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Fear in the fields
How hazardous wastes become fertilizer

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When you're mayor of a town the size of Quincy, Wash., you hear just about everything.

So it was only natural that Patty Martin would catch some farmers in her Central Washington hamlet wondering aloud why their wheat yields were lousy, their corn crops thin, their cows sickly.

Some blamed the weather. Some blamed themselves. But only after Mayor Martin led them in weeks of investigation did they identify a possible new culprit: fertilizer.

They don't have proof that the stuff they put on their land to feed it actually was killing it. But they discovered something they found shocking and that they think other American farmers and consumers ought to know:

Manufacturing industries are disposing of hazardous wastes by turning them into fertilizer to spread around farms. And they're doing it legally.

"It's really unbelievable what's happening, but it's true," Martin said. "They just call dangerous waste a product, and it's no longer a dangerous waste. It's a fertilizer."

Across the Columbia River basin in Moxee City is visual testimony to Martin's assertion. A dark powder from two Oregon steel mills is poured from rail cars into the top of silos attached to Bay Zinc Co. under a federal permit to store hazardous waste.

The powder, a toxic byproduct of the steel-making process, is taken out of the bottom of the silos as a raw material for fertilizer.

"When it goes into our silo, it's a hazardous waste," said Bay Zinc President Dick Camp. "When it comes out of the silo, it's no longer regulated. The exact same material. Don't ask me why. That's the wisdom of the EPA."

What's happening in Washington is happening around the United States. The use of industrial toxic waste as a fertilizer ingredient is a growing national phenomenon, an investigation by The Seattle Times has found.

The Times found examples of wastes laden with heavy metals being recycled into fertilizer to be spread across crop fields.

Legally.

In Gore, Okla., a uranium-processing plant is getting rid of low-level radioactive waste by licensing it as a liquid fertilizer and spraying it over 9,000 acres of grazing land.

In Tifton County, Ga., more than 1,000 acres of peanut crops were wiped out by a brew of hazardous waste and limestone sold to unsuspecting farmers.

And in Camas, Clark County, highly corrosive, lead-laced waste from a pulp mill is hauled to Southwest Washington farms and spread over

crops grown for livestock consumption.

Recycling said to have benefits

Any material that has fertilizing qualities can be labeled and used as a fertilizer, even if it contains dangerous chemicals and heavy metals.

The wastes come from iron, zinc and aluminum smelting, mining, cement kilns, the burning of medical and municipal wastes, wood-product slurries and a variety of other heavy industries.

Federal and state governments encourage the practice in the name of recycling and, in fact, it has some benefits: Recycling waste as fertilizer saves companies money and conserves precious space in hazardous-waste landfills. And, mixed and handled correctly, the material can help crops grow.

"It's a situation where we are facing an overabundance of these materials in landfills and, of course, landfills are getting full," said Ali Kashani, who directs fertilizer regulation in Washington state. "So they (waste producers) are constantly looking for ways to recycle when they have beneficial materials."

The problem is that the "beneficial materials" in industrial waste, such as nitrogen and magnesium to help crops grow, often are accompanied by dangerous heavy metals such as cadmium and lead.

"Nowhere in the country has a law that says if certain levels of heavy metals are exceeded, it can't be a fertilizer," Kashani said. "That would be nice to have."

Instead, officials rely on fertilizer producers to document that their products are safe, and never check back for toxic components. There is not even a requirement that toxics be listed on ingredient labels.

The Times also found that:

-- There is no national regulation of fertilizers in this country, unlike many other industrialized nations. The laws in most states, including Washington, are far from stringent. The lack of national regulation makes it virtually impossible to measure the volume of fertilizers produced by recycling hazardous wastes.

-- Some industries dispose of tons of toxic waste by giving it free to fertilizer manufacturers, or even paying them to take it.

-- One major producer, Monsanto, has stopped recycling waste into fertilizer on its own because of concerns about health and liability. For years, it sold 6,000 tons a year of ashy, black waste from its Soda Springs, Idaho, phosphorus plant to nearby fertilizer companies.

The waste contained cadmium, a heavy metal that studies show can cause cancer, kidney disease, neurological dysfunction, diminished fertility, immune-system changes and birth defects at certain levels of consumption. Company scientists are trying to determine whether the material is safe to be used as fertilizer, even though the federal government allows it.

"What really is a concern is product liability," said Robert Geddes, a Monsanto official and Idaho state senator. "Is somebody going to sue Monsanto because we allowed it to be made as a fertilizer?"

-- Among the substances found in some recycled fertilizers are cadmium, lead, arsenic, radionuclides and dioxins, at levels some scientists say may pose a threat to human health. Although the health effects are widely disputed, there is undisputed evidence the substances enter plant roots.

Just as there are no conclusive data to prove a danger, there are none to prove the safety of the practice.

In other nations, including Canada, that lack of certainty has led to strict regulation. There, the approach is to limit toxic wastes in fertilizer until the practice is proven safe. Here, the approach is to allow it until it's proven unsafe.

Although experts disagree as to whether these fertilizers are a health threat, most say further study is needed. Yet, little is under way.

Few farmers, and probably even fewer consumers, know about the practice.

"This is a definite problem," said Richard Loeppert, a soil scientist at Texas A&M University and author of several published papers on toxic elements in fertilizers. "The public needs to know."

Some remember the Alar scare

Patty Martin is not a popular politician in parts of Grant County these days.

Since she began raising the alarm about the use of toxic waste as fertilizer, she has been threatened with a lawsuit by a local farmer, been verbally attacked in town meetings and seen the City Council - led by a son-in-law of the local manager of the Cenex fertilizer company - pressure her to shut up or quit.

