provide for or forget the "underprivileged billions" outside of the current of history.

day. In constructing science as the "measure of men," while at the same time relegating large portions of racialized populations as outside of the path of scientific progress, Borlaug demarcated two worlds: one of scientific progress, enlightenment values, and whiteness; the other, a non-white, forgotten world not-yet reached by scientific progress.[107] Yet, for Borlaug, there was hope that the forgotten world could be saved through science. Drawing analogies between the "forgotten world" and the Old Testament, he argued that the only salvation for its "victims" of "stagnant" crop yields and scarce land would come from outside intervention, from the privileged world "we" he charged with improving the plight of the poor.

Borlaug ends his lecture on a more positive tone, suggesting that Man might indeed prove to be "rational" and find a way to check population growth. Establishing a sense of historicism—a notion of a unified, Western "mankind" moving toward future progress—Borlaug again references the Old Testament.[108] Whereas Joseph in the Old

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[107] Beth Coleman draws on Michael Adas to discuss the way racial logics underpinned post-Enlightenment Western ideas about the scientific and technological "progress" of non-Westerners. "[W]e live with the legacy of a Western culture," Coleman writes, "in which scientific discovery and mechanical progress were the preeminent gauges by which to assess the evolution of a nation or of an ethnic group. Michael Adas argues that technological advancement established 'the new sense of what it meant to be civilized and the conviction that only peoples of European descent measured up to standards appropriate to the industrial age.' According to Adas, the Enlightenment inaugurated an age of reason that established hierarchies of inequality through a normative evaluation of racial difference. In this period, the synchronic development of a rationalist worldview, which valued scientific innovation and technological invention as the markers par excellence of advanced culture, also arose. Adas describes a post-Enlightenment racist worldview that spans nations and subsequent eras. In his logic I find a conception of race as a mechanism, as a tool, which has been applied with powerful, lasting results to modern society and structure." Beth Coleman, "Race as Technology," *Camera Obscura: Feminism, Culture, and Media Studies* 24, no. 1 (2009): 177–207, https://doi.org/10.1215/02705346-2008-018.

[108] See Chakrabarty *Provincializing Europe* for a discussion of historicism and the role of historicist thought in colonialism. "Historicism," for Chakrabarty, "is a mode of thinking with the following characteristics. It tells us that in order to understand the nature of anything in this world we must see it as an historically developing entity, that is, first, as an individual and unique whole — as some kind of unity at least in potentia — and second, as something that

Testament had used the wisdom provided by "his God," Borlaug argued that "today, we should be far wiser." Invoking the singular power of Western science, he argued that man could, "with the help of our gods and our science" increase food supply. For Borlaug, "science and technology" offered a way out of the "impending doom" of growing population. Suggesting a kind of global techno-managerial solution, Borlaug depicted a future in which "man…will adjust the growth rate to levels which will permit a decent standard of living for all mankind." He ends his lecture with a reference to the Old Testament book of Isaiah, suggesting that "by developing and applying the scientific and technological skills of the twentieth century," [man] could still realize the Prophet Isaiah's dream of making deserts bloom." Here Borlaug revises Isaiah's prophecy, even as he situates himself within the same tradition. Invoking Christian faith toward a future "promised land" of material abundance, Borlaug constructs "modern science" as a new kind of god—if not more powerful than the monotheistic God of the Old Testament, than perhaps equal to Him. Following Schulman's analysis of the ways in which prophecy has been adopted by public figures on both sides of the political spectrum, we might ask how Borlaug's appeals to prophecy and use of the prophetic voice serve particular political aims. What purpose do Borlaug's biblical references

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develops over time." … "Ideas, old and new, about discontinuities, ruptures, and shifts in the historical process have from time to time challenged the dominance of historicism, but much written history still remains deeply historicist. … it still takes its object of investigation to be internally unified, and sees it as something developing over time" (22-23). Importantly, historicist thought has been—and continues to be—a central mode of colonial power. Chakrabarty: "Historicism enabled European domination of the world in the nineteenth century. Crudely, one might say that it was one important form that the ideology of progress or 'development' took from the nineteenth century on. Historicism is what made modernity or capitalism look not simply global but rather as something that became global *over time,* by originating in one place (Europe) and then spreading outside it" (7). See: Dipesh Chakrabarty, *Provincializing Europe: Postcolonial Thought and Historical Difference*, Reissue, with a new preface by the author, Princeton Studies in Culture, Power, History (Princeton, NJ: Univ. Press, 2008).

serve? By placing his own remarks within the lineage of Hebrew prophets, how does Borlaug both appeal to his audience and mobilize support for his arguments?

Schulman argues that a key aspect of the prophet is their ability to speak to the collective community of their particular audience. Moreover, with their unique ability to make clear the circumstances of that community, prophets redefine the very terms upon which that community is shaped. Prophets, Schulman writes, "make claims about the circumstances and difficulties—and fateful decisions—*of the whole*; indeed, in this way they reconstitute the very 'we' they seem to invoke as a given. In each regard they seek to *redeem* the community they address and whose fate they commit to sharing."[109] It is this sense of redemption that Borlaug conveys in the end of his Nobel address. After offering harsh warnings about future Malthusian nightmares, Borlaug offered his audience a solution: Science. It is only with reverence to Western science that the "fateful decisions" Borlaug referenced in his speech—between war and peace, social chaos and technological solutions—can be faced. So while Borlaug's speech can be read as simply rehashing Neo-Malthusian warnings about population scares or reducing the complexities of the Green Revolution to a parable of technology staving off the population monster, it also conveys a particularly durable prophecy around the urgency of embracing scientific Truth in debates about the future of agriculture.

As I have stressed throughout this chapter, it is important to think about how Borlaug's prophecy articulates with whiteness. Here I am conceptualizing whiteness to mean much more than Borlaug's phenotype or racial identity. Though he is recognizably white, Borlaug's whiteness should be understood as more than skin deep. As Richard

[109] Schulman, *American Prophecy,* 6.

Dyer argues in his classic book on whiteness in film, representations of white people in popular culture are often understood to be non-raced.[110] As opposed to images of non-white people, depictions of white people are rarely associated with "race" per se. (Even twenty years after the publication of Dyer's book, despite a resurgence of popular discussions about race, cultural representations of white people are not often viewed as racial.) Dyer argues that unpacking white people's ostensibly "non-raced" subjectivity is crucial to understanding the persistence of white privilege and racial inequality. White people gain tremendous power from their capacity to speak "for humanity" (as opposed to "for" their race). "There is no more powerful position," Dyer writes, "than that of being 'just' human. The claim to power is the claim to speak for the commonality of humanity. Raced people can't do that—they can only speak for their race. But non-raced people can, for they do not represent the interests of a race…."[111] Borlaug's claim to authority, insomuch as it comes from his prophetic pronouncements about "the human race" or "all mankind" demonstrate this relationship between whiteness and authority. As Dyer argues, "the equation of being white with being human secures a position of power."[112] In both the "Man of the Year" biopic and his Nobel lecture, Borlaug appeals to notions of universal humanity. Yet it is precisely from his position of white subject, at once marked and un-marked, that he is able to do so.[113] Even as he invokes a universal

[110] Dyer, *White*.
[111] *ibid.,* 2.
[112] *ibid.,* 9.
[113] Vicente Rafael's definition of the white gaze is useful here. Speaking in the context of the U.S. census project during its occupation of the Philippines in the early 1900s, Rafael argues that the census "renders colonial subjects visible from a transcendent, posthistoric vantage point, one occupied by what we might designate as the white gaze. Spatially, it is a gaze that dreams of surveying and cataloging other races while remaining unmarked and unseen itself; temporally, it is that which sees the receding past of nonwhite others from the perspective of its own

human, Borlaug's separation of humanity into "two worlds," centers the agency of those in the "privileged" world. By emphasizing the agency of modern, liberal subjects in the Global North (or, Borlaug's "privileged" world), Borlaug's arguments "center the agency of whiteness" in history.[114] Indeed, his speech places those in the "forgotten" world outside the current of history. As discussed earlier, this must be understood as a racial historicism rooted in, and reproductive of whiteness.

"New technology will be their salvation": Borlaug turns to Africa

In a sense, Borlaug's Nobel Peace Prize marked the moment his career changed. In memorials of Borlaug, people that knew him describe his hesitancy to embrace the spotlight. Though he preferred working in the fields, he reluctantly accepted his role as a public spokesperson for the cause of the Green Revolution. Following his Peace Prize, Borlaug would frequently be called upon to espouse the benefits of agricultural technologies, including testifying before the UN FAO on the benefits of DDT in the mid 1970s. He denounced environmentalists like Rachel Carson for their "privileged" and irrational opposition to agricultural chemicals. He lamented that Carson's book had sparked a "vicious, hysterical propaganda campaign against the use of agricultural chemicals." Describing Carson's earlier work in feminized language, Borlaug argued that *Silent Spring* "was not typical of her gentle, kind nature." Instead, "It was a diabolic, vitriolic bitter one-sided attack on the use of pesticides, especially insecticides and weed killers. DDT was the main villain." Borlaug saw *Silent Spring* as the center of

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irresistible future." Vicente L. Rafael, *White Love: And Other Events in Filipino History*, American Encounters/Global Interactions (Durham: Duke University Press, 2000).

[114] Keith P. Feldman, "The Globality of Whiteness in Post-Racial Visual Culture," *Cultural Studies* 30, no. 2 (March 3, 2016): 289–311, https://doi.org/10.1080/09502386.2015.1020957.

a widespread communications campaign led by environmental organizations like The Sierra Club, the National Audubon Society, and the Environmental Defense Fund. He argued that these efforts were based largely on "scare tactics" and failed to recognize that DDT was, overall, a societal benefit, especially for its role in combatting malaria. Citing experts from the World Health Organization and the U.S. Public Health Service, Borlaug recounted the prevailing knowledge of the day: DDT was not a threat to human health and did not cause cancer. He then warned that if the "environmental lobby groups" were to succeed in getting DDT banned, it would only be the "first of the dominoes" of agricultural chemicals they would go after. He argued that if these environmental groups were able to get pesticides banned in the US, it would result in tremendous loss of crops and food prices would quadruple. "Who then," Borlaug asked, "would provide for the food needs of the low income groups?" "Certainly not the privileged environmentalists?"

In the last decade of his life, an indefatigable Borlaug would use this same line of reasoning—that privileged Westerners were keeping life-saving technology out of the hands of needy people in the global South—to advocate for the use of biotech crops. In academic journals like *Science* and mainstream publications like *The Wall Street Journal,* he penned editorials arguing for the need to expand biotech crops into the developing world and denouncing biotech opponents. In a particularly poignant example from 2000, he wrote a polemic in the Plant Physiologists journal entitled, "Ending World Hunger: The Promise of Biotechnology and the Threat of Antiscience Zealotry." In the article, Borlaug extolled the potential benefits of biotech crops and stressed their importance in "the battle to ensure food security for hundreds of millions of miserably

poor people."[115] He set up an argument that sounded quite similar to his Noble lecture: global population was "mushrooming," while many of the farmers of the world lacked Western agricultural technologies that could help them overcome their poverty and hunger. But "extremists" and "antibiotechnology zealots" were largely preventing biotech crops from being used in developing countries. Borlaug quotes his own warning from the Nobel lecture about the urgency of "curbing" the "frightening power of human reproduction," arguing that as the world approaches a population of 10 billion people, tools like agricultural biotechnology would be essential. Returning to the kind of "privileged world"/"forgotten world" framing he made thirty years before in Oslo, Borlaug argued: "The affluent nations can afford to adopt elitist positions and pay more for food produced by the so called natural methods; the 1 billion chronically poor and hungry people of this world cannot. New technology will be their salvation, freeing them from obsolete, low-yielding, and more costly production technology."[116]

Borlaug's public support for agricultural biotechnology late in his life reflected both his own close relationships with the biotech industry and the industry's recognition that the Borlaug hero-narrative would prove useful in advancing their public relations (keep in mind that, on the heels of Monsanto's notoriously terrible public relations history, the industry had long struggled to market biotechnology as "sustainable" and "pro-poor.") One region of the world received particular attention across all of these arguments about using agricultural biotechnology to combat "Third World" hunger and poverty: Africa.

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[115] Borlaug, "Ending World Hunger."
[116] *ibid.*, 490.

Africa was at the forefront of Borlaug's work in his later career. He collaborated with former US President Jimmy Carter to develop a project in Ghana during the 1980s and 1990s that sought to introduce hybrid seeds and fertilizer to smallholder farmers. The Japanese philanthropist Ryoichi Sasakawa sponsored this project. Sasakawa, a leading figure in fascist political groups in Japan during World War II who was accused by the U.S. of war crimes made billions of dollars through developing a motorboat racing gambling empire across post-war Japan. After meeting Carter through philanthropic initiatives, Sasakawa became interested in agricultural development projects in Africa. As the story goes, he decided to call Borlaug on the phone to see if the Nobel Prize winner was interested in contributing to this mission.[117] Borlaug agreed to chair a new organization, called the Sasakawa Africa Association (SAA), which was founded in 1986. As president and consultant for Sasakawa's project in Africa, Borlaug traveled to the continent several times each year. Each year during the SAA annual conference, Borlaug would speak to audiences of Western development officials about the need to develop a Green Revolution in Africa. Compared to the Rockefeller and Ford Foundation's programs, the SAA projects were fairly small-scale. They also lacked the kind of state backing Green Revolution projects received in their heyday. Nonetheless, Borlaug was outspoken about the need to further expand the kind of projects SAA developed, which mostly operated through rural agricultural extension programs that introduced new varieties of seeds and fertilizers to smallholder farmers. In the 1995 annual meeting, Borlaug declared that Africa had been "bypassed" by the

[117] Gregg Easterbook tells this story in his profile of Borlaug in *The Atlantic.* Easterbrook, Gregg. "Forgotten Benefactor of Humanity." The Atlantic, January 1, 1997. https://www.theatlantic.com/magazine/archive/1997/01/forgotten-benefactor-of-humanity/306101/.

Green Revolution, and that "explosive population growth" and a lack of investment in "improved agricultural technology" had led to increasing food insecurity across much of the continent.[118] Borlaug outlined a vision of the Green Revolution that depicted Africa as a kind of "sleeping giant," who merely needed to be awakened:

> Africa is a continent of enormous agricultural potential. The bleak predictions of African famine, social chaos, and environmental destruction need not happen. Warm year-round temperatures and vast areas of potentially arable land are conducive to highly productive and environmentally sustainable agricultural systems. The challenge is to break out of this cycle of wasted human potential and help African farmers—and nations—rise up and achieve their full capacity. Central to the solution is a concerted effort among national governments, international donor agencies, research and extension organizations, and the private sector to help small-scale farmers to break out of the vicious cycle of poverty and wasted potential that they currently endure.[119]

Building on the kind of modernization perspective he had used throughout his career, Borlaug introduced a framework for understanding the urgency of extending Western science and technology across the continent: "human potential." This framing also suggest the idea of a "culture of poverty," a concept first popularized by anthropologist Oscar Lewis in his studies of impoverished families in Mexico and Puerto Rico in the 1960s, that would go on to become influential in shaping American international development policy. In short, the "culture of poverty" concept made poverty into a cultural element that poor people passed on through generations (thus the emphasis on "cycles"). As Laura Briggs argues in her classic history of American colonialism in Puerto Rico, Lewis' "culture of poverty" thesis made sex and reproduction the locus of

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[118] Norman E. Borlaug, "Mobilizing Science and Technology for a Green Revolution in Achieving Greater Impact from Research Investments in Africa," ed. Steven Breth (Mexico City: Sasakawa Africa Association, 1996), 209–17.
[119] *ibid.,* 217.

discussions around poverty. The concept, Briggs writes, "provided a terrain on which to debate poverty policy that was based on ideologies of gender, insulated from economics, and tremendously productive of difference, race, class, liberal discourses of rescue, and conservative demonization of the poor. Puerto Ricans were not poor; because of racism, job markets, or colonialism, but because they had the wrong kind of family."[120] As Briggs points out, the culture of poverty concept was highly racialized, yet it relied on a language of "cultural," rather than racial, difference. In this sense, it shifted more overtly racialized discourses about overpopulation in Puerto Rico to social scientific language about a "culture of poverty." As Briggs and other scholars have noted, the trope of the culture of poverty proved durable in post-War World II American development projects.[121] Borlaug's description of poverty demonstrates how his ideas were paralleled some of the assumptions of the culture of poverty thesis. But his argument about African farmers not yet reaching their "full capacity" also sets the stage what would become a more *biopolitical* framing of the "new" Green Revolution.[122] Appearing almost ten years before the uptake of the "Green Revolution for Africa" would really take off in the West, Borlaug's framing here prefigures arguments the Revolution's key proponents would make in the 2000s. The "new" Green Revolution would be about improving "lives and livelihoods." As detailed below, this framing in terms of "human potential"

[120] Laura Briggs, *Reproducing Empire: Race, Sex, Science, and U.S. Imperialism in Puerto Rico*, American Crossroads 11 (Berkeley: University of California Press, 2002), 165.
[121] *ibid.,* 170. "The culture of poverty," Briggs writes, "was not a transhistorical idea that meant the same thing in the 1960s as it did in the 1980s, but a trope, a powerful set of images whose meanings moved and whose political effects ran the gamut from radical to liberal to conservative. Its key component—the thing that was probably responsible for its consistent power to mobilize people and produce public policy effects—was its narrative about the deviant sexuality of poor, usually non-white women." For the influence of the culture of poverty and related ideas about "vicious cycles" of poverty in international development policy, see Escobar: *Encountering Development*.
[122] Patel, "The Long Green Revolution."

would resonate with the philanthrocapitalist dictates of a new wave of Green Revolutionaries.

In the waning years of his life, Borlaug became increasingly outspoken about the need to catalyze widespread agricultural transformations across Africa. He urged this cause in editorials in *Science* and *The Wall Street Journal* and in a biopic on ABC World News Tonight with Peter Jennings.[123] He published a series of editorials in *The Wall Street Journal* between 2007 and 2009 that argued for "continuing the Green Revolution" and urged Western development officials to get behind "A Green Revolution for Africa."[124] Much of Borlaug's rhetoric focused on the urgency of introducing biotech crops to African countries. He repeated many of the talking points of the agricultural biotechnology industry, including arguments about "pro-poor biotechnology" being an essential tool for farmers in the Global South to manage increasingly unstable growing conditions made worse by climate change. Borlaug fervently denounced opponents of GMOs as naive and idealistic, and called for increased funding for biotech research and deregulation of biotech crops in developing

[123] In the 2004 ABC World News Tonight "Person of the Week" biopic, Peter Jennings introduces Borlaug to American television audiences: "His name is Norman Borlaug, and it is agreed in many parts of the world that this quiet American," Jennings narrates, "may have saved a billion lives." After showing clips of Borlaug's 90th birthday party at the U.S. State Department, Jennings relates that "the day after the party, we called him: he'd gone to Africa." Speaking from an "International Conference on Food and Farming in Uganda," the aging Borlaug tells American audiences: "the biggest challenge, of course, is to continue to produce enough food for this large and rapidly growing population." See: University of Minnesota, "Norman Borlaug Interview with Peter Jennings," YouTube, October 10, 2013, https://www.youtube.com/watch?v=A879aLW9B_g.

[124] Norman E. Borlaug, "A Green Revolution for Africa," *Wall Street Journal*, October 26, 2007, sec. Opinion, https://www.wsj.com/articles/SB119336762148772617.; Norman E. Borlaug, "Continuing the Green Revolution," *Wall Street Journal*, July 18, 2007, sec. Opinion, https://www.wsj.com/articles/SB118472139326369773.; Norman E. Borlaug, "Farmers Can Feed the World," *Wall Street Journal*, July 30, 2009, sec. Opinion, https://www.wsj.com/articles/SB10001424052970203517304574304562754043656.

countries. Borlaug's status as father of the Green Revolution anchored the earliest calls in the development community to extend the Green Revolution to Africa. The Rockefeller Foundation's 2006 pamphlet *Africa's Turn: a New Green Revolution for the 21st Century,* also described Africa as frontier. It began by celebrating Borlaug's legacy, but declared: "The Green Revolution stopped at Africa."[125] As mentioned in the opening of this chapter, "the prophet of wheat" died commanding his followers to extend his work to the continent. It would not be long before a new generation of hunger fighters would take up his call.

Fulfilling Borlaug's Dying Wish

Shortly after Borlaug's death, Bill Gates used the World Food Prize—the annual international conference Borlaug had founded—to deliver his first public remarks on agricultural development. The annual event brings together the most important corporate, government, and academic names in international agricultural development. It was an obvious choice as a location for Gates to announce a suite of grants devoted to transforming agriculture across Africa. Gates knew that winning favor in the agricultural development world meant paying homage to Borlaug. Yet his decision to use Borlaug's World Food Prize as the coming out party for the foundation's Ag agenda was more than just smart public relations. As he conveyed in his speech, Gates had connected with the Borlaug story. The legend of the tireless, no-nonsense scientist who had little time

[125] The Rockefeller Foundation, "Africa's Turn: A New Green Revolution for the 21st Century," July 2006, https://assets.rockefellerfoundation.org/app/uploads/20060701123216/dc8aefda-bc49-4246-9e92-9026bc0eed04-africas_turn.pdf.

for politics resonated with Gates' own brand of "impatient optimism."[126] Borlaug's Green Revolution narrative, of technological ingenuity triumphing over Third World poverty also resonated with Gates' approach. Gates' vision for the "new" Green Revolution would, in many ways, pick up right where Borlaug left off—advocating for Western technology to improve the lives of the world's poorest farmers. Though Gates' call for a Green Revolution certainly reworked much of the Borlaug playbook, especially as it adopted a neoliberal empowerment discourse focused on using philanthropy to "lift up" smallholder farmers, it remained steadfast to Borlaug's central tenants. In this section, I show how Gates' efforts to bring the Green Revolution to Africa build directly upon "Borlaug 101." In Borlaug, Gates found the prophecy that his philanthrocapitalist agricultural program was meant to answer. Reading Gates through Borlaug sheds light on how the "new" Green Revolution extends the earlier Revolution's core frameworks regarding race, population, and security.

The Gateses have become two of the most important figures shaping dominant conceptions about how global poverty should be addressed, what Ananya Roy calls "poverty knowledge." Through the Bill and Melinda Gates Foundation, they direct hundreds of millions of dollars each year toward a wide-range of academic and development sector projects in the fields of global health, agriculture, education, and more. Their influence, however, extends beyond monetary terms. The Gateses have become unique public figures in the sense that their benevolent largesse has helped to

[126] The Gateses have cultivated a branded identity around being "impatient optimists." They self-referentially use the phrase when describing their approach to philanthropy. The phrase is central to their Foundation's brand as well, with an "impatient optimists" blog, Janet Echelman's aerial sculpture connecting the Foundation's two headquarters buildings in Seattle is called "impatient optimist." Lisa Rogak's 2012 book on Bill Gates "in his own words" is likewise entitled *The Impatient Optimist.*

solidify their roles as public authorities on global health and poverty. As sociologist Nicole Aschoff details, the Gateses have become important cultural figures (more on Aschoff's argument below).[127] As such, the Gateses are as likely to be found at the World Economic Forum or the White House (at least the Obama White House) as they are on the Ellen DeGeneres show or late-night network talk shows. Because of this cultural status, it is important to not only study the programmatic dimensions of the Gates Foundation, but also Bill and Melinda's public statements.[128] In short, when the Gateses weigh in on something, it matters—even more so when they decide to put their vast philanthropic dollars behind a particular cause. Recently, the Gateses have extended their cultural clout to debates around the "poverty knowledge" shaping agricultural development policy. Though the Gates Foundation's agricultural development program was just getting off the ground at the time of Bill's 2009 speech in Des Moines, the Foundation has arguably become the most influential player in international agricultural development. Moreover, the Gateses and other BMGF leadership have proven especially influential in shaping the conversation around agricultural development, and in contributing financial resources and personnel to a host of development institutions.[129] Taking a closer look at how Bill Gates—and, by extension, the BMGF—framed their agricultural program from the beginning can help to show some of the key modes through which the Foundation's increasingly powerful development machine operates.

[127] Aschoff, *The New Prophets of Capital.*

[128] Here I do not mean to suggest that Bill and Melinda's public statements are *outside* of the operations of the Foundation, or that their public statements are not part in parcel of the workings of the Foundation. Indeed, as I learned from my interviews with Gates Foundation officials, the Gateses and the leadership of their Foundation are incredibly calculative about their public relations.

[129] Rachel Schurman, "Micro(Soft) Managing a 'Green Revolution' for Africa: The New Donor Culture and International Agricultural Development," *World Development* 112 (2018): 180–192, https://doi.org/10.1016/j.worlddev.2018.08.003.

In both tone and tenor, Gates' speech in Des Moines paralleled Borlaug's remarks made forty years earlier. Gates invoked urgency that called to mind Borlaug's warnings about impending famine, arguing that farmers in Sub-Saharan Africa did not have maize varieties capable of adapting to climate change. If something was not done, and done soon, Gates insisted "millions of poor farmers" would soon be on the brink of "starvation." Despite this dire circumstance, Gates reminded the audience that the story of the Green Revolution was cause for optimism. With the Green Revolution as roadmap, he outlined the central tenants for what would become the new Green Revolution: an emphasis on increasing crop "productivity" and raising yields of Africa's most important food crop, maize; funding to help African governments reform their biotechnology laws and open up their markets to international agribusiness; a focus on "unleashing the private sector," both at the local and regional level but also opening up opportunities for international businesses to tap into African markets. Doing this successfully, Gates insisted, meant focusing on the needs of Africa's "smallholder farmer." Outlining what would soon become a mantra in the discourse of the African Green Revolution, Gates declared: "Melinda and I believe that helping the poorest smallholder farmers grow more crops and get them to market is the world's single-most powerful lever for reducing hunger and poverty… Poor farmers are not a problem to be solved — they are the solution, the best answer for a world that is fighting hunger and trying to feed a growing population." If the new Green Revolution would integrate African agriculture into international markets, it would need to do so by focusing on a new kind of subject of development. The figure of the poor farmer as potential entrepreneur would be central to the Revolution's expansion into Africa.

In calling for a development model focused on "the world's poorest farmers" (Gates' keynote was titled "Support for the World's Poorest Farmers"), Gates embodied what Ananya Roy has analyzed as a turn in the development community toward "global poverty" as a central organizing problematic. As Roy argues, since the turn of the millennium, international development has been increasingly defined in terms of imaginaries of and policies directed toward poverty. While global poverty is, of course, nothing new, it has become "sharply visible" in policy circles and development discourse—ranging from the Gates Foundation to the Millennium Development Goals to Corporate Social Responsibility.[130] The idea that the poorest people in the world constitute a site from which to expand markets while solving poverty, thereby tapping into the "fortune at the bottom of the pyramid" has become the new common sense understanding of global poverty. Along these lines, Gates locates the world's "poorest farmers" as a site of hopeful possibility for not only alleviating poverty, but also creating wealth and expanding markets. Tellingly, the figure of the global poor farmer is central to Gates' narrative. While Borlaug's Nobel lecture hardly mentions poverty as a condition, Gates' speech is littered with references to poor people and poor countries.

Like Borlaug, Gates' framing of the global poor depends upon a spatial and temporal separation that defines global poverty as something that happens elsewhere. Where Borlaug described a "privileged" world and a "forgotten" world, Gates divides the world into "rich countries" and "poor countries." And, just as Borlaug had, Gates' mapping of the world disavows historical and geopolitical relations between the global rich and the global poor. Gates reinforces ideas about difference between the "rich

[130] Ananya Roy, *Poverty Capital: Microfinance and the Making of Development* (New York: Routledge, 2010).

world" and the world of these farmers through oblique references to numerous hungry people in Africa. Enforcing the materiality of hunger—the embodied experience—Gates uses the word "starvation" several times throughout his speech. Like Borlaug, he offers Western technology as a solution to the dire circumstances plaguing the developing world. GMOs, he argues, might increase "productivity" and make a difference between people "starving and having a reasonable amount of food." Again, following Glover, we might think about how tropes of hunger function as racial technologies. Gates emphasizes the materiality, the bodiliness of those imagined to be facing starvation. The connotation is that, unlike people in what Borlaug would have called the "privileged world," who merely *have bodies,* the "world's poorest farmers" *are bodies.*[131] Their vulnerability to starvation, the most animal-like death, confirms this material difference.

In chastising opponents of introducing biotech seeds to African farmers, Gates references the "emergency" of climate change and population growth. Like Borlaug, he relies on abstractions to construct a sweeping narrative about impending crises brought upon by food insecurity, population growth, and the effects of climate change. Gates asks his audience to consider: "in the poorest, hungriest places on Earth, population is growing faster than productivity and the climate is changing." Directing his Western audience to think about the "emergency" of poor and hungry places parallels the kind of racial geographies that Borlaug depicted in his Nobel speech. Gates' indirect references to homogenized poor, hungry places appeal to Western associations between non-white

[131] Glover, "'Flesh like one's own,'" 248. In her discussion of the ways in which telethons dehumanize the bodies of suffering people in Ethiopia, Haiti, and New Orleans, Glover quotes Guillermina De Ferrari's construction of "the dissymmetry by which 'one' *has* a body while the 'Other' *is* a body." See Guillermina De Ferrari, *Vulnerable States: Bodies of Memory in Contemporary Caribbean Fiction*, New World Studies (Charlottesville: University of Virginia Press, 2007).

bodies and naturalized poverty, in which people are imagined to be poor because of where they live, while those geographical locations themselves signify poverty. Though Gates avoids the more biologically deterministic language of Borlaug's depictions of "swarming…violent" masses, his crude mappings of poverty and hunger appeal to a similar kind of racial thinking. In constructing particular geographies as intrinsically "poor and hungry," Gates naturalizes poverty as located in "place." This plays upon long-held imaginaries in the West, which associate non-Western places and people living in those places in terms of being "naturally" poor. The racial geography that epitomizes this position is, of course, the singular Africa. Gates need not say "Africa": his audience knows that the prototypical space of emergency is Africa. Yet in relegating the "emergency" to particular places, Gates, like Borlaug before him, disavows relations between those "places" and the West. It is as if those places are naturally poor and hungry. In this sense, Gates' argument at once "distances and confines" food insecurity in the Global South, while raising the specter of that threat spilling over the confines that separate Global North and South.[132] We might consider how hunger also suggests a kind of mindless, drive to find food at any cost, and in any place. Viewed this way, Gates' language invokes fears about hordes of hungry climate refugees, disease, and environmental contamination. These fears are rooted in racialized imaginaries of Third World and non-white threats.[133] They should also be understood in the context of the racial geographies that Borlaug mapped, in which racialized Others are constructed as a security threat to the "privileged world."

[132] *ibid.,* 245.
[133] *ibid.,* 256.

