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*pls file
methyl bromide*

February 19, 1993

Secretary Mike Espy
U.S. Department of Agriculture
Office of the Secretary
14th St. and Independence Ave, SW
Washington, D.C. 20250

Dear Secretary Espy:

As organizations concerned with both the fate of the Earth's ozone layer and the future sustainability of American agriculture, we request that you undertake a complete revision of USDA policy on methyl bromide. We ask you to revamp the Department's policy under the previous Administration, which has not served the interests of either the ozone layer or the farmer. In its place, we ask you to take concrete steps that will help the users of this chemical make a smooth transition to acceptable alternatives. As the new Secretary of Agriculture, your leadership is critical to this effort.

There is no longer any substantial scientific doubt about the fact that this widely used pesticide is a potent depleter of the ozone layer. As a result, in November 1992 methyl bromide was added to the list of controlled substances under the Montreal Protocol, the international treaty to protect the ozone layer. Under the requirements of the Clean Air Act, the Environmental Protection Agency recently proposed to phase out the production and use of methyl bromide in the U.S. by 2000.

During the Bush Administration, USDA did not play a constructive role on this issue. In the international arena, USDA openly undermined the U.S. government's officially-adopted position in favor of a global phase-out schedule for methyl bromide. Domestically, USDA objections caused OMB to hold up EPA actions mandated by the Clean Air Act until the last day of the prior Administration.

USDA staff efforts to block EPA action have apparently continued even into the Clinton Administration, prompting the new Office of Management and Budget leadership to review the EPA proposal again. The EPA phase-out proposal has been released unchanged, but we understand that even as late as last week staff in your office were still trying to reverse it.

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These efforts have not helped USDA's constituency. Instead of raising false hopes that this ozone-depleting and toxic chemical might somehow be retained, the Department should be helping farmers and other users "get ahead of the curve" and prepare for a transition to acceptable alternatives. We urge you to take a decisive stance by reconciling the loss of this pesticide and moving progressively forward to develop sustainable alternatives for American farmers.

The most important action you can take in this regard is to revamp the methyl bromide research agenda recently developed by your staff. As it is currently designed, a significant portion of USDA's resources would be devoted to quantifying methyl bromide emissions from agriculture and forestry and developing technologies and procedures to reduce emissions in the hope of preventing a ban on certain uses. In addition, USDA is also considering proposing to EPA to reinstate currently banned chemicals as substitutes.

Further efforts to avoid a phase-out of methyl bromide by quantifying emissions or developing partial emission controls will be pointless because the phase-out of this chemical is required by law within seven years. In California, regulations already require reduced emissions through better tarping and deeper injections. Efforts to bring back highly hazardous pesticides that have already been banned will not realistically serve the needs of farmers for effective and publically acceptable alternatives to methyl bromide.

We urge you to instead place the highest priority on the development and dissemination of environmentally sound and economically viable alternatives to fumigation. This will furnish farmers with sustainable solutions and provide vital protection of human health and the environment. It will also establish the U.S. as an innovative leader in the development of environmentally beneficial technologies.

One issue upon which all can agree is that there is no single technique or chemical to replace methyl bromide. Methyl bromide is used as a "broad spectrum" biocide to fumigate soil, commodities and structures. As is demonstrated by case studies in the enclosed report, Into the Sunlight: Exposing Methyl Bromide's Threat to the Ozone Layer, viable alternatives already exist for some of these uses. Pests are effectively controlled with heat in a large food processing facility. With certain commodities, modified atmosphere treatments in sealed structures are feasible. Soil pests can be managed in several crops using pest suppressive cover crops, crop rotations and soil amendments.

In many cases, however, additional research and extension is critical for the full development and implementation of alternatives. In this regard, USDA can and should play a crucial role. We urge you to adhere to two guiding principles in designing

USDA's research agenda: 1) focus on projects that assist in preventing pest problems and 2) emphasize on-farm research and extension of information to farmers.

The long term solution for farmers dependent on methyl bromide for soil fumigation is a combination of farming methods that help prevent pest problems before they occur. These techniques include but are not limited to the development of resistant varieties, pest-suppressive cover crops, improved irrigation systems, crop rotations and biological controls to improve the biological diversity and fertility of the soil. Some of these methods are already successfully employed by organic growers but further development is necessary to ensure their economic viability for conventional growers.

In the short term it will be necessary to develop Integrated Pest Management (IPM) systems that incorporate improved monitoring and detection of pests in the field and in storage. If necessary, an IPM approach includes the use of narrow-spectrum pesticides to minimize or eliminate particular soil "pests," and thus avoid total fumigation.

Success with alternative techniques is more likely if the research is conducted on farms in close cooperation with farmers. In addition, USDA should launch a broad effort to quickly disseminate solutions to farmers through the University extension system. In 1991, the Netherlands banned the use of methyl bromide for health and environmental concerns. A strong financial commitment to extension has been an integral component of their success in maintaining, and in many cases improving, agricultural production and profits without methyl bromide.

In addition to research and extension efforts, we recommend that you revise existing regulations within USDA's Plant Protection and Quarantine Treatment Manual. This manual requires that countries exporting to the United States fumigate certain commodities with methyl bromide in order to comply with U.S. quarantine specifications. At a minimum, the manual should be restructured to focus on performance, or end results, and should not simply specify use of a particular chemical. It should also identify and promote alternatives to methyl bromide.

The history of the phase-out of ozone-depleting chemicals has demonstrated that alternatives have been successfully found for chemicals once thought to be irreplaceable. Three times in the last five years, industries have successfully developed alternatives to ozone-destroying chemicals that producers and users first claimed could not be replaced. American farmers, industry, and scientists have the ingenuity necessary to develop sustainable alternatives to methyl bromide. We urge you to support their efforts by developing a research agenda that acknowledges the upcoming ban on all uses of methyl bromide and moves rapidly to procure alternative technologies that sustain production and protect public health and the environment. We

Welcome your leadership in this endeavor and look forward to your response to this request.

Sincerely,



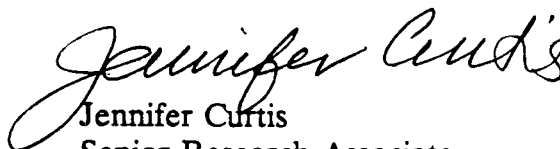
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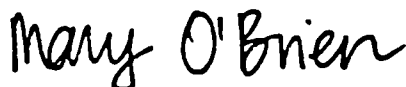
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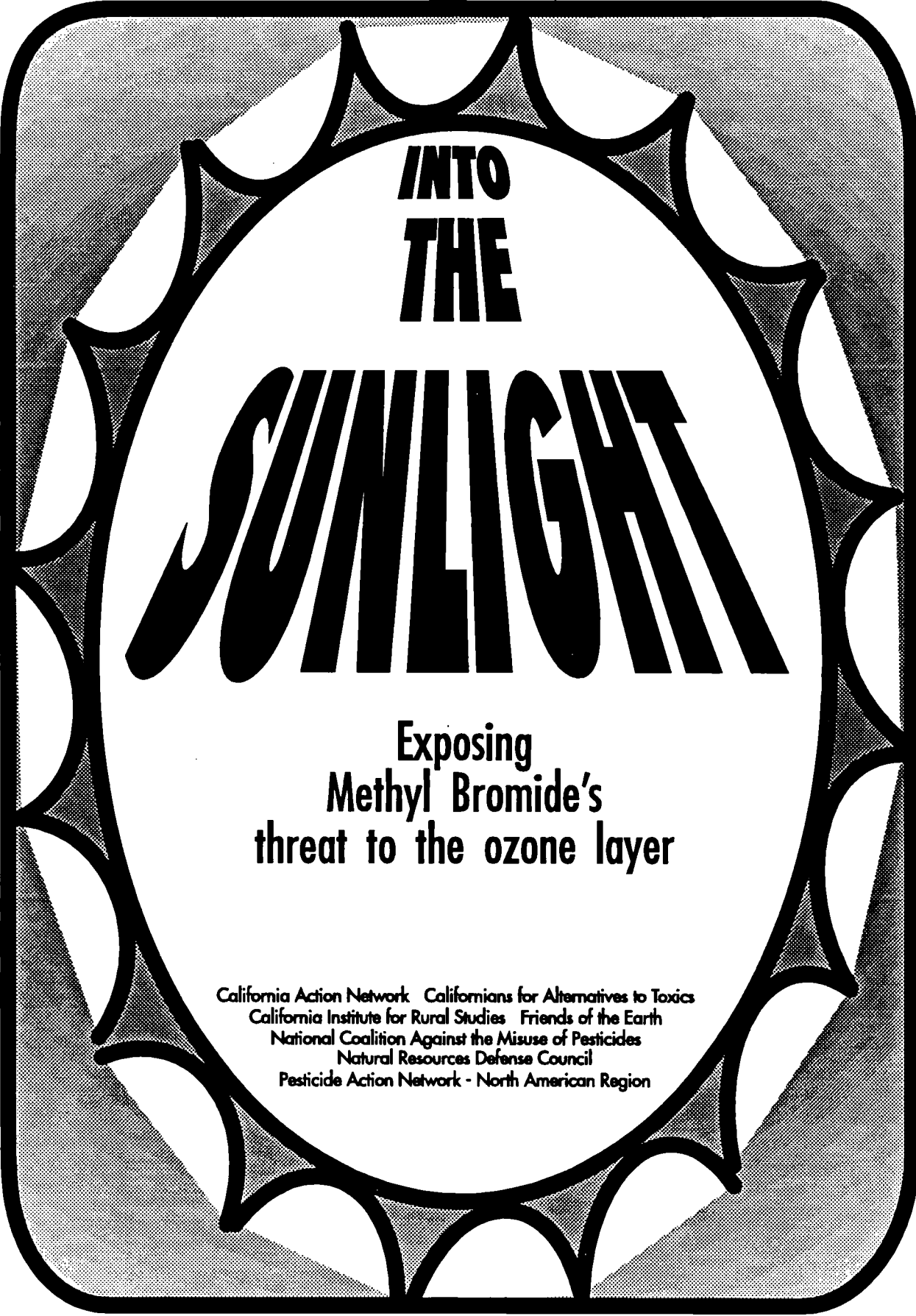


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INTO THE SUNLIGHT

**Exposing
Methyl Bromide's
threat to the ozone layer**

California Action Network Californians for Alternatives to Toxics
California Institute for Rural Studies Friends of the Earth
National Coalition Against the Misuse of Pesticides
Natural Resources Defense Council
Pesticide Action Network - North American Region

INTO THE SUNLIGHT:
EXPOSING METHYL BROMIDE'S THREAT TO THE OZONE LAYER

a report presented by

California Action Network • Californians for Alternatives to Toxics
California Institute for Rural Studies • Friends of the Earth
National Coalition Against the Misuse of Pesticides • Natural Resource Defense Council
Pesticide Action Network - North American Region

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Executive Summary

Methyl bromide, a widely and increasingly used pesticide, poses a serious threat to human health and Earth's protective ozone layer. To defend against these threats, governments and industry should immediately cut methyl bromide's production and use by 50 percent and phase out the chemical within five years.

Methyl bromide is a widely and increasingly used pesticide

Methyl bromide — CH_3Br — is by volume the second most widely used pesticide in the world, after oil. It is manufactured in at least eight countries and sold worldwide. Industrialized countries use the vast majority of methyl bromide, accounting for greater than 80 percent of the world's consumption. The United States alone is responsible for approximately 43 percent of consumption, or 59 million pounds a year. Worldwide, methyl bromide production and use has been growing at an average annual rate of about 7 percent, from about 92 million pounds in 1984 to about 139 million pounds in 1990.

The chemical's pesticide uses fall into three major categories:

- Soil fumigation (to kill pests in soil). In the U.S., 49 million pounds of methyl bromide were used as a soil fumigant in 1990, or about 84 percent of all U.S. use as a pesticide.
- Commodity fumigation (to kill pests on food or in packaging materials). In the U.S., over 5 million pounds of methyl bromide was used as a commodity fumigant in 1990, or about 8 percent of all U.S. use as a pesticide.
- Structural fumigation (to kill pests in buildings). In the U.S., over 5 million pounds of methyl bromide was used as a structural fumigant, or about 8 percent of all U.S. use as a pesticide.

Methyl bromide damages the ozone layer

Much of the methyl bromide used for fumigation — along with large quantities of the chemical produced as a byproduct of manufacturing process — escapes into the atmosphere, where it takes part in chemical reactions that damage the ozone layer.

This damage is allowing increased levels of harmful ultraviolet radiation — called UV-B — to reach Earth's surface. Exposure to UV-B can:

- cause human health problems, such as skin cancer;
- disrupt plant growth, which could negatively effect food production; and
- damage key ecological systems, such as the one that has marine phytoplankton at its base.

Methyl bromide is a potent ozone destroyer. In fact, over the next 20 years, every kilogram of methyl bromide that is released into the atmosphere will contribute far more to ozone depletion than a kilogram of a better known ozone destroyer such as chlorofluorocarbon-11 (CFC-11).

Due to the chemical's strength, eliminating methyl bromide emissions could quickly reduce damage to the ozone layer. Currently, however, the Montreal Protocol on Substances that Deplete the Ozone Layer does not call for eliminating the use and production of methyl bromide. If the Protocol is not amended to control methyl bromide, the chemical's role in ozone destruction will grow. Today, scientists estimate it is responsible for five to ten percent of ozone depletion; by the year 2000, it will be responsible for 15 percent of total ozone depletion if, as expected, emissions continue to increase at the rate of five to six percent per year.

Methyl bromide is highly toxic to humans

Methyl bromide not only threatens the ozone layer, however. It has also proven to be highly toxic to humans. The U.S. En-

Environmental Protection Agency (EPA), for example, classifies methyl bromide as a "Category I acute toxin," the most deadly category of substances.

Numerous poisonings due to methyl bromide exposure have been reported. In California, where the chemical is widely used, there were 15 reported deaths between 1982 and 1990 due to methyl bromide exposure. California's Department of Pesticide Regulation also recorded 148 systemic illnesses, 52 eye injuries, and 60 cases of skin injury due to methyl bromide exposure between 1982 and 1990.

Safer alternatives to methyl bromide exist

For most uses, less dangerous alternatives to methyl bromide currently exist. As the case studies included in this report demonstrate, many alternatives are already being employed in an effective and economical manner. Where alternatives are not currently identified, history suggests that decisive action to control methyl bromide will create incentives for the rapid development of previously overlooked or unforeseen alternatives.

Recommendations

Industry, government, and consumers must work together to phase out methyl bromide use within the next five years. A complete set of recommendations is included in this report. They include:

- Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer must amend the agreement to list and phase out methyl bromide, and provide funding to assist developing countries.
- The U.S. Environmental Protection Agency must list methyl bromide as a Class I substance, set a phaseout timetable, require recycling, ban applications where alternatives are available, and require warning labels on fumigated products.
- The U.S. Department of Agriculture must revise existing quarantine regulations, which promote the use of methyl bromide in the U.S. and abroad.

- Congress must expand the existing tax on ozone-depleting chemicals to include a tax on methyl bromide.
- The Ethyl Corporation and Great Lakes Chemical Company — the two U.S. companies that produce methyl bromine — must immediately cut production by 50 percent and cease all production within five years.
- Agricultural users — including strawberry, tomato, and grape growers — must eliminate the use of methyl bromide as a soil fumigant by shifting to safer, sustainable farming practices and developing new alternatives where needed.
- The pest control industry must eliminate the use methyl bromide as a household and structural pesticide by shifting to safer available alternatives.
- Companies that fumigate commodities with methyl bromide — such as grain processors — must eliminate the use of methyl bromide as a fumigant by adopting safer available alternatives, and employing recovery and recycling systems while developing additional alternatives where needed.

These actions are within our grasp and we must take them. Our health and the health of the environment depend on it. ■

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I. Introduction

Imagine a gas that kills all forms of life - animals, plants, insects, even bacteria. Now imagine that, when released into the atmosphere, this gas acts as a powerful ozone destroyer, voraciously consuming the Earth's protective ozone layer. Finally, imagine that we are pumping tremendous quantities of this gas into our fields and homes, and gassing many of our foods under government sanction — even though safe alternatives exist for many applications.

