PESTICIDES

AND PROPERTY RIGHTS

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"Although today's poisons are
more dangerous than any known before,
they have amazingly become something to
be showered down indiscriminately
from the skies."
— Rachel Carson, *Silent Spring*

Introduction

Malaria kills one million people a year, mostly children, and sickens hundreds of millions. The tragedy is most pronounced in warm, humid places around the world where incomes are low. There, mosquitos breed readily and there are few resources to combat the problem. The disease has no cure at this time, and even treatment to reduce the effects of malaria is too expensive for most sufferers.

Fortunately, a cheap preventive measure is available. An inexpensive generic chemical can be sprayed on the walls of resi-

dences in Africa, Asia, and Latin America. The chemical is effective on mosquitos and some other insects, and the evidence from decades of use is that, unless abused, it has no ill effects on humans and a minor impact on the environment other than disease-carrying insects. Applied once every six months, it can greatly reduce the mosquito problem. Millions of lives can be saved and hundreds of millions will suffer less.

Unfortunately, the chemical is DDT.

How and why a pesticide that could prevent the suffering of millions each year (Attaran et al. 2000) has become largely unavailable is a story that goes back many years. It resulted from a history of abuse of pesticides. That abuse was the direct result of the refusal of the federal government to respect property rights. Had the United States government been held to the same standard of care for the rights of citizens that citizens are expected to have for each other, destructive policies of the past would have been avoided, and the tragedy of malaria would be unlikely to exist today.

By reviewing the history of DDT,[1] this paper will show that public policies imposed on people without consent, even if done with good intentions, may produce bad effects. Respect for property rights, by governments and by private parties, can prevent many environmental and human catastrophes.

THE ADVENT OF DDT

Traditionally, pests, not pesticides, were seen as a serious threat to human health and well-being. The first laws governing pesticide use were state laws, such as one enacted by Washington State to address an alleged problem: Not enough pesticides were being used in the apple industry (Whorton 1974, 74). From the perspective of some apple growers, other farmers were "free-riding" on the efforts of the growers who sprayed to control pests. The other farmers were failing to apply the then-dominant insecticide, arsenic, to their apple trees.

Another problem with pre-DDT pesticides was fraud—many

simply did not work as advertised. Early regulatory efforts, such as the federal Insecticide Act of 1910, were aimed at removing ineffective products from the market and avoiding acute poisonings that could result from pesticides that were too effective (Morriss 1997, 137).

No wonder DDT was hailed as a modern miracle when it was discovered. It was first used late in World War II when, sprayed on soldiers and civilians, it killed body lice, halting a typhus epidemic in Italy (Dunlap 1981, 61–63). Spraying DDT from the air on islands in the Pacific relieved the troops of the many miseries caused by mosquitos, especially malaria. DDT was not only more effective against pests, it was much safer than the inorganic pesticides, such as arsenic, that it replaced.

Recognized as generally benign to humans, DDT was hailed as a boon when it was released for civilian use after the war. Its production rose rapidly. Its inventor, Paul Müller, was awarded the Nobel prize in medicine. DDT was so popular it was even thrown instead of rice at some weddings (Whorton 1974, 248). Because DDT and related chemicals were so cheap and effective and safe, pesticide use increased fivefold between 1950 and 1970 (Rogers 1994, 399).

Promotion through Subsidies

After the war, the U.S. Department of Agriculture (USDA) promoted widespread spraying of DDT and many other pesticides, a program that expanded in the 1950s with bipartisan support. As a member of the House Agriculture Committee said, "We expect the Department of Agriculture, in cooperation with the land grant colleges and experiment stations and . . . with insecticides producers and the chemical industry, to develop pesticides that will control what is left of the immune insects that attack what we produce and present to the American consumer" (Bosso 1987, 69). Enthusiasm was similar in the Senate, where Senator Allen Ellender said in 1953 that pesticide use would help agriculture, thereby improving national security and helping defeat communism.

Pesticide regulation had moved to the federal level after World

War II in response to the pesticide manufacturers' concerns over increasing state regulation. Faced with potentially expensive and inconsistent state requirements, the industry lobbied successfully for the 1947 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). FIFRA was built around the same efficacy and acute health concerns as the earlier state and federal regulation. It did not, however, give the Department of Agriculture any significant regulatory powers. For example, although the statute gave the USDA weak powers to require proof that the pesticide was effective, and required manufacturers to register their products with the agency, it denied the department the ability to refuse to register a product (Morriss 1997, 139).

Manufacturers thus had the best of all possible worlds. They had no significant limitation on their ability to manufacture and sell effective pesticides, limits on competitors' ability to sell ineffective products, preemption of state regulation in many areas, and federal regulatory authority located in a sympathetic agency. While this was not the military-industrial complex that President Eisenhower warned of, it was a parallel set of interests—the private, congressional, and bureaucratic interests that help form the enduring "iron triangle" that determines many policies in Washington. Members of Congress, overseeing numerous diligent employees at the USDA, were happy to expend taxpayers' money to subsidize agricultural production, all the while being patted on the back by the chemical producers. Powerful political forces were at play. While we can look back skeptically upon their behavior now, no doubt the sense of mission was genuine and bolstered the special interests at work. DDT and other new pesticides were seen as cheap solutions to the boll weevil and other scourges that blighted agriculture.

A Public Good?

