

Humanity's Ecological Footprint

Evangelos G. Vallianatos

Life thrives primarily on one-quarter of the earth, about 11.4 billion hectares of land and water. The oceans take up 2.0 billion hectares of that fertile quarter. The remaining 9.4 billion hectares of land is divided into 1.5 billion hectares for raising food; 3.5 billion hectares for grazing domesticated animals; 3.8 billion hectares for forests; 0.3 billion hectares for lakes, rivers, and wetlands; and 0.3 billion hectares for cities. Life barely exists in the other three-quarters of the earth—deserts, ice regions, and deep oceans.

Since the eighteenth century, and especially during the past fifty years, humans have been having deleterious effects on the entire planet. The footprint of man on the earth is of two kinds: ecological, the consequences of human actions on the natural world, and cultural, the abandonment and often willful neglect and destruction of ancient agrarian traditions and knowledge, which are the umbilical cord of humans with the earth.

Ecological Imperialism

Starting in the mid-nineteenth century with the Industrial Revolution and armed with powerful technologies, Europeans and North Americans have been treating the natural world as if it was a lifeless mass of dirt. They spread to the tropics like a cataclysm, and they took the best land of the Africans, Asians, and South Americans and sowed it in cash crops. They killed and decimated wildlife for sport, plundering the valleys, forests, and rivers.

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In the Americas, the white masters of the continent nearly wiped out the indigenous population. David E. Stannard, professor of history at the University of Hawaii, says that the coming of Columbus to America triggered a bloodbath against Native Americans. In time, the Europeans' aggression against the indigenous people took the form of a "ghastly event," a "mammoth cataclysm," which evolved into the largest global genocide, taking the lives of about 100 million people. Disease played a role in the destruction of Native Americans, but only because it operated in the killing policies of the Europeans. Stannard documents that "firestorms of microbial pestilence and purposeful genocide" laid waste the American natives.¹

One of the reasons Native Americans paid such a price at the hands of the white invaders was their worship of nature. They could no more sell land than the sky. The Europeans, in both Europe and the New World, still don't think much of nature. The blows against nature keep coming at the dawn of the twenty-first century under the guise of mining, logging, and fishing; the damming of rivers; and the construction of electricity factories, nuclear power plants, and nuclear weapons. There are also chemical production, fertilizer and munitions factories, wars, development projects, genetic engineering and genetically modified food, intensive farming, and spraying of toxins on the face of the world to blame. The result of such violence is the starving, crippling, killing, and extinction of countless species of plants (including flowers and the wild ancestors of crop plants), trees, birds, insects, mammals, amphibians, reptiles, fish, and other wildlife.

In 1986, Hugh Iltis, botanist at the University of Wisconsin, blamed ambitious cattle ranchers, land-hungry squatters, greedy corporations, and "the world's multilateral development banks" for this new barbarism. He noted that these developers

are recklessly destructive of nature and in an orgy of environmental brutality, clear cut the forests, burn the trees, and plow up the land to grow more food or graze more cattle, even before any scientist has had a chance to find out what lives there. In the name of growth, progress, and development, and with a colossal self-confidence, we humans are now messing up

1. David E. Stannard, *American Holocaust: Columbus and the Conquest of the New World* (New York: Oxford University Press, 1992), ix–xv, 151.

even the last wild lands and damming the last wild rivers, oblivious of the irreplaceable biological treasures that are being destroyed.²

In 1997, Iltis saw biological genocide in the destruction of the tropics. He cited the biodiversity of the land in the Peruvian tropical forest, where in 2.47 acres of land there are forty-one thousand species of insects, mostly beetles. Destroying such rich forest, he said, would inevitably bring the “extermination of millions of plant and animal species, for most of which we do not have a description, a life history, an estimate of their ecological or economic importance, or even a name. As many as twenty percent of all species on Earth may become extinct within twenty years—at least a million species. The utter devastation that human action wreaks in tropical ecosystems has to be seen to be believed.”³

This devastation of life is a sacrifice to the agribusiness gods of cash cropping and the model “scientific” farming of North America and Western Europe. By this new means of colonialism, tropical fruit ends up on the table of the wealthy of the world, especially those living in North America and Western Europe—the North. Iltis denounces the cash-crop plantations in the tropical forests of South and Central America. He sees them not—as an agronomist would—as high-yielding science farms, but as symbols of illiterate plunderers: a “vast ocean of sterile cultivated uniformity.”

The spreading of this cultivated uniformity into the natural world simplifies the complexity of whatever survives in that world, undermining the resilience of species of plants and animals and, sometimes, obliterating entire ecosystems. Iltis is right: Western experts, ignorant of ecology and geography, are having a deadly impact in the tropics. The result is orgies of environmental brutality fueling the agenda of economic development worldwide.

Man's Ecocidal Footprint

At the dawn of the twenty-first century, some scientists in Europe and North America recognize that the earth is alive. We don't know exactly how the

2. Hugh H. Iltis, “Serendipity in the Exploration of Biodiversity: What Good Are Weedy Tomatoes?” in *Biodiversity*, ed. E. O. Wilson (Washington, DC: National Academy Press, 1986), 99.

