# METHYL BROMIDE CRITICAL USE NOMINATION FOR TRAYS TO PRODUCE TOBACCO TRANSPLANTS

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

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|---|---|
| **NOMINATING PARTY:** | The United States of America |
| **BRIEF DESCRIPTIVE TITLE OF NOMINATION:** | Methyl Bromide Critical Use Nomination for Trays to Produce Tobacco Transplants |

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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.

X Yes ☐ No

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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 |
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## PART A: SUMMARY

### 1. NOMINATING PARTY

The United States of America (U.S.)

### 2. DESCRIPTIVE TITLE OF NOMINATION

Methyl Bromide Critical Use Nomination for Trays to Produce Tobacco Transplants

### 3. CROP AND SUMMARY OF CROP SYSTEM

Over the past 15 years, most tobacco producers in the U.S. have transitioned from seedlings produced in methyl bromide-fumigated soil beds to containerized-seedling production in greenhouses and outdoor "float beds". This includes production in the states of North Carolina, South Carolina, Georgia, Virginia, Florida, Missouri, West Virginia, Alabama, Arkansas, Illinois and Kansas. The direct-seeded float system, using polystyrene trays, provides plants with water and nutrients through a waterbed and is the most common method of tobacco transplant production. Direct seeded systems use a variety of commercially prepared and sanitized media. The most common media contains 50% peat and 50% vermiculite and are generally sterilized using steam treatments. Seedlings are germinated in the same polystyrene trays from which they will be transplanted, thereby eliminating the task of seedling transfer from a starter tray to the float tray. Direct seeding is also less labor intensive than transferring starter plugs into a tray. When plants reach transplant size, they are immediately transplanted to the field to avoid disease development. Soil contact is avoided between float bed and trays as many tobacco diseases are soil-borne.

### 4. METHYL BROMIDE NOMINATED

**TABLE 4.1: METHYL BROMIDE NOMINATED**

| YEAR | NOMINATION AMOUNT (KG) | NOMINATION VOLUME (1000 $M^3$) |
|---|---|---|
| **2006** | **4,112** | **86** |

### 5. BRIEF SUMMARY OF THE NEED FOR METHYL BROMIDE AS A CRITICAL USE

Over the past 15 years, tobacco producers have transitioned from seedlings produced in methyl bromide-fumigated soil beds to containerized-seedling production in greenhouses and outdoor "float beds." This has resulted in a massive reduction in methyl bromide use for tobacco production. However, while use of methyl bromide in polystyrene float tray tobacco seedling production is minimal, it is a critical use. As a result of high plant density and high moisture conditions in float tray systems, which favor the development and spread of seedling diseases, float bed trays can become highly contaminated with a wide range of fungal pathogens. Float trays must be disinfected of potentially crop threatening pathogens prior to reuse during a subsequent season. Methyl bromide fumigation of the trays is the most practical and effective means to control the target pathogens.

**TABLE A.1: EXECUTIVE SUMMARY FOR TOBACCO TRAYS**

| Region | *Tray Tobacco* |
|---|---|
| **Amount of Nomination** | |
| **2006 Kilograms** | 4,112 |
| **Application Rate (kg/1000 M$^3$)** | 48 |
| **Volume (1000 M$^3$)** | 86 |
| **Amount of Applicants Request** | |
| **2005 Kilograms** | 10,942 |
| **Application Rate (kg/1000 M$^3$)** | 48 |
| **Volume (1000 M$^3$)** | 228 |
| **2006 Kilograms** | 10,942 |
| **Application Rate (kg/1000 M$^3$)** | 48 |
| **Volume (1000 M$^3$)** | 228 |
| **Economics** | |
| **Marginal Strategy** | **Steam** |
| **Yield Loss (%)** | 0%* |
| **Loss per hectare (US$/ha)** | $1,142 |
| **Loss per kg Methyl Bromide (US$/kg)** | $340 |
| **Loss as % of Gross Revenue (%)** | 11% |
| **Loss as % of Net Revenue (%)** | 12% |

*Additional costs are due to price of conversion to steam.

## 6. SUMMARIZE WHY KEY ALTERNATIVES ARE NOT FEASIBLE:

Heat treatment, steaming, commonly deforms polystyrene trays used in float bed seedling production. Tobacco growers tend to avoid the high temperatures and/or times needed for heat to be effective, therefore, efficacy against the target pathogens cannot be guaranteed. In addition, most tobacco farms are not setup to use heat sterilization to sanitize transplant trays and would incur significant costs to establish such a system. Bleach and disinfectants are much less effective than methyl bromide or heat treatment and can result in serious plant phytotoxicity issues, worker exposure concerns, and environmental concerns (disposal of disinfectant solutions). Discarding and purchasing new trays each year presents serious environmental disposal problems and is a more costly alternative. Routine use of fungicides is not a sound practice because of resistance management issues as these same pathogens are also major field pathogens. Early use of available fungicides during seedling production could limit their effectiveness during field production of tobacco. In addition, transplant market is not sufficiently large to support the labeling of new products and the liability is high. Minor Crop-Use funding is not allowed to pursue registration.

## 7. (*i*) PROPORTION OF CROPS GROWN USING METHYL BROMIDE

**TABLE 7.1: PROPORTION OF CROPS GROWN USING METHYL BROMIDE**

| REGION WHERE METHYL BROMIDE USE IS REQUESTED | TOTAL CROP AREA (2001 AND 2002 AVERAGE (HA)) | PROPORTION OF TOTAL CROP AREA TREATED WITH METHYL BROMIDE (%) |
|---|---|---|
| **Tobacco Transplant Trays** | Not applicable. | Not available because of overlapping use of field and tray grown transplants. |
| **NATIONAL TOTAL:** | Not available. | Not available. |

## 7. (*ii*) IF ONLY PART OF THE CROP AREA IS TREATED WITH METHYL BROMIDE, INDICATE THE REASON WHY METHYL BROMIDE IS NOT USED IN THE OTHER AREA, AND IDENTIFY WHAT ALTERNATIVE STRATEGIES ARE USED TO CONTROL THE TARGET PATHOGENS AND WEEDS WITHOUT METHYL BROMIDE.

Not applicable as only the float trays are treated with methyl bromide.

## 7. (*iii*) WOULD IT BE FEASIBLE TO EXPAND THE USE OF THESE METHODS TO COVER AT LEAST PART OF THE CROP THAT HAS REQUESTED USE OF METHYL BROMIDE? WHAT CHANGES WOULD BE NECESSARY TO ENABLE THIS?