This security framework was central to Gates' argument about the urgency of catalyzing a Green Revolution in Africa. Akhil Gupta describes how the discourses of poverty and security have increasingly converged since the mid 1990s. In the realm of poverty, discourse has shifted from terms of "basic needs and human development," to "human security."[134] This trend was amplified after the terrorist attacks on the United States on September 11, 2001. As Gupta writes, "After 9/11, the *subject* of security changed, so that poverty became a problem of 'human security': the poverty of the global South became a problem for the security of the elite citizens of the global North."[135] Gupta cites the prominent development economist, Jeffrey Sach's influential 2005 book, *The End of Poverty* as illustrative of this trend. Sachs links poverty "abroad" as a looming threat to those of us "at home." Gates' description of "the hungriest places on earth," should be read as racialized descriptions about particular people and places becoming a threat to the global elite (easily personified by Gates, the wealthiest American/man in the world). Following Gupta, we should consider who precisely is the subject of security that is threatened by the emergency in/of Africa.

Aligning with development discourse that situates global poverty as a security threat for the global elite, Gates stresses the urgency of saving African farmers before social instability is unleashed (and, though Gates leaves this unstated, might spill out over the confinements of the region/continent). For Gates, the increasingly insecure situation of smallholder farmers in the global South demands the "urgent" attention of agricultural scientists and agribusiness in the North. The securitizing impulse of Gates

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[134] Akhil Gupta, "Is Poverty a Global Security Threat?," in *Territories of Poverty: Rethinking North and South*, ed. Ananya Roy and Emma Shaw Cran (Athens, Georgia: University of Georgia Press, 2015), 84–102.
[135] *ibid.,* 93.

address is cloaked in scientific and technological arguments. Yet the larger security context looms large. Indeed, Gates keynote address was part of the Borlaug Symposium's theme of "Food, Agriculture, and National Security in a Globalized World." The panel directly after Gates featured representatives from the National Intelligence Council and two prominent defense-oriented Washington think tanks on "Intelligence and Security Perspectives on Agriculture." These defense and intelligence officials spoke about how food security concerns following the 2008 global food price crisis and under increasing climate change, were becoming central to security planning. Gates techno-optimism and philanthrocapitalist prescriptions for the New Green Revolution should, then, be read as the other side of the same coin to the "food security is national security" discourse (discussed further in chapter four).

In terms of both the massive amounts of money spent by his Foundation and his role as a public figure, Gates has become a central spokesperson for the Green Revolution in Africa. It is important to trace the continuities between Gates and Borlaug's visions for the Green Revolution. Though Gates and company are surely rewriting some of the Revolution's central tenants, especially around the role of the state and the emphasis on smallholder farmers, they re-articulate the Green Revolution's racial technologies as they couple security threats and food insecurity. In the next section, I make a case for thinking about the Gates Foundation's agricultural development efforts through the analytic of *post-race.* Although Bill Gates and his Foundation eschew explanations of poverty as racial, the way they describe—and act upon—issues of poverty and hunger are deeply shaped by racial imaginaries.

Pedagogies of poverty at Gates Headquarters

In the summer of 2015, I visited the Gates Foundation's Headquarters in Seattle and interviewed officials in their agricultural development program. Visiting the BMGF in person provided important insights into the way the Foundation presents itself to the public—how it builds its "brand" around particular ideas, imagery, language, and employee culture.

The 500 million dollar complex is architecturally striking and sits in the heart of the city's tourist district, just across the street from the iconic Space Needle and a five minute walk to popular destinations like the Museum of Pop Culture and the Children's Museum. I had passed the Foundation's Visitor Center on my way to and from the main campus and had noticed several prominent representations of their agricultural development programs, including an infographic about the Alliance for a Green Revolution for Africa and a curious sidewalk sculpture consisting of a row of concrete grain sacks. Eager to see more about how the Foundation represented its programs to the public, I decided to check it out on the last afternoon of my visit. This final section turns to some reflections from that visit, in order to think through the ways in which the Gateses philanthropy builds upon and rewrites "Borlaug 101."

The first thing I notice after walking through the Center's front doors is a wall of words seemingly floating behind the information desk. Made up of layers of plywood letters stacked together, the wood block quote juts out from a plane of clear glass: "Whatever the conditions of people's lives, wherever they live, however they live, they share the same hopes, the same dreams as you and I —Melinda French Gates." This appeal to universal humanity expresses an ideal at the heart of the Gateses philanthropic

brand. The Foundation's mission statement (displayed in another oversized block quote on the visitor center's concrete facade) also invokes universality: "Every person deserves the chance to live a healthy, productive life." I had seen similar platitudes about global humanity in the artwork and signage throughout the Foundation's campus, so Melinda's quote was an unsurprising epigraph for the Visitor Center. But I was struck by its second person address—by Melinda's interpellation of *me*. Here was the co-chair of the world's largest philanthropy inviting me to recognize that she and I shared hopes and dreams, and that people that lived in different places and in different ways also shared these hopes and dreams.

I soon discovered more of this second person address as I moved into the Center's galleries. As I made my way through interactive displays about philanthropy and poverty, I came across a wooden desk with two keyboards and a placard reading: "what would your foundation do?" The ever-expanding archive of past guests' answers streamed across a bank of monitors on the wall. Across the room, an exhibit dedicated to explaining the Foundation's positions on more controversial issues like vaccines and GMOs also solicited my input. After watching brief video messages from the Gateses and Foundation CEO, Jeff Raikes, I could enter my own thoughts into a similar digital archive. The placard explains: "we know that not everyone supports our methods… Even when we disagree, we applaud everyone working to help find solutions to big problems. We encourage you to get informed and join these important discussions." Even the drinking fountains offer an object lesson. While quenching my thirst I notice an uncaptioned photo of a woman walking across what appears to be quite dry earth carrying what I assume is a vessel of water on her head. Bold text on the white wall

above the drinking fountain asks: "What if you had to walk 3 miles for this water?" After learning all about the Gateses benevolent largesse, I get a chance to share my own ideas about making the world a better place. A floor-to-ceiling "share your cause" armature features hanging rows of postcards where guests have left inspirational messages ("I'm going to get out and…"; "I support…and you should too"; "I volunteer for…"). I'm asked to take one and leave one.

On the floor surrounding this "share your cause tree," I notice a trail of footprints painted onto the wood floor that extends along the main corridor, back down toward the entrance. The dark brown footprints contrast sharply with the lighter hues of the reclaimed ash hardwood floor. Intrigued, I follow the trail to the other end where I find two metal buckets, one labeled "16 lbs." the other "2 gallons." Eager to try out my strength, I lift the buckets, bringing into view an eye-level display with a photo of three young girls. It explains that women and children all over the world have to walk miles just to get access to water. Again, the second person address invites empathy for these poor girls: "could you carry water for your family?"

As I would later learn, the Visitor Center was curated with the intention of cultivating a sense of empathy amongst its guests. In an interview shortly after the Center opened, its curator spoke about how they strove to design exhibits that would create a "very personal" experience, through which visitors could make connections between the Foundation's work and "their own lives."[136] Thus the Center was designed to prompt visitors to reflect upon their own sense of identity through encountering

[136] Amie Newman, "Gates Foundation Visitor Center: An Interview with Therese Littleton," Impatient Optimists, February 4, 2012, https://www.impatientoptimists.org/Posts/2012/02/Use-Your-Voice-for-Good-An-Interview-with-Therese-Littleton.

lessons about global poverty. Though the Center's interactive exhibits invited me to imagine myself as having something in common with the global poor, they did so through emphasizing that these people lived much different lives than mine. This lesson was reinforced through scenes depicting details of people's lives: close captured portraits, large photographs of women weighing their children at clinics, and, in the restrooms photographs on the stall doors depicting various "Third World" toilets. All of these reinforce the materiality of global poverty, and invite supposed Western guests to imagine what their own lives would be like under such drastic material differences.

While we are asked to share the Gateses' values about "all humans," the Center's repeated object lessons reinforce that some categories of humans experience profoundly different material realities than "us." In this way, the exhibits "bring us and them into a place of temporary and hierarchized false intimacy in which categories of human beings are demarcated for all the world to see."[137] The visual texts of the Visitor Center work through a contradictory impulse that is at once inclusive and exclusive, appealing to universal humanity while "staging" stark differences between categories of human—between the assumed "us" of Melinda's epigraph and the "them" depicted in uncaptioned, decontextualized, and homogenized images as capital "O" Others.

Thinking back to the question of how race operates as technology, we might ask how race mediates the Center's visual narrative—shaping everything from how a photographer "captured" a particular image to why the curators chose to display that image in their Seattle gallery to how we as visitors are likely to view and interpret it. The intimate scenes of difference—toilets, fetching water, taking babies to clinics,

[137] Glover, "'Flesh like One's Own,'" 246.

holding maize seeds in bare hands, bare footprints—are produced through both gazing upon and imagining racialized bodies. Many of the images depict women and children that Visitors would recognize as black and/or African (several of the most striking photos I saw were un-captioned). As Glover writes, humanitarian discourses have long relied on associations between blackness, materiality, and abject poverty.[138] The Visitor Center's staged ethical encounters reproduce these kinds of associations. In the walking with water exhibit, that picture of three young girls above the water buckets prompts me to think about the difficulty of their everyday lives. As I lift the buckets, their thin metal handles dig into my hands and my shoulder muscles soon burn. I feel empathy toward these girls; yet, as their picture drops back into the exhibit, I also think about how different their lives are than mine. Race provides the grammar through which I imagine these material and bodily differences—and through which they become naturalized as something that is common sense. Particular bodies are naturally thought of as poor and having to do things like walk miles for water. The lessons of difference repeated throughout the Visitor Center (such as at the water fountain or in the bathrooms) similarly naturalize these bodily and racialized conceptions of difference.

Though I saw race everywhere in the Visitor Center, the Center's pedagogical narrative elides questions of race. Visitors are prompted to read the images of bodies through other lenses, especially those of technology and access to markets. Yet race remains central to the Visitor Center's lessons. This contrast is not accidental. It is not that race was an oversight, simply not thought about by the curators. Instead, this contradiction helps us to think about how the Center operates through and reproduces

[138] *ibid.,* 236.

post-racial logics. As scholars like Catherine Squires and Roopali Mukkerjee detail, post-race became a pervasive trope in US media around the Obama election.[139] Throughout popular culture and the media, commentators across the political spectrum considered the possibility that Americans had transcended racial divides. Though post-racial was always historically and cultural inaccurate, we should not simply dismiss the concept as a fiction. To paraphrase Erik King Watts, it remains important to attend to the rhetorical heavy lifting that the concept performs.[140] The Gates Visitor Center can be understood as curated toward reproducing a post-racial subject. It does so through teaching us to "see" race, but to do so through particular vantages that disavow structural issues of race and global poverty. In teaching us to think about our own individual actions vis-à-vis the subject of development in the Gateses' philanthropy, the Visitor Center operates through post-racial narratives that shore up neoliberal conceptions of poverty. We are encouraged to view the Poor Others in the photographs as potential entrepreneurial subjects capable of investing in their own lives.[141] The visual narratives taught through images of black and brown people reinforce difference, while teaching us to understand that difference, in Mukkerjee's words "as rational rather than racial."[142] In this way, the visitor center operates along two distinctly post-racial lines: First, its narrative of universal humanity centers the agency of whiteness.[143] And, second,

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[139] Catherine R. Squires, *The Post-Racial Mystique: Media and Race in the Twenty-First Century* (New York: New York University Press, 2014); Roopali Mukherjee, "Antiracism Limited: A Pre-History of Post-Race," *Cultural Studies* 30, no. 1 (January 2, 2016): 47–77, https://doi.org/10.1080/09502386.2014.935455.
[140] Eric King Watts, "Postracial Fantasies, Blackness, and Zombies," *Communication and Critical/Cultural Studies* 14, no. 4 (October 2, 2017): 317–33, https://doi.org/10.1080/14791420.2017.1338742.
[141] Roy, *Poverty Capital.*
[142] Mukherjee, "Antiracism Limited."
[143] Feldman, "The Globality of Whiteness."

through framing poverty as an issue of individual choice and market access, it disavows structural questions about the centrality of race to capitalism.

The Visitor Center itself functions as a site for public pedagogy about poverty action in a particular post-racial and neoliberal vein. Over 80,000 people—many of them K-12 students visit the Center each year.[144] But I think that the Center is important to look at not only because of this immediate impact. I think it also offers us a way to better understand the broader narratives about poverty the Gates Foundation advances. Indeed, Bill Gates himself often relies on a similar post-racial narrative of difference in his arguments about the urgent need to bring Western agricultural technologies like GMOs to poor farmers in the global South. A striking example of this comes from a Gates blog post from a few years ago, entitled "Who Will Suffer Most From Climate Change? (Hint: Not You)."[145] Gates writes that poor farmers in the global South are likely to face the worst impacts of climate change. "Although the severest impacts of climate change may be several decades away," he writes "we have precious little time to find solutions for the world's most vulnerable farmers." Describing a personal trip he and Melinda took to India, Gates argues that smallholder farmers' lives are defined by persistent vulnerability—and that climate change adds even more risk to their already vulnerable lives. Calling for tools like GMOs and weather based index insurance, Gates stresses the urgent need to introduce Western technologies to poor farmers in the global South. "I'm optimistic" Gates writes, "that *we* can avoid the worst impacts of climate

[144] Personal Communication, Bill and Melinda Gates Foundation Discovery Center, March 20, 2018.
[145] Bill Gates, "Who Will Suffer Most From Climate Change? (Hint: Not You)," gatesnotes.com, accessed November 1, 2018, https://www.gatesnotes.com/Energy/Who-Will-Suffer-Most-From-Climate-Change.

change *and* feed the world—if *we* act now…" Directed toward the assumed Western subject, Gates second person address solidifies post-racial imaginaries about global poverty by emphasizing the individual agency of Western subjects and technological solutions to global poverty.

Nicole Aschoff describes Gates as an important figure in maintaining contemporary capitalism.[146] Bill Gates (and, to a lesser extent, Melinda) serves as what Aschoff calls a "prophet of capitalism": he acknowledges that there are problems within capitalism, but, through a discourse of techno-fixes and innovation, argues that capitalism can be fixed to better serve the needs of everyone. Gates and other prominent storytellers of capitalism do the important cultural work of producing a "new spirit of capitalism," thereby allowing capitalism to absorb critique and persist. The Gateses are clearly powerful storytellers for capitalism. But we should also attend to how their particular brand of philanthrocapitalism serves as a conduit for post-racial thinking. The Foundation's focus on technological and market-based "solutions" to global poverty consistently reproduces a de-racialized understanding of inequality, even as it associates material poverty with people and places racialized as non-white. Thus, post-race as a concept helps us to think about the ways in which the Gates Foundation's rhetoric re-articulates the racial logics of Borlaug 101. Though the more overtly racialized language of threatening, animal-like bodies have been replaced with a kind of post-racial framing that disavows race as a modality of power even as it buttresses racialized constructions of difference, race remains a central technology of the Green Revolution.

[146] Aschoff, *The New Prophets of Capital.*

2. “The Landraces are in the Hybrids”: the Green Revolution’s Seeds of Dispossession

Figure 2. “Mexican Maize Landraces,” International Maize and Wheat Improvement Center (CIMMYT), Nairobi, Kenya. *Photograph taken by the author, with permission.*

While interviewing a scientist from the International Maize and Wheat Improvement Center (CIMMYT) in Nairobi, Kenya, I was struck by a display of dried cobs of maize framed in a shadowbox on the wall (figure 2). Amongst the otherwise

ubiquitous office furnishings—a whiteboard, banks of fluorescent lights, a wooden conference table stacked with papers, pleather swivel chairs—the colorful cobs stood out. Locked under the box's glass cover and mated against a black backdrop, were three rows of variously sized maize varieties. Each of the 28 cobs was mounted above a gold nameplate displaying its taxonomic variety—terms like "Bolita," "Olotillo," and "Reventador." Such a prominent display of "Mexican maize" in CIMMYT's East Africa headquarters was, at first glance, curious. I was in Nairobi to research the workings of an international agricultural development project called "Water Efficient Maize for Africa" (WEMA). Funded by the United States Agency for International Development and the Bill and Melinda Gates Foundation, WEMA brings together CIMMYT and the multinational agricultural biotechnology company, Monsanto, in an effort to develop drought-tolerant, genetically modified maize, reform regulatory systems, and build the private seed sector in East and Southern Africa.[147] Most of my interviews at CIMMYT and other WEMA institutions had dealt with the political and ecological context of maize farming *in Africa.* But the shadowbox of Maize Landraces served as a reminder that "Mexican maize" looms large in the history upon which WEMA and a host of other contemporary development efforts aimed at transforming African agriculture build. Indeed, CIMMYT began in Mexico in the 1960s, and became one of the central institutions in the "Green Revolution"—a series of programs led by the US government

[147] For the project's first ten years, WEMA operated in Kenya, Uganda, Mozambique, Tanzania, and South Africa. With the Bayer acquisition of Monsanto in 2018, the project continued under the name TELA (to align with the branded hybrid and biotech seeds the project had developed). A third five-year funding phase for the renamed project began in 2018, with a $24.6 million grant from the Gates Foundation (to add to USAID's $5 million behind the project). See: AATF, "Press Release: AATF Receives Grant to Make New Drought-Tolerant and Insect-Resistant Maize Hybrids Available to Farmers in Africa," AATF, June 18, 2018, https://www.aatf-africa.org/wp-content/uploads/2018/11/Press-release-Gates-Foundation-Grants-AATF-24m.pdf.

and the Ford and Rockefeller Foundations that aimed to modernize agriculture across Latin America and Asia via introducing hybrid seeds, credit, and agricultural chemicals. Though often periodized as a Cold War-era history, the Green Revolution, as Raj Patel argues, is better conceptualized as a "long" history "of state reconfiguration, capitalist accumulation, concentration of power, disenfranchisement, agricultural investment and innovation…[that] both predate[s] the standard history and continued long after 1970."[148] At the same time, the bracketed history of the Green Revolution provides rhetorical fodder for contemporary efforts to bring a "new" Green Revolution to Africa. Projects like WEMA thus build directly upon the Green Revolution's lineage—a lineage that began with CIMMYT's predecessor, the Rockefeller Foundation-sponsored Mexican Agriculture Program (MAP) of the 1940s and 1950s.

But I point to that display of Mexican Maize Landraces in CIMMYT's Nairobi office not merely to illustrate these institutional roots. The story of how Mexico became the "model" for subsequent Green Revolution projects has been well told.[149] This chapter takes a different angle, one that has not received sufficient coverage by scholars of the Green Revolution. Despite a substantial body of scholarship, few scholars have attended to the ways in which the earliest Green Revolutionaries deployed racial logics that shaped constructions of both whiteness and indigeneity. That shadowbox of Mexican Maize serves as an object of analysis through which I examine a key aspect of the early Green Revolution: *racial logics that were central to the collection and appropriation of Mexican landraces—logics that continue to shape Green Revolution projects.*

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[148] Patel, "The Long Green Revolution," 2.
[149] Cullather, *The Hungry World*; Perkins, *Geopolitics and the Green Revolution*; Joseph Cotter, *Troubled Harvest: Agronomy and Revolution in Mexico, 1880 - 2002*, Contributions in Latin American Studies 22 (Westport, Conn.: Praeger, 2003).

This chapter shows how American scientists sent to Mexico by the Rockefeller Foundation in the 1940s legitimized their efforts to improve Mexico's agriculture by juxtaposing them with the agricultural practices of Mexico's indigenous farmers. It focuses in particular on the scientists' efforts to collect maize from throughout Mexico and Central America—and then distribute it to American seed companies and international development institutions across the global South. The scientists often described these varieties as being "exotic" or "landraces" to indicate that they were indigenous to Mexico. This chapter's use of the term "indigenous maize" is not, however, meant to take that category as given. Instead, it examines the ways in which "indigenous maize" became an object of knowledge central to the MAP and later Green Revolution projects.[150] The MAP's extensive efforts to collect, catalogue, and distribute hundreds of varieties of maize relied upon racial logics in which whiteness was equated with the ability to control nature and indigeneity was viewed as "not-yet" developed and thus incapable of managing nature. These racial logics naturalized the appropriation of indigenous maize as the rightful inheritance of white scientists. This racialization not only underpinned the MAP's maize program, but whiteness and indigeneity were mutually formed as racial categories in the process.

Race is at once representational, corporeal, and material.[151] Thus "racial geographies are always *physically* made up of environmental elements in addition to symbolic or mental ones."[152] In this way, race came to be embedded in the MAP's maize

[150] Kim TallBear, *Native American DNA: Tribal Belonging and the False Promise of Genetic Science* (Minneapolis, MN: University of Minnesota Press, 2013).
[151] Rachel B. Slocum and Arun Saldana, *Geographies of Race and Food: Fields, Bodies, Markets*, Critical Food Studies (Farnham, Surrey, England ; Burlington, VT: Ashgate, 2013).
[152] *ibid.,* 5.

seeds—as they were collected from diverse agroecological regions, sorted into varieties, catalogued in pages of academic publications, bred into "composites," and sent to plant breeders across the globe. As Green Revolution projects expanded transnationally from Mexico, the racial logics of white scientific superiority and nonwhite marginality were reproduced (even as they changed forms across different geographies). By highlighting the co-production of "white science" and "indigenous maize" in the early years of the long Green Revolution, this chapter insists that the persistence of what Patel calls "Green Revolution thinking" in policy and development circles is inextricably tied up with racial logics.[153] Science and technology studies scholars use co-production as an analytic for theorizing the interrelation between science and technology and social systems. As Sheila Jasanoff describes, the "idiom" of co-production provides a framework for analyzing the reciprocal "relationship between the ordering of *nature* through knowledge and technology and the ordering of *society* through power and culture.[154] This chapter demonstrates how race has been crucial for the Green Revolution's co-production of science and social order. Without unpacking the particularities of how race is central to the Green Revolution, we cannot understand the staying power of its core tenets about improving non-Western agriculture through technological, capital-intensive interventions.

This discussion is grounded empirically through three vignettes. The first two are culled from the history of the MAP and CIMMYT. I draw on archival research conducted at the Rockefeller Archive Center and the University of Minnesota Archives.

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[153] Patel, "The Long Green Revolution."
[154] Sheila Jasanoff, ed., *States of Knowledge: The Co-Production of Science and Social Order* (London: Routledge, 2010), 4.

Drawing on interview-based research with CIMMYT officials, the third vignette shows how the racial logics cultivated in the early Green Revolution manifest with "new" Green Revolution projects utilizing Mexican maize landraces to combat emerging crop diseases in East Africa. Before moving into these vignettes, I make a case for why we need to consider whiteness in our analysis of the Green Revolution.

Why take a "white science" approach to the Green Revolution?

Several scholars have demonstrated how the Green Revolution began by counterposing the knowledge of indigenous people with American scientists. Stephen A. Marglin describes how during the MAP's early years, the Rockefeller Foundation faced criticism from University of California cultural geographer Carl Sauer for ignoring political and economic issues.[155] The Foundation dismissed Sauer as a romanticist that wanted to preserve "traditional" agriculture as something to study. Rockefeller Foundation officials were entrenched in a modernization orientation, in which "traditional" farming was understood to be in the process of evolving to become modern. They failed to recognize any forms of cultural "hybridity" and viewed Mexico's Indians as "backward" and "primitive." Tracing the Foundation's agricultural development efforts in Mexico and, soon after, Peru, Chris Shepherd argues that Rockefeller scientists systematically ignored and excluded indigenous knowledge.[156] The Foundation's *modus operandi "*refused to 'know' traditional agricultural systems as anything other than 'traditional'—backward, unchanging, and undeveloped. The

[155] Marglin, Stephen A., "Farmers, Seedsmen, and Scientists: Systems of Agriculture and Systems of Knowledge," in *Decolonizing Knowledge: From Development to Dialogue*, ed. Frédérique Apffel-Marglin and Marglin, Stephen A. (Oxford: Oxford University Press, 1996).
[156] Shepherd, "Imperial Science."

indigenous 'other' was incontrovertibly relegated to the status of 'other.'"[157] Elsewhere, historians have shown how Green Revolution architects at the Rockefeller and Ford Foundations and the U.S. State Department were steeped in modernization theories and viewed indigenous people and the "Third World" more generally as needing to be developed.[158]

Conceptions of science were central to Green Revolution modernization. Bruce Jennings demonstrates that the Rockefeller Foundation oriented is development efforts in Mexico around "the management of science," eschewing politics under the guise of scientific neutrality.[159] In both the MAP and later Rockefeller projects in India, American scientists saw their role in terms of cultivating proper agricultural science where none had previously existed before.[160] Green Revolutionaries understood their mission to be objective, rational, apolitical, and authoritative—central components of Western science.[161] In aiming to bring science to the so-called Third World, these scientists extended the historical lineage of Western science's deep entanglements with the colonial project.[162] In both its alignment with U.S. imperialism and its reliance on colonial hierarchies of race, class, and gender, the Green Revolution extends this trajectory. However, the ways in which the mutual construction of whiteness and indigeneity are integral to the Green Revolution's colonial science remains under

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[157] *ibid.,* 131.
[158] Cotter, *Troubled Harvest.* Cullather, *The Hungry World.*
[159] Jennings, *Foundations of International Agricultural Research*, 11.
[160] Perkins, *Geopolitics and the Green Revolution*, 153.
[161] Suman Seth, "Putting Knowledge in Its Place: Science, Colonialism, and the Postcolonial," *Postcolonial Studies* 12, no. 4 (December 2009): 373–88, https://doi.org/10.1080/13688790903350633.
[162] Sandra G. Harding, ed., *The Postcolonial Science and Technology Studies Reader* (Durham: Duke University Press, 2011).

examined. Doing so show sheds light on how race operates in the production of the Revolution's foundational binaries—modern/non-modern, abundance/scarcity, and scientific/non-scientific.

The Green Revolution's "white science" can be viewed in terms of what Michael Omi and Howard Winant call a racial project.[163] Omi and Winant's classic formulation of racial project (and the related concept of racial formation) emphasizes the dynamism of race. It "link[s] what race means in particular contexts to how social life is racially organized in relation to those meanings" and "stresses that the shape and meaning of racial categories evolve in conjunction with struggles to organize resources through those very categories."[164] The white scientists and indigenous farmers brought together through the MAP did not occupy static racial categories before or after their encounters. Meanings of "white science" and "indigenous maize" were shaped through the MAP's development projects. In the process, whiteness and indigeneity were mobilized as racial categories that influenced how American scientists viewed indigenous farmers, how maize was collected and categorized, and how MAP scientists appropriated Indian maize for their developmental and geopolitical "mission."

In order to theorize this racial project, I turn to scholarship on the racial productions of whiteness and indigeneity. Aileen Moreton-Robinson traces how the ability for white people to claim property in non-white land, culture, and bodies has been

[163] Michael Omi and Howard Winant, *Racial Formation in the United States*, Third edition (New York: Routledge/Taylor & Francis Group, 2015).
[164] Priya Kandaswamy, "Gendering Racial Formation," in *Racial Formation in the Twenty-First Century*, ed. Daniel HoSang, Oneka LaBennett, and Pulido, Laura (Berkeley, CA: University of California Press, 2012), 29.

integral to settler-colonial projects in both Australia and the United States.[165] Moreton-Robinson illustrates her concept of the "white possessive" through a discussion of Caption Cook, the British sea captain and explorer celebrated as the "discoverer" of Australia. Cook claimed the continent as possession of the British Empire in 1770, declaring that the indigenous people living there had relinquished their sovereignty. He made this claim on the grounds that the "natives" showed no interest in possessing or exchanging material goods. Cook also racialized Indigenous people in terms of their skin color, differentiating them from whiteness by marking phenotypic difference. Thus "Cook's choice" to forego negotiations with indigenous people and claim their land for the Crown depended upon a possessive orientation toward indigenous people, in which white subjectivity is shaped through the disavowal of indigenous sovereignty. In this way, Cook set the stage for Australia to become a nation-state defined through the legal fiction of *terra nullius* (empty land). For Moreton-Robinson, the white possessive constitutes a "mode of rationality" through which white people understand land and indigenous people as objects existing in a "state of nature," and thus only to be possessed.[166] Importantly, this logic has persisted well past the early colonial period. Indeed, Moreton-Robinson argues that it underpins legal and cultural issues throughout settler-colonial nations.

The relationship between whiteness and indigeneity has also developed through ideas about white people inheriting the cultural and material property of indigenous people. Yael Ben-zvi argues that racial formation in the US occurred not only through

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[165] Aileen Moreton-Robinson, *The White Possessive: Property, Power, and Indigenous Sovereignty* (Minneapolis, MN: University of Minnesota Press, 2015).
[166] *ibid.,* 126.

biological ideas about race being intergenerational, but also through ideas that linked racial inheritance to material property.[167] Ben-zvi analyzes the work of one of the most influential 19th century American anthropologists: Lewis Henry Morgan. Morgan's anthropological studies "reformulated past and present Native American existence as the patrimony of a white United States."[168] Appropriation of Indian culture and land were thereby viewed as an evolutionary process. This was crucial for precipitating a shift in the national perception of race in the US around the turn of the 20th century, in which Indians were excluded from popular imaginations of race. The view that Indians were a race that would be subsumed into whiteness, Ben-zvi argues, naturalized a black/white binary understanding of American race relations—what W.E.B. DuBois famously dubbed "the color-line." Answering the question "Where did Red Go?" Ben-zvi writes: "The imagined line dividing red from white is blurred as Native Americans become the 'ancestors' of white US 'heirs' who inherit and appropriate not only the land of their presumably barbarous predecessors, but their entire, accumulated, tangible, and intangible cultural property."[169] Kim TallBear applies Ben-zvi's theorization in her compelling *Native American DNA: Tribal Belonging and the False Promise of Genetic Science*. TallBear shows how today's genomic researchers and genealogists claim "indigenous DNA" as the collective patrimony of Western science, becoming contemporary incarnations of Henry Lewis Morgan.[170]

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[167] Yael Ben-zvi, "Where Did Red Go?: Lewis Henry Morgan's Evolutionary Inheritance and U.S. Racial Imagination," *CR: The New Centennial Review* 7, no. 2 (2007): 201–29, https://doi.org/10.1353/ncr.2007.0037.
[168] *ibid.,* 202.
[169] *ibid.,* 213.
[170] TallBear, *Native American DNA*, 136–38.