3. Hugh H. Iltis, “Extinction Is Forever,” *Resurgence*, no. 185 (November/December 1997): 19.

earth, a living complex of ecosystems, is reacting to the anthropogenic, man-made violence and onslaught against it. The observable signs in nature, however, are warnings of possible calamities to come. Since 1990 we have witnessed fires of unprecedented ferocity in the tropical forests of Indonesia and Brazil; vast coral bleaching in the Caribbean Sea and the Pacific and the Indian Oceans; the near decimation of fish in the Atlantic; the destruction of the Black Sea, which the ancient Greeks called Euxeinos Pontos, or Welcoming Sea; the devastation of the Aral Sea and Lake Chad; the killer tsunami in Asia in December 2004; Hurricane Katrina that nearly wiped out New Orleans in August 2005; and the ceaseless destruction of wetlands and damming of wild rivers all over the planet.

Between 1970 and 2000 there was a 37 percent decline of life in forest, freshwater, and marine ecosystems—in both seas and oceans. Forests fared better than freshwater and marine ecosystems: the decline among 282 populations of species of birds, mammals, and reptiles was 15 percent. Life in lakes, rivers, and wetlands had the greatest casualties. The decline among 195 species of birds, mammals, reptiles, amphibians, and fish was 54 percent. And for 217 species of birds, mammals, reptiles, and fish living in coastal and marine environments, opportunity for life went down by 35 percent.⁴

The decimation of so much life in such a short period of time, thirty years, barely a moment in the age of the earth, is a result of economic development—logging, fishing, irrigation, and intensive factory-like farming. Between 1961 and 1999 this development, which scientists dub “use of renewable natural resources,” increased by 80 percent. This 80 percent is 20 percent more than the capacity of the earth to renew itself.⁵

The only reason this ecocidal development goes on largely unchallenged is because of corporate tyrannies. Those who control the world—a small number of politicians, doing the bidding of corporations—are interested only in power. Harold Pinter, the 2005 British Nobel Prize winner in literature, spoke of the “vast tapestry of lies” surrounding and feeding people, a

4. World Wildlife Fund International (WWFI), *Living Planet Report 2002* (Gland, Switzerland: WWFI, 2003).

5. *Ibid.*

necessary condition for the politicians to maintain their hold on power.⁶ No democratic society would tolerate the plunder of nature.

Robert Ovetz, professor of biology at the New College of California, reported in February 2004 that the campaign to save the sea turtle is part of an international effort “to end the lawless pillaging of the oceans and needless slaughter of millions of marine species such as the Pacific leatherback [turtle] by industrial fishing.”⁷ In June 2005, the National Oceanic and Atmospheric Administration announced the further privatization of the oceans, enabling American corporations to lease a zone of water for their fish farms, which could be up to two hundred miles from a coast.⁸ That way, fish farmers, completely unsupervised, and following the model of agribusiness, could poison and decimate the oceans.

It is this behavior that prompts me to question the morality of the captains of industrial fishing. These corporate managers live in ostensibly democratic societies, which employ “science” in everything they do. Yet despite their skills, or because of them, they have no respect for nature. When they fish, they mine the seas.

The people of these countries of the North are well educated, which means that, at a minimum, they have the technical smatterings if not the moral substance of civilization. They continue to vandalize the wounded planet, knowing fully well that their actions undermine its future while they saddle the powerless half of the world population (the South)—some 3 billion people—with famine, poverty, and disease. For example, fish is the main food for people living in the coastal regions of the tropics. Yet there’s a fourteen-fold difference in the amount of fish eaten per person in the North and South. Even worse, there’s a sixteen fold difference in the amount of energy used per person in the North and South. In addition, there are approximately 1.2 billion people in the South who don’t even have clean drinking water.⁹

6. Harold Pinter, “Nobel Lecture: Art, Truth and Politics,” presentation upon receiving the Nobel Prize in Literature, Stockholm, 8 December 2005, nobelprize.org/literature/laureates/2005/pinter-lecture-e.html.

7. Robert Ovetz, “Cutting the Longline to Extinction,” *Progressive Populist*, February 2004.

8. Marian Burros, “Plan Would Expand Ocean Fish Farming,” *New York Times*, 6 June 2005.

9. WWFI.

Global Warming

The burning of coal, petroleum, and natural gas fuels the machines of the world, emitting in the process carbon dioxide (CO₂), a greenhouse gas that traps some of the sun's energy, which otherwise would escape into space. Other industrial activities, including intensive factory-like farming, are responsible for emitting into the atmosphere other greenhouse gases, which also trap more of the sun's heat in the atmosphere. These greenhouse gases and the plunder of the world go together. They are part of the same culture that heedlessly excavates the earth as if it was a mine. Plunder and greenhouse gases find expression in the largely uncontested fact of a rising global temperature, which is slowly warming the planet and, in the long term, making the earth inhospitable to life.

Through the United Nations Framework Convention on Climate Change, the world community is urged to stabilize the greenhouse gases in the atmosphere so that they will not become a danger to the climate system. This is a pious wish, falling on deaf ears in the United States, which, with only 4 percent of the world population, is responsible for about 25 percent of all greenhouse gases emissions in the atmosphere.