No, methyl bromide is critical to ensure pathogen free transplants.

## 8. Amount of Methyl Bromide Requested for Critical Use

**Tray Tobacco - Table 8.1: Amount of Methyl Bromide Requested for Critical Use**

| **United States** | | |
|---|---|---|
| **Year of Exemption Request** | **2005** | **2006** |
| Kilograms of Methyl Bromide | 10,942 | 10,942 |
| Use: Flat Fumigation or Strip/Bed Treatment | Transplant Trays | Transplant Trays |
| **Formulation** *(ratio of methyl bromide/chloropicrin mixture)* to be used for the CUE | 98/2 | 98/2 |
| Total Area to be treated with the methyl bromide or methyl bromide/Chloropicrin formulation *(1000 $m^3$)* | 228 | 228 |
| Application rate* *(g/ $m^3$ )* for the **formulation** | 49.04 | 49.04 |
| Dosage rate* *(g/$m^3$)* of **formulation** used to calculate requested kilograms of methyl bromide | 49.04 | 49.04 |
| Application Rate (*g/ $m^3$*) for the **active ingredient** | 48.06 | 48.06 |
| Dosage rate* *(g/$m^3$)* of **active ingredient** used to calculate requested kilograms of methyl bromide | 48.06 | 48.06 |

** For Flat Fumigation treatment application rate and dosage rate may be the same.*

## 9. Summarize Assumptions Used to Calculate Methyl Bromide Quantity Nominated for Each Region:

The amount of methyl bromide nominated by the U.S. was calculated as follows:

- Only the tobacco acreage using float tray seedling production is included in the nomination.
- Growth or increasing production (the amount requested by the applicant that is greater than that historically treated) was subtracted. The applicants that included growth in their request had the growth amount removed.
- Quarantine and pre-shipment (QPS) hectares is the area in the applicant's request subject to QPS treatments. QPS amounts were removed from the request.

**TABLE A.2: 2006 SECTOR REQUEST – TOBACCO TRAYS***

| 2005 (Sector) Request | | State/Tobacco Transplant Trays |
|---|---|---|
| **Applicant Request for 2005** | **Kilograms** | 10,942 |
| | **Application Rate (kg/1000 $M^3$)** | 48 |
| | **Volume (1000 $M^3$)** | 228 |

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

**TABLE A.3: 2006 SECTOR NOMINATION***

| 2006 (Sector) Nomination | | State/Tobacco Transplant Trays |
|---|---|---|
| **Applicant Request for 2006** | **Kilograms** | 10,942 |
| | **Application Rate (kg/1000 $M^3$)** | 48 |
| | **Volume (1000 $M^3$)** | 228 |
| **CUE Nominated for 2006** | **Kilograms** | 4,112 |
| | **Application Rate (kg/1000 $M^3$)** | 48 |
| | **Volume (1000 $M^3$)** | 86 |

| | | |
|---|---|---|
| **2006 Sector Nomination Totals** | Overall Reduction (%) | 62% |
| | **Total 2006 U.S. Sector Nominated Kilograms (kg)** | **4,112** |

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

## TOBACCO TRANSPLANT TRAYS - PART B: CROP CHARACTERISTICS AND METHYL BROMIDE USE

### TOBACCO TRANSPLANT TRAYS - 10. KEY DISEASES AND WEEDS FOR WHICH METHYL BROMIDE IS REQUESTED AND SPECIFIC REASONS FOR THIS REQUEST

**TOBACCO TRANSPLANT TRAYS - TABLE 10.1: KEY DISEASES AND WEEDS AND REASON FOR METHYL BROMIDE REQUEST**

| REGION WHERE METHYL BROMIDE USE IS REQUESTED | KEY DISEASE(S) AND WEED(S) TO GENUS AND, IF KNOWN, TO SPECIES LEVEL | SPECIFIC REASONS WHY METHYL BROMIDE IS NEEDED |
|---|---|---|

| | | |
|---|---|---|
| Tobacco Transplant Trays | *Rhizoctonia spp.*<br>*Pytheium and Phytopthora spp.*<br>Thielaviopsis basicola<br>Soil fungi and bacteria | No effective alternative controls available. |

## TOBACCO TRANSPLANT TRAYS - 11. (*i*) CHARACTERISTICS OF CROPPING SYSTEM AND CLIMATE

**TOBACCO TRANSPLANT TRAYS - TABLE 11.1: CHARACTERISTICS OF CROPPING SYSTEM**

| CHARACTERISTICS | TOBACCO TRAYS |
|---|---|
| **CROP TYPE:** *(e.g. transplants, bulbs, trees or cuttings)* | Transplant production |
| **ANNUAL OR PERENNIAL CROP:** *(# of years between replanting)* | Annual (1 year) |
| **TYPICAL CROP ROTATION** *(if any)* **AND USE OF METHYL BROMIDE FOR OTHER CROPS IN THE ROTATION:** *(if any)* | Not applicable. |
| **SOIL TYPES:** *(Sand, loam, clay, etc.)* | Hydroponic (50% peat and 50% vermiculite) |
| **FREQUENCY OF METHYL BROMIDE FUMIGATION:** *(e.g. every two years)* | Yearly |
| **OTHER RELEVANT FACTORS:** | Item to be treated is polystyrene transplant trays. |

**TOBACCO TRANSPLANT TRAYS - TABLE 11.2 CHARACTERISTICS OF CLIMATE AND CROP SCHEDULE**

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEPT | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLIMATIC ZONE** *(e.g. temperate, tropical)* | 6a and 6b plant hardiness zones. | | | | | | | | | | | |
| **RAINFALL*** *(mm)* | 60.7 | 34.8 | 192.5 | 134.1 | 109.0 | 68.7 | 44.7 | 74.2 | 138.2 | 165.6 | 126.7 | 103.6 |
| **OUTSIDE TEMP.** *(°C)** | 3.2 | 3.2 | 6.9 | 14.3 | 16.2 | 23.6 | 26.2 | 25.6 | 22.3 | 13.3 | 5.9 | 2.0 |
| **FUMIGATION SCHEDULE**** | X | X | | | X | X | | | | | | |
| **PLANTING SCHEDULE** | Not relevant | | | | | | | | | | | |
| **KEY MARKET WINDOW** | Not relevant | | | | | | | | | | | |

* Kentucky data provided as representative of the growing region

** Not applicable to transplant tray seedling production. Fumigation may occur directly prior to tray use or at the end of the previous growing season.