From the vantage point of the 1950s, promotion of DDT and other pesticides was justified on the same grounds as are most government programs. At the time, economists taught that government had an important role in subsidizing "public goods." These are

goods that, according to many economists, will be undersupplied by the marketplace because no one person can capture all the economic benefits of providing them. This rationale is still used to justify government provision of national parks and highways, although we know that the concept is often extended too broadly.

The thinking applies to pesticides this way: If one farmer (say, Jones) sprays his fields to extinguish a pest, the farmer next door (say, Smith) doesn't have to spray as much because Jones inadvertently protects him from pests that would have migrated to Smith's farm in search of food. Thus Jones is providing a "public good" to Smith, while Smith is a "free-rider" who benefits without paying Jones. As a result, many economists believe that there will be too many pests and too little pesticide use. To get to the efficient level of spraying, Smith must be forced to spray (the approach taken by Washington State with apple growers in the early 1900s) or all farmers must be subsidized via general treasury funds. Subsidies are the politically more attractive option since taxpayers are unlikely to be aware of how much of their taxes are going into subsidies or even which programs their taxes support. In contrast, farmers who get the benefit of a subsidy know about it and appreciate the representatives in Congress who deliver it.

The federal government encouraged pesticide use in several ways. The Department of Agriculture itself sprayed acreage with pesticides, and its extension service and experiment stations conducted research on pesticides and promoted their use. Acreage restrictions imposed on major crop production provided additional incentives to increase chemical usage.

Cropland set-asides began in the 1930s under the Agricultural Adjustment Act and have continued since under numerous laws. By 1961 the USDA was paying farmers to retire 53 million acres from production, an area larger than Minnesota (Bovard 1989, 85). The number of acres farmers could plant was controlled, but farmers were not limited in their ability to use fertilizer, insecticides, and herbicides to maximize output from the acres they planted. Crop price supports also encouraged farmers to squeeze more output from their restricted land by using more chemicals. On top of these policies, the USDA promoted intensive chemical

use and would do nothing to help organic farming or nonchemical farming methods (Bovard 1989, 217).

Department of Agriculture pesticide spray programs expanded significantly in the 1950s.[2] Millions of acres of trees in the northeast were sprayed with DDT to kill gypsy moths. In 1957, Congress approved the Fire Ant Eradication Act. The USDA proposed to treat 20 million acres (an area the size of South Carolina), with federal taxpayers bearing half the cost. To justify the program, as Rachel Carson (1962) later noted in *Silent Spring*, the USDA asserted that fire ants were a major threat to agricultural production, animals, and even human life.

By the end of the 1950s, government spraying programs began to provoke some public opposition. The USDA knew little about the effects of widespread dispersion of many of the chemicals it promoted and subsidized. One reason was that Congress directed funds for services such as spraying, not for background research needed to understand the environmental impacts of the programs. In addition, because federal regulation was aimed at preempting state regulation, the federal government discouraged states and localities from controlling pesticide use.

Farmers began to balk at paying for even a share of the spraying of chemicals that sometimes had unfortunate side effects. After a veterinarian in Georgia reported that more than 100 cattle died after one USDA aerial bombardment of dieldrin, farmers across the South increasingly refused to pay for pesticide application. The department's solution was to offer the chemicals for free to those who would take them. Even in Alabama, where fire ants had first appeared via the port of Mobile and where people recognized the problems the ants posed, the legislature withdrew funding for spraying in 1959 after state game officials estimated that the spraying could eliminate up to 75 percent of the state's wildlife. The USDA continued to spray without state or farmer input, but opposition took its toll and the federal spray programs gradually wound down.

Pesticides such as dieldrin and DDT worked as advertised on pests—but they also affected nontarget species as well. When spraying harmed wildlife and domestic animals, the USDA did not have

to compensate the owners and so failed to consider the full costs of the spraying.

The pesticide spraying program ended when the political costs began to outweigh the political benefits. Politicians in Congress and the managers at the USDA had an incentive to maximize the net political benefits of pesticide application. The first spray programs were conducted where the perceived benefits of spraying were largest, such as controlling malaria. As the program expanded, spraying was conducted where the benefits were smaller or localized, such as for gypsy moth control.

Similarly, the spraying programs began in places where the political costs of spraying were lowest (over swamps) and expanded into areas where the political costs increased (inhabited areas). Since Congress could mandate the use of tax dollars, spraying was extended beyond levels that individual decision makers would have reached. When public concern arose, however, especially after the publication of *Silent Spring*, the USDA and Congress were suddenly faced with a sharp increase in the political costs of the program.

Historical Concerns

Growers have long worried about negative publicity about food contaminants. Because many early pesticides were acutely toxic (some were made of arsenic, for example), residues on foods have been a public concern for many years. In 1891 a scare about a fungicide used on grapes caused lurid headlines in the *New York Times* and other papers. Public health authorities destroyed grapes, and sales dropped as consumers avoided them. Analysis by the USDA showed that "an adult would have to eat 300 pounds of grapes a day, including heavily coated stems, to get a harmful dose" (Dunlap 1981, 41). The scare went away, but growers remembered the consequences.

When a similar situation arose in England in 1925, with respect to fruit imported from the United States, growers hired independent chemists to inspect their products and assure the public that the fruit was safe. Testing was costly, however, and some producers sought to shift those costs to others. Beech-Nut, a baby

food producer, complained in the early 1950s about the cost it incurred from testing for insecticide residues and lobbied for regulations to limit pesticides in agricultural products (Dunlap 1981, 68).