Many farmers in and around Quincy, a town of 4,030, say they're doing very well, thank you, with the fertilizer and the help and advice they've received from Cenex Supply and Marketing, which sells expertise, financing and farm supplies in the West and Midwest.

They call Martin a troublemaker and fear she's fomenting a scare akin to the Alar alarm that nearly ruined Washington's apple industry in 1989.

In that case, the CBS television show "60 Minutes" reported that a substance sprayed on Washington apples to preserve them in packing was dangerous to consumers. CBS later admitted it had made some mistakes in the story, and the Washington apple growers sued the network. But the suit was dismissed, and in the end, Alar was classified by EPA as a carcinogen and banned for all food uses.

"We had a woman starting that one, too, and a lot of people got hurt by it," Bill Weber, an apple and potato farmer, said at one council meeting, bringing nods and laughter.

"We don't see a problem," said Greg Richardson, Quincy-based president of the Potato Growers of Washington and a staunch defender of recycling wastes into fertilizer.

Richardson wrote Martin a letter telling her to make "a statement of your trust in the appropriate government agencies and their ability to deal with . . . the waste in fertilizer issue."

Martin is standing firm, and a dozen or so Quincy-area farmers are standing at her side. They insist they, their families and their fields have suffered from bad fertilizer.

State environmental, agriculture and health officials have looked at the situation in Quincy. The environmental and agriculture officials, who encourage recycling waste into fertilizer, say that as far as they can tell, there's no danger to crops or people.

But some admit they wish they knew more. Kashani wants standards for heavy metals in fertilizer. Absent that, he said, he has to apply a general standard that recycled products cannot "pose a threat to public health or the environment."

Regulators in California have been studying the issue for years and still cannot say what constitutes a safe level for lead, cadmium and arsenic in fertilizer.

Mayor Martin's husband works for a potato processor, and when she feels under the harshest attack, he tells her she's doing the right thing.

"I just have the unfortunate distinction of having stumbled across this question and asking questions of the regulatory agencies," she said. "I didn't get the answers."

Trouble was brewed in pond

How Martin and her supporters stumbled upon the discovery of the recycling of toxic waste

into fertilizer begins at a man-made, concrete pond across the street from Quincy High School. The pond, 36 feet wide, 54 feet long and 5 feet deep, was built in 1986 and used by Cenex to rinse fertilizer from farm equipment.

State investigators later found that the company also illegally used the pond to dump pesticides.

Cenex closed the pond in 1990. By then, it contained about 38,000 gallons of toxic goo, with heavy metals, suspected carcinogens, even some radioactive materials. State investigators couldn't determine how all this toxic material ended up there.

Cenex memos show how the company got rid of the sludge. John Williams, the Quincy branch manager, wrote his boss to say the "product," as he called it, would cost $170,000 to ship and store at the Arlington, Ore., hazardous-waste site, as required by federal law.

So Cenex decided to save money by spreading it on a rented plot of cornfield and let nature take its course. The land would act as a natural filter for the hazardous wastes.

Cenex struck a deal with lessee farmer Larry Schaapman. He was paid more than $10,000 to let Cenex put the material, which the company claimed had fertilizer value, on his 100 acres.

It killed the land.

The corn crop failed there in 1990, even though Schaapman and Cenex applied extra water to try to wash the toxics through the soil. Hardly anything grew there the next year, either.

The land belonged to Dennis DeYoung, whose family had farmed it since the early 1950s before he leased it to Schaapman. Since the land was poisoned, DeYoung couldn't make his payments, and the company that financed him foreclosed on a $100,000 debt. DeYoung also owed Cenex money for fertilizer and seed.

Soon after, Cenex bought the land from the financing company.

"They run a farmer out of business, then they get his land," DeYoung said. "Now isn't that something."

DeYoung sued Cenex for damages for ruining the soil, lost in summary judgment but won a reversal in the State Court of Appeals earlier this year. He's preparing for a new trial.

He also managed to stir up an investigation by the federal Environmental Protection Agency, which regulates pesticide use. In a plea bargain, Cenex and its manager were given one year of probation for illegal disposal of a pesticide in the "product" spread on DeYoung's land.

The company never had to explain how the heavy metals - enough cadmium, beryllium and chromium to qualify as a Superfund site - got into the rinse pond in town.

That's where Martin and her supporters come in.

Farmers began comparing notes

Tom Witte is a 53-year-old farmer with 200 acres and about 100 cows a few miles east of Quincy. His father purchased the farm in 1956.

Witte had a disastrous year in 1991. His red spring wheat, silage corn and grain corn all yielded about one-third the normal levels.

"You always blame yourself, you know," Witte said. "You always think you screwed up. But then it wasn't just the crops. Then I started having all these weird problems with the cows."

Six of his cows got sick and died. The veterinarian found cancer in the three that were tested.

When Dennis DeYoung told Witte about his problems, Witte got to wondering about the effects of fertilizer on his fields. Although he hadn't used material from the rinse pond, he had used products from Cenex.

Witte still had the rusty, steel fertilizer tank Cenex had delivered and set up on his property

in 1991. Witte reached in the tank and scooped about two pounds of dust, rust and residue from the bottom. He sent the material to Brookside Farms Laboratory in Ohio, which found levels of arsenic, beryllium, lead, titanium, chromium, copper and mercury.

A reporter showed Max Hammond, the top Cenex scientist in the area, the test results last fall. Hammond, since deceased, said some of the metals might have come from dust or rust in Witte's tank, but he could not explain the beryllium or arsenic.