This gas is no figment of the imagination — it is called METHYL BROMIDE, and it is widely used today.

Industry developed methyl bromide as a pesticide, and many farmers saw it as a panacea for a number of their agricultural pest problems. It was relatively inexpensive and quickly killed pests that live in soil. Partly because of these qualities — and partly because other fumigants were being restricted or banned because of their negative health and environmental effects — methyl bromide use swelled over the last decade. Today, methyl bromide is the last remaining broad-spectrum fumigant and is widely used.

Recently, scientists discovered that methyl bromide contributes significantly to the destruction of Earth's ozone layer, which protects every living thing from the damaging rays of the sun. Experts have also linked the chemical's use to human death and injury and found that it may cause subtler long-term health and ecological problems.

INTO THE SUNLIGHT investigates some of the problems caused by methyl bromide and explores some alternatives for each of its major uses. It presents case studies of how industry and agriculture are using some of these alternatives successfully. And it examines the current national and international regulatory status of methyl bromide, identifying what actions individuals and governments can take to eliminate use of the chemical.

Industry, government, and consumers must work together to do everything possible to protect the ozone layer. Eliminating methyl bromide will be one more step

toward achieving this goal. It is an action that is within our grasp and we must take it: Our health and the health of the environment depend on it. ■

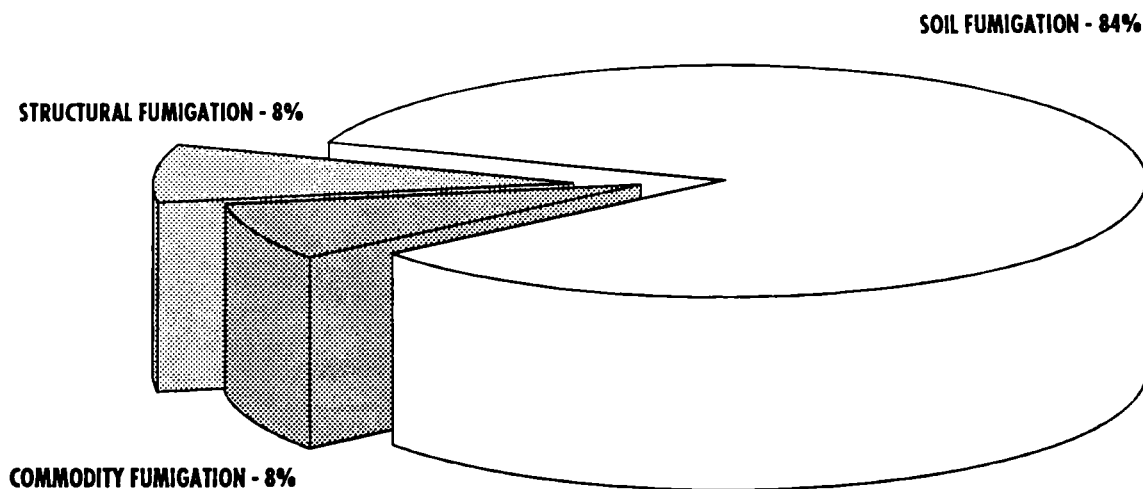
METHYL BROMIDE: PRODUCERS AND USERS

Methyl bromide is by volume the second most widely used pesticide in the world, after oil. It is manufactured in at least eight countries and sold worldwide. In the United States, it is manufactured by Great Lakes Chemical Corporation and the Ethyl Corporation; combined, their output is 50 percent of total global production.¹

Industrialized countries use the vast majority of methyl bromide, accounting for greater than 80 percent of the world's consumption.² The United States alone is responsible for approximately 43 percent of consumption, or 59 million pounds a year.³ Worldwide, methyl bromide production and use has been growing at an average annual rate of about 7 percent, from about 92 million pounds in 1984 to about 139 million pounds in 1990⁴ (see bar chart, "World Methyl Bromide Production Is Rising").

Methyl bromide escapes into the atmosphere both during chemical manufacturing activities and when it is used as a pesticide. The chemical's pesticide uses fall into three major categories:

- soil fumigation (to kill pests in soil);
- commodity fumigation (to kill pests on food or in packaging material); and



USE OF METHYL BROMIDE AS A PESTICIDE IN THE UNITED STATES

(Total: 59 million pounds in 1990)

Source: see end notes 5, 8, and 10

- structural fumigation (to kill pests in buildings).

Soil Fumigation

In the United States, soil fumigation is by far the largest use of methyl bromide as a pesticide, accounting for approximately 49 million pounds in 1990, or about 84 percent of all U.S. use as a pesticide.⁵

The chemical is often used to fumigate soil before planting. It is injected 6-18 inches under the soil, which is then covered with a plastic tarp for two to seven days.⁶ Between 200 and 400 pounds per acre are required to sterilize the soil, depending upon the crop, the location, and the types of pests. Researchers in the Netherlands have found that 80 percent of the amount injected is emitted into the atmosphere.⁷

Commodity Fumigation

In the United States, commodity fumigation accounts for over 5 million pounds a year, or approximately 8 percent of all U.S. use as a pesticide.⁸ Most of this methyl bromide is used to fumigate agricultural crops after harvest in order to minimize losses to pests during shipping and storage. Many governments require the fumigation of agricultural products to satisfy quarantine concerns. The U.S. also requires some durable goods to be fumigated in order to prevent pests in the packaging material from entering the country.

Commodity fumigation methods vary from simply covering the commodity with a tarp and pumping in the gas to fumigating an airtight, near-vacuum pressure chamber. After fumigation, the methyl bromide is vented into the environment, with no attempt made for recovery. Although some methyl bromide is absorbed by the commodities, researchers estimate that 80 percent to 100 percent of the gas is emitted to the atmosphere.⁹

Structural Fumigation

Structural fumigation accounts for over 5 million pounds a year, or approximately 8 percent of all U.S. use of methyl bromide as a pesticide.¹⁰ It is used both to prevent pest infestations in buildings where food is stored and processed and to kill structural pests such as termites. While fumigated structures are usually sealed or covered with a tent-like tarp, no attempt to recover the gas is made. Some of the methyl bromide may be absorbed into materials in the buildings, but experts estimate that over 80 percent of the gas is emitted to the atmosphere.¹¹

Byproduct Emissions

Methyl bromide is also emitted to the atmosphere during manufacturing operations. These emissions occur both during the manufacture of methyl bromide itself, and during the production of other chemi-

cals, such as those used to make polyester.

Worldwide, no accurate information is available on these emissions. In the United States, however, at least some of these emissions are reported in the annual Toxic Release Inventory (TRI), a survey required by the Emergency Planning and Community Right to Know Act. In 1990, TRI data showed that reported byproduct emissions in the U.S. totaled over 1.7 million pounds (see box on page 10, "Facilities Reporting 5,000 Pounds Or More Of Methyl Bromide Releases"). Over 97 percent of this amount was released directly into the atmosphere.¹²

Regional Use

In the United States, methyl bromide use is concentrated in states that produce high value agricultural crops, such as California and Florida (see box, "Florida Crops Rely on Methyl Bromide"). California uses approximately 35 percent of the U.S. total, while Florida uses over 28 percent.¹³ The chemical is used on tomatoes, strawberries, grapes, peppers, tobacco, melons, almonds, eggplant, and more than 100 other crops.

Some crop production systems have become entirely dependent on methyl bromide to control pests. For example, California strawberries and fresh market tomatoes grown in Florida are responsible for large amounts of methyl bromide use.

Florida fresh market tomatoes, grown

primarily in the off season, are fumigated with 8.4 million pounds a year, or 15 percent of the U.S. total. California strawberries are fumigated with over 4.3 million pounds of methyl bromide a year, or over 8 percent of all methyl bromide used in the United States.

The fumigation of residential structures in Southern California is another example of intensive methyl bromide use in one narrow market sector. In Los Angeles area, banks and lending institutions often require that homes be fumigated before they can be sold. In 1990, in Los Angeles County alone, structural fumigation companies used almost 5 million pounds of methyl bromide, mostly against termites in residential structures.¹⁴ Termite extermination in Los Angeles County accounts for more than 60 percent of methyl bromide used for all structural fumigations worldwide.

THE SCIENCE OF METHYL BROMIDE IN THE ATMOSPHERE

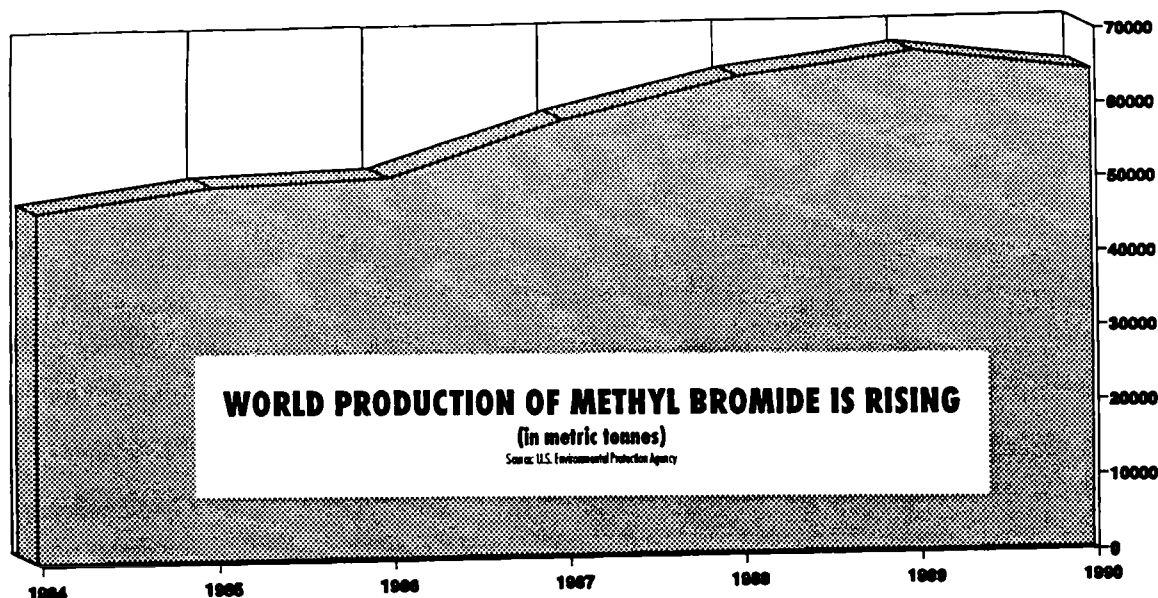
Methyl bromide is a chemical compound composed of one bromine atom and three hydrogen atoms attached to a carbon atom. It is annotated as CH₃Br. It is released into the atmosphere both through natural processes occurring in Earth's oceans, and by human activities. Though natural emissions of methyl bromide may exceed human

HOW METHYL BROMIDE IS USED



- AS A SOIL FUMIGANT ON... asparagus, broccoli, cauliflower, eggplant, onion (dry bulb), lettuce, melons, peppers, pineapple, tobacco, fruit and nut tree and vineyard sites, tomatoes, strawberries, turf, and non-food crops (seed and transplanted beds, nursery and greenhouse soils).
- AS A COMMODITY FUMIGANT ON... barley, beans, beets, cabbage, carrots, chestnuts, cipollini bulbs, citron, grapefruit, kumquat, lemons, limes, oranges, tangelos, tangerines, cocoabeans, copra, corn, cottonseed, cucumbers, dates, garlic, figs, oats, rice, rye, peanuts, spices, apricots, pecans, pumpkins, cherries, nectarines, sorghum, eggplants, wheat, grapes, hay, horseradish, Jerusalem artichokes, Brazil nuts, butternuts, pimentos, sugarbeets, sweetcorn, sweet potatoes, radishes, rutabagas, peas, squash, pimentos, pistachio nuts, apples, pears, potatoes, pineapples, turnips, okra, tobacco, cut flowers, agricultural premises, and others.
- AS A STRUCTURAL FUMIGANT ON... warehouses, trucks, railroad cars, food processing plants, barns, feed rooms, grain bins, greenhouses, poultry houses, bags, boxes, crates, mushroom houses, and other areas.

Source: U.S. Environmental Protection Agency



emissions, they are not of concern because they are part of the natural balance of the atmosphere's chemistry. It is the additional emissions of human origin that are responsible for the imbalance that is helping to destroy the protective ozone layer.

Most of the methyl bromide that is released into the troposphere, which extends from the earth's surface to seven to ten miles out, ultimately falls back to Earth as a relatively harmless acid. But about three percent to five percent of the methyl bromide makes its way up into the stratosphere, which extends from about ten miles from the Earth's surface out to about 31 miles. This band includes the ozone layer.

Technically, methyl bromide that reaches the stratosphere does not itself

destroy ozone. Instead, it breaks down and becomes a major source of bromine atoms.¹⁵ These freed atoms combine with other atoms in the lower stratosphere to produce ozone-destroying compounds, principally bromine monoxide.

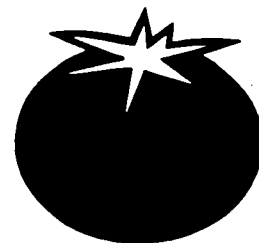
Scientists do not know how much of the methyl bromide measured in the atmosphere has been created by human activities, because they have not measured exactly the amount that comes from natural sources in the ocean. Current estimates are that human sources account for about 25 percent of atmospheric methyl bromide, though the figure could be as low as 15 percent or as high as 35 percent. This figure is based on industry estimates of worldwide methyl bromide sales and industry estimates of

FLORIDA CROPS RELY ON METHYL BROMIDE

Many Florida crops are regularly fumigated with methyl bromide, including cucumbers, eggplant, watermelon, celery, and tomatoes. Florida's tomato industry represents a crop that has become dependent on methyl bromide. For example, 98 percent of the more than 50,000 acres planted in fresh market tomatoes in 1991 was fumigated with methyl bromide. The average application was 200 pounds per acre.⁶⁶

Presently, there is no single chemical that can serve as a substitute to methyl bromide — a series of pesticides, fungicides, nematocides, and herbicides would have to be used. These chemicals would be more costly to apply than methyl bromide and have unknown environmental impacts when used on such a large scale. Meanwhile, virtually no effort has been made to identify non-chemical alternatives.

Rapid research into safe alternatives to methyl bromide use in Florida is essential. Due to its dependence on the chemical, Florida's agriculture industry will require extended assistance in the transition to non-methyl bromide production. The tomato harvest alone, for example, was worth about \$600 million in 1991 and accounted for 34 percent of the income for all Florida vegetable crops that year.⁶⁷



how much of the methyl bromide that is used for fumigation escapes into the atmosphere.

Bromine's Ozone Depletion Potential

Atom for atom, bromine is a much more potent destroyer of ozone than chlorine, the key substance in better known ozone-depleters, such as chlorofluorocarbons (CFCs). For every ozone molecule destroyed by chlorine, bromine will destroy somewhere between 20 to 100 ozone molecules; the current best estimate is that a bromine atom will destroy about 40 times more ozone molecules than a chlorine atom.

To compare the ozone-destroying strength of different chemicals, researchers developed a measure called the ozone depletion potential, or ODP. The ODP is a relative measure of how much ozone will be destroyed by one kilogram of a chemical over an infinite amount of time. Usually, the long-lived chlorofluorocarbon called CFC-11 is considered to have an ODP of 1. In contrast, methyl bromide has an ODP of 0.7 compared to CFC-11.

However, methyl bromide's ozone-destroying potential over the short term may in fact be higher due to its relatively short lifespan. An average methyl bromide molecule exists for about two years in the atmosphere before it is turned into an acid

by an hydroxyl radical (OH-). In contrast, some CFC compounds may remain in the atmosphere for, on average, 50 to 150 years.

If methyl bromide's ODP is calculated over a shorter (more relevant) time scale, its ODP relative to CFC-11 rises dramatically. Over a 20-year time scale, for example, methyl bromide's ODP rises to 3; over ten years, its ODP rises to 7.