Finally, productions of whiteness and racialized indigeneity are geographical. María Josefina Saldaña-Portillo shows how the figure of the Indian in the US and the Indio in Mexico were central to creating each country's national geography.[171] She traces how "Spanish and British colonialism in North America…produced distinct, indeed divergent, racial geographies: colonial places apparently replete with Indians or bereft of them, despite the actual presence or absence of Indians."[172] Following Saldaña-Portillo, my account shows how Indians were central to the MAP's spatial productions, while acknowledging that the program's Mexican and American actors racialized Indians in different ways. My focus on the US side of the story is not to discredit how Mexico's particular racial and ethnic relations have shaped its agriculture.[173] Moreover, in emphasizing, the American-side of the story, I do not mean to discount the ways in which agricultural modernizers on both sides of the border influenced each other. Indeed, as Tore Olson has recently shown, there was a great deal of intellectual cross-pollination between agrarian reformers in Mexico and the U.S., what he calls the "U.S.-Mexican Agrarian Dialogue."[174] Following Olsson, it is far too simple to view the MAP and subsequent Green Revolution programs as simply "Americanization." At the same time, we might extend Saldaña-Portillo's transnational approach to ask how American scientists drew on a kind of national imaginary, rooted in ideas of the frontier and shaped through a process of mapping space as racialized, of "locating Indians in

[171] María Josefina Saldaña-Portillo, *Indian Given: Racial Geographies across Mexico and the United States* (Durham: Duke University Press Books, 2016).
[172] *ibid.,* 7.
[173] Fitting, *The Struggle for Maize*.
[174] Tore C. Olsson, *Agrarian Crossings: Reformers and the Remaking of the US and Mexican Countryside* (Princeton: Princeton University Press, 2017), 10.

landscape."[175] By tracing out the racial logics of American scientists as they encountered Mexico and its Indians, I demonstrate how race figured in cultivating a distinctly "white science" in the Mexican program.

Surveying Mexico's landscape: natural poverty as Indian poverty

The Rockefeller Foundation's first "operational" Green Revolution project was a semi-autonomous Office of Special Studies within the Mexican Ministry of Agriculture.[176] It came to be known by the Foundation's term "Mexican Agriculture Program" (MAP). The program has been widely memorialized in accounts of the Green Revolution. It has also been critiqued for directing Mexico's agricultural policies away from political concerns such as land reform and toward capitalist agriculture.[177] Yet neither critical nor celebratory accounts have directed enough attention to the way the project's scientists contrasted their work with the agricultural practices of Indians, which is precisely where this chapter's story begins.

After returning from a trip to Mexico in 1941, US Vice President Henry A. Wallace urged Rockefeller Foundation leadership to consider how they might assist in improving Mexico's "inefficient and even primitive" agriculture.[178] At the behest of

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[175] Saldaña-Portillo, *Indian Given,* 9-10.

[176] At the time, the Rockefeller Foundation did not conceive of what it was doing in terms of a "Green Revolution." That phrase is often attributed to a comment made in 1968 by USAID administrator William Gaud at a meeting of the Society for International Development in Washington DC. See Patel, "The Long Green Revolution," 5.

[177] Cynthia Hewitt de Alcantara, *Modernization of Mexican Agriculture* (Geneva: UNRISD, 1976).; Cotter, *Troubled Harvest*.

[178] Cullather, *The Hungry World.,* 56. This is a simplified account of the beginning of the MAP, which has been widely covered in scholarship on the Green Revolution. For more comprehensive discussions, see especially chapter two in Cullather, Cotter, *Troubled Harvest*, and Patel, "The Long Green Revolution."

Wallace, the foundation asked Richard Bradfield, a Cornell University soil scientist, Paul Mangelsdorf, a Harvard University plant geneticist, and E.C. Stakman, a plant pathologist from the University of Minnesota to go down to Mexico and assess the country's agriculture. The Survey Commission spent two months driving across the country, putting over 5,000 miles on their GMC Suburban Carryall.[179]

In the report they sent to Rockefeller Foundation headquarters in New York, the Commission declared that Mexico had "many of the aspects of an overpopulated land."[180] Yet the commission argued that simply cutting down "jungles" and turning more hectares into farmland could not improve Mexico's agriculture. Even where they saw efforts to clear "raw land," they maintained that the fundamental issue was that the land was inherently poor quality.[181] In their understanding of Mexico's "land problem," the Commission drew upon the ideas of the influential Mexican intellectual Daniel Cosío Villegas, who argued that Mexico's economic poverty was a result of its "natural poverty."[182]

The Commission's descriptions of Mexico's "natural" conditions extended to "cultural" conditions as well. To get a sense of the rural culture, the Americans hired locals to take them on the backs of trucks or donkeys into areas beyond the highways. No one on the team spoke Spanish, so they brought a recent Ph.D. in botany from Harvard, who had worked in Mexico and knew Spanish. Still, because many of the

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[179] The Commission noted that the Suburban was "originally red in color but repainted green, possibly more in keeping with the mission." E. C Stakman, Richard Bradfield, and Paul C Mangelsdorf, *Campaigns against hunger* (Cambridge, Mass.: Belknap Press, 1967), 25.
[180] *ibid.,* 31.
[181] *ibid.,* 32.
[182] *ibid.,* 2.

people they encountered in their journey spoke indigenous languages, they had difficulty communicating. They later described these backcountry trips, writing:

> [we] learned to appreciate some of the problems and the hopes of the humbler peoples who lived near the end of the trail, close to the land but far from water in the drier areas and close to the water but too far from dry land in the wetter areas. And the horizon was too close to the earth for many people in all areas, because their land was poor, tillage was poor, and they were poor.[183]

The Survey Commission's report makes it clear that they identified these triply poor people as Indians. Their report describes "large populations" of Indians that lacked agricultural skills and "economic resources."[184] And it concluded: "the basic Indian nature of the population is a fact of paramount importance." Extending their blanket assessment of Mexico's "natural poverty" to the country's indigenous population, the commission conflated economic poverty with indigeneity.

The Commission's arguments about Mexico's natural poverty *as Indian poverty* demonstrate how ideas about race and nature are co-constitutive. As Jake Kosek, Donald Moore, and Anand Pandian argue, "Race provides a critical medium through which ideas of nature operate, even as racialized forces rework the ground of nature itself."[185] Both race and nature are used to describe socio-biological "fixity" or "essence." Race, in other words, is often *grounded* in terms of being "natural." The Commission racialized and naturalized Indians as "too close to the earth." The two fundamental facts they

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[183] *ibid.,* 27.
[184] "Agricultural Conditions and problems in Mexico: Report of the Survey Commission of the Rockefeller Foundation," Rockefeller Foundation, 1941, folder 37, box 5, series 323, R.G 1.1 Projects. Rockefeller Foundation Records, Rockefeller Archive Center, Tarrytown, New York. Subsequent citations are referenced in text by referring to the "Commission" or their report.
[185] Donald S. Moore, Anand Pandian, and Jake Kosek, *Race, Nature, and the Politics of Difference* (Durham: Duke University Press Books, 2003), 3.

reported—that Mexico's land was inherently poor and that its people, who were predominantly Indians, were likewise essentially poor—were mutually formed.

Entanglements of the racial and natural are evident throughout the Survey Commission's report on Mexico, which included 143 photographs that depict taxonomies of plants, animals, and people. Declaring, "Mexico was a land of violent contrasts," the Commission categorized Mexico's people and agriculture in terms of where they were located on a presumed historical trajectory. They rated the colleges they visited as either modern or not, often making direct comparisons to American universities. They photographed maize plants in different regions, noting "harsh contrasts" between plants that were "knee high" to those over "20 feet high." They also documented a "pure bred…Jersey" bull, noting that there were only a few purebred animals in Mexico and that the majority was "of mongrel breeding." "The beef cattle which roams the range in Mexico are mainly of mixed breeding but usually show some blood of the original Spanish cattle…" they wrote. Depicting ideas of blood purity, the American scientists suggested that the quality of Mexico's cattle had diminished through inter-varietal breeding. The "original Spanish cattle" represented racial purity, and thus quality. In this way, the Commission defined Mexico's agriculture in terms of a racialized language of inferiority, in which purity had been contaminated by the intermixing of difference.

Alongside photos of corn and cattle, the Commission also documented phenotypic difference in the people they encountered. A photo a group of boys sitting in desks inside a classroom is captioned: "The students at the school at Huichapan are principally Indian boys of the Otomí tribe. Their complexions contrast sharply with the

faces of the four members of the commission." Just as the American scientists noted "harsh contrasts" in the landscape, they also mapped racial contrasts. Using their own whiteness as a benchmark against which to judge the racial difference of the Indian students, the Commission's photographs demarcated both whiteness and non-whiteness. Thus the report was not only about mapping non-white Others. Though it went unnamed, the Survey Commission was also producing whiteness as a racial category.

The commission's co-construction of whiteness and racialized indigeneity is also evident in its depictions of Mexican racial mixing. Another photo's caption reads: "The "mestizos," an Indian-Spanish mixture, dominate the Mexico of today. The Governor of Tamaulips, pictured here, was once a peasant. A new hybrid race of people is in the making in Mexico." The teleology the commission depicts here, in which people evolve from being "peasants," suggests that they viewed racial intermixing in Mexico as a process through which the majority of Mexicans were progressing away from a racial identity marked by "Indianness" and toward whiteness. The "new" race they described was, of course, nothing new. It could be traced back to the beginnings of Spanish colonization and the conquistadors' widespread sexual exploitation of Indian women. But the Commission's views were consistent with those of prominent Mexican nationalists that constructed *mestizaje* as a national resource.[186] Modernizers within Mexico viewed the kind of "hybrid race" as a transitional phase in which culturally inferior Indians progressed toward being more cultured mestizos. The Survey Commission adopted this view of *mestizaje* as whitening. But the Commission also brought its own views about hybridity to this racial logic. As agricultural scientists,

[186] Saldaña-Portillo, *Indian Given.*

members of the Commission were steeped in theories of biological improvement through breeding.[187] They extended this orientation in their understanding of Mexican people, viewing racial hybridity as a process by which superior "traits" could be bred in. Just like crops could be improved by mixing two separate varieties, the scientists held that Mexican culture could essentially be improved through better breeding. This perspective reflected a teleology in which Mexicans were seen as progressing from indigeneity towards a modernity in which the modern, universal subject was defined as white.

The Commission's views about improved breeding through crossing different genetic traits—whether in corn or people—seems to conflict with those they held about the quality of Mexico's cattle. In the case of cattle, the American scientists argued that the animal's quality or "stock" had diminished as different varieties were bred together. But their logic worked the other way around in the case of corn and people, where they believed intermixing would improve "racial" quality. Their logic seems contradictory unless viewed in terms of the racial logics that guided their assessments of Mexico plants, animals, and people. The fact that in both cases it is proximity to whiteness that represents improvement of quality suggests that the racial logic underpinning their assessments was rooted in white supremacy. Both hierarchies of development define the Indian and the racial geography of Mexico in terms of poor quality.

Upon completion of their trip across Mexico, the Commission's recommendations were adopted without change by the Rockefeller Foundation Board of Trustees as "the guideline for an action program in Mexico." Their findings were

[187] Colin R. Johnson, *Just Queer Folks: Gender and Sexuality in Rural America* (Philadelphia: Temple University Press, 2013).

straightforward: Mexico's agriculture was woefully deficient by almost all counts. Yet the Commission argued that before Mexican agriculture could be transformed, its agricultural scientists would need to be improved. They wrote that "[Mexican] schools can hardly be improved until extension men are improved [and] investigational work cannot be made more productive until investigators acquire greater competence." Improving agricultural scientists would be one of the primary aims of the MAP.

As the Commission's most senior member, Stakman was the most outspoken proponent of this educational mission. Returning from another Foundation-sponsored survey trip through Peru, Ecuador, Colombia, and Mexico in 1953, Stakman spoke to his colleagues on the Foundation's Board of Agricultural Consultants about the importance of training Mexicans to become proper scientists. "In order to develop a group of Mexican agricultural scientists intellectually and morally," he declared, "the program must train at least one new generation of scientists."[188] He was encouraged by what he viewed as the remarkable transformation of "young Mexicans" that had trained at the MAP. Describing his experience meeting former MAP trainees, he wrote that the agronomists had become "competent scientists and cultured men." Stakman even suggested that American guidance might have encouraged them to choose more "cultured wives." Stakman's judgment about the Mexicans' quality of spouse is worth noting. Stakman might not have been directly advocating for racial improvement through "better breeding." Nonetheless, his statements about the scientists "marrying up," are inflected with racial undertones in which cultural improvement was equated

[188] "Report of E.C. Stakman, Trip to Columbia, Ecuador, Peru, and Mexico, June 30-August 6, 1953," Rockefeller Foundation, 1953, Folder 31, box 5, E.C. Stakman Papers, University of Minnesota Archives, Minneapolis, Minnesota.

with progression away from indigeneity and toward whiteness. Indeed, Stakman's comments suggest that proximity to white, American scientists was the key factor in the improvement of the Mexican agronomists. These encounters were facilitated through the Rockefeller Foundation's scholarship and fellowship program, through which over 450 Mexican agronomists were trained. Those deemed the most "intelligent [and] industrious" were selected for fellowships in American universities. By 1959, about 100 scientists had been sent to study at U.S. schools, mostly Land Grant Universities.[189]

Land Grant Universities were thus key sites through which the Foundation's paternalistic efforts to guide "young Mexicans" to scientific "maturity" occurred. As Rod Ferguson argues (2012), the Land Grant University institutionalized 19th century racial divisions through its focus on uplifting poor and working-class whites.[190] As Ferguson details, "the land grant movement elaborated the [United States'] racialized contradictions between freedom for some and unfreedom for others and assisted in the development of a white professional class necessary for a changing economy."[191] Blacks and Native Americans were excluded from the 1862 Morrill Act's promises of expanding democratic education to rural America. American scientists working at the MAP were part of the Land Grants' lineage of white educational progress built upon the exclusion of non-whites.[192] Deborah Fitzgerald demonstrates that the majority of the

[189] "Confidential report: Rockefeller Foundation Scholarships and the Mexican Revolution in Agricultural Science," Rockefeller Foundation, 1959, folder 22, box 5, E.C. Stakman Papers, University of Minnesota Archives, Minneapolis, Minnesota.
[190] Roderick A. Ferguson, *The Reorder of Things: The University and Its Pedagogies of Minority Difference* (Minneapolis: University of Minnesota Press, 2012).
[191] *ibid.,* 85.
[192] We should not, of course, examine the Land Grant Movement solely through the lens of race. Race always intersects with and operates through other forms of social difference such as gender, class, and sexuality. See Daniel Martinez HoSang, Oneka LaBennett, and Laura Pulido,

scientists the Rockefeller Foundation sent to Mexico had been trained in Land Grant Universities, and sought to replicate the Land Grant model in their efforts.[193] Fitzgerald's argument should be extended to consider how the American agriculture exported through the MAP had been shaped by US colonial and racial projects, including slavery, Western expansion, and the violent dispossession of indigenous land.

This is not to suggest that the MAP's agricultural development was entirely unidirectional. As Joseph Cotter shows, the Mexican state was also invested in modernizing *campesinos*.[194] Racial logics about culturally inferior Indians also buttressed the industrializing agenda of Mexican modernizers under the Camacho Administration. But the fact that the MAP was largely controlled by Rockefeller Foundation directives—and that they described their intervention as precipitating the "revolution" in Mexico's agriculture—suggests that there was a racial hierarchy operating through the project. Whether through efforts to breed new varieties of crops or train Mexican agronomists, white Americans consistently assumed positions of power. Conversely, non-whites, especially indigenous people were relegated to inferior positions. More than simply being led *by* white people, the program was undergirded with a racial logic that assumed whiteness was superior. This logic can be seen throughout the Survey Commission's diagnosis of Mexican cultural and natural poverty as Indian poverty. And it would underpin the project's widespread effort to train a "new generation" of Mexican agricultural scientists. Stakman's comments about Mexican

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eds., *Racial Formation in the Twenty-First Century* (Berkeley: University of California Press, 2012).

[193] Deborah Fitzgerald, "Exporting American Agriculture: The Rockefeller Foundation in Mexico, 1943-53," *Social Studies of Science* 16, no. 3 (1986): 457–483.

[194] Cotter, *Troubled Harvest.*

agronomists becoming better scientists and more cultured men through their interactions with Americans is but one example of how whiteness was figured at the top of an assumed racial hierarchy. The next section turns to an analysis of how this logic materialized through the project's work on Mexico's most important staple crop: maize.

Collecting corn along the side of the road

From the earliest days of the MAP, the Rockefeller Foundation scientists focused in particular on improving the country's maize crop. The Foundation hired E.J. Wellhausen, a corn geneticist with a Ph.D. from Iowa State University, to lead these efforts.[195] In accounts of the MAP, Wellhausen takes a back seat to his more famous colleague, Norman Borlaug, who came to Mexico a few years after Wellhausen to lead the program's wheat breeding project. He bred a dwarf wheat variety that became synonymous with the Green Revolution, for which he was awarded a Nobel Peace Prize in 1970. Borlaug's memorialization in industry and development discourse seems to only increase. Each October, hundreds of agribusiness and development officials gather in Des Moines, Iowa to bestow the World Food Prize in Borlaug's honor. During the weeklong celebration, banners displaying a sepia-toned photo of the iconic scientist and the words "Norman Borlaug: The man who saved a billion lives" hang from the streetlights of downtown Des Moines.[196] Though overshadowed by Borlaug, Wellhausen's story begs more critical attention. After leading the maize project in the MAP's first decade, he took over as Director of the entire program from 1951-1959. He later became the first Director General of CIMMYT. Wellhausen led efforts to collect

[195] Stakman, Bradfield, and Mangelsdorf, *Campaigns against hunger*, 40.
[196] Author field notes, 2016.

and categorize hundreds of varieties of maize from throughout Mexico and Central America. He bred the different maize types together to create "composite" varieties, which he distributed widely to plant breeders in international development institutions and American seed companies.

After arriving in Mexico, Wellhausen immediately began collecting as many samples of maize as possible from across the country.[197] Understanding Mexico as maize's "center of origin," Wellhausen viewed the country's "exotic" maize as a wealth of "undiscovered" varieties that might prove useful for commercial breeding.[198] In a 1966 oral history recorded by the Rockefeller Foundation, Wellhausen describes numerous "collecting trips" he and his colleagues took in search of maize. He recalls speeding across Mexico's highways, stopping only long enough to collect maize from roadside fields, granaries, and hillside farms:

> … we collected a lot of corn, right along the road, as we went from one place to another, along the main roads in Mexico. This was how we got the first corn collections we ever made. And this was very I interesting to me. This introduced me to the people that were growing the corn and the Indians, and so on (29).

Like the Survey Commission, Wellhausen comes to understand Mexico's agriculture by mapping the country as a geography marked by Indianness—by *"*locating Indians in the landscape."[199] Though it appears to be an offhand comment, Wellhausen's depiction of

[197] Stakman, Bradfield, and Mangelsdorf, *Campaigns against hunger,* 58.
[198] "Edwin J. Wellhausen oral history," Rockefeller Foundation, June 28, 1966, Folder 1, Box 25, RG 13, Oral Histories, FA119, Rockefeller Foundation records, Rockefeller Archive Center, Tarrytown New York, pg 141. Subsequent citations are cited in-text, by page number.
[199] Saldaña-Portillo, *Indian Given,* 9.

Indians as separate from "people…growing the corn" can be read as encapsulating the MAP's epistemological foundation.

Wellhausen positions himself as an objective scientist studying Mexico from an empirical perspective. He is "introduced" to maize, farmers, and Indians as objects for his own knowledge, rather than actors shaping that knowledge production directly. This scientific detachment is further illustrated by the fact that he hardly spoke to the people they encountered on collecting trips. Describing how he employed Mexican college students to facilitate their collecting efforts, Wellhausen recalled: "We stopped along the roadsides and collected corn. The young men I was with did the talking and made the arrangements with the people that we collected corn from, and I learned a lot about corn" (32). This direct language conveys Wellhausen's singular focus on corn. People that grew corn were only useful insofar as they could facilitate Wellhausen's access to it. Though, as the Survey Commission recognized, many of Mexico's maize farmers were indigenous people, Wellhausen's "scientific" understanding of maize separates it from its cultural context, confining indigenous people to the background of his project. Wellhausen himself found little interest in venturing into this background. As the collecting mission expanded, he mostly relied on the college students to collect his samples. He would give them bus tickets and some empty sacks and instruct them to go out into the "hinterlands" and collect maize from the people they found there (133). Wellhausen utilized one agriculturalist in particular, Efraín Hernández Xolocotzi. (The Rockefeller scientists did not use Hernández's Aztec name, calling him "X" for short.)[200]

[200] Reflecting their keen interested in genetic heritage, they also doubted that he was "pure bred" Aztec, as he reportedly claimed, because he had "blue eyes." See "Neil B. Manglesdorf oral history," Rockefeller Foundation, November 16 and December 19, 1966, Folder 1, Box 18, RG

Wellhausen praised "X" for his ability to speak "Indian dialects" and thus venture to "the most remote villages" on behalf of the project and negotiate with Indians to get access to their maize, even ceremonial varieties (133 and 136).

With the help of the college students and "X," Wellhausen had amassed over 2,000 varieties of maize by 1950. He bred these to produce new varieties with desirable characteristics, such as greater tolerance to drought. In his oral history, Wellhausen describes this work in terms of a "hunt" for a particular gene. Discussing one trait believed to yield more drought-tolerant maize, he remarked: "Not very many people know that this gene exists" (60-61). Wellhausen acknowledges that Indians played a role in the gene's evolution: because they replanted seeds from plants that survived droughts, they had "no doubt" selected for the characteristic. But, describing their farming practices in the past tense, he argues that Indians had "never really fixed [the gene] in the variety" (61).

Wellhausen's argument about discovering a gene in Indian maize parallels settler-colonial narratives about Indians that Jean O'Brien calls 'firsting,' 'lasting,' and 'replacing' (2010).[201] O'Brien shows how these narratives erased Indian history in colonial New England. Together, these tropes "insisted that non-Indians held exclusive sway over modernity, denied modernity to Indians, and in the process created a narrative of Indian extinction that has stubbornly remained in the consciousness and unconsciousness of Americans."[202] Claiming to be one of the first people to recognize a

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13, Oral Histories, FA119, Rockefeller Foundation Records, Rockefeller Archive Center, Tarrytown, New York, pg. 65.

[201] Jean M. O'Brien, *Firsting and Lasting: Writing Indians out of Existence in New England*, Indigenous Americas (Minneapolis: University of Minnesota Press, 2010).

[202] *ibid*., xii.

particular gene, Wellhausen marks his work as a decisive break from the past—and from Indian practices. Indians are figured as non-modern, thus their cultivation of the physiological dynamics of maize plants that Wellhausen names "gene" can only be a precursor for his modern science.[203]

Wellhausen positions himself as a modern subject uniquely capable of "fixing" genes as resources to be extracted. Indians are thereby relegated to the status of "non-fixers" incapable of possessing nature.[204] This racialized discourse would underpin Wellhausen's frequent arguments about using "exotic" maize varieties in commercial breeding efforts. During a talk given at the 1965 American Hybrid Corn Industry Research Conference, he argued that "the possibilities for the further improvement of corn through a more complete exploitation of the many different germplasm complexes existing in the tropics [was] extremely great."[205] Speaking of the potential of "some of the outstanding indigenous varieties of Mexico," Wellhausen posed a rhetorical question to the agribusiness officials at the conference: "If this is what man and nature have produced in a more or less haphazard way through chance inter-hybridization of different varieties and races, what can the modern geneticist do with his present knowledge of genetics and gene action, and with over 300 different races at his

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[203] Donna Haraway reminds us that "a gene is not a thing" in itself, but must be made legible through social and technical processes. This does not mean that they are not real, she insists. Being "made" is not the same as being "made up." "A gene is not a thing," she writes, "much less a 'master molecule' or a self-contained code. Instead, the term *gene* signifies a node of durable action where many actors, human and nonhuman, meet." Donna Haraway, *Modest_Witness@Second_Millennium.FemaleMan_Meets_OncoMouse: Feminism and Technoscience* (New York: Routledge, 1997), 142.

[204] TallBear, Kim, "The White Possessive: Property, Power, and Indigenous Sovereignty" (Annual meeting of the American Studies Association, Denver, Colorado., 2016).

[205] Wellhausen, E.J., "Exotic Germ Plasm for Improvement of Corn Belt Maize," in *Proceedings of the 20th Annual Hybrid Corn Industry-Reserach Conference* (Chicago, 1965), 43. Subsequent citations from Wellhausen's talk are cited in text.

disposal" (31)? Though unnamed, Indians are once again central to Wellhausen's "firsting" logic. Figured as the absent "non-fixers" of genes, Indians are understood as *part of* nature. The modern geneticist, by contrast, can *control* nature through seeing and manipulating genes.

In this way, Wellhausen's possessive orientation toward seeds extends to essentialist constructions of Indians. The argument he made at the seed industry conference is one in which "Indigenous 'others' are represented and constituted in discourse as white epistemological possessions."[206] Moreton-Robinson shows how this "epistemological possessiveness" is integral to colonial *dis*possession. Describing Captain James Cook's views of Indians in a "state of nature," Moreton-Robinson argues that "[Cook's] epistemological possessiveness operated as an inhibitor to reduce the capacity for Indigenous people to be recognized as having a will, as property-owning sovereign subjects possessing different knowledges…"[207] Violent dispossession of indigenous people's land was justified because they were viewed as lacking a will-to-possess. Wellhausen's scientific pronouncements about Indians and their maize exemplify this white possessive logic. His possessive orientation toward maize is both material and epistemological, as he claims possession of the seeds, but also of the history of knowledge—"man and nature"— they hold.

Wellhausen's white possessive logic is also evident in the book based upon his maize collection: *Races of Maize in Mexico: Their Origin, Characteristics, and*

[206] Moreton-Robinson, *The White Possessive*, 114.
[207] *ibid.*, 114.

Distribution.[208] This Harvard University Press book described the MAP's maize collection in terms of racial categories. The book's authors wrote that the project presented some difficulty because, as an open-pollinated plant, maize intermixes widely and unselectively. Though they acknowledged the futility of searching for "pure" races of maize, they maintained that "races" could essentially be deduced through categorizing plants based upon their phenotypic characteristics. Following American botanists Anderson and Cutler, Wellhausen and his co-authors defined "race" as "…a group of related individuals with enough characteristics in common to permit their recognition as a group" (44). Using this definition, they charted 25 races and four sub-races of Mexican maize. While most of the varieties in the collection were combinations of different "races," they outlined likely "genealogies" of particular racial groups in family tree-like diagrams.

Like Wellhausen's collecting efforts, *Races of Maize in Mexico* essentially removes maize from any human cultural context. The various "races" are defined based upon plants' physical characteristics. Yet the book's purported "natural science" is written in terms of a decidedly human history. The four general racial subcategories are situated in terms of a history of Spanish colonialism, with maize varieties defined as "Ancient Indigenous, Pre-Columbian Exotic, Prehistoric Mestizos, and Modern Incipient." The authors define their "modern" races as those "which appear to have developed since the Conquest, and which have not yet reached a state of racial stability" (205). This racial categorization of maize is inextricable from colonial thinking about people. In creating a racialized *teleology* of maize, in which it evolves from "Ancient" to

[208] Wellhausen, E.J., *Races of Maize in Mexico: Their Origin, Characteristics and Distribution* (Cambridge, Mass: Bussey Institution of Harvard University, 1952).

"Modern" varieties, the book's racial mapping parallels racial improvement logics about improving indigenous people through mixing with European "blood." (Following the Rockefeller Foundation Survey Commission's views on *mestizos*.) Further, maize's teleology is described in terms of *moving toward* becoming a tool for "modern" plant breeders like Wellhausen (modern varieties are dubbed "incipient," or coming into being). It is only when it is possessed by the modern scientist (figured as white, male, and American) that maize becomes a modern object. Thus the authors conclude that their book will "reveal relationships and paths of origin and should provide an inventory of the kinds of germplasm *available to the plant breeder* (200, emphasis added). That the entirety of maize germplasm should be the possession of the modern breeder is a foregone conclusion. This possessive logic again renders Indians to the past, foreclosing any possibility of their farming practices or ways of knowing becoming modern.

Here we see the connection between the process of racializing Indians and producing knowledge about maize. We can think about this relationship in terms of a racialized *spatialization* of maize. In an interview in which he discusses how his work engages the spatial, Michel Foucault points to the importance of tracing how "spatial techniques" are used to define a particular "knowledge as a science."[209] Foucault describes how 17th Century Linnaean taxonomists "classif[ied] a plant only on the basis of that which was visible." In the process, "All the traditional elements of knowledge, such as the medical functions of the plant, fell away.[210] This spatialization shaped both the plants' reproduction (as they were increasingly understood, and thus bred, in terms

[209] Michel Foucault, *Power*, ed. James D. Faubion, Essential Works of Foucault 1954-1984, Vol. 3 (New York: New Press, 2000).
[210] *ibid.,* 363.

of Linnaean categorization) and their representation "into illustrations within books." Wellhausen's maize projects catalyzed these kinds of spatial techniques. Maize varieties would be diagrammed as a spatial object in *Races of Maize in Mexico.* But they would also be *re*spatialized as the Green Revolution expanded beyond Mexico: they were stored in new germplasm banks, shipped to plant breeders around the world, and used to breed new varieties.

As Wellhausen's maize seeds were respatialized across the Green Revolution's geographies, the racial divisions so crucial to their appropriation were also extended. In his oral history, Wellhausen describes laying out his maize collection across a warehouse floor, mapping the country in terms of where each variety was grown. He then bred the maize together by region, creating "composite" varieties based upon similar phenotypes and reducing his collection of around 6,000 varieties to around 1,000. He distributed these composites to breeding programs around the world, including development institutions in Kenya, India, and Thailand, and U.S. seed companies operating in the American Midwest and throughout the Southern Hemisphere.[211] Using the Philippines as a case study, Sarah Wright demonstrates how Western knowledge about seeds as intellectual property "jumped scales" in the Green Revolution, operating as a universal, instead of particular, situated knowledge.[212] Though Wright examines a different Green Revolution crop (rice), there are clear parallels

[211] Wellhausen's Rockefeller Foundation Officer Diaries detail extensive correspondence with company leadership from the burgeoning American hybrid seed industry. Wellhausen sent maize varieties to companies like Pioneer, DeKalb, and Northrop King.

[212] Sarah Wright, "Knowing Scale: Intelle©tual Property Rights, Knowledge Spaces and the Production of the Global," *Social & Cultural Geography* 6, no. 6 (December 2005): 903–21, https://doi.org/10.1080/14649360500353350. Wright builds upon Haraway's classic theorization of "situated knowledge." See: Haraway, *Simians, Cyborgs, and Women,* 183-202.

between her case study and the story of Wellhausen's maize. In each case, Western knowledge about seeds as genetic resource expands at the expense of other ways of knowing seeds. Wright's useful analysis should be extended to consider how race is integral to the Green Revolution's "scale jump." Wellhausen's efforts to possess maize from throughout the continent were shaped through—and productive of—racial logics. These racial logics were thus crucial to the spatialization of maize across the Green Revolution's expanding networks. In this way, racial logics came to be embedded in the Revolution's "modern" seeds.

