Misreading the Bengal Delta

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Entangling Rice, Soil, and Strength in a Freshwater Village

Back in Dhaka, I was invited to present some preliminary fieldwork findings at a donor office located in the luxurious Gulshan 2 embassy area. During the presentation, I shared the concerns of my interlocutors regarding the overuse of fertilizers and their damaging impact on the soil, the lack of nutrition in high-yielding rice, as well as the prevalence of toxic pesticides that harmed the soil, multiple species, water, and people. As soon I finished, the donor’s climate and environment representative dismissed these statements as “nostalgic anecdotes.” He argued that “to ensure the food security of Bangladesh’s 160 million population, the higher yields offered by high-yielding variety seeds and agrochemicals are essential.” The focus on population growth and quantity of food was similarly emphasized in a World Bank modeling study of the economic cost of yield loss under different climatic scenarios; it ultimately recommended high-yielding rice and agrochemicals as a form of climate change adaptation (Yu et al. 2010, 116).

In several donor countries, citizens, states, and businesses all acknowledge inefficiencies in, and the unsustainability, of “conventional” agricultural production. Indeed, a growing movement for sustainable practices is taking place in many donors’ home countries in the West. However, agricultural interventions in the Global South continue to be based on narratives of “feeding the hungry” (Cullather 2010, 3), where Bangladesh, with its large population, is referred to as a “modern-day Malthusia” in ways that legitimize technologies to increase crop yields (Orr 2012, 2). Donors reframe concerns for climatic risks and a growing population to legitimize and promote “food security” projects that are essentially for-profit interventions that include intensified cropping patterns and high-yielding and high-value crops dependent on agrochemicals (US Agency for International Development 2017; Yu et al. 2010). Like embankments as protection against rising sea levels and tiger-prawn cultivation as a response to salinity, increased agricultural output for “food security in a climate risk future” also constitutes a narrative of improvement that maintains an ignorance...
of how these very same technologies (groundwater irrigation, agrochemicals, monocultivation) have been damaging both in Bangladesh and throughout the world. Agrochemicals are based on finite fossil fuels and contribute to global warming (Kahrl et al. 2010). Their overuse also results in soil acidification and reduces the long-term food production capacity of the soil (Mulvaney, Khan, and Ellsworth 2009).

The translation of capital-intensive agricultural technologies as adaptation to climate change is a continuation of activities pushed on Bangladesh throughout the Cold War and through donor imposition of Structural Adjustment Policies. Examination of critical histories of colonial famines and the Green Revolution allow us to rethink Bangladesh as Malthusia where food supply must be increased to feed growing and starving Asian populations.1 Looking at how the Green Revolution was introduced to Bangladesh—spawning resistance, contestations, and criticisms—helps contextualize the long-standing and unresolved problems caused by these interventions seeking to “modernize” and enrichen a “poor” Bangladesh. Sadhu Kaka’s song bigganer lorai (the struggle fought by science) is an example of a local critique of modernization that brings together two key concerns of intensive agriculture in Bangladesh today: the loss of shakti (strength, soil fertility, energy) and increased bhejal (adulterated, corrupted) foods. People in Nodi believe high-yielding rice causes the loss of shakti in soil, food, and humans, and highlight the loss of taste and nutrition in food and the loss of multiple species in the environment. The Bengali concept of shakti resonates with how environmental anthropology is increasingly concerned with the entanglements of organisms whose lives and deaths are linked to human socioecological worlds (Kirksey and Helmreich 2010, 545). The emic concept of shakti further captures the material effects of the overuse of synthetic nitrogen: both on the soil and the multiple species that live within it. This includes, among other things, the micronutrients and microorganisms necessary for human health. Anthropologists have long been urged to resist a positivist reflex to empirically validate ethnographic insights through “the blinding lights of western science” (Comaroff and Comaroff 2003, 158). However, the multispecies turn in anthropology today is an effort to take seriously material understandings of the entanglements of environment and bodies (Daly and Shepard 2019, 17), thus helping us to better understand the concept of shakti as something that captures physical and not only social or symbolic change.

Bangladeshi concerns over bhejal food encompass extensive and illicit pesticide use as well as widespread practices of food adulteration. Bhejal food exemplifies Polanyian critiques of the self-regulated market: the intensification
of commercial agriculture has made food into an anonymous commodity and thereby disrupts local understandings that view soil, food, and humans as entangled. The translation of yield-centered agriculture as adaptation—like embankments and tiger prawns—thus ignores a longer history of how these proposed interventions are unsustainable and fails to address an acute problem of the overuse of chemicals that risks both human health and long-term soil fertility. This toxic agroindustry has brought on ecological disruption by dumping unwanted chemicals in Bangladesh (Gregow and Gain 2002), which together contribute to unknown and multiple extinctions of organisms in the soil, resulting in the loss of shakti and growing health problems.

Rethinking Bangladesh as Malthusia: From Famines to the Green Revolution

Malthus regarded the food supply as fixed and an inevitable check on the growing population and wealth of each country. Malthusian discourses establish hunger as related to a country’s size and the amount of food it can produce and was at the forefront of discourses of famines in colonial times (Davis 2007). With the growth of neo-Malthusian convictions that agricultural technological innovation is our only hope to save billions of lives from hunger, it remains a powerful discourse today (Stone 2019). Critically examining such colonial discourses and that of the Green Revolution helps us to rethink Bangladesh as a modern-day Malthusia (Orr 2012).

Areas that were not cultivated in colonial times were considered unprofitable wastelands. In the 1860s, the newly created British Raj promoted the process of agrarian “involution”: intensified cultivation of two to three crops per year (Van Schendel 2009). Colonial efforts to increase agricultural productivity focused on export-oriented commercial cash crops with high-market value—cotton (before 1820), indigo (1820–1870s), jute (1850s–1930s), and staple food crops—rather than local food security (Caird 1878). Different parts of Bengal experienced varying degrees of capitalist agriculture during the British period. The Sundarbans region of what is now southwest coastal Bangladesh was not exposed to intensive rice cultivation: seasonal migrants planted rice in the monsoon and returned in the winter for the harvest (Lahiri 1936, 21). Large areas of cultivated rice fields were left without a trace of human habitation for the rest of the year (37).

During the 1870s famine, the Indian Famine Commission—despite its avowed aim to protect its Indian subjects from famine—neglected the role of
colonial grain export policies in undermining local food supplies and threatening food security (Caird 1878). Similarly, the Bengal Famine of 1943 occurred in the wake of the colonial Churchill administration exporting grain out of Bengal to feed British soldiers abroad during WWII. The famine was compounded by the lack of food for domestic consumption. In total, 1.7 million people died, the majority of whom were landless agricultural laborers, fishermen, artisans, the permanently workless, destitute, and beggars (Iqbal 2010). Stockpiling food from the subcontinent for postwar Britain and Europe—with advice from Malthusian scientist and eugenicist Lord Cherwell—resulted in the deaths of around three million South Asian people (Mukerjee 2010). This highlights the important insight that famines are always human made and the outcome of mismanagement (Sen 1981; Drèze and Sen 1989).

While donor-dependent Bangladesh continues to evoke an image of masses of poor, starving people, the issue of food availability is one anchored in a socio-political reality of inequalities within Bangladesh. This is poignantly illustrated by the difference between the overweight and diabetic urban upper and middle classes versus the poorer and physically active rural populations. Thus, a narrative of improvement that insists on increasing yields to ensure food security does not engage with the problem of food (mis)distribution, which has been persistent since colonial times.

The Green Revolution: Yields to Feed a Hungry World?