These figures mean that, in the short term, every kilogram of methyl bromide that is released into the atmosphere contributes far more to ozone depletion than a kilogram of released CFC-11. They also indicate that the methyl bromide released into the atmosphere now will inflict the majority of its damage on the ozone layer relatively quickly — over the next 20 years, when ozone depletion and its effects will be at their worst

Eliminating methyl bromide emissions could prevent this damage and quickly reduce ozone depletion. Currently, however, the Montreal Protocol on Substances that Deplete the Ozone Layer does not call for eliminating the use and production of methyl bromide. If the Protocol is not amended to control methyl bromide, the chemical's role in ozone destruction will grow. Today, scientists estimate it is responsible for five to ten percent of ozone depletion; by the year 2000, it will be

WITH METHYL BROMIDE, EVERY BREATH YOU TAKE COULD BE DANGEROUS

People can be exposed to potentially dangerous levels of methyl bromide in a variety of work and home situations. For example, structural fumigation workers entering a treated home (wearing breathing apparatus) could be exposed to an average methyl bromide concentration of 204 parts per billion (ppb).⁶⁸ A resident entering the home one day following treatment* can be exposed to levels of 100 ppb to 270 ppb, while someone living next door could be exposed to one to six ppb.

Soil fumigation workers — such as truck drivers — could be exposed to concentrations of methyl bromide as high as 733 ppb.⁶⁹ This exposure would be far above the 200 ppb Minimal Risk Level (MRL) set for short-term exposure to methyl bromide in air (the long-term level is 5 ppb).⁷⁰ MRLs are an estimate of daily human exposure to a chemical that is likely to be without an appreciable risk of deleterious effects (noncancerous) over a specified duration of exposure.

Studies have revealed that people who have breathed:

- 100,000 ppb of methyl bromide in air for one to two weeks had double vision and numbness in their hands and feet;
- 1,600,000 ppb for four hours died.⁷¹

**Normally, residents are not allowed to return to treated homes until airborne concentrations of methyl bromide are reduced to 0.005 ppb. This can take from 3 to 7 days.*

WORKER EXPOSURE AT THE DIAMOND WALNUT PLANT

The Diamond Walnut plant is a Stockton, California walnut processing facility owned cooperatively by over 2,000 growers. Workers at this plant are exposed to a variety of chemicals, including methyl bromide, which is used to fumigate walnuts.

Claiming unfair and unjust treatment, 500 Teamster Union workers at Diamond Walnut began a strike in September 1991 (these workers have now been permanently replaced). The workers complained of severe headaches and cracked and bleeding lips following exposure to methyl bromide.⁷² The Occupational Safety and Health Administration (OSHA) has received notice of excessive employee exposure to methyl bromide. In 1988, seven employees were sent to the hospital as a result of methyl bromide exposure.⁷³

Union workers have organized an international boycott of Diamond walnuts. In October 1992, the European Parliament called for a thorough and urgent review of the safety of imported California walnuts, principally because chlorine is used to bleach the nuts and methyl bromide is used to kill pests. Forty percent of the production of the Diamond Walnut Company is exported to the European community. Because of consumer and worker safety concerns, Germany has already banned the importation of walnuts treated with chlorine and France has banned the use of methyl bromide on walnuts.⁷⁴

To support the Teamsters' strike and address worker exposure to methyl bromide, the Teamsters are calling on consumers to boycott walnuts carrying the Diamond Walnut brand. Citizens can also write to the Diamond Walnut Company and urge them to adopt methyl bromide recovery technologies that will eliminate emissions of methyl bromide to the atmosphere. Write Mr. Bill Cuff, CEO, Diamond Walnut Company, 1050 Diamond Way, Stockton CA 95205.

responsible for 15 percent of total ozone depletion if, as expected, emissions continue to increase at the rate of five to six percent per year.¹⁶

DIRECT TOXIC EFFECTS OF METHYL BROMIDE

Methyl bromide is extremely toxic and is known to cause acute and potentially chronic health effects in humans, including poisoning, neurological damage, cancer, and reproductive harm. Based on extensive evidence of toxicity in humans and animals, the U.S. Environmental Protection Agency (EPA) classified methyl bromide as a Category I acute toxin, the most deadly category of substances.¹⁷

Those at greatest risk of exposure are workers involved in the production and use of methyl bromide (*see box, "Worker Exposure at the Diamond Walnut Plant"*). People living or working where methyl bromide is used as a soil or structural fumigant may also be exposed.¹⁸ People living near industrial facilities that release the gas into the air could also be at risk. Because methyl bromide is a gas at room temperature, the most likely route of ex-

posure for humans is through inhalation (*see box, "With Methyl Bromide, Every Breath You Take Could Be Dangerous"*).

The most immediate effects of methyl bromide poisoning are caused by damage to the nervous system. Depending on the duration of the exposure, symptoms range from headaches, nausea, and shortness of breath to muscle tremors, visual disturbances, seizures, and even death. Most acute symptoms do not appear immediately following exposure but are delayed at least several hours.¹⁹

Numerous poisonings due to methyl bromide exposure have been reported. In California, where the chemical is widely used, there were 15 reported deaths between 1982 and 1990. These cases usually involved illegal entry by transients or burglars into homes treated with methyl bromide for structural pests. At times, however, residents have died from exposure after re-entering their fumigated homes, where methyl bromide levels had been measured and found to be within legally safe limits.

California's Department of Pesticide Regulation also recorded 148 systemic illnesses, 52 eye injuries, and 60 cases of skin

injury due to methyl bromide exposure between 1982 and 1990.²⁰

In 1984, 1,500 people in California were evacuated from a 2.2 square mile residential area within several miles of a recently fumigated field. Thirty-two people sought medical attention for eye and throat irritation, shortness of breath, and chest pains.

In 1987, children from a nearby labor camp created holes and tears in the plastic tarp covering treated field, allowing the gas to escape. About 140 people were evacuated from the labor camp, and 71 people later reported suffering ill effects.²¹

In September 1992, six people — including several children — in Oxnard, California became ill after methyl bromide vapors from a nearby strawberry field drifted into a residential neighborhood. Their symptoms included vomiting and dizziness. Methyl bromide fumes entered the area after the plastic tarps meant to contain the chemical in the field were removed.²²

Long Term Health Effects

In addition to the immediate health effects of methyl bromide poisoning, there are concerns about long-term health effects. Permanent neurological damage has resulted from both acute and chronic exposure. In one study, fumigators exposed for an extended period of time experienced neurological symptoms such as muscle ache, fatigue, and impaired motor coordination.²³ Animal studies have also found that chronic exposure to methyl bromide results in moderate to severe neurological injury.²⁴

Researchers have only minimally investigated the ability of methyl bromide to induce cancer. Methyl bromide has produced positive results in mutagenicity studies, which suggests that it may be a carcinogen. The EPA, however, has not concluded whether methyl bromide is a carcinogen and has therefore rated it as unclassifiable (known as Group D).²⁵ More data are required to determine whether or not long term exposure to methyl bromide leads to the development of cancer.

The California Department of Pesticide Regulation (CDPR) recently reviewed several animal studies and found that methyl bromide induced birth defects when pregnant animals were exposed.²⁶ In addition,

several studies found that male rats exposed to methyl bromide through inhalation suffered from testicular degeneration and atrophy.²⁷ The CDPR concluded that these findings are cause for concern, and imposed greater restrictions on the use of methyl bromide to fumigate structures.²⁸

The full extent of methyl bromide's toxicity cannot be adequately understood, however, without further health studies. For example, no studies have been conducted on the potential for immune system effects. Methyl bromide's movement in the lower troposphere continues to be poorly understood, making it difficult to determine the risk faced by neighborhoods near methyl bromide use and manufacturing sites. Little is also known about methyl bromide's potential to interact with other chemicals to cause synergistic effects. Finally, there have never been investigations into the question of whether methyl bromide can disproportionately affect more vulnerable subgroups of the population, such as children.

THE HUMAN HEALTH AND ECOLOGICAL CONSEQUENCES OF OZONE DEPLETION

The ozone layer is a protective layer of ozone gas in the atmosphere that prevents damaging ultraviolet-B (UV-B) radiation from reaching the Earth. Destruction of the ozone layer results in increased UV-B exposure, which can adversely effect human health and the environment.

Human Health

UV-B radiation can affect human health in a variety of ways, from weakening the immune system which helps defend against disease, to causing skin cancer and damaging eyesight.

Worldwide, skin cancer is expected to increase as ozone depletion worsens. UV-B directly affects skin cells to cause cancer.²⁹

UV-B radiation also effects the vision of people exposed to high amounts of sunlight. Age-related near-sightedness, deformities of the lens capsule, and eye cancer are all linked to increased UV-B exposure. The incidence of cataracts is predicted to rise as ozone depletion worsens.³⁰

Finally, UV-B exposure can cause

reduced immune system response in all human populations, including dark-skinned individuals.³¹ Immune system breakdown is known to lead to increases in the incidence and severity of infectious disease, although the exact dimensions of UV-B immune effects not yet known.³² UV-B exposure may also be associated with the activation of the AIDS and herpes viruses.³³

The people most at risk from ozone loss and higher UV-B exposure are those who work outside much of the day. These people are exposed to maximum sunlight and thereby to maximum UV-B radiation.³⁴

Ecological Consequences

Not only does increased UV-B threaten human health, but it can have potentially detrimental effects on ecological systems. Of particular concern is UV-B's effects on agricultural plant communities, which provide the world with food.

Results from numerous experiments have prompted scientists to state that "continued research on plant responses to UV-B radiation underscores the concern for agriculture, forestry, and natural ecosystems as the ozone layer is depleted."³⁵

About 66 percent of the approximately 300 species and varieties tested (mostly important agricultural plants) appear to be susceptible to damage from increased UV-B radiation.³⁶ Growth (plant height, weight, leaf area, etc.), photosynthesis, and flowering of have been shown to be inhibited by UV-B.³⁷

Researchers have found, however, that sensitivity to UV-B radiation varies tremendously among plant species, and even among varieties of a species.³⁸ Some are sensitive, while others — often plants that have evolved at higher elevations — are apparently unaffected by large doses of UV-B.³⁹

Studies also show UV-B effects on crop yield vary by climate and soil fertility.⁴⁰ Carbon dioxide concentration and tempera-

OZONE DEPLETION PUTS FARMERS AT RISK

Farmers are at a higher risk from ozone depletion than the rest of the population: UV-B exposure not only threatens their health, it also threatens their livelihood. Because they work outside much of the day, farmers are exposed to harmful levels of UV-B radiation. Increased UV-B radiation also threatens crop productivity and the stability of the food supply.

By working to quickly eliminate all uses of methyl bromide, farmers can directly participate in the international effort to reduce ozone depletion and simultaneously protect themselves and their farms.

ture variations, two important factors in global climate change, influence the manner in which plants respond to increased UV-B, adding to the difficulty of understanding the full impact of ozone depletion on plants.⁴¹

Ozone depletion may also have an indirect effect on crop production. UV-B exposure, for example, may destroy aquatic bacteria which fix atmospheric nitrogen.⁴² To compensate for the loss of these organisms, farmers would have to greatly increase their use of fertilizers.

Marine phytoplankton are also threatened by increased UV-B.⁴³ These tiny building blocks of the aquatic food chain act as a major atmospheric carbon dioxide "sink" and produce dimethylsulfate, an essential factor in cloud formation. Phytoplankton reductions, such as those occurring in Antarctica, may contribute to global climate change.⁴⁴

Crop-damaging air pollution, such as lower atmospheric ozone and other potentially harmful substances, is predicted to worsen due to enhanced atmospheric chemical reactivity caused by increased UV-B radiation.⁴⁵

FACILITIES REPORTING 5,000 POUNDS OR MORE OF METHYL BROMIDE RELEASES

COMPANY	ADDRESS	PARENT COMPANY AIR RELEASES (LBS/YR)
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METHYL BROMIDE PRODUCERS

Great Lakes Chemical Co. El Dorado Plant Hwy. 15 S. • El Dorado, AR 71731	Great Lakes Chemical Corp.	99,364
Ethyl Corp. (includes byproduct emissions) Rte. 79 South • Magnolia, AR 71753	Ethyl Corp.	83,300
	TOTAL:	182,664

COMPANIES THAT MAKE METHYL BROMIDE AS A BYPRODUCT OR IMPURITY

Du Pont Cape Fear Plant	State Rd. 1426 • Leland, NC 28451	E.I. Du Pont de Nemours & Co. Inc.	790,880
Amoco Chemical Co.	Clements Ferry Rd. • Hwy 98	Amoco Chemical Co.	341,000
Cooper River Plant	Wando, SC 29492		
Amoco Chemical Co.	Finley Island Rd. • Decatur, AL 35601	Amoco Corp.	210,970
Du Pont Old Hickory Plant	1002 Industrial Rd.	E.I. Du Pont de Nemours & Co. Inc.	101,000
	Old Hickory, TN 37138-3693		
Tennessee Eastman Co.	Eastman Rd. • Kingsport, TN 37662	Eastman Kodak Co.	93,000
Polaroid Corp.	238 S. Main St. • Assonet, MA 02702		7,326
		TOTAL:	1,544,176

FACILITIES THAT USE OR REPACKAGE METHYL BROMIDE

Gowan Co.	12300 E. County 8th St. • Yuma, AZ 85365		44,100
Niklor Chem Co. Inc.	2060 E. 220th St. • Long Beach, CA 90810		13,800
Trical Inc.	PO Box 1327 • Hollister, CA 95024-1327		12,727
Mobay Corp. Ag Chem. Division	8400 Hawthorn Rd. • Kansas City, MO 64120	Bayer USA Inc.	10,816
Hendrix & Dail Inc.	7610 Hwy. 41 N. • Palmetto, FL 34221-9611		5,612
Hendrix & Dail	Golden Rd. • Tifton, GA 31794		5,570
		TOTAL:	92,625

FOOD PROCESSING FACILITIES THAT USE METHYL BROMIDE FOR PEST CONTROL

Hershey Chocolate, USA Hershey Plant	19 E. Chocolate Ave. • Hershey, PA 17033	Hershey Foods Corp.	40,490
Nabisco Foods Co.	1555 W. Ogden Ave. • Naperville, IL 60540	Nabisco Brands Inc.	32,000
Nabisco Brands Inc.	1400 Murphy Ave. SW • Atlanta, GA 30310	RJR Nabisco Inc.	24,000
Pillsbury Co.	P.O. Box 487 • Buffalo, NY 14240	Gramet Holding Corp.	23,000
Gerber Products Co.	4301 Harriet Ln. • Fort Smith, AZ 72904	Gerber Products Co.	21,400
North American Pasta Operations	1 Prince Ave. • Lowell, MA 01852	Borden Inc.	18,200
Viviano Macaroni Co. Grocery	W. Nobletown Rd. • Carnegie, PA 15106	Borden Inc.	17,000
Nabisco Brands Inc.	243 Urban St. • Buffalo, NY 14211	Nabisco Brands Inc.	16,000
Hershey Pasta Group	P.O. Box 210 • Lebanon, PA 17042	Hershey Foods Corp.	15,718
Nabisco Biscuit Co.	2211 Rte. 208 • Fair Lawn, NJ 07410	RJR Nabisco Inc.	15,500
Pillsbury "A" Mill	335 Main St. SE • Minneapolis, MN 55414	Gramet Holding Corp.	15,470
Quaker Oats Co.	1551 East Willow St. • Kankakee, IL 60901	Quaker Oats Co.	14,400
North American Pasta Operations	26155 Groesbeck Hwy. • Warren, MI 48089	Borden Inc.	14,233
Golden Grain	7700 W. 71st St. • Bridgeview, IL 60455	Quaker Oats Co.	14,000
Martha White Foods Inc.	240 Preston St. • Jackson, TN 38301-1609	Riklis Family Corp.	13,800
Bay State Milling Co.	P.O. Box 188 • Winona, MN 55987		12,015
Del Monte Foods Plant #65	8250 S Temperance Ave • Fowler, CA 93625	DMPF	11,672
Ravarino & Freschi Inc.	4651 Shaw Blvd. • St. Louis, MO 63110	Borden Inc.	11,200
Nabisco Biscuit Co.	7300 S. Kedzie Ave. • Chicago, IL 60629	RJR Nabisco Inc.	11,000
North Dakota Mill	1823 Mill Rd. • Grand Forks, ND 58206		10,800
North American Pasta Operations	7300 36th Ave. N • New Hope, MN 55427	Borden Inc.	10,500
Comet Rice Inc.	Warfield Pt Rd. • Greenville, MS 38701	Erly Industries Inc.	9,850
Consolidated Cigar Corp	Rte. 14 Montellano Ward • Cayey, PR 00736		7,140
		TOTAL	379,388

TOTAL 1990 METHYL BROMIDE AIR RELEASES: 2,205,819 lbs. (includes releases less than 5,000 lbs/yr)

Source: 1990 Toxic Release Inventory air emission data

II. ALTERNATIVES TO METHYL BROMIDE

LESSONS FROM THE RECENT PAST

Methyl bromide users have reacted strongly against proposed cutbacks, claiming the chemical is irreplaceable. But alternatives are already available — or will be available soon — that will allow sharp cuts in methyl bromide use and emissions.

