**METHYL BROMIDE CRITICAL USE NOMINATION**
**FOR POST HARVEST USE FOR COMMODITIES**

| |
|---|
| FOR ADMINISTRATIVE PURPOSES ONLY:<br>**DATE RECEIVED BY OZONE SECRETARIAT:**<br>YEAR: CUN: |

| | |
|---|---|
| **NOMINATING PARTY:** | The United States of America |
| **BRIEF DESCRIPTIVE TITLE OF NOMINATION:** | Methyl Bromide Critical Use Nomination for Post Harvest Use for Commodities (Submitted in 2006 for 2008 Use Season) |

**NOMINATING PARTY CONTACT DETAILS**


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Following the requirements of Decision IX/6 paragraph (a)(1), the United States of America has determined that the specific use detailed in this Critical use Nomination is critical because the lack of availability of methyl bromide for this use would result in a significant market disruption.

☐ Yes ☐ No

Signature Name Date

Title:

## CONTACT OR EXPERT(S) FOR FURTHER TECHNICAL DETAILS


| | |
|---|---|
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## LIST OF DOCUMENTS SENT TO THE OZONE SECRETARIAT IN OFFICIAL NOMINATION PACKAGE

*List all paper and electronic documents submitted by the Nominating Party to the Ozone Secretariat*

| **1. PAPER DOCUMENTS:** **Title of Paper Documents and Appendices** | **Number of Pages** | **Date Sent to Ozone Secretariat** |
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| **2. ELECTRONIC COPIES OF ALL PAPER DOCUMENTS:** **Title of Electronic Files** | **Size of File (kb)** | **Date Sent to Ozone Secretariat** |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

# *TABLE OF CONTENTS*

# *LIST OF TABLES*

## PART A: SUMMARY

### 1. NOMINATING PARTY

The United States of America (U. S.)

### 2. DESCRIPTIVE TITLE OF NOMINATION:

Methyl Bromide Critical Use Nomination for Post Harvest Use for Commodities (Submitted in 2006 for the 2008 use season)

### 3. SITUATION OF NOMINATED METHYL BROMIDE USE

This sector includes walnuts, dried fruit (prunes, raisins, figs), dates, and dried beans garbanzo and blackeye) produced in California, which are under intense pressure from numerous insect pests. Methyl bromide is being used to treat these commodities in a very short time period, during the peak production season and shortly after harvest, before they can be stored and/or shipped to prevent pests from infesting and degrading the commodity in storage. Most fumigations are made over a few weeks, during the peak production season when the bulk of the harvest is moving into the storage and shipping channels. These periods can be compressed when harvest occurs close to key market windows, such as holiday markets for certain types of dried fruits, nuts, and beans.

### 4. METHYL BROMIDE NOMINATED

**TABLE 4.1: METHYL BROMIDE NOMINATED**

| YEAR | NOMINATION AMOUNT (KG) | VOLUME TREATED (1,000 $M^3$) |
|---|---|---|
| 2008 | 67,699 | 1,749 |

The U. S. nomination is only for those facilities where the use of alternatives is not suitable. For U. S. commodities there are several factors that make the potential alternatives to methyl bromide unsuitable. These include:

- Pest control efficacy of alternatives: the efficacy of alternatives may not be comparable to methyl bromide, making these alternatives technically and/or economically infeasible.
- Constraints of the alternatives: some types of commodities (e.g., those containing high levels of fats and oils) prevent the use of heat as an alternative because of its effect on the final product (e.g., rancidity). In other cases the character of the final product is changed, becoming cooked (toasted) rather than raw nuts, for example.
- Transition to newly available alternatives: Sulfuryl fluoride recently received a Federal registration for dried fruits and nuts. California state registration for dried fruits and tree nuts, but not for use on dates or dry beans, was issued in early 2005. Many of the countries to which the U. S. exports have not yet registered sulfuryl fluoride, severely restricting its use in this sector. All of the dried fruit and nut operations requesting methyl bromide are located in California.
- Longer fumigations: e.g., the use of some methyl bromide alternatives can add a delay to production by requiring additional time to complete the fumigation process. Production

delays can result in significant economic impacts if the delay causes the producers to miss a market window. Longer fumigation periods may not be feasible in situations where there is not excess fumigation capacity i.e. when facilities are in continuous use. In these situations longer fumigations for some products mean that others cannot be fumigated.

## 5. Brief Summary of the Need for Methyl Bromide as a Critical Use

Methyl bromide is needed primarily to treat stored agricultural commodities in a very short period, during the peak production season, shortly after harvest before they can be stored and/or shipped. These treatments prevent field pests from infesting and degrading the commodity in storage. Fumigations must be made over a very short period, during the peak production season when the bulk of the harvest is moving into the storage and shipping channels. These periods can be compressed when harvest occurs close to key market windows, such as holiday markets for certain types of nuts.

Sulfuryl fluoride was registered in California for use in tree nuts and dried fruits (but not for dried beans or dates) in May of 2005. Many of the trade partners for these commodities have not yet registered sulfuryl fluoride for these uses. There is no way to determine at harvest which products will be exported. All the walnuts and dried fruits are fumigated directly out of the field before storage or processing, thus limiting the use of sulfuryl fluoride for these commodities at this time.

The technical and economic feasibility analyses indicate that phosphine alone or combined with carbon dioxide (Eco2fume®) is the only chemical alternative currently available for use on in-shell walnuts, dried fruit, dates, and dried beans. Phosphine fumigation, however, takes longer than methyl bromide and is not a currently feasible alternative when rapid fumigations are needed. Harvest of commodities occurs in autumn, when temperatures are falling, making temperature-dependent phosphine fumigation less likely. These sectors are already using phosphine alone or in combination to the extent that their processing systems and marketing needs allow it. Any additional shifting from methyl bromide to the slower phosphine fumigation would result in disruption of commodity processing during peak production times, lost market windows, and substantial economic losses.

Adoption of not in kind alternatives, such as controlled atmospheres, cold, and carbon dioxide under pressure would require major investments for appropriate treatment units and /or retrofitting of existing warehouses. As with Eco2fume®, these alternatives could not be implemented in the short term without significant investment in new facilities. Estimated costs for treatment facilities are at least as great as building costs for Eco2fume, and do not include costs of land acquisition and development. The dried fruit and nut industries in the United States have reduced the number of methyl bromide fumigations by incorporating many of the alternatives identified by MBTOC, such as implementing IPM strategies, especially sanitation, in storage facilities. Pest populations are monitored using visual inspections, pheromone traps, light traps and electrocution traps. When insect pests are found, plants will attempt to contain the infestation with treatments of low volatility pesticides applied to both surfaces and cracks and crevices. These techniques do not disinfest a facility but are critical in monitoring and managing pests.

Although, in time, the commodity industry will be able to gradually adopt alternatives as these become available, the sudden adoption of the next best alternative, phosphine alone or in combination, would adversely impact the industry's ability to rapidly process commodities during the peak harvest season and to access key market windows. That is, the industry would likely suffer significant economic losses if it were to fully replace methyl bromide with phosphine, mainly because of the cost of production delay. The estimated economic loss as a percentage of net revenue is greater than 100% for the CUE applicants in the commodity sector.

**TABLE A.1: EXECUTIVE SUMMARY***

| | *Walnuts* | *Beans* | *Dried Plum* | *Dates* |
|---|---|---|---|---|
| **Amount of Request** | | | | |
| **2008 (kg)** | 108,046 | 7,342 | 20,412 | 3,464 |
| **Amount of Nomination** | | | | |
| **2008 (kg)** | 43,888 | 4,371 | 17,410 | 2,009 |

* See Appendix A for complete description of how nominated amount was calculated.