The goal of the Green Revolution was to enable year-round cultivation. It promoted short-term maturing crops and horticulture, high-yielding seed varieties, agrochemicals, and mechanized plowing, harvesting, and irrigation. The premise was that modern agricultural technologies could save billions of lives through the application of scientific innovations. In the past decade, critical histories of this Cold War experiment provide a fundamental rethinking of the many key aspects of this movement, the motivations behind it, the merits of the agricultural sciences in South Asia that it replaced, and whether new seeds actually led to increased food production (Stone 2019).

The Green Revolution was essentially an American Cold War project based on the Malthusian narrative of balancing food supply and population to avoid hunger resulting in communist revolutions. It was also a modernizing project that aimed to inculcate “progressive” (capitalist) values to “backward peasants” and inspire them toward broader social change. In this context, agriculture was a way of reshaping nations well beyond US borders (Cullather 2010).

The Green Revolution emerged in most of the Third World in the mid-1960s. In 1966, the
American Ford Foundation and the Rockefeller Foundation created the International Rice Research Institute (IRRI) in the Philippines to breed a “miracle rice”: a high-yielding variety that required artificial irrigation, pesticides, and synthetic fertilizer to sharply increase crop yields—known as IR-8—in a “big jump” to compete with the many different rice-breeding stations in the Philippines and greater Asia (Cullather 2010, 167). During this period, IRRI and the Ford Foundation established the Pakistan Academy of Rural Development in Comilla, East Pakistan, which became known as the “Comilla model of rural development.” Enabled by the Ford Foundation’s aim to “modernize peasants through science and development,” the laboratory became a frontline in the Cold War, promoting the superiority of US capitalism with its irrigation technologies, American agrochemicals, and “scientifically bred” miracle rice (Cullather 2010).

Although the Comilla experiment ultimately failed to spread in East Pakistan (Lewis 2011), war-torn Bangladesh received substantial funding to modernize agriculture from USAID, the Asian Development Bank, and the World Bank (Alauddin and Tisdell 1991). Groundwater irrigation and the cultivation of *boro* (spring) rice during the otherwise fallow dry season expanded during the 1970s. In 1972 there were only 1,237 deep tube wells in the country; by 1979 the government had installed 9,329. In Khulna district, deep tube wells went from zero to forty-four in between 1973 and 1979. Similarly, the area irrigated with shallow tube wells and power pumps increased in the late 1970s in the Khulna area, while the area irrigated with canals dropped from twenty-six thousand acres in 1977 to nine thousand acres the next year (Bangladesh Bureau of Statistics 1980, 194–200). The use of tube-well water for dry-season irrigation and drinking water contributed to falling levels of groundwater, which increased salinity and arsenic levels in tube wells. “This, in turn, contributed to widespread arsenic poisoning in both drinking water and irrigated crops.”

Increased food production in India and Bangladesh was due to the development of shallow and deep tube wells for artificial irrigation, rather than high-yielding rice (Subramanian 2015). Irrigation enabled the addition of a new winter crop and the expansion of crops to areas that were previously fallow (Alauddin and Tisdell 1991). Bangladesh’s deep-water rice demand made HYV miracle rice only possible as an irrigated spring (*boro*) crop. The Bangladesh Rice Research Institute worked for a decade to release rainfed *aman* variety BR-11 in the 1980s (Orr 2012). The development of a deep-water rice variety combined with structural adjustment policies (chap. 5) resulted in Green Revolution technologies spreading only in the mid-1980s. Longstanding public-sector agricultural research and extension were now supplemented by privatized agricultural
input provisions to promote high-yielding seeds, mechanized plowing and irrigation, chemical fertilizers, and pesticides (Lewis 2011).

Bangladesh has gone from producing twelve million tons of rice in the 1970s to thirty-six million tons in 2019, meaning that it is more than self-sufficient in grains and can export rice. Many believe that the Green Revolution was the key factor in this increase in production (Jensen 2020). The government of Bangladesh, through donor-funded development interventions, actively subsidized and promoted synthetic fertilizers and pesticides to expand agricultural land and increase output per acre. Bangladesh’s first fertilizer factory began to produce urea (synthetic nitrogen) in Ghorasal in 1970 and 1971 (Ministry of Agriculture 1973). Promotional activities include significant subsidies that more than doubled pesticide use from 7,350 tons in 1992 to 16,200 tons in 2001 (Development Economics Research Group 2013). Urea is now the most widely used fertilizer in Bangladesh and the use of synthetic nitrogen per hectare is one-third higher than in the rest of Asia—and double the world average (Qureshi 2002, cited in Rasul and Thapa 2003). In 2008–9, Bangladesh spent US$758 million on urea support to farmers (Huang et al. 2011; FAO 2011, 88). Such modern seed-fertilizer-irrigation technology is import intensive; by the early 1990s Bangladesh had become heavily import-dependent on agrochemicals (Alauddin and Tisdell 1991, 279).

To maintain the same amount of crop yield, farmers have to apply significantly more chemical-based fertilizer per year. Since the 1990s, agricultural scientists have warned that the imbalanced use of fertilizer for cultivating high-yielding rice varieties has increased soil acidity in Bangladesh (Conway 1990; Alauddin and Tisdell 1991, 274; Hossain, Salam, and Alam 1994). The Green Revolution and its focus on yields exemplifies how capitalist exploitation of the land as an extractable resource is unsustainable, which Marx described as “blind desire for profit” that “exhausted the soil” (Marx 1976, 348). The loss of soil fertility plays an important part of the lived experiences of agrochemicals and HYV seeds in Nodi—an area where the Green Revolution came late. An attention to local people’s conceptualization of the loss of shakti in the soil in Nodi supplements scholarly analysis of the violence of the Green Revolution (Shiva 1991; 1993).

The Struggle Fought by Science
Despite the implementation of Green Revolution technologies in central and northern Bangladesh, the southwest coastal regions, including Khulna district, still grow a single, low-yielding rice crop during the wet season using tall, photoperiod-sensitive traditional varieties. Much of the land remains fallow for three to seven months every year (Mondal et al. 2015). Agricultural scientists suggest
that this region has largely “missed out” on the adoption of “improved” and “progressive” agricultural technologies and management (Yadav et al. 2020, 333). Increasingly, the region’s vulnerability to climatic risk is hailed as a reason to scale up and intensify agricultural production that will lead from poverty and hunger to prosperity. Despite the Green Revolution’s contested legacy and its poor results on both social issues and the environment, the development industry has invoked it for the past few decades to expand global capitalist flows of agriculture into Africa and beyond—where hunger, along with climate change, are subject to technical fixes that avoid historical responsibility (Cullather 2010).

This is similar to maintaining ignorance in schemes to improve the human condition, where particular parts of the state simplify agriculture by drawing on narratives of improvement and a high modernist ideology that venerates high-yielding variety seeds, artificial irrigation, petroleum-based capital-intensive inputs, and year-round cultivation. The coalition between state and capital includes global corporate networks of the agrochemical industry (Monsanto, Syngenta), certain donors, and specific research organizations. Yet at both the state and institutional level one can find internal contestation—between fisheries and agriculture, export-oriented aquaculture and indigenous wild fisheries, and import-heavy agricultural technologies and indigenous rice varieties as well as local practices of irrigation and fertilization. The hegemony of a “state” narrative is therefore not uniform or uncontested and reflects different institutional agendas.