The MAP became the model for subsequent programs sponsored by the Rockefeller and Ford Foundations and the US government.[213] The germplasm collection, storage, and dissemination model piloted at the MAP became the basis for the Green Revolution's ongoing *ex situ* seed banks and exchanges through the CGIAR.[214] Wellhausen continued collecting maize from throughout Mexico and Central and South America as Director General of CIMMYT, and CIMMYTs seed bank became the largest collection of maize in the world. Jack Kloppenburg argues that CIMMYT and other CGIAR centers facilitated the transfer of germplasm from the South to the North, as Western agricultural scientists claimed plant genetic material as the "common heritage of mankind."[215] But this concept of the world's germplasm as "common heritage" is itself profoundly racialized. Following Ben-zvi's theorization of the way that ideas about inheriting material property have figured in racial formation, the "common heritage"

[213] Perkins, *Geopolitics and the Green Revolution,* 117.
[214] T. Garrett Graddy, "Situating In Situ: A Critical Geography of Agricultural Biodiversity Conservation in the Peruvian Andes and Beyond: Situating In Situ," *Antipode* 46, no. 2 (March 2014): 426–54, https://doi.org/10.1111/anti.12045.
[215] Kloppenburg, *First the Seed*, ch. 7.

perspective needs to be understood as one that is rooted in whiteness.[216] The Green Revolution's claims to the world's germplasm as the genetic toolbox of the modern maize breeder parallels claims to inherit the "cultural property" of indigenous people. Ben-zvi shows how the logic of white inheritance *naturalizes* colonial violence and dispossession. In conceptualizing indigeneity as eventually being absorbed into whiteness, this logic rationalizes white violence against Indians. Wellhausen's possession of Indian maize was naturalized through ideas that situated whiteness and indigeneity along a continuum of scientific development. This set the stage for a long history of normalized violence in the name of Green Revolution development.[217]

"Landraces are in the hybrids"

This final vignette returns to where this chapter began—contemporary agricultural development in Africa—to demonstrate how Wellhausen's racial logics are rearticulated on the "new" Green Revolution's frontier. Since the mid 2000s, Africa has been the site of a wave of agricultural industry and development efforts. While the most heralded successes in the "first" Green Revolution were in rice and wheat, maize is inarguably the central crop in today's Green Revolution for Africa. Maize is not only the most consumed food crop on the continent, it is also the most important commercial crop for multinational agricultural seed/biotechnology companies. As Kloppenburg details, hybrid maize revolutionized the seed industry because hybrid seeds' dramatic

[216] Ben-zvi, "Where did Red Go?"
[217] Vandana Shiva, *The Violence of the Green Revolution: Ecological Degradation and Political Conflict in Punjab*, 1st ed. (Dehra Dun: Research Foundation for Science and Ecology : Exclusively distributed by Natraj Publishers, 1989).

increase in yield—their "hybrid vigor"—is only demonstrated for one generation.[218] Thus farmers are compelled to purchase new varieties each growing season, as opposed to replanting open-pollinated varieties saved from previous seasons. Because of this unique capacity, hybrid maize is central to the business model of multinationals like Monsanto and DuPont Pioneer. (One agricultural scientist I interviewed quipped that the three most important crops for these companies are "maize, maize, and maize.") Yet, as proponents of the African Green Revolution often point out, most of the continent's maize crops are grown with open-pollinated varieties.[219] Moreover, outside of South Africa, the market penetration of multinational seed companies is miniscule. At an early meeting in the U.S. about the potential of bringing drought tolerant biotech crops to Africa, agricultural biotech company officials noted that less than ten percent of farmers on the continent purchased seeds from multinationals.[220] Given that Africa is the "final frontier" for global seed companies, it is unsurprising that the expansion of hybrid maize markets has been the explicit goal of the largest projects in the Green Revolution for Africa.[221]

[218] Kloppenburg, *First the Seed.*
[219] Juma, Calestous, "How to Improve Africa's Seed Industry," World Economic Forum, September 11, 2015, https://www.weforum.org/agenda/2015/09/how-to-improve-africas-seed-industry/.
[220] Don S Doering, "Public-Private Partnership to Develop and Deliver Drought Tolerant Crops to Food-Insecure Farmers," Summary and Interpretation of the May 3-4 Strategy and Planning Meeting (Winrock International, May 31, 2005).
[221] Such as the Alliance for a Green Revolution in Africa's Program for Africa's Seed Systems, CIMMYT's Drought Tolerant Maize for Africa (now Drought Tolerant Maize for Africa Seed Scaling), and Water Efficient Maize for Africa.

Africa is also bearing the brunt of climate change, with increasingly high temperatures and more frequent and severe droughts.[222] Green Revolution projects like Water Efficient Maize explicitly frame their efforts in terms of helping smallholder African farmers cope with the vagaries of climate change. At the same time, climate change is producing unforeseen barriers to large-scale industrial agriculture. A case in point is the emergence of new crop diseases such as "Maize Lethal Necrosis" (MLN), which has decimated maize crops across eastern Africa since 2011.[223] First discovered in Western Kenya, MLN soon became a threat for the entire region's commercial seed production.

In 2013, CIMMYT partnered with Kenya's agricultural research system to establish a research center devoted to screening maize varieties for MLN susceptibility and resistance.[224] Funded by the Gates Foundation and the Syngenta Foundation for Sustainable Agriculture, the facility screened varieties brought by the multinational and national seed companies and national agricultural research programs operating in the region. However, none of the companies or research centers had seeds resistant to MLN.[225] Forced to find another solution to this mounting problem, CIMMYT requested landraces from its seed bank in Mexico. The landraces were found to hold genetic

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[222] Philip K. Thornton et al., "Agriculture and Food Systems in Sub-Saharan Africa in a 4°C+ World," *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 369, no. 1934 (January 13, 2011): 117–36, https://doi.org/10.1098/rsta.2010.0246.

[223] George Mahuku et al., "Maize Lethal Necrosis (MLN), an Emerging Threat to Maize-Based Food Security in Sub-Saharan Africa," *Phytopathology* 105, no. 7 (March 30, 2015): 956–65, https://doi.org/10.1094/PHYTO-12-14-0367-FI.

[224] CIMMYT, "New Screening Cycle Begins for Maize Lethal Necrosis Disease in Kenya," CIMMYT, April 20, 2016, http://www.cimmyt.org/press_release/new-screening-cycle-begins-for-maize-lethal-necrosis-disease-in-kenya/; accessed 7/12/17.

[225] Author Interview, CIMMYT, Des Moines, Iowa, October 13, 2016.

material resistant to MLN. CIMMYT now provides these seeds to companies and National Agricultural Research Systems so that they can incorporate them into their own breeding pipelines. Mexican maize landraces are proving to be vital to the continuation of hybrid maize development in the Green Revolution for Africa. The promise of mining the genetic potential of landraces in search of lucrative traits like drought and disease resistance has been amplified with the emergence of cutting edge genomic editing tools like CRISPR-Cas9 (often shorthanded as just CRISPR), which gives breeders the ability to make genetic edits with unprecedented quickness and precision (Montenegro de Wit 2016a).[226] CIMMYT entered into an agreement to sublicense a CRISPR technology from DuPont Pioneer in 2016. The partnership's first project is to further develop MLN resistance for African hybrids.[227]

The CIMMYT/DuPont deal was struck on the occasion of CIMMYT's 50th anniversary, when hundreds of international scientists and agribusiness officials gathered in Mexico for a commemorative conference. Neal Gutterson DuPont Pioneer's Vice President of Research and Development, spoke to the conference attendees about how CRISPR promised to revolutionize agricultural science.[228] He described CRISPR as analogous to a "search" function in a computer's word processor: scientists can use it to quickly locate genetic sequences of interest in the "text" of a plant's genome and then

[226] Maywa Montenegro, "OPINION: CRISPR Is Coming to Agriculture — with Big Implications for Food, Farmers, Consumers and Nature," *Ensia* (blog), January 28, 2016, https://ensia.com/voices/crispr-is-coming-to-agriculture-with-big-implications-for-food-farmers-consumers-and-nature/.
[227] CIMMYT, "DuPont Pioneer and CIMMYT Form CRISPR-Cas Public/Private Partnership," CIMMYT, September 28, 2016, http://www.cimmyt.org/press_release/dupont-pioneer-and-cimmyt-form-crispr-cas-publicprivate-partnership/Sept. 28 accessed 7/9/17.
[228] CIMMYT, *CRISPR-CAS Technology by Neal Guterson [Sic]*, 2016, http://www.youtube.com/playlist?list=PLjXdzeDP_y5FEhl8XKm7dosQbArng7mn3.

efficiently "delete, edit, or replace" genes. With CRISPR, he explained, plant breeders can knock out unwanted genes, bolster a gene sequence to change a plant from having, say, drought tolerance to *high* drought tolerance, or replace an unwanted gene (disease susceptibility) with a desired gene (disease resistance). Because of CRISPR's powerful "search" capabilities, geneticists can now efficiently find "native" traits in a particular plant, and then move that trait into an "elite" variety that has been highly adapted to a particular place. He used the example of editing MLN-resistance genes from Mexican maize landraces into hybrids adapted for Kenyan agriculture. This process would take years of successive breeding with conventional methods; CRISPR makes it feasible in just one or two breeding cycles.

Gutterson described a timeline of "modern plant breeding" that began with Henry Wallace, the founder of Pioneer, first hybridizing maize and moved through successive advances in hybridization and plant biotechnology. He argued that CRISPR would soon be viewed as the next big "game changer" in this history. Gutterson's historicization harkens back to Wellhausen's claims about the potential for "modern geneticists" to improve maize with "exotic" germplasm. The fact that Gutterson marks the beginning of "modern" breeding with the founding of hybrid maize (and his company) displays the kind of "firsting" logic that Wellhausen displayed in his claiming his unique ability to "fix" genes. Where Wellhausen organized his collections visually, making piles of corn on a warehouse floor, CRISPR offers heretofore-unimaginable optics of discovery. Though CRISPR certainly promises remarkable advancements in breeding, questions about property and possession remain. This is not to suggest that the landraces should not have been used to combat MLN. Rather, we should attend to the

ways technologies like CRISPR can bolster particular approaches to climate change adaptation at the expense of others.[229] Whether or not landraces are preserved as objects of cultural significance to indigenous people or as objects for *ex-situ* oriented genomic science remains to be seen.[230] That MLN resistant landraces are being bred into seeds owned by the world's largest seed companies suggests the need to consider how logics of racial exclusion are rearticulated in today's cutting edge science.

CIMMYT's use of landraces should not, however, be read as something that happened in the past and is only now reoccurring with contemporary advances in plant genomics. The landraces first collected by Wellhausen and his colleagues would form the genetic background for countless varieties of maize across the global South. As one CIMMYT representative conveyed in an interview, virtually all of the commercial varieties of maize grown across the world's tropical regions contain that material in their pedigree. "The landraces *are in the hybrids*," this official insisted.[231] The long Green Revolution's incorporation of indigenous maize is continuous. The most recent re-appropriation of landraces for use in fighting crop diseases in east Africa is part of ongoing cycles of dispossession.

Conclusion

To conclude, I want to revisit the image with which I began this chapter: the shadowbox of Mexican maize landraces in CIMMYT's Nairobi office. This artifact

[229] Maywa Montenegro de Wit, "Stealing into the Wild: Conservation Science, Plant Breeding and the Makings of New Seed Enclosures," *The Journal of Peasant Studies* 44, no. 1 (January 2, 2017): 169–212, https://doi.org/10.1080/03066150.2016.1168405.
[230] Graddy, "Situating In Situ."
[231] Author Interview, CIMMYT, Des Moines, Iowa, October 13, 2016.

could be viewed as a sort of natural history of the varieties from which modern maize has evolved. Yet that display of Mexican landraces at the epicenter of the Green Revolution for Africa is better read in terms of the living history of "white science" and "indigenous maize." In the earliest Green Revolution project, American scientists sent to Mexico negotiated their own racial subjectivity through literal and figurative encounters with Mexico's indigenous people. Based on the disavowal of indigenous knowledge as modern, scientists like Wellhausen collected "exotic" varieties of maize from throughout Mexico and Central America—and began to transport indigenous maize around the globe. In the process, whiteness and indigeneity were mutually formed in terms of a racial hierarchy of science and modernization. This racial logic was respatialized as the Green Revolution grew beyond Mexico. The Revolution's white science would expand through encountering multiple iterations of nonwhite agriculture.

In this way, this chapter emphasizes the need to make whiteness visible as a racial project in the Green Revolution. This entails examining the ways that "whiteness derives its meaning and value from various forms of nonwhiteness" in and through agricultural science and development projects.[232] Increased attention to whiteness can shed light on the ways that race articulates with other modalities of power across the long Green Revolution. Further, attending to how Green Revolutionaries produce both whiteness and non-whiteness through their science should help us better understand how race works to legitimate the Revolution's hierarchies of knowledge and power. As this chapter suggests, race is embedded in the seeds of the long Green Revolution. This does not, however, mean that the Revolution's story of race is singular. We cannot explain

[232] Pulido, "Geographies of Race and Ethnicity II," 4.

the political and cultural dynamics of the Green Revolution for Africa in the same terms of the Revolution's history in Mexico or elsewhere. Yet, we should examine the ways in which multiple hierarchies of whiteness and non-whiteness are brought together across the long Green Revolution. Tracing connections between CIMMYT and Pioneer's use of CRISPR to fight crop diseases and expand markets in Africa and Wellhausen's white possessive orientation offers an example of how scholarship on the Green Revolution might make these connections.

This chapter also points to the importance of analyzing how Green Revolution science "produce[s] space in racial terms" across multiple geographies.[233] Green Revolution spatial productions in Mexico are different than those in eastern Africa. Yet we should consider how the Green Revolution both enlists and produces multiple space-making racial projects—and how these intersect. The example of the ways that landraces cultivated by indigenous people in Mexico have become crucial to a wave of projects that aim to transform agriculture across Africa is suggestive in this regard. Examining how racial projects operating along white/indigenous lines articulate with other racial projects (whether spatial imaginations and productions of Africa or the smallholder African farmer as a racialized figure) can shed light upon how multiple racial projects intersect in the Green Revolution for Africa. As this chapter suggests, tracing the persistence of "white science" across the long Green Revolution is crucial for understanding—and resisting—its power.

[233] Saldaña-Portillo, *Indian Given,* 17.

3. Seeing Like a Seed Company

In the summer of 2015, during a visit to the St. Louis headquarters of Monsanto, the world's largest agricultural biotechnology company, I spoke to a plant breeder about his experience working to genetically engineer maize plants to be more resistant to drought. The breeder explained how, during the early 2000s, Monsanto scientists moved strands of bacterial DNA into the genomes of maize plants in hopes of developing plants that could survive, and even thrive, under drought conditions. Long considered the "holy grail" of agricultural biotechnology, "drought tolerance" had the potential to be a blockbuster trait.[234] So biotech companies like Monsanto and DuPont Pioneer were in a race to develop a genetically modified (GM) drought tolerant crop.

The breeder I spoke to remembered vividly the moment in 2003 when he and his team realized that they had found their elusive drought gene. "I have a picture of me in Kansas," he said, "when we had just collected the ears from the plants in the first field trials. There's one bag from the non-transgenic plants and two bags from the transgenic plants. And we were like: 'something's going on here!' We were pretty excited."[235] That extra bag of the GM crop suggested that Monsanto scientists had found a gene that would allow maize plants to produce higher yields under drought conditions. The scientists' excitement would soon reverberate throughout the company. Not only was a patented "drought gene" potentially worth millions, but Monsanto officials believed that

[234] Emily Waltz, "Beating the Heat," *Nature Biotechnology* 32, no. 7 (July 2014): 610–13, https://doi.org/10.1038/nbt.2948.
[235] Personal Interview, Monsanto Company, May 27, 2015.

the trait might help them rewrite the script on the company's public reputation, one that had suffered from years of activist critiques about their "patenting of life" and aggressive market expansion through buying up seed companies.[236] As the impacts of climate change increasingly became reality for farmers, a GM technology that saved plants from drought would likely be much less controversial than the two traits upon which the company had built its biotech empire: herbicide tolerance and insect resistance.

The Monsanto scientists I met in St. Louis explained that the gene that they found could make plants less susceptible to drought was in and of itself unremarkable. In the early 2000s, company scientists found that when they inserted a particular "event," or genetic sequence, from a soil bacteria (*Bacillus subtilis)* into the maize genome, the gene (called *cspB*) essentially changed the way the maize plant reacted to stress under drought conditions. Plant scientists had known about this particular "cold shock" mechanism for years. But *the use of the gene*—transferring it into a commercial crop like maize to help that plant deal with the stress of drought—was something novel. It was this use that Monsanto could patent and claim as their intellectual property. And it is in that sense—the gene-as-property—that the drought gene is central to the story I tell in this chapter. Since 2008, Monsanto's proprietary molecular process has been at the center of a transnational development project aimed at smallholder farmers in sub-Saharan Africa called "Water Efficient Maize for Africa," often referred to by its acronym, WEMA.

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[236] Rachel Schurman and William A. Munro, *Fighting for the Future of Food: Activists versus Agribusiness in the Struggle over Biotechnology* (Minneapolis, MN: University of Minnesota Press, 2010).

The WEMA project brings together public and private sector plant scientists from Monsanto and the International Center for the Improvement of Maize and Wheat (known by its Spanish acronym, CIMMYT), which is part of the largest multilateral public sector agricultural research and development organization, the CGIAR. CIMMYT and Monsanto partner with the National Agricultural Research Centers in five African countries: Kenya, Uganda, Tanzania, Mozambique, and South Africa. Funded by the Bill and Melinda Gates Foundation and the U.S. Agency for International Development, the project is facilitated through the Nairobi based non-profit the African Agricultural Technology Foundation (AATF), whose mission is to make proprietary biotechnology products available to smallholder farmers and public sector researchers across Africa.[237] Together, these organizations work under WEMA's "philanthropic mandate" to deliver hybrid and genetically modified drought tolerant maize to smallholder farmers in sub-Saharan Africa.[238] Monsanto is contributing the drought gene and another one of its GM technologies, the insect resistance trait derived from the bacterium *Bacillus thuringiensis*, commonly known as *Bt*, to the project and has agreed to waive the royalty fees, or "technology fees," it normally charges farmers and seed companies for licensing its proprietary GM material.[239] The hope is that farmers will be more likely to purchase GM seeds if they do not have to pay the extra costs of royalties. At the beginning of the project, South Africa was the only partner country that allowed

[237] The Howard Buffett Foundation was also an original funder, but is not currently funding the project. USAID began funding the project during its second phase, which began in 2013.
[238] African Agricultural Technology Foundation, "Concept Note: Water Efficient Maize for Africa," accessed June 19, 2015, http://www.aatf-africa.org.
[239] The *Bt* trait was added when the project began its second phase. My arguments about the gene-as-property apply equally to this biotech trait, but because the framing of the project so often focuses on the drought trait, I primarily focus on that technology.

GM crops. Thus a primary goal of the project is to usher in and/or speed up the process of forming legal regimes for GM crops.

Maize is the most important food crop across sub-Saharan Africa, but is largely farmed by smallholder farmers outside of commercial markets. The WEMA project is also a catalyst for the expansion of commercial markets in hybrid seed, which, unlike many non-commercial varieties, need to be bought from seed distributors each year. The project has quickly become the largest hybrid maize-breeding program in Africa and is working with a range of seed companies to commercialize these new varieties.[240] These hybrids, which combine material from CIMMYT, Monsanto, and the national research centers are licensed by AATF to small, medium-sized and multinational seed companies that can then commercialize the hybrids under their own brand, as long as they include WEMA's "DroughtTego" (Swahili for "drought shield").

Because the WEMA project revolves around a proprietary biotech trait, questions surrounding the issue of *property* are central to the project's cultural and political significance. Scholars use the term "property regime" to delineate the multiple social processes through which people address the issue of if and how things are owned. Property regimes include private property, open access, commons, collective property, public goods, state property, and socialist property.[241] Agricultural biotechnology in the U.S. emerged alongside the rise of a legal-economic system in which genes came to be

[240] Several of my informants claimed that the project was the largest maize-breeding program in Africa.

[241] On "property regimes," see Katherine Verdery, *The Vanishing Hectare: Property and Value in Postsocialist Transylvania*, Culture & Society after Socialism (Ithaca: Cornell University Press, 2003), 18-19.

viewed as commodities that should be governed under a private property regime.[242] But in many countries seeds—much less genes—are not necessarily treated like private property. When WEMA began, South Africa was the only participating country with a regulatory system for testing and commercializing biotech crops. Therefore in order for WEMA to introduce maize seeds containing the drought gene to farmers in countries outside of South Africa, *private property regimes in agricultural biotechnology must also be developed.* Thus a key part of the WEMA project is its efforts to "build capacity" for a legal system in which private ownership and control of germplasm is the norm.

In its efforts to build capacity for biotech agriculture, WEMA is part of a growing number of public-private partnerships involving multinational agribusiness companies and public sector research and development institutions. The project begs critical attention on account of both what it is doing—developing and promoting biotech crops in Africa—and who is involved—the most powerful private, public, and philanthropic organizations in international agriculture. Moreover, the project has also received widely differing assessments. It has been heralded as a successful and novel public-private partnership that effectively addresses the intertwined challenges of climate change and food insecurity. Monsanto received a corporate social responsibility award from the University of Notre Dame for its efforts to address the impacts of climate change. And a *New York Times* article described the project in terms of an urgent philanthropic effort to stave off the effects of climate change and population

[242] William Boyd, "Wonderful Potencies?: Deep Structure and the Problem of Monopoly in Agricultural Biotechnology," in *Engineering Trouble: Biotechnolgoy and Its Discontents*, ed. Rachel A. Schurman and Dennis Doyle Takahashi Kelso (Berkeley, CA: University of California Press, 2003), 24–62.

increase across sub-Saharan Africa.[243] At the same time, activist groups describe the project as a kind of "Trojan horse" that is expanding corporate control of seed systems under a humanitarian guise.[244] Both of these interpretations deserve consideration. But this chapter is ultimately less concerned with trying to prove either position (claiming, as it were, that the project is either *really* humanitarian or *really* just shrewd corporate calculus) than it is with analyzing how arguments about the project's two imperatives—improving the plight of smallholder farmers and expanding private property regimes—mutually reinforce each other. In particular, I theorize how the expansion of private property in agricultural biotechnology extends a longer lineage of an "improvement" logic, in which development is coupled with the expansion of private property. Drawing on scholarship at the intersection of legal and critical race studies, I situate WEMA—and the broader push to expand agricultural biotechnology across the "final frontier" of untapped markets in Africa—within a genealogy of colonial and racial ideas about improvement and private property.

As the chapter's title—"Seeing Like a Seed Company"—suggests, WEMA enables scientists, seed company partners, and farmers to shift their *orientation*—in terms of values and everyday practices—to be more in line with the profit motive that drives multinationals like Monsanto.[245] This is not to directly attribute causality to

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[243] Gayathri Vaidyanathan, "A Race to Introduce GM Corn Before Africa's Climate Worsens," *New York Times ClimateWire*, March 30, 2010, https://archive.nytimes.com/www.nytimes.com/cwire/2010/03/30/30climatewire-a-race-to-introduce-gm-corn-before-africas-c-40010.html?pagewanted=print.

[244] See especially the work of the African Center for Biodiversity.

[245] The title is also a riff on James Scott's classic, *Seeing Like a State.* Scott's attention to the ways in which development schemes developed a "high modernism" that discounted local knowledge is a generative example for the line of inquiry pursued in this chapter. James C. Scott, *Seeing like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven, Conn.: Yale Univ. Press, 2008).

Monsanto's profit motive or argue that the company is purposely trying to infiltrate the inner workings of National Agricultural Systems or small seed companies. Rather, as WEMA's mutually enforcing logics of improving smallholder farmers and expanding private property manifests at different sites and across different scales, partner organizations reorient their practices and policies in ways that make them more in line with those of Monsanto's. In other words, the coupling of "development" and expanding private property in seeds is made "commonsense." Understanding how the expansion of private property becomes a kind of *apolitical* "improvement" mission for WEMA's different institutional members demands more attention to the history of improvement logics upon which the project builds.

In the chapter's first section, I show how project participants describe WEMA in terms of "improving" the lives of smallholder farmers and then review scholarship that elucidates how ideas of improvement have historically been yoked to the expansion of private property and the production of racialized subjects deemed to be "not yet" developed. The second section describes the efforts involved in founding the WEMA partnership. Finally, in the third and final section of the chapter, I show how WEMA's twin logics of improvement and private property manifest not only in legislative changes and regulatory system reforms, but also in a whole range of micro-level changes through which the practices of research and development in WEMA's partner institutions are being reoriented toward the interests of private property.

"Improving yields/Improving lives"

Soon after that promising field trial in Kansas, Monsanto officials began to consider how the emerging technology might be developed for farmers they saw as most vulnerable to drought. Alongside their plans to introduce drought tolerant GM maize in the U.S. market, company leadership announced their intention to introduce the drought trait in sub-Saharan Africa. Bemoaning the fact that the company's biotechnologies had not penetrated African countries outside of South Africa, Monsanto's CEO, Hugh Grant, declared a mission to take the drought gene to Africa. Several of the Monsanto officials with whom I spoke recalled hearing Grant talk about the company's ethical obligation to get the drought product into the hands of African farmers as close as possible to its U.S. release. Drought, Grant would say, was a "matter of life and death" for farmers in Africa.[246] As one Monsanto official recalled, there was a widely felt belief that getting their drought technology into the hands of smallholder farmers in sub-Saharan Africa was simply "the right thing to do."[247] In the context of increasingly destabilized weather conditions brought on by climate change, Monsanto and its partners framed the project as an ethical imperative. The urgency of this ethical appeal was captured in the headline of a *New York Times* "climate wire" article about WEMA, which described "A Race to Introduce GM Corn Before Africa's Climate Worsens."[248]

These ethical framings were not only crucial to getting the project funded and developed, but have continued to buttress the project. My WEMA interviewees frequently invoked an urgent need to use WEMA maize varieties to benefit smallholder farmers. Describing these farmers as "vulnerable," "resource poor" or "the poorest of the

[246] Author Interview, Monsanto Company, St. Louis, MO, 5-26-15.
[247] Author Interview, Monsanto Company, St. Louis, MO, 5-26-15.
[248] Vaidyanathan, "A race to introduce GM corn."

poor," WEMA officials often expressed the need to help with missionary-like zeal. "WEMA is something that you do because you're passionate about the mission," said one Monsanto official. Because of a particularly fervent enthusiasm for that mission, colleagues have even dubbed one WEMA official "the preacher."[249] This dedication to the WEMA cause was evident in my informants' use of the word "improve," which they used to describe both the work of breeding better maize varieties, but also that of *improving* lives. One Monsanto official stressed that the project would only be successful if it "actually helps a farmer change, helps them improve their life."[250] A Gates Foundation official argued that raising crop yields was the key component to "improving the condition of smallholder farmers."[251] An AATF official declared: …"for us it's not about the money. We're about the livelihoods. Improvement. That is our focus."[252] And a CIMMYT scientist pointed out that their mission was to "improve the income and livelihoods of smallholders."[253]

Several of my informants stated that the goal of improving farmers' lives had actually kept the project together during the difficult early years when much team-building and negotiating were required in order to find ways to bring the different institutional cultures together. I explore these tensions around the different institutional cultures later in the chapter, but the important point to note here is how frequently the improvement mantra was cited as *the* critical factor that helped project participants weather the initial storm. ("Weathering the storm" is how several of my informants put

[249] Author Interview, AATF, Nairobi, Kenya, 8-26-15.
[250] Author Interview, Monsanto Company, St. Louis, MO, 5-26-15.
[251] Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-22-15.
[252] Author Interview, AATF, Nairobi, Kenya, 8-17-15.
[253] Author Interview, CIMMYT, Nairobi, Kenya, 9-2-15.

it.) One WEMA official told me that in their early team-building activities, project participants would use the figure of the smallholder African farmer as a "north guiding star," to help them stay on course and navigate through their differences.[254] Another official echoed this sentiment. As they put it: "the cool thing about the project was that even at the time we were all, I'd say, trying to work through differences, is that we just kept saying that the end goal of this project is to improve the lives of farmers. And when we focus on that goal, we have to, like we have to find a way."[255]

This fervor for improving the lives of smallholder farmers by bringing them the drought gene technology should be situated within a longer genealogy of ideas linking improvement with the expansion of private property. Taking this approach, this section provides a way to begin to interrogate WEMA's foundational narrative of improving lives through introducing proprietary agricultural technologies. Because the language of "improving lives" is so central to how WEMA participants explain the project, we need to critically examine how this narrative is constructed—how it acquires and maintains its "givenness." This section lays out a theoretical and historical lineage of the entangled logics of improvement and private property as a way to better understand why WEMA participants so readily draw on the language of improvement.

To begin, I want to point to a foundational moment in the history of capitalist agriculture, when a doctrine of improvement justified the *enclosure* of the English commons between the 16th and 18th centuries. Ellen Meiksins Wood details how efforts to privatize land during the long history of enclosure gained traction through the writings of seventeenth century British scientists and liberal philosophers, most

[254] Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-22-15.
[255] Author Interview, Monsanto Company, St. Louis, MO, 6-26-15.

prominently John Locke, whose famous chapter "On Property" is the clearest articulation of the improvement doctrine.[256] Locke argued that in order for one to possess property in land, one must first "improve" that land and make it productive. Because it established "industrious and rational" white men as rightful improvers, Locke's property doctrine was also a racial doctrine. This set the stage for a British empire based upon what Richard Drayton calls "an imperialism of improvement," in which settler-colonists justified land dispossession based on the premise that their unique scientific knowledge made them more efficient improvers, and thus owners, of land.[257] As Drayton shows in the colonial context and Wood demonstrates in the case of the English countryside, the improvement doctrine was used to legally exclude people from land upon which they had previously held customary use-rights.[258] Thus, as Wood argues, enclosure should be understood not only as a process of fencing and privatizing land, but also as one that excluded other property regimes in favor of private property.