The administration of George W. Bush came to power in January 2001. It immediately rejected the Kyoto Protocol, a global agreement on cutting the amounts of the earth-warming gases to the 1990 level. President Bush withdrew the country from the international legal system that was trying to reverse the rising greenhouse gas emissions into the global environment. This undemocratic and immoral policy prompted condemnation at home and abroad. Donald Kennedy, editor of *Science*, lashed out at President Bush. The "nonparticipation of the United States in the global effort on climate change," he wrote in January 2003, "is more than a national embarrassment. It's dangerous."¹⁰ David King, chief scientific adviser to the British prime minister, Tony Blair, said in January 2004 that the United States, "the World's only remaining superpower," is "failing to take up the challenge of global warming, [which] is the most severe problem that we are facing today — more serious even than the threat of terrorism."¹¹

10. Donald Kennedy, "The Policy Drought on Climate Change," *Science*, 17 January 2003, 309.

11. David A. King, "Climate Change Science: Adapt, Mitigate, or Ignore?" *Science*, 9 January 2004, 176–7.

John Harte, professor of environmental science at the University of California, Berkeley, described the consequences of climate change in 17 September 2004 as “enormous and severe.” He said that during the next fifty years his home, the American West, would be hit by more droughts and more destructive wildfires. The West would also have less water in its rivers because of reduced snowfall and more severe heat waves.¹² The ecological conditions of the past few years underlie Harte’s contentions. From 1999 to 2004 drought kept shrinking the water of rivers and lakes in Montana, Idaho, California, Arizona, Utah, and New Mexico.¹³

Meanwhile, on 7 June 2005, the national academies of science of eleven countries, including that of the United States, urged world leaders to begin addressing the causes of global warming.¹⁴ And a month later, during the G-8 summit in England, Blair failed to convince George W. Bush to join the rest of the world on global warming. And during the Montreal conference on climate change in early December 2005, Bush’s agents continued their “shameful foot-dragging,” ignoring all evidence on the melting polar ice caps, ferocious hurricanes, dying coral reefs, melting glaciers, and 2005 being one of the warmest years ever. China joined the United States in walking out of the climate talks.¹⁵ In fact, China also joined the United States, Australia, India, Japan, and South Korea in forming the AP6, the Asia-Pacific Partnership on Clean Development and Climate, in order to support the continuing burning of fossil fuels, particularly coal. In their 12 January 2006 meeting in Sydney, Australia, the AP6 “handed over the issue of climate change to private industry.”¹⁶

This is unsurprising, since Bush came to power to enforce the agenda of corporations. For example, he appointed Philip A. Cooney, an oil industry man, to control the federal government’s information on climate change, a job this White House official exercised vigorously by “doctoring” or deleting

12. John Harte, interview on Public Broadcasting System, “Warmer and Warmer,” *NOW*, 17 September 2004.

13. Traci Watson, “Drought Shrinking Jewels of the Desert,” *USA Today*, 30 September 2004, 15A–16A.

14. “Joint Science Academies’ Statement: Global Response to Climate Change,” *New York Times*, 8 June 2005.

15. Andrew C. Revkin, “U.S. Delegation Walks Out of Climate Talks,” *New York Times*, 9 December 2005; “America’s Shame in Montreal,” editorial, *New York Times*, 13 December 2005; Juliet Eilperin, “2005 Continues the Warming Trend,” *Washington Post*, 16 December 2005.

16. Tim Flannery, “The Ominous New Pact,” *New York Review of Books*, 23 February 2006, 24.

sentences in government documents that linked industrial emissions of carbon dioxide to global warming.¹⁷ The Bush administration did away with the Deep Space Climate Observatory, which would have been able to monitor the energy falling on the earth, thus settling once and for all the cause for global warming.¹⁸ The Bush administration also threatened its top climate expert, James Hansen, with “dire consequences” if he kept calling for a responsible American policy on global warming.¹⁹

Even the Pentagon had doubts about Bush’s climate policy. It became uneasy about global warming. In 2002 it funded a study that imagined the unthinkable: What if the climate changed abruptly, and instead of the gradual rising of the global temperature, there was a sudden collapse of the Atlantic Ocean’s warm current, which could trigger a possible ice age?

The Atlantic conveyor belt of water acts like a heat pump, moving warm water and warm moist air from the tropics to Northern Europe, where it becomes cold and dense, sinks, and returns to the tropics. This circular journey keeps the climate of the earth hospitable to life. A breakdown of the Atlantic heat pump, which happened eighty-two-hundred years ago, is possible because the rising temperatures of the past few decades resemble the climate changes preceding the previous breakdown. Were the Atlantic heat pump to slow abruptly, the consequences would be unpleasant for the people of the world, according to the Defense Department scenario. The Northern Hemisphere would experience partial or total chill. Harsh winter weather, severe drought, and intense winds would bring about dust bowls and vast forest fires, disrupting and reducing food production in North America and Europe, while other climate conditions would cause unprecedented stress in the political and economic relations among states. Southern Europe, for example, would be flooded with Northern European and African refugees. Such a global crisis would bring wars for water, food, and energy, creating fortress states against the rest of humanity, which would suffer a series of calamities.²⁰ British scientists found that between 1957 and 2005 there has been a 30 percent decline

17. Andrew C. Revkin, “Bush Aide Softened Greenhouse Gas Links to Global Warming,” *New York Times*, 8 June 2005; “Climate Action,” *Washington Post*, 11 June 2004.

18. Robert L. Park, “Scorched Earth,” *New York Times*, 15 January 2006.

19. “Censoring Truth,” editorial, *New York Times*, 9 February 2006.

