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USDA photo

Methyl Bromide Phaseout Proceeds: Users Request Exemptions

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Methyl bromide, a widely used fumigant in agriculture, is one of a number of chemicals—including refrigerants such as freon—being phased out of use worldwide under the Montreal Protocol signed by the U.S. and 182 other countries. The Protocol is an international treaty aimed at reducing or eliminating use of chemicals that contribute to the depletion of the atmosphere's ozone layer, which protects the Earth from ultraviolet radiation (UV). Higher levels of UV can increase the incidence of skin cancer and cataracts, suppress the immune system, and damage crops. The phaseout of methyl bromide could mitigate some of these harmful effects, but because methyl bromide is so important to agricultural production, the phaseout could also have some negative effects for producers and consumers.

Methyl bromide is a principal product used to fumigate soil before planting many fruit and vegetable crops, for post-harvest storage and facility fumigation, and for government-required quarantine treatments. The product controls many soil insects, diseases, nematodes, and weeds, as well as insects and other organisms present in stored or shipped commodities and storage, shipping, and processing facilities. For many uses, no single alternative to methyl bromide is available that is as effective and economical. Analyses by ERS and cooperators indicate that the phaseout could cause short-term losses until more cost-effective alternatives are developed and made available. Initially U.S. producers could experience lower yields, higher costs, or lost market share to imports, while U.S. consumers could face higher prices and reduced supply, depending on the commodity.

Under the Protocol, the U.S. and other developed countries will be prohibited from producing or importing methyl bromide for domestic use after 2004, except for quarantine and preshipment uses and for temporary "Critical Use Exemptions" granted for approved uses (see box, "The Methyl Bromide Phaseout"). The international phaseout is already reducing the supply of methyl bromide. Supplies for the U.S. and other developed countries were first reduced in 1999 by 25 percent from a 1991 baseline. The reduction reached 50 percent in 2001 and is scheduled to reach 70 percent in 2003. Developing countries are on a slower timetable, with complete phaseout scheduled for 2015.

The Methyl Bromide Phaseout

Phaseout Schedule. Under the Montreal Protocol, developed countries are scheduled to reduce methyl bromide consumption (production + imports - exports) from a 1991 baseline by:

- 25 percent in 1999,
- 50 percent in 2001,
- 70 percent in 2003, and
- 100 percent in 2005.

Developing countries that have signed the Protocol are scheduled to freeze consumption in 2002 at the 1995-98 average level and reduce consumption from that baseline by 20 percent in 2005 and 100 percent in 2015.

Quarantine and Preshipment Exemption. Quarantine and preshipment applications of methyl bromide are exempt from the phaseout. Quarantine applications are performed or authorized by a national plant, animal, environmental, or health authority to prevent the introduction, spread, or establishment of quarantine pests.

Under the current U.S. Environmental Protection Agency rule, quarantine treatments include those for:

- U.S. imports when methyl bromide is on an official list of treatments for quarantine pests or required for emergency quarantine application.
- U.S. exports when needed to meet the quarantine requirements of an importing country, including quarantine pest-free requirements that do not specify control measures.
- Phytosanitary requirements of Federal, State, or local authorities that specifically address the control of quarantine pests.
- Production of propagative materials to meet official requirements of destinations where the materials are to be transported, such as preplant soil fumigation of nursery stock for replanting to meet official pest-free standards for underground portions of the material.

Preshipment treatments are performed 21 or fewer days before export to another country to meet official requirements, including nonquarantine standards such as food sanitation, of the importing country or existing U.S. export requirements. However, preventive treatments of stored commodities or facilities not related to quarantine or preshipment requirements are not exempt.

Critical Use Exemptions. Critical uses can be exempted on a yearly basis in developed countries after 2004 by the determination that a technically and economically feasible alternative with acceptable health and environmental effects is not available and that a significant market disruption would occur without methyl bromide. The country must take technically and economically feasible steps to minimize methyl bromide use and emissions and conduct research to develop and deploy alternatives.

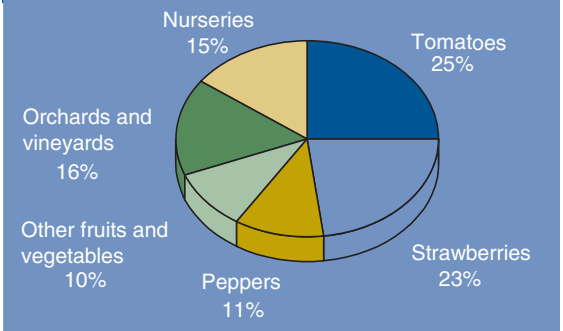
Emergency Use. After the phaseout, a country can use up to 20 metric tons per year for emergency use and apply for approval after the event.

