

Farm chemicals dilemma: High yield for low water quality

Fourth in a series
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WASHINGTON, D.C. — Agricultural chemicals have become the lifeblood of America's intensive farm production over the past 30 years, but they also have turned into one of the country's most vexing environmental problems.

Powerful insecticides, herbicides and chemical fertilizers continue to be applied to farm fields in ever increasing amounts, and, in the case of insecticides, despite mounting evidence that some bugs are growing resistant to the chemical killers.

Environmentalists and public health advocates began to attack pesticide usage in the 1960s and were successful in driving from the market DDT and its chemical cousins, which persist in the environment long after use and lodge in the body tissues of man, animals and fish.

Those attacks on pesticides enraged farmers, split the scientific community and resulted in federal pesticide regulation being taken away from the U.S. Department of Agriculture (USDA). They were founded mainly on alleged direct health effects, including fears that pesticide residues could cause cancer.

Water Pollution Laws

Those questions will continue to be raised, but in addition, the use of pesticides and fertilizers is being scrutinized closely today because of the demands of recent federal water pollution laws.

Agricultural activities are causing pollution in two-thirds of the river basins in the U.S., according to a just-completed report by the Soil Conservation Service (SCS). That is of serious concern to federal environmental officials because of legislation that requires U.S. waters to be of fishable and swimmable quality by 1983.

The SCS study reveals that, despite regulatory actions against chemicals, including many of the so-called "persistent" pesticides like DDT, the use of pesticides, particularly herbicides, is "still rising."

Pesticides in Food

The benefits of pesticides in boosting crop yields are "undeniable," but "excess use of pesticides is occurring," the study says. Monitoring by government agencies continues to turn up evidence of pesticide residues in the American food supply; the possible health effects are not well understood.

More than 1,800 pesticide compounds are sold in the United States in more than 32,000 different products. Pesticide production, estimated at 750,000 tons in 1977, will reach 1.25 million tons by 1985, the SCS study said, and will be marketed for more than \$3 billion.

Although a relatively small percentage of the insecticides and herbicides find their way into waterways — probably about five per cent — "some chemicals are highly toxic to fish or other aquatic forms and can persist in the aquatic environment for a long time, so that even very low levels of these pesticides are of environmental concern," it said.

Studies in the late 1960s showed pesticides present in 60 percent of the water sampled. In 1975, Iowa State University chemists reported that all major streams in the state and many sources of urban drinking water were contaminated with pesticides such as atrazine, DDE and dieldrin. The scientists warned that no one yet knows the long-term human health effects of ingesting the chemicals.

Joseph A. Krivak, an official of the Environmental Protection Agency (EPA), said that "volumewise, erosion and sediment are the biggest agricultural pollution problem, but the most serious problem is the toxic chemicals, because of the possible health hazards."

Chemical Fertilizers

Similar water pollution problems have been traced to the heavy use of chemical fertilizers, now applied to the land by U.S. farmers at the rate of about 40 million tons a year.

Some chemicals used in fertilizers can, if concentrated enough, become toxic to humans, animals, or fish. Both fertilizers and pesticides are believed responsible, for example, for severe oyster kills in Chesapeake Bay last year. But another problem with fertilizers is that when they are carried into waterways by rain and



A central Iowa farmer unloads herbicides and insecticides this spring for application to his fields.

erosion, they raise havoc with the ecosystems of rivers and lakes.

The "nutrients," which are essentially what nitrogen and phosphorus-containing fertilizers are, "tend to speed up the process of eutrophication, the enrichment of water, and the resulting overabundant growth of plants, including algae," said the SCS.

"Although this growth can be a problem in itself, it often leads to other problems, including decreased oxygen levels in water and the production of certain toxins, such as those from decaying algae."

The U.S. General Accounting Office said last year that "an estimated one million metric tons of nitrogen found in surface and ground waters are the result of using fertilizers."

The pollution threat from agricultural chemicals is compounded by the run-off of livestock wastes into rivers and streams. The new SCS study, which was made in connection with new federal efforts to stop agricultural pollution, said 2 billion tons of livestock wastes are produced annually in the United States.

About half this waste is "regulated" and presumably treated

or safely disposed of, under recent rules governing large confined feedlots and smaller feedlots very close to waterways. But unconfined livestock, roaming large areas of the United States, produce the rest of the waste, and much of it reaches streams, rivers and lakes because of rain-caused run-off.

The livestock wastes contain nutrients, which add to the fertilizer nutrient problem, and bacteria, which can cause disease. Livestock waste remains "a potentially significant pollution hazard," the EPA said early this year.