It is true that alternatives for every use of the chemical have not yet been developed. But that should not cause methyl bromide users to oppose a commitment to a total phaseout, even over a number of years. Past experience has shown that no chemical, however widely used, is irreplaceable.

For example, three times in the last five years industry successfully developed alternatives to ozone-destroying chemicals that

users claimed couldn't be replaced. Once governments and industry made the commitment to a phaseout schedule, research and investment was stimulated and alternatives were "found." Sometimes, the alternatives had been previously overlooked. In other instances, the alternatives were completely unforeseen. In each case, it happened with astounding speed (*see box, "Finding Alternatives to 'Irreplaceable' Chemicals."*)

This recent history suggests that phasing out methyl bromide is a sound strategy. In fact, it is the key to spurring the development of alternatives — while protecting the ozone layer.

1. ALTERNATIVES TO METHYL BROMIDE IN SOIL FUMIGATION

When used as a soil fumigant, methyl bromide is considered to be a "broad spectrum" biocide. It kills all organisms in the soil: bacteria, fungi, nematodes, microorganisms, earthworms, and even gophers.

Currently, methyl bromide is used for high value, annual crops that are planted intensively on the same piece of land year after year. Tomatoes, strawberries, green peppers, container plants, and nursery starts are examples of such crops.

Methyl bromide is also used, although on a less regular basis, before replanting vineyards and fruit and nut orchards. This is done because transplants are particularly vulnerable to soil pathogens and plant-eating organisms.

There are at least two possible alternatives to using methyl bromide as a soil fumigant. First, farmers could adopt non-

chemical farming techniques. Instead of replacing methyl bromide with other potentially dangerous chemicals, many farmers may be able to shift to sustainable, biologically-based pest control systems. An increasing number of farmers are already successfully and economically employing such methods, which emphasize building healthy, biologically-balanced soil.

Some of these methods include:

- Periodically "resting" land used for high-value, high-input crops. Such a system would involve rotating different crops to ensure proper soil-life balance.
- Alternating with pest-suppressive cover crops. Peas, barley, and alfalfa cover are sometimes grown to suppress nematodes, for instance.
- Developing and using transplants that are resistant to particular soil pests.
- Using biological controls. Plant growth-promoting rhizobacteria, for instance, can compete with other microorganisms

FINDING ALTERNATIVES TO 'IRREPLACEABLE' CHEMICALS

Three times in the last five years industry successfully developed alternatives to ozone-destroying chemicals that users claimed couldn't be replaced:

• CFC-113 and Electronics

In 1986 and 1987, when governments were negotiating the initial Montreal Protocol on Substances that Deplete the Ozone Layer, a fierce debate raged over the inclusion of CFC-113, a solvent widely used by the electronics industry to clean printed circuit boards and other electronic components. As is the case with methyl bromide today, methods were readily available to reduce CFC-113 use, through recycling and better control of waste. But the industry staunchly opposed a phaseout, arguing that CFC-113 was irreplaceable. Largely for these reasons, the 1987 Montreal Protocol demanded just a 50 percent CFC reduction over ten years.

But in three short years, the picture totally changed. Challenged to find alternatives, the electronics industry experienced a burst of innovation. The industry is awash in alternatives: New solvents range from chlorinated compounds to detergents and water. New "no-clean" manufacturing processes have eliminated the need for any solvent. The first major electronics manufacturer totally eliminated CFC-113 in 1991, just four years after the Protocol was signed. Many others firms have set phaseouts over the next few years.

As a result, the 1992 amendments to the Montreal Protocol (to be adopted in Copenhagen in November) are likely to include a new phaseout of production of CFC-113 (and other CFCs) by the end of 1995.

• Halons and Fire Protection

The same story can be told of halons. In 1986 and 1987, industry and some governments fought any restrictions on these fire-fighting chemicals, claiming that they were irreplaceable. The first Protocol included only a freeze and no cutbacks.

But since then, demand for halons has tumbled dramatically as users reassessed their fire protection needs. Satisfactory alternatives have been found for nearly all uses, with the exception of special applications, such as aircraft and submarines. But even these needs can be met by managing a halon "bank" that will help reallocate existing stocks of halons to those limited remaining exceptions. The halon "bank" is so large that there is no need for any more new halon production.

As a result of this progress, the 1992 Copenhagen amendments to the Protocol are likely to terminate halon production by the end of 1993.

• Methyl Chloroform and Metal Cleaning

Methyl chloroform was recognized as an important ozone-depleter only in 1989. When faced with demands to add it to the Montreal Protocol in 1990, the electronics and metal manufacturing industries responded, once again, with the claim that methyl chloroform was irreplaceable. The Montreal Protocol parties decided nonetheless to phase out methyl chloroform, although they allowed until 2005, an extra five years beyond the original phaseout date for CFCs.

Once again, the challenge of replacing an ozone-depleting chemical was met by a burst of innovation. Alternatives to methyl chloroform were developed so quickly that methyl chloroform's producers and users have now abandoned any objection to eliminating it on the same schedule as CFCs. The Copenhagen amendments are likely to set the phaseout for this chemical at the end of 1995.

for colonization on developing roots.⁴⁶

- Using compost and green manure rather than chemical nitrogen fertilizer. Compost and green manure provide for in-

creased numbers and diversity of beneficial soil organisms.

- Obtaining short-term protection through inoculation, root dips, or compost teas

with beneficial organisms. This approach can provide a measure of biological diversity that may not otherwise be present in intensively cultivated land.

- Minimizing use of transplants. Organic strawberry farmers, for instance, grow strawberries as a biennial, rather than annual, crop to halve the number of transplant situations.
- Using semi-permanent drip beds, which avoid soil compaction and minimize pathogens.⁴⁷
- In seeding beds, container plants, and nurseries, small volumes of soil can be "fumigated" with steam or solarization. Soil can also be replaced entirely with artificial substrates, such as glass wool, and liquid plant foods. These practices are widely used in nurseries in the Netherlands.
- Various narrow-spectrum chemical pesticides can be used to minimize or eliminate particular soil "pests," thereby avoiding total soil fumigation.

Second, where a complete transition to non-chemical farming is not yet practical, farmers could replace methyl bromide with one of several potential substitute chemi-

cals or a combination of chemicals that kill particular groups of organisms. Possible substitute chemicals include:

- dazomet, though it is currently registered only for non-food crops in the United States;
- metham sodium, which is only effective for some of the uses which currently employ methyl bromide;
- 1,3-dichloropropene (telone), a nematocide suspended from use in California due to worker health, groundwater contamination, and food residue concerns;
- nematocides such as ethoprop, aldicarb, and carbofuran; and
- fungicides such as benomyl and metalaxyl.

Each of these chemicals must be carefully evaluated for health and environmental impacts. They may not prove to be acceptable for some or all uses. Potential problems include contamination of groundwater and health effects. They may also eventually increase pest problems because they may kill both harmful and helpful organisms, such as those that prey on pests.

2. ALTERNATIVES TO COMMODITY FUMIGATION

Methyl bromide, when used as a commodity fumigant, rapidly kills all organisms present. It is used to fumigate durable food commodities such as coffee beans, nuts, and grains; perishable food commodities such as fruits and vegetables; and non-food commodities such as logs, cut flowers, packaging, and artifacts.

Sometimes a specific organism is the target of fumigation, such as the codling moth on walnuts. At other times, all organisms are targeted to prevent damage to the stored commodity or to prevent unwanted organisms from being imported into the receiving country or state. Worldwide, however, only one percent of all methyl bromide use is to meet government quarantine requirements.

Alternatives to methyl bromide for commodity fumigation vary depending on the commodity and circumstances:

- In some cases, methyl bromide is used to fumigate commodities even when there is no apparent threat from unwanted organisms. In order to reduce these unnecessary "prophylactic" treatments, improved monitoring and pest detection, both in the field and in storage, are critical.
- Both durable and perishable commodities can be exposed to "controlled atmosphere" treatments, which include using low oxygen, high carbon dioxide, or high nitrogen within a closed chamber. Freezing, cold storage, and heat treatments are also feasible for certain commodities. Longer treatment times than those needed when using methyl bromide are generally necessary. Treatments may

require three to 40 days, depending on the commodity.

- Biological control using parasites, predators, and pathogens can be used to control particular commodity pests during storage.
- Reduced pesticide doses can be combined with non-chemical methods, such as subjecting the commodities to both phosphine and a modified atmosphere. This combination may provide for more rapid fumigation than non-chemical methods alone.

Recycling

The feasibility of recycling methyl bromide rather than venting it to the atmosphere following fumigation has been demonstrated by a pilot project conducted by DSIR, a research center in New Zealand. This recovery system uses a sealed chamber, activated carbon, and the principle of temperature-swing absorption. When the activated carbon is chilled, the methyl bromide in the fumigation chamber is absorbed by the carbon. The fumigation chamber may then be opened to remove

fumigated commodities and to allow the entry of additional commodities to be fumigated. When the chamber is closed again, the carbon is heated, releasing the methyl bromide fumigant.

During the 300 to 400 trials using this activated carbon recovery system, New Zealand researchers recorded 95 percent to 97 percent recovery of the methyl bromide with no loss of the carbon's capability to absorb and release the chemical.⁴⁸

Officials from developing countries have voiced concerns that this recovery method may not be economical for their nations, as the system requires completely sealed fumigation chambers as well as the activated carbon equipment. The eventual elimination of methyl bromide production may make investment in recovery systems less attractive for developing countries.⁴⁹ These problems may be alleviated through aid programs financed by the Interim Multilateral Fund, which was established to assist developing countries to invest in technologies that reduce the destruction of the ozone layer.

3. ALTERNATIVES TO STRUCTURAL FUMIGATION

Methyl bromide is used to fumigate structures such as food processing facilities, warehouses, homes, historic buildings, and transport structures such as aircraft and ships. Some of these structures are fumigated for quarantine against exotic organisms and diseases.

There are a wide variety of alternatives to the use of methyl bromide for structural fumigation, depending on the structure and target organisms. Many structural infestations can be treated on a spot basis by cutting and removing infested boards, or treating with liquid nitrogen, electric shock, or borates. Inert dusts are effective against certain crawling insects.

Some large food processing facilities are effectively treated with heat. Modified atmosphere (e.g., oxygen elimination, or in-

creased carbon dioxide, nitrogen, or argon) treatments are feasible in sealed buildings and structures.

Many food processing facilities, warehouses, and quarantine treatment structures are not sealed, decreasing the potential for environmentally sound treatment with modified atmosphere or heat. Because these facilities are not sealed, conventional treatments with toxic chemical fumigants such as methyl bromide, phosphine and hydrogen cyanide, threaten workers and the environment, including, in the case of methyl bromide, the ozone layer. Even sealed facilities, however, eventually vent the fumigants to the atmosphere.

Preventing pest infestations by ensuring that structures are sound and have systematic pest detection methods can reduce the need for structural treatments.

Filling most of a structural space, such as

a warehouse or ship hold, with large inflatable polyethylene bladders can greatly reduce the volume of space to be filled with

a chemical fumigant, thereby reducing the amount of fumigant required.⁵⁰

4. REDUCING MANUFACTURING BYPRODUCT EMISSIONS

Not all methyl bromide emissions are intentional. In some manufacturing processes, methyl bromide is produced as a byproduct. In these cases, the methyl bromide is usually vented to the atmosphere, contributing to the destruction of the ozone layer. Reported manufacturing byproduct emissions totalled over 1.7 million pounds in 1990, according to Toxic Release Inventory (TRI) figures.

The majority of methyl bromide byproduct emissions come from the production of terephthalic acid, a raw material used in the production of polyester. Hydrobromic acid is used as a catalyst in an oxidation process, inadvertently creating methyl bromide in small concentrations. While other reactants that occur at higher concentrations are condensed or removed from the waste stream, methyl bromide is difficult to remove because it is present in such small concentrations.

Three companies, Du Pont, Eastman Kodak, and Amoco Chemical Co., are responsible for the majority of manufacturing byproduct emissions in the United States, according to self-reported TRI data. Together, these companies have formed a working group to pool their research efforts to develop emissions reduction technologies.

This group approached the EPA in July 1992 to propose "streamlining" regulation of methyl bromide. The EPA had not been

aware of the byproduct emission problem, because their focus had been on intentional production and emissions from commercial applications.⁵¹

The companies are meeting again to discuss the analytical method used to gather data for the Toxic Release Inventory. There is a question of uniformity in these methods. The coalition has not yet shared any technologies, nor have they shared the economic consequences of the possible listing of methyl bromide under the Clean Air Act.

The companies have shown varying degrees of commitment towards eliminating byproduct emissions. The Tennessee Eastman Co, for example, indicates that it reduced its annual emissions from 150,000 lbs. in 1989 to 96,000 lbs. in 1991 through process changes.⁵² Amoco stated that it would like to eliminate bromine from its production processes because of the chemical's high reactivity and hence difficulty in handling.⁵³ DuPont stated that it "will abide by all the laws" and look toward eliminating these emissions.⁵⁴

Ethyl Corporation, a producer of methyl bromide that also emits some methyl bromide, claims that it has invested \$25,000,000 in capital spending, not including worker hours, to achieve emissions reductions. Ethyl did not reveal the types of technologies being used but stated that they are looking for an 85% reduction in emissions.⁵⁵

III. Case Studies:

How To Live Without Methyl Bromide

CASE STUDY #1: ALTERNATIVES TO THE USE OF METHYL BROMIDE FOR SOIL FUMIGATION

THE NETHERLANDS BANS METHYL BROMIDE

In 1991, The Netherlands — one of the largest methyl bromide users in Europe — ended use of the chemical for soil fumigation due to concerns about public and environmental health. The chemical was widely used in tree, plant, and flower nurseries.⁵⁶

The way that the Netherlands handled the phase-out and the search for alternatives could provide an important model for phasing out methyl bromide in other nations, especially those with similar climates and economic conditions.



For example, farmers in The Netherlands no longer use methyl bromide in the greenhouse culture of high-value strawberries, tomatoes, cucumbers and other vegetables, and flowers.⁵⁷ In contrast, these are crops with the highest percentage of methyl

bromide soil fumigation in the United States, although these crops are generally grown outdoors in that nation.⁵⁸

Agriculture commands a significant segment of the Netherlands' economy, and until the mid-1980s several of the country's highest value crops were grown in systems dependent on the use of methyl bromide. But by 1991, no farmer in the Netherlands could purchase or use the soil fumigant. Despite the ban, however, production of and profits from the crops once most dependant on methyl bromide increased dramatically.⁵⁹

The techniques developed in the Nether-

lands to replace methyl bromide soil fumigation had to accommodate the country's cool, rainy, northern latitude and the affluent European market. They included:

- **"stepwise reduction"** of the fumigant while new alternatives were researched and implemented. For example, farmers reduced doses of methyl bromide by fifty percent or more almost immediately by using improved gas-tight tarps to cover fumigated soil more tightly and for longer periods of time.
- **"steam sterilization"** of the soil with "negative pressure." In the negative pressure system, ventilation draws steam down into ducts buried 18-24 inches below the soil surface. It is a highly effective soil sterilant and, in the Netherlands, is comparable in price to the use of methyl bromide. In developing this alternative, ways were found around many obstacles.
- **Soil-less cultures on artificial substrates.** Rockwool, rock and clay granules, and flexible polyurethane foam blocks can be steam cleaned. Peat, which can be steam cleaned, is used, sometimes elevated and sometimes placed directly in the soil. Costs for these systems are high, but increased crop production offsets these costs. Advantages include reduced soil borne pests, increased yields, and agricultural flexibility such as quick market response.⁶⁰
- **Chemical substitutes.** The chemicals

that are used are metham sodium, dazomet, and 1,3-dichloropropene, all chemicals heavily restricted or under consideration for further restriction in the United States due to health and environmental concerns. In the Netherlands, the narrower effectiveness of substitute pesticides, combined with government limitations, have encouraged innovative methods to be developed.