## TOBACCO TRAYS – 11. (*ii*) INDICATE IF ANY OF THE ABOVE CHARACTERISTICS IN 11. (*i*) PREVENT THE UPTAKE OF ANY RELEVANT ALTERNATIVES?

None were identified as being relevant factors.

## TOBACCO TRAYS - 12. HISTORIC PATTERN OF USE OF METHYL BROMIDE, AND/OR MIXTURES CONTAINING METHYL BROMIDE, FOR WHICH AN EXEMPTION IS REQUESTED

**TOBACCO TRAYS - TABLE 12.1 HISTORIC PATTERN OF USE OF METHYL BROMIDE**

| FOR AS MANY YEARS AS POSSIBLE AS SHOWN SPECIFY: | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|
| VOLUME TREATED *(1,000 cubic meters)* | 185 | 197 | 227 | 226 | 216 | 216 |
| RATIO OF FLAT FUMIGATION METHYL BROMIDE USE TO STRIP/BED USE IF STRIP TREATMENT IS USED | Not relevant (Trays are fumigated). | | | | | |
| AMOUNT OF METHYL BROMIDE ACTIVE INGREDIENT USED *(total kilograms)* | 9,399 | 10,084 | 11,592 | 11,484 | 11,001 | 10,974 |
| FORMULATIONS OF METHYL BROMIDE *(methyl bromide /chloropicrin)* | 98:2 | 98:2 | 98:2 | 98:2 | 98:2 | 98:2 |
| METHOD BY WHICH METHYL BROMIDE APPLIED *(e.g. injected at 25cm depth, hot gas)* | Gas | Gas | Gas | Gas | Gas | Gas |
| APPLICATION RATE OF FORMULATIONS IN $g/m^3$ * | 48.3 | 50.5 | 50.5 | 50.5 | 50.5 | 50.5 |
| ACTUAL DOSAGE RATE OF FORMULATIONS IN $g/m^3$ * | 48.3 | 50.5 | 50.5 | 50.5 | 50.5 | 50.5 |
| APPLICATION RATE OF ACTIVE INGREDIENT IN $g/m^3$ * | 47.4 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 |
| ACTUAL DOSAGE RATE OF ACTIVE INGREDIENT IN $g/m^3$ * | 47.4 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 |

** For Flat Fumigation treatment application rate and dosage rate may be the same.*

## Tobacco Trays - PART C: TECHNICAL VALIDATION

## TOBACCO TRAYS - 13. REASON FOR ALTERNATIVES NOT BEING FEASIBLE

**TOBACCO TRAYS – TABLE 13.1: REASON FOR ALTERNATIVES NOT BEING FEASIBLE**

| NAME OF ALTERNATIVE | TECHNICAL AND REGULATORY* REASONS FOR THE ALTERNATIVE NOT BEING FEASIBLE OR AVAILABLE | IS THE ALTERNATIVE CONSIDERED COST EFFECTIVE? |
|---|---|---|
| **CHEMICAL ALTERNATIVES** | | |
| Etridizole | Etridizole has not been shown to be effective against *Rhizoctonia spp.* and does not provide adequate control of *Phytophthora spp*. (major cause of damping off in tobacco transplants). | No |
| Sanitizers and disinfectants (chlorine and quaternary ammonia) | Not as effective as they do not penetrate the spaces with the polystyrene trays to kill fungal pathogens. Phytoxicity problems. Worker safety concerns. Environmental concerns. | No |
| **NON CHEMICAL ALTERNATIVES** | | |
| Biofumigation | Not applicable as still experimental. | No |
| Purchase new trays | Cost prohibitive. Environmental problems associated with disposal of large quantities of polystyrene trays | No |
| Steam sterilization | Fixed costs for the average grower make this prohibitive. Trays are easily damaged to the point of being unusable by this system. | No |
| Solarization | Unacceptable tray damage and unacceptable disease control. | No |
| Irradiation | No data has been found which indicates that irradiation is effective and does not damage the polystyrene trays. Economically infeasible due to high cost of irradiation plus transportation to the facility. | No |
| Resistant cultivars | Already used but not sufficient disease control by themselves against any of these pathogen in a seed situation. In fact, using resistant varieties for this purpose could result in widespread field development of the disease by harboring the pathogens at low levels in a hidden state. It is more desirable for black shank to appear prior to transplanting so that infected plants will not be transferred into the production fields. | No |
| **COMBINATIONS OF ALTERNATIVES** | | |
| No combinations identified. | | |

** Regulatory reasons include local restrictions (e.g. occupational health and safety, local environmental regulations) and lack of registration.*

## TOBACCO TRAYS - 14. LIST AND DISCUSS WHY REGISTERED *(and Potential)* PESTICIDES AND HERBICIDES ARE CONSIDERED NOT EFFECTIVE AS TECHNICAL ALTERNATIVES TO METHYL BROMIDE:

**TOBACCO TRAYS – TABLE 14.1: TECHNICALLY INFEASIBLE ALTERNATIVES DISCUSSION**

| NAME OF ALTERNATIVE | DISCUSSION |
|---|---|
| None | There are no available alternatives for the control of fungal pathogens. |

## TOBACCO TRAYS - 15. LIST PRESENT *(and Possible Future)* REGISTRATION STATUS OF ANY CURRENT AND POTENTIAL ALTERNATIVES:

**TOBACCO TRAYS – TABLE 15.1: PRESENT REGISTRATION STATUS OF ALTERNATIVES**

| NAME OF ALTERNATIVE | PRESENT REGISTRATION STATUS | REGISTRATION BEING CONSIDERED BY NATIONAL AUTHORITIES? (Y/N) | DATE OF POSSIBLE FUTURE REGISTRATION: |
|---|---|---|---|
| Iodomethane | Not-registered | Y | Unknown |
| Fosthiazate | Not-registered | Y | Unknown |
| Furfural | Not-registered | Y | Unknown |
| Sodium azide | Not-registered. No registration package has been received. | N | Unknown |
| Propargyl bromide | Not-registered. No registration package has been received. | N | Unknown |
| Diallyl sulfide | Registered to control *Sclerotinia* fungus, but label does not include float bed systems. | N | Unknown |

**TOBACCO TRAYS - 16. STATE RELATIVE EFFECTIVENESS OF RELEVANT ALTERNATIVES COMPARED TO METHYL BROMIDE FOR THE SPECIFIC KEY TARGET PESTS AND WEEDS FOR WHICH IT IS BEING REQUESTED**