Arsenic, a known carcinogen, is a highly toxic residue from mining and smelting processes.

Mayor Martin, who had been closely tracking the rinse-pond controversy, caught wind of Witte's and DeYoung's problems.

Martin, Witte, DeYoung and others began researching fertilizer manufacturing. In their reading, they discovered that, as a result of landfill costs and the stringent environmental laws of the 1970s, a lot of heavy industries were recycling and marketing their hazardous waste as fertilizer.

In their research, they came upon an Oregon lawsuit they think provides a critical insight to Quincy's problems.

Aluminum case was studied

Northwest Alloys, a subsidiary of the Aluminum Company of America (Alcoa), has a smelter in Addy, an hour's drive north from Spokane. Between 1984 and 1992, the company recycled more than 200,000 tons of hazardous waste from the smelter through a smaller company that sold it as a fertilizer and road de-icer.

Based on industry research that said the material was safe, state officials in Washington, Oregon and Idaho allowed the waste to be sold as "CalMag" and "AlMag" fertilizers and "Road Clear" de-icer.

The fertilizer was produced and marketed by L-Bar Products Inc. of Chewelah, near Addy. With the recycling, Alcoa saved at least $17 million in disposal costs, according to company documents, and many farmers used the products with apparent success.

But one Oregon farmer who used it saw his red-clover crop mysteriously wilt. In 1993, he hired James Vomocil, an Oregon State University soils expert, to test his fields and fertilizers.

Vomocil said L-Bar's sales flier was "designed to deceive" and the product was volatile, unpredictable and unsafe.

With that ammunition, farmer Wes Behrman of Banks, Ore., won an out-of-court settlement from L-Bar. He refused to discuss terms of the settlement; he has told other people it was substantial.

So what did that have to do with Quincy?

Perhaps nothing. Cenex managers in Quincy and in its regional office say they never bought anything from L-Bar Products and had never even heard of the company, according to Cenex spokeswoman Lani Jordan.

But a 1994 fax from L-Bar owner Frank Melfi indicates otherwise. It says Cenex had already bought the L-Bar product and was considering buying 30,000 tons that year in "some sort of mutual marketing or venture relationship."

Although that deal never happened, Melfi says now that he definitely sold CalMag to Cenex.

Mayor Martin thinks some of it wound up on fields in Quincy, among a variety of other recycled hazardous wastes.

And although Cenex denies buying recycled wastes from L-Bar, it has bought material from Bay Zinc to add to custom fertilizer mixes, said Pete Mutschler of Cenex. But Mutschler said the company didn't realize the Bay Zinc fertilizer contained recycled hazardous waste.

Dennis DeYoung began to wonder if fertilizer was to blame not only for his recent problems,

but also for his land turning unproductive in the late 1980s, the reason he decided to lease it to Schaapman in the first place. At the time, his corn, beans and hay were going bad and he didn't know why.

And the more he and others read about what went into recycled fertilizers, the more they began to worry about possible health effects. Martin encouraged Witte and DeYoung to submit hair samples to a Chicago laboratory that tests for heavy metals in human tissues.

The lab, Doctor's Data Inc., found high levels of aluminum, antimony, lead, arsenic and cadmium in hair samples from DeYoung, Witte and Witte's children.

Joseph DiGangi, a scientist with Greenpeace in Chicago, reviewed the hair samples. "I thought it was kind of creepy, really - all the people, really headed for a serious health problem, if not now, then later," he said.

And it was all perfectly legal.

"It's amazing that something like this could run across the nation and nobody would know about it," DeYoung said.

Martin, Witte and DeYoung felt their discovery explained the heavy metals found in Witte's crops. They wondered if the toxic metals in the Cenex pond came from fertilizer residues rinsed from equipment, a theory Cenex vigorously denies.

Most importantly, the mayor and farmers knew that while they might never sort out exactly what had happened in their town, they had discovered something other farmers and consumers deserved to know about.

"This recycling might be great in theory, but in fact it's being abused," Martin said. "There's no enforcement. Nobody is watching the companies. Nobody can tell me what's really happening. Nobody knows."

For a man with rough hands and dirty shoes, Tom Witte writes a good letter.

"The state has no mechanism set up to prevent toxic heavy-metals contamination of fertilizers," he wrote then-Gov. Mike Lowry last year. "Fertilizer is only tested for fertility elements. Nobody checks on what is in the inert ingredients, so we have a situation tailor-made for abuse.

"People in industry think that the best way to dispose of waste is to sell it for fertilizer and let unsuspecting farmers spread it on their land."

Agriculture Director Jim Jesernig wrote back, agreeing there were problems and promising to look into it further. The departments of agriculture, ecology and health have set up a staff group that plans to issue a report later this year saying the practice, which they have encouraged for years, is safe. State officials say they have tested a sampling of 27 potatoes and that heavy-metal readings were well within safe limits.

Meanwhile, Mayor Martin and Witte's sister, Nancy, a nurse, went to EPA Administrator Carol Browner's Children's Health Conference in Washington, D.C., in February. Nancy Witte prodded a nervous Martin to go to the microphone and ask a question of Browner.

Martin asked whether the EPA knew about companies making toxic wastes into fertilizer. Browner said she didn't know anything about it but she'd look into it. Later, an aide to Browner contacted the mayor, explained the benefits of waste recycling and assured her there would be further study.

Frustrated with the lack of action by public officials, Martin contacted The Times, asking the newspaper to develop this information.