As processes of enclosure brought "improved" land into the market in both colony and metropole, "unimproved" land—and the people dispossessed from it—came to be seen as *under*productive. A colonial discourse about underproductive land and people thus emerged, one that, as Gidwani shows, centered upon the concept of "waste."[259] Gidwani argues that Locke's theory of improvement and property rested upon a moral argument that yoked rational and orderly conduct with the improvement of

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[256] Ellen Meiksins Wood, "The Agrarian Origins of Capitalism," in *Hungry for Profit*, ed. Frederick H. Buttel, Fred Magdoff, and John Bellamy Foster (New York: Monthly Review Press, 2000), 23–41; John Locke, *The Second Treatise of Government and A Letter Concerning Toleration* (Mineola, NY: Dover, 2002), ch. 5, section 34.
[257] Richard Harry Drayton, *Nature's Government: Science, Imperial Britain, and the "Improvement" of the World* (New Haven: Yale University Press, 2000).
[258] Wood, "The Agrarian Origins of Capitalism," 33.
[259] Gidwani, *Capital Interrupted.*

unused or "wasted" nature. This moral and economic coupling was integral to British governance in India, where ideas about underutilized, "waste" land and culturally inferior "wasteful" Indians justified colonial rule based upon the civilizing mission of development (another instantiation of improvement).[260] Ideas about underutilized, "waste" land and culturally inferior "wasteful" Indians justified a colonial rule based upon the civilizing mission of development (another instantiation of improvement).[261] Importantly, this mission produced a teleology in which both waste land and wasteful populations came to be viewed as "not-yet" improved. In other words, the discourse of improvement and waste defined colonized subjects and land as possessing the *potential* to be developed. As Jesse Goldstein argues, capitalist enclosure revolutionized ideas about land and nature, so that "waste" became more than simply land or people outside of development.[262] Rather, enclosure produced an ideology of nature as a "condition of possibility" for capitalist development. Land not-yet developed then becomes part of "a universal field of wasted potential"—a kind of ever-expanding literal and figurative frontier.[263] This construction lends improvement narratives a powerful political and economic thrust. Waste is no longer simply viewed as undeveloped, it now becomes "not-yet" developed, historicized in terms of a teleology that anticipates what it is to become.

In *Colonial Lives of Property: Law, Land, and Racial Regimes of Ownership*, Brenna Bhandar shows how the Lockean improvement/waste dichotomy was shaped

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[260] *ibid.,* xx.
[261] *ibid.,*19.
[262] Jesse Goldstein, "*Terra Economica* : Waste and the Production of Enclosed Nature," *Antipode* 45, no. 2 (March 2013): 357–75, https://doi.org/10.1111/j.1467-8330.2012.01003.x.
[263] *ibid.,* 360.

through and productive of racial subjectivities. Tracing the development of modern property law through the enclosure of the English Commons to settler colonial sites in Canada, Australia, and Israel/Palestine, Bhandar argues that modern property regimes and modern racial subjectivities were "produced through one another."[264] In the colonial context, Bhandar writes,

> The types of use and possession of land that justified ownership were determined by an ideology of improvement. Those communities who lived as rational, productive economic actors, evidenced by particular forms of cultivation, were deemed to be proper subjects of law and history; those who did not were deemed to be in need of improvement as much as their waste lands were. Prevailing ideas about racial superiority were forged through nascent capitalist ideologies that rendered race contingent on specific forms of labor and property relations. Property ownership was not just contingent on race and notions of white supremacy; race too, in the settler colonial context, was and remains subtended by property logics that cast certain groups of people, ways of living, producing, and relating to land as having value worthy of legal protection and force.[265]

Thus Bhandar argues for the need to consider the co-constitution of "racial regimes" and "property regimes." In this way, Bhandar adds the useful concept of "racial regime of ownership" to the discussion of the history and genealogy of property. "The colonial encounter," Bhandar summarizes, "produced a racial regime of ownership that persists into the present, creating a conceptual apparatus in which justifications for private property ownership remain bound to a concept of the human that is thoroughly racial in its makeup."[266] Bhandar also points to the importance of thinking through the ways in which "improvement" depends upon a racial logic of exclusion. Racialized conceptions

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[264] Brenna Bhandar, *Colonial Lives of Property: Law, Land, and Racial Regimes of Ownership* (Durham: Duke University Press, 2018), 8.
[265] *ibid.,* 9.
[266] *ibid.,* 4.

about the kind of people who could and could not own property created harsh divisions between the figure of the modern, liberal subject (as property owning and self-possessing white man, in the Lockean sense) and those excluded from this position (for Locke, women, slaves, and indigenous people). As Bhandar suggests, the improvement doctrine's legacy remains with us today, as modern property law continues to operate through hierarchies of racial status.[267]

Together, this scholarship on improvement provides a useful framework through which to analyze the agricultural development projects most closely associated with contemporary development projects like WEMA: the Green Revolution. This history includes U.S.-led agricultural modernization projects throughout the global South. It is commonly bracketed as a Cold War-era event, but is arguably better conceptualized, as Raj Patel argues, as a "long Green Revolution" spanning from the 1940s to today.[268] Funded by the Rockefeller and Ford Foundations and USAID, Green Revolution programs in Mexico, India, and the Philippines (among other countries) were built upon narratives about the need to improve agriculture through scientific intervention.

The Revolution's earliest program, the Rockefeller-funded Mexican Agriculture Program in the 1940s and 1950s began after a team of prominent American agricultural scientists went on a "social survey" trip throughout Mexico to gauge the possibility of contributing to the country's agricultural development. The recommendations the scientists delivered back to the Foundation were steeped in the language of racial

[267] On bringing the improvement doctrine forward to the historical present, Bhandar builds explicitly on the influential work of legal scholar Cheryl Harris. See especially Cheryl I. Harris, "Whiteness as Property," *Harvard Law Review* 106, no. 8 (June 1993): 1707, https://doi.org/10.2307/1341787.
[268] Patel, "The Long Green Revolution."

difference and improvement (and, less explicitly, waste). After traveling nearly 5,000 miles across much of Mexico, the Commission concluded that for the majority of Mexican farmers, "the horizon was too close to the earth… because their land was poor, tillage was poor, and they were poor."[269] An almost mythological narrative about the heroic efforts of American scientists bringing science to the frontiers of the Third World emerged, captured neatly in a later Rockefeller Foundation report on their Mexican Agriculture program. The report painted a picture of the original pioneering scientists traveling to Mexico, seeing firsthand "a land of poverty and hunger in the midst of *substantial undeveloped resources*"; though dismayed by the poverty they saw, the scientists viewed Mexico as "ripe for a surge of progress."[270] For the American scientists, Mexico's farmland, farmers, and agricultural scientists were poor and traditional. But they also possessed the *potential* for revolutionary change—change that was to be brought about by adopting hybrid seeds and capitalist agriculture.[271]

The spatial and historical constructions about "untapped" potential deployed in Mexico would be re-articulated throughout the history of Rockefeller, Ford, and USAID-sponsored Green Revolution programs that followed. Nick Cullather describes American scientists actively working to contrast the "modern" and the "traditional" at the International Rice Research Institute (IRRI) in the Philippines in the 1960s.[272] An

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[269] Stakman, Bradfield, and Mangelsdorf, *Campaigns against hunger,* 22-27.
[270] "Confidential Report: Rockefeller Foundation Scholarships and the Mexican Revolution in Agricultural Science," Rockefeller Foundation, 1959, E.C. folder 22, box 5, Box 5, Stakman Papers, University of MN archives, University of MN, Minneapolis, emphasis added.
[271] Scholars have shown that the Foundation's development efforts were specifically aimed at developing capitalist agriculture, as a kind of response to the revolutionary land reforms of the Cardenista government. See especially Cotter, Joseph, *Troubled harvest* and Jennings, *Foundations of international agricultural research*.
[272] Cullather, "Miracles of Modernization."

IRRI educational film depicted Filipino farmers in racialized language, describing them as "primitive," "inefficient [and] wasteful of human energy."[273] Elta Smith demonstrates how the Rockefeller Foundation's "homogenizing and paternalistic" representations of rice and the developing world functioned as tools of governance, shaping the specific research and policies in the Foundation's rice programs.[274] And, focusing on the Green Revolution in Latin America, Chris Shepherd analyzes how the Rockefeller Foundation's leadership constructed narratives of Latin American cultural and scientific inferiority.[275] But while Rockefeller officials viewed Latin American scientists and farmers as "deficient" and "lacking," they also held a unique kind of "optimism" that Latin American science and scientists could be improved—"given favourable intervention" from more knowledgeable American scientists.[276] Collectively, the work of Cullather, Smith, and Shepherd, demonstrates how the architects of the Green Revolution understood their subjects of development—described by one early Rockefeller official as "materials, methods, and men"—as possessing the *potential* to become modern through agricultural science.[277] Realizing that potential, however, required guidance from American expertise. Throughout the Green Revolution, these improvement narratives were integral to the expansion of private property regimes in

[273] *ibid.,*478.
[274] Elta Smith, "Imaginaries of Development: The Rockefeller Foundation and Rice Research," *Science as Culture* 18, no. 4 (December 2009): 461–82, https://doi.org/10.1080/09505430903186070.
[275] Shepherd, "Imperial Science."
[276] *ibid.,* 119-120.
[277] "Report on Mexico, Jan. 8 – April 9, 1960: The Agricultural Revolution," Rockefeller Foundation, 1960, folder 12, box 4, E.C. Stakman Papers, University of Minnesota Archives, Minneapolis, Minnesota.

agriculture.[278] In the context of thwarting communism, Green Revolution projects sought to expand capitalist agriculture and introduce private property regimes along the Cold War's contested frontier.[279] This expansion depended upon, logics that I argue are best described under the rubric of "improvement." Following Bhandar, we might also read this improvement logic in terms of ideas of racial hierarchies. Extending Lockean constructions that associated science and reason with whiteness, the improvement narrative depicted non-white others as the *subjects of improvement* (a cause that would be re-articulated under the banner of "development" or "modernization" as well).[280]

Following Patel, we should situate WEMA's efforts to modernize African seed systems in the context of a "long Green Revolution."[281] Showing how the Green Revolution has drawn on older colonial and racialized narratives of improvement and waste, my discussion here provides an even longer backstory for WEMA. In this sense, twenty-first century calls to improve African smallholder farmers' lives with genetically modified seeds are nothing new. This chapter insists on placing WEMA within a longer genealogy of improvement and property, even as it recognizes that WEMA and related new Green Revolution projects have their own unique characteristics. My point is not to say that WEMA is the same as any number of these earlier colonial or developmental projects. Instead, I want to show that contemporary projects like WEMA hold material and discursive sediments of these histories. In addition to inheriting a genealogy of ideas

[278] Cullather, "Miracles of Modernization," for example, points to the US firms that directly benefitted from the GR development programs. As Jack Kloppenburg argues, the expansion of hybrid seeds is also the expansion of private property in seed systems. Kloppenburg, *First the Seed.*
[279] Perkins, *Geopolitics and the Green Revolution*; *Cullather, The Hungry World.*
[280] On this point, see: Adas, *Machines as the Measure of Men*.
[281] Patel, "The Long Green Revolution."

about improvement, WEMA is rooted in the Green Revolution's material and institutional history. Following its Mexican Agriculture Program in the 1950s and 1960s, the Rockefeller Foundation helped found the International Center for the Improvement of Maize and Wheat (CIMMYT) in Mexico in 1966. CIMMYT would expand globally throughout the Green Revolution, and its Nairobi location is now a key hub in the WEMA project. CIMMYT scientists inherit the Green Revolution's scientific legacy, working with maize varieties developed from germplasm first collected throughout Mexico and Central America in the 1940s and 1950s. And, alongside the Rockefeller Foundation, the Bill and Melinda Gates Foundation has been at the forefront of funding efforts to bring a "Green Revolution for Africa." In my interviews with WEMA officials, the story of the Green Revolution was often invoked. In many ways, the Green Revolution is a very *active* history, providing intellectual and material fodder for contemporary efforts like WEMA. This section has given us a more expansive look into this history, revealing how it is part of a lineage of an improvement logic that equated development with the expansion of private property. We can now move into a discussion of the WEMA project itself, with these historical and ideological sediments in mind.

Taking the drought gene to Africa

Monsanto's mission to take the drought gene to Africa was by no means a simple task. There were both political and agroecological impediments to introducing their developing technology to sub-Saharan Africa. Politically, biotech crops were not grown

in Africa countries outside of South Africa when the WEMA project began.[282] Regulatory systems were either in their infant stage or did not exist at all. Getting regulatory approvals necessary to approve testing and, eventually, commercialization of the drought technology would require financial resources, public relations efforts, and work by scientists and lawyers to put together and submit regulatory documents to governments. In terms of agroecological challenges, Africa's tropical maize was a much different crop than the temperate maize the company had been working with in the U.S. Combining the drought gene with these temperate maize varieties would take plant breeders years of trial and error. Because of these challenges, Monsanto officials sought out partner organizations that could help their efforts to get their drought product into the hands of smallholder farmers in sub-Saharan Africa. Not only could a partnership potentially save the company the vast sums of research and development expenditures necessary to bring a product like drought tolerance to market, but it also offered the possibility of some good public relations for a company that activist's had spent years maligning as a greedy agribusiness hell-bent on gaining monopoly over the world's seeds.[283]

The company had previously shared its proprietary technology with public sector researchers for humanitarian projects. Yet a project around its developing drought trait would be considerably different than any of Monsanto's previous partnerships. While earlier partnerships had dealt with crops like cowpeas, sweet potatoes, or eggplants, a public-private partnership around a drought trait in maize would involve the company's

[282] Egypt and Burkina Faso would soon deregulate varieties of Monsanto's GM cotton. Egypt in 2008 and Burkina Faso in 2009. See ISAAA GM approval database: http://www.isaaa.org/gmapprovaldatabase/

[283] Schurman and Munro, *Fighting for the Future of Food.*

key commercial crop, which represents about a quarter of the company's business.[284] The drought trait was also relatively unproven when the project began. It would first be commercialized in the U.S. in 2011, but in the early years of the project, the trait was still moving through field trials in Monsanto's research and development "pipeline." For these reasons, the founding of WEMA involved high level discussions with leadership from across the company.[285] For company leadership, the main issue was how to set up a partnership that would not interfere with their immediate commercial interests in the drought product. As one official explained, Monsanto's key question at that time was: "How could we structure a public private partnership that would do two things: protect the company's business and profitability in the developed world, and yet, share it and make it available in the developing world?"[286]

To pursue this question, Monsanto hired Don Doering, a consultant who had previously served on the company's Biotechnology Advisory Council, to approach public sector donors about the possibility of forming a public-private partnership around the drought trait.[287] The company had begun a small series of tests to breed drought tolerant maize in South Africa (which already had a large commercial market in its other GM maize traits, herbicide-resistance and *Bt*).[288] But because of the huge costs and uncertain economic returns involved in developing the drought trait for sub-Saharan

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[284] Author Interview, Monsanto Company, St. Louis, MO, 5-26-15.
[285] *ibid.*
[286] Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-21-15
[287] "Monsanto Creates Biotechnology Advisory Council" High Plains/Midwest Ag Journal, January 1, 2001, accessed June 14, 2015; Robert L. Paarlberg, *Starved for Science: How Biotechnology Is Being Kept out of Africa*, (Cambridge, Mass.: Harvard University Press, 2009).
[288] These early projects were the precursor to WEMA. Under the name "project rain barrel," Monsanto began a drought tolerance maize-breeding program in South Africa in 2005. The first biotech traits were introduced to field tests in 2007. Personal Communication, Monsanto Company, 7-1-15.

Africa, they sought help from the public and philanthropic sectors.[289] Under Doering's leadership, Monsanto spearheaded a series of meetings with officials from prominent public sector and non-profit agricultural development organizations. These meetings led to a planning meeting funded by the Rockefeller Foundation and USAID in Arlington, Virginia in May of 2005. Dubbed the "Drought Tolerant Crop Initiative," the meeting gathered representatives of some of the leading public sector organizations with several biotechnology company representatives, notably Monsanto and its largest competitor, DuPont Pioneer. Though several crops and geographical areas were on the meeting's agenda, participants focused most of their attention on the topic of drought tolerant maize in Africa. The biotech companies had made most of their progress in maize and anticipated that it would be the first commercial crop marketed as "drought tolerant."[290] Maize had also been central to public sector organizations like CIMMYT's efforts to develop conventional (non-GM) drought tolerant maize.

Though no farmers or farmer-group representatives attended the Arlington meeting, the figure of the smallholder farmer loomed large. The meeting's declared goal was to explore different models for a public-private partnership so that private sector discoveries might benefit "food in-secure" farmers.[291] Yet just how this goal would be accomplished was up for debate. In his meeting summary document, Doering describes "explicit and underlying tensions" amongst meeting participants around the issue of how corporations like Monsanto and DuPont Pioneer might serve the interests of smallholder farmers in Africa. Representatives from the CGIAR questioned the extent to which the

[289] Doering, "Public-Private Partnership to Develop and Deliver Drought Tolerant Crops to Food-Insecure Farmers," ii.; Paarlberg, *Starved for Science,* ch. 5.
[290] Doering, Don S., "Public-Private Partnership," 2.
[291] *ibid.,* 1.

multinational companies would work to develop small and medium-sized seed companies. These regional companies were the key partners for the CGIAR, but might be competitors for a multinational company working to establish new markets. Public sector representatives also argued that public investments in a partnership that benefitted Monsanto or Pioneer in the name of smallholder farmers would need to find ways to "be accountable" to the interest of those smallholder farmers.[292]

On the other side of the table, Monsanto and Pioneer officials expressed reservations about the extent to which smallholder African farmers merited their companies' interest. Because most of these smallholder farmers saved seed from year to year and thus did not even buy hybrid seed, they had generally been outside the purview of multinational agribusinesses like Monsanto and Pioneer. At the time of the Arlington meeting, the market penetration of the multinationals across the African continent was minuscule: less than ten percent of seed sold on the continent came from the large international agribusiness companies.[293] Though Africa represented a kind of "last frontier" for GM crops, with the exception of South Africa, the big companies were not devoting many resources to expansion on the continent. It was too undeveloped. The farmers were too far outside of commercial seed markets.

As a solution to these issues, Monsanto and Pioneer officials argued that the public sector could help catalyze private sector investment in smallholder agriculture. Public-private partnerships, in this line of thinking, are ways to bring the technological advancements of the big players to "poor" and "rural" farmers that would otherwise be

[292] *ibid.,* 5.
[293] *ibid.,* 4.

of little interest to the multinationals.[294] But they could also be a way to advance those farmers along a path to becoming consumers of hybrid seeds and other inputs. Yet farmers could not make this transition without public sector intervention—without support from the state or international development organizations like CIMMYT. Thus a pressing question emerged at the meeting: "What public investments can make it profitable for the private seed industry to improve the livelihoods of the poor?"[295] Read in reverse, this question demonstrates a crucial argument that would soon prop-up public-private partnerships like WEMA: In order for the private sector to improve the livelihoods of the poor, that improvement work must be profitable. But before this profitable improvement work can occur, public investments must first *develop* smallholder farmers so that they reach their capacity as consumers of hybrid seeds. Because they are *not yet* capable consumers, smallholder farmers constitute a site for another kind of intervention, one that we would call humanitarian or developmental—one that is associated with the public sector.

Tellingly, the meeting's question about public investments making smallholder farmers profitable for the seed industry is phrased in the language of improvement. The profit motive is not the only driver here. Other logics—development, humanitarianism, and improvement—are at play. The question could also be read as a kind of invitation to public sector institutions like CIMMYT and USAID, which often describe "poor" and "food insecure" farmers are their target beneficiaries. But because the private sector companies own the biotech drought traits deemed a tool for alleviating that poverty and

[294] Throughout Doering's summary document, "poor" and "rural" are frequently used to describe smallholder farmers. I include the terms here in order to demonstrate how these farmers are consistently figured in terms that emphasize what they lack.
[295] *ibid.,* 4.

insecurity, they invite the public sector to partner in the name of development. This developmental imperative, recognized as more in the realm of the public sector, becomes even more urgent in the face of moral and ethical challenges of hunger and poverty. In this sense, the private sector's willingness to share their technology becomes a kind of "can't miss" opportunity for the public sector. Doering's meeting summary makes this case. One of its "bottom line" points notes that given the private sector's rapid gains in maize research and development, public sector organizations like CIMMYT needed to "move promptly to maintain the current interest within the private sector in maize for food-insecure farmers."[296] No longer simply outside of the perspective of the agribusiness companies, smallholders are here figured in terms of their *potential* to become a profitable market. Yet both the onus for developing those farmers and the opportunity to capitalize on corporate donations that will spur that development lies in the hands of the public sector.

In their arguments about what role the public and private sector might each play in improving the plight of smallholder African farmers, participants in the Arlington meeting spoke in terms of a humanitarian impulse. This impulse—this "will to improve"—then becomes essential for catalyzing the smallholder farmers' transformation from subsistence farming to buying hybrid seeds.[297] "Improvement" serves as the necessary corrective for the smallholder's "vulnerable" and "food insecure" status (though the term "waste" is no longer in vogue, colonial ideas of waste resonate in contemporary descriptions of these farmers as "resource poor" or as Africa as a

[296] *ibid.,* 3.
[297] Tania Li, *The Will to Improve: Governmentality, Development, and the Practice of Politics* (Durham: Duke University Press, 2007).

"frontier" with "potential"). We might also think about this improvement logic as one that "binds together land and its populations."[298] In this way racialized imaginaries of Africa and Africans serve to construct both Africa as a frontier, waiting *in potentia* for agribusiness development and African smallholder farmers in need of development before they can become fully modern consumers. Again, the improvement logic renders this narrative commonsensical, so that public sector intervention should act as a precursor to the business development of multinational seed companies. Here we see the *telos* of public-private partnerships emerging in a way in which the public sector's orientation toward improving the plight of smallholder farmers is coupled with the private's mandate to maximize profits. This should not be understood as conspiratorial. The Monsanto and Pioneer representatives at the Arlington meeting were not trying to dupe the public sector representatives into forming a partnership with them that would only benefit their profit margins. Rather, as meeting participants on both sides of the table described smallholder farmers in terms that demanded development or improvement, ethical claims to improve the livelihoods of these farmers were mutually implicated with the commercial aims of the companies. Foregrounding the arguments that would soon be central to the WEMA project, the meeting's summary document notes that "private sector plans for maize development and introduction to profitable commercial markets in Africa may be accelerated by the potential to apply drought tolerance discoveries for humanitarian benefit."[299] Beginning with some of the earliest

[298] Bhandar, *Colonial Lives of Property,* 36.
[299] Doering, "Public-Private Partnership to Develop and Deliver Drought Tolerant Crops to Food-Insecure Farmers," 4.

conversations leading up to WEMA, profit and humanitarian aims were framed as mutually beneficial.

Though the Arlington meeting did not immediately lead to a formal partnership, in outlining the potential for partnering around the twinned logic of improvement and commercial expansion, it was a critical step in establishing the WEMA partnership. The meeting also brought together representatives from several of the eventual WEMA partners, including Monsanto, CIMMYT, and the AATF. Representatives from Monsanto and the AATF continued to discuss possible collaborations following the meeting. Monsanto officials had participated in the three-year process of forming the Nairobi-based organization, which had recently launched in 2004. Based on their mandate to make proprietary biotechnology products available to smallholder famers, AATF officials had placed drought tolerant GM crops high on their list of possible projects. So forming a partnership was of interest to both organizations.[300] In 2006, two AATF officials visited Monsanto headquarters in St. Louis.[301] Monsanto officials were interested in gauging the AATF's technical and legal capacity for managing a large-scale public-private partnership for drought tolerant maize.[302] Following these conversations, the AATF and Monsanto began the process of recruiting African countries to join the developing project. Because their proposed project aimed to introduce biotech crops into countries where they had not been deregulated, the AATF

[300] My interviewees often framed WEMA as an "African led" project. It would be inaccurate to discount the fact that African-based scientists and politicians had been interested in bringing GM crops to their respective countries prior to WEMA. But describing the origins of the project as stemming entirely from the interests of African countries is also inaccurate. The narrative of the project as originating "from Africa" discounts the enormous market potential the project represented for Monsanto.
[301] Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-22-15.
[302] *ibid.*

and Monsanto needed to court high-level government officials. (One former AATF official told me about joining the Vice President of Monsanto in a meeting with the presidents of Malawi and Tanzania during the UN general assembly in New York.)[303] AATF representatives traveled across sub-Saharan Africa, pitching the project and formalizing agreements with partner countries. Five countries agreed to sign-on to the development project: Kenya, Tanzania, Uganda, Mozambique, and South Africa.

Around the same time, Monsanto officials began conversations with the Bill and Melinda Gates Foundation about funding their drought tolerant maize project. Though it would soon become a major player in international agricultural development, the Gates Foundation did not even have an agriculture program at the time of the Arlington meeting.[304] However, perhaps by somewhat fortuitous events, the Foundation had recently decided that they were interested in expanding into agriculture *and* had sought advice on how to do so from Monsanto leadership.[305] Gates officials visited Monsanto headquarters in St. Louis in 2005 and soon thereafter hired one of Monsanto's pioneering plant biologists, Rob Horsch, to lead its agricultural development program.[306] Spurred on by discussions with Horsch about Monsanto's drought tolerance work, the

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[303] *ibid.*

[304] A longtime veteran of international agricultural development projects, Robert Herdt, who himself worked at the Gates, Ford, and Rockefeller Foundation, wrote in 2012 that the Gates Foundation's agricultural development program was larger than those of the World Bank and USAID. Robert W. Herdt, "People, Institutions, and Technology: A Personal View of the Role of Foundations in International Agricultural Research and Development 1960–2010," *Food Policy* 37, no. 2 (April 2012): 179–90, https://doi.org/10.1016/j.foodpol.2012.01.003.

[305] The Foundation engaged several officials from Monsanto during the planning of its agriculture program. As a Gates Foundation official explained to me, as the foundation was considering an agriculture program, leadership in the Foundation's global development group had several generative conversations with a retired Monsanto CEO. The Gates Foundation sought the expertise of Monsanto leadership in their earliest discussion about what their agricultural development program might look like. Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-21-15

[306] Horsch, "Reflections of a Science Pioneer," Monsanto News 1/31/2006.

Gates Foundation formally requested that Monsanto and the AATF make a proposal to fund their maize partnership.[307] Monsanto seemed to find in the Gates Foundation the perfect funder for their project. As one commentator noted, the Foundation was "less political, less bureaucratic, and more corporate friendly" than the donors that had passed on a partnership opportunity at the Arlington meeting.[308] The Gates Foundation's *modus operandi* is philanthropy that uses private funds to invest in public services in its three areas of grant-making: education, global health, and agricultural development.[309] This approach, deemed by proponents as "philanthrocapitalism"—and by Bill Gates himself as "creative capitalism"—has been criticized for using development programs to open up markets for US and European-based corporations.[310] With this emphasis, the Foundation seemed to be the ideal donor for a project that coupled humanitarian intervention with the expansion of private property regimes. Perhaps a private philanthropy would be better suited to answer the question posed in Arlington about how public investments might make smallholder farmers profitable. The Foundation

[307] Because of his association with Monsanto, Horsch does not work on the WEMA project; Monsanto/AATF, "Combining Breeding and Biotechnology to Develop Drought Tolerant Maize for Africa: A Proposal to the Bill and Melinda Gates Foundation." May 25, 2007, St. Louis.
[308] Paarlberg, *Starved for Science,* 170.
[309] Linsey McGoey, *No Such Thing as a Free Gift: The Gates Foundation and the Price of Philanthropy* (London: Verso, 2016).
[310] McGoey, *No Such Thing as a Free Gift,* 19. McGoey describes the Foundation's financial ties to corporations like Goldman Sachs, Coca-Cola, and Monsanto. Roundly criticized for investing in Monsanto (The *Wall Street Journal* reported in 2010 that the Foundation had purchased 500,000 shares of Monsanto, valued at over 27 million USD). The Foundation later divested its shares. It also divested its shares in Goldman Sachs. But, as McGoey points out, it still maintains ties to Goldman Sachs through its largest financial contributor, Warren Buffet's Berkshire Hathaway. See McGoey page 215 for the discussion of Gates, Buffett, and Goldman Sachs. McGoey makes the important point about the Gates Foundation investing in Monsanto (though they later divested). I would argue that the Foundation's ties with Monsanto extend beyond just this investment. Monsanto officials were consulted about what the priorities should be for an agricultural development program as the Foundation was working to develop its agricultural program; Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-22-15.

soon became the most powerful donor in agricultural development, using its private money to fund projects that partnered with and worked through public sector organizations like the CGIAR and the National Agricultural Research Centers in different countries.[311]

As one of the Gates Foundation's earliest agricultural development projects, the WEMA partnership officially launched on March 19, 2008. Monsanto's commercial testing of the drought trait in South Africa entered its second year, but the project would move under the WEMA umbrella.[312] With Gates financial backing, the well-resourced project set its aims high. Yet bringing together the different institutional cultures and different partner countries would present challenges. It is to these challenges—how WEMA would actually work on the ground, in other words—that the next section turns.

Building Capacity for the Drought Gene

The WEMA officials with whom I spoke described the difficulty of bringing together the nine different institutions that made up the partnership (Monsanto, the AATF, CIMMYT, the Gates Foundation, and the National Agricultural Research Systems from Kenya, Tanzania, Uganda, Mozambique, and South Africa). There were cultural differences between the partnership's different ethnic and national cultures. One Monsanto official explained that though Westerners often lump together different African countries, there were real cultural differences between scientists from, say,

[311] McGoey argues that despite popular praise for moving *around* the state, philanthrocapitalism is more accurately described as working *through* the state. See Linsey McGoey, "The Philanthropic State: Market–State Hybrids in the Philanthrocapitalist Turn," *Third World Quarterly* 35, no. 1 (January 2, 2014): 109–25, https://doi.org/10.1080/01436597.2014.868989.
[312] Personal communication, Monsanto Company, 7/1/15.

Kenya or Tanzania or Uganda or South Africa.[313] This official described how there were "just different ways of doing things" that project participants had to negotiate early in the partnership.[314] While the project had to reconcile some differences between U.S. culture and those of the different African countries, perhaps the biggest obstacle to overcome early in the project was the difference in *institutional* cultures.

While each of the partners had signed on to the project's mission to deliver drought tolerant seeds to smallholder farmers, there remained, as one official put it, significant differences between the institutions' "cultures, visions, and business models."[315] In particular, differences in practices and values between public and private sector institutions constituted a major hurdle for the project in its early stages. As an AATF official detailed, bringing together the practices and values of the public and private sector was a challenge early in the partnership:

> At the initial stage we had problems. I mean this was what you always expect when you have organizations coming together from — I mean they have different cultures. CIMMYT has its own culture. AATF has its own culture. Monsanto has its own culture. Monsanto, don't forget, is the private sector. They are more business-like. [CIMMYT] is more open because they are public sector. Everything that is produced is seen as public good. For public consumption. [Monsanto] doesn't see everything produced as public. Some things are proprietary material — confidential information that you shouldn't share. And so there is always at the beginning that kind of friction. This one wants to be too open, the other wants to be closed.