**TOBACCO TRAYS – TABLE 16.1: EFFECTIVENESS OF ALTERNATIVES – *Rhizoctonia spp.***

| KEY PEST: KEY PEST 1 | AVERAGE DISEASE % OR RATING AND YIELDS IN PAST 3~5 YEARS | | | | |
|---|---|---|---|---|---|
| METHYL BROMIDE FORMULATIONS AND ALTERNATIVES | # OF TRIALS | DISEASE (% OR RATING) | # OF TRIALS | ACTUAL YIELDS (T/HA) | CITATION |
| Methyl bromide (5.07 g/$m^3$ , gas) | 1 | 0% | | | Gutierrez et al. |
| New trays | 1 | 0% | | | Gutierrez et al. |
| Heat (steam) | 1 | 0% | | | Gutierrez et al. |
| Heat (dry) | 1 | 56% | | | Gutierrez et al. |
| Disinfectants (chlorine) | 1 | 56% | | | Gutierrez et al. |

Gutierrez, WA, HD Shew and TA Melton. 1997. Plant Disease 81:604-606.

**TOBACCO TRAYS – TABLE C.1: ALTERNATIVES YIELD LOSS DATA SUMMARY**

| ALTERNATIVE | LIST TYPE OF PEST | RANGE OF YIELD LOSS | BEST ESTIMATE OF YIELD LOSS |
|---|---|---|---|
| New trays | pathogen | 0% | 0% |
| Heat (steam) | pathogen | 0% | 0% |
| Heat (dry) | pathogen | 55 - 100% * | 70% |
| Disinfectants | pathogen | 55 - 100% * | 70% |
| **OVERALL LOSS ESTIMATE FOR ALL ALTERNATIVES TO PESTS** | | | **70%*** |

*Though Guitierrez et al show a 56% yield loss, losses can reach 100% as producers will not purchase seedlings from float bed production facilities that may be potentially infected.

**TOBACCO TRAYS - 17. ARE THERE ANY OTHER POTENTIAL ALTERNATIVES UNDER DEVELOPMENT WHICH ARE BEING CONSIDERED TO REPLACE METHYL BROMIDE?**

No. Transplant market is not sufficiently large to support labeling products and liability is high. Minor Crop-Use funding is not allowed for tobacco. Pesticide companies are not interested in labeling pesticides on tobacco for disease control due to economic and image issues.

**TOBACCO TRAYS 18. ARE THERE TECHNOLOGIES BEING USED TO PRODUCE THE CROP WHICH AVOID THE NEED FOR METHYL BROMIDE?:**

Tobacco farmers have reduced methyl bromide use by over 95% by moving from field transplant production to greenhouse float systems. The remaining methyl bromide use is to sterilize production trays to prevent pathogen contamination in subsequent years. While this method has reduced the use of methyl bromide, it has not eliminated the need for methyl bromide.

**TOBACCO TRAYS SUMMARY OF TECHNICAL FEASIBILITY**

The biological analysis of alternatives to methyl bromide to control target pathogens in float tray tobacco seedling production indicates no acceptable alternatives that can provide the necessary efficacy at this time. It is essential in float tray tobacco seedling production to produce a totally pathogen free crop for transplantation into tobacco fields. Disinfectants, chlorine bleach, can be used but are less effective than methyl bromide and require extreme care and expertise to achieve acceptable control and avoid plant phytotoxicity. Most farmers do not have the expertise to ensure repeatable results using disinfectants. In addition, disinfectants also have issues pertaining to worker and environmental safety, which limit their adoption by tobacco producers. Heat sterilization using steam is as effective as methyl bromide. However, the polystyrene trays used in float bed tobacco seedling production are easily misshapen or deformed by heat and producers tend to avoid the high temperatures and exposure times required to ensure tray sterilization. In addition, very few farms have equipment available for steam sterilization and would incur significant costs to establish a steam sterilization program.

## PART D: EMISSION CONTROL

### 19. TECHNIQUES THAT HAVE AND WILL BE USED TO MINIMIZE METHYL BROMIDE USE AND EMISSIONS IN THE PARTICULAR USE

**TABLE 19.1: TECHNIQUES TO MINIMIZE METHYL BROMIDE USE AND EMISSIONS**

| TECHNIQUE OR STEP TAKEN | VIF OR HIGH BARRIER FILMS | METHYL BROMIDE DOSAGE REDUCTION | INCREASED % CHLOROPICRIN IN METHYL BROMIDE FORMULATION | LESS FREQUENT APPLICATION |
|---|---|---|---|---|
| **WHAT USE/EMISSION REDUCTION METHODS ARE PRESENTLY ADOPTED?** | Currently some growers use HDPE tarps. | No | No | No |
| **WHAT FURTHER USE/EMISSION REDUCTION STEPS WILL BE TAKEN FOR THE METHYL BROMIDE USED FOR CRITICAL USES?** | The U.S. anticipates that the decreasing supply of methyl bromide will motivate growers to try high barrier films. | The U.S. anticipates that the decreasing supply of methyl bromide will motivate growers to try lower dosage rates. | The U.S. anticipates that the decreasing supply of methyl bromide will motivate growers to increase the percentage of chloropicrin. | The U.S. anticipates that the decreasing supply of methyl bromide will motivate growers to try less frequent applications |
| **OTHER MEASURES** *(please describe)* | Not available. | Examination of promising but presently unregistered alternative fumigants, alone or in combination with non-chemical methods, is planned | Not available. | Not available. |

### 20. IF METHYL BROMIDE EMISSION REDUCTION TECHNIQUES ARE NOT BEING USED OR ARE NOT PLANNED FOR THE CIRCUMSTANCES OF THE NOMINATION STATE REASONS:

In accordance with the criteria of the critical use exemption, each party is required to describe ways in which it strives to minimize use and emissions of methyl bromide. The use of methyl bromide in the growing of tobacco seedlings in plant beds in the United States is minimized in several ways. First, because of its toxicity, methyl bromide has, for the last 40 years, been regulated as a restricted use pesticide in the United States. As a consequence, methyl bromide can only be used by certified applicators that are trained at handling these hazardous pesticides. In practice, this means that methyl bromide is applied by a limited number of very experienced applicators with the knowledge and expertise to minimize dosage to the lowest level possible to achieve the needed results.