Potential for danger unclear

So what to make of Mayor Martin and her crusaders? Are they, as Richardson of the Potato Growers of Washington insists, unnecessarily "opening up an ugly can of worms"?

All that's clear is that the potential for danger is

unclear. Some scientists and public officials say the benefits of recycling waste outweigh the possible risks.

"The farmer is coming out a little ahead," said soils specialist Charlie Mitchell of Alabama's Auburn University. "The person spreading it is getting his profit. The company is using its waste instead of dumping it. So we're helping the environment. We're creating jobs. If it's done right, it can really be a win-win situation."

But Ken Cook, a soils scientist who heads the nonprofit Environmental Working Group, said no one yet knows what constitutes "doing it right."

Mayor Martin and friends are raising good questions, Cook says.

"Let's put it this way: We're well into the use of these materials before these questions are even asked, and that doesn't seem to me to be a good sign that we've been very rigorous in our science on this."

Meanwhile, Quincy farmers such as Witte, DeYoung and Duke Giraud want some action. Giraud lost his family's onion business because of poor yields, and he suffers from respiratory problems. He figures he unknowingly spread recycled-waste fertilizer on his fields.

It might be too late for him, he says, but he wants government agencies to look out for the welfare of other farmers.

"They have to start testing fertilizer for what they don't say is in there," Giraud says, "because they have no problem letting them add who-knows-what."

Here's what's known, and not known, about toxics, plants and soil

So far, no study has documented harm to human or animal health in the United States from the recycling of hazardous wastes into fertilizers.

In Japan, however, studies showed that subsistence rice farmers had been sickened by ingesting cadmium that had passed from fertilizers through the rice crop.

And there is consensus among scientists that toxic chemicals from fertilizers can go into the plants growing in the soil.

The disagreement concerns whether those substances move along the food chain at levels that pose any danger.

For fertilizers made from biosolids, or sewage waste, levels of heavy metals are strictly regulated by the federal government. But for those made from recycled industrial wastes, there are no federal controls.

There's not even a requirement that toxic materials be included in the list of fertilizer ingredients.

When consumers buy fertilizer, they usually don't know exactly what they're getting. A fertilizer labeled "20-20-20" has 20 percent each of the beneficial ingredients nitrogen, potassium and phosphate. That adds up to 60 percent. The manufacturer doesn't have to say what's in the other 40 percent, which often includes trace metals.

In its 1992 rules regulating the use of biosolids applied to land, the Environmental Protection Agency named nine metals of potential health concern. Three - lead, cadmium and arsenic - have been identified as possible concerns by health, environmental and fertilizer experts studying recycled hazardous wastes.

Scientists say there has been much study of the food-chain effect of biosolids but not enough of other fertilizers. Here is some of what is known

about heavy metals, soil, plants and health:

-- A 1980 study showed lead and cadmium linger in the top layers of soil for long periods of time and are absorbed efficiently for many seasons of crops.

-- Scientists disagree about whether there is any safe level of lead, the most studied toxic metal. Infants are particularly vulnerable to lead poisoning.

-- Two studies published in April 1997 say lead may be even more toxic than previously believed, causing high blood pressure and kidney damage at unexpectedly low levels. Lead also causes neurological disorders, reproductive problems, diminished intelligence and a host of other ills.

-- The major exposure of lead to the general population is through fruits and grains, according to the Agency for Toxic Substances and Disease Registry, part of the U.S. Public Health Service.

Lead in the food chain comes mostly from direct deposit from the air to plants and from livestock eating soil laced with lead as they eat the plants. The bans on leaded gasoline and paint have reduced exposure.

-- The cadmium in the edible portion of many plants increases in direct proportion to the cadmium concentration in the soil.

-- Food products account for more than 90 percent of human exposure to cadmium, except in the vicinity of cadmium-emitting industries, the Agency for Toxic Substances and Disease Registry says. Cadmium has fast uptake through the roots to edible leaves, fruits and seeds.

-- Cadmium builds up in animal milk and fatty tissues. A 1990 study showed that acute cadmium toxicity from food is rare, but chronic exposure at lower levels increases cadmium in certain body organs.

-- The uptake rate of arsenic through soil to plants is lower than the other metals, but arsenic is highly toxic to plants and animals. Root plants are most at risk. Threshold levels are extremely difficult to set.

Some fertilizers, though, actually have higher levels of arsenic than the Asarco Superfund site in Tacoma. Some are higher in lead than banned paint. Their manufacturers say the products are safe for plants.

A 1995 World Health Organization report on biosolids says there is still very little information on pollutant transfer from soil to plants.

"In land application, the human-health-related issues involving toxic chemicals must be addressed," three University of California scientists wrote in the report.

Until the safety or danger can be established, Canada, Australia and many European countries have set strict limits on allowable heavy metals and other toxins in fertilizers.

In the United States, meanwhile, a hands-off approach persists as the scientific debate heats up.

Some experts, such as Rufus Chaney of the U.S. Department of Agriculture, say consumers have little, if any, reason for concern. Chaney's studies, since 1976, indicate that dangerous substances are highly unlikely to move through the food chain to humans, he said.

Others, such as Bill Liebhardt of the University of California-Davis, say we just don't know enough yet.

"How much lead and cadmium is going to get in a particular crop - all you can say is it depends on a lot of factors," he said. "There is no clean, easy answer. Some crops may not take up hardly any of it, and other crops may take up quite a bit and not be affected in terms of their external appearance. This has the potential to move up the food chain.

"When these inert ingredients have the potential

for moving up the food chain, then it's not just the farmer that ought to be concerned, it's the consumer, because we all consume these products."

