

**METHYL BROMIDE CRITICAL USE NOMINATION FOR PREPLANT SOIL USE ON STRAWBERRY NURSERIES IN OPEN FIELDS OR IN PROTECTED ENVIRONMENTS**

FOR ADMINISTRATIVE PURPOSES ONLY: <b>DATE RECEIVED BY OZONE SECRETARIAT:</b> YEAR: _____ CUN: _____
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<b>NOMINATING PARTY:</b>	The United States of America
<b>BRIEF DESCRIPTIVE TITLE OF NOMINATION:</b>	Methyl Bromide Critical Use Nomination for Preplant Soil Use for Strawberry Nurseries Grown in Open Fields or in Protected Environments (Submitted in 2006 for the 2008 Use Season)

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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

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Signature \_\_\_\_\_ Name \_\_\_\_\_ Date \_\_\_\_\_

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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

<b>1. PAPER DOCUMENTS: Title of Paper Documents and Appendices</b>	<b>Number of Pages</b>	<b>Date Sent to Ozone Secretariat</b>

<b>2. ELECTRONIC COPIES OF ALL PAPER DOCUMENTS: Title of Electronic Files</b>	<b>Size of File (kb)</b>	<b>Date Sent to Ozone Secretariat</b>

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**PART A: SUMMARY**

**1. NOMINATING PARTY**

The United States of America (U.S.)

**2. DESCRIPTIVE TITLE OF NOMINATION**

Methyl Bromide (MB) Critical Use Nomination for Preplant Soil Use for Strawberry Nurseries in Open Fields or in Protected Environments (Prepared in 2005 for the 2008 Use Season)

**3. CROP AND SUMMARY OF CROP SYSTEM**

Southeastern U.S. growers (from Maryland, North Carolina, and Tennessee) produce transplants in open fields. An individual field is planted to strawberries once every three years. Approximately 85% of transplants produced are exported to Florida.

California growers produce their transplants over a five-year cycle (see Appendix B for an extensive overview—submitted by the California Strawberry Commission—of the California strawberry nursery production system). Screenhouses are used during the first two years and open field plantings are used during the last three years. MeBr is needed in production years 2 thru 5. Individual planting sites are planted to strawberries once every three years. The fourth and fifth production years account for 22% and 77%, respectively, of the current MeBr nursery usage in California. Transplants produced are distributed widely throughout the U.S. and other countries.

**4. METHYL BROMIDE NOMINATED**

**TABLE 4.1: METHYL BROMIDE NOMINATED**

YEAR	NOMINATION AMOUNT (KG)*	NOMINATION AREA (HA)
2008	8,838	31

\* Includes research amount of 454 kgs.

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

The U.S. nomination is for those areas where the alternatives are not suitable. In U.S. strawberry nursery production there are several factors that make the potential alternatives to MeBr unsuitable. These include:

- Pest control efficacy of alternatives: the efficacy of alternatives may not be comparable to MeBr in some areas, making these alternatives infeasible
- Quarantine and Pre-Shipment uses are not included in this CUE

For the 2008 season, MeBr is critical for strawberry nurseries to produce plants free of diseases and nematodes to meet state and foreign certification standards, as well as prospective buyer expectations. In addition to these certification-related pest control concerns, weed control is also essential to insure maximum runner production and prevent the spread of noxious weeds. The available alternatives have not been developed sufficiently to provide effective control of the key pests to depths of 1 m. In addition, there are no markets for plants that do not meet the certification standards, which mean that losses up to 100% are possible when inadequate pest control occurs. Failure to adequately manage pests in transplants will jeopardize the viability of the transplant and fruit production industries in the U.S., as well as the viability of fruit production in countries purchasing U.S. plants (e.g., Canada, Mexico, Spain, countries in South America, and some others).