For example, the framing of traditional versus progressive agriculture is driven by American agrointerests, echoing how the Ford Foundation’s Comilla experiment saw farmers as backward (Yadav et al. 2020). The American-funded Pakistan Academy believed that it was Muslim peasants’ religiosity that contributed to their unwillingness to embrace technologies and practices that would result in farmers being deeply entangled with the market (T. Ali 2019, 446). Yet, objections to tube wells, though couched in religious terms, were responses to the commodification of water. As a farmer stated to an academy official: “[Water] is the Gift of God and everybody has the right to use it free of cost. Why should we spend money for such a Divine Gift?” (445).

Spirituality in South Asia has a long history in resisting foreign and colonial interventions of modernization. In crafting a link between diet and nationalism, Mahatma Gandhi used food as a potent symbol of the value of the particular, the local, and the individual under assault from the homogenizing logic of science (Cullather 2010, 31). Progress, science, and modernity thus became a tool for the colonizer that also helped create the category of undeveloped (Gupta 1998). The Green Revolution was also a modernizing project: to change the mindset of
Third World farmers through science to make them modern and ensnare them into the global capitalist market. This science favored heavily deductive models over “more inductive local ones” (Sillitoe 2000b, 7)—casting “indigenous” agricultural practices (including those of *aushtomashi bandhs*) as “traditional” and therefore backward and inefficient (Sillitoe 2000b, 3). In such a context, religion and spirituality remained spheres in which to contest and resist foreign high-yielding capital-intensive agricultural technologies.

Sadhu Kaka lives in southern Dhanmarti (“rice paddy soil”). He is an eighty-year-old farmer who studied to the age of nine (class four) in the 1940s and keeps abreast of local, national, and global news through newspapers and the radio. Sitting in his earthen home, he described how the construction of embankments reduced soil fertility. “Now we must grow IRRI rice that needs *sarh* [synthetic fertilizer] and *kitnasak* [pesticide].” Sadhu Kaka asked if I wanted to hear a song he had written. He sang:

*The Struggle Fought by Science*

This world is engulfed by the struggle fought by science
There are no longer elephants, horses, boats, and canoes
Now paddy is made through technology
While people are becoming *sangkar* [hybrids, impure]
With the pure knowledge of Science we can breed children without men
Now we can hear of terror, robberies, and rape
We talk through telephones, sending news abroad
The breeze from electric fans and the light of lamps help soothe physical fatigue
We see far away through telescopes
We find answers through computers
Mechanical plows cross the fields
Men are flying to the realm of the moon
The atom bomb was invented
Seeing signs of the world’s destruction
Oh, *dada bhai* [brothers, Hindu and Muslim]
Seeing signs of the world’s destruction

People are cut up and stitched up again
Seeing people we run and flee because of fear
Now God took the opportunity to dive into the ocean
With tidal surges he seeks to drown the earth
Tornado, cyclone, and thunderbolt cause lives to be lost
I see death all around me
Everyone says let’s pray once more
Then the world’s chaos will be diminished
Let us die now
Arun says “Krishna, offer your blessings at the end of the game”

Bigganer Lorai—original Bangla (transliterated)
Cholchey e jogotey bigganer lorai
Hati, ghora, nouka, dingi, kono kichur nei balai
Ar projuktitey dhan holo
Manusher bhitor shongkor jonmiloi
Bigganer shuddho gayaney purush bhinno shontan pai
Eybar shontrash ar rabajani dhorshoner o kotha shuntey pai
Telephoney bolchey kotha, bideshetey pathai barta
Fan, light er alo batashey deber klanti durey jai
Durbin er durodrishtie
Computer ey uttor pai
Koler langol ghurchey mathey
manush urchey oi chondralokey
Srishti holo atom bomber
Bishsho dongshe ingit pai
Oh dada bhai
Bishsho dongshe ingit pai

Manush ketey manush jorey
Manush deykhey bhoey palai
Bhogoban eybar shujog bujhey dub dieychey oi shagor soliley
Uthoniya jolochchasbe prithibi dubatey chai
Tornado ar ghurnijhorey bojraghatey pran harai
Choturdijey deykhie mrittur role
Shobhey ekbar horibol
Nibhey jabe bhober gondogol
Cholo eybar morey jai
Arun boley kheylar sheyshey choron dio pran kanai

Sadhu Kaka’s song is a nuanced and evocative critique of technology that draws on divine powers and their wrath to highlight the dangers of human hubris. By
making both paddy and humans through technology, rice and people are *sangkar* (hybrid). High-yielding IRRI rice is also locally referred to as hybrid rice. Sadhu Kaka suggests that hybrid rice is turning people into hybrids, mixed of two different substances. The use of hybrid can be interpreted as an expression of local cultural contestations that critique the fragmentation of agricultural knowledge and how it has become divorced from its sociocultural context (Vasavi 1999). In India, like in Bangladesh, hybrid impurity is transferred from rice to humans and transforms people who produce and consume them into “hybrid people,” where hybrid is associated with increased disease and destruction, symbolizing the erasing of duties, traditions, and charitable work (Vasavi 1994; 1999).

However, Sadhu Kaka describes how the struggle fought by science has both bodily and wider environmental consequences. Rice and people becoming *sangkar* captures how IRRI rice—produced through synthetic fertilizer rather than with cow dung—is said to lack *shakti*. His reference to people being cut and stitched up again was a common local reference to organ snatching. Several of my interlocutors described this as a growing problem, because so many people suffer from liver and kidney problems caused by *bhejal* foods. Sadhu Kaka’s critique not only reflects social change but also captures material and physical changes to (socioenvironmental) well-being. Agricultural technologies based on heavy use of synthetic nitrogen and toxic pesticides reduce biodiversity and ecological resilience captured through the loss of *shakti* in the soil, plants, and people, as well as the loss of species (birds, frogs, earthworms).

**Tasting Shakti: Microbial Soil Assemblages**

While I was visiting different villages for my household survey, my motorcycle driver Hassan would often return home to Dhanmarti village in the middle of the day to bathe, pray at the mosque, and have lunch. I often accompanied him and sat with his wife, Bhabi [“brother’s wife”], in their earthen kitchen, trying to learn how to prepare the fish that Hassan caught moments earlier from their pond. This became a relaxing space as I immersed myself in the daily routine of preparing food and eating and chatting with them and their neighbors, particularly with Fupu. Fupu was in her seventies and extremely thin, her skin leathery with wrinkles and her short stature further accentuated by a hunched back, yet she would often smile with her kind eyes. During one of our conversations she described how the remaining salt residue in the soil from tiger-prawn cultivation necessitated a continued cultivation of high-yielding variety rice. She mourned the loss of *desi* [local] rice varieties and the loss of *shakti* [life force] in the soil and in rice.
The soil lacks *shakti* after the salinity of tiger-prawn cultivation and we must continue to eat IRRI dhan. This rice makes me cry; it has no taste. It needs a lot of salt and spices to make it edible. There were so many types of *mota dhan* [thick rice, used interchangeably with *desi dhan*]: kachra, moglai balam, chapshoil, bashmoti, bargaza, boglapata, dudiaktail, bashful balam, bohora, moinamoti before *bagda gher* started here. I no longer remember them all. These were such fragrant rice varieties; it was heaven to eat the grain just on its own with some salt and nothing else. We even drank the starch water. You can’t do that with IRRI rice, it doesn’t have the same taste. We eat it [IRRI] so that we do not feel hunger, but there is no *pushti* [nutrition] and no *shakti* [strength] in IRRI rice. We did not have these chemical pesticides and fertilizers when I was young. There was so much *shakti* in the soil, we got high yields and the rice was filled with taste, *pushti*, and *shakti*. Now that we use all these chemicals there is no *shakti* in the soil or in IRRI rice.