When a trucker picks up a load of gray, toxic ash from a metal-processing plant in California, he hangs a "hazardous waste" sign on his rig. On crossing the border into Nevada, he takes the sign down.

In that state, what he's carrying is no longer considered hazardous waste, but fertilizer ingredients. The waste will be delivered to a factory in Reno, treated to remove part of the heavy metals, blended with other materials and sold as fertilizer to farmers in, among other places, California.

Such is the fractured regulation of the fertilizer industry. Fertilizer - unlike food, animal feed, pesticides, herbicides and sewage sludge - is not controlled by federal law. To the degree it's regulated at all, it's on a state-by-state basis.

A Seattle Times investigation found that, across the nation, industrial wastes laden with heavy metals and other dangerous materials are being used in fertilizers and spread over farmland. The process, which is legal, saves dirty industries the high costs of disposing of hazardous wastes.

The lack of national regulation and of labeling requirements means most farmers have no idea exactly what they're putting on their crops when they apply fertilizers.

There's a limit on the amount of lead in a can of paint, but not in fertilizer. There's a limit on the amount of dioxin in a concrete highway barrier, but not in fertilizer.

If that same trucker tried to wheel that ash up Interstate 5, he could take off the hazardous-waste sign through Oregon and Washington, which both have less regulation than California.

But when he got to British Columbia, he'd be turned away at the border.

Canada and many European countries have stringent limits on toxic metals found in industrial byproducts. They refuse to buy products that, on American farms, routinely are sprinkled on the ground.

Some U.S. experts say those nations are less interested in science than in trade protectionism. These experts, working for government agencies and the fertilizer companies, say the products are safe and the process of recycling hazardous waste into fertilizer is good for America and Americans.

"It is irresponsible to create unnecessary limits that cost a hell of a lot of money," says Rufus Chaney of the Department of Agriculture's Research Service.

Canada's limit for heavy metals such as lead and cadmium in fertilizer is 10 to 90 times lower than the U.S. limit for metals in sewage sludge. The United States has no limit for metals in fertilizer.

Canada requires tests every six months for metals in recycled-waste fertilizer; the U.S., none.

"In the U.S., I hear them say, `OK, how much can we apply until we get to the maximum people can stand?' " said Canada's top fertilizer regulator, Darlene Blair. "They're congratulating people for recycling things without understanding what the problems are with the recycled material."

In Canada, Blair said, "We're a little beyond the point where we wait till something is proved bad before we fix it. Sorry, but we won't compromise our health."

Some health and environmental experts are pushing for similar regulation in this country. But from Washington state to Washington, D.C., the fertilizer industry is waging a successful campaign against it.

The $15-billion-a-year business cultivates clout.

In Congress three years ago, lobbyists for The Fertilizer Institute won removal of a section of the proposed Lead Exposure Reduction Act that would have banned fertilizers with more than 0.1 percent lead.

Internal minutes of the institute, the industry's main lobbying group, show it wants to streamline hazardous-material laws and "manage the issue of regulation of heavy metals in fertilizers."

The industry also lobbies its own members to oppose fertilizer regulation.

In Colorado, a manufacturer whose product does not include recycled hazardous waste was told by the director of the Far West Fertilizer Association to "stop adding fuel to the fire" by talking about the risks of heavy metals.

"I told him there are things going on that are bogus and I won't be quiet because I think this is unsafe," replied Kipp Smallwood, sales manager for Cozinco.

"I'm crying for national regulation, or at least truth in labeling," Smallwood said. There is no requirement that toxic substances be listed on fertilizer labels.

The primary argument against labeling or regulating fertilizers with toxic wastes is that it would raise costs, both of waste disposal and food production.

"Agriculture is being used as a dumping ground," Smallwood said. "They get away with it because there's nobody watching, nobody testing. It's the lure of the dollar."

While all the substances in question occur in nature, science is finding there is no safe level for many of them. History has taught that many substances initially believed to be safe were not.
In recent years, doctors and scientists learned that trace amounts of lead can cause developmental problems in children and high blood pressure in adults. Lead is prohibited in gasoline, paint and food-can solder, but not in fertilizer.

In fact, lead is in many fertilizers. It is never disclosed on the label, though, even when it is as high as 3 percent of the product.

As a result, farmers and orchardists are spreading up to one-third of a cup of lead per acre when they follow the manufacturers' recommendations. The farmers and orchardists aren't told about the lead, which has no nutrient value for plants.

Hazardous-waste recyclers say they could remove more lead, but it would cost more and make it harder to compete on price unless everybody had to do it.

Bill Liebhardt, chairman of the Sustainable Agriculture Department at the University of California-Davis, previously worked for fertilizer companies but says the industry is wrong to oppose regulation.

"When I heard of people mixing this toxic waste in fertilizer, I was astounded," he said. "And it seems to be a legal practice. I'd never heard of something like that - getting cadmium or lead when you think you're only getting zinc.

"Even if it's legal, to me it's just morally and ethically bankrupt that you would take this toxic material and mix it into something that is beneficial and then sell that to unsuspecting people. To me it is just outrageous."

Janet Phoenix, a physician with the National Lead Information Center, said she had no idea industries were recycling lead into fertilizer.

"I, personally, was under the impression that, at least in this country, lead was no longer allowed to be an ingredient in fertilizer," Phoenix said. "Clearly, it seems to me that a process recycling industrial waste into fertilizer that contains lead would be at odds to efforts to reduce lead in soil. There is no safe level."