## 6. METHYL BROMIDE CONSUMPTION FOR PAST 5 YEARS AND AMOUNT REQUESTED IN THE YEAR(S) NOMINATED:

**TABLE 6.1: METHYL BROMIDE CONSUMPTION FOR THE PAST 5 YEARS AND THE AMOUNT REQUESTED IN THE YEAR(S) NOMINATED (WALNUTS)**

| | Historical Use[1] | | | | | | Requested Use |
|---|---|---|---|---|---|---|---|
| **For each year specify:** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2008** |
| **Amount of MB (kg)** | 81,025 | 68,305 | 77,111 | 67,132 | 93,159 | 83,007 | 137,983 |
| **Volume Treated (1000 $m^3$)** | 1,686 | 1,421 | 1,605 | 1,397 | 1,936 | 1,727 | 2,871 |
| **Dosage Rate (kg/1000 $m^3$)** | 48.06 | 48.06 | 48.06 | 48.06 | 48.13 | 48.06 | 48.06 |
| **Actual (A) or Estimate (E)** | E | E | E | E | E | E | E |

[1] Based on most current information.

**TABLE 6.2: METHYL BROMIDE CONSUMPTION FOR THE PAST 5 YEARS AND THE AMOUNT REQUESTED IN THE YEAR(S) NOMINATED (BEANS)**

| For each year specify: | Historical Use[1] | | | | | | Requested Use |
|---|---|---|---|---|---|---|---|
| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2008 |
| Amount of MB (kg) | 14,734 | 10,620 | 6,577 | 7,564 | 5,409 | 3,334 | 7,342 |
| Volume Treated (1000 m³) | 334 | 241 | 149 | 172 | 123 | 76 | 157 |
| Dosage Rate (kg/1000 m³) | 44.05 | 44.05 | 44.05 | 44.05 | 44.05 | 44.06 | 46.64 |
| Actual (A) or Estimate (E) | E | E | E | E | E | E | E |

[1] Based on most current information.

**TABLE 6.3: METHYL BROMIDE CONSUMPTION FOR THE PAST 5 YEARS AND THE AMOUNT REQUESTED IN THE YEAR(S) NOMINATED (DRIED PLUMS)**

| For each year specify: | Historical Use[1] | | | | | | Requested Use |
|---|---|---|---|---|---|---|---|
| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2008 |
| Amount of MB (kg) | 17,001 | 16,251 | 18,218 | 18,250 | 16,571 | | 20,412 |
| Volume Treated (1000 m³) | 1109 | 684 | 773 | 734 | 804 | | 850 |
| Dosage Rate (kg/1000 m³) | 15.33 | 23.76 | 23,57 | 24.85 | 20.62 | | 24.03 |
| Actual (A) or Estimate (E) | E | E | E | E | E | E | E |

[1] Based on most current information.

**TABLE 6.4: METHYL BROMIDE CONSUMPTION FOR THE PAST 5 YEARS AND THE AMOUNT REQUESTED IN THE YEAR(S) NOMINATED (DATES)**

| For each year specify: | Historical Use[1] | | | | | | Requested Use |
|---|---|---|---|---|---|---|---|
| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2008 |
| Amount of MB (kg) | 2,616 | 2,468 | 2,887 | 3,145 | 1,999 | 2,019 | 3,464 |
| Volume Treated (1000 m³) | 109 | 103 | 120 | 131 | 83 | 84 | 167 |
| Dosage Rate (kg/1000 m³) | 24.03 | 20.03 | 24.03 | 24.03 | 24.03 | 24.03 | 24.03 |
| Actual (A) or Estimate (E) | E | E | E | E | E | E | E |

[1] Based on most current information

## 7. LOCATION OF THE FACILITY OR FACILITIES WHERE THE PROPOSED CRITICAL USE OF METHYL BROMIDE WILL TAKE PLACE

This nomination package represents four commodity sectors, all produced entirely in California: walnuts, dried fruit (prunes, raisins, and figs), and dates. Walnuts are grown and processed primarily in the Sacramento and San Joaquin Valleys. Significant production also occurs in the coastal valleys in the counties of Santa Barbara, San Luis Obispo, Monterey, and San Benito.

The majority of California prunes are grown in the Sacramento Valley. Other production areas in the San Joaquin Valley include primarily Tulare and Fresno counties.

About 99% of California's raisin grape production is in the southern San Joaquin Valley region. Fresno County alone produces about 70% of California's raisins. Merced County is the only northern San Joaquin Valley County with any significant commercial production of raisins.

The San Joaquin Valley is the predominantly fig-producing area in California with Madera, Merced, and Fresno counties leading in production.

Most U.S. dates are grown in California's Coachella Valley, Riverside and Imperial counties.

## PART B: SITUATION CHARACTERISTICS AND METHYL BROMIDE USE

### 8. KEY PESTS FOR WHICH METHYL BROMIDE IS REQUESTED

**TABLE 8.1: KEY PESTS FOR METHYL BROMIDE REQUEST**

<table>
<tr><th>GENUS AND SPECIES FOR WHICH THE USE OF METHYL BROMIDE IS CRITICAL</th><th>COMMON NAME</th><th>SPECIFIC REASON WHY METHYL BROMIDE IS NEEDED</th></tr>
<tr><td>Cydia pomonella</td><td>Codling Moth</td><td rowspan="9">MB is used mainly where rapid fumigations are needed to meet customer timelines during critical market windows and peak production periods. During peak production months, phosphine fumigation takes 3 times longer (6 days) than conventional MB fumigation (2 days) and up to 20 times longer than vacuum MB fumigation (7 hours). The required duration of phosphine fumigation increases as commodity temperature decreases, making its use impractical during the cold winter months. No technically or economically feasible alternatives exist at present during these critical periods. Pest status is due to health hazard: allergens; plus body parts, exuviae, and excretia violate FDA regulations[1].</td></tr>
<tr><td>Amyelois transitella</td><td>Navel Orangeworm</td></tr>
<tr><td>Plodia interpunctella</td><td>Indianmeal Moth</td></tr>
<tr><td>Tribolium castaneum</td><td>Red Flour Beetle</td></tr>
<tr><td>Cadra figulilella</td><td>Raisin Moth</td></tr>
<tr><td>Carpophilus sp.</td><td>Dried Fruit Beetle</td></tr>
<tr><td>Ectomyelois ceratoniae</td><td>Carob Pod Moth</td></tr>
<tr><td>Carpophilus spp., Haptoncus spp.</td><td>Nitidulid Beetles</td></tr>
<tr><td>Callosobruchus maculates</td><td>Cowpea Weevil</td></tr>
</table>

[1] FDA regulations can be found at: http://www.cfsan.fda.gov/~dms/dalbook.html and http://www.fda.gov/opacom/laws/fdcact/fdcact4.htm.

**TABLE B.1: KEY PESTS BY COMMODITY**

| COMMON NAME | WALNUTS | DRIED FRUIT AS SPECIFIED | DATES | BEANS |
|---|---|---|---|---|
| Codling moth | Common | | | |
| Navel orangeworm | Common | | | |
| Indianmeal moth | Common | Common | | |
| Red Flour Beetle | Minor | | | |
| Raisin Moth | | Common | Minor | |
| Dried Fruit Beetle | | Common | | |
| Carob pod moth | | | Common | |
| Nitidulid beetles | | | Common | |
| Cowpea weevil | | | | Common |

**TABLE B.2: CHARACTERISTIC OF SECTOR**

| | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Harvest Material In:** | **Walnuts, Dried Fruit** | | | | | | | | X | X | X | X | |
| | **Dates** | X | | | | | | | | X | X | X | X |
| | **Beans** | | | | | | X | X | | X | X | X | |
| **Fumigation Schedule (MB): All Commodities** | | x | x | x | x | x | x | x | x | X | X | x | x |
| **Retail Target Market Window: All Commodities** | | X | | | | | | | | | X | X | X |

Critical methyl bromide fumigations occur during the peak harvest of the commodities. Other fumigations occur as indicated by monitoring throughout the year.