Indeed the products of CIMMYT and Monsanto's agricultural research and development have historically been produced from opposite sides of the public goods/private property spectrum. As one of the oldest centers in the CGIAR, the international network of

[313] Author Interview, Monsanto Company, St. Louis, MO, 5-26-15.
[314] *ibid.*
[315] Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-22-15.

public sector research and plant material gene banks, CIMMYT has for nearly fifty years provided open, non-exclusive access to the products of its research and development.[316] As the world's largest agricultural biotechnology company, Monsanto's business model is built around pursuing and maintaining patent-protected ownership over its crop traits and biotechnologies.[317] Each organization's work involves drastically different practices and, as another interviewee put it, cultural "attitudes" around intellectual property rights.[318] Uniting the approaches of public and private sector partners with the aim of developing new varieties of hybrid and genetically modified maize would prove challenging.

This section begins by looking at how the project addressed and, eventually, overcame these challenges. WEMA participants stressed the importance of creating a project culture that was more than just the sum of its institutional parts—of forming a way of doing research and development that was unique to the project. These descriptions of an overarching "WEMA culture" serve as a point of departure for considering how the project generates new approaches to science and development. The "friction" generated when project partners began working together would, in Anna Tsing's words, "enable, exclude, and particularize" different practices, knowledges, and values.[319] This section explores this productive aspect of the project's early friction. To do so, we must first return to our protagonist, the gene-as-property. For throughout

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[316] As part of its recent organizational reforms, the CGIAR officially dropped the title of "Consultative Group for International Agricultural Research" and became known as simply the CGIAR.
[317] Schurman and Munro, *Fighting for the Future of Food,* 40-50.
[318] Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-21-15.
[319] Anna Lowenhaupt Tsing, *Friction: An Ethnography of Global Connection.* (Princeton: Princeton University Press, 2011), 6.

WEMA's "frictive encounters," the cultural and political values attached to the gene-as-property construct would define how the project took shape.

Working with the gene-as-property necessitated that project participants make changes to their everyday research and development practices. A series of trainings took place early in the partnership to facilitate these changes. Because the project dealt with Monsanto's intellectual property (IP), the company brought in legal experts to train WEMA participants in "confidentiality" issues.[320] Through these confidentiality trainings, WEMA officials learned what kind of information could and could not be shared and protocols for sharing information within the partnership.[321] As one AATF official told me, it was important that WEMA members knew what kind of information could be discussed in daily conversations and what could not. Explaining how internal documents were shared in the project, this interviewee stressed the importance of adhering to the project's confidentiality requirements. "There are some things that even when I know about them, I can't disclose them to my boss. Yes, it gets to that level. If I know something is confidential."[322] The legal and cultural practices of the gene-as-property demanded that some communications remain "closed." Thus public sector participants had to learn to adapt the project's strict internal rules and protocols for working with the gene-as-property.[323]

Aside from these legal trainings, the project also took efforts to unify its different institutional cultures. An independent management consultant facilitated a series of

[320] Author Interview, AATF, Des Moines IA.,10-14-14. As company lawyers explained to me, Monsanto's business is built around "trade secrets"—information that they cannot really legally protect with patents, but that they are careful not to share.
[321] *ibid.*; Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-22-15.
[322] Author Interview, AATF, Des Moines IA.,10-14-14.
[323] Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-22-15.

"team-building" trainings during the project's first year. These meetings were designed to help the partners to better understand their differences and try to find ways to build consensus.[324] As one WEMA official explained, the meetings aimed to help the project members "define the way [they] were going to do business together" and come up with organizational "norms."[325] This entailed creating a kind of partnership "culture"—not a CIMMYT, Monsanto, or an AATF culture, but a WEMA culture.[326] To this end, WEMA officials participated in team building activities, including singing a WEMA "jingle" about doing things the "WEMA way."[327] Several informants stated that these team-building efforts had greatly helped project participants to bridge divides between institutional cultures.

Forming a "WEMA way" meant finding ways to overcome institutional differences and unite around the project's common goal. Despite what they described as sometimes "tense" negotiations around how the project would work, all of my interviewees indicated that the project's early "storming" period had been overcome.[328] As I discussed earlier in this chapter, WEMA officials talked about how the imperative to improve the livelihoods of smallholder farmers unified project partners. As several of my interviewees explained, with the figure of the poor smallholder farmer in their sights, project leadership were willing to make compromises and find ways to work together.[329]

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[324] Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-22-15.
[325] *ibid.*
[326] Author Interview, Monsanto Company, St. Louis, MO, 6-26-15.
[327] As one of my interviewees shared, the jingle was in the tune of "The Lion Sleeps Tonight," made famous in the U.S. by the Tokens in 1961. Apparently, an astute team-building facilitator turned the song's memorable opening lyrics (A-weema-weh, a-weema-weh, a-weema-weh, a-weema-weh) into "A WEMA way."
[328] Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-22-15.
[329] Author Interview, Monsanto Company, St. Louis, MO, 6-26-15.

Recalling the early negotiations around how to bridge differences between public and private sector approaches, one interviewee described how project leaders emphasized the importance of working for the smallholder farmer. "We kept reminding people why we were even around the table. The key point was: don't lose sight of who you want this project to serve. Small-scale farmers. If you keep that as your 'north guiding star,' all other issues can be dealt with."[330] As this official detailed, each organization was willing to work together to advance the mission of improving the lives of smallholder farmers, and was willing to make negotiations and compromises in order to do so. In this way, the imperative to improve the lives of smallholder farmers functioned as a kind of binding creed under which the partners could work together. Several of my interviewees compared the unifying process of the partnership to a marriage. They spoke of how the partners needed to learn how to live with each other and how, committed to their vows of serving the smallholder farmer, they had united.[331] Marriages are also legal agreements, of course. Thus marriage is perhaps an apt way to describe the WEMA partnership, one built not only around different institutional cultures working to "trust" each other, but also around legal arrangements. Because the project was built around the drought-gene-as property, a legal apparatus to manage that property was essential. Lawyers needed to hash out how the whole thing would actually work, in other words.

The WEMA project involves the sharing of IP—in the form of Monsanto's biotech traits and maize varieties or "lines" donated by Monsanto, CIMMYT, and the National Agricultural Research Systems. Because of the multiple ways in which IP

[330] Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-22-15.
[331] Author Interview, AATF, Des Moines IA, 10-14-14; Author Interview, Monsanto Company, St. Louis, MO, 6-26-15.

enters into and moves through WEMA networks, the partners would need legal agreements in place that defined how their IP would be shared in the project. Lawyers from CIMMYT, Monsanto, and the AATF had to negotiate what their institutions were willing to share—and how that sharing would happen in practice. Each institution brought their own interests to these negotiations. For Monsanto, the key issue was forming the partnership in ways that would protect their IP from being taken and used by another multinational competitor.[332] While company leadership was enthusiastic about the potential for WEMA, they wanted assurance that the IP sharing model would not jeopardize their business in other countries. To protect its interests in the negotiations, CIMMYT hired outside legal counsel from two organizations, Public Intellectual Property Resource for Agriculture (PIPRA), a non-profit organization founded as a kind of IP "clearinghouse" to facilitate public-sector access to and licensing of IP, and the San Francisco law firm Morrison and Foerster. The AATF's legal team also participated in initial negotiations, serving as the institutional "broker" for the project. After the negotiations, the partners agreed to structure the partnership around licensing agreements, in which each institutional partner licenses their material to the other partners. Aside from these "internal" licenses, the AATF also licenses WEMA material to seed companies.[333] This model of licensing and cross licensing material is quite common for multinational seed companies like Monsanto. Monsanto licenses material to and from its largest competitors. But this kind of legal system in agriculture either does not exist or is just being developed in the five WEMA countries. Thus putting the project's licensing arrangements into practice would require new legal

[332] Author Interview, Monsanto Company, St. Louis, MO, 5-26-15.
[333] Author Interview, AATF, Nairobi, Kenya, 8-10-15.

channels through which IP could move—"capacity building" in program parlance. It is with this generative, or in Tsing's words, "frictive," element of WEMA's legal apparatus in mind that I now turn to tracing out how the project's licensing arrangements work on the ground.[334]

An Intellectual Property Clearing House

As the institutional manager of WEMA, the AATF provides the legal and institutional framework that enables the partnership. Founded as a not-for-profit organization with a mandate to make biotechnology products available to smallholder farmers, the AATF was set up to provide the legal structure for projects like WEMA. Rachel Schurman describes the history of the AATF, detailing negotiations between the Rockefeller Foundation and the major agricultural biotechnology companies that led to the AATF.[335] Schurman shows just how crucial the issue of maintaining control over their IP was for the companies. Though they were interested in making their proprietary material available for humanitarian uses, the companies were adamant that they would not be "giving" anything away. Illustrating this point, Schurman tells the story of a tense moment in the meetings leading up to the AATF. According to an official that participated in the meetings, a biotech company official vehemently expressed frustration with a Rockefeller Foundation official who kept talking about the biotech companies "donating" their IP. "We aren't donating anything," the biotech official insisted. The companies, rather, were willing to *license* their material with strict

[334] Tsing, *Friction.*
[335] Rachel Schurman, "Building an Alliance for Biotechnology in Africa," *Journal of Agrarian Change* 17, no. 3 (July 2017): 441–58, https://doi.org/10.1111/joac.12167.

regulations about how and where it could be used. There was a big difference between licensing and donating. By insisting that they would license their material on their terms, the companies ensured that the AATF would be set up as they saw fit. As Schurman argues, "the [AATF's] structure, operating rules, and codes of conduct [all] reflected the agricultural biotech companies' main concerns.[336] In structure and governance, the organization would allow the companies to maintain "tight control" over their property. As its flagship public-private partnership, WEMA exhibits this fundamental dynamic of the AATF.

In the WEMA project, the AATF allows Monsanto to maintain control over its biotech property, even as it facilitates the sharing of that property. While popular sources and even some WEMA officials have said that Monsanto is "donating" its proprietary biotech traits, members of the project's legal team made it clear that "donating" is not an accurate term.[337] Through the AATF, Monsanto licenses the two biotech traits it contributes to the project. These legal licenses designate who can use the traits, and where and how they can be used. Thus the AATF works as the "technology broker," channeling Monsanto's property through the project's network, which is made up of both public and private sector institutions. Monsanto has agreed to wave the technology fee for WEMA's two biotech traits (the drought gene, and, since the start of the project's second phase in 2013, the company's insect resistance or *Bt* technology). But users of these traits must sign licensing agreements that detail how and where they can use them. The AATF actually licenses the material from Monsanto, and then sub-

[336] *ibid.*, 12.
[337] Author Interview, Monsanto Company, St. Louis, MO, 5-26-15; Author Interview, CIMMYT, 7-31-15.

licenses to what WEMA officials call "technology developers"—CIMMYT, seeds companies, and the National Agricultural Research Systems. Here is how a WEMA official described how the drought gene was licensed in the project:

> AATF negotiated with Monsanto for the donation of the [drought trait] into the WEMA project and then Monsanto accepted and offered the technology to WEMA as a project. Because this is a public-private partnership meant to benefit smallholder farmers, the royalty aspect has been eliminated by the virtue of the AATF [negotiating] access to proprietary technologies that otherwise smallholder farmers would not have accessed because of the requirements to pay royalties…and when the technology arrives to AATF it brings these [seed companies] on board, they pick up the technology and they develop a product out of it and that product is not subjected to royalties because AATF did the negotiation and advocacy from the technology owner [Monsanto].[338]

The AATF provides the legal coverage for making this arrangement work. They license Monsanto's trait downstream, to what the above interviewee described as a "developer"; that developer can use the trait in their own material, can even sell products that contain it, but, because of the license, they are held to strict limitations over how they can use the trait. Though this official used the term "donate," Monsanto maintains legal ownership and control of the drought trait, even after they have "gifted" the trait. Strings—in this case, legal contracts, are attached. The important thing to note here is not just that these licenses maintain Monsanto's legal control over the drought gene, determining how and where "developers" can use the trait. That much was a given from the beginning of the AATF and the WEMA project. But the more interesting aspect of the WEMA project is how it is "building capacity" for a legal system in which private ownership and control of germplasm is the norm. This happens because in order for

[338] Author Interview, Monsanto East Africa, Nairobi, Kenya, 8-20-15.

WEMA maize seeds containing the drought gene to proliferate and move into markets, *the property regime that enables the drought-gene-as property must also expand.*

This property regime essentially moves with the seed, in the "material-semiotic" form of the gene-as-property and the legal contracts that are now attached to that seed as it moves through institutional networks.[339] Regulators must be trained in order to govern the dissemination of the new biotech crops. Seed companies licensing WEMA material must develop the capacity to "steward" biotech traits. And farmers will need to learn the requirements of buying and growing GM seeds. All of this various "capacity building" happens regardless of whether the seed is moving through public or private channels. Even as the trait moves into public organizations and, perhaps, is even used as an ostensibly *public* good, it remains defined as private property. The "event" of the drought gene, is always the property of Monsanto, no matter where seeds containing that event travel. As one of the lawyers I interviewed put it, as long as "someone else's event" is in a particular seed, that seed cannot be truly publicly available.[340] The fact that the event is proprietary—that the gene *is* property— necessitates a legal architecture that protects private property. This is how WEMA's humanitarian mission of improving the lives of smallholder farmers articulates with the expansion of private property. But before WEMA seeds can be licensed, sold, bought, and grown, the legal structures for regulating biotech crops must first exist. Thus WEMA explicitly works to drive regulatory reforms, which will facilitate broader shifts in regimes of ownership, moving control of seeds and seed traits "upstream" to private seed companies.[341]

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[339] In describing the gene as "material-semiotic," I am drawing on Haraway, *Modest_Witness.*
[340] Author Interview, CIMMYT, 7-31-15.
[341] Kloppenburg, *First the Seed.*

Pushing the Regulatory Envelope

When the project began, South Africa was the only participating country with a functioning regulatory system for testing and commercializing biotech crops. Thus the project explicitly aimed to "build capacity" for the regulation of GM crops in Kenya, Mozambique, Tanzania, and Uganda. Project leadership outlined this goal in an early "concept note" that defined WEMA's vision and objectives. Framed in the language of modernization, the "concept note" argued that African regulatory systems needed to "catch up" to those in other parts of the world (where GM crops are deregulated):

> Unfortunately, the vast majority of farmers in [sub-Saharan Africa] have not even had the opportunity to witness field trials of biotechnology products. This "technology gap" is largely due to a lack of science-based regulatory frameworks that would allow testing and evaluation of new agricultural products and reliable delivery systems to reach resource-poor farmers. It means that the most vulnerable African farmers fall further and further behind their counterparts in the developed world. Unless efforts are made now to begin establishing functional regulatory capacity and equipping seed delivery systems, it is unlikely that farmers in [sub-Saharan Africa] will be given the choice to benefit from drought tolerant (DT) technology without an additional decade or more of sequential efforts after its launch elsewhere in the world.[342]

The document depicts both farmers and governments as lacking, as "not-yet" developed. This leads to a twofold improvement mission: both technical and political. Alongside its efforts to improve maize varieties, the project also aims to "sensitize African policymakers and stakeholders to the importance of biotechnological improvements in maize and … [to] improve regulatory policy." We can read this as another instantiation of the logic of improvement. The moral improvement mission of helping "poor" and

[342] African Agricultural Technology Foundation, n.d., "Concept Note: Water Efficient Maize for Africa Program."

"vulnerable" farmers depends upon and, at the same time, catalyzes, regulatory reforms that will enable the expansion of a private property regime in agricultural biotechnology.

The moral urgency of saving the "at risk" farmer from "fall[ing] further and further behind" also spurs an urgency to reform regulatory systems. The AATF exists at the confluence of this twofold improvement mission, holding up African smallholders as the target for its projects while explicitly advocating for changing regulatory policies. The concept note emphasizes the importance of this advocacy work, defining the AATF's goal of "sensitiz[ing] African policymakers and stakeholders to the importance of biotechnological improvements in maize and … improv[ing] regulatory policy." Though WEMA policy documents state that the project will adhere to the regulatory policy of each country, it is clear that the project aims to change policies. Indeed, the WEMA's mission of "ensur[ing] that the developed drought tolerant maize products will be accessible to smallholder African farmers," demands regulatory reforms. Again, "improving" the plight of smallholders legitimizes an argument for the expansion of private property. The moral improvement mission of helping "poor" and "vulnerable" farmers depends upon and, at the same time, catalyzes, changes in regulatory policy that will enable the expansion of private property regimes.

Throughout my interviews, WEMA officials emphasized the importance of pushing governments to implement and/or change regulatory policies. They stressed the importance of WEMA's work to "build capacity" and an "enabling environment" for biotech regulatory systems.[343] Several of my interviewees talked about how, in the case of Kenya, WEMA had worked to "push the envelope" of regulatory systems by forcing

[343] Author Interview, AATF, Nairobi, Kenya, 8-19-15.

the state to consider an application to deregulate a maize variety containing Monsanto's *Bt* insect-resistance trait. Since Monsanto offered its regulatory expertise to the drafting and submission process, the application was also a very thorough one. WEMA's application for the deregulation of *Bt* maize was written, in other words, with the legal and scientific expertise of a company with arguably more experience engaging agricultural biotechnology regulators than any other. Thus the project's *Bt* maize application was well positioned to advance the cause of getting Kenya to deregulate (or approve) its first GM crops. In an exchange worth quoting at length, an AATF official uses the Kenya case to describe to me the potential for WEMA to "shake up" regulatory systems.

> he best way to push things is when there is a product at hand. Pushing an abstract [idea?] is very difficult. People sit down and then they eat lunches in meetings and that's it. But when there's a product. Say there's this product here, the Biosafety authority needs to review the document. So you need a committee to *review*. Not to sit for meetings. To read. Review it. And after they review the document they need to make a decision. And give it back to the applicant. Now *that* is *action*. So there must be something. And after that there's a consequence. If you say "yes, it looks ok," production must start. So the regularity certification authority must come in. So [WEMA] *works* the system. They are working the system. What WEMA has done—and it is a very big contribution—is working the policy and certification and regulatory systems with an *actual* product. That has really changed the ballgame. There is no just saying. It's doing. It has changed a lot. [Kenya Plant Health Inspectorate Service] has changed a lot. And the biosafety authorities in Kenya, for example, [have also changed]. And WEMA has pushed the law also because now when you go talk to the politicians there is a product. "This can help farmers." "How does it perform?" "Come. We'll take you. It performs like this." "Really? Okay. Where will we get the farmers?" "We need the Biosafety law to be passed. And you guys…" "Okay. Just that? Okay. I'll show the chairman of the parliamentary committee in agriculture to come and sit in this meeting and so on…" So it works the system.[344]

[344] Author Interview, AATF, Nairobi, Kenya, 8-17-15. This last point, in which my interviewee staged a possible conversation with a politician, would actually apply to a country like Uganda, in which WEMA officials were advocating for the passage of a biosafety policy. Kenya already

As this AATF official outlines, the project's efforts to "work" the system occur in several ways. These include forcing regulatory officials to consider an actual product (as they had in Kenya) or pushing members of parliament to pass a regulatory policy for biotech crops (a biosafety law, as they were doing in Uganda at this time). Indeed, sentiments about pushing regulators and legislators were echoed in several of my conversations with WEMA officials. The "working the system" approach proved successful in Kenya, where the AATF and Kenya's National Agricultural Research System were able to get WEMA's *Bt* maize approved for a series of national field trials in 2016. Kenya's first deregulated biotech crop will likely be a WEMA product. The product will include Monsanto's proprietary trait, but will be marketed under the WEMA brand. Though Monsanto's regulatory team worked on the application, it was officially submitted on behalf of AATF and Kenya's Agricultural Research Organization. This behind-the-scenes role is advantageous to Monsanto. In media coverage and meetings with government officials, AATF is often represented as being the "driver" behind the regulatory application process.[345] Not the controversial multinational. The *Bt* trait was approved for trials under the terms of WEMA's humanitarian objectives. Using a humanitarian project to get a country to begin to adopt GM crops proved to be an effective strategy in Kenya. If that country's case is any indication, this strategy could yield more policy victories for the project in the future.

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had a biosafety policy in effect at the time of this interview (2015), but had not deregulated any biotech crops. Thus we can see how WEMA has the capacity to push regulatory systems in different ways, whether advocating for passing laws or pushing the system to approve products.

[345] Author Interview, Monsanto Company, St. Louis, MO 6-26-15.

Though at the time of this writing, South Africa is the only country to have released any commercial varieties of WEMA's biotech seeds, project participants express optimism about the project's future. It is still somewhat premature to speculate about the likelihood of more countries deregulating GM crops in the near future. However, it is possible to sketch out a few likely long-term implications of the regulatory changes that already have been catalyzed by the WEMA project. First, Monsanto is interested in developing markets for *licensing* its biotech traits to smaller seed companies for their own use.[346] This is the model that the company has used to market *Bt* cotton in India. As of 2015, the company licenses its *Bt* trait to 44 companies across India.[347] Thus Monsanto's commercial business does not produce cotton seeds directly, but rather licenses their biotech traits to Indian seed companies for their own use. If it is any indication, the company recently hired an experienced Monsanto leader who had directed programs in India to head its sub-Saharan Africa program.[348] In a recent interview, this official noted that the company was relocating its African headquarters from Johannesburg to Nairobi, because the latter was in the middle of the region where they hoped to be gaining the most future customers.[349] Along these same lines, an AATF official I interviewed talked about how through WEMA, they were fostering links between Monsanto and seed companies—links that Monsanto was likely to further develop outside of the WEMA project.[350] The second key point to make is that Monsanto and other biotech companies have other GM traits that they can market. If

[346] Author Interview, Monsanto Company, St. Louis, MO, 5-26-15.
[347] Visser, Jaco, "Monsanto Targets Smallholder Farmers," Farmer's Weekly, January 8, 2015, https://www.farmersweekly.co.za/bottomline/monsanto-targets-smallholder-farmers/.
[348] *ibid.*
[349] *ibid.*
[350] Author Interview, AATF, Nairobi, Kenya, 8-17-15.

WEMA is successful in its mission to get GM crops deregulated and markets begin to develop for marketing additional traits like herbicide tolerance, Monsanto and other biotech companies are likely to increase their regulatory applications. The "capacity building" that WEMA has accomplished at multiple levels throughout the government would benefit these later applications. In Monsanto's case, the company has only shared two of its biotech traits with the WEMA project. These are the only traits that are "off limits" for commercialization. As one Monsanto official explained to me, once legal frameworks are up and running, nothing prevents the company from applying to introduce additional biotech traits.[351] The third, and final, implication is WEMA's "capacity" building for producing, testing, and regulating biotech crops. Many of my informants spoke about how WEMA was developing capacity in several ways, including training scientists to conduct confined field trials of biotech crops to getting regulators accustomed to biotech regulatory documents.[352] These efforts are occurring across scales—from farmers learning how to "steward" biotech traits to the highest levels of government—and are likely to spur changes in policy and practice that move beyond the parameters of the WEMA project.

This multifaceted approach to changing practice and policy leads me to my concluding argument about WEMA: that the project expands private property regimes at both macro-level legal/regulatory reforms and more micro-level ways in which the project's scientists, partner seed companies, and farmers are reorienting their practices to

[351] Author Interview, Monsanto East Africa, Nairobi, Kenya, 8-20-15.
[352] Author Interview, CIMMYT, Nairobi, Kenya, 9-2-15.

be more in line with the demands of private property.[353] As I have argued throughout this chapter, the gene-as-property is fundamental to WEMA. The project's legal edifice, scientific practices, and product marketing, therefore, all revolve around this central point. Project partners have also had to adapt to working with the gene-as-property. This necessitates a range of new or reformed practices. Public sector scientists working on the project are changing their communications practices to conform to confidentiality requirements. Seed companies that will license WEMA varieties are adapting their breeding and paperwork practices. And farmers will have to learn how to properly plant biotech crops—"stewardship," in industry parlance.[354] Each of these demonstrates ways in which the project changes its partner organizations' orientation so that their agricultural and scientific practices are more in line with the strictures of private property regimes.

Developing the capacity of its partner organizations to work with intellectual property has been a key objective of the WEMA project. The AATF has helped the National Agricultural Research Centers develop their own IP policies.[355] The project is also directly building the institutional and legal capacities of seed companies, conducting trainings on how companies can license and then work with biotech traits in their own products.[356] Monsanto plays a critical role in WEMA's various "capacity building" initiatives. Company officials have, for example, trained scientists from the

[353] Here I'm drawing on Daniel Lee Kleinman, *Impure Cultures: University Biology and the World of Commerce*, Science and Technology in Society (Madison, Wis.: University of Wisconsin Press, 2003).
[354] One of WEMA officials' biggest concerns is whether smallholder farmers will be able to adhere to the requirement to plant a "refuge" area when planting *Bt* GM crops. Companies like Monsanto require farmers to plant a certain percentage of their fields in non-*Bt* crops, to lessen insects' ability to develop resistance to *Bt's* poisonous effect.
[355] Author Interview, AATF, Nairobi, Kenya, 8-10-15.
[356] *ibid.*

National Centers to work with IP requirements.[357] An AATF official spoke about "building capacities" of African seed companies, mentioning that Monsanto had "been very helpful" in this work as well.[358]

As the WEMA project trains its partners, Monsanto's practices are held up as a model from which others might learn more efficient scientific practices. Several of my interviewees talked about how CIMMYT and other public sector organizations had benefitted from working with Monsanto. These officials described Monsanto in terms of being the provider of expertise in its different institutional partnerships. Monsanto was depicted as having already developed a high level of capacity. CIMMYT, the National Agricultural Research Systems, and small and medium sized African seed companies, conversely, are described in terms of their lack of capacity. In terms similar to the kind of improvement teleology that I traced through the long green revolution, the public sector and African seed companies are depicted as having *not-yet* reached their full potential.[359] A directionality of the "capacity building", in which CIMMYT and the National Systems adapt to Monsanto practices rather than *vice versa,* logically follows from this development teleology. Indeed, my interviewees noted a whole range of ways in which CIMMYT and the National Systems were changing their practices, everything from more mechanized data collection in field trials to how internal project emails were sent.[360]

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[357] *ibid.*
[358] *ibid.*
[359] Informants at both the AATF and the Gates Foundation talked about how CIMMYT and other CGIAR centers were "catching up" in terms of their approach to IP.
[360] Author Interview, BMGF, Seattle, WA, 7-22-15; Author Interview, Monsanto, St. Louis, MO, 5-26-15.

The improvement logic is a key part in naturalizing this particular teleology of development. Again, the figure of the smallholder farmer serves as the central subject of development in this narrative. One CIMMYT official quite clearly demonstrated this connection, arguing that as long as CIMMYT's development efforts resulted in *improved seeds reaching smallholder farmers,* it did not matter whether their work enabled the commercial expansion of companies like Monsanto and Pioneer. This official stated bluntly that CIMMYT's role should be to make Africa a more favorable environment for investment, even indicating that there were five or six seed companies that would likely be among the first to be bought by the big multinationals.[361] Here is an example of a public sector scientist articulating the improvement logic. The improvement imperative and the political economic claim are mutually reinforcing. This kind of claim is not, of course, anything new in the world of public-private partnerships for agricultural development. The CIMMYT official's comments about making Africa a favorable market for investment were strikingly similar to the provocation made at the 2005 drought tolerant crop meeting in Arlington. "What public investments can make it profitable for the private seed industry to improve the livelihoods of the poor?"[362] In each case, the public is depicted as a kind of temporary solution, funding the initial *development* that will enable greater investment by the private sector. It is unsurprising that Monsanto officials would argue for development that enables more private sector investment. But the fact that prominent public sector development officials express this narrative suggests that public-private partnerships like WEMA generate shifts in their orientation *vis-á-vis* the profit motive. As I have shown in this section, the friction

[361] Author Interview, CIMMYT, Nairobi, Kenya, 9-2-15.
[362] Doering, "Public-Private Partnership to Develop and Deliver Drought Tolerant Crops," 4.

generated through WEMA's public-private partnership is "particularizing" practices and policies throughout the WEMA network, enabling the logic and values of private property to become increasingly "common sense."[363]

Conclusion

I would often ask the WEMA officials with whom I spoke about their opinion about where the project should be positioned along a continuum with humanitarian interest on one end and profits on the other. The answers varied, with some people saying that the project was primarily humanitarian and some claiming that it had started as more humanitarian and morphed into a project that could potentially align with Monsanto's business plans. In a way, though, I was asking the wrong question. Because, many of my informants did not view humanitarian interests and profit as radically different. Despite my efforts to get WEMA officials to claim that the project was either humanitarian or profit-centered, my informants consistently explained the project as being *both* humanitarian and "smart business."[364] As I have shown throughout this chapter, the power of the improvement logic is crucial for explaining how these two categories work together—how the assumption that improvement equals the expansion of private property has "maintained its givenness" amongst WEMA project participants.[365] The givenness of this logic also catalyzes the project's legal and political economic reforms, *while allowing project participants to claim a position of political neutrality.* It is precisely because of the givenness that this very political project is

[363] My use of "particularizing" here draws on Tsing, *Friction,* 6.
[364] Author Interview, Monsanto Company, St. Louis, MO, 6-26-15.
[365] Gidwani, *Capital Interrupted.*

rendered apolitical. I saw this throughout my interviews, when people would claim neutrality or call themselves "honest brokers." The "common sense" linkage of property and improvement provides the unspoken justification for AATF officials to describe their work as an "honest broker."[366] And it is only because development is equated with the expansion of private property that Gates Foundation officials could insist that they were "agnostic" on the question of developing markets for multinationals like Monsanto and Pioneer.[367] Returning to the genealogy of improvement with which I began this chapter, we might ask how WEMA's improvement narratives reproduce logics with a much longer colonial and developmental lineage. As Bhandar shows, we should also consider how productions of racial difference work in tandem with the expansion of private property. Though there are certainly some "African-led" efforts to expand biotechnology and commercial seed systems, we should consider how the broader new Green Revolution effort extends racial regimes of ownership along new techno-scientific and geographic frontiers. Bhandar's argument that "we cannot…understand the emergence of modern concepts of race without understanding their imbrication with modern ideologies of ownership and property logics" can be extended to examine entanglements of race/property along the Green Revolution's expanding frontiers.[368]

Despite WEMA officials' certainty that the expansion of private property regimes in agriculture would lead to more social and economic development, the relationship between intellectual property rights (IPR) and societal benefit remains contested. A recent edited collection by leading legal and economic scholars on IPR

[366] Author Interview, AATF, Nairobi, Kenya, 8-10-15.
[367] Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-22-15; Author Interview, Bill and Melinda Gates Foundation, Seattle, WA, 7-23-15.
[368] Bhandar, *Colonial Lives of Property,* 105.

argues that the expansion of IP rights has not, in fact, resulted in increased innovation.[369] "The link between stronger IPR and innovation," the authors declare, "is ambiguous at best."[370] Indeed these scholars argue that because intellectual property rights can lead to increased monopolization, decreased access to knowledge, expensive and burdensome processes of navigating a world of "patent thickets," and more defensive patents, further IPR expansion actually discourages innovation. Importantly, the authors point out that the relationship between IPR and innovation has been the subject of ongoing controversy.[371] Yet, my research indicates that within the public and private sector organizations that form WEMA, this important debate is ignored for the now "common sense" equation of private property with "innovation" and "progress."