A major public scare about residues and improper use of chemicals was the cranberry scare of 1959. In early November 1959, the secretary of Health, Education, and Welfare announced that cranberries were contaminated with aminotriazole, a USDA-registered herbicide, which the Food and Drug Administration (FDA) said caused cancer in laboratory rats (Bosso 1987, 98). Cranberry sales dropped just before Thanksgiving, the critical market period, and sales were halted in some states. The Department of Agriculture sputtered that there was no real threat; presidential candidates Nixon and Kennedy ate cranberries to demonstrate that they were safe, but sales collapsed to one-third their normal level. The damage to the cranberry market eventually passed but the scare left heightened public awareness that agricultural sprays might not be as beneficial as had been touted. Rachel Carson and other writers were inspired to dig into such matters. Public concern about chemical sprays was rising.

DDT: FROM HERO TO SCAPEGOAT

DDT was every bit as effective in agriculture as it had been in eliminating disease-carrying pests in World War II, but it was overused. DDT is a broad spectrum pesticide—one that affects a wide range of species. From the start, some scientists warned that more studies should be done regarding the effects of DDT before it was widely applied. Cheap and effective, it was produced and used in large amounts. While DDT appeared to be harmless to people, even if large quantities were ingested, it could affect things besides pests.

When USDA began gypsy moth eradication in New York, millions of acres in eastern New York, including Long Island, were subject to massive aerial spraying in the mid-1950s. The moth was a real scourge to forests and no other effective control chemical had been discovered. DDT was mixed in oil, so it would stick to

the trees, and sprays blanketed the area.[3]

Residents complained about the scum that coated cars, swimming pools, and houses. Of greater concern were reports of large fish kills and charges that DDT, consumed by cows, would contaminate milk. Organic farmers were angry because, by definition, they no longer had organic crops. In 1957, Robert Cushman Murphy, an authority on birds and curator-emeritus of the Museum of Natural History, led a group of Long Island residents in filing suit against the USDA to enjoin the spraying program. Murphy and other plaintiffs charged that the spraying program deprived them "of property and possibly lives without due process of law and [took] their private property for public use without just compensation" and was a "trespass upon the persons and property of the plaintiffs."[4]

Murphy argued that DDT is a poison that can damage humans, animals, birds, and insects and that it made the food from gardens unsafe to eat. It made land unsuitable for organic cultivation. He argued that there was no public emergency that could justify the spraying program, especially since no trees in Long Island were infected with the gypsy moth and, even if they were, it would be best to let nature take its course.

The judge reviewed the program, noting that the spray consisted of one pound of DDT per one gallon of light oil sprayed by aircraft. There was no doubt that the spray irritated some people and damaged some wildlife. But the government wanted to spray DDT. In 1955 the National Plant Board, representing all 48 states, had passed a resolution urging the USDA to eradicate the gypsy moth. "Such a formulation of informed opinion could not be ignored," the judge wrote. Furthermore, "the research conducted by the trained staffs of both Federal and New York State departments was directed to an intelligent program designed to deal with the realities of a perplexing situation."[5] USDA experts also testified that there was no evidence of illness caused by DDT. Since the public benefit was great and plaintiffs had failed to show that there was a threat of irreparable damage to them greater than the community would suffer from the gypsy moth, the program was not enjoined.

Murphy was back in federal district court again the next year trying to stop the spraying program. This time, Murphy came armed

with more evidence of dangers from DDT exposure. Dropping the claim of a violation of the Constitution for an uncompensated taking, the plaintiffs argued that the aircraft and the spray it deposited were trespass. Again, plaintiffs argued that they had the right to not have their property sprayed because it destroyed their ability to farm organically and it harmed wildlife. The court rejected these arguments because there was testimony that injured populations of insects were soon replenished and that crops sprayed with DDT were not unfit to eat, even though some people preferred not to eat such crops. The court dismissed the plaintiffs' claims, holding that they really only complained of "annoyance" rather than damage. That bother was offset by a valid exercise of the government's police power, the court said. "The rights of individuals are not limitless. Individuals must yield to the requirements of the public as a whole."[6]

Murphy appealed, but the Second Circuit Court of Appeals made short shrift of his argument. The spraying program was over, so the case was moot. Besides, the court noted, Murphy failed to prove damages.[7] Murphy then appealed to the Supreme Court, but it denied certiorari. Justice William O. Douglas dissented, arguing that the issue was not moot because spraying could resume and because the damage from DDT was not well understood enough for the courts to dismiss the possibility of danger.[8] Had the government been held to the same standard to which private parties who engaged in spraying chemicals were held, the program would have been halted and damages paid. The pesticide issue would not have become a matter for political decision makers.

COMMON LAW ENVIRONMENTALISM

The strongest protection for the environment comes from common law property rights enforced by the courts. As Murphy argued to the federal courts, spraying was trespass. Like all citizens, he had a common law right not to have his property invaded by a substance he believed to be damaging to the vegetation and wildlife on his property. The court rejected the claim be-

cause even if there was some damage to the plaintiffs, "the greater good," as defined by the legislature, requires that we submit to, and pay for, collective action such as chemical spraying.

Because the debate about DDT has been a debate about government programs, it has been conducted in all-or-nothing terms. Either we all get sprayed or no one gets sprayed. Either we all pay for spraying, via our taxes, or no one may pay. That tends to be the nature of political decisions—winners get more than what they are willing to pay for; losers are denied what they prefer and must contribute to the other side.