Methyl Bromide's Use in the U.S.

The U.S. Environmental Protection Agency (USEPA), the agency responsible for implementing the Protocol in the U.S., estimates that U.S. use of methyl bromide for soil fumigation in 1997, before the mandated reductions began, was 38 million pounds of active ingredient (a.i.). About 70 percent of this quantity was applied to land used to raise small fruits, melons, and vegetables, mostly fresh-market tomatoes, strawberries, and peppers. Methyl bromide was also widely used before planting or replanting orchards and vineyards, accounting for about 16 percent of use, while ornamentals and agricultural nurseries accounted for another 15 percent. Agricultural nurseries use methyl bromide to ensure vigorous transplants of strawberries, perennials, and other crops, and to meet the pest-free requirements of such States as California for transporting transplants. California and Florida together accounted for about 75 percent of total preplant use.

By killing insects and other organisms, methyl bromide protects the quality of stored commodities and perishable goods and helps meet sanitary standards of the Food and Drug Administration (FDA) and of importing countries. Large quantities of dried plums, raisins, figs, dates, almonds, and walnuts produced in California are routinely treated before and during storage and before packing or shipping. Walnuts are treated prior to export for European holiday markets to meet import standards. Other products treated include grains, grain products, dried fish and meats, dry beans, tobacco, and timber and wood products. Methyl bromide is also used to control pests and meet FDA sanitary standards in mills, processing plants, warehouses, ships, railcars, and other transport vehicles.

Soil fumigation before planting tomatoes and strawberries accounted for nearly half of U.S. preplant use of methyl bromide, 1997



Preplant use was 38 million pounds of active ingredient.
Based on USEPA data at
www.epa.gov/ozone/mbr/background

Agricultural exports and imports are often fumigated with methyl bromide to control pests.

USDA photo

The U.S. and many other governments require the use of methyl bromide to prevent the spread of specific regulated pests and for emergency quarantine treatments. These uses are exempt from the phaseout. USEPA estimated about 600,000 pounds of methyl bromide were used in the U.S. for quarantine treatments in 1997. Fresh fruit—including grapes, peaches, nectarines, and kiwifruit—imported from Chile during the winter accounted for a major portion of U.S. food imports receiving methyl bromide quarantine treatments. U.S. exports of sweet cherries, peaches, nectarines, plums, prunes, apricots, dates, dried prunes, walnuts, oak logs, cotton, rice, and tobacco have been treated to meet requirements of importing countries. Methyl bromide is also used for domestic quarantine treatments of such goods as Florida and Texas citrus and southeastern blueberries before shipment to Western States.

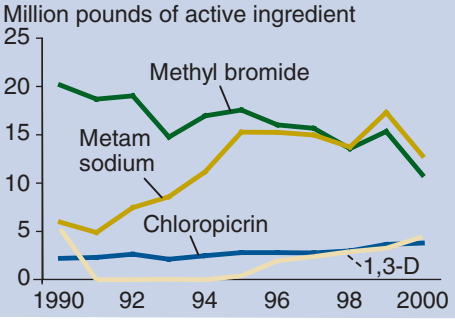
Phaseout Has Reduced Use and Increased Price

Methyl bromide use in the U.S. has declined since the phaseout began. Data collected by California's EPA show lower total methyl bromide use from 1990 to 2000, while USDA data for Florida show reductions for three major crops (peppers, strawberries, and tomatoes) from 1992 to 2000. Available data show a decline since 1999, when the required 25-percent reduction went into effect, but there are no data showing use since 2001, when the reduction reached 50 percent. Florida growers reduced application rates and tomato and pepper acreage, contributing to the decline in use, while the share of crop acreage treated with methyl bromide remained high. Methyl bromide use for California and Florida strawberries was relatively stable between 1992 and 2000, despite increasing crop acreage. The share of strawberry acreage treated with methyl bromide declined in California, while application rates declined in Florida, especially since 1996.

The price of methyl bromide increased as the phaseout reduced supply. The U.S. average price rose from $2.50 per pound of active ingredients in 1999, when the first reduction began, to $4.50 in 2001—a more rapid increase than in previous years. Users receiving the greatest benefits from methyl bromide are willing to pay more to obtain the fumigant and have driven up the price. The rising price reduces users' net revenues and lowers the material's cost effectiveness. This should encourage some growers to try available alternatives (see box, "Alternatives to Methyl Bromide").