## 9. SUMMARY OF THE CIRCUMSTANCES IN WHICH METHYL BROMIDE IS CURRENTLY BEING USED

**TABLE 9.1(a.): COMMODITIES**

| **COMMODITY** | **MB DOSAGE** *(Kg/1000 m³)* | **EXPOSURE TIME** *(hours)* | **TEMP.** *(ºC)* | **NUMBER OF FUMIGATIONS PER PRODUCT** | **PROPORTION OF PRODUCT TREATED AT THIS DOSE** | **FIXED** (F) **MOBILE** (M) **STACK** (S) |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **Dried Fruit** | 24 | 24 | Variable | 1 | 100% | F, M |
| **Walnuts** | 56[1] | 24 | Variable | 1 | 100% | F, M |
| **Dates** | 21 | 24 | Variable | 1 | 100% | F, M |
| **Beans** | 47 | 24 | Variable | 1 | 100% | F, M |

**TABLE 9.1(b.): FIXED FACILITIES** *(MB fumigation done mainly in vacuum chambers)*

| COMMODITY | TYPE OF CONSTRUCTION AND APPROXIMATE AGE IN YEARS | VOLUME ($m^3$) OR RANGE | NUMBER OF FACILITIES (E.G. 5 SILOS) | GAS TIGHTNESS ESTIMATE |
|---|---|---|---|---|

[1] MBTOC has asserted that 48g/m$^3$ is adequate for the fumigation of in-shell walnuts. The USG disputes this assertion and offers the following:

SUBJECT: Reducing the dosage used on walnuts for export

TO: Christine Augustyniak
USEPA

FROM: Jim Leesch /s/
Research Entomologist
Commodity Protection & Quality Research Unit

The requested dose of 61g/m3 of methyl bromide is not excessive considering the insect pest of concern. When walnuts are harvested and exported, the most tolerant stage to methyl bromide and the insects of interest are the diapausing larvae of the codling moth, Cydia pomonella hidden inside sound walnuts. Original testing established the treatment schedule at 56g/m3 for 24 hours at atmospheric pressure, which is too long for the walnut industry to hold walnuts being processed for the holiday (Thanksgiving , Christmas and New Years) season. Because a 24 hour exposure was too long, the schedule was changed to conduct the fumigation under vacuum using the same dose but reducing the time to 4 hours. If the time is cut any shorter, then 61 g/m3 is not out of line to assure that all diapausing codling moth larvae are killed. If there is a recommendation that the dosage be reduced below the original 56 g/m3, that would jeopardize the effectiveness of the treatment. Again, if the time were reduced to 3 hours ins
tead of 4 hours, then the dose would have to be adjusted upward to compensate for the reduced contact with the fumigant, so 61 g/m3 is certainly in line and in fact, it may be too low for total kill.

I hope this explanation helps you with your assessment of the recommendations for walnuts. Hope to see you at eh MBAO meetings in San Diego.

United States Department of Agriculture Research, Education and Economics Agricultural Research Service

Commodity Protection & Quality Research Unit San Joaquin Valley Agricultural Sciences Center 9611 S Riverbend Ave, Parlier, CA 93648 KLM[nrs

Jim Leesch: Voice: 559-596-2739 Fax: 559-596-2721
E-mail: jleesch@fresno.ars.usda.gov Pacific West Area

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| | |
|---|---|
| **Dried Fruit** | No information is available as to the type of construction, age, volume, number of facilities, and gas tightness of the diverse types of facilities in this sector. |
| **Walnuts** | |
| **Dates** | |
| **Beans** | |

## 10. LIST ALTERNATIVE TECHNIQUES THAT ARE BEING USED TO CONTROL KEY TARGET PEST SPECIES IN THIS SECTOR

Many of the MBTOC not-in-kind alternatives to methyl bromide are critical to monitoring and managing pest populations, but they are not designed to disinfest commodities for which there is a zero tolerance for insect infestations. The most critical of these for commodities in storage are: sanitation and IPM strategies. Sanitation is important and constantly addressed in management programs. Cleaning and hygiene practices alone do not reduce pest populations, but reportedly improve the efficacy of insecticides or diatomaceous earth (Arthur and Phillips, 2003). The principles of IPM are to utilize all available chemical, cultural, biological, and mechanical pest control practices. These include pheromone traps, electrocution traps**,** and light traps to monitor pest populations. If pests are found in traps, then contact insecticides and low volatility pesticides are applied in spot treatments for surfaces, cracks and crevices, or anywhere the pests may be hiding. These applications are intended to restrict pests from spreading throughout the facility and thus avoid fumigation (Arthur and Phillips, 2003). However, IPM is not designed to completely eliminate pests from any given facility or to ensure that a facility remains free from infestation. Although the U. S. Food and Drug Administration (FDA) allows minimal contamination of food products, there is a zero tolerance for insects imposed by market demands, therefore, neither sanitation nor IPM is acceptable as an alternative to methyl bromide fumigation; but these strategies are used to manage pest populations and extend the time between methyl bromide fumigations.

In addition to sanitation and IPM, most commodity operations in the United States currently use both phosphine, alone and in combination whenever feasible. Phosphine fumigation has proven to be too slow for treating large commodity volumes that need to be processed rapidly. Although phosphine is more suitable for fumigating commodities in storage, where fumigation time is not a factor, its corrosive nature to certain metals limits its use in some processing plants, especially those outfitted with electronic sorting and processing control equipment.

# PART C: TECHNICAL VALIDATION

## 11. SUMMARIZE THE ALTERNATIVE(S) TESTED, STARTING WITH THE MOST PROMISING ALTERNATIVE(S)

### TABLE 11.1: SUMMARY OF THE ALTERNATIVES TESTED

Please see Table 12.1.

## 12. SUMMARIZE TECHNICAL REASONS, IF ANY, FOR EACH ALTERNATIVE NOT BEING FEASIBLE OR AVAILABLE FOR YOUR CIRCUMSTANCES

**TABLE 12.1: SUMMARY OF TECHNICAL REASON FOR EACH ALTERNATIVE NOT BEING FEASIBLE OR AVAILABLE**

| NAME OF ALTERNATIVE | TECHNICAL REASON FOR THE ALTERNATIVE NOT BEING USED |
|---|---|
| **Contact and low volatility insecticides** | Not registered in the U.S. for use on stored commodities. The only insecticides registered for use in storage facilities are for crack and crevice treatment. These fogs, mists, and aerosols are effective only against exposed insects in the facilities and are not designed to penetrate the walnut shell or any kind of bulk commodity (Zettler, 2002). |
| **Ethyl or methyl formate** | Not registered in the U.S. for use on stored commodities. |
| **Ethylene oxide** | Not registered in the U.S. for use on stored commodities. |
| **Phosphine alone or in combination** | In general, phosphine alone or in combination is not suitable to replace methyl bromide when rapid fumigations are needed to meet customer timelines. The delay would disrupt processing of dried fruit and nuts, increasing production costs and interfering with access to the holiday market. Furthermore, phosphine is corrosive to some metals in electric and electronic equipment in processing plants.<br><br>Phosphine fumigation takes 3-10 days, depending on temperature, compared to 1 day for MB (Hartsell et al., 1991, Zettler, 2002, Soderstrom et al., 1984, phosphine labels). An additional 2 days are needed for outgassing phosphine. Phosphine fumigation is least feasible during the colder winter months when, according to label directions, the minimum exposure periods increases to 8-10 days (plus two days for aeration) when commodity temperature decreases to 5°C - 12 °C. Phosphine is not used when commodity temperature drops below 5°C (Phosphine and Eco2fume® labels).<br><br>For walnuts sold as in-shell (approximately 25% of the California production) phosphine fumigation takes too long during the peak production period, when large volumes of walnuts are processed and shipped rapidly. In some cases, however, phosphine has already replaced MB fumigation whenever feasible. For walnuts sold as shelled product, phosphine combined with carbon dioxide (Eco2fume®) is being used for in-storage fumigation by approximately 50% of the industry since 2001. The remaining 50% lack large storage facilities that can be sealed and left for at least five days, the time required to fully disinfest the commodity (California Walnut Commission & Walnut Marketing Board, 2003). |
| **Propylene oxide** | Propylene oxide (PPO) was recently labeled for use on in-shell nuts in California. Because PPO is a volatile, flammable liquid that must be used under vacuum conditions for safety, several years of commercial-scale testing will probably be necessary before this technique is perfected for commercial use. Furthermore, adoption for use on in-shell nuts will be limited by the need to use expensive vacuum chambers. At present, PPO is already being used by the walnut industry to sterilize approximately 20% of bulk shelled walnuts sold for dairy and bakery ingredients, targeting primarily mold and bacteria, and secondarily insects (California Walnut Commission & Walnut Marketing Board, 2003). PPO is not labeled for use on dried fruits. |
| **Sulfuryl fluoride** | Sulfuryl fluoride was registered in United States for use on dried fruit and nuts on January 23, 2004. A California registration for use on tree nuts and dried fruit was issued in May, 2005. The use of this chemical and its accompanying interactive computerized program will require training and licensing of applicators by the manufacturer. Research to date has shown that sulfuryl fluoride is effective against the adult, pupal, and larval stages of target insects, but less effective against the egg stage (Fields and White, 2002, Schneider et al. 2003). The efficacy of this chemical remains to be demonstrated in the field. It may take up to 5 years to validate its use as a methyl bromide replacement and for the necessary industry conversion ( See Section 17.2.1.). Sulfuryl Fluoride is not registered in the major markets where walnuts are exported. Because walnuts are fumigated as they leave the field, and before they are segregated into export and domestic use, the use of sulfuryl fluoride will continue to be restricted until there is an EU registration for sulfuryl fluoride on walnuts. |