20. Peter Schwartz and Doug Randall, “An Abrupt Climate Change Scenario and Its Implications for United States National Security” (Washington, DC: US Department of Defense, 2003).

in the circulation of warming waters in the Atlantic, the implication being that a colder Europe may be in the works.²¹

However, one of the immediate dangers of the warming of the earth is what happens to food crops growing in a sea of carbon dioxide. In just the nineteenth and twentieth centuries, industrialization raised the concentration of greenhouse gases in the atmosphere to levels about 50 percent higher than those of the preindustrial age. In 2004 there were 372 parts per million of carbon dioxide in the atmosphere, an amount “higher than at any time in at least the past 420,000 years.”²²

Crops and other plants use carbon from CO₂ to build the bulk of their dry weight. A doubling of CO₂ would speed up photosynthesis and plant growth, boosting some increases in yields. However, higher levels of CO₂ in brown rice fields changes the chemical composition of rice. Nitrogen declines in rice by about 14 percent, zinc by 28 percent, and iron by 17 percent. So, in general, higher concentrations of carbon dioxide in the atmosphere may be responsible for a decrease in food crops of essential elements like iron, zinc, iodine, and selenium, which, because of the tremendous poverty and very inadequate diets in the South, are already causing the hidden hunger of about half of the people of the world. This hunger is hidden because its deleterious effects manifest themselves very slowly. Very poor people, especially in the rural South, rely for their survival on only one or two crops, thus failing to replenish the crucial elements in their food that come by eating a variety of foods. This potential—that higher CO₂ in the atmosphere can increase the hunger of those already hungry—is very explosive, especially those eating rice, the most important crop in the world. We can expect that the global environment, loaded with more carbon dioxide than ever before, will affect the quality of our food. For this reason, says Princeton biologist Irakli Loladze, “it is imperative to recognize and quantify at the early stage how the changing environment shifts the stoichiometry [the measured amounts of the elements] of plants—the foundation of human nutrition and the base of virtually all food webs in nature.”²³

21. Andrew C. Revkin, “Scientists Say Slower Atlantic Currents Could Mean a Colder Europe,” *New York Times*, 1 December 2005.

22. King, 176.

23. Irakli Loladze, “Rising Atmospheric CO₂ and Human Nutrition: Toward Globally Imbalanced Plant Stoichiometry?” *Trends in Ecology and Evolution* 17, no. 10 (October 2002): 457–61.

However, I don't think it's enough to simply measure the coming danger. We need to put a brake on the release of more carbon dioxide and other greenhouse gases in the atmosphere, which cause the warming of the earth, and to reform or abandon industrial activities like chlorine production; the manufacture of pesticides; the burning of petroleum, coal, and natural gas; and factory-like agriculture, all of which exacerbate and complement the deleterious warming of the planet. Factory farming, for example, is responsible for the drastic reduction of the types of food crops and animals we eat. Nine crops make up more than three-quarters of the plants in our diet. About 97 percent of the fruits and vegetables Americans ate in early 1900s no longer exist. This diminished variety in what we eat also diminishes the essential micronutrients in our food.²⁴ Hidden hunger is global.

The warnings coming from the frozen poles of the earth, the Antarctic and the Arctic, are telling. The Antarctic suffers from both the depletion of the ozone layer above it and increasingly warmer temperatures. Ozone is part of the atmosphere, absorbing the ultraviolet portion of the sun's rays. But even when the ozone amount in the atmosphere is as it ought to be, unaffected by any human activity, some harmful ultraviolet B (UVB) radiation goes through the ozone column and reaches the land and waters of the earth. Once there, in the surface waters of the oceans, UVB moves into the proteins and the genetic stuff of life of the water animals, wounding and otherwise diminishing their chances for a healthy life and survival. With a shredded ozone layer around the earth, particularly over the Antarctic, the harm of the UVB radiation is affecting biodiversity and food in the ecosystems of the ocean. Phytoplankton and krill also suffer. These tiny plants and animals are indispensable for the life of fish, penguins, seals, and whales. In addition, increasing temperature increases the stress for survival among the animals of the Antarctic. Penguins no longer can count on their winter and summer feeding, nesting, and breeding grounds. Snow falls in different patterns and amounts, and ice is melting faster. Meanwhile, the Arctic, the earth's air conditioner, is in just as much if not greater trouble. The Arctic is warming much more rapidly than the rest of the world. Its glaciers are melting, the ice cover-

24. Cary Fowler and Pat Mooney, *Shattering: Food, Politics, and the Loss of Genetic Diversity* (Tucson: University of Arizona Press, 1990); Courtney Van de Weyer, *Changing Diets, Changing Minds* (London: Sustain, 2005), 75–84.

ing the sea is thinning, and the temperatures of the permanently frozen land are rising. A study done from 2000 to 2004 by hundreds of scientists reveals that “the reduction in sea ice [in the Arctic] is very likely to have devastating consequences for polar bears, ice-dependent seals, and local people.”²⁵

Hubris: The Road to the Silent Spring

Underlying this planetary crisis is hubris, the colonial and paternalistic attitude of the world's most powerful countries in Europe and North America that they know what they are doing. Some of their scientists who study global warming see the disaster coming, but their voices are muffled by the cacophony of other scientists on the pay of polluters. The real obstacle to a moral policy toward the earth, however, springs from corporations themselves: the oil, coal, gas, and other extraction companies that make a killing from the eventual killing of the planet.