Why do people perceive IRRI rice as lacking *shakti*? What issues are there with synthetic nitrogen as a fertilizer and what is its impact on the soil and the multiple species contained within it? People in Dhanmarti state that they can *taste* the difference of food with, and without, *shakti*. Attention to the materiality of this sensory experience, rather than seeing it as symbolic of changes in social relations, may help us better understand these questions.

**Fertilizer Sucks the Earth Dry**

In Nodi, more than thirty different *desi* rice varieties were extensively cultivated during the monsoon season until the 1980s when tiger-prawn cultivation was introduced. Sadhu Kaka and Fupu mentioned *patnai*, *baktoolshi*, sylhet, dbhalaboga, balam, kalajira, salbang soru, rupsail, rampail, dalpi, bankchure, kamal bhog, dad khani, kalo bogra, rani pagal, kanakchura, sorpati, tirasail, malapati, pono-aush, pan-kalosh, darpotru, baneshwar, bonachal, paysra-rai, kalaraia, jingasail, harimati, kapilbhog, bharahri, hamai, lilabati, oratsail, chadansail and katicail. Few farmers today cultivate the rare and expensive *desi* varieties benaphol, bashful balam, and *kachra*, and if they do, it is for their own household consumption and not for sale. Most of these *desi* varieties have been replaced by a handful of IRRI rice varieties, mainly BR-23 (*IRRI teish*)\(^{10}\)—highlighting how the search for higher yields has also resulted in a loss of biodiversity and plant species (Shiva 1991; 1993).\(^{11}\)

*Desi* paddy plants are tall, grow slower, and their leaves “bitter,” while IRRI paddy plants are shorter, mature much faster, and their leaves and stems are “sweet” and succulent in a way that attracts insects.\(^{12}\) This, my interlocutors
explained, is because IRRI rice is grown with synthetic nitrogen (*sarh*). Fupu connected this to greed: “When people grow food to sell [in the market], they use too much *sarh* so that they can grow faster to make a profit. But there is no *shakti* in *sarh*.”

Urea lacks *shakti*. This results in less *shakti* in the soil (reduced soil fertility). Saanchit, a small farmer from Dhanmarti who often acts as a broker between his fellow villagers and different development projects, explained his concerns:

Before these modern technologies [HYV seeds, agrochemicals], our main sources of fertilizer were river silt (*polli*) during the monsoon and from cow dung. We used to learn how to cultivate from our fathers, but this use of IRRI *dhan* that is dependent on synthetic fertilizers like urea, this is new knowledge. Every year we must increase the amount of urea. It [urea] is such a damaging thing that it sucks the earth dry; the actual *shakti* of the soil is consumed by urea to strengthen itself to give to the plant. I’m not sure if it is possible to grow rice in ten years, the capacity of the soil is weakening.

Bangladeshi agricultural professionals like Mr. Golam, a Department of Agricultural Extension official, describe soil infertility as arising from nutrient imbalance in the soil due to farmers overusing synthetic macronutrients:

We [DAE] promote organic manure, but farmers prefer to use urea, TSP, potash. There are a lot of microorganisms in the soil. Overusing nitrogen without adding the other nutrients results in microorganisms dying in the long term, rendering chemical fertilizers less and less effective. The land is becoming barren and we have known that this is a problem for the past twenty to twenty-five years. Both chemical fertilizers and red-listed pesticides are still in use, because farmers do not want to listen if you don’t have any project.¹³

Such a narrative ignores the ways in which coalitions of state actors, NGOs, and research organizations have “experimented” with rural development in Bangladesh through subsidies and credit to start this mode of agriculture in the first place. Mr. Das, an agricultural research officer at a different institution, pointed out how various agriculture projects and extension services imparted the importance of yield and profit on the Bangladeshi farmers, adding: “Urea [synthetic nitrogen] is inexpensive and helps farmers grow their crops quicker and make them look attractive. Micronutrients, on the other hand, are expensive and the effects are not visible to the eye, so farmers prefer to use urea as it will help their
prof. Farmers are overusing macronutrients, particularly overusing nitrogen. Too much macronutrients results in a nutrient imbalance in the soil.”

**Lifegiving Cow Dung**

Could it be that the lack of *shakti* in the soil and food is equivalent to the lack of micronutrients? People in Nodi described *desi* rice varieties as rich in *shakti*—*shakti* was used to describe not only soil fertility and plant resilience, but also strength, nutrition, and good health. *Desi* rice, at least in Nodi, continues to only be fertilized with organic matter such as fermented cow dung and decomposed plants (from monsoon inundation). These substances are deemed to be filled with *shakti*, in contrast to IRRI rice cultivated with synthetic fertilizers, which does not contain *shakti*. This lack of *shakti* was denoted through the embodied experience of taste. Food with less *shakti* also has less *shaad* (taste), as Salma expressed: “*Mota dhan* is so tasty that you can eat it with only salt, while eating IRRI *dhan* with salt brings tears to my eyes. . . . There is so much *sarh* used in IRRI to make the rice grow faster, but it makes the taste disappear. Rice cultivated with cow dung tastes nice.”

Recent plant ethnographies highlight the importance of sensory experiences to understand how plants communicate. They mediate information of the environment and of their own health (Boke 2019), where phytochemicals, chemosensation/biosignals of tastes and properties such as “bitter” and “strong,” transmit information within plants themselves, to one another, and to fungi, animals, and the biosphere (Daly and Shepard 2019). That *desi* rice—fertilized with organic matter like fermented cow dung, which is filled with microbial life—*tastes* better is an indicator that it too is filled with *shakti*. Indeed, in South India, farmers refer to dung from *desi* cows as a “nectar of life” (Münster 2018; 2019).

Cow dung is still essential in Nodi, where not all land is cultivated during the dry season. Instead of being “unproductive” (Yadav et al. 2020), this fallow land enables people to access common grazing land for their cows and provides several important benefits to local families. As Fupu described: “Before tiger-prawn cultivation [in the 1980s], we had so many buffalos in this area. The buffalos were great. We used them to plow the fields. Their manure, filled with *shakti*, fertilized the fields and replenished the soil with *shakti*. We drank their milk, there is a lot of *shakti* in buffalo milk. But now we do not have enough cows to fertilize the fields.”

However, as machines have increasingly replaced animals in tilling the land, there is now less incentive to keep them. Furthermore, once dry season crops (tiger prawns, *boro* rice, sunflower, maize) are introduced, they replace the fallow

FIGURE 4.2. Rare view of men plowing rice fields with desi cows and a langol (indigenous plow), 2015. Photo by author.
period, and local families are then pressed to buy feed for their livestock. In Nodi today, very few households can afford to keep cows, as fodder has turned into a commodity to be purchased. The number of livestock has dropped drastically due to these expenses; most of my interlocutors in Nodi were unable to provide their children with fresh milk as they did not own cows, and buying milk was too expensive.

When the number of buffalos and cows drop, so does the availability of manure. Consequently, farmers, through the DAE, are encouraged to use sarb. Fupu described how earthworms (kechu) thrived in soils fertilized with cow manure. She lamented the death of earthworms in recent decades: “We used to have earthworms that acted as a natural form of plow (prakritik langol) and they increased martir shakti [soil fertility, life force of the soil]. The salt from ghers killed them, but even with monsoon rains removing the salt from the soil, synthetic fertilizers and pesticides continue to harm them. Without earthworms, the soil loses its shakti.” The loss of earthworms indicates that soil health is suffering. Synthetic nitrogen is proven to negatively affect earthworms, enchytraeids, microarthropods, and nematodes, which all contribute to declined soil fertility (Postma-Blauw et al. 2010). We still do not fully understand the ecology of soil organisms and how they are connected, how biodiverse soil ecosystems may be, or what ecological roles this diversity plays (M. Smith 2011). We do not know all the life present in the soil, with at least half a million species of bacteria in a single soil sample site. We do not know the soil’s relations with various microbes, soil mites, nematode species, vascular plant roots, algae, insects, fungi, earthworms, and mammals, all of which are creating and consuming soil particles, decaying organic matter, and aqueous solutions. We therefore cannot know to what extent the loss of micronutrients, microorganisms, and shakti may be connected as many soil-inhabiting species have become extinct before we even identified them.