In contrast, markets and the common law generally make decisions at the margin: I decide if it is worth buying some spray, and, if so, how much will work for me. If I spray, some molecules of spray will drift on to my neighbor's property; if I spray too much, the impact will rise to the level of actionable damage, and I will pay for my carelessness for violating my obligation to protect my neighbor from my actions.

The fact that one is responsible for spraying pesticides carelessly, and inflicting injury on the property of another, has long been the rule of law. As Robert Blomquist wrote in a law review article in 1995, "common law theories" that impose liability for damage from pesticide drift "should be understood as social efforts to internalize those external costs by making the polluter pay" (Blomquist 1995, 397).

Cases from the 1950s indicate a general liability rule for pesticide drift. A farmer (and a sprayer hired by the farmer) could be held liable for spray that was accidentally dumped on a neighbor's property or that drifted onto a neighbor's property if it damaged crops, livestock, or persons (for example, *Crouse v. Wilbur-Ellis Co.* 1954 [9]). No bad intention was needed, and usually it did not exist, because neither the farmer or the spray pilot had reason to waste money by dumping spray on the property of another or dropping the spray when it was windy (*Faire v. Burke* 1952[10]).

Quite a number of cases concern spraying that drifted and killed bees; liability was imposed (see *Lundberg v. Bolon* 1948[11]). Other cases concerned spray that infected dairy milk with unacceptable levels of pesticide (*Smith v. Okerson* 1950[12]). If one was

careless and sprayed too much because directions from the manufacturer were not followed, the action rose to the level of negligence per se (*Bennett v. Larsen* 1984[13]). Completely contrary to what happened to the organic growers on Long Island, whose crops were sprayed with DDT, farmers have won cases when pesticide sprays from neighboring farmers made them ineligible for "organic" certification, even though the level of pesticides on the crops was within federal standards for human consumption (*Langan v. Valicopters, Inc.* 1977[14]).

Common law protections against careless neighbors aside, what about careless governments, or even well-meaning governments that have a good purpose at heart? That is a different story. There is no doubt that under the Constitution governments can condemn property for a public purpose, whether it is spraying the property with DDT or bulldozing it to build a public school. The difference is that, as the Supreme Court usually reads the Constitution, if the government wishes to bulldoze property it pays the fair market value of the property; but if it sprays chemicals on private property and injures the owner, tough luck. The government is not held to the same standard of care that private property owners are to make sure that their actions do not inflict harm on their neighbors' property. If it were, the tragic saga of DDT and, today, the malaria epidemic, would likely have been avoided.

Why did the legal system fail to control the problems identified by Murphy that were caused by DDT spraying?[15] The answer is that the plaintiffs sought to restrain the government, not private parties. There is no doubt that the plaintiffs could have won injunctive relief against a private party who chartered a plane and sprayed even a harmless substance on the plaintiffs' land. But compared to the "public interest," as articulated by the federal government, the plaintiffs could not hope to prevail without more dramatic harm. Since federal regulations generally override property rights and common law protections, the battle over pesticides had to be played out in the public and political arena.

THE COURT OF PUBLIC OPINION

In 1962 Rachel Carson, a professional writer with a master's degree in zoology, made DDT Public Enemy No. 1 in the chemical world. Her book, which was serialized in part in the *New Yorker* before its publication, was well-written, knowledgeably discussed scientific research, and painted a horrifying picture of the world that was coming if DDT use was not restricted. Carson told her readers of a silent spring, when no birds would sing because they would all be dead from DDT exposure.

Carson's assertions about the hazards of DDT were exaggerated, but there was enough to the story she told to fan public fears. By the late 1950s there was growing evidence that DDT, when sprayed over large areas, could cause fish kills and bird kills, as well as the intended insect kills. By the 1960s, scientists who studied birds were becoming increasingly convinced that DDT was decimating bird populations where it was sprayed widely. Studies of peregrine falcon and other birds of prey found evidence of a thinning of egg shells caused by DDT (Dunlap 1981, 137). Conclusive or not, studies by qualified scientists pointed to wildlife problems stemming from extensive government use of DDT.

The Environmental Defense Fund (EDF), at that time a small environmental pressure group, went on the offensive in the late 1960s with high-profile lawsuits and scare-tactic campaigns that brought in substantial revenues (see note 15). At the same time, general public concern about chemicals in food and the environment was increasing. The FDA, for example, banned the sweetener cyclamate on thin evidence and was considering, with congressional support, banning assorted other substances. The EDF campaign thus hit a nerve.

Trying to stem uninformed public concerns about health hazards and increasing political support for banning DDT, the secretary of Health, Education and Welfare established a commission to produce a report on DDT. The report, prepared primarily by the National Cancer Institute, noted suspicions about DDT but found there was no firm evidence that it was carcinogenic to hu-

mans. More testing was recommended.

Environmentalists attacked the report, and a wide range of groups pressed to have DDT banned as carcinogenic. Smelling victory, the Environmental Defense Fund sued the USDA and was allowed by the courts to challenge the USDA's registration of DDT.

The federal appeals court took the opportunity to excoriate the Department of Agriculture for its clumsy handling of the matter.[16] Moving quickly by Washington standards, federal agencies back-pedaled and began announcing that DDT use would be phased out (Dunlap 1981, 207–211). The secretary of Interior banned DDT from use on federal lands. The Food and Drug Administration asserted its jurisdiction should DDT appear in any food product. If it did, the agency would feel free to limit or ban DDT use, an action opposed by the USDA. Perhaps most important, Congress shifted responsibility for pesticide regulation from the USDA to the newly created EPA in 1970. Politics—between and within agencies, between Congress and the Nixon administration, and between the chemical industries and environmental activists—now dominated the debate.