Despite warming the earth and engaging in an agricultural system pregnant with mad cow disease and, possibly, an avian flu pandemic, the North continues to spread its family-farm-killing giant agricultural system to the rest of the world. At the same time, many scientists of the North say they have the answers for practically all the problems of the planet. They are the same scientists whom Iltis accuses of ecological and geographical illiteracy. They are the scientists who have justified immense one-crop plantations, animal factories, toxic farm sprays, and genetic engineering as advanced forms of scientific agriculture. They also claim their knowledge of farming is superior to the traditional know-how of peasants.

Howard Odum, an ecologist at the University of North Carolina, lamented the “great conceit of industrial man.” He said, in 1971, it was “a sad joke” that experts from industrialized countries advised “underdeveloped” nations “on improving agriculture,” which, in the best of circumstances, would mean setting up another “zone of fossil-fuel agriculture.” Odum did not think that was such a great idea, so he reminded his colleagues that their agriculture was extremely vulnerable. “The citizen in the industrialized country,” he

25. Susan Joy Hassol, *Arctic Climate Impact Assessment* (New York: Cambridge University Press, 2004), 8.

says, “thinks he can look down upon the system of man, animals, and subsistence agriculture that provides some living from an acre or two in India when the monsoon rains are favorable. Yet if fossil and nuclear fuels were cut off, we would have to recruit farmers from India and other underdeveloped countries to show the now affluent citizens how to survive on the land while the population was being reduced a hundredfold to make it possible.”²⁶

Iltis is just as courageous as Odum. He also found conventional science and policies not to his liking. He is an expert on biological diversity who sees little wisdom in pushing plantation agriculture as the salvation of the world from hunger. Since the 1960s, he has been warning his colleagues, and the rest of us, that plantation agriculture is a mortal enemy of agricultural genetic diversity and that it should no longer be exported to the tropics and, particularly, to agricultural regions with great genetic diversity. Preserving crop genetic diversity in “cold-storage gene banks,” says Iltis, “*provides no long-term solution*. The only way we can hope to save a crop’s dynamic evolutionary potential is to literally protect the diverse ‘ancestral’ genotypes in their cradle region from modern agricultural interference, in effect, by ‘freezing’ the genetic landscape, even to the extent of subsidizing primitive agricultural systems. . . . *Only by the deliberate and permanent preservation of selected specific local genetic landraces*, scientifically justified, politically negotiated, and perhaps internationally subsidized, and by the *deliberate exclusion of agricultural ‘improvements’* as represented by the ‘*Green revolution*’ and *modern agricultural technology*, is there any hope for long-range success in continuing the evolution of our crops.”²⁷

Two years after Iltis proposed to end the so-called green revolution in the tropics, in 1976, I published *Fear in the Countryside*, my book against the green revolution. I wrote that for reasons of ecological integrity, democratic family farming, and justice, the industrialization of agriculture had to go. The wounds of rural America at the hands of agribusiness—the desolation of communities, the decline of democracy, and the poisoning of the land—should not become a global cancer. The agrarian traditions of the

26. Howard T. Odum, *Environment, Power, and Society* (New York: Wiley-Interscience, 1971), 115–20.

27. Hugh H. Iltis, “Freezing the Genetic Landscape,” *Maize Genetics Cooperation Newsletter*, 1974, Department of Botany, University of Illinois (emphasis added).

people of the South were good enough to keep feeding its people, while protecting biological diversity and nature.

But my message on food sovereignty, like that of Iltis's warning on the vital significance of protecting genetic diversity, did not go very far. The green revolution, a propaganda name for American-style intensive farming, has been competing and, in many places, overwhelming peasant agriculture throughout the tropics.

Agribusinessmen, however, are not interested in the continuing evolution of our crops. They love cash crops. They don't worry that kidnapped children of Mali work cocoa in Ivory Coast. Sometimes, as in Honduras, Peru, Colombia, and Southeast Asia in the 1990s, cash croppers waged war against each other, their policies affecting the livelihood of hundreds of thousands of families. The misuse of fungicides for the "protection" of bananas from the black leaf wilt, or *sigatoka negra*, would cause chaos downstream in the shrimp farms where the toxins in the water would not allow the shrimp to molt and form an exoskeleton, causing a global epidemic of shrimp death.

The dream of Iltis for "freezing" the bountiful genetic landscape is nearly dead, and, along with it, the possibility of "continuing the evolution of our crops." In fact, in the home of the green revolution, North America and Western Europe, the genetic engineering of crops is further diminishing the future of seeds, the primordial stuff of all agriculture and food. Not only have some crops—corn, soybeans, cotton, and canola—already been genetically engineered for insect resistance and adaptation to a weed poison, but other crops have been modified with hundreds of foreign genes for a variety of uses—producing food, drugs, and industrial chemicals.

We don't know how many of these genetically modified crops will produce a product that will find a commercial market. However, we know that all those altered crops release their genes to the environment, where they are spread near and far, contaminating wild and cultivated crops and plants. As a result, say Margaret Mellon and Jane Rissler, "traditional varieties of corn, soybeans and canola are pervasively contaminated with low levels of DNA sequences derived from transgenic varieties."²⁸ If we think that we depend

28. Margaret Mellon and Jane Rissler, *Gone to Seed: Transgenic Contaminants in the Traditional Seed Supply* (Cambridge, Mass: Union of Concerned Scientists, 2004).

on uncontaminated seeds and crops for survival, and we do, then the future will write a bleak epitaph on the missionaries of the green revolution, the same scientists, college teachers, politicians, and businessmen who made rural America a subsidiary of giant agriculture. Those farm missionaries will be remembered for killing nature, or, at least, for bringing nature and humanity closer to extinction.

