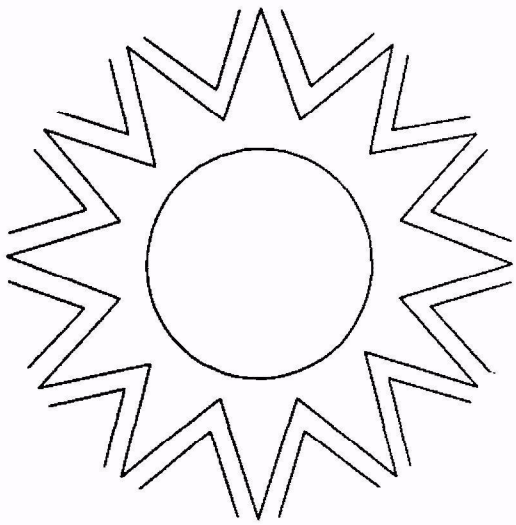
Field report



Pesticides, Agriculture, and Hot Weather in the Mississippi Delta

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INTRODUCTION

I visited Mississippi during the week of August 27 - 31, 1990, to assess problems of heat stress, pesticide handling, and the use of protective clothing and equipment in agriculture under very hot, humid conditions and to assess how these problems are managed. Earl Dotter, a photographer under contract with EPA, travelled with me.

Robert McCarty of the Mississippi Department of Agriculture and Commerce (MDAC) provided members of his staff to take us around. Mike Ledlow, Mickey Sims, and Bobby Moore were thoroughly knowledgeable guides. They took us to over 19 sites where pesticides were handled and numerous other places where people were doing field work in the heat.

After arriving in Jackson, we travelled west through Mississippi's "Hill Country," visiting three aerial pesticide applicators, and continued on to the Mississippi Delta, where we spent the remainder of the week. On three afternoons, the temperature was around 105°F. There had been no rain since about May 21. The main crops we saw in the Delta were cotton, soybeans, and rice. There were also significant crops of milo (a grain sorghum) and pecans, and extensive "aquacultural" farming of catfish. We were told that catfish ponds generally were built on parts of farms where the soil was poorest.

AWARENESS OF PESTICIDE SAFETY

My impression from talking to aerial pesticide applicators was that the State of Mississippi's pesticide program had an excellent working relationship with them. Many people felt that pesticide safety has improved greatly over the years and is continuing to improve. The flying services we visited usually had one or two planes. We were told that this is characteristic of flying services in Mississippi and throughout the United States. Most aerial applicators spoke with pride about their practices and the way their mixing/loading stations were set up. Almost all the aerial mixing/loading stations we saw were neat and well-kept. The ground at most loading areas was covered with concrete, sloped towards a drain for collecting the planes' wash water. Many aerial applicators expressed interest in and enthusiasm for the work of EPA's

Occupational Safety program. Some asked us what we thought they might do to improve their operations.

The mixing/loading stations which we saw for ground applications did not compare with those for aerial applications. One aerial applicator complained that ground applicators were not effectively regulated and "can do anything they want." A second aerial applicator said that farmers who apply pesticides with ground machines are allowed to do sloppy work and get away with illegal disposal. One of our guides said that the state may increase enforcement at "High Boy" tractor applications next year.

Many pilots, especially older pilots, spoke with respect about the toxicity of pesticides and appreciated the trend towards pesticides that were less "hot" (toxic). The loaders we met (people who mix and load pesticides, who are called "loader boys" in Mississippi) did not express an opinion about this issue. Most of these loaders were younger men, who may have been working for the season at minimum wage.

The loaders concentrated on loading the planes quickly. Some wore shorts. Half wore tennis shoes. We saw only two loaders wearing long-sleeved shirts. The choice of clothing most by loaders was dictated more by the hot weather than concern about being splashed or coming into routine contact with pesticide-covered surfaces. Some loaders wore rubber gloves. Most did not. Few wore protective aprons, although loaders at two different locations, who had been working without aprons (one was wearing a sleeveless shirt, the other a short-sleeved shirt), put aprons on to demonstrate mixing and loading in protective clothing for Earl's photographs. The loader wearing a sleeveless shirt got very hot working with the apron on.

We saw one loader with ten years' experience loading methyl parathion. He wore a short-sleeved shirt and jeans with holes in the front, but no protective clothing or equipment. The cuffs of his jeans hung below his heels and were soaked with methyl parathion wash water. Methyl parathion is a Tox I insecticide. More on methyl parathion under "Hygiene and Protective Clothing" below.