As methyl bromide has become scarcer, users in the United States have, where possible, experimented with different mixes of methyl bromide and chloropicrin. Specifically, in the early 1990s, methyl bromide was typically sold and used in methyl bromide mixtures made up of 95% methyl bromide and 5% chloropicrin, with the chloropicrin being included solely to give the chemical a smell enabling those in the area to be alerted if there was a risk. However, with the outset of very significant controls on methyl bromide, users have been experimenting with significant increases in the level of chloropicrin and reductions in the level of methyl bromide. While these new mixtures have generally been effective at controlling target pests, at low to moderate levels of infestation, it must be stressed that the long term efficacy of these mixtures is unknown.

Tarpaulin (high density polyethylene) is also used to minimize use and emissions of methyl bromide.

Reduced methyl bromide concentrations in mixtures, cultural practices, and the extensive use of tarpaulins to cover land treated with methyl bromide has resulted in reduced emissions and an application rate that we believe is among the lowest in the world for the uses described in this nomination.

## PART E: ECONOMIC ASSESSMENT

### 21. COSTS OF ALTERNATIVES COMPARED TO METHYL BROMIDE OVER 3-YEAR PERIOD:

**TABLE 21.1: COSTS OF ALTERNATIVES COMPARED TO METHYL BROMIDE OVER 3-YEAR PERIOD**

| ALTERNATIVE | YIELD* | COST IN YEAR 1 *(US$/ha)* | COST IN YEAR 2 *(US$/ha)* | COST IN YEAR 3 *(US$/ha)* |
|---|---|---|---|---|
| Methyl Bromide | 100 | $612 | $612 | $612 |
| Steam | 100 | $1752 | $1752 | $1752 |
| 10% Chlorine bleach | 30 | $340 | $340 | $340 |

** As percentage of typical or 3-year average yield, compared to methyl bromide*

### 22. GROSS AND NET REVENUE:

**TABLE 22.1: YEAR 1 GROSS AND NET REVENUE**

| YEAR 1 | | |
|---|---|---|
| ALTERNATIVES | GROSS REVENUE FOR LAST REPORTED YEAR *(US$/ha)* | NET REVENUE FOR LAST REPORTED YEAR *(US$/ha)* |
| Methyl Bromide | $10,210 | $9,600 |
| Steam | $10,206 | $8,458 |
| 10% Chlorine bleach | $3,063 | $2,725 |

**TABLE 22.2: YEAR 2 GROSS AND NET REVENUE**

| YEAR 2 | | |
|---|---|---|
| ALTERNATIVES | GROSS REVENUE FOR LAST REPORTED YEAR *(US$/ha)* | NET REVENUE FOR LAST REPORTED YEAR *(US$/ha)* |
| Methyl Bromide | $10,210 | $9,600 |
| Steam | $10,206 | $8,458 |
| 10% Chlorine bleach | $3,063 | $2,725 |

**TABLE 22.3: YEAR 3 GROSS AND NET REVENUE**

| YEAR 3 | | |
|---|---|---|
| ALTERNATIVES | GROSS REVENUE FOR LAST REPORTED YEAR *(US$/ha)* | NET REVENUE FOR LAST REPORTED YEAR *(US$/ha)* |
| Methyl Bromide | $10,210 | $9,600 |
| Steam | $10,206 | $8,458 |
| 10% Chlorine bleach | $3,063 | $2,725 |

## MEASURES OF ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES

**TOBACCO TRANSPLANT TRAYS - TABLE E.1: ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES**

| TOBACCO TRANSPLANT TRAYS | METHYL BROMIDE | STEAM | BLEACH |
|---|---|---|---|
| YIELD LOSS (%) | 0 | 0 | 70% |
| YIELD PER HECTARE | 2,379 | 2,379 | 695 |
| * PRICE PER UNIT (US$) | 2 | 2 | 2 |
| = GROSS REVENUE PER HECTARE (US$) | $4,758 | $4,758 | $3,063 |
| - OPERATING COSTS PER HECTARE (US$) | $612 | $1,752 | $339 |
| = NET REVENUE PER HECTARE (US$) | $4,146 | $3,006 | $2,725 |
| **Loss Measures** | | | |
| 1. LOSS PER HECTARE (US$) | $0 | $1,142 | 6,875 |
| 2. LOSS PER KILOGRAM OF METHYL BROMIDE (US$) | $0 | $340 | 2,045 |
| 3. LOSS AS A PERCENTAGE OF GROSS REVENUE (%) | 0% | 11% | 67% |
| 4. LOSS AS A PERCENTAGE OF NET REVENUE (%) | 0% | 12% | 72% |

## SUMMARY OF ECONOMIC FEASIBILITY

The economic analysis compared the costs of two alternative control scenarios to the baseline costs for methyl bromide. The economic estimates were first calculated in pounds and acres and then converted to kilograms and hectares. The costs for the first alternative are based on using portable steam equipment to sterilize tobacco polystyrene trays while the costs for the second alternative are based on the cost for dipping polystyrene trays into a 10% chlorine solution. The chlorine costs were derived from CUE applicant data and the steam from U.S. EPA data. The baseline costs were based on the average number of applications to treat tobacco trays with methyl bromide per year, which was 1, with 3 pounds methyl bromide per 1,000 cubic feet. The loss per hectare measures the value of methyl bromide based on changes in operating costs and/or changes in yield. The loss as a percentage of the gross revenue is based on the ratio of the loss to the gross revenue. Likewise for the loss as a percentage of net revenue. The profit margin percentage is the ratio of net revenue to gross revenue per hectare. The values to derive gross revenue and the operating costs for each alternative were averaged from the three tobacco polystyrene tray CUE's (numbers, 03-25, 63 and 65). Tobacco beds will be discussed under a separate review. The differences in the cost of production were primarily from the cost of the capitol investments and/materials costs. Labor was assumed to cost $6.50 per hour. The estimated cost of a portable steam generator was depreciated over 10 years. One gallon of chlorine was assumed to cost $1 per gallon. Yield loss estimates were based on data from the CUE, and U.S. EPA data as well as expert opinion. Yield losses for steam was estimated to be 0% and 70% for the 10% chlorine bleach solution.

Using steam (Under Alternative 1), operating costs in U.S. dollars per hectare was $1,752. The estimated net revenue was $8,458 per hectare. The loss per hectare is estimated to be $1,142. The loss per kilogram of methyl bromide in U.S. dollars is estimated to be $340 per kilogram.