The use of alternative fumigants has also increased. Data collected by California's EPA show a general increase in the use of metam sodium, chloropicrin, and 1,3-D between 1990 and 2000, with chloropicrin and 1,3-D use increasing between 1998 and 2000. USDA data for Florida show a general increase in chloropicrin use for peppers, strawberries, and tomatoes throughout the 1990s, but espe-

Methyl bromide use down and other fumigant use up in California...



Based on California EPA data at
www.epa.gov/ozone/mbr/background

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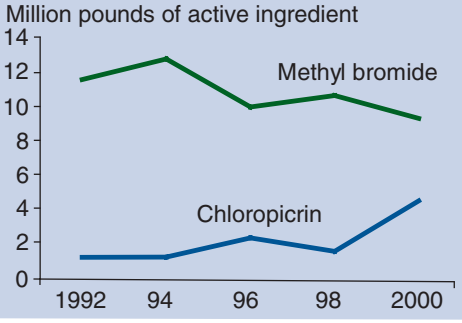
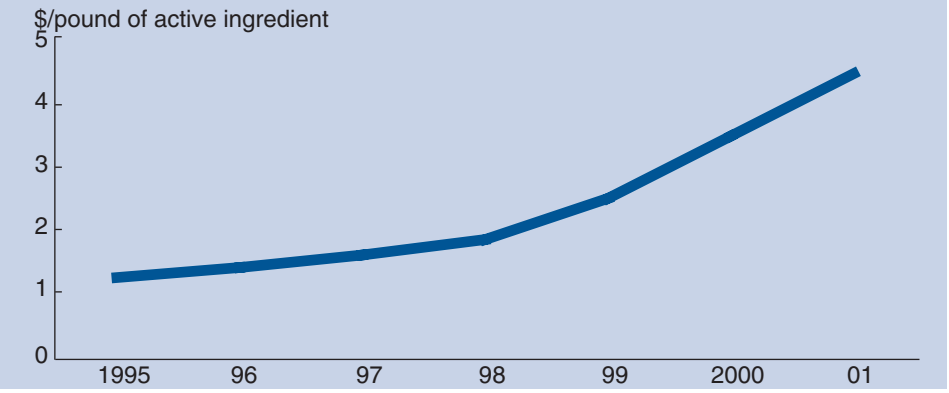


Use on peppers, strawberries, and tomatoes.
Based on NASS, USDA data

Average methyl bromide price has jumped since the product's phaseout began in 1999



Based on USEPA data at www.epa.gov/ozone/mbr/background

cially since 1996. Reformulating products to reduce the application rate of methyl bromide and increase that of chloropicrin, often applied simultaneously with methyl bromide, has contributed to these trends.

Higher Costs, Lower Returns Could Result

U.S. tomato, pepper, eggplant, and strawberry production could decline for several years as effective alternatives are developed, especially in States dependent on methyl bromide. A cooperative ERS/University of Florida study, assuming a complete ban on production uses of methyl bromide for annual fruit and vegetable crops, estimated that Florida and California initially would each lose about $200 million annually in gross shipping point revenues, which represented about 20-30 percent of estimated revenues from treated commodities in each State.

With reduced U.S. production and higher retail prices, U.S. imports of Mexican-produced tomatoes, peppers, eggplants, and strawberries could increase. The phaseout would have little immediate effect on Mexican costs and yields because Mexico, as a developing country under the Montreal Protocol, is subject to a freeze on methyl bromide use at 1995-98 levels and a longer phaseout that lasts until 2015. Use in Mexico is much less than in the U.S., averaging 4.2 million pounds of active ingredient from 1995-98, less than 10 percent of U.S. use as estimated by USEPA.

The National Center for Food and Agricultural Policy (NCFAP), in cooperation with ERS, estimated initial annual losses of $480 million from using available alternatives in place of methyl bromide for preplant fumigation of specialty crops: $235 million for annuals (strawberries, tomatoes, and other vegetables), $143 million for perennial crops, and $102 million for ornamentals and nurseries (excluding forest nurseries). These losses represented 12 percent of revenues for annual crops (10 percent for strawberries, 15 percent for tomatoes), 3 percent for perennial crops, and 15 percent for ornamental and nursery crops. The NCFAP study also estimated that post-harvest treatment costs for dates, figs, prunes, raisins, and walnuts would rise by $2 million if phosphine were used instead of methyl bromide. There would be additional costs for retrofitting storage facilities, increasing storage, or changing processes to accommodate longer treatment times and revenue losses from missed market opportunities.

Several factors will influence the actual impact of the phaseout. The NCFAP and University of Florida estimates of economic effects assume that methyl bromide

Agricultural engineers discuss methyl bromide alternatives.