At the only active ground application mixing/loading operation we observed, two workers were mixing and loading pesticides into a tank on a "High Boy" tractor. The loader wore a cap, a short-sleeved shirt, long pants, leather shoes, and rubber gloves. The tractor driver put on leather gloves when he helped with the loading. The pesticides were Prep (Prep is ethephon, a plant growth regulator, Tox I eye and skin irritant; full-length trousers, long-sleeved shirt,

protective gloves, and goggles or face shield required on the label) and Def 6 (Def 6 is butifos, a cotton defoliant, Tox II; hat, long-sleeved shirt, long-legged trousers, rubber or neoprene gloves required on the label). The "High Boy" tractor had an enclosed cab with air-conditioning and was similar to the other "High Boy" tractors that we saw.

If loaders and applicators wore the protective clothing and equipment required under EPA's proposed Worker Protection Standards, it would be a significant departure from what we observed. One pilot active with the Mississippi Agricultural Aviation Association said that loaders wear protective clothing and equipment until the weather gets hot. Another pilot said that the heat was "too much for suiting up in protective clothing." More on protective clothing below.

I was impressed by the levels of pride and awareness about pesticide safety and the quality of the mixing/loading stations at the aerial pesticide application operations we visited. Most aerial applicators expressed a desire to do things right and were receptive to making further improvements. While none of the handlers I observed wore all the protective clothing and equipment required on the pesticide labels, I believe that most would readily follow appropriate protective measures, if these measures made sense in their working environment.

PILOTS, COCKPITS, PESTICIDES, AND HEAT

The cockpits of agricultural aircraft can get very hot, due to a "greenhouse effect" from the sun's radiation and to a tremendous amount of heat coming off the engine, which is in front of the cockpit. We were told that about half of all agricultural aircraft has air-conditioning. Nearly every plane that we saw had air-conditioned cockpits. Most pilots swore by their air-conditioning. A typical comment was, "Air-conditioning is about the best thing that ever happened to a pilot." Another pilot who had installed air-conditioning on his planes said that he would no longer try to operate his business without it. A third pilot said that pilots are "more alert" with air-conditioning than they are without it. Most aerial applicators with whom I spoke said that they appreciated the engineering controls which have become available over the years to reduce their exposure to pesticides.

We saw several cockpit air-conditioning systems: air-driven, electric, and engine-driven. One person told us that air-conditioning pressurizes a cockpit with clean air. (The cockpit is either totally enclosed or has a small air port on top towards the rear.) Another person told us that cockpit seals are not sufficient to keep cockpits free of pesticides. Most systems deliver cool air in front of the pilot, directed towards the chest. One configuration that we saw delivers air in two streams behind the pilot, above each shoulder.

Some pilots spoke about their experiences spraying pesticides before they had air-conditioning. In Flora, Mississippi, Rudy Holcomb, a pilot who is also the president of the Mississippi Agricultural Aviation Association, said that before air-conditioning in cockpits became available, he would have a continual headache throughout the flying season each year from May through October, due to "poison" (pesticides) and the heat. He would also get what he described as a "low burning" all over his body, lie awake all night, and use nerve pills in order to sleep. These effects obviously decrease a pilot's ability to fly safely.

Edgar Hobbs of the Mississippi Agricultural Aviation Board (and a former spray pilot himself) and Buddy Box, an aerial applicator, told how they used to experience psychotropic effects from methyl parathion. They said they also knew other pilots who experienced these effects. Methyl parathion would make them "do crazy things." A powerful impulse would come over them and they would find themselves flying their plane into familiar obstacles on a field, such as a tree, because they felt a strong desire to clear these obstacles out of the way. They also spoke about "pilot exhaustion" arising from both the heat and long hours of flying. The issues of psychotropic effects and exhaustion among pilots who do not have air-conditioning may bear further investigation. [The subject of psychotropic effects among aerial applicators is discussed in "Organophosphorus Ester Insecticides: Chronic Toxicity: Psychopathological Effects," in Ecobichon and Joy's Pesticides and Neurological Diseases, CRC Press, Boca Raton, 1982, pp. 167-171.]

Other anecdotes we heard about pesticides and aerial application safety included:

‡ A pilot said that he got sick from methyl parathion last year during take off. Just before he took off, he had helped "load" (perhaps both mix and load?) methyl parathion.