Loss of Shakti: A Material and Ecological Critique

Shakti is not only a critique of a new mode of agriculture, or solely related to soil fertility. Shakti is strength, power, force, capacity, and potency. Fupu argued that less shakti in the soil means less shakti in food, which ultimately means less shakti in humans. Shakti is a vital energy, a substance, transmitted from nature (soil, plants) to humans. Such a view of substance exchange belongs to a long tradition of Ayurvedic thought. Ethnosociologists of India interpreted this as a cosmology where people are “individus” who constantly exchange parts of themselves with what is in their environment: that material substance and spiritual essence interact and that these bodily substance-codes are repeatedly transformed
through material transfers and transactions (Marriot 1976; 1989; 1990). Rather than directly analyzing environmental change and its impact on the body, the anthropological theories of dividual, substance code, and person-centric categories were used to make sense of social organization, notions of purity, and caste hierarchies.16

However, symbolic interpretations of local cosmologies where rife with misinterpretations. For example, McKim Marriot translated *dosa* (biological energies in Ayurveda) as humors (*vatta* [air, wind], *pitta* [bile], and *kapha* [phlegm]) even though “due to the ‘inseparable blending’ of the ‘physical’ with the ‘metaphysical’ *dosa* should never be translated as wind, bile and phlegm, but the bio-motor force, the metabolic activity, and the preservative principle of the body” (Langford 2002, 151). The inseparability of *dosa* from the environment is thus connected with the idea that the body cannot be separated from the world.

Such ideas of inseparable blending can also be found in Marx’s *Early Writings* on *stoffwechsel* (exchange of substances, metabolism) as “a process by which man, through his own actions, mediates, regulates, and controls the *stoffwechsel* between himself and nature” (Foster 1999, 141). Marx wrote: “Nature is man’s *inorganic* body, that is to say, nature in so far as it is not the human body. Man *lives* from nature, i.e., nature is his body, and he must maintain a continuing dialogue with it if he is not to die. To say that man’s physical and mental life is linked to nature simply means that nature is linked to itself, for man is a part of nature” (cited in Foster 1999, 72).

Here Marx’s use of nature resonates with the Ayurvedic concept of *prakṛti* [nature, constitution, disposition], where a person’s *prakṛti* can change slowly due to influences of medicine, food, and climate: it is a feature of the relationship between the patient and her environment (Langford 2002, 151). Land and labor were not separated within Europe prior to the twentieth century: “labor forms part of life, land remains part of nature, life and nature form an articulate whole” (Polanyi 1957, 187). From South Asia and preindustrial Europe, a similar idea of sharing substances between humans and the environment is also found in Amazonian personhood where the indigenous Makusian concept of *ekaton* [soul] is the vital essence that “brings life to things” (Daly and Shepard 2019). Like *shakti*, *ekaton* unites plants, animals, and humans in an integrated web of cosmic sociality that defies Cartesian duality as the transmission of a plant’s *ekaton*—manifested in its taste, odor, and coloration—and infuses the body of the person consuming it.

Such cosmological and spiritual processes may not simply be part of “local beliefs.” Our understanding of the biological world has always been fundamentally
linked to how we are able to perceive it, and what we can perceive is tied to the technologies we have for seeing. Today, with greater power, resolution, and visual analyses, transmission electron microscopes have sparked several new biological insights (McFall-Ngai 2017). Darwinian ideas of autonomous species and single, individual organisms have proven to be significantly flawed as the latest biological research shows that individuals are not particularly individual at all (Gilbert 2017, M71). Instead of bounded entities made up of preexisting bounded units, “organisms” have turned out to be complex assemblages (McFall-Ngai 2017, M52). Human beings through our skin, gut, and genomes are entangled with multiple species, our bodies interdependent with the trillions of beneficial microorganisms dwelling inside us (Schuller 2018). They are a medley of microbial becoming (Haraway 2008, 31; Kirksey and Helmreich 2010), containing more bacterial cells than human ones (Gilbert 2017). Human personhood thus constitutes a “microbial self” emerging from a network of interdependent interspecies relations (Schuller 2018) and symbiotic assemblages in complex systems (Haraway 2017; Rosenberg and Zilber-Rosenberg 2016).

Multispecies ethnography has helped anthropology move beyond interpreting human-environmental relations as symbolic of social relations (Kirksey and Helmreich 2010). By incorporating cross-disciplinary insights, anthropologists are increasingly able to conceptualize the importance of symbiotic makings (sympoiesis, making-with) in the comaking of living things (Haraway 2017). Such research has caught up with the inseparability of bodies and environments captured through concepts such as *dividual, doṣa, stoffwechsel,* and *shakti. Shakti* can thus be seen, if translating it into multispecies terms—as sympoiesis. The symbiotic relations in the soil, in cow dung, and the vital role of earthworms are entangled with microbial and plant life, which transmit to the human gut through food—where plants communicate their properties through chemosensory signals such as taste (Boke 2019; Daly and Shepard 2019). Thus, *desi* rice filled with *shakti* tastes better than IRRI rice lacking *shakti* and indicates how sensory experiences (taste, smell, vision, and touch) mediates information of plant and soil health (Boke 2019).

Could it also be the case that this taste is linked to microbial life and soil biodiversity? Our enteric nervous system is inseparable from the rich microbial life within our guts (Schuller 2018). Without intestinal bacteria we cannot digest our food; if our gut bacteria becomes ill, so do we. The metabolic products of gut bacteria interact with our entire bodies in complicated ways that we are just beginning to explore—they also have significant impacts on our brains, affecting the ways we think and feel (McFall-Ngai 2017, M64). Thus, the difference
between *desi* and IRRI rice, what they are fertilized with, and what makes them grow could potentially affect gut bacteria and human health.

This brings us to the importance of soil and personhood. One of the first questions Bengalis ask each other is *Apnar desh kothay* (Where is your home/district/land)? *Desh* signifies a regional identity, where people of the same soil share similar characteristics, similar to the Tamil word *ūr*, that Daniel (1984) proposes is a “person-centric category.” However, engaging with insights of the microbial self, could *desh* entail more than a category of social identity? Bangladeshis often remarked that each *desh*, each soil, produces regionally specific foods, where the same seeds when grown elsewhere taste different. This resonates with how indigenous microflora convey the taste of a particular locality, where “terroir taste” describes a sense that climate and soil create distinctive pastures that generate flavor components transmitted to milk—although how this happens is a mystery (Paxson 2008). Similarly, microbial life may—potentially—also create distinctive tastes of plants in the different *deshs* of Bangladesh if we (one day) could measure sensory experiences and view complex symbiotic assemblages of (invisible) microorganisms.

The Anthropocene entails the loss of complex microbial worlds both within and beyond organismal bodies (McFall-Ngai 2017). It captures decades of capitalistic expansion and the extraction of profits (through yields) from nature, exhausting the soil and polluting the waters. *Shakti* highlights the importance of understanding how food is also about taste, nutrition, and health not just of humans, but the soil that we depend on. Species influence each other in open-ended assemblages (Tsing 2015) as captured in the concept of sympoiesis (Haraway 2017). Rather than delineated organisms, species are like fungi, entanglements of organisms and nature that interact in a multitude of ways (Ingold 2008). Thus, the use of agrochemicals may have several implications for the assemblages of interdependent species relations contained within it, where scientific hubris of increasing yield will only worsen (in)visible species extinction, risking further vulnerability in a climate uncertain future.