| NAME OF ALTERNATIVE | TECHNICAL REASON FOR THE ALTERNATIVE NOT BEING USED |
|---|---|
| **Biological Agents** | The only biological agent available for use in commodities is the granulosis virus, which acts specifically against Indian meal moth larvae (Johnson et al., 1998, Vail et al., 1991, Vail et al., 2002). No effective biological agents are available for use against other commodity pests. The U.S. Food and Drug Administration does not allow the use of predatory or parasitic insects in commodity storage areas. |
| **Cold Treatment** | This technique is unfeasible for use on a commercial scale, especially during harvest when large volumes need to be processed rapidly. Longer treatment times would also interfere with meeting the demands of critical European markets by delaying shipments by 1-3 weeks. For example, at $0^oC$ to $10^oC$ a 4-week exposure time is needed to control the Indian meal moth in stored walnuts (Johnson et al., 1997). Although it has been demonstrated that at $-10^oC$ to $-18^oC$ several insect pests of dates can be controlled in a few hours, (Donahaye et al., 1991, 1995), the slow rate of cold penetration and daily introduction of fresh commodities would interfere with the ability to maintain a constant low temperature throughout storage areas. In California, the grower cooperative Diamond Walnuts (representing approximately 50% of the walnuts grown in that state) alone processes about 3,630 metric tons per day at its Stockton plant during the peak harvest season in September (California Walnut Commission & Walnut Marketing Board, 2003). The longer treatment would also affect the industry's ability to take advantage of national and international market windows. Furthermore, the cost of retrofitting storage facilities and the energy cost required to rapidly cool large volumes of walnuts would be prohibitive. |
| **Controlled/Modified Atmospheres** | Exposure to low oxygen or high carbon dioxide has been shown to effectively control pests of stored dried fruit and nuts in laboratory studies. However, this approach would require a minimum of 2-5 days, depending on temperature (Calderon and Barkai-Golan, 1990, Soderstrom and Brandl, 1984, Tarr et al., 1996), and would not be feasible when commodity needs to be moved rapidly during peak production periods and to meet international market demands. In California, the grower cooperative Diamond Walnuts (representing approximately 50% of the walnuts grown in that state) alone processes about 3,630 metric tons per day at its Stockton plant. Moreover, adopting this alternative would require considerable expenditures for special treatment facilities and retrofitting existing structures. |
| **Cultural practices and Integrated Pest Management** | IPM, which includes cultural practices, is designed to manage pests at low population levels, not to completely eliminate them or prevent infestations. |
| **Heat Treatment** | This approach is not feasible for treating commercial-scale commodity volumes. Under laboratory conditions, brief exposure of commodities to high temperatures may eliminate insects without adversely affecting product quality**.** Most insects do not survive more than 12 hours when exposed to $45^oC$ or more than 5 minutes when exposed to $50^oC$ (Fields, 1992). However, the effectiveness of this approach has not been tested with large volumes of commodities. Substitution of heat treatments where high temperatures are not already used for other applications would require extensive retrofitting of existing facilities, as well as heat delivery systems capable of rapidly and uniformly heating large volumes of walnuts in order to achieve total insect control. Furthermore, walnut quality may be adversely affected by exposure to heat, causing rancidity in walnut kernel oils (California Walnut Commission & Walnut Marketing Board, 2003). According to the California Dried Plum Board (2003), an attempt to use heat treatment commercially with prunes in California not only failed to control target pests, but resulted in several tons of prunes being damaged from heat exposure. |
| **High pressure carbon dioxide** | High-pressure carbon dioxide for commodity treatment requires the availability of small fumigation chambers designed to withstand the required high pressures. The small size of these units would limit the amounts of walnuts that could be treated at any one time, delaying the process and causing critical market windows to be missed. This technique is, therefore, not suitable for use on a commercial scale in U.S. warehouses, where large volumes of walnuts must be processed within relatively short periods. Furthermore, these chambers are not readily available, and the cost of building a large number of them would be prohibitive (Zettler, 2002). |

| NAME OF ALTERNATIVE | TECHNICAL REASON FOR THE ALTERNATIVE NOT BEING USED |
|---|---|
| **Irradiation** | Although rapid and effective, irradiation may result in living insects left in the treated product. Treated insects are sterilized and stop feeding, but are not immediately killed. The high dosages necessary to cause immediate mortality in target insects may reduce product quality. Irradiation affects walnut oils, causing changes in flavor, lowering kernel quality, and shortening walnut shelf life. Irradiation would, furthermore, require major capital expenditures. Moreover, irradiated food is not widely accepted by consumers, adding another element of uncertainty to this method's adoption (California Walnut Commission & Walnut Marketing Board, 2003). |
| **Pest Resistant Packaging** | This measure only prevents reinfestation of finished product, and is not designed to control infestations in bulk commodity storage (Johnson and Marcotte, 1999). |
| **Physical removal/ Cleaning/Sanitation** | This technique is widely used as an IPM component in all dried fruit and nut operations, but by itself not designed to disinfest a commodity. |

**TABLE 12.2: COMMODITY PROCESSING PLANTS – COMPARISON OF ALTERNATIVES TO METHYL BROMIDE FUMIGATION**

| Fumigant | Preparation Time (hr) | Fumigation Time (hrs) | Dissipation Time (hrs) | Total Time (hrs) | Number of Alternative Applications to One MB Application |
|---|---|---|---|---|---|
| **Methyl Bromide** | 24 | 24 | 4 | 52 | -- |
| **Methyl Bromide (in vacuum chamber)** | 1 | 4 | 2 | 7 [1] | -- |
| **Phosphine alone or in combination with $CO_2$** | 24 | 72 - 96 | 48 | 144 - 168 | 2.7 - 3.2 (MB under normal pressure)<br>20.6 - 24 (MB + low pressure) |

[1] During the 3-4 week peak harvest season, many commodity processing plants operate 24 hours a day. Since it takes approximately 7 hours to fumigate a given lot with MB under vacuum, these plants can fumigate 3.4 lots per day per fumigation chamber, thus keeping up with the incoming harvested commodities.