‡ A pilot found pyrethroids (such as Payoff, a Tox I insecticide) going through the air-conditioning system into the cockpit after the rubber cockpit seals were no longer performing like new. Pyrethroids are toxic to the nervous system. This pilot said that, even though he has replaced the rubber seals, his face "burns up" when he flies all day long. His loader's face gets burned too. He stresses washing, but last year his loader got pyrethroid in his eye. The loader had ignored the pilot's instructions. The pilot said that he plans next year to get a face guard for his establishment. He also said that the "mental stress of the job and mental fatigue" lead to pilot accidents.

A pilot gave us his assessment that most accidents characteristically happen with a tank overload on a short strip, "usually a heavy load, after lunch, mostly about 1 p.m." He and one other applicator also noted that "when you're sweating, pesticides go right through your skin."

One pilot said that, before he got air-conditioning, he would keep cool by soaking towels in an ice water tank and flying with the towels wrapped around him. On occasion, he would also have his cockpit filled with cool water while he sat in it, transforming the cockpit into a bathtub to cool him off.

We did not observe any pilots wearing protective clothing or equipment for pesticides. The standard protective gear we saw pilots using were crash helmets and shoulder harnesses. The pilots wore t-shirts, short-sleeved shirts, trousers, and regular footwear.

The frequency that flying services washed the exteriors of their planes differed from place to place. Some applicators said that they routinely washed their planes daily or more often. Others said that they did this once or twice a week. Many cockpit interiors are coated with epoxy. Washing the interiors of planes ranged from once a week to twice a year.

MIXING AND LOADING

"Closed" mixing systems were used at many of the aerial application establishments we visited. We saw a variety of models. One applicator, Buddy Box, was building a mixing system himself with his own innovative design. Another applicator showed us a "totally hands-off" mixing system he plans to install. Where closed systems were used, we saw some loaders still doing secondary mixing in open buckets and collecting and carrying dilute pesticides in open buckets from washing out spray systems.

I have questions about the design of at least one of the "closed" systems we saw. At one airstrip, a loader, dressed in shorts, a short-sleeved jersey, a billed cap worn backwards, and tennis shoes, was using a "Captain Crunch" system to mix methyl parathion. The "Captain Crunch" slashes a five-gallon metal can through the bottom and crushes and rinses it. As the loader crushed and rinsed one can, I saw parathion splash out the rear of the device. I wonder whether the parathion could have just as easily splashed out the front on the loader. More on methyl parathion under "Hygiene and Protective Clothing" below.

We saw some loaders using a "probe," a specially-designed nozzle with a pointed end. (This device is also known as a "pressure rinse nozzle.") A probe screws onto a standard water hose and serves the combined functions of puncturing plastic containers, "triple-rinsing" (actually power rinsing), and rendering the containers useless. Probes were distributed widely under a special program of MDAC.

Many places used a device called a "dry couple," which connects the hose coming off the mixing tank or holding tank to a connection to a plane's pesticide tank. This seems like a good device. We saw some spillage where dry couples were not used. But there was also a little spillage with some of the dry couples we saw. Some loaders wore rubber gloves when connecting and disconnecting hoses to aircraft pesticide tanks, others did not.

PESTICIDE CONTAINERS

One aerial applicator recounted how loaders used to get sick from handling bags of Lannate insecticide because there were no warnings on the bags. (Lannate is methomyl, a wettable powder, Tox I; protective clothing, goggles, and respirators now required on the label.) He also showed us containers of Blazer (the herbicide acifluorfen, a Tox I eye and skin irritant) and Triton CS-7 (a Tox II oil emulsifier spreader binder), which look similar and have the same shape and colors. He was concerned that there could be accidental poisoning if workers confuse these similar containers. This applicator said that handling bags of pesticides used for rice was particularly hot work. Another aerial applicator had a forklift truck for moving 55-gallon pesticide drums, eliminating most manual handling of these heavy containers.

We learned of several ways of how empty pesticide containers were disposed. Some pesticide manufacturers and formulators have a "boomerang" system, where they take back their 15- or 20-gallon stainless steel drums for re-use. MDAC established a pilot program in Washington County with the National Agricultural Chemicals Association to collect triple-rinsed or power-rinsed containers. Plastic and metal containers are separated and compacted and baled at a gin. About 500 plastic containers make a bale. The products from recycling include plastic flower pots and -- pesticide containers. This program is being expanded to other counties.