Push is on to recycle

Nobody really knows how much risk exists in

waste-recycling programs that have sprouted since Congress passed the Resource Conservation and Recovery Act in 1976. The law raised the cost of disposing of hazardous substances fivefold in 12 years.

Soils specialist Charlie Mitchell, an Auburn University professor, says he gets 10 times as many calls as he used to get about recycling industrial byproducts into agricultural products. "Every industry is looking at it," Mitchell said.

"People were scrambling," said John Salmonson, president of Monterey Chemical of Fresno, Calif. "What happened was they were trying to shove the waste onto agriculture."

At least 26 states, including Washington, have created programs to match generators of hazardous-waste with recyclers, like blind dates. A brochure from the King County Hazardous Waste Management Program tells companies: "TURN YOUR DISPOSAL COSTS INTO PROFITS."

"Recycle and reuse, that's our national strategy," said the Department of Agriculture's Chaney. "It costs so much more to put it in a landfill. And if the recycling program avoids any chance of risk, then it's a responsible program."

That's the tricky part. While sewage sludge has been studied exhaustively for 25 years, there is little science on long-term effects of heavy metals in recycled fertilizer.

Shiou Kuo, a Washington State University professor and a consultant to the state, says sewage sludge is a very different material from industrial waste. While he's not particularly worried, he said, "this is something that troubles my mind."

"Deep down in my heart, I think the less amount a toxic substance like cadmium is in the soil, the better," Kuo said. "But, in reality, the question is really how much input can be tolerated. Until we know what the critical level is, this kind of question cannot be answered."

Every state has a fertilizer regulator. But they don't check for heavy metals even when they know the metals are included in the product. They only check for nutrients listed on the label.

Washington's Department of Agriculture has three people who go around the state collecting samples of feed, seed and fertilizers. The state laboratory in Yakima analyzes the samples to make sure they match the advertised ingredients.

It's the same story in other states.

"We really don't have any rules or regulations addressing that," said Dale Dubberly, Florida's fertilizer chief. "There's a lot of materials out there that have plant nutrient values, but nobody knows what else is in them."

Testing for heavy metals would cost $50,000 to $150,000 in capital investment for the typical state lab, plus additional staff, plus $10 to $60 per sample, said Dr. Joel Padmore, director of North Carolina's lab and an officer of the American Association of Plant Food Control Officials.

Instead of making that investment, some states - most of them in the Northeast - are cutting back their labs and their regulation of fertilizers. New York doesn't even test for nutrients anymore, he said.

"Once a state has dropped its regulatory apparatus, then essentially anything can be registered because nobody is checking," Padmore said.

The EPA, meanwhile, is focusing not on testing or regulating but on promoting waste recycling.

"We feel the direction they're going is not always in the interest of agriculture," said Maryam Khosravifard, staff scientist for the California Department of Food and Agriculture. "EPA is in charge of getting rid of these materials. They do reuse and recycling. But we do agriculture; we're the stewards of the land."

Edward Kleppinger, a chemist, wrote hazardous-waste rules for EPA in the 1970s and is now a consultant for industry, environmental and health groups. He, too, dislikes EPA's posture on this issue.

"The heavy metals don't disappear," Kleppinger says. "They're not biodegradable. They just use this as an alternate way to get rid of hazardous waste, this whole recycling loophole that EPA has left in place these last 20 years.

"The last refuge of the hazardous-waste scoundrel is to call it a fertilizer or soil amendment and dump it on farmland."

If change is to come, it probably will come slowly.

"It feels like it's the very beginning of this debate," said Ken Cook, president of the Environmental Working Group, a nonprofit research agency.

"Right now, it appears there's an economic use of this waste material. But it may just mean that we haven't looked at it yet," he said. "Sometimes it's a bonanza if it can be recycled, and sometimes it's just a shell game where we're transferring the risk back to the land.

"Even if it gets flushed out, if 80 percent gets flushed out, it just takes longer to build up to the threshold effect," Cook says. "And maybe there is no threshold. Maybe there is no safe level."

The bottom line, Cook says, and many others echo: "We really don't know."

Throughout the country, example after example of hazardous wastes being turned into fertilizer

More than 1,000 acres of peanut crops were killed by Lime Plus, a toxic brew of hazardous waste and limestone that had been sold - legally - to unsuspecting farmers.

It is the worst confirmed case in the United States of heavy metals in fertilizer destroying crops aimed for human consumption.

The farmers don't want to talk about it. But Jessica Davis, a soils scientist who has studied the incident, is more than happy to. She says the fields of Georgia show why government officials need to tighten waste-recycling rules and restrict the hidden toxic elements in fertilizer.

"Anything that's fed directly to humans or even to animals, I really don't understand why this is permitted," Davis said.

Five steel mills in the Southeast paid Sogreen Corp. an undisclosed amount to take their gray, powdery dust from electric-arc furnaces. The waste material was 10 percent zinc, a whopping 3.6 percent lead, and highly alkaline.

Sogreen mixed one part waste with three parts limestone and sold it as Lime Plus with approval of the state of Georgia. Sogreen "made money coming and going," said Davis, formerly with the University of Georgia, now with Colorado State University.

The peanut crops needed liming to raise the pH of the soil. They didn't need zinc, but it was advertised as a micro-nutrient, or added benefit. The farmers weren't told about the lead, cadmium or chromium.

The practice of allowing steel-mill waste to be plowed into fields is nationwide. Some soil experts say there is a safety net in biology: The plants would die from too much zinc before they'd absorb dangerous levels of lead.

In Tifton, that was true. However, Davis said, peanuts are more sensitive to zinc than are other crops.