## PART D: EMISSION CONTROL

## 13. HOW HAS THIS SECTOR REDUCED THE USE AND EMISSIONS OF METHYL BROMIDE IN THE SITUATION OF THE NOMINATION?

The dried fruit, bean, and nut industries in the United States have reduced the number of methyl bromide fumigations by incorporating many of the alternatives identified by MBTOC, such as implementing IPM strategies, especially sanitation, in storage facilities. Pest populations are monitored using visual inspections, pheromone traps, light traps and electrocution traps. When insect pests are found, plants will attempt to contain the infestation with treatments of low volatility pesticides applied to both surfaces and cracks and crevices. These techniques do not disinfest a facility but are critical in monitoring and managing pests. Furthermore, the phosphine + $CO_2$ (Eco2fume®) combination is already being used to fumigate a substantial proportion of dried fruit and nuts in storage.

## PART E: ECONOMIC ASSESSMENT

## 14. Costs of Alternatives Compared to Methyl Bromide Over 3-Year Period:

**Table 14.1 Annual Costs of Alternatives Compared to Methyl Bromide Over a 3-Year Period**

| MB and Alternatives | Cost Ratio | Cost in Current Year (US$) | Cost One Year Ago (US$) | Cost 2 Years Ago (US$) |
|---|---|---|---|---|
| Walnuts | | | | |
| Methyl Bromide | 1 | $ 612 | $ 612 | $ 612 |
| Phosphine | 1.10 | $ 674 | $ 674 | $ 674 |
| Dried Fruits | | | | |
| Methyl Bromide | 1 | $ 413 | $ 413 | $ 413 |
| Phosphine | 1.27 | $ 525 | $ 525 | $ 525 |
| Dates | (Not estimated since there are no technically feasible alternatives.) | | | |
| Dried Beans | (Not estimated since there are no technically feasible alternatives.) | | | |

* Costs in this table only include fumigation cost plus electrical corrosive cost due to phosphine. Losses such as reductions in revenue due to lost days are included in Tables E.1 though E.3.
These costs assume one treatment per year with methyl bromide or phosphine.

## 15. Summarize Economic Reasons, if any, for each Alternative NOT being Feasible or Available for your Circumstances

**Table 15.1. Summary of Economic Reasons for each Alternative NOT being Feasible or Available**

| No. | Methyl Bromide Alternative | Economic Reason (if any) for the Alternative not Being Available | Estimated Month/Year when the Economic Constraint could be Solved |
|---|---|---|---|
| 1 | Phosphine | **Economic losses from additional production downtimes due to longer fumigation time and from capital expenditures required to adopt an alternative.** | **Economic losses due to downtime with phosphine are persistent.** |

Economic costs in the post-harvest uses of the commodity sector can be characterized as arising from three contributing factors. First, direct pest control costs increase in most cases because phosphine is more expensive due to increased labor time required for longer treatment time and increased number of treatments. Second, capital expenditures may be required to adopt phosphine for accelerated replacement of plant and equipment due to the corrosive nature of phosphine. Finally, additional production downtimes for the use of alternatives are unavoidable. Many facilities operate at or near full production capacity and alternatives that take longer than methyl bromide or require more frequent application can result in manufacturing slowdowns, shutdowns, and shipping delays. Slowing down production would result in additional costs to the methyl bromide users. The additional economic cost per 1000 $m^3$ was calculated if methyl bromide users had to replace methyl bromide with phosphine.

The four economic measures in Tables E.1 through E.3 were used to quantify the economic impacts to post-harvesting uses for commodities. The four economic measures are not independent of each other since they can be calculated from the same financial data. The measures are, however, supplementary to each other in evaluating the CUE applicant's economic viability. These measures represent different ways to assess the economic feasibility of methyl bromide alternatives for methyl bromide users.

***Net revenue is calculated as gross revenue minus operating costs. This is a good measure as to the direct losses of income that may be suffered by the users. It should be noted that net revenue does not represent net income to the users. Net income, which indicates profitability of an operation of an enterprise, is gross revenue minus the sum of operating and fixed costs. Net income should be smaller than the net revenue measured in this analysis. We did not include fixed costs because it is often difficult to measure and verify.***

A separate analysis was conducted for each sub-sector (described below), and in each case the least cost alternative fumigation system, based on phosphine, was found to be not economically feasible. Production downtime was estimated on average at 84 days per year and total capital expenditures for accelerated replacement of plant and equipment due to corrosive nature of phosphine was assumed to be $1,076 per 1000 m$^3$ with 10-years lifespan with 10% interest rate from the data provided by the CUE applicants for post-harvesting uses. The potential economic losses associated with the use of phosphine mainly originate from the cost of production delay. The estimated economic losses are shown in Tables E.1 through E.3. The estimated economic losses as a percentage of net revenue are over 100% for all the CUE applicants in the commodity sector, which results in negative net revenues with use of phosphine. The industries that use methyl bromide for commodity fumigation are, in general, subject to limited pricing power, changing market conditions, and government regulations. Companies within these industries operate in a highly competitive global marketplace characterized by high sales volume, low profit margins, and rapid turnover of inventories. In addition, companies of this type generally managed by producers' associations and therefore, making new capital investment is often difficult. The results suggest that phosphine is not economically viable as an alternative for methyl bromide.

**Walnuts**

The United States walnut industry operates almost exclusively in California, where approximately 5,300 growers and 51 processors are located. Over the past five years, growers have produced an average of 265,000 tons of walnuts per year on 80,940 hectares in California. The largest processor is the Diamond Cooperative facility in Stockton, California, through which 50 percent of all harvested walnuts in California pass. The other 50 independent handlers operate much smaller facilities that process the remaining 50 percent of California walnuts. Sales of walnuts to Europe accounts for one-fifth of all revenue. Both production and sales peak in the fall in anticipation of the holiday season in December. Fumigation of walnuts takes place during the entire year, but fumigation capacity is primarily a limiting factor immediately after harvest. Approximately 25 percent of walnuts are sold in the shell, and these are usually packed and shipped to European market within a couple of days of the initial fumigation treatment. The remaining 75 percent of walnuts are processed further to create a variety of packaged shelled products. These walnuts must be fumigated before they are put in long-term storage or continue in the processing chain due to the key pests. The U.S. walnut industry already has replaced methyl bromide 70 percent with Eco2fume for in-storage fumigation. Diamond Cooperative has completely converted to using Eco2fume for in-storage fumigation.

The primary scenario for this analysis is based on the Diamond Cooperative facility for processing walnuts in the shell as the representative user using the existing phosphine capacity to treat all walnuts. Given the existing capacity of 1500 tons per day of processing walnuts in the shell, having to rely on phosphine alone would require an additional five days to treat walnuts in the shell. At the processing rate of one lot every five days with phosphine compared with 7-hour turn-around time currently achieved with methyl bromide under vacuum, the processing walnuts in the shell would be only 5 percent or fumigation chamber capacity would need to be expanded to approximately 20 times the existing capacity.

Alternatively, all the walnuts could be stored and processed. However, prices paid to growers would be reduced by the increased supply that would be forced onto the domestic market. Given that the nature of the demand for walnuts is inelastic, the impact of this supply increase is expected to result in a decrease in price to the growers. In addition to the price effect, there are increased costs from using phosphine. Additional expenditures are required to adopt phosphine for accelerated replacement of plant and electronic equipment due to the corrosive nature of phosphine. The net effect of price decreases and cost increases is shown in Table E.1.

Another scenario could represent the cost of building additional fumigation chambers, so that the same amount of commodity could be fumigated during the critical time period, and avoid commodity loss and price declines from missing key market windows. In case of the Diamond plant, it is estimated that a tank farm of ten 1-million pound capacity silos would be required to support substitution of phosphine for on-receipt fumigation of in-shell walnuts alone. The costs of these silos and fumigation chambers were not estimated due to lack of information, but the Diamond Cooperative indicates that there is no space for such a tank farm at the Diamond Cooperative facility, so an offsite location would have to be found; hence there would be the associated costs of land acquisition and development. An environmental impact study would also be required. The Diamond Cooperative estimates that at least three to five years would be required for permitting and development of an offsite fumigation facility.