DRINKING WATER AND REST BREAKS

The most common vessels in which workers carried drinking water to the fields were two- and three-gallon portable water coolers. Equipment operators typically carried a cooler by their seat. Field workers got water from coolers kept in the beds of pickup trucks. Some workers said that they found the coldness of ice water disagreeable and preferred cool water to ice water. Some farmers supplemented drinking water for their workers with cans of soft drinks kept in cooler chests. Three women "chopping cotton" (hoeing weeds in a cotton field), who were not regular field workers, said they often went the entire workday in the field from 7 a.m. to 1 p.m. without

drinking any water because "it took too much time" to walk across the field to the pickup truck to get water. No other workers indicated that they found it inconvenient to go for drinking water. Drinking water was available at virtually every work site we visited. Other field workers told us how much water on average they drank during the workday. This ranged from one gallon to two gallons.

The workers we observed seemed to pace themselves, taking breaks when they thought they needed to. Two workers who were Army veterans indicated the greatest awareness of keeping well-hydrated and taking rest breaks to cool off. This is understandable, given the Army's extensive program to prevent heat illness. One worker, a member of a crew hand-rouguing a rice field, said that he will customarily take a break for fifteen minutes, even for an hour, if he gets very hot. The second worker, a Vietnam veteran who works for his brother, offered a program on the spot to manage heat stress: drink plenty of water, take breaks when you need them, and don't let any employer push you to keep on working when you need a break from the heat.

The Army had made believers in heat stress prevention out of the two veterans. This is encouraging. Employer commitment and effective worker training should be able to reduce substantially the incidence of heat illness throughout agriculture, although use of protective clothing presents some special problems.

One of the workers hand-rouguing rice said he often gets heat cramps at night. We discussed the standard remedy for normally healthy persons with heat cramps --- light salting of food.

CANOPIES AND REDUCING HEAT AT PESTICIDE MIXING STATIONS

While enclosed, air-conditioned cabs on mobile equipment were in wide use, we also saw many open tractors. Canopies, which give shade, were universally popular with workers. One tractor driver with many years' experience said that this was the first year his tractor had been equipped with a canopy. He said he didn't like air-conditioning, but he liked his canopy.

There were canopies over many of the aerial applicator mixing stations we visited. Loaders said that canopies made a big difference

in reducing heat. One aerial applicator who had a canopy over the mixing station at his home airstrip said that he did not have canopies at his satellite air strips, but he was going to put them up.

Some mixing stations were equipped with fans, both to cool the loaders and to blow pesticide fumes away. Most mixing stations that we visited were not equipped with fans. In Yazoo City, an applicator said that a fan had not worked out for his mixing station because the wind often shifted in three different directions.

TRAINING

One farmer who operated his own flying service said his pesticide handlers were given training every year. He said he didn't see the need for the federal government to require training because he already takes care of this on his own. No other person mentioned training to us during the week.

HEAT STRESS AND PROTECTIVE CLOTHING

I sympathize with applicators over the problem of working in protective clothing and equipment in the heat. One applicator said that "the main threat to the loader is heat exhaustion." This sentiment was echoed by others. We observed only one loader wearing nearly all required protective clothing for the pesticide he was mixing, and he was very hot. He was mixing and loading the insecticide Larvin 3.2 (thiodicarb, a Tox II insecticide/ovicide) in 105-degree heat. He wore all the clothing indicated on the label, except for a head covering. In addition, he wore a face shield, a rubber apron, and rubber boots, which were not required by the Larvin label and which undoubtedly added to his heat stress. He was still cooler than he would have been had he been mixing methyl parathion wearing the chemical-resistant protective coveralls required for handling methyl parathion. All but one of the other loaders we saw mixed and loaded pesticides, which just happened always to include methyl parathion or Prep (both Tox I), in short-sleeved shirts and various inadequate clothing ensembles.

One person spoke of his and his workers' abhorrence of wearing rubber boots on concrete. A loader at another establishment spoke of the "impossibility" of wearing rubber boots on concrete. What can be done for people for whom rubber boots are a problem? Rubber boots are required for handling certain pesticides; concreting the ground is an effective means to keep mixing/loading stations sanitary and control pesticide-contaminated wash water from planes.

I discussed the use of cooling vests to make protective clothing more tolerable for loaders in the heat. No one had ever heard of cooling vests, but several applicators said they would like to try them out. I also discussed cooling vests with Robert McCarty. He said that MDAC is amenable to a trial program to assess their suitability.

Most applicators may understandably consider it inhumane to make their workers wear the full protective clothing ensembles required on the labels of Tox I and Tox II pesticides in very hot weather, unless effective cooling devices, such as cooling vests, become available. I hope that EPA's heat stress management program, the training requirements under the new Worker Protection Standard, and related activities by MDAC will help.