One problem for a ban on DDT was that the alternative products were noticeably inferior—they cost more and did not work as well. DDT was recognized as harmful to some wildlife under certain conditions, but there was no existing evidence of danger to humans. If it were banned, would cotton crops be wiped out by insects? And more generally, if it were banned, would not the alternative pesticides be more toxic and more costly?

With the focus on real or imagined horrors of DDT use, those issues got little public attention, and DDT was banned in June 1972 by EPA Administrator William Ruckelshaus. That decision was not enough for the EDF; it sued to have all production halted so DDT could not be used for export or even used in case of domestic public health emergency, such as an outbreak of malaria (Dunlap 1981, 234). Environmental organizations have continued to press for bans on DDT in the years since, and bans have been imposed in many nations. The transformation of DDT from a public good to a public bad was complete. There it remains today.

ROLL BACK MALARIA

Banning DDT may have played a significant role in helping the bald eagle and other birds make a comeback in the past three decades, but it has definitely allowed malaria to make a comeback. The worry of scientists that there was no good, less toxic, cost-effective substitute for DDT to control mosquitos and other pests is as true today as it was three decades ago. A disease that was on the way to being vanquished has returned with a vengeance.

The hundreds of millions of sufferers of malaria and the millions of families that lose infants to malaria (the equivalent of "filling seven Boeing 747s with children, and then crashing them, every day") are being denied an effective solution (Attaran et al. 2000, 729). The number of countries using DDT has been whittled down to 23. It is produced in only three countries and is becoming difficult to obtain. The United Nations Environment Program has put it on the hit list for extinction. The U.N. seeks a global ban by treaty (Tren and Bate 2001, 22).

Besides killing a child every thirty seconds, malaria is a recurring disease for many. Children who survive malaria past infancy suffer an average of six bouts each year, making it the most common reason to miss school; adult sufferers miss an average of ten working days a year (United Nations Children's Fund [UNICEF] 1999, 4). The infection rate had fallen significantly over the decades, primarily because of DDT sprayed inside homes and on mosquito breeding sites. But as a UNICEF (1999, 6) report describes it, "DDT was widely discredited in the 1960s because of its harmful effects on the environment." So the disease is nearly back to where it was 50 years ago.

The tragedy is not being ignored. Roll Back Malaria was launched in October 1998 by UNICEF, the World Health Organization, and the World Bank to "prevent and control this centuries-old scourge" (UNICEF 1999, 1).

Since DDT is unavailable in most nations, and international agencies are shy to use it even where it is legal, the UNICEF pro-

gram must rely on other measures. These include "insecticide-treated mosquito nets, mosquito coils, repellants and other materials; early detection, containment and prevention of malaria epidemics; and strengthening of local capacity to monitor malaria in affected regions" (UNICEF 1999, 8). If that list gives the impression that the results may not be as effective as DDT, the evidence is consistent with that impression.

A UNICEF showcase effort in Laos, instituted in 1994, for example, reduced malaria by 25 percent over three years (14). The ambitious goal of Roll Back Malaria is to reduce infant mortality from malaria (not the incidence of malaria in infants) by 50 percent by 2010. Even if that optimistic level could be reached, it is no where near the level of success achieved by the proper application of DDT in other countries (Goklany 2000).

Money is being pieced together from multiple sources for this project, whose organizers are hoping for a budget of $1 billion per year. By early 2000, $27 million had been collected from or pledged by various countries and international agencies (World Health Organization 1999a). While that sum is trivial for the task at hand, the World Bank has promised to fund up to half the budget (*Lancet* 2000b). Other funds are solicited from governments, agencies, nongovernmental organizations, and private businesses, including pharmaceutical companies that can provide drugs to relieve symptoms as well as perhaps discover a cure. The World Bank is spearheading this private-public partnership called "New Medicines for Malaria Venture," which aims at providing new medicines at prices affordable for hundreds of millions of impoverished persons (World Bank 1999).

In malaria prevention, the focus of Roll Back Malaria is on the use of mosquito nets. For the program to be fully effective, all people in the tropical regions of the world would have to sleep under such nets. At a price of $5 to $10 each, they are expensive for people in countries where per capita personal income is measured in the hundreds of dollars per year. Moreover, the nets require continual retreatment—soaking the nets in liquid insecticide (UNICEF 1999, 3).

Substituting chemically impregnated mosquito nets for DDT

has reduced exposure to DDT but increased exposure for many people to malaria, as well as to the insecticide used in treating the nets. This occurs through unprotected skin contact when nets are dipped in tubs of insecticide for retreatment and through exposure to air filtered through the insecticide-impregnated nets. Given the terrible cost of the disease, people probably accept these minor risks. They are denied, however, the choice between those risks and those of a DDT-spraying program. The ban on DDT substitutes a more expensive and less effective program for the cost-effective program of DDT spraying.

As might be expected, in regions where malaria is a scourge, people question the viability and morality of Roll Back Malaria when a proven cost-effective malaria-control product, DDT, already exists. In December 2000, the World Health Organization sponsored a meeting in Harare, Zimbabwe, entitled "Regional Consultation to Prepare African Countries towards Reduction on Reliance on DDT for Malaria Control." Delegates to the meeting agreed to issue a statement expressing the "deep concerns of the participating member states on the possible economic and health implications of any restriction made on DDT use for malaria control" (World Health Organization 2000). In sum, the delegates noted that no cost-effective or proven alternatives that are less toxic exist to replace the job DDT does.