In the United States, outdoor tree and plant nurseries use methyl bromide-dependent culture systems. In contrast, nurseries in the Netherlands use relatively low-tech solutions to avoid soil fumigation. These techniques include **sanitation**, requiring prompt identification and disposal of infested stock; **certification** of nursery stock, including strict quarantine control; and **crop rotation**. Growers also are willing to tolerate a three to five percent infestation and disposal rate.⁶¹ Great care is also taken in monitoring the quality of container soils.⁶²

Integral to the success of the Netherlands phaseout of methyl bromide were the con-

cepts that guided government and farmers to reach a difficult goal.

- **Research and extension** served to develop solutions and transfer them quickly to the farmer. The close research/farm relationship encourages research that is practical and priority is placed on the actual needs of farmers. Extension, the means by which research solutions are made available to farmers by consultation, is well financed by the government.⁶³
- **Limiting the use** of methyl bromide through government regulation was key to providing motivation for developing alternative solutions for soil pest problems.
- **Government incentives**, such as tax incentives and/or capital investments in the form of low cost loans, grants or subsidies, were helpful in relieving the financial burden on farmers of a phase-out.
- **Cooperation of government with industry** to develop alternatives was also important.

CASE STUDY #2: ALTERNATIVES TO METHYL BROMIDE IN STRAWBERRY PRODUCTION

CALIFORNIA ORGANIC STRAWBERRY INDUSTRY

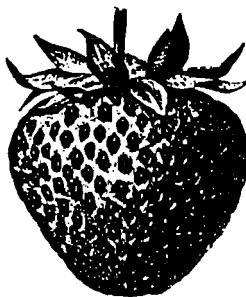
Methyl bromide is used in strawberry production in California as an annual soil treatment. It is used to control soil root pathogens, fungi, and nematodes; kill weed seeds, eliminate mammal pests such as gophers, and exterminate insects such as sow bugs. The sterilized soil is almost completely devoid of living organisms.

After fumigating with methyl bromide, strawberry farmers place clear plastic tarps, called mulch, on their rows. This mulch warms the soil over the winter, giving the plants a much quicker start in the spring and ultimately improving yields. Because methyl bromide has killed all the weed seeds, weeds do not come up through the

plastic.

California strawberries lead the nation as the most economically valuable crop. Strawberry growers also lead the state as the largest agricultural users of methyl bromide. Strawberry acreage in California totals roughly 25,000 acres, on which 75 percent of the nation's strawberry crop is produced. Of this 25,000 acres, only between 50 and 100 acres are used to grow strawberries organically.

Virtually all non-organic strawberry growers in California use methyl bromide, injecting the soil with over 4.3 million pounds annually. Using methyl bromide, farmers can produce an average yield of over 25 tons an acre. Using organic methods, yields



drop by 15 to 30 percent or more, but are still far above the national average of under 5 tons per acre.

An Alternative

Organic strawberry farms are located in most of California's major strawberry growing areas, including the Central Coast and the Oxnard Plain. In interviews, some growers reported ceasing methyl bromide use as early as 1983. They offered a number of reasons for the change, including the desire to avoid health risks to family and employees and a goal of having their farm certified as "organic," which in California requires that the operation use no methyl bromide for three years.

Organic farmers in California control root diseases and reduce overall pest pressure by crop rotation, which includes the use of cover crops. The crop rotation program is enhanced by paying careful attention to soil amendments that improve physical soil characteristics. Careful water management that produces good drainage is also important to reduce root rot problems. Weeds are controlled by hand weeding and by using black plastic mulch.

In addition, fields with a history of intense root disease or nematode problems are judged unsuitable and are removed from strawberry production. In this way, major below-ground pest problems are avoided.

Barriers to Eliminating Methyl Bromide

As a group, strawberry farmers are very resistant to giving up methyl bromide for a variety of reasons. For example, methyl bromide controls a wide range of pest problems; controlling these pests using alternative farming methods requires a higher level of skill and care. These requirements, combined with the fact that many farmers are unfamiliar with these methods, pose the risk of crop failure. Financial institutions may be less willing to lend money to strawberry growers if they perceive that their capital is at greater risk in a non-methyl bromide production system.

These fears can be allayed if the strawberry industry works to educate its members about the techniques already in use on organic strawberry farms in California and the Netherlands (see Case Study #1).

A LETTER TO THE CALIFORNIA STRAWBERRY ADVISORY BOARD

In light of the concerns raised by the use of methyl bromide, the organizations which issued this report wrote to the California Strawberry Advisory Board, asking the group to take three actions:

"Support the elimination of methyl bromide and aid (your) members in adapting sustainable farming techniques that are not dependent upon soil fumigation. Furthermore, the Board must immediately plan and adopt a strategy outlining how you as an industry intend to eliminate methyl bromide. Finally, we urge you to inform the public about your efforts to phase out the use of methyl bromide and provide farmers with sustainable alternatives.

I look forward to a formal response from you regarding your plans to eliminate the use of methyl bromide."

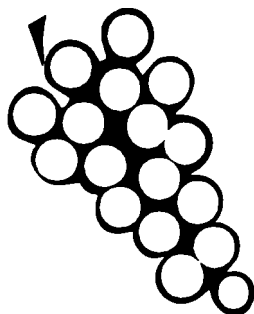
A copy of the full letter is included in the appendix to this report.

FETZER VINEYARDS

In grape vineyards, methyl bromide is used as a soil fumigant to control nematodes and soil borne diseases. Methyl bromide is applied only once in the lifetime of a vineyard, prior to planting. Once the vineyard is established, methyl bromide is not used again until the vineyard is replanted.

Fetzer vineyards currently farms 315 acres of wine grapes in southern Mendocino county in California. Until recently, however, Fetzer vineyards included a larger 1,000 acre family operation now farmed by Kohn Properties. Even with the planting of new vines, methyl bromide has not been applied to either of these vineyards for the past four years.

Because of environmental and safety concerns, Fetzer decided four years ago to produce grapes without using acutely toxic (Class I) pesticides, including methyl bromide. Fetzer Vineyards and Kohn Properties now grow 175 and 280 acres of organic grapes, respectively, without using methyl bromide or any other unapproved organic material. In January 1993, Fetzer Vineyards will submit all of their acreage



for organic certification.

Fetzer attempts to control nematodes and diseases in their vineyards by planting resistant rootstock and building healthy soil. They plant the same resistant varieties used by most grape growers. To increase soil fertility, Fetzer depends on soil amendments and cover crops. Soil

amendments include composted manure, pomace (crushed fruit), and other vegetable by-products. Cover crops are planted annually between vine rows and are incorporated into the soil for their nutrients. Soil amendments and cover crops help vines survive nematode and disease infestations by providing a healthier soil environment, which in turn creates healthier vines.

In addition to specific preventive measures, Fetzer tolerates a higher amount of root damage from disease than would be found in a methyl bromide-treated vineyard. Nematodes have not presented a serious threat to productivity. Fetzer officials concede that this may be due to regional soil conditions that are less hospitable to nematodes compared to other grape-growing regions in California, such

A LETTER TO THE CALIFORNIA GRAPE AND TREE FRUIT LEAGUE

In light of the concerns raised by the use of methyl bromide, the organizations which issued this report wrote to the California Grape and Tree Fruit League, asking the group to take three actions:

"First, direct a substantial proportion of your pest control research efforts towards developing and demonstrating the feasibility of non-toxic and sustainable methods of nematode and disease control in grape vineyards. In the long term, cultural and biological pest control methods will be more effective substitutes for methyl bromide than alternative soil fumigants.

Second, you must educate growers about methyl bromide's detrimental effect on the ozone layer and the ensuing threat to public health and farm productivity.

Finally, you must inform the public about your efforts to phase out the use of methyl bromide and provide farmers with sustainable alternatives.

I look forward to a formal response from you regarding your plans to eliminate the use of methyl bromide."

A copy of the full letter is included in the appendix to this report.

as the San Joaquin Valley.

It should be noted that most conventional and organic wine grape producers are likely to apply methyl bromide prior to planting in fields that have severe nematode infestations.⁶⁴ Fetzner has yet to encounter such severe conditions in their fields. However, if presented with this situation, Fetzner states they would attempt to reduce populations through organic means or simply not plant in that area.

In order to be competitive, Fetzner has had to maintain yields and keep production costs as low as possible. During their initial four-year transition period away from

chemical inputs, Fetzner experienced a 10 to 15 percent loss in yields and their costs increased approximately 25 percent. After this initial stage while healthy soils were being established, however, production costs and yields stabilized. In most cases, yields are competitive.

Next year, Fetzner will be releasing a new organic line of wines. These wines will be made strictly from certified organically grown grapes. For their other wines, Fetzner purchases organic and conventionally grown grapes from other growers. Prices for their regular and organic varieties are comparable.⁶⁵

CASE STUDY #4: ALTERNATIVES TO METHYL BROMIDE IN COMMODITY FUMIGATION

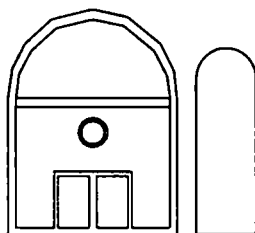
ARROWHEAD MILLS GRAIN STORAGE

The nation's preeminent producer of organically-grown grain products, Arrowhead Mills of Hereford, Texas, has developed a number of methods for economically controlling grain storage insects that have eliminated the use of methyl bromide.

According to Doug Brown, organic program manager at Arrowhead, "We have insect activity in our storage bins, but we're able to manage it so that it does not create a large degree of concern."

Arrowhead uses a variety of practices to control 12 common stored products insects (the insects include moths, beetles and weevils). The first line of defense is good sanitation. All storage facilities are cleaned prior to introducing a new crop for storage. The bins are vacuumed to eliminate spoiled grain and debris in and around the storage facility and from cracks and crevices where insects may hide and feed while reproducing.

Second, Arrowhead introduces a pest control measure by blowing diatomaceous earth into bins with an ionizer that enables the material to stick to the sides of the bin. This natural material abrades the outer shell of insects, causing those that come in contact with it to die.



Third, Arrowhead uses venting techniques and raised perforated floor bins to move air through the stored grain. This aeration, in tandem with a leveling off of stored product at the top of the bin (as opposed to conventional storage with peaked or coned formations at the top of bins), permits uniform air flow. The storage facility temperature is maintained at or below 70 degrees Fahrenheit and relative humidity is closely monitored to ensure that moisture content of the grain is at or below 13 percent. Given the climate of west Texas, where Arrowhead is located, it is necessary to move the grain out of the bin and through a grain elevator a couple of times a year in order to maintain the temperature and moisture content in the desired range.

Fourth, pheromones — chemical attractants — are used to control about 5 of the 12 common problem insects. A biological control — the naturally occurring *Bacillus thuringiensis* (B.t.), is also used specifically to control the Indian Meal Moth.

Finally, in 1987 Arrowhead Mills developed — with the help of Biofac, Inc., — a "beneficial insect program." Biofact breeds four kinds of beneficial insects that either eat pests or parasitize their eggs or

larvae, preventing them from damaging stored products. The normal grain cleaning machines are able to remove the insects and insect fragments from the grain.

Buddy Maedgen, Jr., president of Biofac, says that the 4-cent-per-bushel cost of releasing beneficial insects year round is less than the cost of conventional fumigation, which ranges from 8 to 10 cents a bushel.

But not everyone is supportive of the innovative technique. In 1988, the Food and Drug Administration (FDA) challenged the introduction of beneficial or parasitic insects into grain storage facilities and closed Arrowhead Mills' program, classifying the

grain as adulterated. The FDA action was opposed by others in the government and scientific community. For example, Orville Bentley, the U.S. Department of Agriculture Assistant Secretary for Science and Education, stated: "Agricultural Research Service scientists have reviewed the available information on insect fragments in commodities and they are of the opinion that adding parasites to the stored products will not lead to any increase in insect fragments, but [will] actually reduce fragments in milled commodities, especially if the grain is properly cleaned prior to milling." In 1992, the FDA reversed its position and endorsed Arrowhead's operation.

A LETTER TO THE NATIONAL GRAIN AND FEED ASSOCIATION

In light of the concerns raised by the use of methyl bromide, the organizations which issued this report wrote to the National Grain and Feed Association, asking the group to "immediately eliminate the use of methyl bromide in the storage of grain and other commodities represented by your association... and to assist your industry in implementing tested and effective alternatives to methyl bromide use for stored products, including: good sanitation, venting techniques, moisture control, and biological pest control measures."

CASE STUDY #5: ALTERNATIVES TO METHYL BROMIDE IN STRUCTURAL FUMIGATION IN FOOD PROCESSING PLANTS

QUAKER OATS

Quaker Oats operates a facility in St. Joseph, Missouri that has never been fumigated with methyl bromide or any other pesticide. The plant makes pancake mixes, and hot and ready to eat cereals. It contains a mill, and processing and packaging facilities.

The plant, which uses heat to control pests, is an excellent example of how pre-methyl bromide pest-control solutions are still effective today.

In the early 1900s, heat was commonly used by cereal manufacturers to control insects in mills. The Quaker Oats facility uses a steam radiator system. Prior to treatment, all machinery and work areas are thoroughly cleaned to remove any food residues that could provide insects refuge from the heat. Liquid pesticides are applied at entryways to provide a barrier to pest

migration. The plant is then heated to 120-130 degrees Fahrenheit for 24-30 hours.

Fans distribute heated air evenly throughout the facility. Exactly how much heat is needed for success is determined largely through trial and error. Live insects in test cages are used to monitor the effectiveness of the treatment, along with continuous temperature recorders and hand held thermometers.

Treatments are scheduled four to six times per year to disrupt the life cycles of the insects. Four treatments are done in the warmer months, when insect activity is greater.

Quaker Oats believes that there are many advantages to heat treatment: It is safer for workers than pesticides; there are no toxic releases or residues; and heat will penetrate metallic closed systems such as

pipes, killing insects that fumigants would miss. Structures must only be sealed "draft tight" (small leaks are tolerable), whereas fumigation requires an air-tight seal.

Cost per treatment is also lower than methyl bromide fumigation. As a result, treatments can be done more often and used more proactively. Initial set-up costs are relatively high. Steam heaters cost from \$2,500-\$5,000 per heater. One heater treats 10,000-20,000 cubic feet.

Other concerns can be easily remedied. Highly mobile insects such as cockroaches may escape the effects of heat treatments, but are susceptible to inert dusts. Retrofitting a working facility can be difficult and costly, but costs can be reduced by designing facilities with heat treatment in mind. Heat can cause some paints to peel prematurely and cause some lubricants to leak from bearings and gear boxes, but heat

resistant paints and lubricants are available. Heat can damage some electronic equipment; however, high temperature electronics are available and all electronics should be turned off prior to heat-up. Wooden equipment, not often used anymore, can be warped by heat, but humidity levels can be adjusted to avoid this. If air circulation is ineffective, heat may trigger fire sprinkler systems, particularly if systems are old. The installation of new sprinkler heads with higher temperature ratings provides a solution to this problem.

Quaker Oats' St. Joseph plant has had success treating over 4,000,000 cubic feet of space for over 50 years without the use of fumigants. This success is largely due to the incorporation of the heat treatment system into the original design of the plant and the ongoing maintenance of the system.