**Dried Fruit**

California produces 99 percent of the domestic supply and 70 percent of the world's supply of dried plums. California also produces 99 percent of the domestic raisin crop, and 40 percent of world raisin production. California is responsible for nearly all of domestic fig production and 20 percent of global supply. The industry has already replaced 50% methyl bromide with phosphine in processing dried fruits.

The primary scenario for this analysis is based on the representative user using the existing phosphine capacity to treat all dried fruits. U.S. EPA reviewers estimated that having to rely on phosphine alone would require an additional 84 days to treat all dried fruits. In addition to the production loss, there are increased costs from using phosphine. Additional expenditures are required to adopt phosphine for accelerated replacement of plant and electronic equipment due to the corrosive nature of phosphine. The net effect of production losses and cost increases is shown in Table E.3.

**Dates**

An economic analysis was not done for dates because there are no technically feasible alternatives for dates.

**Dried Beans**

An economic analysis was not done for dried beans because there are no technically feasible alternatives for dried beans.

## MEASURES OF ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES

**THESE ANALYSES ASSUME ONE TREATMENT PER YEAR FOR METHYL BROMIDE AND PHOSPHINE**

**TABLE E.1: ANNUAL ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR WALNUT**

| Loss Measure | Methyl Bromide | Phosphine |
|---|---|---|
| Total Commodity Treated (kg/1000 m³) | 320,455 | 320,455 |
| Average Market Price (US$/kg) | $ 1.08 | $ 0.886 |
| Gross Revenue (US$/1000 m³) | $ 346,091 | $ 283,795 |
| Operating Cost (a+b) per 1000 m³ | $ 328,087 | $ 328,149 |
| a) Cost of MB or Alternative | $ 612 | $ 459 |
| b) Other Operating Costs | $ 327,475 | $ 327,690 |
| Net Revenue (US$/ha) (net of operating costs) | $ 18,005 | $ (44,354) |
| Loss measures | | |
| Time Lost (days) | 0 | 84 |
| Loss per 1000 m³ (US$/1000 m³) | $ - | $ 62,358 |
| Loss per Kilogram MB (US$/kg) | $ - | $ 1,299 |
| Loss as a % of Gross Revenue (%) | 0% | 18% |
| Loss as a % of Net Revenue (%) | 0% | 346% |

TIME LOST WITH PHOSPHINE IS ASSUMED TO RESULT IN A LOWER AVERAGE MARKET PRICE FOR WALNUTS BECAUSE LESS WOULD BE TREATED DURING PEAK PRICES, AND INCREASED SUPPLY AT OTHER TIMES WOULD DEPRESS OFF-PEAK PRICES.

**TABLE E.3: ANNUAL ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR DRIED FRUIT**

| Loss Measure | Methyl Bromide | Phosphine |
|---|---|---|
| Total Commodity Treated (kg/1000 m³) | 88,235 | 63,529 |
| Average Market Price (US$/kg) | $ 0.75 | $ 0.75 |
| Gross Revenue (US$/1000 m³) | $ 66,176 | $ 47,647 |
| Operating Cost (a+b) per 1000 m³ | $ 61,741 | $ 57,889 |
| a) Cost of MB or Alternative | $ 413 | $ 310 |
| b) Other Operating Costs | $ 61,328 | $ 57,579 |
| Net Revenue (US$/ha) (net of operating costs) | $ 4,435 | $ (10,242) |
| Loss measures | | |
| Time Lost (days) | 0 | 84 |
| Loss per 1000 m³ (US$/1000 m³) | $ - | $ 14,677 |
| Loss per Kilogram MB (US$/kg) | $ - | $ 612 |
| Loss as a % of Gross Revenue (%) | 0% | 22% |
| Loss as a % of Net Revenue (%) | 0% | 331% |

TIME LOST WITH PHOSPHINE IS ASSUMED TO REDUCE THE TOTAL COMMODITY THAT COULD BE TREATED.

**TABLE E.4: ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR DATE**

An economic analysis was not done for dates because there are no technically feasible alternatives for dates.

**TABLE E.5: ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR DRIED BEANS**

An economic analysis was not done for dried beans because there are no technically feasible alternatives for dried beans.

## PART F: FUTURE PLANS

### 16. PROVIDE A DETAILED PLAN DESCRIBING HOW THE USE AND EMISSIONS OF METHYL BROMIDE WILL BE MINIMIZED IN THE FUTURE FOR THE NOMINATED USE

The Industry is committed to studying how to improve insect control with IPM strategies and sanitation and further reduce the number of methyl bromide fumigations. They are also continuing to pursue research of phosphine to maximize efficiency. The United States government is supporting research in this sector (see Section 17.1) and the United States Environmental Protection Agency (EPA or Agency) has made registering methyl bromide alternatives a priority (see Section 17.2). U.S. EPA registered sulfuryl fluoride for some commodities on January 23, 2004 (see Section 17.2.1) and further expanded the use sites on this label on July 15, 2005. Sulfuryl fluoride was registered for use on dried fruit and tree nuts, but not on dry beans or dates, in the state of California in May, 2005. Many of the applicants are waiting for the foreign countries to which they export to register this product to fully utilize the potential of this compound.

For further details regarding the transition plans for this sector please consult the national management strategy.-+

### 17. PROVIDE A DETAILED PLAN DESCRIBING WHAT ACTIONS WILL BE UNDERTAKEN TO RAPIDLY DEVELOP AND DEPLOY ALTERNATIVES FOR THIS USE:

#### 17.1 Research

The amount of methyl bromide requested for research purposes is considered critical for the development of effective alternatives. Without methyl bromide for use as a standard treatment, the research studies can never address the comparative performance of alternatives. This would be a serious impediment to the development of alternative strategies. The U.S. government estimates that commodities research will require 20 kg per year of methyl bromide for 2005 and 2006. This amount of methyl bromide is necessary to conduct research on alternatives and is in addition to the amounts requested in the submitted CUE applications. One example of this type of research is a study testing the comparative performance of several fumigants for penetration through packing material for control of the Indianmeal moth or confused flour beetle.

To date, the U.S. government has spent U. S.$135.5 million to implement an aggressive research program to find alternatives to methyl bromide under the USDA's Agricultural Research Service (ARS) Methyl Bromide Alternatives program (select Methyl Bromide Alternatives at this web site: http://www.nps.ars.usda.gov).

The post-harvest sector has invested substantial time and funding into research and development of technically and economically feasible alternatives to methyl bromide. Past and current research focuses on the biology and ecology of the pests, primarily insect pests. To implement non-chemical controls and reduce methyl bromide use requires a thorough understanding of the pests in order to exploit their weaknesses. Some of these investigations have studied the effects of temperature and humidity on the fecundity, development, and longevity of a specific species. Other studies have been to determine the structural preferences and microhabitat requirements of a species. Studies of factors affecting population growth (interactions within and among species) have been conducted.

The USDA is continuing to fund research projects in post-harvest pest management. Such activities include:

> **Biology and Management of Food Pests (Oct 2002 - Sep 2007)** to: examine the reproductive biology and behavior of storage weevils, Indianmeal moth, and red and confused flour beetles; determine the influence of temperature on the population growth, mating and development of storage pests, specifically storage weevils, Indian meal moth, and red and confused flour beetles; examine the use of CO2 concentrations within a grain mass to predict storage weevils and flour beetle population growth; and examine the use of alternative fumigants on insect mortality (ozone, sagebrush, Profume).
>
> **Chemically Based Alternatives to Methyl Bromide for Post Harvest and Quarantine Pests (Jul 2000 - Dec 2004)** to: develop quarantine/post harvest control strategies using chemicals to reduce arthropod pests in durable and perishable commodities; develop new fumigants and/or strategies to reduce methyl bromide use; develop technology and equipment to reduce methyl bromide emissions to the atmosphere; develop system approaches for control using chemicals combined with nonchemical methodologies which will yield integrated pest control management programs; and develop methods to detect insect infestations.
>
> Propylene Oxide and Carbon Dioxide: A non-flammable 8% PPO and 92% $CO_2$ mixture is being tested for use as fumigant on dried fruit and nuts. Unlike 100% PPO, this mixture would not require the use of vacuum chambers (Griffith, 2004).