Experts know, for example, that most agrottoxins came into being primarily as chemical and biological warfare weapons, which were dumped on the farm to kill insects and weeds. That history ought to warn them that these toxins had no place in agriculture, the mother of all sciences and civilization. But, in fact, they praise the toxins of the farmer. For instance, J. D. Fryer, director of the Weed Research Organization of Oxford, England, considers the hormone weed killers, products of biological warfare research in England and the United States, responsible for transforming agriculture, bringing about the birth of the agrochemical industry. Herbicides like MCPA, 2,4-D and 2,4,5-T, says Fryer, “are . . . amongst the greatest scientific advances of this [the twentieth] century.”²⁹

Sacrificing Children, Giving Cancer to the World

Some scientists expressed concerns about pesticides early on. The US Environmental Protection Agency (EPA), which banned DDT, the granddaddy of all agrottoxins, in 1972, warned at the time that the impacts of pesticides on the natural world had deleterious consequences. The EPA did that in a report edited by Charles Reese, a biologist I remember with affection. “[Pesticides] may have had an indirect insidious influence on the health and welfare of the population,” the report noted. The concern of EPA was also strong on the toxic effect of pesticides on the very beginnings of life as well as mature organisms:

On a cellular level pesticides can inhibit cell division, photosynthesis, and growth; alter membrane permeability; change metabolic pathways; and inhibit the action of enzymes, including those functional in metabolizing

29. J. D. Fryer, quoted in Celia Kirby, *The Hormone Weedkillers* (London: BCPC Publications, 1980), 1.

steroid hormones (i.e., estrogen and testosterone), and the enzyme which is functional in the deposition of calcium carbonate in eggshells.

The EPA report continued:

Blood changes, systemic lesions in the brain, spinal cord, liver, kidneys, and stomach, and subsequent susceptibility to bacterial and fungal infections may ensue [from exposure to pesticides].³⁰

Two years later, in 1974, the EPA published another revealing study with the appropriate title “Herbicide Report.” The main conclusion of this study is that herbicides change the physiology of crops and plants. The sprayed crops are less capable of resisting pathogens and insects. Farmers using herbicides also disrupt crop rotation, “resulting in increase in pest weeds, insects, and pathogens that may require additional pesticides for control.” In addition, herbicides may change the nutrition of crops. Second, weed killers may cause “serious insect-pest outbreaks” because they change the chemistry of the plants, making them “more attractive and nutritious to insects.” Third, herbicides may, indirectly, stimulate the “reproduction” of insects.³¹

These potential and real impacts of pesticides were buried in the same silence that devoured Rachel Carson's *Silent Spring*, despite that book's immense popularity. I thought for a long time that this silence was a paradox in American society. Here was a best-seller denouncing poisons, and yet the widespread circulation of this book went hand-in-hand with the widespread use and increase of the “pest” poisons in the United States. The only way I could make sense of this paradox was the decline of democracy in America. Only powerless people do nothing while they look danger in the face.

The EPA also paid a price for banning DDT in 1972. Slowly, but steadily, it collapsed, remaining a skeleton of what it was supposed to be. In 1979, the EPA discovered from university researchers that young men with reduced sperm concentrations had some 20 poisons in their seminal fluid. Chief among the sperm poisons were polychlorinated biphenyls (PCBs), industrial

30. Charles D. Reese et al., *Pesticides in the Aquatic Environment* (Washington, DC: US Environmental Protection Agency, 1972), 9, 12.

31. Hazardous Materials Advisory Committee, *Herbicide Report* (Washington, DC: US Environmental Protection Agency, 1974), 45–6, 61.

toxins contaminated by the TCDD-dioxin, the most powerful poison created by man. These PCBs poison the sperm of men. More PCBs in the seminal fluid mean fewer healthy sperm, which often result in the sterility and castration of men. However, the EPA did not follow up on this very troubling news. Congress banned PCBs in 1976, but they continue to poison life in the bottom of rivers and other parts of nature.

Meanwhile, after the EPA banned DDT, corporate polluters reasserted themselves, especially with the election of the Republican Ronald Reagan to the presidency in 1981. The coming of the Democrat Bill Clinton to the White House in the 1990s did not make much difference to the hostile environmental policies of the Reagan administration embedded into the flesh of EPA. Clinton's vice president, Al Gore, had made a name for himself on global climate politics in the Senate, yet as a vice president he did practically nothing to lead the country away from its addiction to petroleum and other greenhouse fuels and industries. So the EPA, like a docile servant of the polluters, has been confirming the policies of "regulated" industry, using government "science" and "law" to make hazards "reasonable" and "acceptable."

Even the discovery of pesticides in the breast milk of mothers and the blood, urine, and tissues of Americans in the 1960s and 1970s left the EPA and the country unmoved. Then, at a time the country was torn by the demands of black Americans to make the final transition from slavery to citizenship, researchers discovered there was an intimate connection between pesticides, race, and class, especially a positive association of toxins with poverty, urban overcrowding, and race.