HYGIENE AND PROTECTIVE CLOTHING

With few exceptions, the clothing we saw worn by most loaders, pilots, and ground applicators seemed to be the same clothing they wore outside of work. Most loaders and applicators wore regular hot weather clothes, including short-sleeved or sleeveless shirts, shorts or long-legged pants, and tennis shoes. Avoiding heat stress only partially explains this.

At one operation, an aerial applicator said that he and his workers do not wear protective gloves because the gloves are uncomfortable. He also noted that methyl parathion is particularly hard on the diaphragms inside aircraft spray nozzles. It distorts the diaphragms' shape and they have to be replaced. He said that he and his employees use their bare hands when they worked on sprays, relying on "plenty of soap and water" to wash pesticides off themselves. We watched one of his workers replacing spray diaphragms with his bare hands after a plane had made a run with methyl parathion. I told the applicator that there are manufacturers

who make specially-lined gloves, which they claim are comfortable, and I suggested that he ask MDAC where he can obtain these gloves. Interestingly, one of the pilots who works for this applicator does not get out of the cockpit at all during the workday, even to eat lunch. He eats his lunch in the cockpit.

Two applicators told us that they used surgical gloves for protection, throwing them away after each use.

Most applicators we met expressed a sincere desire to work safely, but many did not view wearing protective clothing and equipment as very important. Some pilots expressed awareness of low-level and sub-clinical effects of exposures to pesticides. This is understandable, given that the demands of flying safely require pilots to have unimpaired mental performance. It may be that ground workers accept or even ignore low-level symptoms and subtle neurobehavioral effects of exposures to pesticides. Pilots are probably getting exposures when they hold on to the exterior surfaces of their planes with their bare hands while climbing in and out between loads when they are applying Tox I and Tox II pesticides. (See requirements for methyl parathion below.) Pesticides can also enter enclosed cockpits through leaking cockpit seals, air ports, and, of course, open air vents. I wonder how much exposures to certain pesticides also affect applicators and loaders when they drive motor vehicles outside of work.

Although some aerial applicators told us that their employees were generally familiar with the requirements on pesticide labels, what we saw indicated that they mainly relied for protection on their mixing/loading equipment, minimal protective clothing (gloves) to no protective clothing, and, at aerial stations, wash water for emergencies. Some aerial applicators said that they and their workers wore protective gloves or surgical gloves faithfully, although it was clearly the preference of pilots and loaders at many establishments not to wear gloves at all. At many of the aerial application establishments we visited, the requirements for protective clothing and equipment printed on the pesticide labels did not seem to be much of a concern; the focus of attention, understandably, was on accomplishing the immediate mixing/loading and application tasks at hand.

We did not see any handlers or applicators wearing ordinary coveralls or chemical-resistant suits, nor did we see anyone wearing a respirator for protection, even when a respirator was required, as it is for open mixing of methyl parathion. Loaders would show us their respirators when we asked to see them. All the respirators were the dual-cartridge type and looked like new. We also saw two new respirators hanging on a coat rack on the wall of the office of one

flying service.

EPA's registration standard and the pesticide label for the Tox I insecticide methyl parathion require loaders to wear a long-sleeved shirt, long-legged pants, chemical-resistant gloves, a chemical-resistant apron, and shoes and socks when closed mixing/loading systems are used. Goggles or a face shield, must be worn when the system is under pressure. A protective coverall or two-piece protective suit, goggles or a face shield, a hood or wide-brimmed hat, chemical-resistant shoes (or chemical-resistant shoe coverings or chemical-resistant boots), and a pesticide respirator must be available nearby and worn during repair and cleaning of application equipment or if open mixing/loading is done. Pilots in enclosed cockpits must wear a long-sleeved shirt, shoes, and socks; and wear chemical-resistant gloves when getting in and out of the plane. Loaders and applicators must shower and change to clean clothes before leaving the job. Except for pilots wearing long-legged trousers, we saw no indication that any of the above provisions were followed.

Some flying services used mobile homes or modular structures for their offices. We saw bathtub/showers in the bathrooms of some of them. The showers did not seem to be actively used. We saw one bathtub used to store manuals and other documents. I don't think it would be difficult for most flying services to upgrade their hygiene program for pilots and loaders who handle methyl parathion and other pesticides requiring stringent hygiene. But even if existing showers at flying service offices were put into use, the problem of pilots and loaders entering offices in contaminated clothing would remain, unless a company built a change room connected to the bathroom, with a separate entrance to the outside.

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This trip broadened my perspective on problems of pesticide handling and agriculture under very hot conditions. These problems are common to other parts of the United States. I hope that the insights gained from this trip can improve the work of EPA.

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