Photo by Peggy Greb, USDA/ARS

Photo by Brian Prechtel, USDA/ARS

This healthy looking strawberry plant was grown in soil treated with methyl bromide alternatives. The other is from untreated and unfumigated soil and is infested with Verticillium wilt.

Photo by Scott Bauer, USDA/ARS

Growers in California set aside portions of their farms for collaborative studies on methyl bromide alternatives for strawberries.

Alternatives to Methyl Bromide

For preplant control of the same spectrum of pests, some potential alternatives to methyl bromide are chloropicrin or Telone (trade name) products containing 1,3-D and chloropicrin, in combination with an herbicide such as napropamide (trade name Devrinol) or metam sodium (trade names Busan, Metam, Sectagon, Vapam). While there has been much research on using 1,3-D/chloropicrin in combination with pebulate (trade name Tillam) in Florida and Southeastern tomato production, this alternative might not be feasible because the pebulate registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) lapsed in December 2002. Metam sodium or other materials might be used where 1,3-D use is restricted to protect air quality or ground water. In addition, researchers are examining the potential use of such herbicides as halosulfuron-methyl (trade names Permit, Sempra) and trifloxysulfuron-sodium (trade name Brawn) in combination with fumigants. Researchers in California are studying the application of Telone, chloropicrin, or metam sodium products through drip irrigation systems to improve efficacy.

To control pests before planting some perennial crops, a year of fallow may be needed in addition to application of chemical alternatives. Dazomet (trade name Basamid) might be used for some nonfood crops, such as forest seedling nurseries. Methyl iodide (or iodomethane) is a potentially effective pesticide alternative, but its use is prohibited until it is registered under the FIFRA.

For some postharvest uses, phosphine (trade names Phostoxin, Magtoxin) and a phosphine/carbon dioxide combination (trade name ECO_2FUME) are potential alternatives. Research continues on other postharvest treatments, such as controlled atmospheres, pressurized carbon dioxide, heat, and cold. Phosphine fumigation and some other potential alternatives require a longer treatment time than methyl bromide fumigation to be effective. As a result, processors might miss higher market prices or might have to invest in additional facilities to treat greater volumes of commodity within a critical timeframe. Also, facilities may require better sealing to prevent phosphine leakage and additional protection or replacement of electrical equipment because of the chemical's corrosive effects on some metals. Sulfuryl fluoride (trade name ProFume) is a promising alternative currently used to fumigate facilities, but residue tolerances must be established before it can be used on stored food commodities.

would no longer be permitted for crop production uses and that only current alternatives would be available. However, continuing research and development and registration of new pesticides may improve the effectiveness of available alternatives or introduce new alternatives that could reduce the effects. For example, the effects estimated by NCFAP and the University of Florida are lower than those from a 1994 USDA report because of progress in developing alternatives and a better understanding of their effects on yields.

USDA has been supporting research to develop alternatives to methyl bromide, spending $17.9 million in 2002. The Agricultural Research Service (ARS), the Cooperative State Research, Education, and Extension Service, and the cooperative Federal-State University IR-4 program fund research on alternatives for soil and postharvest treatments (see box, "Alternatives to Methyl Bromide"). Also, USEPA's Office of Pesticide Programs has given the registration of methyl bromide alternatives its highest priority.

Critical Use Exemptions Will Help Some Users

Some methyl bromide users may be granted Critical Use Exemptions (CUEs) on a yearly basis starting in 2005 because the users may otherwise incur particularly severe losses (see box, "The Methyl Bromide Phaseout"). The CUEs also allow more time for alternatives to be developed and adopted.

The first application period for CUEs in the U.S. occurred in 2002, with many users submitting requests. Among these users were:

- Producers of fruits, vegetables, and other specialty crops,
- Operators of agricultural, ornamental, and forest tree nurseries,
- Firms that process and store dried fruit, nuts, grains, and other commodities.

The countries signing the Montreal Protocol decide which uses of methyl bromide qualify for exemption. Applications filed by U.S. users during 2002 for CUEs for 2005 (and later years) were reviewed by USEPA—with input from experts at USDA, State universities, and other organizations—against the Montreal Protocol criteria. In February 2003, the U.S. Government forwarded a package of CUE nominations to the Ozone Secretariat of the United Nations. The U.S. nominations totaled 21.9 million pounds for 2005 and 20.8 million pounds for 2006, 39 percent and 37 percent, respectively, of the 1991 baseline. The Methyl Bromide Technical Options Committee, an international committee of experts created under the Protocol, reviews the nominations from the U.S. and other developed countries. The signatory countries will authorize exemptions in the fall of 2003, and USEPA will formally allocate CUEs in the U.S. in 2004.

This article is drawn from...

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