*Bhejal* Foods: Profit as Ethics in Agriculture

It was December, and the monsoon rice paddy was already ripe when I went to visit Sadhu Kaka again. He sat on a wooden bed covered with a simple straw mat. He was in poor shape, his hands shaking. I asked what ailed him, and he replied that he had harvested paddy (*IRRI teish*) all day. Despite his weariness, he asked for me to sit down while his wife brought me water and a banana from their
own tree. We spoke for a long time about his cultivation plans, and I asked him about the new project he had joined, which chose to cultivate foreign-produced sunflower seeds in the dry season rather than boro rice or sesame. He replied that they received the seeds for free as part of the first year of a development project he recently joined. Furthermore, he added, this allowed them to refine their own cooking oil to avoid buying bhejal oil from the market: “All food today is bhejal. Today people are eating bhejal foods and are themselves becoming bhejal [khabar bhejal, manush bhejal]. Everyone participates in this: the farmers, the food sellers, the state. We are making each other and ourselves sick. Bhagbhan [God, Divinity] will destroy humans for their sins.”

Bhejal food is contaminated with external substances that diminish the quality of the food itself. IRRI rice is subject both to the overuse of synthetic fertilizer and pesticides banned elsewhere. More than half the rice in Dhaka is contaminated with lead and cadmium through exposure to phosphatic fertilizers and industrial effluents in irrigation water (M. R. Islam 2013). Furthermore, food items bought at local markets in Bangladesh suffer from high levels of pesticide residue, resulting in people eating foods bought from the market that are essentially still toxic (M. W. Islam et al. 2014; A. Z. Chowdhury et al. 2014).

In addition to synthetic urea and toxic pesticide residue, cultivated fish is perceived as bhejal as it is grown with lime, soap, and other chemicals used to increase yield and profit, but which also make it bhejal (as Ahmed Kaka points out in chap. 3). Food sellers lace fruit and fish with formalin to prevent them from rotting—during my fieldwork in Nodi, a child died after eating mangoes filled with formalin. These sellers also use ripening chemicals for early maturation of fruit, brick powder to fill out spices, motor oil to dilute cooking oil, and uncertified colorings to make fruit look more attractive. Whether speaking to landless day laborers, small farmers, researchers, academics, lawyers, or NGO workers, concerns over food safety and the potential dangers of consuming bhejal food bought in domestic markets preoccupied everyone from Dhaka to Khulna and Nodi.

Local experiences of the toxicity of pesticides for both humans and other living beings in Nodi is linked to poor enforcement and global systems of agrocapitalist production. For decades, Bangladesh has been a dumping ground for unwanted waste from the Global North. The intensification of commercial agriculture and the commodification of food has shifted food away from being embedded in a social context to an anonymous commodity sold in a depersonalized market by nameless sellers. People have experienced health effects of eating bhejal foods, where bhejal points to the ways in which things are allowed to
become adulterated. Such food adulteration includes the overuse of uncertified fertilizers, the use of banned and toxic pesticides, as well as the injection of various chemicals into food sold at markets. These are practices that all center on increasing profit, reflecting how food is now part of the capitalist market so long resisted by “backward peasants.”

*Depending on a Poisonous Environment*

The “simplifications” of industrial farming on a particular target species (be it tiger prawns or rice cultivation) disrupts symbiotic assemblages, creating “monsters” (Swanson et al. 2017, M6). Not only does synthetic nitrogen kill earthworms and reduce *shakti*, it also makes IRRI paddy plants “soft,” “sweet,” and “juicy.” By doing so, this type of rice attracts more pests than bitter local *desi* varieties. I asked Fupu whether farmers used pesticides before the introduction of *IRRI dhan*. She replied:

> The trees of Bangladesh did not get sick before; there were very few insects on them. Now there are too many insects: without pesticides, the trees become sick. In 1971, the state urged farmers to use these pesticides, but we never needed them earlier. We didn’t need it because we had so many more birds and frogs that ate these pests. We even ate some of these birds such as *dhaner pakhi*, *boki*, *angalti*, *khori*, *kora*, and *dhunho*, but the young ones they have never seen or heard of any of these. There are barely any of them left. Even fish like *patari*, *shoil*, and *taki* ate insects. The pesticides killed our freshwater fish. *Puti*, *koi*, *bhedi* have disappeared from the *beels* [wetlands] and canals due to these synthetic chemicals. Livestock are eating grass and becoming ill. *Paribesh bishakto hoyeche* [the environment has become poisonous, toxic].

Fupu highlighted how the introduction of pesticides disrupted an ecological symbiosis where various species helped keep pests at bay. The use of pesticides caused such species to disappear while essentially making the environment toxic.

Sadhu Kaka pointed out that after decades of state and donor advocacy of intensifying yields through agrochemicals and the subsequent decline of pest-eating species, farmers have become dependent on pesticides to avoid crop failure:

> We cannot abstain from pesticides because if ours is the only field without pesticides, the pests from other sprayed fields will attack our crop. So, we use pesticides such as Endrin and Dimacron [see table 4.1]. We tried to not use pesticide on the sunflowers we cultivated this year because we will be
eating this ourselves. If we were to use the pesticide, it would go straight into the seed. Now we’re paying the price, the sunflowers are suffering from *nera poka* [bald beetle].

Sadhu Kaka’s example highlights the problem of small-holder farmers (below five *bigha*, 165 decimals). To cultivate even one crop of IRRI rice, small farmers must buy high-yielding variety seeds, fertilizer, and pesticides, hire wage labor during the harvest and pay for fuel-driven irrigation for dry-season cultivation.21 They often use credits to pay for these inputs. If a crop fails due to pests, the farmers become indebted and put their livelihoods at risk. Cheap pesticides are therefore extensively used as cost-effective insurance against crop failure.

*Spraying Poison*

In using pesticides to protect crops, farmers may also endanger human health. During one of my trips in Nodi with Hassan, we saw two young men in the middle of the fields carrying plastic tanks on their backs. They were clad only in *lunghis* [cotton fabric wrapped around the waist] and handkerchiefs over their mouths. The smell of the pesticides was pungent and nauseating even from a kilometer away. Hassan stopped the motorcycle and we went toward the field to meet the two men, Emmad and Bilal, hired by the landowner to spray the *aman* rice fields with pesticides. They stood barefoot and knee-deep in the contaminated water. “Does such close contact with these chemicals affect your health?” I asked. Emmad replied: “This is *bish* [poison]. It kills many fish that otherwise is naturally occurring in *aman* rice fields. When we work in these sprayed fields, we get rashes and scars, but we shower afterward and wash it away. The women who work in these fields to remove weeds also complain of skin problems.”

The pesticides used are seen as poison and several surveys have noted how toxicity affects pesticide applicators, but these surveys focus on the lack of protective equipment and clothing (Dasgupta 2013). Pesticide applicators without protective equipment are cast as individually responsible for their own health problems; there is no discussion about environmental contamination in the landscape (Greco 2016, 16).