Under alternative 2 (bleach), the 10% chlorine bleach treatment was based on dipping trays into a solution of 1gallon of chlorine bleach and 9 gallons of water and allowing to air dry. EPA estimated that a 70% yield loss would result with the use of chlorine bleach. Operating costs in U.S. dollars per hectare was $340. The estimated net revenue was $2,725 per hectare. The loss per hectare is estimated to be $6,875. The loss per kilogram of methyl bromide in U.S. dollars is estimated to be $2,045 per kilogram.

It should be noted that the applicants do not consider any alternative to be feasible and that these estimates are a first draft attempt to measure potential impacts. The final numbers and economic feasibility conclusions will not be decided until the accuracy of the data used in the calculation of the economic measures are thoroughly examined.

## PART F. FUTURE PLANS

### 23. WHAT ACTIONS WILL BE TAKEN TO RAPIDLY DEVELOP AND DEPLOY ALTERNATIVES FOR THIS CROP?

Since 1997, the United States EPA has made the registration of alternatives to methyl bromide a high registration priority. Because the U.S. EPA currently has more applications pending in its registration review queue than the resources to evaluate them, U.S. EPA prioritizes the applications. 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/EPA Methyl Bromide Alternatives Work Group since 1993 to help coordinate research, development and the registration of viable alternatives. 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 US$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 US$2.5 million per year methyl bromide alternatives research has further ensured close coordination between the U.S. government and the research community.

### 24. HOW DO YOU PLAN TO MINIMIZE THE USE OF METHYL BROMIDE FOR THE CRITICAL USE IN THE FUTURE?

The U.S. wants to note that our usage rate is among the lowest in the world in requested sectors and represents efforts of both the government and the user community over many years to reduce use rates and emissions. We will continue to work with the user community in each sector to identify further opportunities to reduce methyl bromide use and emissions.

### 25. ADDITIONAL COMMENTS ON THE NOMINATION?

## 26. CITATIONS


Gutierrez, WA, HD Shew and TA Melton. 1997, Sources of Inoculum and Management for *Rhizoctonia solani* Damping-off on Tobacco Transplants under Greenhouse Conditions. Pla. Science 81:604-606.

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Clemson Extension. South Carolina Tobacco Growers Guide 2003. http://www.clemson.edu/peedeerec/Tobacco/2003%20tableof.htm


## CITATIONS REVIEWED BUT NOT APPLICABLE


Hensley Sr., R and DJ Fowlkes. The Float System for Producing Tobacco Transplants.

Bateman K. 2002. Tobacco Greenhouse Float Tray Sanitation. NC State University Cooperative Extension Service. http://www.utextension.utk.edu/tobaccoinfo/2002TOC.htm

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Vani Muller, J J. 2000. Brazilian Tobacco Growers Choose Floating Seed Trays as Methyl Bromide Replacement. RUMBA April 2000. http://www.uneptie.org/ozonaction/compliance/rumba/00april.html

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Mulrooney, B. 1998. Weekly Crop Update – Sanitation of Greenhouse Trays. University of Delaware Cooperative Extension. Volume 1, Issue 1 March 13, 1998. http://www.rec.udel.edu/Update98/upd31398.html

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Salles, LA. 2001. Effective Alternatives to Methyl Bromide in Brazil. FAO Plant Production and Protection Paper, No.166:13-24. http://fao.org/DOCREP/004/Y1809E/y1809e02.htm

The mentioned articles were reviewed but not cited because either they contained material only outlining the production methodology or did not include relevant scientific methods and data in support of the conclusions.

## APPENDIX A. 2006 Methyl Bromide Usage Numerical Index (BUNI).

**Methyl Bromide Critical Use Exemption Process** **Date:** 2/26/2004

**2006 Methyl Bromide Usage Numerical Index (BUNI)** **Sector:** TOBACCO TRAYS

| Average Volume in the US: | not available |
|---|---|
| % of Average Volume Requested: | not available |

| 2006 Amount of Request | | | | 2001 & 2002 Average Use | | | Quarantine and Pre-Shipment | Regional Volume | |
|---|---|---|---|---|---|---|---|---|---|
| REGION | Kilograms (kgs) | Volume ($1000m^3$) | Use Rate ($kg/1000m^3$) | Kilograms (kgs) | Volume ($1000m^3$) | Use Rate ($kg/1000m^3$) | | 2001 Volume | % of Volume |
| TOBACCO TRAYS | 10,942 | 228 | 48 | 10,987 | 216 | 51 | 60% | not available | not available |
| TOTAL OR AVERAGE | 10,942 | 228 | 48 | 10,987 | 216 | 51 | 60% | not available | not available |

| 2006 Nomination Options | Subtractions from Requested Amounts (kgs) | | | | | Combined Impacts Adjustment (kgs) | | MOST LIKELY IMPACT VALUE | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| REGION | 2006 Request | (-) Double Counting | (-) Growth or 2002 CUE Comparison | (-) Use Rate Difference | (-) QPS | HIGH | LOW | Amount (kgs) | Volume ($1000m^3$) | Use Rate ($kg/1000m^3$) | % Reduction |
| TOBACCO TRAYS | 10,942 | - | 634 | 28 | 6,168 | 4,112 | 4,112 | 4,112 | 86 | 48 | 62% |
| Nomination Amount | 10,942 | 10,942 | 10,308 | 10,281 | 4,112 | 4,112 | 4,112 | 4,112 | 86 | 48 | 62% |
| % Reduction from Initial Request | 0% | 0% | 6% | 6% | 62% | 62% | 62% | 62% | 62% | | |

| Adjustments to Requested Amounts | Use Rate ($kg/1000m^3$) | | (%) Key Pest Distribution | | (%) Adopt New Fumigants | | (%) Combined Impacts | | Time, Quality, or Product Loss | Marginal Strategy |
|---|---|---|---|---|---|---|---|---|---|---|
| REGION | 2006 | Low | High | Low | High | Low | HIGH | LOW | | |
| TOBACCO TRAYS | 48 | 48 | 100 | 100 | 0 | 0 | 100% | 100% | 70% | Steam |

| Other Considerations | Dichotomous Variables (Y/N) | | | Other Issues | | | Economic Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| REGION | Currently Use Alternatives? | Research / Transition Plans | Pest-free Market Requirement | Change from Prior CUE Request (+/-) | Verified Historic MeBr Use / State | Frequency of Treatment /Yr | Loss per 1000 $m^3$ (US$/1000m) | Loss per Kg of MeBr (US$/kg) | Loss as a % of Gross Revenue | Loss as a % of Net Revenue |
| TOBACCO TRAYS | No | ? | Yes | 0 | No | 1/year | | | | |

Conversion Units: 1 Pound = 0.453592 Kilograms 1,000 cu ft = 0.028316847 1,000 cubic meters

**Footnotes for Appendix A:**

Values may not sum exactly due to rounding.