**TABLE A.1: EXECUTIVE SUMMARY**

<b>Region</b>	<b>California</b>	<b>Southeastern States</b>
<b>AMOUNT OF APPLICANT REQUEST</b>		
<b>2008 Kilograms</b>	4,690	34,934
<b>AMOUNT OF NOMINATION*</b>		
<b>2008 Kilograms</b>	4,690	3,693

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

**6. SUMMARIZE WHY KEY ALTERNATIVES ARE NOT FEASIBLE**

The key alternatives are 1,3-dichloropropene (1,3-D)/chloropicrin, 1,3-D/chloropicrin/metam-sodium, and 1,3-D/metam-sodium. Dazomet is also a possible alternative probably in combination with chloropicrin and/or 1,3-D. These chemicals, in addition to other strategies, such as use of high density tarps, may ultimately reduce or replace MB. However, to maintain certification quality protocols for effective use of these alternatives have not been sufficiently developed to provide adequate disease and nematode control throughout the root zone (up to 1 m deep). Additionally, these alternatives will require further study to show their consistency in providing control of yellow and purple nutsedge (*Cyperus esculentus*, *C. rotundus*) (SE states only) and a number of other critical weed pests in California (Table 10.1). The certification requirements associated with the requesting states are strict (virtually zero tolerance for any damaging diseases and plant-parasitic nematodes) in order to minimize the prospect of spreading these nematode and diseases to other states and countries where these plants are shipped. Research has been cited (e.g., Kabir et al., 2003) in this review that indicates potential alternatives for some nurseries, but the need for MeBr for 2008 is critical until alternatives have been sufficiently tested for use in commercial strawberry nursery operations.

**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 – 2001-2002 AVERAGE (HA)	PROPORTION OF TOTAL CROP AREA TREATED WITH METHYL BROMIDE (%)
Southeastern States	69	100
California	1,386	100

**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 THERE.**

Pest-free standards for nursery stock make complete transition to alternatives difficult.

**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?**

Not applicable because the alternatives have not been proven effective for the control of the target pests in nursery production.

**8. AMOUNT OF METHYL BROMIDE REQUESTED FOR CRITICAL USE**

**SOUTHEASTERN STATES AND CALIFORNIA- TABLE 8.1: AMOUNT OF METHYL BROMIDE REQUESTED FOR CRITICAL USE**

REGION:	SOUTHEASTERN STATES	CALIFORNIA
YEAR OF EXEMPTION REQUEST	2008	2008
KILOGRAMS OF METHYL BROMIDE	34,934	4,690
USE: FLAT FUMIGATION OR STRIP/BED TREATMENT	FLAT FUMIGATION	FLAT FUMIGATION
FORMULATION (ratio of methyl bromide/chloropicrin mixture) TO BE USED FOR THE CUE	67:33	67:33
TOTAL AREA TO BE TREATED WITH THE METHYL BROMIDE OR METHYL BROMIDE/CHLOROPICRIN FORMULATION (ha)	85	18 (w/o QPS)
APPLICATION RATE (kg/ha) FOR THE FORMULATION	604	390
APPLICATION RATE (kg/ha) FOR METHYL BROMIDE	413	263
DOSAGE RATE (g/m <sup>2</sup> ) OF FORMULATION USED TO CALCULATE REQUESTED KILOGRAMS OF METHYL BROMIDE	60.4	39.0
DOSAGE RATE (g/m <sup>2</sup> ) OF METHYL BROMIDE	41.1	26.1

**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:

- The percent of regional hectares in the applicant’s request was divided by the total area planted in that crop in the region covered by the request. Values greater than 100 percent are due to the inclusion of additional varieties in the applicant’s request that were not included in the USDA National Agricultural Statistics Service surveys of the crop.
- Hectares counted in more than one application or rotated within one year of an application to a crop that also uses MeBr were subtracted. There was no double counting in this sector.
- Growth or increasing production (the amount of area requested by the applicant that is greater than that historically treated) was subtracted. The two applicants that included growth in their request had the growth amount removed.
- There was a small adjustment for use rate in one of the applications.
- Quarantine and pre-shipment (QPS) hectares is the area in the applicant’s request subject to QPS treatments. Both applicants had QPS listed the amount requested and reflects the subtraction of the QPS amount.
- Only the area experiencing one or more of the following impacts were included in the nominated amount: moderate to heavy key pest pressure.

**SOUTHEASTERN STATES - PART B: CROP CHARACTERISTICS AND METHYL BROMIDE USE**

**SOUTHEASTERN STATES - 10. KEY DISEASES AND WEEDS FOR WHICH METHYL BROMIDE IS REQUESTED AND SPECIFIC REASONS FOR THIS REQUEST**

**SOUTHEASTERN STATES - 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 (AND % OF TOTAL GROWING AREA WITH MODERATE-SEVERE INFESTATION OF PEST)	SPECIFIC REASONS WHY METHYL BROMIDE IS NEEDED
Southeastern Nurseries	Weeds: Yellow nutsedge ( <i>Cyperus esculentus</i> ) and Purple nutsedge ( <i>Cyperus rotundus</i> ) (50%)  Diseases: Black root rot ( <i>Rhizoctonia</i> and <i>Pythium</i> spp.) (100%); Crown rot ( <i>Phytophthora cactorum</i> ) (<5%); root-knot nematodes ( <i>Meloidogyne</i> spp.) (100%)	The major issue for pest management in the nursery is the zero-tolerance threshold for pests. To meet certification and production requirements, MeBr is critical for the portion of nursery land that cannot accomplish certification otherwise.