It is in this sense that public-private partnerships like WEMA should be seen as normalizing private property regimes in agricultural science and development. That the world's largest agricultural biotechnology company would be on the front lines of this effort is, of course, unsurprising. But the fact that partnerships like WEMA, work *through* the public sector in several ways—using public money, public lands, and publicly trained and paid scientists—raises questions about the implications of the partnership paradigm. How will agricultural systems in the global South transform as public sector development organizations increasingly turn to more private sector-oriented approaches to addressing climate change, poverty, and hunger? And how will this affect millions of smallholder farmers that really are on the forefront of this

[369] Mario Cimoli et al., eds., *Intellectual Property Rights: Legal and Economic Challenges for Development*, First edition, The Initiative for Policy Dialogue Series (Oxford ; New York, NY: Oxford University Press, 2014).
[370] *ibid.*, 18.
[371] *ibid.*, 18.

increasingly volatile intersection? As my interviewees often reminded me, maize is the most important food crop in sub-Saharan Africa. What are the implications of WEMA's efforts to "build capacity" for biotechnology regulation and commercialization and revolutionize maize farming and markets? Though the answers to these questions remain to be seen, challenging assumptions about the relationship between progress and private property opens up space for asking a new set of questions about the future of agricultural science and development in an age of climate change—one that might center other categories, such as justice or sovereignty.[372]

[372] See the special issue of *The Journal of Peasant Studies* (vol. 36, no. 3., 2009) on Food Sovereignty.

4. Securitizing smallholder farmers on the frontier of climate change

I attended the World Food Prize Conference in Des Moines, Iowa each fall between 2014 and 2017. Centered on the bestowal of the self-described "Nobel Prize in Food and Agriculture," the annual conference brings together hundreds of agribusiness leaders, development officials, and international scientists for a weeklong celebration of the mission of feeding the world with technological innovation. At the 2014 conference, I was struck by a discussion during a session called "The smallholder's lifeline: Innovations in Agro-financing and insurance." The executive director of the Syngenta Foundation, the philanthropic branch of the world's third largest agricultural biotechnology company, explained an insurance scheme his Foundation had developed for smallholder farmers in Kenya. He described rural farmers going to their local agrodealer and buying a bag of seed. Inside the bag of seed would be a card with a code that the farmer would enter into their cell phone, activating a microinsurance policy. That cell phone code would automatically link to a local weather station. If the weather station measured less than a predetermined amount of rain during the growing season, then the farmer would receive an automatic payment through Kenya's mobile money system. The Syngenta official boasted that weather based index insurance—often shortened to just index insurance—could bring millions of previously uninsurable smallholder farmers into insurance markets. Insured farmers were also much more likely to buy hybrid seeds and agricultural inputs like those sold by Syngenta. For insurers,

seed companies, and farmers, index insurance promised to be a triple win. Most of the risk in index insurance schemes is transferred to global multinational reinsurance companies like SwissRe and MunichRe (insurers who insure insurers)—companies that have fast become major players in a burgeoning microinsurance industry. These risks also hold the potential to be further pooled together as tradable debts—or securitized—in the form of insurance-linked securities. These financial instruments add another layer of abstraction—and point for speculation and profit-making—upon the original risk captured when the farmer links their mobile phone to the weather station.

The project the Syngenta official described in Des Moines—as well as index insurance writ large—have taken off in the time since. That project was spun-off into a for-profit company in 2014, called Agriculture and Climate Risk Enterprise, or ACRE. The company grew rapidly, and claims to have already insured over 1 million farmers in Kenya, Tanzania, and Rwanda.[373] Promoted by the World Bank, USAID, and the G7, index insurance has become a much-heralded technology for managing "climate risk" across the global South. Index insurance is part of an emerging trend of financialized development. Mainstream development organizations increasingly describe "access to finance" as a key goal of development.[374] Smallholder farmers are the subject of development in many of these initiatives, with a budding "smallholder finance" sector emerging. That there is a great deal of value to be captured from these farmers is also widely repeated, with a recent World Bank publication stating that Africa's agricultural

[373] "ACRE Africa Achievements - Over 1,000,000 Farmers Insured," ACRE Africa, accessed July 31, 2017, https://acreafrica.com/achievements/.
[374] Emma Mawdsley, "Development Geography II: Financialization," *Progress in Human Geography*, November 28, 2016, https://doi.org/10.1177/0309132516678747.

markets could be trillion dollar industry by 2030.[375] Africa is constructed as the "final frontier" for agribusiness development, led by the U.S.[376] A 2016 report funded by the MasterCard Foundation and USAID noted a range of efforts seeking to bring finance to smallholder farmers.[377]

The increasing financialization of agricultural development, especially as applied to various efforts aimed at transforming agriculture across Africa, has been well covered by critical agrarian scholars.[378] These scholars have described index insurance as a key technology within this trend. Leigh Johnson insists that index insurance represents an important mode of financialization.[379] Because it both brings new commodity producers into larger "value chains" and brings new consumers into global finance markets through insurance products, index insurance provides a particularly useful lens through which to view the intersection of finance capital and the expansion of commercial agriculture. As smallholder farmers are linked to global financial markets, index insurance also provides a useful case study for examining the ways in which African geographies intersect with the global economy—and, following James Ferguson, for

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[375] "Africa's Agriculture and Agribusiness Markets Set to Top US$ One Trillion in 2030," World Bank, March 4, 2013, http://www.worldbank.org/en/news/feature/2013/03/04/africa-agribusiness-report.

[376] William Moseley, Matthew Schnurr, and Rachel Bezner Kerr, "Interrogating the Technocratic (Neoliberal) Agenda for Agricultural Development and Hunger Alleviation in Africa," *African Geographical Review* 34, no. 1 (January 2, 2015): 1–7, https://doi.org/10.1080/19376812.2014.1003308.

[377] "Inflection Point: Unlocking Growth in the Era of Farmer Finance" (Mastercard Foundation and Rural and Agricultural Finance Learning Lab, April 7, 2016), https://www.raflearning.org/post/inflection-point-unlocking-growth-era-farmer-finance.

[378] Sally Brooks, "Investing in Food Security? Philanthrocapitalism, Biotechnology and Development," 2013, http://www.sussex.ac.uk/spru/documents/2013-12-swps-brooks.pdf; Jennifer Clapp, "Financialization, Distance and Global Food Politics," *The Journal of Peasant Studies* 41, no. 5 (September 3, 2014): 797–814, https://doi.org/10.1080/03066150.2013.875536.

[379] Leigh Johnson, "Index Insurance and the Articulation of Risk-Bearing Subjects," *Environment & Planning A* 45, no. 11 (2013): 2663–2681, https://doi.org/10.1068/a45695.

asking what kinds of new political and economic relationships are built as "Africa" articulates materially and discursively with the "global economy."[380]

Brooks points to the need to "map the contours of an emerging global food politics" in its increasingly financialized orientation.[381] Yet despite several recent critical overviews of the intersections of global food and finance, few scholars have engaged explicitly with the links between race, finance, and empire in the emerging financialized agricultural development landscape. I examine index insurance projects alongside recent texts from the U.S. security state and U.S. global food security policy, showing how the discourses in each of these three areas share common assumptions about the need to secure racialized, vulnerable people and places. As Zenia Kish and Justin Leroy argue, there is a "long and intertwined history of race and finance."[382] "[F]inance," they argue "has historically developed new innovations through arenas of experimentation in which privatized control over racialized bodies and life possibilities expand the boundaries of financial value." They connect contemporary financial instruments such as "social impact bonds" and "development impact bonds," which allow third-party investors to make money through funding social programs that serve impoverished communities, to the financialization of slavery in 19th century Britain and the U.S. Rather than showing that contemporary projects like social impact bonds directly emerge from the practices that financialized the slave economy, they "examine [these] seemingly unrelated modes of investment to demonstrate that racialized life has repeatedly served as the basis for

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[380] James Ferguson, *Global Shadows: Africa in the Neoliberal World Order* (Durham, NC: Duke University Press, 2006), 14.
[381] Brooks, "Investing in Food Security," 4.
[382] Zenia Kish and Justin Leroy, "Bonded Life: Technologies of Racial Finance from Slave Insurance to Philanthrocapital," *Cultural Studies* 29, no. 5–6 (September 3, 2015): 632, https://doi.org/10.1080/09502386.2015.1017137.

development of new methods to assess and augment the future value of particular lives."[383] Building upon Kish and Leroy and other scholarship that places neoliberal financialization in the context of longer histories of racial capitalism, I argue that the narratives driving the index insurance/national security/food security nexus reproduce racial hierarchies that locate particular people and geographies as sites for investment.[384] I argue that the mainstream development discourses that call for financializing ever-greater pools of climate risk through index insurance are normalized through racialized logics and that these logics, in turn, articulate with the practices and discourses of the U.S. security state. I suggest that one of the key reasons that index insurance's financialized approach to climate change adaptation and development—what Ryan Isakson calls "derivatives for development"—is so widely and uncritically supported in mainstream development is because of its articulation with racialized finance and security.[385]

Building resilience in a world of vulnerability

The intersection of climate change and global food security is primary concern of the U.S. security state. Recent publications from the National Intelligence Council (NIC), the U.S. intelligence agency responsible for long-term strategic analysis, describe

[383] *ibid.,* 633.
[384] Paula Chakravartty and Denise Ferreira Da Silva, "Accumulation, Dispossession, and Debt: The Racial Logic of Global Capitalism - An Introduction," *American Quarterly* 64, no. 3 (2012): 361–385, https://doi.org/10.1353/aq.2012.0033; Jodi Melamed, *Represent and Destroy: Rationalizing Violence in the New Racial Capitalism* (Minneapolis, MN: University of Minnesota Press, 2011).
[385] S. Ryan Isakson, "Derivatives for Development? Small-Farmer Vulnerability and the Financialization of Climate Risk Management," *Journal of Agrarian Change* 15, no. 4 (2015): 569–580, https://doi.org/10.1111/joac.12124.

climate change and food security as key national security issues. The NIC first examined the security implications at a 2012 conference in Arlington, VA, where agriculture and national security experts described food insecurity as a "threat multiplier"—the same term American defense officials have used to describe climate change.[386] Volatilities across the global food system, the NIC warned, might force countries to pull out of international food markets "where the United States has a major economic interest."[387] At the behest of Secretary of State Hillary Clinton and Raj Shah, the director of USAID, the NIC continued to examine potential links between food security, climate change, and national security. The unclassified version of its 2015 global food security assessment declares that food insecurity in "many countries of strategic importance to the United States" is likely to increase and that the outlook for countries already experiencing food insecurity is likely to worsen.[388] The NIC argued that intensifying climate change effects like drought, conflict, and diseases could compound each other in the coming decade: "warmer temperatures might lead to disease spread or prolonged drought, prompting rapid rural migration to cities. In turn, urban slums may become hotbeds for unrest" (1). In its 2016 assessment of climate change, the NIC further warned of the impending effects climate change would have on food security, suggesting that climate destabilization could soon lead to widespread social and political unrest.[389] The report

[386] Christian Parenti, *Tropic of Chaos: Climate Change and the New Geography of Violence* (New York: Nation Books, 2012).
[387] National Intelligence Council, "Global Food Security: Key Drivers—a conference report," 2012, pg. 13.
[388] National Intelligence Council. "Intelligence Community Assessment: Global Food Security," September 2015. An NIC official that spoke at the 2016 World Food Prize Conference in Des Moines, Iowa mentioned that these NIC assessments were unclassified derivatives of classified reports. Author field notes.
[389] National Intelligence Council, Implications for US National Security of Anticipated Climate Change, Sept. 2016, pgs 8-9.

concluded that climate change is "likely to pose significant national security challenges for the United States over the next two decades."[390]

The NIC's perspective on the looming threat of climate change and food insecurity is further detailed its latest quadrennial "global trends" publication. Entitled *The Paradox of Progress* the report outlines possible future scenarios in a world of ever more frequent shocks—things like the Arab spring, the financial crisis of 2008-2009, but also large-scale droughts and flooding events.[391] Climate change is listed as one of the most pressing emerging trends that will shape the security landscape. One of *Paradox of Progress's* lead authors and Director of the NIC's Strategic Futures Group, Susan Fry, spoke about the intersection of climate change and food security at a recent "Global Food Security" Symposium in Washington DC.[392] Speaking on a "food security is national security" panel, Fry argued that climate change-related "shocks" were already wreaking havoc around the world. She told the audience that it wasn't just countries like Afghanistan and Somalia that should expect to see climate-triggered instability.

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https://www.dni.gov/files/documents/Newsroom/Reports%20and%20Pubs/Implications_for_US_National_Security_of_Anticipated_Climate_Change.pdf

[390] *ibid.,* 5.

[391] National Intelligence Council, *Global Trends: A Paradox of Progress,* 2017. As Melinda Cooper writes, the scenario planning method deployed in the NIC's global trends publications utilizes the scenario planning method that has become ubiquitous in international business and governance—ranging from the International Monetary Fund to the Intergovernmental Panel on Climate Change (IPCC) to multinational oil companies. Scenario planning, Cooper argues, constitutes an important paradigm shift in the way powerful security and corporate officials view the future. It departs from early futures methodologies in that it does not try to predict the future in terms of a linear progression from the past. Rather, "scenario planning is designed to foster decision-making under conditions of uncertainty. Its focus is not risk as such, but rather the radical uncertainty of unknowable contingencies—events for which it is impossible to assign a probability distribution on the basis of past frequencies." See: Melinda Cooper, "Turbulent Worlds: Financial Markets and Environmental Crisis," *Theory, Culture & Society* 27, no. 2–3 (March 1, 2010): 167–90, https://doi.org/10.1177/0263276409358727.

[392] Suzanne Fry, "National Security Is Food Security: Strategic Leadership and a Moral Imperative: Panel Remarks" (March 30, 2017).

> When we do our [global] risk analysis…I'm not kidding you—there's something like two thirds of the planet that have risk conditions, literally about 120 countries…that have risk conditions that make them vulnerable to a shock that could tee off large-scale instability. You compound that with some pretty profound demographic shifts, technological shifts, and we have been living through climate shifts—and [then] the next phase of these climate shifts. So we've got a great deal of vulnerability in the world.

Fry stressed that the US would not be able to isolate itself from this increasing vulnerability. Discussing American trade interests in particular, she urged that the US would need to anticipate how climate events could set off shocks that could ripple through the global food system. The best way to manage these inevitable shocks, Fry argued, was to "invest in resilience in…both the economic systems but also the natural systems that allow for food security across the whole planet."

Fry equates resiliency with strengthening international trade and describes resilience as something that can be cultivated in both "economic" and "natural systems." But we do not actually get much of a sense of just what investing in resilience entails. A recent review of critical literature on resilience describes it as "the most used and abused term in contemporary policy and decision making."[393] Much like "sustainability," its usefulness is in its flexibility and ability to enroll actors with multiple agendas into its cause. (Whether or not we know exactly what resilience means, it connotes something that we are likely to see as positive or desired.) Yet the ubiquity of resilience in development and security discourses alike begs further examination. "Abstract and malleable enough to encompass the worlds of high finance, defence and urban infrastructure within a single analytic," Jeremy Walker and Melinda Cooper write,

[393] Mark Vardy and Mick Smith, "Resilience," *Environmental Humanities* 9, no. 1 (May 1, 2017): 175., https://doi.org/10.1215/22011919-3829199.

resilience, "is becoming a pervasive idiom of global governance."[394] Tracing the concept to its origins in the ecological theory of complex adaptive systems, Walker and Cooper argue that the sweeping uptake of resilience as a governing logic has much to do with the way it aligns with the influential neoliberal economist and philosopher Fredrich Hayek's ideas that economic markets function like "complex ecological systems." Examining parallels between two key thinkers, one from ecology (Holling), the other, neoliberal economics (Hayek), they show how these two strands of thought "have ended up merging in the contemporary discourse of crisis response through resilience."[395] Importantly, Walker and Cooper argue that the concept itself works to normalize the neoliberal management of an increasing array of social life. Pointing to the "resiliency" that the concept itself has, they suggest that the political stakes surrounding the governmental uses of resilience are indeed high: "At stake in this tacit union [of ecological and economic thinking] is a governmental philosophy of nature and society so all-encompassing and resilient to critique that the effects of political interventions (and non-interventions) made in its name, even when catastrophic, seem as inescapable as the weather."[396] Following Walker and Cooper, we might ask how resilience normalizes particular approaches to risk management in the realm of food security. Fry's description of resilience in terms of both the economic and natural certainly conveys the link between systems ecology and neoliberalism that Walker and Cooper trace. Resilience is also a key concept that underlies the NIC's approach to forecasting the

[394] Jeremy Walker and Melinda Cooper, "Genealogies of Resilience: From Systems Ecology to the Political Economy of Crisis Adaptation," *Security Dialogue* 42, no. 2 (April 1, 2011): 143–60, https://doi.org/10.1177/0967010611399616.
[395] *ibid.,* 144.
[396] *ibid.,* 144-145.

future through its scenario exercises. Though the possible futures it outlines are grim—financial collapses, atomic bombs, rampant cyber attacks all appear—the *Paradox of Progress* argues that the future will be much brighter for the resilient. While the future will bring great danger, consequential trends like climate change will also yield potential for positive outcomes:

> In the emerging global landscape, rife with surprise and discontinuity, the states and organizations most able to exploit such opportunities will be those that are resilient, enabling them to adapt to changing conditions, persevere in the face of unexpected adversity, and take actions to recover quickly. They will invest in infrastructure, knowledge, and relationships that allow them to manage shock—whether economic, environmental, societal, or cyber.

Resilience is cultivated through investments, through exploiting opportunity in a world of perpetual flux. Resilient "states and organizations" must adopt a stance of what Walker and Cooper call "permanent adaptability" to navigate—and, more importantly become productive in—this world of ever increasing risk.[397] As Walker and Cooper trace, resilience has become prominent in U.S. National Security policy, especially with the post-9/11 rise of the Homeland Security apparatus. As the Security State expands, "resilience thinking" has increased in development circles as well. Indeed, resilience is now central to U.S. global food security policy and strategy.

Perpetual climate shock and the racialized resilient subject

The NIC's prescription of resilience as the remedy for shock is central to the US Global Food Security Act, which was voted into law in the summer of 2016 with nearly complete bipartisan congressional support. The law describes global food security as a

[397] *ibid.,* 154.

vital national security interest to the US.[398] This framing proved to be pivotal for getting the bill passed. At a moment when Democrats and Republicans in Congress rarely agreed on anything, "food security as national security" was something nearly everyone could get behind.[399]

A central objective of the law is to "build resilience to food shocks among vulnerable populations and households while reducing reliance upon emergency food assistance." The five-year Global Food Security Strategy (GFSS) that outlines how the policy will be implemented situates "strengthening resilience amongst people and systems" as one of its three organizing objectives. Similar to the *Paradox of Progress*, the Food Security Strategy defines shocks like droughts, floods, and price shocks as "perennial features" that smallholder farmers in rural areas of the Global South can expect to face.[400] Smallholder farmers must therefore cultivate resilience as both a means and an end to cope with their vulnerability. The GFSS depicts climate change as precipitating a world of never-ending shock—one that demands farmers adopt a "culture of resilience."[401]

The Strategy indicates that the road to resilience is paved with financialized approaches to development. It declares that breakthroughs in digital technologies like

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[398] *Global Food Security Act of 2016,* H.R. 1567, 114th Congress, (4/12/2016). https://www.congress.gov/bill/114th-congress/house-bill/1567

[399] Speaking at a symposium at the Center for Strategic and International Studies in 2016, Adele Adeyemo, the Deputy Assistant to the president and deputy national security adviser for international economics, stated that the national security framing of the Global Food Security Act had been crucial for getting it passed with sweeping bipartisan support. See: CSIS, "The Power of Global Food Security: Examining Economic and National Security Implications,"," CSIS, 2016, https://www.csis.org/events/power-global-food-security-examining-economic-and-national-security-implications.

[400] Explaining the "theory of change" behind its resilience objective, the strategy states: "We will design and implement investments that anticipate and treat recurrent shocks and stresses as perennial features, not as unanticipated anomalies" (18).

[401] Walker and Cooper, "Genealogies of Resilience," 154.

mobile money have made it more feasible to bring smallholder farmers into financial markets—allowing them to "both weather shocks and seize economic opportunity."[402] The global market for smallholder finance is described in terms of vast untapped wealth. Citing a World Bank report, the Strategy declares that two billion people in the world lack access to financial products. With "an estimated US$210 billion in demand for smallholder finance alone…" the need for "tailored financial services, products, and systems…" that can target smallholder farmers has never been greater (p 24, fn 40). The Food Security strategy calls for rolling out more financial tools like crop insurance, credit, and money transfer technologies. Whereas the small amount of finance efforts aimed at smallholder farmers has been primarily public sector-led, the Food Security Strategy emphasizes the importance of developing links between development efforts and the private financial sector.[403] The strategy targets not only individual smallholder farmers, but also governments' financial policies—what it dubs "resilience and risk management policy" (30). Reaching the strategy's goal of creating resilient people and systems entails that countries participating in U.S.-led development projects create "enabling environments" for private sector finance.

One of the key GFSS objectives listed under "resilience" is to "improve proactive risk reduction, mitigation, and management" (18). The Strategy describes risk in terms of both "potential and realized," and lists "drought, flood, price shocks, pests,

[402] "U.S. Government Global Food Security Strategy," FY 2017-2021, USAID, September 2016. Available at: https://www.usaid.gov/sites/default/files/documents/1867/USG-Global-Food-Security-Strategy-2016.pdf

[403] On the public sector's role in finance efforts aimed at smallholders, see Initiative for Smallholder Finance, "Inflection Point." The Food Security Strategy declares: "Our work with the private financial sector… will be particularly essential to promoting sustainable development of the agriculture sector.." (24).

and diseases." The GFSS lists crop insurance technologies like index insurance as key risk management tools. Risk is a key term in the strategy—appearing as both something to be avoided, but also something to be transferred or taken on. Like "resilience," "risk" can be a slippery term. Throughout my interviews with officials from development, agribusiness, and philanthropy organizations involved in large-scale development projects in eastern Africa, I have been frequently reminded that smallholder farmers are "risk averse." A truism in development discourse holds that, given their vulnerability, smallholder farmers avoid risk—they are therefore unlikely to spend much on seeds or take out loans. As one agricultural economist detailed: "risk is an impediment to technology investment."[404] The discourse of risk management is prevalent across Green Revolution for Africa development projects. The USAID-funded Drought Tolerant Maize for Africa billed itself as "insurance in the seed." Index insurance is promoted as a risk-reducing technology that can enable farmers to further invest in credit and agricultural inputs. Thus risk is also something farmers "take on" when they adopt these practices. They run the risk that they will not get a good harvest and default on their loans. Risk is also described as something to be avoided—climate risks such as the risk of suffering from a drought are generally described as bad things. Despite this negative connotation, risk is often described as potential. Proponents of insurance schemes for smallholder famers describe risk in terms of a pool of "uninsured risk."[405]

[404] Author interview, Syngenta Foundation, 2015.
[405] Michael Carter et al., "Improving Index Insurance for Small-Scale Farmers in Developing Economies," Innovation Lab for Assets and Market Access Policy Brief (USAID, 2017).

Historian Jonathan Levy's work is especially useful for coming to terms with risk. Levy traces the genealogy of risk as a noun to 18th century maritime insurance.[406] He shows how merchants essentially dealt with two kinds of commodities during their voyages across the Atlantic: the first were physical commodities, whether cotton or the human cargo of slaves, and the second were financial commodities, or "risks," that quantified the possibility of losing their physical commodities. Importantly, this second commodity could be separated spatially and temporally from the original cargo that it secured and traded in financial markets. This is the basis for the global trade in "risk" that continues today. As I mentioned earlier most of the risk in index insurance schemes is transferred to global multinational reinsurance companies like SwissRe and MunichRe. This risk also hold the potential to be further pooled together as tradable debts—or securitized— in the form of insurance-linked securities. Financial analysts see the growth of index insurance schemes like the ones developed by ACRE becoming increasingly relevant to global securities markets.[407]

Understanding how risk functions as a commodity—and as the basis for financial securitization—is crucial to understanding the logic of resiliency as risk management that underpins the Global Food Security Act and index insurance schemes like ACRE. Viewed this way, we can get a better understanding of how "investment in resilience" means that farmers "take on more risk"—in the form of both insurance and debt from loans taken out to purchase agricultural inputs like drought tolerant seeds. Risk as harm

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[406] Jonathan Levy, *Freaks of Fortune: The Emerging World of Capitalism and Risk in America* (Cambridge, Mass.: Harvard University Press, 2012).
[407] Artemis, "Weather-Index Microinsurance Growing up, Targeting Sustainability," December 2, 2014, www.artemis.bm accessed July 22, 2017.

is meant to go down, for sure. But risk as commodity is meant to perpetually expand. Tapping into pools of uninsured risk demands farmers adopt new approaches to risk. Because index insurance is based upon statistical measurements at the weather station or satellite, it is always a partial estimation of what actually happens on farm. There is always the possibility of discrepancy between what the index "reads" and what actually happens in farmers' fields. This means that in order to transfer the risk associated with drought and crop loss onto an insurance market, farmers must take on the risk that what happens in their field will not correlate with the "trigger point" on the index.

Leigh Johnson points out that the insurance coverage offered by index insurance is always only partial.[408] Economists call this risk that farmers will experience drought but still not receive a payout "basis risk." (One economist I interviewed put it in more blunt terms: "It's when the worst thing that could happen to you gets worse.") Because of the issue of basis risk, index insurance creates a twofold dynamic of risk: farmers both transfer risk to national and international insurance markets and take on the risk that they will face a drought and not get paid. In this process, farmers become both a particular type of agricultural producer (as they are brought into commodity chains and begin purchasing credit, inputs, and seeds) but also a financial consumer—what Johnson calls "risk-bearing subjects." She calls this process by which markets for financial products are expanded by both bringing farmers in and simultaneously excluding them from coverage, "expansion-by-exclusion."[409]

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[408] Johnson, "Index Insurance."

[409] Here is how Johnson defines "expansion-by-exclusion": "the technology of index insurance is structurally dependent upon the individual policyholders' acceptance of some degree of basis risk; this is to say, making security accessible to the poor also requires them to bear some of the risks themselves (2667)."

The Food Security Strategy equates resiliency with the development of risk-bearing subjects. Following the arguments made by proponents of index insurance, the GFSS states: "Resilience… is necessary before individuals can afford the risk inherent in increasing investment in their farms…" (8). In this way, index insurance promises to be a tool that offers farmers both "protection" and "promotion"—it gives them ways to transfer risk but also take on more risk as they invest in credit and agricultural inputs.[410] The "preemptive risk management" promoted by the GFSS then, paradoxically, increases risk. This was made clear when I interviewed one of the founders of ACRE from the Syngenta Foundation. "As farmers invest," he told me, "their risk goes up."[411] This is climate risk as an accumulation strategy, the financialization of vulnerability on climate change's frontier.

Johnson and others have pointed out that index insurance technically is not insurance at all, but a derivative. Given the criticism about rampant financial speculation and unregulated derivatives markets that followed the 2007-2008 global financial crisis and the related food crisis, one might think that there would be some caution on the part of international development organizations about the possibility of "derivatives for development."[412] Yet across mainstream development organizations like the World Bank, USAID, and CGIAR, index insurance is widely promoted as a socially just means to address poverty and climate change. How could the financialization of the livelihoods of those most vulnerable to climate change be so uncritically promoted—particularly in

[410] Helen Greatrex et al., "Scaling up Index Insurance for Smallholder Farmers: Recent Evidence and Insights" (CCAFS Working Paper, 2015), www.ccafs.cgiar.org.
[411] Author Interview, Syngenta Foundation, 1-22-2015.
[412] On the connections between financial speculation and global food price crises, see Jayati Ghosh, "The Unnatural Coupling: Food and Global Finance," *Journal of Agrarian Change* 10, no. 1 (2010): 72–86; "Derivatives for development," is Isakson's article of the same name.

the wake of the financial/food crisis? Discourses of security and humanitarianism frequently ignore any ethical or practical questions about the implications of furthering index insurance. Could this be entirely a case of techno-financial utopianism? Of being so caught up in brilliant new ways to capture and trade risk? This is surely part of index insurance's appeal. But this does not go far enough in explaining the exuberance for a financial fix so soon after financial meltdown. We gain a better understanding of the gap between techno-financial optimism and recent history by attending to the relationship between race and finance. Examining how race operates in the discourses and practices of global food security and financialized climate risk management sheds light on how seemingly questionable development practices move forward with little criticism.