1. **Average Hectares in the US** – Average Hectares in the US is the average of 2001 and 2002 total hectares in the US in this crop when available. These figures were obtained from the USDA National Agricultural Statistics Service.
2. **% of Average Hectares Requested** - Percent (%) of Average Hectares Requested is the total area in the sector's request divided by the Average Hectares in the US. Note, however, that the NASS categories do not always correspond one to one with the sector nominations in the U.S. CUE nomination (e.g., roma and cherry tomatoes were included in the applicant's request, but were not included in NASS surveys). Values greater than 100 percent are due to the inclusion of these varieties in the U.S. CUE request that were not included in the USDA NASS: nevertheless, these numbers are often instructive in assessing the requested coverage of applications received from growers.
3. **2006 Amount of Request** – The 2006 amount of request is the actual amount requested by applicants given in total pounds active ingredient of methyl bromide, total acres of methyl bromide use, and application rate in pounds active ingredient of methyl bromide per acre. 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.
4. **2001 & 2002 Average Use** – The 2001 & 2002 Average Use is the average of the 2001 and 2002 historical usage figures provided by the applicants given in total pounds active ingredient of methyl bromide, total acres of methyl bromide use, and application rate in pounds active ingredient of methyl bromide per acre. Adjustments are made when necessary due in part to unavailable 2002 estimates in which case only the 2001 average use figure is used.
5. **Quarantine and Pre-Shipment** – Quarantine and pre-shipment (QPS) hectares is the percentage (%) of the applicant's request subject to QPS treatments.
6. **Regional Hectares, 2001 & 2002 Average Hectares** – Regional Hectares, 2001 & 2002 Average Hectares is the 2001 and 2002 average estimate of hectares within the defined region. These figures are taken from various sources to ensure an accurate estimate. The sources are from the USDA National Agricultural Statistics Service and from other governmental sources such as the Georgia Acreage estimates.
7. **Regional Hectares, Requested Acreage %** - Regional Hectares, Requested Acreage % is the area in the applicant's request divided by the total area planted in that crop in the region covered by the request as found in the USDA National Agricultural Statistics Service (NASS). Note, however, that the NASS categories do not always correspond one to one with the sector nominations in the U.S. CUE nomination (e.g., roma and cherry tomatoes were included in the applicant's request, but were not included in NASS surveys). Values greater than 100 percent are due to the inclusion of these varieties in the U.S. CUE request that were not included in the USDA NASS: nevertheless, these numbers are often instructive in assessing the requested coverage of applications received from growers.
8. **2006 Nomination Options** – 2006 Nomination Options are the options of the inclusion of various factors used to adjust the initial applicant request into the nomination figure.
9. **Subtractions from Requested Amounts** – Subtractions from Requested Amounts are the elements that were subtracted from the initial request amount.
10. **Subtractions from Requested Amounts, 2006 Request** – Subtractions from Requested Amounts, 2006 Request is the starting point for all calculations. This is the amount of the applicant request in kilograms.
11. **Subtractions from Requested Amounts, Double Counting** - Subtractions from Requested Amounts, Double Counting is the estimate measured in kilograms in situations where an applicant has made a request for a CUE with an individual application while their consortium has also made a request for a CUE on their behalf in the consortium application. In these cases the double counting is removed from the consortium application and the individual application takes precedence.
12. **Subtractions from Requested Amounts, Growth or 2002 CUE Comparison** - Subtractions from Requested Amounts, Growth or 2002 CUE Comparison is the greatest reduction of the estimate measured in kilograms of either the difference in the amount of methyl bromide requested by the applicant that is greater than that historically used or treated at a higher use rate or the difference in the 2006 request from an applicant's 2002 CUE application compared with the 2006 request from the applicant's 2003 CUE application.
13. **Subtractions from Requested Amounts, QPS** - Subtractions from Requested Amounts, QPS is the estimate measured in kilograms of the request subject to QPS treatments. This subtraction estimate is calculated as the 2006 Request minus Double Counting, minus Growth or 2002 CUE Comparison then

multiplied by the percentage subject to QPS treatments. *Subtraction from Requested Amounts, QPS = (2006 Request – Double Counting – Growth)*(QPS %)*

14. **Subtraction from Requested Amounts, Use Rate Difference** – Subtractions from requested amounts, use rate difference is the estimate measured in kilograms of the lower of the historic use rate or the requested use rate. The subtraction estimate is calculated as the 2006 Request minus Double Counting, minus Growth or 2002 CUE Comparison, minus the QPS amount, if applicable, minus the difference between the requested use rate and the lowest use rate applied to the remaining hectares.

15. **Adjustments to Requested Amounts** – 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.
    16. **(%) Karst topography** – Percent karst topography is the proportion of the land area in a nomination that is characterized by karst formations. In these areas, the groundwater can easily become contaminated by pesticides or their residues. Regulations are often in place to control the use of pesticide of concern. Dade County, Florida, has a ban on the use of 1,3D due to its karst topography.
    17. **(%) 100 ft Buffer Zones** – Percentage of the acreage of a field where certain alternatives to methyl bromide cannot be used due the requirement that a 100 foot buffer be maintained between the application site and any inhabited structure.
    18. **(%) Key Pest Impacts** - Percent (%) of the requested area with moderate to severe pest problems. Key pests are those that are not adequately controlled by MB alternatives. For example, the key pest in Michigan peppers, *Phytophthora* spp. infests approximately 30% of the vegetable growing area. In southern states the key pest in peppers is nutsedge.
    19. **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.
    20. **Unsuitable Terrain (%)** – Unsuitable terrain (%) is the percent (%) of the requested area where alternatives cannot be used due to soil type (e.g., heavy clay soils may not show adequate performance) or terrain configuration, such as hilly terrain. Where the use of alternatives poses application and coverage problems.
    21. **Cold Soil Temperatures** – Cold soil temperatures is the proportion of the requested acreage where soil temperatures remain too low to enable the use of methyl bromide alternatives and still have sufficient time to produce the normal (one or two) number of crops per season or to allow harvest sufficiently early to obtain the high prices prevailing in the local market at the beginning of the season.
    22. **Combined Impacts (%)** - Total combined impacts are the percent (%) of the requested area where alternatives cannot be used due to key pest, regulatory, soil impacts, temperature, etc. 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). For example, if 50% of the requested area had moderate to severe key pest pressure and 50% of the requested area had karst topography, then 75% of the area was assumed to require methyl bromide rather than the alternative. This was calculated as follows: 50% affected by key pests and an additional 25% (50% of 50%) affected by karst topography.
23. **Qualifying Area** - Qualifying area (ha) is calculated by multiplying the adjusted hectares by the combined impacts.
24. **Use Rate** - Use rate is the lower of requested use rate for 2006 or the historic average use rate.
25. **CUE Nominated amount** - CUE nominated amount is calculated by multiplying the qualifying area by the use rate.
26. **Percent Reduction** - Percent reduction from initial request is the percentage of the initial request that did not qualify for the CUE nomination.
27. **Sum of CUE Nominations in Sector** - Self-explanatory.
28. **Total US Sector Nomination** - Total U.S. sector nomination is the most likely estimate of the amount needed in that sector.
29. **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.
    30. **Strip Bed Treatment** – Strip bed treatment is 'yes' if the applicant uses such treatment, no otherwise.
    31. **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.