Black people carried in their fatty tissues, among other toxins, nearly double the amount of DDE, the cancer-causing form of DDT, found in the fat of whites. The other revelation linked class, race, and poisons. President Lyndon Johnson was fighting his war on poverty while data showed the poorer you were the more poison in your body, and among the poor, there was more poison in the blacks than the whites. But no one connected the political and the chemical. No one did anything about the contamination of the country's drinking water and food with agrottoxins, either. The EPA was in no position to defend either nature or the poor. The mountain of bad news had frozen the EPA into nothingness. It paid for data, only to hide them,

shred them, and dump them, becoming as a matter of course a pollution protection agency.

In 1982, the EPA acknowledged that some four hundred insects and mites were becoming immune to the farmers' sprays, scientific proof that the system the EPA supervised was broken. The EPA, as usual, buried the information and did nothing.

However, this indifference to an evolving tragedy in nature angered one of the country's scientists. This was Robert Metcalf, professor of biology and entomology at the University of Illinois. Metcalf had reasons to be livid. He discovered carbamate insecticides, one of two groups of central nervous system toxins popular among farmers. He probably felt terrible he entrusted his discovery to irresponsible corporations. He must also have felt guilty for having done chemical warfare research. But his anger was with farmers who treated the insects like enemies, dumping on them a constant torrent of sprays without any thought that, unwittingly, they helped the insects become resistant to those sprays.

One such a bug is the Colorado potato beetle. It learned to defuse the pesticide bombs thrown at it, so it became a man-made super beetle. Then the dangerous habit of farmers to keep growing the same crop continuously, having abandoned the ancient tradition of rotating one crop with another, went hand-in-hand with increasing uses of sprays. Metcalf could turn to the continuous corn grown around his college campus, an unscientific monoculture that takes more than a billion dollars a year from the pockets of American farmers for killing corn rootworms. In 1987, Metcalf expressed his grave misgivings with the careless attitude of the farmers and the government agencies and scientists endorsing the toxic practices of the farmers. His fear was that the "short-sighted and irresponsible use of pesticides and antibiotics is producing strains of monster-bugs that are resistant to our chemical weapons. . . . The outlook is dismal—and getting worse."³² Metcalf could also argue that the outlook in farm communities hooked on such destructive practices was just as dismal as their spraying habit. Large farmers and corporations have been sucking the life out of them, wrecking rural America, and snuffing democracy from countless rural communities.

32. Robert Metcalf, interview, *Newsletter of the College of Liberal Arts and Sciences* (University of Illinois), summer 1987.

The result of the triumph of agribusiness has been the emptying of rural America of small family farmers, a cruel policy of roulette, the government washing its hands from the consequences of the experiment it supervises. Family farmers, the foundation of American values and character, are forced out of their way of life. Urban people also suffer from disease and even death from the effects of agribusiness, but there's practically no one studying the consequences of eating and drinking contaminated food and drink. America's scientific, public health, and medical establishments, funded by the government and corporations, stays clear of controversial issues.

The harvest of this indifference has been devastating and bitter. For example, the EPA has had data for a long time showing that farmers are dying from cancer at twice the rate affecting the rest of the population. Some of these farmers, however, spray the super weed killers, sulfonylurea herbicides, which have the power of the most insidious biological weapons. Minute amounts of these toxins, parts per trillion, fractions of an ounce or milligrams per acre, kill trees or other "unwanted" vegetation or "weeds."

A part per trillion is so small a quantity one has to imagine it: compare a human hair to the distance across the United States and you have a part per trillion. Being so small and sprayed in these minute quantities also makes these poisons difficult to detect in nature. Since the 1960s, enough evidence has been accumulating against pesticides, showing that these toxins are deleterious to all life, that, in a moral and just society, pesticides would have never been approved, and had they been used in error, they would have been withdrawn from both agriculture and urban uses long ago.

Warren Porter, professor of zoology at the University of Wisconsin, has been studying the effects of pesticides on animals and children. He is warning of a tragedy no less significant than the killing of birds. He is saying that the victims of pesticides this time are our own children. His message is that the world can't afford generations of children who are both slow learners and aggressive. And yet that is already happening. His research shows that when one tests rats and mice with the most common mixture of pesticides and fertilizers in groundwater (for instance, aldicarb insecticide, atrazine weed poison, and nitrate fertilizer), at concentrations found in groundwater all over the United States, the animals suffer measurable effects on their immune, endocrine, and neurological systems. This translates into more aggression

and fewer skills for the rats and mice. Other studies complement these findings, revealing that children who were exposed to pesticides while in utero or at preschool age turn out to be highly aggressive with diminished intelligence and decreased stamina. So the contamination of the food, air, and water of children with pesticides is having deleterious effects on them.³³

The innocent-sounding pesticide, which in countries like India and Greece is known as medicine, is much more than a spray allowing the farmer to become an emperor over a plantation. It is political power, lubricating the industrialization of the world. Writing in 1994, two scientists of the United Nations University, Robert Ayres and Udo Simonis, described the spread of industrialization in the nineteenth and twentieth centuries “as a cancer: industrialization, in its present form is a process of uncontrolled, unsustainable ‘growth’ that eventually destroys its host — the biosphere.”³⁴