Kish and Leroy expand Levy's work by showing how the slave trade was crucial to building an expansive British market for financial tools like credit, insurance, stocks and bonds. They also show how in the US, Southern planters devised financial instruments in which they used slaves as collateral. In their words: "slaves worked doubly and produced two types of revenue: the results of the physical labour in the form of cotton and sugar, and the fact that they underwrote bonds that gave planters additional credit. The buying and selling of such bonds implicated a wide variety of actors in the financialization of slavery."[413] Kish and Leroy draw parallels between this earliest form of "securitizing human life" and contemporary financial products called "social impact bonds," which allow socially conscious investors a chance to earn returns while funding social services like prison recidivism and early childhood education. Though these financial products are pitched as ways to earn money by doing good, Kish and Leroy

[413] Kish and Leroy, "Bonded Life," 645.

show how they rely on racialized constructions of "at risk" populations. They "revalu[e] racialized life" by turning a social burden (such as a prisoner or homeless person) into a potential investment. Kish and Leroy demonstrate that social impact bonds' financial experimentation is nothing new. "Financial instruments have long articulated with the devaluation of racialized life. Indeed race has been a tool with which financial innovators elide the ethical concerns raised by financial practices in any given historical context."[414]

We see a similar revaluation of racialized life in index insurance schemes. Farmers on the frontline of climate chaos become sites for financial investment. Securitizing the livelihoods of smallholder farmers by betting on the possibility of a climate catastrophe should certainly raise ethical concerns. But in mainstream development discourse, index insurance is promoted as an unequivocal social good that will save the most vulnerable from climate change. This says much about how racial logics both naturalize particular people and places as "at risk" and also produce new racialized subjects in whom to invest. That the NIC can describe the continent of Africa as one giant "zone of experimentation" for developing technologies for climate change adaptation, or that the capital in these insurance schemes is likely to move along deeply racial and colonial circuits (value extracted from Africa, while capital circulates to and from London, Brussels, and Zurich, for example), suggests the need to read these recent risk management technologies as embedded in longer histories of race and finance.[415]

Index insurance builds upon racial geographies that situate large areas and people in terms of lack and others in terms of capacity. María Josefina Saldaña-Portillo

[414] *ibid.,* 646.
[415] NIC, *Paradox of Progress,* 119.

defines racial geography as "a technology of power" that can be used "as an analytic and theory of spatial production [that] indexes the series of techniques used to produce space in racial terms."[416] Importantly, "Visualizing spaces as racial geographies is not just about discussing a manner of seeing," but rather "theoriz[ing] a way of envisioning, of mapping, of accounting for and representing space as [racialized]."[417] Scholars like Achille Mbembe and Katherine McKittrick have written about how Africa has been imagined and produced by the West as a particular racialized space. Mbembe writes how the West defines itself through a dialectic of capacity/lack that depends upon Africa as the ultimate other. This discourse has long been shaped through spatial practices—through racial geographies. "More than any other region, Africa thus stands out as the supreme receptacle of the West's obsession with, and circular discourse about, the facts of 'absence,' 'lack," and 'non-being,' of identity and difference, of negativeness—in short, of nothingness."[418] Drawing on the work of Sylvia Wynter, Mckittrick traces how colonial thinking rendered particular places and people as the absolute other of Western Man.[419] In their encounters with the strange people and landscapes of the New World, Europeans tied ideas about racially inferior Others to particular geographies. As McKittrick, writes: "Past colonial encounters created material and imaginative geographies that reified global segregations through 'damning' the spaces long occupied

[416] Saldaña-Portillo, *Indian Given*, 17.
[417] *ibid.,* 17.
[418] Mbembe, *On the Postcolony*, 4.
[419] Katherine McKittrick, "Plantation Futures," *Small Axe: A Caribbean Journal of Criticism* 17, no. 3 42 (January 1, 2013): 1–15, https://doi.org/10.1215/07990537-2378892; For an overview of Wynter's work, see especially: Katherine McKittrick, ed., *Sylvia Wynter: On Being Human as Praxis* (Durham: Duke University Press, 2015).

by Man's human others"—Africa and the indigenous Americas.[420] In this way, Africa has long existed as a racialized space imagined as "uninhabitable"—"an unlivable space occupied by the racially condemned."[421] One need not look far in development discourse for geographic generalizations about the continent of Africa. The cover of the influential European-based agricultural development organization's 2015 Montpellier Panel's 2015 "agriculture for impact" report provides a case in-point. Under the headline "The Farms of Change: African smallholders responding to an uncertain climate future" a heat-map rendered image of the continent appears as severely dry-cracked earth (Figure 3).

Such spatial depictions of Africa as unlivable—as one giant "risk environment"—are prominent throughout development literature. The racialization in these constructions of Africa as a space is more than simply equating vulnerability with blackness, or fears of migration or "climate refugees" as also racialized (though it is also both of those).[422] It also entails attention to the way race operates at the material and discursive level to delineate particular places as undeveloped, vulnerable, or lacking capacity.

In her compelling analysis of how microfinance expands "poverty capital," Ananya Roy calls microfinance "the new subprime frontier of millennial capitalism, where development capital and finance capital merge and collaborate such that new subjects of development are identified and new territories of investment are opened up

[420] *ibid.,* 5.
[421] *ibid.,* 7.
[422] Chris Methmann, "Visualizing Climate-Refugees: Race, Vulnerability, and Resilience in Global Liberal Politics," *International Political Sociology* 8, no. 4 (December 1, 2014): 416–35, https://doi.org/10.1111/ips.12071.

and consolidated."[423] The subjects of development of global microfinance are then the new "subprime borrowers" that are deemed high risk: "Their financial inclusion takes place on subprime terms."[424] In the case of the financial crisis precipitated in part by a mortgage-backed securities crisis, race proved a critical factor in not only constructing the category of "high risk" borrowers, but also in allocating blame after the housing crisis. Chakravartty and Silva argue that popular media accounts of the housing crisis as the "subprime crisis" worked to lay the blame for the crisis on "subprime" racialized populations, rather than the bankers who sought to recklessly gamble on their exploitation.[425] Extending Roy's theorization, they insist that the figure of the "subprime" in both the U.S. and global south should be understood "as a racial/postcolonial, moral and economic referent, which resolves past and present modalities and moments of economic expropriation into *natural* attributes of the 'others of Europe.'"[426] Racial logics create particular places and people as naturally inclined to vulnerability and "subprime" economic statues. The figure at the center of the Green Revolution for Africa—the homogenous "African smallholder farmer"—can be thought of as a global subprime.

This "subprime" logic has materialized in index insurance in a whole range of ways in which developmental experts seek to train farmers to take on risk. In some instances, the insurance providers like ACRE have found that it makes more sense not to tell the farmers that they are being insured: to simply insure the creditor or agricultural

[423] Roy, *Poverty Capital,* 218.
[424] *ibid.,* 218.
[425] Chakravartty and Da Silva, "Accumulation, Dispossession, and Debt."
[426] *ibid.,* 364.

Figure 3. "The Farms of Change," Montpellier Panel Report, 2015.

input supplier. This is surely the logic of the subprime borrower: farmers don't understand risk; leave the financial reasoning to lenders and agribusinesses. This, too, builds upon racial trajectories in which the "others of Europe" have been understood as subjects "without self-determination."[427] Thus efforts are needed to cultivate resilience in these smallholder farmers. This entails a different approach to farming and an ethic of

[427] *ibid.,* 369.

resilience. As the Global Food Security Strategy argues, farmers must become more resilient in order to take on more risk. Resilience is a concept that recasts racialized life in terms of a site for the production of value. It also positions particular places and subjects as always already at risk. It establishes the logic of "permanent adaptability in and through crisis."[428] In this way, climate crisis is rendered as an ongoing site for the production of value based upon racialized difference.[429] That reinsurance companies and financial institutions might profit off of "protecting" vulnerable smallholders—or that they have every right to set up the insurance schemes to maximize their profits is normalized as a win-win scenario through the logic of resiliency as investment in racialized life.[430] Following Kish and Leroy, we might look at index insurance as a case for the normalization of exploitative financial "investments" that extend thoroughly racialized asymmetries of power. In the process, important political and ethical questions about very real climate and security concerns go unspoken because of naturalized, racialized understandings of vulnerable people and places.

The racialized finance/resilience discourse of index insurance and global food security strategy also articulates with national security discourses and practices. We can see this by returning once more to the NIC's pronouncements about food security and national security.

"The battlefield of tomorrow, today"

[428] Walker and Cooper, "Genealogies of Resilience," 152.
[429] Pulido, "Geographies of Race and Ethnicity II."
[430] Author Interview, Syngenta Foundation, January 22, 2015.

During her aforementioned remarks at the Chicago Council's "global food security conference" in the spring of 2017, the NIC's Fry spoke about the unpredictable nature of large-scale political, social, and ecological instability. She told the audience that a future of "greater exposure to climate risks and extreme weather" would likely bring not only slowly developing climate events, but "really dramatic, sudden shock type climate phenomena" that could bring "catastrophic" changes to global food markets overnight. These "climate shocks" were likely, but Fry insisted that the NIC could not accurately predict where they might emerge.

> We will not be able to predict the location, the geography of where these climate events will happen. We know they are going to happen. We have a sense, probably a better sense in looking out decades, of the type of challenges to come. What we don't have a better sense of is the near-term prediction of where these events will occur. And I think the take-away from that, again, for me, is about building resilience both into the natural and economic systems here.

The uncertainty of where catastrophic climate events will occur demands a resilient state, defined by an adaptable, security-focused approach. The "we" Fry suggests here is the U.S. security state. Though NIC's scenario planning might imagine particular "hotspots" of vulnerability likely to descend into chaos, climate change presents an unprecedented *global* security threat. The framework of resilience, rooted in the ecological understanding of complex systems, provides an approach to security that aligns with the future of inevitable, yet unpredictable shock on a global scale.[431] The resilient state harkened by Fry's "we" here is charged with policing global food/climate insecurity and building resilience into global markets. That this is the sole responsibility of the U.S. is a key imperial assumption. It goes without saying that security on the

[431] Walker and Cooper, "Genealogies of Resilience."

(unknowable, always in flux) frontier of climate change and global food markets is the primary responsibility of the U.S.

This logic of fighting an unpredictable threat that might emerge "overnight" anywhere around the globe justifies the expansion of American empire. That the threat of climate change mirrors that of global terrorism is made explicit in the NIC's framing of resilient states. In its discussion of the new global realities of power, *The Paradox of Progress* argues that dispersed power and the increase of non-state actors like the Islamic State have led to a radically new global geopolitical landscape. These disbursed threats make "securing and sustaining outcomes—whether in combatting violent extremism or managing extreme weather…" increasingly difficult. [432] The NIC depicts the resilient state as one that can cultivate resilience to adapt to these changes: "Sustaining outcomes will require a constant tending to relationships."[433] This kind of "ecosystemic" understanding of geopolitics applies equally to both defense and development.[434] Both are oriented toward constant crisis. Both the global war on terror and the fight to securitize the frontier of climate change demands resilience.

The intersection of the NIC's resilient state and the contemporary moment of development and security occurs at a moment when the U.S. military is expanding its reach in Africa. Though the continent has long been considered "offstage" in the American imperial theater, the past decade has seen a steady buildup of military operations and proxy wars across the continent. Investigative reporter Nick Turse has tracked U.S. military expansion in Africa since 2012. Through a series of reports, Turse

[432] NIC, *Paradox of Progress,* 28.
[433] *ibid.,* 28.
[434] Cooper, "Turbulent Worlds."

has shown a dramatic expansion in U.S. military presence in Africa—in terms of fighting proxy wars, engaging in small-scale counterterrorism missions, training African countries' militaries, and conducting drone operations—during the Obama administration.[435] A quote Turse includes in the introduction to a book of his reporting demonstrates how the U.S. strategic focus toward Africa is changing: a group of US special forces officials in 2013 quoted an oft-repeated phrase from their commander: "'Africa is the battlefield of tomorrow, today.'" A Special Forces official continued: "…I couldn't agree more. This new battlefield is custom made for [Special Operations Command] and we'll thrive in it. It's exactly where we need to be today and I expect we'll be for some time in the future."[436] In the time sense, it seems that that understanding of Africa as tomorrow's battlefield has legitimized an ever-growing expansion of U.S. military presence on the continent.

Shortly into the Trump administration, in early 2017, Turse published details from internal Pentagon reports that describe an extensive range of secret military bases and "forward operating locations" across the continent.[437] As Turse's work shows, the U.S. military machine positions itself to be able to conduct surveillance and embark in counterterrorism efforts across the continent. Several African countries represent strategic hubs for U.S. military operations in the region and beyond. As the NIC predicts climate change-caused instability to extend political and social instability across much of the continent, clearly the U.S. aims to have a significant military presence on the

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[435] Nick Turse, *Tomorrow's Battlefield: U.S. Proxy Wars and Secret Ops in Africa* (Chicago: Haymarket Books, 2015).
[436] *ibid.,* 3.
[437] Nick Turse, "The U.S. Military Moves Deeper into Africa," TomDispatch, April 27, 2017, http://www.tomdispatch.com/post/176272/tomgram%3A_nick_turse%2C_the_u.s._military_moves_deeper_into_africa/.

continent. Turse's work shows that the Trump administration is likely to ramp up military posturing and increase the military presence across the continent.

The memorable quote attributed to the leader of US special forces in Africa—calling the continent "the battlefield of tomorrow, today"—conveys the kind of preemptive logic that Randy Martin has argued is central to both financial risk management and American empire in the age of the perpetual war on terror.[438] A preemptive logic undergirds the battlefronts of "managing extreme weather" and "combatting" terrorism, as the NIC puts it. As Martin explains, high finance and American warfare share a preemptive, securitizing logic, in which "Potential threats are actualized as demonstrations of the need for future intervention. Preemption is the temporality of…the political and moral economy of securitization, the future made present."[439] Martin likens the shift toward a counterterrorism mode of U.S. warfare—dispersed warfare fought by small groups of soldiers—to the logic of the financial arbitrageur who leverages volatility in risk markets for profit. Whether in financial markets or the hinterlands of the global war on terror, military leaders and the masters of finance perform parallel "arbitrage": Special Forces "[exploit] small variations in the environment to achieve large-scale gain," while bankers and hedge fund managers use "quick shifts in [the] deployment of capital to leverage larger money-making effects."[440] In both cases, we see the temporality of the derivative: a present ruled by the promise of future instability, today.

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[438] Martin, Randy, *An Empire of Indifference: American War and the Financial Logic of Risk Management*, Social Text Books (Durham: Duke University Press, 2007).
[439] *ibid.*, 18.
[440] *ibid.,* 10.

Climate change and terrorism both raise the threat-level for unpredictable "shocks." Both call for a particular approach to risk management akin to what Walker and Cooper call a "culture of resilience"—an acceptance of perpetual flux in environmental and social "systems" and an adoption of practices ordered around fostering "permanent adaptability in and through crisis."[441] In this way, we can see a parallel between the U.S. pivot to Africa and the ramping up of development efforts based upon financial logics and practices. Both position Africa as a space of perpetual crisis that demands securitization. Resilience as both a security strategy and development strategy calls for cultivating resilient governments and individuals. In the process, geographical peripheries of global agri-financial markets and U.S. warfare become productive frontiers for agribusiness and the expanding security state. The processes of making the development-security frontier productive are embedded in longer trajectories of racial and colonial power. While Green Revolution for Africa projects are couched in terms of entrepreneurial humanitarianism—as helping the African smallholder access markets and approach farming as a business—these developments must be linked to ongoing trajectories of racialized empire. The process of building more resilient global food markets that Fry called for at the Chicago Council food security symposium needs, then, to be understood as co-productive with racialized global finance and the expansion of U.S. empire, which relies on racial constructions to justify both its exceptional status as global police force in the war on terror and the need to intervene, or secure, the livelihoods of others.[442] A "resilient" American empire strives

[441] Walker and Cooper, "Genealogies of Resilience," 152.
[442] Nicholas De Genova, "The 'War on Terror' as Racial Crisis: Homeland Security, Obama, and Racial (Trans)Formations," in *Racial Formation in the Twenty-First Century*, ed. Daniel

to "secure outcomes" at the trade/security nexus. That Green Revolution for Africa development is increasingly oriented around the development/finance nexus has been well covered. But we need also attend to the ways that this intersection articulates with racialized finance and racialized empire—and how these, in turn, are mutually formed.

Conclusion

By way of conclusion, I want to return to the "food security is national security" trope. With the beginning of the Trump Administration signaling both huge cuts in development/diplomacy spending and an increase in defense spending, the future of food security and its intersection with national security seems unclear. But officials appearing on the "food security is national security" panel this spring alongside Fry—a former general from the Marines, the President of the Chicago Council on Global Affairs (the Think Tank sponsoring the symposium), and a former Congress member—each conveyed that "food security" was likely to continue to have bipartisan support. While it might have to shift to be more "defense" oriented to align with Trump Administration priorities, "food security as national security" seems like a cause likely to proceed in the new administration. After the first few months of the Trump era, a food security agenda increasingly focused on securitization seems compatible with the nebulous New Order. When tracing the shifting political tide and its implications for global food policy, we must attend to what is and is not new in the evolving role of the U.S. in global food politics. A Secretary of State from the oil industry might promote the kind of financial development on the resource frontier that index insurance develops

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Martinez HoSang, Laura Pulido, and Oneka LaBennett (Berkeley, CA: University of California Press, 2012); Chakravartty and Da Silva, "Accumulation, dispossession, and debt."

(weather derivatives were first introduced by energy companies.[443] And with a president that met with CEO's of multinational agribusiness companies at the beginning of his administration, it seems like American security, agribusiness, and financial interests might likely continue along the path of financialized resilience charted by the NIC and GFSS.[444] Regardless of what happens in the near-term future with impending changes in defense and development policy, it remains important to situate the contemporary global food landscape in terms of the kind of intersections of race, finance, and security that this chapter as traced.

[443] Cooper, "Turbulent Worlds."
[444] Tom Philpott, "Trump Is Ready to Bless Monsanto and Bayer's Massive Merger," *Mother Jones* (blog), January 19, 2017, http://www.motherjones.com/politics/2017/01/monsanto-bayer-trump-antitrust/.

Conclusion

Narrated by astrophysicist and popular science educator Neil DeGrasse Tyson, the documentary film *Food Evolution* examines the debates around the health and safety of GMO food.[445] The film opens with statistics about a growing global population and raises the question of whether or not biotech crops can "feed the world" sustainably. It focuses in particular on ongoing legal battles around two high-profile "second-generation" GM crops, that have been heralded for their potential to serve humanitarian causes: GM papaya in Hawaii and GM bananas in Uganda. Using these cases, the film argues that biotech crops have been proven scientifically safe, that concerns over corporate control of seed supplies are overwrought, and that GM technology is a necessary tool to grow crops in the era of climate change. The film's primary narrative revolves around getting to the "scientific truth" around GMOs. This approach appeals directly to liberal-leaning audiences and environmentalists, groups that have historically outright opposed agricultural biotechnology or been leery about embracing GM crops because of health and environmental concerns.[446] Challenging these viewers to consider their biases regarding GM technology, the film emphasizes purportedly humanitarian GMOs, while downplaying concerns around pesticide overuse and corporate

[445] Scott Hamilton Kennedy, *Food Evolution* (Black Valley Films, 2016).
[446] For further discussion on the classed aspects of this discourse, see Heidi Zimmerman and Aaron Eddens, "Governing the Liberal Self in a 'Post-Truth' Era: Science, Class and the Debate over GMOs," *Cultural Studies* 32, no. 6 (November 2, 2018): 953–74, https://doi.org/10.1080/09502386.2018.1431301.

consolidation. In this way, the film operates as a pedagogical tool, offering viewers a chance to consider the science and reflect on their own values.

The film's explicit pedagogical mission—changing people's minds about GMOs—aligns with a growing number of articles and editorials across the mainstream American media, in which liberal journalists and commentators have openly questioned their previous doubts about GMOs, and called for embracing the technology in the name of helping poor farmers in the Global South. A headline in the Washington Post declared: "The Last thing Africa Needs to be Debating is GMOs."[447] A long-form *Slate* magazine essay admonished privileged westerners for opposing GMOs that might help poor people in the global South.[448] And a *Newsweek* cover story that featured profiles of African scientists developing GMO crops stated that "Everything you Know about GMOs is wrong."[449] Public handwringing about the question of whether Western consumer opposition to biotech crops might inadvertently harm poor Others is central to all of these arguments.[450]

I want to conclude this dissertation by considering *Food Evolution* and the proliferation of arguments about Western opposition to GMOs harming poor farmers in

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[447] Tamar Haspell, "The Last Thing Africa Needs to Be Debating Is GMOs," The Washington Post, May 22, 2015, https://www.washingtonpost.com/lifestyle/food/the-last-thing-africa-needs-to-be-debating-is-gmos/2015/05/22/81b76574-fe62-11e4-833c-a2de05b6b2a4_story.html?utm_term=.845e5f82a430.

[448] William Saletan, "Are GMOs Safe? Yes. The Case against Them Is Full of Fraud, Lies, and Errors.," Slate Magazine, July 15, 2015, http://www.slate.com/articles/health_and_science/science/2015/07/are_gmos_safe_yes_the_case_against_them_is_full_of_fraud_lies_and_errors.html.

[449] Tom Parrett, "GMO Scientists Could Save the World from Hunger, If We Let Them," Newsweek, May 21, 2015, https://www.newsweek.com/2015/05/29/gmo-scientists-could-save-world-hunger-if-we-let-them-334119.html.

[450] Mark Lynas, the former Greenpeace activist turned pro-GMO science communicator, has been an especially vocal person in this discourse. See Mark Lynas, *Seeds of Science: Why We Got It so Wrong on GMOs* (London: Bloomsbury, 2018).

Africa. I do so not to weigh in on questions about whether or not particular biotech crops might benefit poor farmers, or even whether or not biotech crops should be deregulated in countries that currently prohibit them. Those arguments should be considered largely on a case-by-case or even country-by-country basis. And there are large differences between contexts, depending on crops, intellectual property issues, etc. Rather, I want to consider *Food Evolution* because it offers a clear example of the ways in which liberal narratives about technological inclusion and providing farmers in the Global South with "choice" are shaped through—and perpetuate—ways of thinking that continue to divide the world in terms of harsh colonial and racial divisions between "the west and the rest." Though *Food Evolution* positions itself in terms of democratizing Western technology in the name of helping poor people in the Global South, we should attend to the ways that it reproduces more "insidious practices of distancing and confinement"[451] that continue to shore up asymmetries of power—between those who develop technologies and those who become target markets, between geographical regions in the South, from which economic value is extracted and global centers of capital in the North that reap profits, and between people thought of as victims and people thought of as the universal "we" charged with the project of feeding the world.

Like the arguments of Norman Borlaug and Bill Gates, the story told in *Food Evolution* pits the "privileged world" against what Borlaug might have called the "forgotten world." Africa stands in as representative of this forgotten world. The film profiles smallholder farmers in Uganda whose banana trees are dying from a crop disease, but who are unable to access a GM variety that might save their trees because of

[451] Glover, "'Flesh like one's own,'" 256.

Uganda's restrictive biosafety law. We meet a family of women farmers, including an elderly woman who is brought to tears while describing how her banana trees are dying. In another emotionally wrenching interview with a black South African farmer, we learn that this farmer is "awaiting" a drought-tolerant maize seed (though the project goes unnamed in the film, the seed referenced is a WEMA variety). The camera captures a close-up view of the man standing in front of his tractor, wearing a Pannar seed company baseball cap, as he tells us that farmers in South Africa are "struggling" and that "climate change is real."[452] The camera zooms in on the farmer's face as he says: "I'm waiting, really, impatiently, because we are losing here." After cutting to clips of a prominent American anti-GMO activist declaring at a conference that his group had "stopped" GM crops like Golden Rice and Alfalfa, the camera cuts to a ground-level perspective of a small boy from the Uganda banana farm. The boy gazes solemnly into the camera, staring across a pile of slowly burning disease-infected banana trees. The camera then cuts back to the South African farmer standing amongst his maize plants, panning away from him to take in more of his field. It then cuts to the farmer standing in front of his tractor as he speaks directly to the film's presumed audience: "Americans, beware, please, be informed that whenever you say no to GM technology you are suppressing Africa—South Africa and the rest of the continent is being left behind."

This kind of argument has long circulated in the agricultural development/agribusiness world. Norman Borlaug forcefully made it throughout the last

[452] The Pannar seed company hat itself is worth considering in greater detail. Though the film suggests we see this farmer in terms of being uniquely "African" (framed in terms of "suffering" and lack), his brand name hat suggests that he is, in fact, part of global agricultural commodity markets. Pannar is an international African seed company, which was the continent's largest, before DuPont Pioneer acquired it in 2013. See Pioneer company timeline: https://www.pioneer.com/home/site/about/business/who-we-are/our-heritage/

two decades of his life.[453] In *Food Evolution* and the growing number of popular media arguments about Africa and GMOs, we see Borlaug's argument re-articulated. These arguments extend the Green Revolution's racialized framing to a wider audience. Yet reviewers have largely overlooked the film's imagery of Africa and Africans, including reviewers quite critical of the film's pro-GMO message. Reviews of the film have mostly interpreted it as either "science strik[ing] back" (*The New York Times*) or in terms of towing the corporate line that biotech crops will feed the hungry world (Marion Nestle, also a group of scholars at UC Berkeley that spoke out against the screening of the film on campus).[454] I argue, however, that the film should be evaluated in terms of its use of racialized images and tropes of poverty, especially its depiction of poor people in Africa.

The film's opening montage offers quick glimpses of crowded urban streets juxtaposed with images of barefooted black people filling plastic water tanks from a communal water pump in an unnamed slum (likely Kampala, Uganda). Tyson narrates facts about population growth while images of decontextualized black children eating food from a rubbish pile are used to signal concerns about food scarcity. One of the film's central plot lines concerns the family of women farmers in Uganda, struggling to combat a deadly crop disease that is wiping out their banana trees and expressing frustration that they do not have access to a potentially saving biotech variety. As

[453] Norman Borlaug, "Feeding a Hungry World," *Science* 318, no. 5849 (October 19, 2007): 359–359, https://doi.org/10.1126/science.1151062. See also examples from chapter 1.
[454] Daniel M. Gold, "Review: In 'Food Evolution,' Scientists Strike Back," The New York Times, June 22, 2017, https://www.nytimes.com/2017/06/22/movies/food-evolution-review.html; Marion Nestle, "GMO Propaganda Film: Food Evolution," *Food Politics by Marion Nestle* (blog), June 21, 2017, https://www.foodpolitics.com/2017/06/gmo-industry-propaganda-film-food-evolution/.

Ananya Roy has written, contemporary Western development projects such as microfinance often frame women as "the figure of resilience charged with converting poverty into enterprise."[455] This figure of the "Third World woman," is central to what Roy calls "poverty capital," as she becomes both a site for investment and a mediating figure between Western subjects and the spatially distant poor. "It is the Third World woman," Roy writes, "who makes possible a transformation of the distance of gender and race into a liberal intimacy with the world's poor."[456] *Food Evolution* plays upon these gendered conceptions of global poverty, inviting viewers to see the women farmers in terms of what Roy calls "timeless image[s] of aspiration."[457] Imbued with moral urgency, these women's stories come to stand in for the plight of poor farmers in Uganda—and across Africa. These gendered constructions are also racialized. In the images of the women, the camera fixates and lingers on their arms, feet, and legs. A shot of the oldest woman farmer chopping up dead banana trees with machetes emphasizes the physicality of her work. These representations work to reinforce "material-cum-ontological borders that draw a sharp line between 'us' and 'them.'"[458] An overhead view of the women and children walking through their banana trees places them *in* the landscape. These ways of framing "African" subjects recall *National Geographic* magazine's lessons about global difference, in which photographs of racialized and sexualized Third World "others" instructed its largely middle class readers to think

[455] Roy, "Technologies of Risk," 136.
[456] *ibid.,* 149.
[457] *ibid.,* 149.
[458] Glover, "'Flesh like one's own,'" 237.

about global difference as racial difference.[459] This imagery naturalizes an understanding of material difference as racial difference, appealing to an assumed Western audience likely well versed in what Glover calls "bodily-based narratives of noncommonality."[460]

These differences are reasserted through the film's explicit teaching moments. The film's producer, Trace Sheehan, and its director, Scott Hamilton Kennedy, have both described their hopes that the film might enable wider "choices" for poor farmers in the Global South. Kennedy often begins his post-viewing screenings by invoking the relationship between "American" viewers and homogenized farmers across Africa. After screenings of the film to packed auditoriums on college campuses across the country, the film's director, Scott Hamilton Kennedy would usually begin the post-film discussion by posing a question a set of questions to the audience. The first, a repeat of the question he had asked before the film, asked the audience: "how many of you have concerns about eating GMO food?" Kennedy then asks the audience: "how many of you think that farmers in Africa should have the right to choose GM bananas?"[461] Inevitably, most of the crowd raises their hands in favor of "farmer choice." In this way, the moral

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[459] See Lutz and Collins, *Reading National Geographic.* "*National Geographic,"* they write, "is the product of a society deeply permeated with racism as a social practice and with racial understandings as ways of viewing the world. It sells itself to a reading public that, while they do not consider themselves racist, turn easily to race as an explanation for culture and for social outcomes" (156-157).

[460] Glover, "'Flesh like one's own,'" 245.

[461] This was how he posed the question at a viewing at the Hammer Museum on the UCLA campus. At other screenings (available on YouTube), he referred to "farmers in Uganda." "Post-Screening Q&A: Food Evolution," The Hammer Museum, November 1, 2017, https://hammer.ucla.edu/programs-events/2017/11/food-evolution/ accessed May 21, 2019. In an interview, Kennedy talks about how they often poll people about their opinions on GMOs before and after the film. He said that in Seattle, the crowd went from 100% "concerned" before the film to having "zero people" raise their hand after the film. "We are seeing the film change people's minds in real time," Kennedy declared. "Scott Hamilton Kennedy – Ecomodernist Podcast," Ecomodernist Podcast, July 31, 2017, http://ecomodernistpodcast.org/tag/scott-hamilton-kennedy/ accessed May 23, 2019.

imperative to "include" poor Others in Western technological progress operates through racialized and gendered exclusions that reinforce conceptions of difference.

Thinking through this kind of inclusionary exclusion demands thinking about the relationship between racial capitalism, colonialism, and liberalism. The narrative of *Food Evolution* is couched in terms of liberal values of rationality, universality, and progress. Following Lisa Lowe's important contributions in *The Intimacies of Four Continents,* we should account for how liberal ideas were built through the violent exclusion of colonized and enslaved people deemed outside the realm of the liberal subject. As Lowe argues: "as modern liberalism defined the 'human' and universalized its attributes to European man, it simultaneously differentiated populations in the colonies as less than human."[462] "Even as it proposes inclusivity," Lowe writes, "liberal universalism effects principles of inclusion and exclusion; in the very claim to define humanity, as a species or as a condition, its gestures of definition divide the human and the nonhuman, to classify the normative and pathologize deviance."[463] Legacies of racialized violence and differentiation extend through this colonial legacy into the present. *"Race* as a mark of colonial difference is an enduring remainder of the processes through which the human is universalized and freed by liberal forms, while the peoples who created the conditions of possibility for that freedom are assimilated or forgotten."[464] Following Lowe, we should attend to liberalism's forgotten (or disavowed) history of racialized and colonial violence. This would mean calling into question how stark conceptions of geographical and bodily difference become naturalized through

[462] Lisa Lowe, *The Intimacies of Four Continents* (Durham: Duke University Press, 2015), 6.
[463] *ibid.,* 6.
[464] *ibid.,* 7.

discourses about poverty and hunger. The lessons we learn from film's like *Food Evolution,* about the urgency of bringing Western technology and expanding capitalist agriculture, encourages viewers to think about African farmers as isolated and absolutely different from their own lives. In this way, it perpetuates a way of thinking about global poverty that disavows historical, political, and economic relations between North and South.[465]

This dissertation offers ways to begin to think relationally about pressing issues of poverty and hunger in an era of climate change. The kind of historical and genealogical analysis of the Green Revolution offered here opens up a different set of questions than those offered by *Food Evolution* and many other recent commentaries on the issue of "feeding the world." These include questions about historical responsibility, about how particular knowledges are deemed modern and authoritative, while others are viewed as "not yet" developed, and about how racialized thinking persists, even in ostensibly post-racial and humanitarian projects. Through tracing transnational and historical continuities across the Green Revolution, this dissertation will hopefully enrich many future conversations concerning ever-pressing issues around food, power, and justice.

[465] Ananya Roy and Emma Shaw Crane, eds., *Territories of Poverty: Rethinking North and South* (Athens, Georgia: University of Georgia Press, 2015).

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