"Let's say you're planting a crop that's not sensitive to zinc and so it doesn't die," Davis

said. "Well, this material is high not only in zinc, but it's got lead and cadmium and chromium - all kinds of fun stuff that could be hazardous to humans.

"Somebody uses this on their sweet corn and eats it. Nobody knows how much lead they'll be eating."

Davis worked with three farmers to detoxify their soil. Under a confidentiality agreement, she can't reveal who they are.

"They're afraid if people know they had this problem on their land, they won't be able to sell what they've grown there and they won't be able to sell their land, either."

For the same reason, the farmers wouldn't sue Sogreen.

But the fertilizer manufacturer had other legal problems. Owner Herman Parramore Jr. had a permit to store 500 cubic yards of the toxic waste. He was stockpiling 75,000 cubic yards. And it wasn't covered up, as the permit required.

Parramore pleaded guilty to two felonies under environmental laws.

The mountain of hazardous waste was near a school in a low-income neighborhood. Residents said it dusted their homes whenever the wind blew.

The residents won a big lawsuit for damages, and the steel mills that had supplied the dust are paying more than $10 million to clean it up. But they're still selling Lime Plus. A uranium-processing plant is disposing of low-level radioactive waste by spraying it on 9,000 acres of company-owned grazing land.

Three and a half years after the shutdown of the Sequoyah Fuels Uranium Processing facility, workers are still sprinkling its waste, diluted by rain, from a holding pond at the rate of 10 million gallons a year.

It is called Raffinate and is registered as a fertilizer with the Oklahoma Department of Agriculture.

State and federal officials approved the fertilizer plan in 1986. Raffinate, the main waste from a solvent used to extract uranium for nuclear-plant fuel, is slightly radioactive and contains 18 heavy metals.

"We were screaming our heads off when all this was happening," says Kathy Carter-White, an attorney representing residents of the area. "But it was just like the powers-that-be were going forward. We just felt violated by what happened because the land will never recover."

John Ellis, Sequoyah Fuels president, said the company is piping the material to 75 acres of bermuda grass where as many as 400 cattle graze.

Some people blame the fertilizer for such mutations as a nine-legged frog and a two-nosed cow. They also say it could be a factor in some of the 124 cases of cancer and birth defects counted in families living near the plant.

There's no proof, though.

"It's hard to separate out what damage came from the chimneys at Sequoyah Fuels and what was from the pallets on the ground and the groundwater and the land disposal," said Carter-White.

"But the frog was found by a little boy at a country pond that was real close to where this surface application was taking place. The boy shot it and turned it over, and found it had legs sticking out all over its sternum." Stoller Chemical of Charleston exported 3,000 tons of especially toxic material to Bangladesh and Australia in 1992. The material was loaded with cadmium and lead, far beyond even what is in the recycled-waste fertilizers used on U.S. farms.

The company failed to notify the EPA of the toxic shipment, as required by law, and was fined $1 million. Stoller went bankrupt.

"We just happened to catch it," said Ben Haygood, the former U.S. attorney who prosecuted the case. If the fertilizer had been used domestically, he said, the government might not have known about its high toxicity.

Some of the fertilizer was spread on rice fields before it was recalled from Bangladesh. Some of it also was used by market gardeners and pasture owners in Australia. Frit Industries attached a fertilizer factory to the Nucor steel mill to recycle the mill's hazardous waste for agriculture.

By operating on site, Frit avoids any chance of spillage, and also avoids having to get the federal permits required of other hazardous-waste recyclers.

The chalky, black waste is collected from a pollution-control device in the mill's chimney. Since it is rich in zinc, a nutrient for many plants, the dust has been recycled onto farms for years. It's also laden with lead and cadmium.

The industry won an exemption from an environmental law passed by Congress in 1976. The flue dust is a federal hazardous waste unless it is processed into fertilizer.

"We think it is an intelligent and safe and reasonable thing to do with the material," said Carl Schauble, executive vice president of Frit, based in Alabama. "I feel that the fertilizer industry has done a real service being able to utilize some of these byproducts."

Schauble said the lead doesn't have much effect on plants. Frit sells its Nucor zinc product to nearby fertilizer dealers in the heart of corn country and to custom blenders throughout the Midwest.

The arrangement works for Nucor, the steel company, too.

John Hatfield, an Idaho fertilizer manufacturer, says he was asked to build the plant on the Nucor site before Frit stepped in.

"Nucor didn't want to ship their lead zinc dust to Monterrey, Mexico, at $100 a ton, and so they got Frit Industries to move in there," Hatfield says. "You say how do I know that? Because they asked me to do it before Frit."
Tom Wimmer is seeing more and more industrial waste from Washington state being pushed on farmers in Oregon, and liking it less and less.

Wimmer owns Marion Agriculture Service, which supplies and advises farmers south of Portland.

He says waste brokers from metal-, cement-, paper- and wood-products companies are calling, hoping he'll find them farmers to take their dangerous wastes as fertilizer.

"There's a lot of it out there now," Wimmer says. "They've got to get rid of it or put it in a landfill somewhere. That's what it boils down to."

In many cases, companies offer to pay the farmer to take the wastes. Sometimes, Wimmer believes, it's good business and good recycling. Other times, it's neither.

"We've even had a situation where the paper byproduct was not mixed in the soil well enough and the paper product ended up with vegetables in a cannery," he says.

"The farmers, they're getting something free - or so they believe. But it does come at a cost. It just depends on who's picking up the cost."
Seven hundred tons of ash is collected each month from the chimney of a giant pulp and paper mill on the Columbia River.