CASE STUDY #6: ALTERNATIVES TO METHYL BROMIDE IN STRUCTURAL FUMIGATION

TALLON PEST CONTROL

When Los Angeles County property owners want to sell or refinance buildings and homes, lending institutions routinely require a termite inspection. Inspections frequently result in a methyl bromide treatment of the entire structure under the cover of a tent. In fact, some 5,000 Los Angeles structures, mostly residences, were fumigated with methyl bromide each month in 1990. This fumigation pattern resulted in the use of over 4.08 million pounds of methyl bromide that year, making Los Angeles by far first in the world for urban fumigation with this Class I toxin.

The same year, 1990, was a big year for the Tallon Termite & Pest Control Company. Until four years before, the Tallons had run a standard tent-and-fumigate business. Always assured of work due to a hard-earned reputation for quality and care, the family owned and operated company made a good profit. But as the brothers became more aware of environmental degradation in general, and about the lack of research



on the effects of methyl bromide in particular, they became increasingly reluctant to fumigate. In particular, it had always bothered the Tallons that an entire house had to be fumigated when only a small area would actually contain termites.

In response, Tallon invented the Heat Wave and the Blizzard System, which only treat the part of the structure where the termites are actually living. Company profits began to improve dramatically.

Both methods are based on the fact that insects, including termites, can survive within only a narrow range of temperatures. They also take into account the way termites live. Wood termites of Southern California tend to cluster and usually live in only three or four of the support timbers of the house. When looking for termites, Tallon inspectors employ the standard method of checking for visual evidence on the exterior of walls. But often termites hide in inaccessible places, such as wall voids. To see into these areas, Tallon crews

use high tech fiber optics, originally designed to view the inside of airplane engines. A dime-sized hole is drilled into the wall to put the fiber optic instrument through. When termites have made the wood inside a wall void their home, as is usually the case, the Blizzard System is the more effective of the two extermination methods. Liquid nitrogen is pumped into the wall void through a small hole. The termites are killed by the cold, which reaches minus 20 degrees, and not by the liquid nitrogen itself. Once the job is done, the nitrogen evaporates. Nitrogen already constitutes seventy-eight percent of the air we breathe, so with careful handling by trained exterminators, there are no ill effects for people, animals, or the environment.

Sometimes termites infest a window

frame, or some other spot not accessible through a wall void. In these situations, the Heat Wave method works best. This method involves using a conduction heating system with heat "strips" applied to the wood. The interior of the wood is heated to 135 degrees, hot enough to kill the termites in all life phases, but not hot enough to damage the wood or paint. (The Tallon Systems are approved by government agencies and have successfully treated tens of thousands of structures.)

The California legislature granted the University of California at Berkeley funds to study the new, non-toxic termite extermination methods. Within a year, a report will be released to help guide exterminators and consumers alike in adapting these least-toxic pest control practices.

A LETTER TO THE NATIONAL PEST CONTROL ASSOCIATION

In light of the concerns raised by the use of methyl bromide, the organizations which issued this report wrote to the National Pest Control Association, asking the group to take three actions:

"First, you must immediately inform your association members of the detrimental effects of methyl bromide on the Earth's protective ozone layer.

Second, we urge you to disseminate to your members information about the available alternatives to methyl bromide.

Finally, we urge you to inform the public of your association's efforts to phase out the use of methyl bromide as a structural pest control measure.

We look forward to a formal response from you regarding your plans to eliminate the use of methyl bromide."

IV. Political Actions Needed

INTERNATIONAL ACTIONS

- In order to stop ozone depletion and provide an incentive for the adoption of safer alternatives, Parties to the Montreal Protocol must agree in Copenhagen to immediately cut by 50 percent all methyl bromide use and production and completely eliminate the chemical's use within five years. They should also contribute sufficient funds to the Multilateral Ozone Fund to enable developing nations to eliminate methyl bromide on a timetable as close as possible to this date.

The Montreal Protocol on Substances that Deplete the Ozone Layer is an international agreement controlling ozone-depleting chemicals worldwide. If this pact is to achieve its goal of protecting Earth's ozone layer, governments must amend it to include a phaseout of methyl bromide. Controlling methyl bromide under the Protocol will provide the framework for eliminating methyl bromide around the globe.

Eighty-nine governments have now ratified the Montreal Protocol. Governments negotiated the agreement in 1987 and strengthened it in 1990 due to scientific evidence which showed the ozone problem was worsening. The Protocol currently requires industrialized countries to eliminate production and consumption of CFCs, halons, and carbon tetrachloride in 2000, and methyl chloroform in 2005. Developing countries have up to ten additional years to comply with the control measures.

When governments signed the agreement in 1987, they committed to providing developing countries with technical and financial assistance necessary to enable them to participate in the Protocol. In 1990, the Parties to the Protocol set up the Interim Multilateral Ozone Fund to pay the costs

incurred by developing countries when they switch to alternatives to ozone-depleting chemicals.

An assessment process is built into the Protocol requiring the Parties to periodically review the adequacy of the agreement. An assessment in 1989 that the ozone problem was worsening led Parties to strengthen the agreement at their second annual meeting in London in 1990. The Parties are now engaged in a similar process based on a 1991 assessment and plan to make further changes to the agreement at their fourth annual meeting in Copenhagen on November 23-25, 1992.

The 1991 scientific assessment identifies methyl bromide as a significant contributor of ozone-destroying bromine to the stratosphere. The assessment also shows that the rate of ozone depletion is accelerating and that more stringent controls on ozone-depleting chemicals are necessary to minimize future ozone depletion. During 1992, the Parties convened a working group to respond to these new findings and formulate Protocol amendment proposals.

In April 1992, the working group decided it needed more information on methyl bromide and requested a detailed assessment on its role in ozone depletion and the availability of alternatives. The June 1992 Methyl Bromide Interim Scientific Assessment informed the Parties that there is no single substitute for the broad spectrum of methyl bromide uses, but there are many alternatives for specific methyl bromide applications.

Despite the assessment's conclusion that a methyl bromide phaseout will bring a significant benefit to the ozone layer, little support currently exists among the Parties for including a complete phaseout in the Protocol. The United States is the only government calling for a phaseout and has proposed the year 2000. Israel, which is a major producer of methyl bromide, and

several developing countries are strongly opposed to even bringing methyl bromide into the agreement. These countries stress the importance of methyl bromide to their agricultural export-based economies. They also claim that the scientific understanding of methyl bromide is too uncertain to take action at this time.

In the interest of reaching consensus, Mustafa Tolba, the Executive Director of the United Nations Environment Program, has circulated a note to all the Parties supporting a freeze of methyl bromide use and production in 1995 at 1992 levels. Tolba additionally suggests that the Parties should agree to cut consumption by 25 percent by 2000, with an exemption for quarantine fumigation uses. Even though any amendment to the Protocol is likely to maintain a grace period for developing country compliance, Tolba proposes that developing countries should be exempt

from any new obligations, such as controls on methyl bromide, until the effectiveness of the Multilateral Ozone Fund is reviewed by the Parties in 1994.

None of the methyl bromide proposals currently on the international negotiating table is sufficient to protect the ozone layer. The public will view the Copenhagen meeting as a failure if governments leave any chemical harmful to the ozone layer either inadequately controlled or uncontrolled by the agreement.

A commitment by wealthy nations to provide technical and financial support through the Ozone Fund should allay developing country concerns about their ability to achieve a methyl bromide phaseout. The assistance should be sufficient to enable them to phase out methyl bromide on a timetable as close as possible to that of developed countries.

UNITED STATES ACTIONS

1. The Clean Air Act

The Clean Air Act is the primary law that controls airborne pollutants in the United States and protects the atmosphere. At the national level, the Clean Air Act contains strong provisions for protecting the ozone layer. Where its provisions are more stringent than those in the Montreal Protocol, the Clean Air Act takes precedence.

The Clean Air Act requires the Environmental Protection Agency to list methyl bromide as a Class I ozone-depleting chemical and to phase out its production and use. The Act also requires other actions to cut methyl bromide use and emissions before the final phaseout, such as recycling.

Listing and Phasing Out Methyl Bromide

The Clean Air Act creates a list of ozone-depleting chemicals and sets deadlines for phasing out their production and use. The list written into law itself includes the ozone-depleting chemicals that were known in 1990, including CFCs, halons, HCFCs, carbon tetrachloride, and methyl chloroform. The law requires the EPA Ad-

ministrator to keep the list up to date by adding any other ozone-depleting chemicals that come to light after the law was passed.

Any substance with an ozone depletion potential (ODP) of 0.2 or greater is a Class I chemical. Production of Class I chemicals named in the law must be reduced according to a specified schedule and eliminated no later than January 1, 2000. If a new chemical is listed after the end of 1993, industry is allowed seven years to eliminate production.

But 2000 is just the "outside" deadline that the law specifies. The law also requires the EPA to speed up the phaseout schedule if the EPA Administrator decides, based on new scientific information, that a faster schedule "may be necessary to protect human health and the environment". This is a "better-safe-than-sorry" standard. The EPA does not need to be absolutely certain that more deaths, illnesses, or environmental damage will occur if the phaseout deadline remains 2000 — only that there is a *danger* of such consequences.

Independently, the law also mandates an accelerated schedule if breakthroughs on substitutes or alternatives make a faster

THE FAILURE OF FIFRA

Even though methyl bromide will be regulated by the Clean Air Act, many of the problems caused by the chemical could have been avoided if "FIFRA" — the Federal Insecticide, Fungicide and Rodenticide Act — worked correctly.

Methyl bromide was first registered as a pesticide in the United States in 1961. Despite its registration over 30 years ago, the Environmental Protection Agency (EPA) still has not performed the health, safety, and environmental studies needed to make final regulatory decisions. Nor has the EPA answered basic questions about the potential adverse health and environmental effects of methyl bromide.

In 1972, Congress passed amendments to FIFRA requiring that methyl bromide, along with over 600 other active pesticide ingredients, be reevaluated or reregistered in accordance with modern health, safety and environmental protection standards. For methyl bromide, that process will not be complete until after 1995, when the EPA is expecting the last test for cancer effects.

Despite incomplete information on the potential long-term adverse effects of methyl bromide, food residue regulations have been written by EPA for the inorganic component of methyl bromide. They allow for residues ranging from 5 parts per million (ppm) on apples to 300 ppm on lettuce, for post-harvest and soil fumigation uses respectively, and up to 400 ppm on fumigated processed food and feed.

In order to fill this gap in knowledge, the EPA issued data call-in notices in August 1986 requesting that manufacturers complete safety testing data. The data requested included information on residue and product chemistry data to determine consumer exposure from methyl bromide in food stuffs, and certain environmental fate studies to determine methyl bromide's groundwater contamination potential were ordered. This information was requested under a normal, albeit delayed, reevaluation that was required of all pesticides on the market when FIFRA was amended in 1972. The Methyl Bromide Industry Panel was formed by manufactures of methyl bromide and interested user groups to jointly develop this data for reregistration of the chemical.

The EPA's Office of Pesticide Programs subsequently established regulations restricting the use of the chemical to certified applicators and those operating under their supervision, and requiring specific protective equipment and application procedures.

In September 1991, the EPA issued another data call-in notice, given concerns that the earlier 1986 request was not proceeding adequately. This time the methyl bromide registrants agreed to conduct the required studies and submit annual progress reports for all studies required in the notice. The last study is due to be completed by the manufacturer and received by the EPA in October 1995.

In April, 1992, the EPA announced voluntary interim changes in label requirements for products used to fumigate homes and other structures. After numerous deaths over the years and a policy that allowed treated homes to be reoccupied after ambient air levels of methyl bromide dropped to 5 parts per billion, the EPA reached the following conclusion: "Recent data, however, indicate that [levels of] methyl bromide may rise after the structure has been vented and closed up again in preparation for reoccupancy. The data show that gas absorbed during treatment by walls, ceiling, carpet and furniture may take several days to dissipate completely."

Furthermore, the EPA announced in 1992 that, "Short-term exposure to very high levels or long-term exposure to lower levels may adversely affect the nervous system. New information provided in the agency indicates that methyl bromide may produce birth defects in some sensitive laboratory animals at levels that cause illness in the mothers."

phaseout practical.

On December 3, 1991, the Natural Resources Defense Council, Friends of the Earth, and the Environmental Defense Fund submitted a petition demanding the Class I listing of methyl bromide and an emergency phaseout schedule for the

chemical. The Clean Air Act required the EPA to grant or deny this petition within 180 days, i.e., by June 1, 1992.

But following instructions from the White House Office of Management and Budget, the EPA failed to respond. In September, the three groups filed a lawsuit in

Federal District Court in Washington, D.C., seeking a court-ordered deadline for the EPA to make the overdue decision on the petition. The case probably will be heard in late 1992 or early 1993.

Under the law, the EPA has no choice but to list methyl bromide as a Class I substance. Methyl bromide has an ODP of 0.7. This is three-and-a-half times the trigger level for mandatory Class I listing.

- **The EPA also must order an immediate and sharp cutback in methyl bromide production and a rapid final phase-out deadline. These measures must meet or surpass an immediate production cutback of at least 50 percent, and a complete phaseout within five years.**

Substitutes and alternatives are already available for many uses. Recycling and other available management measures could cut usage and emissions levels even in areas where alternatives are not yet fully developed. The risks to human health and the environment are too high for any less stringent timetable.

Recycling and Other Steps to Cut Methyl Bromide Emissions

Once the EPA lists methyl bromide as a Class I substance, the Clean Air Act also directs the agency to take steps to minimize emissions during the phase-out period. The EPA must issue regulations that will "maximize the recapture and recycling" of the chemicals and cut its use and emissions to the "lowest achievable level." The deadline for issuing these regulations is November 1994, but the EPA can and should do so more quickly.

In addition, the EPA can issue "safe alternatives" rules that forbid use of methyl bromide in particular applications where there are safer alternatives. The deadline for issuing "safe alternatives" regulations is November 15, 1992, a deadline EPA has failed to meet.

Under these authorities, the EPA should issue regulations to:

- **Prohibit fumigation of commodities for which alternative treatments — such as CO₂, cold, and heat — are available.**

- **Require fumigation to take place in sealed chambers outfitted with recycling equipment for commodities for which no alternative to methyl bromide presently exists.** Recycling units have been developed and demonstrated in New Zealand.

- **Ban soil fumigation where commercially viable alternatives are already available and set a phaseout date for remaining uses.**

- **During the phaseout period, set standards for remaining soil fumigation to stop wasteful over-dosing and cut emissions to the air.** Currently, experts report that many fields may be treated with excessive amounts of methyl bromide on a calendar basis. Require "prescription use only" for methyl bromide soil fumigation based on documented verification of need. Require strict pest monitoring programs to be incorporated into management practices.

- **Excessive emissions also occur when the chemical is not applied deeply enough into the soil, or when fields are inadequately covered.** Currently, little accurate data are available on the fate of methyl bromide following soil fumigation. **Accurate mass-balance accounting for methyl bromide soil fumigation is needed. The EPA must set standards to assure that the minimum amounts are used, and that the chemical is kept out of the air to the maximum practical extent.**

- **Ban fumigation of buildings for wood-eating insects.**

Labelling

The Clean Air Act also requires warning labels on products that are manufactured with a process that uses an ozone-depleting chemical, starting in May 1993. Exceptions are allowed only if the EPA finds that no substitute manufacturing processes are potentially available that are safer and are free of Class I substances.

- Once methyl bromide is listed as a Class I chemical, the EPA should consider crops grown with methyl bromide to be products manufactured with such a process. As a result, crops grown with methyl bromide would have to bear this label: *"Warning: Grown or processed with methyl bromide, a substance which harms public health and the environment by destroying ozone in the upper atmosphere."*

The labelling requirement would be a powerful market incentive to eliminate methyl bromide as soon as possible. It would inform consumers of the danger to the ozone layer and empower them to reduce that danger by purchasing other foods. The label would appropriately reward those growers who do not use methyl bromide now, and those who are the earliest to stop using it in the future.

2. POLICY CHANGES BY THE U.S. DEPARTMENT OF AGRICULTURE

- In order to eliminate the use of methyl bromide as a quarantine agent in the United States and discourage its use internationally, the United States Department of Agriculture (USDA) must revise the existing regulations which promote its use.