I asked Hassan to take me to a pesticide shop to learn more about why people willingly and knowingly use poison. One market day in Shobuj town, we walked toward a small shop that gave off a pungent odor. He introduced me to the shopkeeper, Mr. Mitra, who showed me the various toxic pesticides he believed that the state would eventually ban. He also showed me one that is “safe”
<table>
<thead>
<tr>
<th>Pesticides used by interlocutors</th>
<th>Official Availability</th>
<th>Manufacturer and origin</th>
<th>Chemical name</th>
<th>Class</th>
<th>Local toxicity description</th>
<th>WHO Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endrin</td>
<td>Not sold in shops, but still available to farmers</td>
<td>Unlisted for Bangladesh, but banned globally</td>
<td>Endrin</td>
<td>Organochlorine</td>
<td>“Kills everything”: insects, fish, frogs, worms, rats, snakes, birds</td>
<td>O: Obsolete as pesticide, not classified</td>
</tr>
<tr>
<td>Dimacon</td>
<td>Sold in pesticide shops</td>
<td>Unlisted for Bangladesh</td>
<td>Phosphamidon</td>
<td>Organophosphate</td>
<td>“Kills everything”: insects, fish, frogs, worms, rats, snakes, birds</td>
<td>Ia: Extremely hazardous</td>
</tr>
<tr>
<td>Hildon</td>
<td>Sold in pesticide shops</td>
<td>Unlisted for Bangladesh</td>
<td>Phosphamidon</td>
<td>Organophosphate</td>
<td>“Kills everything”: insects, fish, frogs, worms, rats, snakes, birds</td>
<td>Ia: Extremely hazardous</td>
</tr>
<tr>
<td>Bijli</td>
<td>Not sold in shops, but still available to farmers</td>
<td>Unlisted for Bangladesh, Deva Pesticides Ltd., India (?)</td>
<td>“herbal product”</td>
<td>Unlisted</td>
<td>For rice</td>
<td>N/A</td>
</tr>
<tr>
<td>Vintaco</td>
<td>Yes</td>
<td>Syngenta</td>
<td>Chlorantraniliprole 20% + Thiamethoxam 20%</td>
<td>Does not kill fish, but does cause illness in grazing livestock</td>
<td>U: Unlikely to present acute hazard</td>
<td></td>
</tr>
<tr>
<td>Shobicron</td>
<td>Yes</td>
<td>Syngenta (Singapore)</td>
<td>Profenofos (40%) + Cypermethrin (2.5%)</td>
<td>Organophosphate + Pyrethroid</td>
<td>Kills insects and arachnids (ticks, mites); used on vegetables</td>
<td>II: Moderately hazardous</td>
</tr>
<tr>
<td>----------------</td>
<td>-----</td>
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<td>----------------------------------------</td>
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<td>--------------------------</td>
</tr>
<tr>
<td>Kung fu, Karate</td>
<td>Yes</td>
<td>Syngenta</td>
<td>Lambda-Cyhalothrin</td>
<td>Pyrethroid</td>
<td>Does not kill fish</td>
<td>II: Moderately hazardous</td>
</tr>
<tr>
<td>Damdama</td>
<td>Yes</td>
<td>Intefä</td>
<td>Profenofos (40%) + Cypermethrin (2.5%)</td>
<td>Organophosphate + Pyrethroid</td>
<td>“Kills everything”: insects, fish, frogs, worms, rats, snakes, birds</td>
<td>II: Moderately hazardous</td>
</tr>
<tr>
<td>Selection</td>
<td>Yes</td>
<td>Bangladesh Agricultural Industries</td>
<td>Chlorpyrifos (50%) + Cypermethrin (5%)</td>
<td>Organophosphate + Pyrethroid</td>
<td>Used on beans against aphids and termites.</td>
<td>II: Moderately hazardous</td>
</tr>
<tr>
<td>Kasir</td>
<td>Yes</td>
<td>Intefä</td>
<td>Chlorpyrifos</td>
<td>Organophosphate</td>
<td>“Kills everything”: insects, fish, frogs, worms, rats, snakes, birds</td>
<td>II: Moderately hazardous</td>
</tr>
<tr>
<td>Shefa</td>
<td>Yes</td>
<td>Intefä</td>
<td>Cypermethrin</td>
<td>Pyrethroid</td>
<td>For vegetables</td>
<td>II: Moderately hazardous</td>
</tr>
<tr>
<td>Jubas</td>
<td>Yes</td>
<td>Intefä</td>
<td>Lambda-Cyhalothrin</td>
<td>Pyrethroid</td>
<td>Protects against hairy caterpillars, cutworms</td>
<td>II: Moderately hazardous</td>
</tr>
</tbody>
</table>

**Source:** Compiled from author’s fieldnotes, WHO (2010), and Dasgupta (2013).
as it targets specific rice pests without killing fish—Virtako by Syngenta. When I asked why he sells toxic pesticides instead of Virtako, he replied: “Syngenta sells ten products in bulk. I cannot only buy Virtako, I must buy the more lethal ones as well. I cannot afford to be selective. I would be making a loss if I do not sell the harmful ones from Syngenta. Also, some farmers want pesticides that kill everything. They may not want snakes or rats, for example, and don’t care if the fish die.” Mr. Mitra highlights how pragmatism drives his actions. He must buy and sell pesticides that are harmful or else lose money. Similarly, farmers are pragmatic when they apply pesticides to save crops as to not lose capital costs invested in cultivation.

However, most of the pesticides they use are not safe. The pesticides used in Bangladesh consist of high shares of toxic chemicals, such as carbamates and organophosphates in insecticides, and dithiocarbamates and inorganics in fungicides (Development Economics Research Group 2013). Both carbamates and organophosphates have been found to be carcinogenic, mutagenic (causing genetic damage), and damaging to fetuses (Zahm, Ward, and Blair 1997). Table 4.1 lists the most often-mentioned pesticides, their toxicity, and whether they are listed as officially sold in Bangladesh to indicate their legality. Dimacron and Hildon are popular pesticides and are classified by the WHO as “highly hazardous” organophosphates that can cause nerve damage (Pillay 2013) and significant damage to fish (Reddy, Vineela, and Kumar 2016; Joseph and Raj 2011). Endrin is particularly harmful and is regarded as “obsolete” and no longer in use (WHO 1992; 2010). It is an organochlorine, the same category of pesticide as (banned) DDT, both of which are still used informally in Bangladesh (Khan 2003).

Farmers referred to some of the pesticide brands as Indian pesticides, reflecting how pesticide traders easily smuggle banned pesticides across borders. As a Bangladeshi professor in agriculture pointed out: “In 1955, the Government of East Pakistan gave out insecticides free of cost to farmers and then removed these subsidies. It has been difficult to control illegal imports and Bangladesh is flooded with low-cost chemicals from India. These are not tested or regulated, they are essentially poisons. Children have died eating fruit contaminated with these chemicals.”

USAID distributed IRRI’s miracle rice in a package with petrochemicals from leading US manufacturers of farm chemicals. The Ford and Rockefeller foundations enabled US multinationals to penetrate Third World agriculture (Cullather 2010, 170). Nobel Prize laureate Norman Borlaug, the “hero” of the Green Revolution who was allied with the chemical lobby (Montrose Chemical, the world’s largest manufacturers of DDT), argued against a global ban of DDT,
stating that the risks to animals were morally insignificant next to the needs of hungry humans; he aligned high yields with chemical toxins and corporate profits (Cullather 2010, 246).

But where did DDT end up once it was finally banned? Many pesticides banned in the Global North are still sold and used in Bangladesh. In 1993, 6,300 tons of US-manufactured zinc oxysulphate, a highly toxic fertilizer containing lead and cadmium, was sold to Bangladesh through ABD loans via Houston’s Stoller Chemical Company; 3,250 tons were distributed and 2,800 tons were stored at Bangladesh Agricultural Development Corporation warehouses in Khulna and Chittagong (Gregow and Gain 2002, 66). A loophole in US law allows agrochemical corporations to continue to export banned and unregulated pesticides to developing countries (Dowdall and Klotz 2013). Thus, Bangladesh has a history of having other countries dump their unwanted chemicals onto her soil (Gregow and Gain 2002, 66) and is subject to toxic-waste colonialism (Liboiron 2018).