Most pesticides, fertilizers and animal wastes that reach public waters do so because of water erosion from farms. What troubles scientists and government officials is that the problem seems to be feeding upon itself.

As soil erosion increases, farmers must apply more fertilizer to compensate for the declining productivity of the soil. If they don't, their crop yields will drop.

Then, when rains come, the erosion

carries more fertilizers, pesticides and animal wastes into the waterways. The erosion drains away more topsoil, damaging the land further, and making more fertilizer necessary for the next crop.

All-Out Production

Adding to that vicious circle is the fact that the all-out crop production policies of the mid-1970s brought into cultivation marginal-quality lands most subject to water and wind erosion.

"It's a simple process," said William H. Greiner, executive vice president of the Soil Conservation Society of America (SCSA). "You put chemicals on the farmlands. They attach themselves to soil particles. When the soil moves off the farm, the chemicals move with it. Thirty-five to 40 years ago, the pollution problem from farm erosion was just sediment, but now it's chemicals, too."

Most of the experts see two possible solutions — stopping soil erosion so that the chemicals won't wash and blow from the land, and reducing the use of the chemicals

themselves. Both solutions sound simple, but neither is.

Under the new Rural Clean Water Program, set up by federal water pollution legislation, the government plans to pay farmers half the cost of installing "best management practices" on their land to halt water pollution. The practices most likely will consist of more-or-less conventional soil conservation techniques, like terracing and contouring, but could also include new pest control programs and substitution of organic fertilizers for chemical nutrients.

The problem is the cost — an estimated \$10 billion — at a time when budget considerations seem uppermost in the minds of the public and many politicians. How successful such a program will be, and how long it will take, is anyone's guess.

Scientists and agricultural leaders now believe that a great deal of soil erosion could be controlled if farmers didn't plow their land so much. Leaving crop residues on the ground, through "minimum tillage" practices, helps hold soil in place. But there also are signs that the residues harbor weeds and insects, and that minimum tillage could lead to greater insecticide and fertilizer use.

As for reducing the use of agricultural chemicals, some environmentalists and a few scientists talk about organic farming, where chemicals are dropped entirely. Such a move is highly unlikely, at least anytime soon, although studies at Washington University's Center for the Biology of Natural Systems seemed to show that farmers could switch to organic farming with no loss of income.

Experimenting with actual corn crops planted on actual farms, and without chemical insecticides, herbicides and fertilizers, the researchers produced yields only 10 percent below neighboring farms that used chemicals.

The organic farms' lower production costs made their net income come out about the same as the other farms. The findings were confirmed by similar experiments conducted later by the University of Missouri.

"Not on a Large Scale"

Many experts share the view, however, of the SCSA's Greiner, who says, "Truly organic farming will not work on a large scale. There just isn't enough of the 'organic stuff' that would be needed — animal wastes, garbage and so on."

A more conventional and more accepted approach to reducing chemicals use is that taken by officials who talk optimistically of "integrated pest management," in which biological controls and other measures take over some of the role of chemical pesticides, and of persuading farmers to make wiser and



reduced use of fertilizers. So far, not much progress is evident.

Pesticides and fertilizers have enabled U.S. farmers to build the greatest food-producing machine in the history of the world, and often have meant the difference between a profitable crop and losing money. Farmers are not about to give them up easily.

"Pesticides are an essential tool of agricultural production," said the American Farm Bureau Federation in resolutions adopted at its last annual meeting. The nation's largest farmer organization called the EPA "unreasonable and detrimental" in its pesticide restrictions, and said regulation should be returned to the more friendly USDA.

Incidents such as this year's invasion of Great Plains wheat fields by hordes of grasshoppers understandably bring cries from farmers seeking permission to attack the insects with DDT and other banned chemicals.

The National Agricultural Chemicals Association, the trade organization of the pesticide industry, acknowledges that non-chemical pest controls are "desirable" but "not always practical or feasible."

Last December, however, Agriculture Secretary Bob Bergland announced a department-wide policy to "develop, practice and encourage the use of integrated pest management methods that are practical, effective and energy-efficient."

He said research will be conducted on pest-resistant crops and non-chemical biological pest controls.

Chemical pesticides will continue to be used, but hopefully in reduced amounts, Bergland indicated. "Since World War II, a revolution in chemical technology has made normally bountiful U.S. farms even more bountiful, with hundreds of chemicals used to increase productivity, protect crops and cut labor needs," he said.

"But in using these advances we did not give enough thought to the eventual consequences to the environment and to people."

THURSDAY: Agriculture's thin for water.

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