Causes of Methyl Bromide Use for Quarantine Fumigation

Current USDA regulations require that certain imported commodities be fumigated before they can enter the United States.⁷⁵ Some fruits and vegetables must be treated with methyl bromide in order to pass inspection by the United States Plant Protection and Quarantine officer.

Countries wishing to export their produce into the United States receive the Plant Protection and Quarantine Treatment Manual. According to the USDA, the purpose of the treatment manual is to prevent the movement of agricultural pests into or within the United States. The manual dictates the schedules, treatment procedures, and required gas calculation regulations by which each exporter must abide. In some cases, fumigation occurs in quarantine warehouses at the U.S. port of entry.

In essence, the manual is responsible for requiring that methyl bromide be used as a fumigant and a quarantine agent for several agricultural commodities before they arrive at American grocery stores.

The manual emphasizes pesticide use, requiring that importers meet "specification standards" rather than "performance standards." (For example, it specifies that an importer use a certain amount of a chemical to fumigate produce, rather than let the importer use other techniques to reach the same goal.) In all but a few cases, alternative methods such as vapor heat treatment, and cold treatment are not cited as approved methods for quarantine fumigation, leaving methyl bromide as the only option for fumigation of some products. For example, methyl bromide is required for the entry of all onions, beans and lentils into the United States; all grapes, apples, nectarines, pears, plums, and cherries imported from Chile; and all pears and peaches imported from Italy.

- **Alternative forms of quarantine commodity fumigation already exist for many commodities. To remove the barriers and accelerate the implementation of these alternatives, the USDA must amend the existing Plant Protection and Quarantine Treatment Manual. The manual must identify and promote alternatives to methyl bromide fumigation for all imports where possible.**

The USDA has been reluctant to take a strong initiative towards investigating alternatives to methyl bromide. The Department must make research of non-hazardous and environmentally safe alternatives to methyl bromide a priority.

The USDA must also ensure that existing

quarantine warehouses, such as the 215 square mile facility in Los Angeles County, implement recovery and recycling technologies for methyl bromide that is presently used. According to USDA's Plant Protection Treatment Manual, the last step

of the fumigation process is to open the enclosure slightly to allow the entry of fresh air. Instead, the manual should require that the methyl bromide be recovered for reuse or destruction.

3. USING A TAX TO ELIMINATE METHYL BROMIDE

- **Congress must tax methyl bromide. Expanding the existing tax on ozone-depleting chemicals to include methyl bromide will create an incentive for the phaseout of methyl bromide in the United States.**

The tax on ozone-depleting chemicals is a powerful economic instrument that raises revenue and provides an incentive for conservation and the adoption of alternatives. In 1989, Congress demonstrated leadership by placing an excise tax on CFCs and halons, the two groups of chemicals that were covered by the original Montreal Protocol on Substances that Deplete the Ozone Layer. In the short period since the CFC tax took effect, U.S. CFC production has dropped by approximately 42 percent.

In 1990, Congress expanded the tax and added two chemicals to the list of taxed substances: methyl chloroform and carbon tetrachloride. This action followed amendments to the Montreal Protocol and the U.S. Clean Air Act which established new controls on these substances.

In the excise tax, the total tax per pound of chemical equals the base tax rate multiplied by the chemical's ozone depletion potential (ODP). The most widely used CFCs have an ODP of 1.0. By comparison, scientists estimate that methyl bromide has an ODP of 0.7. The current base rate is \$1.67 for chemicals first taxed in 1989, and

\$1.37 for chemicals first taxed in 1990. Congress set the tax's base rate to increase each year, reaching \$3.10 per pound in 1995. The tax on these chemicals is expected to raise approximately \$5 billion through fiscal year 1995.

Recognizing the effectiveness of the tax on ozone-depleting chemicals, environmental groups worked with Members of Congress to strengthen the tax as part of the Energy bill recently signed by President Bush. The new law increases the base rate to \$3.35 in 1993, \$4.35 in 1994, and \$5.35 in 1995. The Joint Committee on Taxation projects that the increased base rate will raise an additional \$991 million over the next five years. The extra revenue will pay for tax incentives for energy conservation and investment in renewable energy sources.

Congress can further strengthen the tax on ozone-depleting chemicals by expanding it to include methyl bromide. Raising the price of methyl bromide will encourage users to take immediate steps to eliminate wasteful practices as well as increase pressure on them to adopt alternatives. A methyl bromide tax will speed the phaseout of this harmful chemical.

Further, the Joint Committee on Taxation has estimated that a tax on methyl bromide would raise \$247 million over five years. The Committee calculated this figure before the Energy Bill raised the tax's base rate, so even more revenue would be raised if Congress would tax methyl bromide at the base rates in the new law.

4. STATE AND LOCAL ACTIONS: A CALIFORNIA MODEL

Local governments in the United States can play a significant role in protecting

human health and Earth's ozone layer from the threats posed by methyl bromide. For example, California — which leads the nation in the use of methyl bromide — has

given local and regional officials a number of legal "tools" that policymakers in other states may find of interest. In California:

- City governments have the power to limit or ban pesticide activities within city limits.
- City and county governments can prohibit the use of methyl bromide on their property.
- City and county governments can limit their purchases to products that have not been treated or grown with methyl bromide.
- Regional air quality control districts can mandate strict air quality monitoring standards for applications of methyl bromide. This forces users to avoid releasing methyl bromide in concentrations

that are dangerous to surrounding neighborhoods.

- All methyl bromide use must be reported to the county agriculture commissioner. Because these records are open to the public, the citizens most at risk can also be better informed about the chemical's dangers. The agricultural commissioner can also demand public review of the environmental effects of methyl bromide.

These measures could be a starting point for other local governments working to eliminate methyl bromide and protect public health. But local officials should not limit themselves to this list: the nation's varying state, county, and municipal laws may offer many other valuable actions that can be taken without delay.

V. What Citizens Can Do

Urgent action is needed in order to phase out the production and use of the life-threatening, ozone depleting pesticide, methyl bromide. There are many actions each of us can take to prevent its use. We encourage concerned citizens to join us in taking any or all of the following actions towards eliminating methyl bromide use. Letters that we have written to industry and government leaders are included in an appendix to this report as models, along with relevant addresses.

- Write to the United States Environmental Protection Agency and demand that they use their authority under the Clean Air Act to phase out methyl bromide at the earliest possible date. Furthermore, demand that the EPA take steps to minimize methyl bromide emissions and promote recycling of methyl bromide. Finally, your letter should demand that the EPA require labelling on all products fumigated by methyl bromide to help consumers make informed purchasing choices.
- Write to the United States Department of

Agriculture and demand that they revise the Plant Protection and Quarantine Treatment Manual to cease promoting and requiring fumigation with methyl bromide. In addition, your letter should also stress the need for research, development, and implementation of alternatives for methyl bromide. Lastly, your letter should protest their opposition to listing methyl bromide as a Class I ozone depleting substance under the Clean Air Act.

- When possible, purchase food that has not been fumigated with methyl bromide. Urge your supermarket to label food that has been grown in fumigated soil or treated with methyl bromide after harvest. Demand that they carry food that is not fumigated with methyl bromide.
- If you are considering having your home fumigated for termites, do not allow it to be fumigated with methyl bromide. Contract a company that uses environmentally safe alternatives.
- Protest companies in your community

which release methyl bromide into the atmosphere. (See the list of companies included in this report.)

- If you have knowledge of crops in your county which are presently being fumigated with methyl bromide, demand that your County Board of Supervisors post signs on those fields indicating that the field has been fumigated with methyl bromide, and ozone depleting substance.
- Write to the House Ways and Means Committee and the Senate Appropriations Committee and demand that they expand the existing tax code on ozone-depleting substances to include methyl bromide as a taxable ozone-depleting substance.
- Write to the two major methyl bromide producers in the United States and demand that they adopt a company wide policy on the public health dangers of methyl bromide and rapidly move to phase out production and sales of methyl bromide with a 50 percent phaseout by 1995 and a complete phaseout no later than five years from now. Write to: Great Lakes Chemical Corporation, PO Box 2200, West Lafayette IN 57906; Ethyl Corporation, PO Box 2189, Richmond VA 23217.
- Write to the California Strawberry Advisory Board and demand that they support the elimination of methyl bromide and aid their members in adapting farming techniques that are not dependent on methyl bromide.
- Write to the California Grape and Tree Fruit League and demand that they support the elimination of methyl bromide and promote the sharing of information on appropriate alternatives to fumigation among their members.
- Write to the Methyl Bromide Task Force and demand that they support the elimination of methyl bromide and promote the sharing of information on appropriate alternatives to commodity fumigation between their members.
- Write to the National Pest Control Association and demand that they cease using methyl bromide for structural fumigation and instead adopt non-ozone depleting methods of pest control.
- Investigate what state and local laws can be applied to reduce or eliminate the use of methyl bromide in your area. State legislatures, city councils, county agricultural commissions, and — in California — the agricultural commissioner, can collect methyl bromide use statistics which are public information. In some cases, these governing bodies have the authority to restrict where, when, and how toxic chemicals such as methyl bromide are used in their jurisdictions.

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APPENDIX I.

A Call For Action: Letters on Methyl Bromide

California Action Network * Californians for Alternatives to Toxics * California Institute for Rural Studies * Friends of the Earth * National Coalition Against the Misuse of Pesticides * Natural Resources Defense Council * Pesticide Action Network - North American Region

November 11, 1992

Hon. William K. Reilly
Administrator
Environmental Protection Agency
401 M Street, SW
Washington, D.C. 20460

Dear Mr. Reilly,

We are writing you to call your attention to the threat to the environment posed by methyl bromide. Health experts have long known methyl bromide to be highly toxic to humans, and atmospheric scientists recently have shown it to be a potent destroyer of the Earth's protective ozone layer as well. As Administrator of the Environmental Protection Agency, you are in a unique position to help us phase out and eliminate this dangerous chemical in the United States.

Enclosed is a copy of our report, Into the Sunlight, in which our investigations show that there are viable alternatives to the use of methyl bromide in your industry. In light of the damage we have already done to the ozone layer, as evidenced by the hole in the ozone layer over Antarctica and reduced stratospheric ozone values over the Northern Hemisphere, we cannot afford to continue emitting any ozone-depleting substances into the atmosphere. Thus, as a coalition of environmental, farming, and pesticide action organizations committed to protecting the public health and environment, we request that you take immediate action to reduce and ultimately eliminate production and use of methyl bromide.

Specifically, we urge you to grant without further delay the petition filed by Natural Resources Defense Council, Friends of the Earth, and Environmental Defense Fund to list methyl bromide as a Class I ozone-depleting substance under Section 602 of the 1990 Clean Air Act Amendments and establish a rapid schedule for a complete phaseout under Section 606.1. Furthermore, we urge you to require a fifty percent cut in methyl bromide production for 1993, and prohibit methyl bromide production no later than January 1, 1998.

In addition, our report recommends that you take action under Sections 608, 611, and 612 to:

- * require that all commodity and quarantine fumigation using methyl bromide occur in closed chambers outfitted with recycling equipment.

- * minimize methyl bromide use for soil fumigation to the lowest achievable levels by banning applications where alternatives exist, and by setting standards for

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218 D Street, S.E.
Washington, D.C. 20003
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remaining soil fumigation to stop wasteful over-dosing and cut emissions to the atmosphere.

* prohibit the use of methyl bromide as a residential building fumigant.

* require a warning label on foodstuffs grown with methyl bromide at the consumer point-of-purchase.

We also ask that you support efforts to impose a tax on methyl bromide parallel to the tax on other ozone-depleting chemicals, and that you support reforms in USDA guidance documents that unnecessarily promote methyl bromide use.

We are sure that your commitment to the environment and the well being of the planet will lead you to implement these measures as quickly as possible. Our health and the well being of the environment depend upon your timely action.

Sincerely,



William Allen
Community Outreach
California Institute for Rural Studies



Patricia Clary
Executive Director
Californians for Alternatives to Toxics



Liz Cook
Ozone Campaign Director
Friends of the Earth



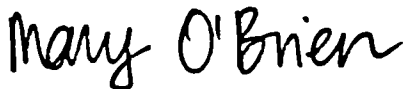
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California Action Network * Californians for Alternatives to Toxics * California Institute for Rural Studies * Friends of the Earth * National Coalition Against the Misuse of Pesticides * Natural Resources Defense Council * Pesticide Action Network - North American Region

November 11, 1992

Secretary R. Madigan
U.S. Department of Agriculture
Office of the Secretary
14th and Independence Ave, SW
Washington, DC 20250

Dear Secretary Madigan,

We are writing you to call your attention to the threat to the environment posed by methyl bromide. Health experts have long known methyl bromide to be highly toxic to humans, and atmospheric scientists recently have shown it to be a potent destroyer of the Earth's protective ozone layer as well. As Secretary of the Department of Agriculture (USDA), you are in a unique position to expedite the phaseout of this dangerous chemical.

Enclosed is a copy of our report, Into the Sunlight, in which our investigations show that there are viable alternatives to the use of methyl bromide in your industry. In light of the damage we have already done to the ozone layer, as evidenced by the hole in the ozone layer over Antarctica and reduced stratospheric ozone values over the Northern Hemisphere, we cannot afford to continue emitting any ozone-depleting substances into the atmosphere.

Thus, as a coalition of environmental, farming, and pesticide action organizations committed to protecting the public health and environment, we request your cooperation as a governmental leader in doing everything possible to facilitate the elimination of methyl bromide in the United States and internationally.

Specifically, we urge you to rewrite USDA's Plant Protection and Quarantine Protection manual, which requires that countries exporting to the United States fumigate certain commodities with methyl bromide in order to pass U.S. quarantine requirements. The manual should identify and promote alternatives to methyl bromide. It should also require that existing quarantine houses in the United States implement recovery and recycling technologies instead of venting methyl bromide directly to the atmosphere.

Additionally, the USDA must make research of non-hazardous and environmentally-safe alternatives to methyl bromide a priority. Now that data on the ozone-depleting strength of methyl bromide is available, the Clean Air Act requires the Environmental Protection Agency to list methyl bromide as a Class I substance and phase it out by 2000 or within seven years of its listing. Given the limited future of methyl bromide, the USDA should take a realistic and supportive approach to these forthcoming regulations by helping users to adopt alternatives.

We are sure that your commitment to the environment and the well being of the planet will lead you to implement these measures as quickly as possible. Our health and the well being of the environment depend upon your timely action.

Sincerely,



William Allen
Community Outreach
California Institute for Rural Studies



Patricia Clary
Executive Director
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Liz Cook
Ozone Campaign Director
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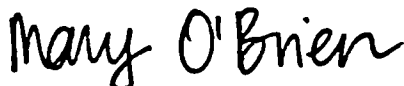
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Rural Studies * Friends of the Earth * National Coalition Against the Misuse of Pesticides *
Natural Resources Defense Council * Pesticide Action Network - North American Region

November 11, 1992

The Honorable Rostenkowski
Chairman
House Ways and Means Committee
U.S. House of Representatives
Rayburn Building
Independence and S. Capitol Street, S.W.
Washington, D.C. 20515

Dear Honorable Rostenkowski,

We are writing you to call your attention to the threat to the environment posed by methyl bromide. Health experts have long known methyl bromide to be highly toxic to humans, and atmospheric scientists recently have shown it to be a potent destroyer of the Earth's protective ozone layer as well. As Chairman of the House Ways and Means Committee, you are in a unique position to help accelerate the phaseout of this dangerous chemical.

Enclosed is a copy of our report, Into the Sunlight, in which our investigations show that there are viable alternatives to the use of methyl bromide. In light of the damage we have already done to the ozone layer, as evidenced by the hole in the ozone layer over Antarctica and reduced stratospheric ozone values over the Northern Hemisphere, we cannot afford to continue emitting any ozone-depleting substances into the atmosphere.

Thus, as a coalition of environmental, farming, and pesticide action organizations committed to protecting the public health and environment, we request your cooperation as a Congressional leader to help rapidly eliminate all use of methyl bromide. Specifically, we urge you to tax methyl bromide.