**Bhejal Food, Bhejal People**

While many states can ensure the safe use, dosage, and application of approved pesticides, they may end up exporting those agrochemicals over time. Banned agrochemicals easily end up in Bangladesh, which to date has failed to enforce legislation and regulation of the toxins used in its domestic food production. Bangladeshi agriculture thus suffers from weak institutional capacity for regulating the unauthorized agrochemicals that enter its borders, while quality control is inconsistent. This has resulted in farmers using fertilizers that are not quality assured, many of which are counterfeits with traces of heavy metals (Das 2015).

I asked Mr. Das why the weak enforcement of chemicals in food production is allowed to continue and why the government does not promote brands of pesticides that are less harmful. He replied: “In Bangladesh there is only one form of ethics and that is profit. There is no ethics driving business, only profit.” His words capture a wider sentiment expressed by many of my interlocutors, that people are greedy and only think of profit (*manush lobhi, suddho labh dekhe*). People are spraying their fields with poison and farmers are buying illegal chemicals at the micro level, while urea subsidies and the lack of state enforcement at the macro level contribute to nitrogen imbalance in the soil. These agrochemicals are used to increase profit and, as most of my interlocutors like Mr. Das, Salma, Sadhu Kaka, and Fupu expressed in different ways, the state and donors have promoted development interventions that have actively taught the Bangladeshi
farmer to increase yields for profit through development narratives of “food security” and “poverty reduction.”

This focus on yield and profit provided an incentive for food growers and food sellers to, in a multitude of ways, make all kinds of food items for domestic consumption in Bangladesh bhejal and unsafe for human health. Bhejal foods, they argued, contributed to health problems in major organs and increased the incidence of strokes and cancer in Bangladesh. Among the four hundred households I surveyed, most had at least one case of stroke, cancer, diabetes, or gastric problems in the extended family. The World Health Organization (2011) has identified an emerging epidemic of noncommunicable diseases associated with increasing morbidity and mortality in Bangladesh—including diabetes, heart disease, stroke, cancer, and chronic respiratory disease. Rather than food security and yields being the problem, the largest concern shared by Bangladeshis is whether food is safe to eat.

When speaking with Professor Hossain in Khulna city (see chapter 2), I asked whether he agrees with concerns that bhejal foods have a negative effect on human health. He replied:

Today, there are so many foreign substances that the body cannot handle: the pesticides, the heavy metals, and arsenic. Not to forget the ripening chemicals and formalin used by food sellers. When these chemicals pass through the body, they place significant strain on intestines and kidneys. This ultimately leads to their failure as the organs must constantly remove dangerous substances. The damage in people’s kidneys has in turn resulted in an increasingly large kidney selling business in Bangladesh, with advanced stage of kidney transplant for rich people who appoint dallals [brokers], mostly from North Bengal, to buy kidneys for their operations, stitching them up again. The cost of a kidney ranges from one hundred to two hundred thousand taka. By law, the kidneys need to be from a relative, but these brokers procure them from poor people, mostly children. The operation itself costs two to three million taka, and only rich people can afford it.

Widespread fear of the black-market trade in kidneys is linked to toxins entering the body through food. Discussions about the kidney trade in Bangladesh is emblematic of a wider public health and safety failure of systematic proportions (there is no public organ donation list; see chapter 5), which Sadhu Kaka’s song about people being cut and stitched up highlighted.
Studies on “food scares” and the lack of food safety in China (Tracy 2016; Klein 2013; Yan 2012) and India (Nichols 2015) suggest that national concerns about food safety are part of social food anxiety in the face of the change that accompanies the transition to technological development (Jackson 2015). However, the effects of agricultural change are not just social or symbolic; the quality and misuse of agrochemicals contribute directly to toxicity in Bangladeshi soil, food, plants, and bodies. Thus, the problem of bhejal food and its effects on kidneys is more than a wider critique of capitalism or the failure of modernity (Comaroff and Comaroff 1999)—it reflects lived public health concerns. Climate change is not just a symbolic fear of the world we are living in, it is a biophysical reality with effects on multiple species of life on earth. Similarly, the toxicity of food coupled by the changes to the soil and the microbial universe of life within it is most likely having effects on our bodies and well-being.

The concern of reduced shakti and bhejal foods highlight how capitalist land-use practices such as export-oriented tiger-prawn cultivation and high-yielding rice cultivation reduced both the environment and food into commodities in a depersonalized and profit-oriented market. A market that detached food from its socioenvironmental context of desh, soil, self, and place. This illustrates Karl Polanyi’s point that the expansion of capitalism and the self-regulated market since the 1850s has turned human beings and the natural environment into pure commodities (Polanyi 1957, 187). Commodification and separation of soil, plants, food, and humans enabled farmers and food sellers to (mis)use chemicals in food production and distribution in Bangladesh. This allowed profit to replace morality, culminating in the dominance of bhejal foods sold at the market. Yet, as Fupu once poignantly put it: as we make food bhejal, humans increasingly become bhejal too. The Bengali proverb “rice and fish make a Bengali” highlights the importance of these food items for Bengali identity. As both rice and fish have become bhejal through large-scale, globally oriented production, Bengalis themselves have become bhejal: both morally and physically corrupted, with an embodied weakness ridden with ill health.

**Conclusion: Increasing Yields, Weakening Health**

Climate reductive translations of food security and higher yield as adaptation misreads the landscape while ignoring a longer—colonial and postcolonial—history of how artificial irrigation, synthetic nitrogen, toxic pesticides, and intensive cropping patterns have adversely impacted water, soil, biodiversity, and, ultimately, human health. Like embankments and tiger prawns, such development
assemblages use climate adaptation as a narrative of improvement so that they can continue imposing the same bundle of interventions that they have for decades. This is despite the fact that such interventions may exacerbate climatic risks, and ignores how intensive agriculture may be a way of increasing exports rather than reducing hunger, thus helping us rethink Bangladesh as a modern-day Malthusia.

The loss of *shakti* in the soil due to the use of synthetic fertilizer—a loss that can be experienced through taste—captures the local understanding of how soil, food, and humans are entangled. Rather than a loss of *shakti* being a symbolic critique of the changing social relations caused by changes in agricultural practices, it highlights a material and ecological critique of how intensive high-yielding agricultural technologies erode species diversity in the soil and water. Ultimately, this weakens Bangladesh’s food production capacity. Showing the entanglements of humans, the environment, and nonhuman species can throw light on complex interdependent species assemblages, particularly of invisible microorganisms and their role in human well-being (Daly and Shepard 2019; Schuller 2018).

By “modernizing” farmers through the intensification of commercial agriculture, both the environment and food have become commodities. Polanyi suggests that the commodification of the environment and humans will assure the destruction of both. Similarly, in his critique of *bhejal* foods and human technological hubris and greed, Sadhu Kaka suggests that a divine force will drown humans in tidal surges as punishment for their sins. Thus, the separation of humans from the environment expressed through the loss of *shakti* highlights the artificial alienation that arises as food is reduced to a commodity subject to *bhejal* practices. These *bhejal* practices—carried out solely to increase profit—have considerable material effects. The urban and the rural, the rich and the poor, are all worried about the damaging effects of today’s *bhejal* and *bishakto* (toxic) food sold at the market. In Nodi, health, more than climatic change, is a major concern and source of vulnerability.