**SOUTHEASTERN STATES - 11. (i) CHARACTERISTICS OF CROPPING SYSTEM AND CLIMATE**

**SOUTHEASTERN STATES - TABLE 11.1: CHARACTERISTICS OF CROPPING SYSTEM**

CHARACTERISTICS	SOUTHEASTERN STATES
<b>CROP TYPE:</b> (e.g. transplants, bulbs, trees or cuttings)	Strawberry transplants
<b>ANNUAL OR PERENNIAL CROP:</b> (# of years between replanting)	Annual crop, replanted in same site once every three years
<b>TYPICAL CROP ROTATION</b> (if any) <b>AND USE OF METHYL BROMIDE FOR OTHER CROPS IN THE ROTATION:</b> (if any)	Various crops planted
<b>SOIL TYPES:</b> (Sand, loam, clay, etc.)	93% medium and 7% light soils, containing up to 2% organic matter
<b>FREQUENCY OF METHYL BROMIDE FUMIGATION:</b> (e.g. every two years)	Every year
<b>OTHER RELEVANT FACTORS:</b>	None identified

**SOUTHEASTERN STATES - TABLE 11.2 CHARACTERISTICS OF CLIMATE AND CROP SCHEDULE**

	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB
<b>CLIMATIC ZONE</b>	6a, 6b, 7a, 7b, 8a, 8b											
<b>RAINFALL</b> (mm)	163	124	109	87	78	146	113	202	109	116	54	76
<b>OUTSIDE TEMP.</b> (°C)	9.4	14.5	17.7	23.4	26	25.9	22.6	14.9	7.7	3.4	2.9	4.2
<b>FUMIGATION SCHEDULE</b>							X	X				
<b>PLANTING SCHEDULE</b>		X	X									
<b>HARVEST SCHEDULE</b>							2X	X				

\* Macon, GA

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

None were identified as being limiting factors.

**SOUTHEASTERN STATES - 12. HISTORIC PATTERN OF USE OF METHYL BROMIDE, AND/OR MIXTURES CONTAINING METHYL BROMIDE, FOR WHICH AN EXEMPTION IS REQUESTED**

**SOUTHEASTERN STATES - TABLE 12.1 HISTORIC PATTERN OF USE OF METHYL BROMIDE**

<b>FOR AS MANY YEARS AS POSSIBLE AS SHOWN SPECIFY:</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
<b>AREA TREATED</b> ( <i>hectares</i> )	82	55	67	71	75	83
<b>RATIO OF FLAT FUMIGATION METHYL BROMIDE USE TO STRIP/BED USE IF STRIP TREATMENT IS USED</b>	Nearly all flat fumigation	Nearly all flat fumigation	Nearly all flat fumigation	Nearly all flat fumigation	Nearly all flat fumigation	Nearly all flat fumigation
<b>AMOUNT OF METHYL BROMIDE ACTIVE INGREDIENT USED</b> ( <i>total kilograms</i> )	33,764	22,900	27,747	29,251	30,923	34,433
<b>FORMULATIONS OF METHYL BROMIDE</b> ( <i>methyl bromide/ chloropicrin</i> )	67:33	67:33	67:33	67:33	67:33	67:33
<b>METHOD BY WHICH METHYL BROMIDE APPLIED</b>	Soil injection	Soil injection	Soil injection	Soil injection	Soil injection	Soil injection
<b>APPLICATION RATE OF FORMULATIONS IN kg/ha</b>	619	619	619	619	619	619
<b>APPLICATION RATE OF METHYL BROMIDE IN kg/ha*</b>	413	413	413	413	413	413
<b>ACTUAL DOSAGE RATE OF FORMULATIONS</b> ( <i>g/m<sup>2</sup></i> )*	61.9	61.9	61.9	61.9	61.9	61.9
<b>ACTUAL DOSAGE RATE OF METHYL BROMIDE</b> ( <i>g/m<sup>2</sup></i> )*	41.3	41.3	41.3	41.3	41.3	41.3