BIRDS VERSUS CHILDREN?

Meanwhile, environmental groups ignore the role that DDT could play in combating malaria. A review of Web sites offered by major environmental organizations (Audubon, Environmental Defense, the Natural Resources Defense Council, and the Sierra Club) indicates nothing but an historical interest in DDT. It is listed as a chemical that everyone is presumed to know is a major environmental hazard. Greenpeace sponsors protests at the few factories in various nations where DDT is still produced. The World Wildlife Fund is pushing to eliminate all use of DDT (Tren and Bate 2001, 23).

Perhaps the groups that champion the banning of DDT are chagrined to have the issue discussed. If the public were aware that a million lives are being lost each year and immeasurable human misery inflicted on the basis of limited evidence from the 1960s that DDT may have caused some egg shell thinning after massive government spraying, there might be an outcry. Should millions of lives be sacrificed in poor nations because wealthy residents of Western nations are worried about bird populations? If indeed the risk of DDT is such that it could lead to silent springs, then billions should be spent on alternative malaria eradication, prevention, and treatment techniques. But as the Roll Back Malaria program indicates, only modest improvements in fighting malaria are likely.

DDT USE AND DISUSE

In the decades that have passed since the banning of DDT in the United States, research on DDT has continued. Because some nations still spray DDT to control mosquitos, because some quit and then resumed spraying, and because others quit at a known point in time, data have been collected from studies around the world. A review article covering numerous studies in the British medical journal *The Lancet* provides the basis for this discussion (Roberts, Manguin, and Mouchet 2000).

When DDT spraying is ended, malaria's incidence rises markedly. In the high and moderate risk regions of Columbia and Peru, for example, the risk of malaria doubled when spraying ceased in the 1990s. The disease has returned to areas in which it had been eradicated: urban areas of the Amazon Basin, Korea, Armenia, Azerbaijan, and Tajikistan. In Sri Lanka, malaria cases fell from 2.8 million and 7,300 deaths per year before DDT spraying to 17 cases and no deaths. After the spraying stopped in 1961, malaria jumped back to 500,000 cases by 1969 (Attaran et al. 2000, 729), The spread of the disease means it has reappeared even in the United States and Europe.

That DDT is effective at eliminating mosquitos has never

been the main issue; the key questions concern long-term toxicity and environmental damage. Yet "claims of risks of DDT to human health and the environment have not been confirmed by replicated scientific inquiry," write Roberts, Manguin, and Mouchet (2000, 33). Evidence from more than 50 years of use indicate that, properly applied, DDT is not harmful to humans or the environment in general. Further, the evidence is that, when it is properly applied, mosquitos do not become resistant to DDT, a benefit that is not shared by most alternative sprays (Villet 2000).

DDT appeared to be so harmful in the 1950s and 1960s because of its widespread use in heavy dosages, mostly from government spray campaigns but also from overuse by private sprayers who had not learned proper conservation. When DDT is sprayed in massive doses, birds can suffer acute and long-term effects. "The fault for this lies in the massive agricultural use of DDT. Dusting a single 100-hectare cotton field, for example, can require more than 1,200 kg of DDT over 4 weeks," write Attaran et al. (2000, 729).

Today, even if DDT is sprayed from the air to combat mosquitos, the volume and frequency are far less than common agricultural practices in earlier years. However, aerial spraying is not needed for DDT to provide significant protection to people against mosquitos. Attaran and associates write:

> The current practice is to spray the interior surfaces only of houses at risk, leaving a residue of DDT at a concentration of 2 g/m² on the walls, ceiling and eaves, once or twice a year. Half a kilogram can treat a large house and protect all its inhabitants. Doubtless some fraction of this escapes to the outdoors, but even assuming it all did, the environmental effect is just 0.04% of the effect of spraying a cotton field. Guyana's entire high-risk population for malaria can be protected with the DDT that might otherwise be sprayed on 0.4 km² of cotton in a season (Attaran et al. 2000, 729).

WHY THIS POLICY?

Decades of evidence indicate that DDT can be applied in manners much more cautious than was the case decades ago, saving millions of lives and hundreds of millions from misery at a low cost and with minimal environmental damage. Since we now know this, why does the old policy persist? Hundreds of independent scientists, including three Nobel laureates in medicine, signed a public letter in 2000 advocating the use of DDT for spraying inside houses (Lancet 2000a).

But good science rarely forms the basis of public policy. Science may indicate that careful use of DDT will be greatly beneficial and pose trivial environmental harm, but "environmentalists are still seeking a global ban, arguing that if DDT is produced for use in improving public health, it will also be used for agriculture and lead to global pollution of the environment" (Roberts, Manguin, and Mouchet 2000, 331).

The world of pesticide politics today is much like the world of pesticide politics a half-century ago, except that the impact is much greater. Recall that back in the 1950s, special interests for agriculture pressed for public money to be used to spray DDT over millions of acres to attack gypsy moths and other pests. The Department of Agriculture benefited as an agency from this expansion into active pest management, which traditionally had been left to individual farmers or to states. Members of Congress who sat on the agriculture committees could report to their constituents that they were generating benefits for them—the government would spray for pests and, at most, the beneficiaries would only have to pay a fraction of the bill. And chemical companies that made DDT and other pesticides no doubt lobbied for expanded spray programs, since it meant more sales of their products.