Overall, future research plans for this industry encompass testing alternatives that fumigate rapidly and achieve high mortality rates. So far the most promising of these are sulfuryl fluoride, heat treatments; and various combinations of heat, phosphine, and carbon dioxide. Industry is supportive of and closely follows USDA research on these alternatives.

U. S. efforts to research alternatives for methyl bromide have been increasing as the phase-out has approached. The U. S. is committed to sustaining its research efforts into the future until technically and economically viable alternatives are found for each and every controlled use of methyl bromide. We are also committed to continuing to share our research. Toward that end, for the past several years, key U. S. government agencies have collaborated with industry to host an annual conference on alternatives to methyl bromide. This conference, the Methyl Bromide Alternatives Outreach (MBAO), has become the premier forum for researchers and others to discuss scientific findings and progress in this field.

The following are additional examples of research actions supported by the dried fruit and nuts industry in California, with funding levels in excess of U.S. $1,000,000, and implemented by USDA (California Dried Plum Board, 2003):

- Determination of seasonal prevalence and spatial variation of navel orangeworm.
- Development of pheromone-mediated mating disruption of navel orangeworm and attract-and-kill techniques for nitidulid beetles.
- Determination of the efficacy of propylene oxide: carbon dioxide mixtures against a variety of stored product insects.
- Determination of the loading of MB on activated carbon after repeated use and the effect of high moisture on the sorption process.
- Indianmeal moth granulovirus as an alternative to methyl bromide for protection of dried fruits and nuts.
- Low temperature studies for eggs of Indianmeal moth and navel orangeworm as a component of integrated post harvest systems.
- Optimization of Indianmeal moth trapping.
- Physical treatment for post harvest insects, aimed at determining heat tolerance of moths species, identifying stage and pests species most tolerant to vacuum, and describing response of cowpea weevil eggs to commercial cold storage temperatures.

In addition, the following study is being carried out by the Dried Fruit Association of California and Dow Chemical Company: Sulfuryl fluoride efficacy and residue studies on dry fruit, designed to determine this chemical's effectiveness against dried fruit pests and to develop data for its registration

**17.2 Registration**

While the U.S. government's role to find alternatives is primarily in the research arena, we know that research is only one step in the process. As a consequence, we have also invested significantly in efforts to register alternatives, as well as efforts to support technology transfer and education activities with the private sector.

Since 1997, the Agency has made the registration of alternatives to methyl bromide a high registration priority. Because the Agency currently has more applications pending in its review than the resources to evaluate them, U.S. EPA prioritizes the applications in its registration queue. By virtue of being a top registration priority, methyl bromide alternatives enter the science review process as soon as U.S. EPA receives the application and supporting data rather than waiting in turn for the U.S. EPA to initiate its review.

As one incentive for the pesticide industry to develop alternatives to methyl bromide, the Agency has worked to reduce the burdens on data generation, to the extent feasible while still ensuring that the Agency's registration decisions meet the Federal statutory safety standards. Where appropriate from a scientific standpoint, the Agency has refined the data requirements for a given pesticide application, allowing a shortening of the research and development process for the methyl bromide alternative. Furthermore, Agency scientists routinely meet with prospective methyl bromide alternative applicants, counseling them through the preregistration process to increase the probability that the data is done right the first time and rework delays are minimized

The U.S. EPA has also co-chaired the USDA/U.S. EPA Methyl Bromide Alternatives Work Group since 1993 to help coordinate research, development and the registration of viable alternatives. The work group conducted six workshops in Florida and California (states with the highest use of methyl bromide) with growers and researchers to identify potential alternatives, critical issues, and grower needs covering the major methyl bromide dependent crops and post harvest uses.

This coordination has resulted in key registration issues (such as worker and bystander exposure through volatilization, township caps and drinking water concerns) being directly addressed through USDA's Agricultural Research Service's U. S.$15 million per year research program conducted at more than 20 field evaluation facilities across the country. Also U.S. EPA's participation in the evaluation of research grant proposals each year for USDA's U. S.$2.5 million per year methyl bromide alternatives research has further ensured close coordination between the U.S. government and the research community.

Since 1997, the U.S. EPA has registered the following chemical/use combinations as part of its commitment to expedite the review of methyl bromide alternatives:

- 2000: Phosphine in combination to control stored product insect pests
- 2001: Indianmeal Moth Granulosis Virus to control Indianmeal moth in stored grains

**Sulfuryl Fluoride**

On January 23, 2004, the U. S. EPA registered sulfuryl fluoride as a post-harvest fumigant for dried fruit and tree nuts. Sulfuryl fluoride was registered for these uses in California in May, 2005. While registration for these uses will provide opportunities to reduce methyl bromide use, it must be emphasized that such replacement, if feasible, will only occur gradually over time. The primary hurdle to overcome is that many of these commodities are exported. Unfortunately, our trade partners have not all registered sulfuryl fluoride for these specific uses.

Alternatives must be tested by users and found technically and economically feasible before widespread adoption will occur. As noted by TEAP, a specific alternative, once available may take up to 5 fumigation cycles of use before efficacy can be determined in the specific circumstance of the user. The registrant is requiring that applicators be trained by them before using sulfuryl fluoride (there is a 3-tiered certification system). However, the registrant has been training applicators in California. It may take some time for other potential applicators to be identified and to take this training before the product can be applied in all the specific circumstances of users.

There are also data limitations preventing U.S. EPA, at this time, from estimating the degree to which sulfuryl fluoride might replace methyl bromide use in fumigating dried fruits and nuts. We currently lack the information to evaluate sulfuryl fluoride's performance relative to methyl bromide. We have limited relative product performance data (direct comparisons to methyl bromide), little experience in how well it performs in different facilities and climates over multiple years, limited price data, and limited information on what other costs might be associated with adopting sulfuryl fluoride. Lacking such information, we cannot reach science-based conclusions on the technical and economic feasibility of sulfuryl fluoride at this time.

For these reasons, and given the current state of data, U.S. EPA is refraining from speculating on the degree to which sulfuryl fluoride registrations might lead to amended CUE nominations. At the same time, U.S. EPA commits to carefully studying sulfuryl fluoride use during the next year, with the aim of identifying specific sectors where CUE requests can be modified, once we have (and have analyzed) the necessary data.

Registering potential alternatives is not the end of the process. Potential alternatives must be tested by users and found technically and economically feasible before widespread adoption will occur. Also, countries to which we export must also have registered the alternatives for the same uses. As noted by TEAP, a specific alternative, once available may take two or three cropping seasons of use before efficacy can be determined in the specific circumstance of the user. In an effort to speed adoption of alternatives, the U.S. government has also been involved by promoting technology transfer, experience transfer, and private sector training.

## 18. Additional Comments

### Pheromone Traps

“One misconception about pheromone traps is that a pest population can be controlled by deploying these traps—that is not true for most situations. Traps usually attract only a small percentage of the population that is within the effective range of the trap. Also, female-produced sex pheromones attract only males; the females that lay eggs and perpetuate the infestation are not affected. Since males of the many insect species will mate with multiple females, any males that are not trapped can easily contribute to the production of a subsequent generation of pests. New methods are being researched for using pheromones in pest suppression, but current uses of pheromone traps are best used only for monitoring purposes.” (Arthur and Phillips 2003)

### Sulfuryl Fluoride

There are some industry concerns regarding sulfuryl fluoride. Primarily that it is temperature dependent and that higher concentrations are necessary to kill eggs of insect pests. The post harvest industry is very concerned about the price of sulfuryl fluoride at these concentrations required to control all life stages of pests, especially when temperatures are low.