32. **Research/ Transition Plans** – Research/ Transition Plans is 'yes' when the applicant has indicated that there is research underway to test alternatives or if applicant has a plan to transition to alternatives.
33. **Tarps/ Deep Injection Used** – Because all pre-plant methyl bromide use in the US is either with tarps or by deep injection, this variable takes on the value 'tarp' when tarps are used and 'deep' when deep injection is used.
34. **Pest-free cert. Required** - This variable is a 'yes' when the product must be certified as 'pest-free' in order to be sold

35. **Other Issues**.- Other issues is a short reminder of other elements of an application that were checked
36. **Change from Prior CUE Request**- This variable takes a '+' if the current request is larger than the previous request, a '0' if the current request is equal to the previous request, and a '-' if the current request is smaller that the previous request.
37. **Verified Historic Use/ State**- This item indicates whether the amounts requested by administrative area have been compared to records of historic use in that area.
38. **Frequency of Treatment** – This indicates how often methyl bromide is applied in the sector. Frequency varies from multiple times per year to once in several decades.

39. **Economic Analysis** – provides summary economic information for the applications.
40. **Loss per Hectare** – This measures the total loss per hectare when a specific alternative is used in place of methyl bromide. Loss comprises both the monetized value of yield loss (relative to yields obtained with methyl bromide) and any additional costs incurred through use of the alternative. It is measured in current US dollars.
41. **Loss per Kilogram of Methyl Bromide** – This measures the total loss per kilogram of methyl bromide when it is replaced with an alternative. Loss comprises both the monetized value of yield loss (relative to yields obtained with methyl bromide) and any additional costs incurred through use of the alternative. It is measured in current US dollars.
42. **Loss as a % of Gross revenue** – This measures the loss as a proportion of gross (total) revenue. Loss comprises both the monetized value of yield loss (relative to yields obtained with methyl bromide) and any additional costs incurred through use of the alternative. It is measured in current US dollars.
43. **Loss as a % of Net Operating Revenue** -This measures loss as a proportion of total revenue minus operating costs. Loss comprises both the monetized value of yield loss (relative to yields obtained with methyl bromide) and any additional costs incurred through use of the alternative. It is measured in current US dollars. This item is also called net cash returns.

44. **Quality/ Time/ Market Window/Yield Loss (%)** – When this measure is available it measures the sum of losses including quality losses, non-productive time, missed market windows and other yield losses when using the marginal strategy.
45. **Marginal Strategy** -This is the strategy that a particular methyl bromide user would use if not permitted to use methyl bromide.

## APPENDIX C. SUMMARY OF NEW APPLICANTS

A number of new groups applied for methyl bromide for 2005 during this application cycle, as shown in the table below. Although in most cases they represent additional amounts for sectors that were already well-characterized sectors, in a few cases they comprised new sectors. Examples of the former include significant additional country (cured, uncooked) ham production; some additional request for tobacco transplant trays, and very minor amounts for pepper and eggplant production in lieu of tomato production in Michigan.

For the latter, there are two large requests: cut flower and foliage production in Florida and California ('Ornamentals') and a group of structures and process foods that we have termed 'Post-Harvest NPMA' which includes processed (generally wheat-based foods), spices and herbs, cocoa, dried milk, cheeses and small amounts of other commodities. There was also a small amount requested for field-grown tobacco.

The details of the case that there are no alternatives which are both technically and economically feasible are presented in the appropriate sector chapters, as are the requested amounts, suitably adjusted to ensure that no double-counting, growth, etc. were included and that the amount was only sufficient to cover situations (key pests, regulatory requirements, etc.) where alternatives could not be used.

The amount requested by new applicants is approximately 2.5% of the 1991 U.S. baseline, or about 1,400,000 pounds of methyl bromide, divided 40% for pre-plant uses and 60% for post-harvest needs.

The methodology for deriving the nominated amount used estimates that would result in the lowest amount of methyl bromide requested from the range produced by the analysis to ensure that adequate amounts of methyl bromide were available for critical needs. We are requesting additional methyl bromide in the amount of about 500,000 Kg, or 2% or the 1991 U.S. baseline, to provide for the additional critical needs in the pre-plant and post-harvest sector.

| Applicant Name | 2005 U.S. CUE Nomination (lbs) |
|---|---|
| California Cut Flower Commission | 400,000 |
| National Country Ham Association | 1,172 |
| Wayco Ham Company | 39 |
| California Date Commission | 5,319 |
| National Pest Management Association | 319,369 |
| Michigan Pepper Growers | 20,904 |
| Michigan Eggplant Growers | 6,968 |
| Burley & Dark Tobacco Growers USA - Transplant Trays | 2,254 |
| Burley & Dark Tobacco Growers USA - Field Grown | 28,980 |
| Virginia Tobacco Growers - Transplant Trays | 941 |
| Michigan Herbaceous Perennials | 4,200 |

| | |
|---|---|
| Ozark Country Hams | 240 |
| Nahunta Pork Center | 248 |
| American Association of Meat Processors | 296,800 |
| Total lbs | **1,087,434** |
| Total kgs | **493,252** |