So pesticides mirror the hubris of science wedded to giant agriculture. Such a combination has been especially toxic to the United States. Once, millions of family farmers had a stake in the agrarian economy in rural America. Now four companies have monopoly power in each sector of the food and agricultural system. For example, IBP, ConAgra Beef, Excel Corporation (Cargill), and Farmland National Beef Packing Company slaughtered 79 percent of the cattle in the United States in 1998. Six companies, Smithfield, IBP, ConAgra (Swift), Cargill (Excel), Farmland Industries, and Hormel Foods, slaughtered 75 percent of all pigs in the country in 1999. Four companies, Cargill (Nutrena), Purina Mills (Koch Industries), Central Soya, and Consolidated Nutrition (ADM and AGP), controlled all feed plants in the United States by 1994. Also, by 1997, four companies, Cargill, ADM Milling, Continental Grain, and Bunge, controlled America's grain trade. They managed 24 percent of the grains, 39 percent of the facilities for storing grain, and 59 percent of the grain export facilities in the country.³⁵

33. Warren P. Porter et al., “Endocrine, Immune, and Behavioral Effects of Aldicarb (Carbamate), Atrazine (Triazine), and Nitrate (Fertilizer) Mixtures at Groundwater Concentrations,” *Toxicology and Industrial Health* 15, nos. 1–2 (1999): 133–50; Elizabeth A. Guillette et al., “An Anthropological Approach to the Evaluation of Preschool Children Exposed to Pesticides in Mexico,” *Environmental Health Perspectives* 106, no. 6 (1998): 347–53.

34. Robert U. Ayres and Udo E. Simonis, eds., *Industrial Metabolism: Restructuring for Sustainable Development* (Tokyo: United Nations University Press, 1994), xii.

35. William Heffernan, *Consolidation in the Food and Agriculture System: Report to the National Farmers Union* (Denver, Colo.: 1999), www.nfu.org.

Conclusion

Clearly we have a moral responsibility to put agribusiness out of business. Alternatives to intensive factory-like farming exist, raising bountiful food without the cancer and cancer-like effects of industrialized agriculture on people and the biosphere.

All ecological effects are also effects against human health. Humanity's ecological footprint has serious consequences for humans. The warming of the earth alone is likely to force into extinction some 1.25 million plants and animals in the next five decades.³⁶ It's painful but convenient to do nothing, letting the message of Carson, Odum, Iltis, and Porter be forgotten, keeping the appearance of civilization, scholars pretending to do science and teaching, while our world is falling apart, while the captains of industry earn incomes from the sacrifice of our children and selling cancer to the world.

Reform and the remaking of the world's agricultural system ought to be the number one priority in any effort to make human civilization less threatening to the earth, because the industrialization of agriculture shapes all other plunder of the world. This means the World Trade Organization, the agent of business as usual, ought to have nothing to do with agriculture. In its place we deserve to have a world environment organization (WEO) defending the earth from plunder and toxic development. The WEO should be a global supreme court, having the power to launch a solar age for the benefit of humanity while bringing the era of fossil fuels to an end. Global warming is not a theoretical issue. In the United States, the rivers of northern New England are becoming warmer, and since 1936 the annual number of days of river ice have kept getting smaller, a development threatening Atlantic salmon, wetlands, and northern economies.³⁷ Already the Himalayan and Greenland glaciers and the Antarctic ice sheet are melting very fast.³⁸

The WEO would also embrace family farming. Once people "freeze" the

36. Guy Gugliotta, "Warming May Threaten 37 Percent of Species by 2050," *Washington Post*, 8 January 2004.

37. Cheryl Lyn Dybas, "Early Spring Disturbing Life on Northern Rivers," *Washington Post*, 20 March 2006, A5.

38. Shankar Vedantam, "Glacier Melt Could Signal Faster Rise in Ocean Levels," *Washington Post*, 17 February 2006, A1, A12; Juliet Eilperin, "Antarctic Ice Sheet is Melting Rapidly," *Washington Post*, 3 March 2006, A1, A5.

genetic landscape of the tropics, or whatever farm biodiversity has survived the onslaught of corporate agriculture, for the preservation of seeds and crops and knowledge for gentle farming, the future is ensured for taking the next step, which ought to be the freeing of all wild rivers from cement and pipes to start creating deltas of lush lands and wildlife. The near annihilation of New Orleans by Hurricane Katrina in the last week of August 2005 is a warning of the price we pay for our hubris. Any rebuilding of New Orleans ought to include the freeing of the Mississippi River at least south of New Orleans. Third, agrarian reform ought to bring giant farming and agricultural genetic engineering to an end. The state must give the landless land to farm without toxins and massive machines. Africa, and other agrarian regions of the world, must return to their culture, abandoning cash cropping for food cropping, using their own ancient seeds on the best lands, which ought to no longer produce gastronomic pleasures for foreigners but real food for local people. Give land security to peasants and they would deliver food sovereignty to Africa, Latin America, and Asia. Abolish agribusiness and the family farmers of North America and Europe will deliver food sovereignty to the North. Organic farming and traditional peasant agriculture provide guidelines for leaving as little a footprint as possible on the land. Each country ought to strive for food sovereignty, trading only the surplus. With such policies in place, the challenge of moving away from the brink of global warming and destruction, including making our world just and democratic, will, at least, have a fighting chance.