Expanding the existing tax on ozone-depleting chemicals to include methyl bromide will create an incentive for the phaseout of methyl bromide in the United States. Raising the price of methyl bromide will encourage users to take immediate steps to eliminate wasteful practices as well as increase pressure on them to adopt alternatives.

Further, the Joint Committee on Taxation has estimated that a tax on methyl bromide would raise \$247 million over five years. The Committee calculated this figure before the Energy Bill raised the tax's base rate, so even more revenue would be raised if Congress would tax methyl bromide at the base rates in the new law. Enacting a tax that protects the ozone layer and raises badly needed revenue for the growing budget deficit will bring the public multiple benefits.

We are sure that your commitment to the environment and the well being of the planet will lead you to begin the phaseout without delay. Our health and the well being of the environment depend upon your timely action.

Sincerely,

Will Allen

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November 11, 1992

The Honorable Lloyd Bentsen
Chairman
Senate Finance Committee
United States Senate
Hart Building
2nd and C Streets, N.E.
Washington, D.C. 20510

Dear Honorable Bentsen,

We are writing you to call your attention to the threat to the environment posed by methyl bromide. Health experts have long known methyl bromide to be highly toxic to humans, and atmospheric scientists recently have shown it to be a potent destroyer of the Earth's protective ozone layer as well. As Chairman of the Senate Finance Committee, you are in a unique position to help accelerate the phaseout of this dangerous chemical.

Enclosed is a copy of our report, Into the Sunlight, in which our investigations show that there are viable alternatives to the use of methyl bromide. In light of the damage we have already done to the ozone layer, as evidenced by the hole in the ozone layer over Antarctica and reduced stratospheric ozone values over the Northern Hemisphere, we cannot afford to continue emitting any ozone-depleting substances into the atmosphere.

Thus, as a coalition of environmental, farming, and pesticide action organizations committed to protecting the public health and environment, we request your cooperation as a Congressional leader to help rapidly eliminate all use of methyl bromide. Specifically, we urge you to tax methyl bromide.

Expanding the existing tax on ozone-depleting chemicals to include methyl bromide will create an incentive for the phaseout of methyl bromide in the United States. Raising the price of methyl bromide will encourage users to take immediate steps to eliminate wasteful practices as well as increase pressure on them to adopt alternatives.

Further, the Joint Committee on Taxation has estimated that a tax on methyl bromide would raise \$247 million over five years. The Committee calculated this figure before the Energy Bill raised the tax's base rate, so even more revenue would be raised if Congress would tax methyl bromide at the base rates in the new law. Enacting a tax that protects the ozone layer and raises badly needed revenue for the growing budget deficit will bring the public multiple benefits.

Friends of the Earth
218 D Street, S.E.
Washington, D.C. 20003
Tel. 202/544-2600, Fax 202/543-4710

We are sure that your commitment to the environment and the well being of the planet will lead you to begin the phaseout without delay. Our health and the well being of the environment depend upon your timely action.

Sincerely,

Will Allen

William Allen
Community Outreach
California Institute for Rural Studies

Patricia Clary

Patricia Clary
Executive Director
Californians for Alternatives to Toxics

Liz Cook

Liz Cook
Ozone Campaign Director
Friends of the Earth

Jennifer Curtis

Jennifer Curtis
Senior Research Associate
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Richard Reed

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Program Director
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November 11, 1992

Mr. Emerson Kampen
President
Great Lakes Chemical Corporation
P.O. Box 2200
West Lafayette, Indiana 57906

Dear President Kampen,

We are writing you to call your attention to the threat to the environment posed by methyl bromide. Health experts have long known methyl bromide to be highly toxic to humans, and atmospheric scientists recently have shown it to be a potent destroyer of the Earth's protective ozone layer as well. As President of Great Lakes Chemical, one of the two U.S. producers of methyl bromide, you are in a unique position to initiate the phaseout of this dangerous chemical.

Enclosed is a copy of our report, Into the Sunlight, in which our investigations show that there are viable alternatives to the use of methyl bromide. In light of the damage we have already done to the ozone layer, as evidenced by the hole in the ozone layer over Antarctica and reduced stratospheric ozone values over the Northern Hemisphere, we cannot afford to continue emitting any ozone-depleting substances into the atmosphere.

Thus, as a coalition of environmental, farming, and pesticide action organizations committed to protecting the public health and environment, we request your cooperation as an industry leader to rapidly eliminate all Great Lake's production of methyl bromide. Specifically, we urge you to cut production by 50 percent immediately and phase out production within the next five years.

We are sure that your commitment to the environment and the well being of the planet will lead you to begin the phaseout without delay. Our health and the well being of the environment depend upon your timely action.

Sincerely,

Will Allen

William Allen
Community Outreach
California Institute for Rural Studies

Patricia Clary

Patricia Clary
Executive Director
Californians for Alternatives to Toxics

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November 11, 1992

Mr. Bruce Gottwald
President
Ethyl Corporation
P.O. Box 2189
Richmond, VA 23217

Dear President Gottwald,

We are writing you to call your attention to the threat to the environment posed by methyl bromide. Health experts have long known methyl bromide to be highly toxic to humans, and atmospheric scientists recently have shown it to be a potent destroyer of the Earth's protective ozone layer as well. As President of Ethyl Corporation, one of the two U.S. producers of methyl bromide, you are in a unique position to initiate the phaseout of this dangerous chemical.

Enclosed is a copy of our report, Into the Sunlight, in which our investigations show that there are viable alternatives to the use of methyl bromide. In light of the damage we have already done to the ozone layer, as evidenced by the hole in the ozone layer over Antarctica and reduced stratospheric ozone values over the Northern Hemisphere, we cannot afford to continue emitting any ozone-depleting substances into the atmosphere.

Thus, as a coalition of environmental, farming, and pesticide action organizations committed to protecting the public health and environment, we request your cooperation as an industry leader to rapidly eliminate all Ethyl Corporation's production of methyl bromide. Specifically, we urge you to cut production by 50 percent immediately and phase out production within the next five years.

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We are sure that your commitment to the environment and the well being of the planet will lead you to begin the phaseout without delay. Our health and the well being of the environment depend upon your timely action.

Sincerely,

Will Allen

William Allen
Community Outreach
California Institute for Rural Studies

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Patricia Clary
Executive Director
Californians for Alternatives to Toxics

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November 11, 1992

David Riggs, President
California Strawberry Advisory Board
P.O. Box 269
Watsonville, CA 95077

Dear Mr. Riggs,

We are writing you to call your attention to the threat to the environment posed by methyl bromide. Health experts have long known methyl bromide to be highly toxic to humans, and atmospheric scientists recently have shown it to be a potent destroyer of the Earth's protective ozone layer as well. As President of the California Strawberry Advisory Board, you are in a unique position to help us remove this dangerous chemical from use in strawberry fields.

Enclosed is a copy of our report, Into the Sunlight, in which our investigations show that there are viable alternatives to the use of methyl bromide in your industry. In light of the damage we have already done to the ozone layer, as evidenced by the hole in the ozone layer over Antarctica and reduced stratospheric ozone values over the Northern Hemisphere, we cannot afford to continue emitting any ozone-depleting substances into the atmosphere. Thus, as a coalition of environmental, farming, and pesticide action organizations committed to protecting the public health and environment, we request your cooperation as an industry leader in doing everything possible to rapidly eliminate all use of methyl bromide.

Specifically, we urge that the California Strawberry Advisory Board support the elimination of methyl bromide and aid its members in adapting sustainable farming techniques that are not dependent upon soil fumigation. Furthermore, we urge that the Board immediately plan and adopt a strategy for your industry to immediately cut methyl bromide use by 50 percent and to eliminate all use within five years. Finally, we urge you to inform the public about your efforts to phase out the use of methyl bromide and provide farmers with sustainable alternatives. We look forward to a formal response from you regarding your plans to eliminate the use of methyl bromide.

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218 D Street, S.E.
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We are sure that your commitment to the environment and the well being of the planet will lead you to implement these measures as quickly as possible. Our health and the well being of the environment depend upon your timely action.

Sincerely,

Will Allen

William Allen
Community Outreach
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Executive Director
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November 11, 1992

Richard Matoian, President
California Grape and Tree Fruit League
1540 Shaw Avenue, Suite 120
Fresno, CA 93710

Dear Mr. Matoian,

We are writing you to call your attention to the threat to the environment posed by methyl bromide. Health experts have long known methyl bromide to be highly toxic to humans, and atmospheric scientists recently have shown it to be a potent destroyer of the Earth's protective ozone layer as well. As President of the California Grape and Tree Fruit League, you are in a unique position to help us remove this dangerous chemical from orchards and vineyards across the state and even across the country.

Enclosed is a copy of our report, Into the Sunlight, in which our investigations show that there are viable alternatives to the use of methyl bromide in your industry. In light of the damage we have already done to the ozone layer, as evidenced by the hole in the ozone layer over Antarctica and reduced stratospheric ozone values over the Northern Hemisphere, we cannot afford to continue emitting any ozone-depleting substances into the atmosphere. Thus, as a coalition of environmental, farming, and pesticide action organizations committed to protecting the public health and environment, we request your cooperation as an industry leader in doing everything possible to rapidly eliminate all use of methyl bromide.

Specifically, we urge you to do three things. First, we urge you to immediately cut the use of methyl bromide in your industry by 50 percent and eliminate its use completely within five years. To achieve these steps, you should direct a substantial proportion of your pest control research efforts towards developing and demonstrating the feasibility of non-toxic and sustainable methods of nematode and disease control in grape vineyards. In the long term, cultural and biological pest control methods will be more effective substitutes for methyl bromide than alternative soil fumigants. Second, we urge you to educate growers about methyl bromide's detrimental effect on the ozone layer and the ensuing threat to public health and farm productivity. And, last, we urge you to inform the public about your efforts to phase out the use of methyl bromide and provide farmers with sustainable alternatives. We look forward to a formal response from you regarding your plans to eliminate the use of methyl bromide.

We are sure that your commitment to the environment and the well being of the planet will lead you to implement these measures as quickly as possible. Our health and the well being of the environment depend upon your timely action.

Sincerely,

Will Allen

William Allen
Community Outreach
California Institute for Rural Studies

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Executive Director
Californians for Alternatives to Toxics

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November 11, 1992

Mr. Fred Hegele, Chairman
Methyl Bromide Task Force
1 General Mills Blvd.
Minneapolis, MN 55426

Dear Mr. Hegele,

We are writing you to call your attention to the threat to the environment posed by methyl bromide. Health experts have long known methyl bromide to be highly toxic to humans, and atmospheric scientists recently have shown it to be a potent destroyer of the Earth's protective ozone layer as well. As Chairman of the Methyl Bromide Task Force, you are in a unique position to help us remove this dangerous chemical from food warehouses and processing plants across the country.

Enclosed is a copy of our report, Into the Sunlight, in which our investigations show that there are viable alternatives to the use of methyl bromide in your industry. In light of the damage we have already done to the ozone layer, as evidenced by the hole in the ozone layer over Antarctica and reduced stratospheric ozone values over the Northern Hemisphere, we cannot afford to continue emitting any ozone-depleting substances into the atmosphere. Thus, as a coalition of environmental, farming, and pesticide action organizations committed to protecting the public health and environment, we request your cooperation as an industry leader in doing everything possible to rapidly eliminate all use of methyl bromide.

Specifically, we urge you to take four steps towards eliminating methyl bromide use. First, we urge members of your task force to immediately cut methyl bromide fumigation of food products by 50 percent and to completely eliminate its use within five years. Second, we urge you to direct your task force's pest control research efforts towards developing environmentally safe methods such as the use of heat and cold treatments, modified atmosphere, and biological control methods using predatory insects and pheromone traps. Third, we urge you to disseminate information to your members about the detrimental effects of methyl bromide on the Earth's protective ozone layer and the available alternatives to methyl bromide. Finally, we urge you to inform the public about the task force's efforts to eliminate the use of methyl bromide in the food industry. We look forward to a formal response regarding your plans to eliminate the use of methyl bromide in your industry.

We are sure that your commitment to the environment and the well being of the planet will lead you to implement these measures as quickly as possible. Our health and the well being of the environment depend upon your timely action.

Sincerely,

Will Allen

William Allen
Community Outreach
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November 11, 1992

Harvey Gold, Executive Vice President,
National Pest Control Association
8100 Oak Street
Dunn Loring, VA 22027

Dear Mr. Gold,

We are writing you to call your attention to the threat to the environment posed by methyl bromide. Health experts have long known methyl bromide to be highly toxic to humans, and atmospheric scientists recently have shown it to be a potent destroyer of the Earth's protective ozone layer as well. As Executive Vice National Pest Control Association, you are in a unique position to help us remove this dangerous chemical from the structural fumigation industry.

Enclosed is a copy of our report, Into the Sunlight, in which our investigations show that there are viable alternatives to the use of methyl bromide in your industry. In light of the damage we have already done to the ozone layer, as evidenced by the hole in the ozone layer over Antarctica and reduced stratospheric ozone values over the Northern Hemisphere, we cannot afford to continue emitting any ozone-depleting substances into the atmosphere. Thus, as a coalition of environmental, farming, and pesticide action organizations committed to protecting the public health and environment, we request your cooperation as an industry leader in doing everything possible to rapidly eliminate all use of methyl bromide.

Specifically, we urge you to do three things. First, we urge you to lead your association members to immediately cut methyl bromide use by 50 percent and a complete phaseout within five years. Second, we urge you to disseminate to your members information about the detrimental effects of methyl bromide on the Earth's protective ozone layer and the available alternatives to methyl bromide. Finally, we urge you to inform the public of your association's efforts to phase out the use of methyl bromide as a structural pest control measure. We look forward a formal response regarding your plans to eliminate the use of methyl bromide.

We are sure that your commitment to the environment and the well being of the planet will lead you to implement these measures as quickly as possible. Our health and the well being of the environment depend upon your timely action.

Sincerely,

Will Allen

William Allen
Community Outreach
California Institute for Rural Studies

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November 11, 1992

Mr. Kendall Keith
President
National Grain and Feed Association
1201 New York Avenue, NW, Suite 830
Washington, D.C. 20005

Dear Mr. Keith,

We are writing you to call your attention to the threat to the environment posed by methyl bromide. Health experts have long known methyl bromide to be highly toxic to humans, and atmospheric scientists recently have shown it to be a potent destroyer of the Earth's protective ozone layer as well. As President of the National Grain and Feed Association, you are in a unique position to help us remove this dangerous chemical from grain and feed warehouses and processing plants across the country.

Enclosed is a copy of our report, Into the Sunlight, in which our investigations show that there are viable alternatives to the use of methyl bromide in your industry. In light of the damage we have already done to the ozone layer, as evidenced by the hole in the ozone layer over Antarctica and reduced stratospheric ozone values over the Northern Hemisphere, we cannot afford to continue emitting any ozone-depleting substances into the atmosphere. Thus, as a coalition of environmental, farming, and pesticide action organizations committed to protecting the public health and environment, we request your cooperation as an industry leader in doing everything possible to rapidly eliminate all use of methyl bromide.

Specifically, we urge you to immediately cut methyl bromide fumigation of stored grain and other products represented by your association by 50 percent and to completely eliminate its use within five years. Because of the hazardous nature of methyl bromide, we urge you to assist your industry in implementing tested and effective alternative methods for stored products, including good sanitation, venting techniques and moisture control, and biological pest control measures. Second, we urge you to disseminate information to your members about the detrimental effects of methyl bromide on the Earth's protective ozone layer and the available alternatives to methyl bromide. Finally, we urge you to inform the public about your association's efforts to eliminate the use of methyl bromide in the grain and feed industry. We look forward to a formal response regarding your plans to eliminate the use of methyl bromide in your industry.

Friends of the Earth
218 D Street, S.E.
Washington, D.C. 20003
Tel. 202/544-2600, Fax 202/543-4710

We are sure that your commitment to the environment and the well being of the planet will lead you to implement these measures as quickly as possible. Our health and the well being of the environment depend upon your timely action.

Sincerely,

Will Allen

William Allen
Community Outreach
California Institute for Rural Studies

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Patricia Clary
Executive Director
Californians for Alternatives to Toxics

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Ozone Campaign Director
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