**SOUTHEASTERN STATES - PART C: TECHNICAL VALIDATION**

**SOUTHEASTERN STATES - 13. REASON FOR ALTERNATIVES NOT BEING FEASIBLE**

**SOUTHEASTERN STATES – 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?
<b>CHEMICAL ALTERNATIVES</b>		
Chloropicrin	<p>Reduced efficacy on nutsedge (Locascio 1997 &amp; 1999); in some instances it caused increased emergence of nutsedge (Motis and Gilreath 2002); Unlikely that nematode control required by state certification programs can be attained throughout the 1 m root zone.</p> <p>Chloropicrin is generally considered a good control measure for certain pathogens (<i>Pythium</i>, <i>Phytophthora</i>, <i>Fusarium</i>, <i>Verticillium</i>), but is not considered effective for nematode or weed control. [See also chloropicrin issues addressed in the fumigant combination entries in this section.]</p>	No
<b>NON CHEMICAL ALTERNATIVES</b>		
Biofumigation	<p>Lack of adequate data on the activity of biofumigation materials on nutsedge control; Based on studies with other crops, allelochemicals may cause phytotoxic effects (Norsworthy 2002; Johnson et al. 1993); unlikely that the level of disease and nematode control required by state certification programs can be attained throughout the 1 m deep root zone.</p> <p>Biofumigation is not feasible alone because it does not provide adequate, or consistent, control of target pests to produce a certifiable strawberry nursery stock. Research conducted in Florida showed some control of plant pathogens, but no control of nematodes or weeds in the soil. In cases where biofumigation have been shown to control weeds, the data are mostly for small-seeded weed species that have small carbohydrate energy sources compared to nutsedge. The data on biofumigation are too limited to consider it as a practical alternative to methyl bromide, and strategies to incorporate biofumigation with other alternatives have not been adequately developed.</p> <p>It is not clear that Brassica crops can be supplied in such quantity needed to control target pests. Estimates are that the biofumigant would have to occupy approximately 3 hectares for every hectare of strawberry production. Incorporation of Brassica at these levels would be likely to have allelopathic effects on the target crop.</p>	No

NAME OF ALTERNATIVE	TECHNICAL AND REGULATORY* REASONS FOR THE ALTERNATIVE NOT BEING FEASIBLE OR AVAILABLE	IS THE ALTERNATIVE CONSIDERED COST EFFECTIVE?
Solarization	<p>Even in warm climates (Georgia) it is difficult to attain temperatures lethal to nutsedge (50-55°C) at depths below 10 centimeters (Miles et. al. 2002). However, research to enhance the efficacy of solarization with tarps is being conducted (e.g., Arbel et al., 2003).</p> <p>Solarization is not a feasible alternative by itself because it does not provide adequate control of target pests to produce certifiable strawberry nursery stock. Use of solarization might not be practical due to the depth of heating required to eliminate viable weed seed, nematodes, and disease organisms. The time for solarization to raise soil temperatures to the level needed to kill soil pathogens in most strawberry nursery regions is likely to also be the time when the crops themselves must complete their growth cycle. In one Southeast field trial, solarization gave poor yields in two years out of three with losses ranging from 0% to 40% (Miles et. al. 2002).</p>	No
General IPM	<p>IPM, the use of pest monitoring activities coupled with chemical and non-chemical management tools, has been adopted already for management of weed, diseases, and nematodes in most nurseries. General IPM is being used in strawberry nursery stock production, but it is not feasible alone to provide adequate pest control. IPM practices include field sanitation to limit inoculum buildup, crop rotation to provide non host periods, and breeding for resistance to pathogens.</p>	No
Cover crops mulching	<p>Cover crops/mulching is currently being used but it is not feasible as a replacement for MB; disease and nematode control required by state certification programs require several years of pest-free history prior to certification.</p> <p>Some cover crops that have been shown to reduce weed populations also reduced or delayed crop maturity and/or emergence, as well as yields (Burgos et al., 1996; Galloway et al., 1996). Cowpea and sun hemp have been shown to suppress nutsedge, but the effect is short lived due to the weed's capacity for rapid tuber production. Allelochemicals released by some cover crops or organic mulches can injure crops (Johnson et al., 1993; Norsworthy, 2002).</p>	No



















































































