Now the politics has moved to the international level. The groups that now want to prohibit the use of DDT are different from those that supported its use in the 1950s, but the self interest exhibited is just as strong. Without a ban on DDT, the World Bank, UNICEF, the World Health Organization and other international

government agencies would not be needed for malaria control. DDT is inexpensive and effective; many countries were handling the situation decades ago without help from Geneva or New York. Without DDT, malaria is a global tragedy that easily justifies a billion-dollar-a-year budget for Roll Back Malaria, a program likely to become a permanent feature so long as DDT is outlawed. The plague will never go away. It may be made smaller and less tragic. A permanent program is growing that will put a dent in a persistent problem that was near extinction three decades ago.

The World Bank specifically benefits from its participation in Roll Back Malaria because it is routinely blasted (with good reason) by environmentalists for supporting programs that are environmentally (and economically) destructive (Brown 2002). Roll Back Malaria gives the World Bank a public health role that has a plausible impact on economic development (sick people cannot work as well as healthy people). So the World Bank finds a way to make peace with its environmental critics while justifying its continued existence for years to come. The World Bank is not alone among agencies that have incorporated environmental goals. Terry Anderson and Henry Miller (2000) and others have documented in *The Greening of Foreign Policy* that a host of federal agencies have evolved into agencies with environmental agendas or, at least, agendas that will not offend the politically potent environmental organizations. With the waning of the cold war, these agencies need new friends.

Roll Back Malaria will have only limited success, even if it meets its goals, but it does not irritate environmental organizations, who indeed applaud the use of mosquito nets rather than DDT to fend off mosquitos. Knowing that nets will not prevent many people from getting malaria (the hope is that fewer infants will be stricken), the big focus must be on developing a vaccine. While there is nothing on the immediate horizon, drug companies and other researchers are willing to accept funds from government agencies to work on the project.

While DDT is banned, and poor countries that consider its use have been threatened with a loss of foreign aid (Tren and Bate 2001, 21–25), other chemicals will be allowed under Roll Back

Malaria. Yet other chemicals present two problems: they cost a lot more and they have toxicity problems. Malathion, considered the next cheapest alternative, costs three times as much to apply as DDT (Attaran et al. 2000, 730). Similarly, pyrethroids also cost about three times what DDT does to treat a house for mosquitos. That high cost, an entomologist at the Environmental Protection Agency asserts, is likely to lead many countries to abandon house spraying altogether (Stolberg 1999).

The alternatives also do not appear to work as well as DDT. According to an entomologist in South Africa, certain malaria-carrying species of mosquitos "are completely resistant to the new, softer pyrethroid insecticides that were introduced by the National Department of Health" (Villet 2000). While these newer, more costly, and less effective insecticides may help some, and are believed to be less toxic to birds than DDT, they have not been subject to as much study as DDT and so they may pose other environmental problems yet unknown.

In any event, chemical companies are no doubt pleased to supply more costly and less effective chemicals in lieu of cheap, generic DDT. Roberts, Manguin, and Mouchet (2000, 331) observe that the

> insistence of environmental advocacy seems to have won approval of powerful pesticide companies because it allows them to sell their more expensive insecticides. The replacement of DDT by organophosphate, carbamate, or pyrethroid insecticides is commonly proposed even though price, efficacy, duration or effectiveness, and side-effects (e.g., unpleasant smell), are major barriers to use in poor countries.

Cost barriers may disappear if sufficient money is poured in by the World Bank, UNICEF, World Health Organization, and other government agencies—perhaps much the way the Department of Agriculture expanded the use of DDT in the United States back in the 1950s.

The major environmental groups do not admit that the DDT ban produces results similar to that of some of the most horrific

man-made and natural catastrophes. While we hear much in the media about AIDS in Africa, almost nothing is said about the malaria epidemic. No doubt there is some element of embarrassment that keeps the general media, which has consistently supported the view that DDT is an unmitigated evil, from saying much about the matter. Yet some scientists assert that the insistence of "rich countries" that malaria-infected countries "do without DDT is 'eco-colonialism' that can impoverish no less than the imperial colonialism of the past did" (Attaran et al. 2000, 730).

Environmental groups and, far more importantly, government policy makers who decided that DDT should not be used against mosquito infestations face no responsibility for the millions of babies dying and hundreds of millions of people suffering. There are no legal forces or market forces to push for a correction except one: the hope that serious scientific evidence will be considered by policy makers. However, since policy makers need not make decisions based on sound science, and because they fear the wrath of environmental groups and thus voters, there is no reason to expect a change in policy.

WHEN PROPERTY RIGHTS ARE TRAMPLED

The saga of DDT, now a half-century long, is the result of moving decision making from the private sector to government. Public decision makers, spending other peoples' money and responding to special interest pressures, sprayed DDT and other chemicals over millions of acres, all in the name of the public good. Residents of Long Island who objected to their property being sprayed with DDT saw the consequences of centralized decision making. Today, once again, it is public decision makers, spending other peoples' money, deciding that DDT may not be used and that other less effective and more costly measures will be taken instead. Residents of many villages in many nations who might wish to use DDT in their own homes to save their children also see the consequences of centralized decision making.