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## APPENDIX A. 2008 METHYL BROMIDE USAGE NEWER NUMERICAL INDEX

| 2008 Methyl Bromide Usage Newer Numerical Index - BUNNI | | | California Bean Shippers | California Dried Plum Board | California Walnut Commission | California Date Commission | Sector Total or Average | Notes |
|---|---|---|---|---|---|---|---|---|
| January 24, 2006 | Region | | California Bean Shippers | California Dried Plum Board | California Walnut Commission | California Date Commission | Sector Total or Average | Notes |
| Dichotomous Variables | Currently Use Alternatives? | | Yes | Yes | Yes | Yes | | |
| | Pest-free Requirements? | | Yes | Yes | Yes | Yes | | |
| Other Issues | Frequency of Treatment of Product | | 1 | 1 | 2 | 1 | | |
| | Quarantine & Pre-Shipment Removed? | | Yes | Yes | Yes | Yes | | |
| Most Likely Combined Impacts (%) | Regulatory Issues (%) | | 0% | 0% | 0% | 0% | | |
| | Key Pest Distribution (%) | | 100% | 100% | 100% | 100% | | |
| | **Total Combined Impacts (%)** | | **100%** | **100%** | **100%** | **100%** | | |
| Most Likely Baseline Transition | (%) Able to Transition | | 0% | 0% | 0% | 0% | | |
| | Minimum # of Years Required | | 0 | 0 | 0 | 0 | | |
| | **(%) Able to Transition per Year** | | **0%** | **0%** | **0%** | **0%** | | |
| EPA Adjusted Use Rate (kg/1000m3) | | | 44 | 23 | 56 | 21 | | |
| 2008 Applicant Requested Usage | *Amount - Pounds* | *Pounds* | *16,187* | *45,000* | *304,200* | *7,637* | *373,024* | |
| | *Volume - 1000ft$^3$* | | *5,560* | *30,000* | *101,400* | *5,901* | *142,861* | |
| | *Rate (lb/1000ft$^3$)* | | *2.91* | *1.50* | *3.00* | *1.29* | *3* | |
| | **Amount - Kilograms** | Metric | **7,342** | **20,412** | **137,983** | **3,464** | **169,201** | |
| | Volume - 1000m$^3$ | | 157 | 850 | 2,871 | 167 | 4,045 | |
| | Rate (kg/1000m$^3$) | | 47 | 24 | 48 | 21 | 42 | |
| **EPA Preliminary Value** | | **kgs** | **7,070** | **18,234** | **45,401** | **3,016** | **73,721** | |
| EPA Baseline Adjusted Value has been adjusted for: | | | MBTOC Adjustments, QPS, Double Counting, Growth, Use Rate, Miscellaneous Adjustments, and Combined Impacts | | | | | |
| EPA Baseline Adjusted Value | | kgs | 4,371 | 17,410 | 43,888 | 2,009 | 67,679 | |
| EPA Transition Amount | | kgs | - | - | - | - | - | |
| **Most Likely Impact Value (kgs)** | | kgs | **4,371** | **17,410** | **43,888** | **2,009** | **67,679** | |
| | | 1000m$^3$ | **99** | **769** | **784** | **97** | **1,749** | |
| | | Rate | **44** | **23** | **56** | **21** | **39** | |
| **Sector Research Amount (kgs)** | | | **20** | **2008 Total US Sector Nomination** | | | **67,699** | |

1 Pound = 0.453592 kgs; 1000 cubic feet= 0.028316847 1000 cubic meters

1 lb/1000 ft$^3$ = 0.0624 kg/1000 m$^3$; (ounces/1000 ft$^3$ ~ kg/1000 m$^3$)

**Footnotes for Appendix A:**

Values may not sum exactly due to rounding.

1. **Dichotomous Variables** – dichotomous variables are those which take one of two values, for example, 0 or 1, yes or no. These variables were used to categorize the uses during the preparation of the nomination.
2. **Currently Use Alternatives** – Currently use alternatives is 'yes' if the applicant uses alternatives for some portion of pesticide use on the crop for which an application to use methyl bromide is made.
3. **Pest-free Requirements** - This variable is a 'yes' when the product must be pest-free in order to be sold either because of U.S. sanitary requirements or because of consumer acceptance.
4. **Other Issues**.- Other issues is a short reminder of other elements of an application that were checked
5. **Frequency of Treatment of Product** – This indicates how often methyl bromide is applied in the sector. Frequency varies from multiple times per year to once in several decades.
6. **Quarantine and Pre-Shipment Removed?** – This indicates whether the Quarantine and pre-shipment (QPS) hectares subject to QPS treatments were removed from the nomination.
7. **Most Likely Combined Impacts (%)** – Adjustments to requested amounts were factors that reduced to total amount of methyl bromide requested by factoring in the specific situations were the applicant could use alternatives to methyl bromide. These are calculated as proportions of the total request. We have tried to make

the adjustment to the requested amounts in the most appropriate category when the adjustment could fall into more than one category.

8. **Regulatory Issues (%)** - Regulatory issues (%) is the percent (%) of the requested area where alternatives cannot be legally used (e.g., township caps) pursuant to state and local limits on their use.
9. **Key Pest Distribution (%)** - Percent (%) of the requested area with moderate to severe pest problems. Key pests are those that are not adequately controlled by MB alternatives. For structures/ food facilities and commodities, key pests are assumed to infest 100% of the volume for the specific uses requested in that 100% of the problem must be eradicated.
10. **Total Combined Impacts (%)** - Total combined impacts are the percent (%) of the requested area where alternatives cannot be used due to key pest, regulatory, and new fumigants. In each case the total area impacted is the conjoined area that is impacted by any individual impact. The effects were assumed to be independently distributed unless contrary evidence was available (e.g., affects are known to be mutually exclusive).
11. **Most Likely Baseline Transition** – Most Likely Baseline Transition amount was determined by the DELPHI process and was calculated by determining the maximum share of industry that can transition to existing alternatives.
12. **(%) Able to Transition** – Maximum share of industry that can transition
13. **Minimum # of Years Required** – The minimum number of years required to achieve maximum transition.
14. **(%) Able to Transition per Year** – The Percent Able to Transition per Year is the percent able to transition divided by the number of years to achieve maximum transition.
15. **EPA Adjusted Use Rate** - Use rate is the lower of requested use rate for 2008 or the historic average use rate or is determined by MBTOC recommended use rate reductions.
16. **2008 Amount of Request** – The 2008 amount of request is the actual amount requested by applicants given in total pounds active ingredient of methyl bromide, total volume of methyl bromide use, and application rate in pounds active ingredient of methyl bromide per 1,000 cubic feet. U.S. units of measure were used to describe the initial request and then were converted to metric units to calculate the amount of the US nomination.
17. **EPA Preliminary Value** – The EPA Preliminary Value is the lowest of the requested amount from 2005 through 2008 with MBTOC accepted adjustments (where necessary) included in the preliminary value.
18. **EPA Baseline Adjusted Value** – The EPA Baseline Adjusted Value has been adjusted for MBTOC adjustments, QPS, Double Counting, Growth, Use Rate/ Strip Treatment, Miscellaneous adjustments, and Combined Impacts.
19. **EPA Transition Amount** – The EPA Transition Amount is calculated by removing previous transition amounts since transition was introduced in 2007 and removing the amount of the percent (%) Able to Transition per Year multiplied by the EPA Baseline Adjusted Value.
20. **Most Likely Impact Value** – The qualified amount of the initial request after all adjustments have been made given in total kilograms of nomination, total volume of nomination, and final use rate of nomination.
21. **Sector Research Amount** – The total U.S. amount of methyl bromide needed for research purposes in each sector.
22. **Total US Sector Nomination** - Total U.S. sector nomination is the most likely estimate of the amount needed in that sector.