It is a highly corrosive ash laced with heavy metals such as lead, chromium and zinc. The ash is classified as dangerous waste by state authorities because 30 out of 30 rainbow trout died in a test using a 1 percent mixture of the ash in water.

But this is no ordinary dangerous waste. It's also a product called NutriLime, registered for

farm use in Washington and Oregon.

James River Corp. workers take the ash from the pulp-mill chimney, add water to hold down dust, pour it into trucks and haul it to six farms in Clark and Skamania counties. There, it is spread out on 425 acres.

NutriLime is plowed into soil growing oats, clover, grass and other crops for livestock consumption.

Farmers signed contracts to receive the lime at cut-rate prices and to get their fields plowed. James River was happy to supply them: It was less expensive than paying to dispose of the ash in a landfill.

And company-paid scientists say it helps the crops by raising the pH of the soil.

The heavy metals in the ash varied widely over a series of tests. Lead was just 4 parts per million in a sample of ash tested for state regulators in 1991, but up to 562 parts per million in later tests.

At that rate, Canada wouldn't have allowed it to be used as fertilizer.

The United States, though, has no limit, just a state-by-state discretion based on a general principle that fertilizers shouldn't hurt plant or human health when properly used.

NutriLime was re-registered as a farm product, not a dangerous waste, in 1993. The company paid a $35 filing fee and sent results of what it said were random analyses on 18 samples. Only one of the 18 was tested for heavy metals.

"The popularity of NutriLime is growing daily," wrote mill manager A.G. Elsbree, "and we look forward to serving the agricultural community." Two fertilizer companies are being investigated for illegal use of toxic wastes in California, which has some of the nation's toughest environmental laws.

One company was mixing zinc into a waste product so it could be marketed as a zinc-based fertilizer instead of having to pay for disposal, said Larry Matz, chief of compliance for the Department of Toxic Substances Control. The waste had no fertilizing qualities of its own, so could not be sold as fertilizer.

Leads from the California investigations have sparked similar probes in Missouri, New York and Texas. Farmers here say they are unconvinced of the safety of a plan to send liquid waste from a Superfund site through sewage treatment and apply it on a 50,000-acre, government-owned wheat farm.

Lowry Landfill is one of the worst Superfund sites in the country, with a brew of industrial solvents, petroleum oils, pesticides and radioactive material.

The EPA is considering the novel disposal plan in a ruling that may set a precedent for new ways to clean up Superfund sites. A public comment period ended June 30.

One EPA official said the agency will be sure the landfill water will be neither radioactive nor hazardous. Another questioned the idea.

The wheat field is owned by Denver's Metro sewage agency, which would mix the waste with sewage sludge. The huge, black hill on Monsanto's property here grows taller every day with the addition of big steaming vats of hot ash.

It's the same ash Monsanto used to sell to a nearby factory as an ingredient in fertilizer.

No more. Monsanto is the first major company to stop selling its toxic byproduct to fertilizer factories, even though there is no regulatory pressure to stop.

Robert Geddes, the environmental specialist at Monsanto's Soda Springs phosphorus plant and a Republican state senator, said the company is concerned about safety and liability.

Until 1994, Monsanto had been selling 6,000 tons a year of the ash. It was a fine source of nutrients for plant growth. But it also contained

heavy metals, including significant levels of cadmium.

Since then, Monsanto scientists in St. Louis have been studying the material to see if it is safe. Company lawyers are studying the liability, and marketing officials are trying to figure out what to do with it.

"Because we've got everything in the world in it, there isn't any easy process," Geddes said.

Even though the government allows selling the ash for fertilizer, Geddes said Monsanto still could be stuck with the bill for a mistake. He remembered when Asarco had to pay to clean up sawmill yards in Tacoma covered with arsenic-laced slag from a government-approved program.

"Sometimes we pay for mistakes the federal government even helps us make," Geddes said.

Monsanto sells one of its other byproducts to a nearby plant operated by Kerr-McGee. Kerr-McGee extracts vanadium and is building a plant to process the byproduct into - what else? - fertilizer.

"Kerr-McGee is a pretty big company," Geddes said. "If they have a (liability) problem, they'll probably face their problem without dragging Monsanto into it."

In the end, Geddes said, such decisions are "all about money."

"It's kind of a symbiotic relationship. Everybody's trying to work together to get as much value out of this stuff as we can."

Experts: How to reduce risk

Some experts recommend these actions to minimize the health risks from toxic-laced ingredients in fertilizer:

Right to know: Change the laws to require sellers to list all ingredients on the fertilizer label. Currently, manufacturers are only required to tell buyers about nutrients, and state regulators only check for that.

Product testing: Require regular, independent tests of fertilizer products, especially those with recycled waste. Require companies to disclose their own tests when they find certain levels of dangerous materials.

Study: Provide more money for research on the health risks from heavy metals in fertilizer. Independent authorities, protected from pressure from the industry and recycling or landfill interests, ought to select the areas of study. Meanwhile, the Environmental Protection Agency needs to complete its long-delayed studies of mercury and dioxins.

Standards: Set national limits for heavy metals in any fertilizer product, as Canada and many European nations have done. Under the Interstate Commerce Clause, Congress could set federal maximums even if the fertilizer-registration laws remain in the control of states.

Treatment: Require recyclers to remove more of the heavy metals from waste. If this was a national requirement, processors would not be afraid of losing market share.

Global view: Establish worldwide standards for hazardous wastes and for fertilizers. Now, richer nations are exporting hazardous wastes to poorer nations, where they are being used dangerously.