We posit that, except for the spraying of soldiers in World War II, the government had little justification for spraying DDT (and other pesticides). It was a violation of property rights. We agree with Robert Murphy and the original plaintiffs who sued the Department of Agriculture in 1957,[17] contending that the spray program was a trespass on their property and that it deprived them of the full value of their property without compensation. Those who preferred to have pesticide-free crops may have been "irrational" in their preferences, in that there was no scientific basis for their concerns about trace levels of DDT, but they should have been able to enjoy such a preference on their own property. They asked for no forced subsidy from taxpayers; they merely asked to be left alone on their property and for their preferences to be respected.

Public decision makers have little reason to respect such personal preferences because it weakens the latitude of the legislature and the agencies that execute its wishes. As an assistant secretary of Agriculture told Congress with respect to the fire ant spray program, "all infestations must be treated without regard to location, land use, or ownership" (Bosso 1987, 87). That is, property rights cannot be considered when the wisdom of public decision makers is expressed. As one critic noted, the spray program is "a monument to the power which key congressmen on strategic committees can exercise over environmental policy" (86).

Spraying against fire ants drew the same kind of reaction among some farmers in the South that DDT spraying drew in New York. As the Department of Agriculture began to back down, it admitted that "areas have been aerially treated contrary to the wishes of property owners" (102). Not everyone agrees with "public health" measures or even programs designed to help a specific interest group, such as farmers whose land contains fire ants. Those who did not like the programs, having no legal protection, had to turn to political action and the creation of groups such as the Environmental Defense Fund (now Environmental Defense), to try to get their way. Had the courts held, in the early challenges to the DDT spraying, that such spraying was a trespass or a taking without compensation, the bald eagle may have not suf-

fered such large population drops that it needed the protection of the Endangered Species list, and millions of human lives would have been saved.

Political action, unlike markets and the rule of law, tends to dictate one solution for all. If you are on the winning side, you get to have your preferences forced on others and make them help pay for what you want. If you are on the losing side, you may not exercise your preferences and you are forced to pay for what the winning coalition wants.

CONCLUSION

Since the early 1970s opponents of DDT have had the upper hand politically. The winning coalition has been the opposite of the coalition that dominated the previous two decades. The former coalition forced people to have their property sprayed with DDT or some other pesticide. The present one has persuaded political actors and government agencies to carry out their preferences by prohibiting people from using DDT—even on their own property to protect themselves from mosquitos and the deadly diseases they carry. To prevent any risk to birds, humans suffer and die. The cause is the same—public decision makers running roughshod over the rights of citizens to protect their persons and their property in the way citizens most see fit.

Clearly, under the common law, one would be free to spray the inside of one's own house to reduce the risk of a deadly disease, and the evidence is that this would not inflict injury on neighbors' property. Yet that level of personal protection, one that could be lifesaving, is now prohibited in the United States, and the political decision to prohibit it has been exported to most countries of the world. Today, command-and-control rules dictate minuscule details of the use of one's own property, even if no harm is done to anyone, with harmful consequences extending throughout the world. Such decisions are too important to be left to politicians.

NOTES

1. The full name of the chemical is dichlorodiphenyltrichloroethane.

2. The following discussion is based on Bosso (1987, 81–106).

3. This discussion is based on Dunlap (1981, 87–91).

4. *Murphy v. Benson*, 151 F.Supp. 786 (E.D.N.Y., 1957), 789.

5. *Murphy v. Benson*, 151 F.Supp. 786 (E.D.N.Y., 1957), 792.

6. *Murphy v. Benson*, 164 F.Supp. 120 (E.D.N.Y., 1958), 128.

7. *Murphy v. Benson*, 270 F.2d 419 (2nd Cir., 1959).

8. *Murphy v. Benson*, 362 U.S. 929, 80 S.Ct. 750 (Sup. Ct., 1960; cert. denied).

9. *Crouse v. Wilbur-Ellis Co.*, 77 Ariz. 359, 272 P.2d 352 (1954).

10. *Faire v. Burke*, 363 Mo. 562, 252 S.W.2d 289 (1952).

11. *Lundberg v. Bolon*, 194 P.2d 454 (Supreme Court, Arizona, 1948).

12. *Smith v. Okerson*, 73 A.2d 857 (Superior Court, New Jersey, 1950).

13. *Bennett v. Larsen*, 348 N.W.2d 540 (Supreme Court, Wisconsin, 1984).

14. *Langan v. Valicopters, Inc.*, 5678 P.2d 218 (Supreme Court, Washington, 1977).

15. The same issue arose again in state court in New York in 1967. This time, the Environmental Defense Fund, which had been formed that year largely due to the DDT issue, was behind a suit to try to enjoin government spraying of DDT to control mosquitos on Long Island (Dunlap 1981, 142–200, discusses this history). Perhaps being more savvy politically, the plaintiff did not argue on the basis of trespass or takings. Rather, the plaintiff proposed a theory that the court had the right to enjoin actions that adversely affect natural resources (*Yannacone v. Dennison*, 285 N.Y.S.2d 476 [Supreme Court, Suffolk Co., New York, 1967]). That novel argument had no basis in common law or statutory law, so no injunction was issued, but plaintiffs were well aware that the issue was moving to the political level, so the impact on the media may have been the

major goal of this and similar suits brought by the new organization. Coverage of such litigation added to the drumbeat against DDT that emerged after publication of *Silent Spring* in 1962. The product was not long for the market.

16. See *Environmental Defense Fund v. Hardin*, 428 F.2d 1093 (District of Columbia Circuit, 1970).

17. *Murphy v. Benson*, 151 F.Supp.786 (1957).

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