METHYL BROMIDE CRITICAL USE RENOMINATION FOR PREPLANT SOIL USE (OPEN FIELD OR PROTECTED ENVIRONMENT)

NOMINATING PARTY:
The United States of America

NAME
USA CUN09 SOIL EGGPLANT GROWN IN OPEN FIELDS

BRIEF DESCRIPTIVE TITLE OF NOMINATION:
Methyl Bromide Critical Use Nomination for Pre-plant Soil Use for Eggplants Grown in Open Fields (Submitted in 2007 for 2009 Use Season)

CROP NAME (OPEN FIELD OR PROTECTED):
Pre-plant Soil Use for Eggplant Grown in Open Fields

QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION:

TABLE COVER SHEET: QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION

YEAR	NOMINATION AMOUNT (METRIC TONNES)*
2009	**62.789**

*This amount includes methyl bromide needed for research.

SUMMARY OF ANY SIGNIFICANT CHANGES SINCE SUBMISSION OF PREVIOUS NOMINATIONS:

Major changes to this year's nomination include a change in the karst topographical features estimate, the use rate, and reporting area in units of treated area. These changes directly impacted the nomination amount and our calculation methods. They are highlighted in Appendix A. A transition rate was applied based on the best estimate of yield losses and feasibility associated with likely methyl bromide alternatives that could be made by USG biologists and economists. In addition, a dosage rate of 150 kg/ha (for areas where disease pathogens were considered to be key pests) and 175 kg/ha (for areas where weeds were considered to be key pests) was used in calculating the amount of methyl bromide requested. USG also refined the estimates of the proportion of crop acreage to which methyl bromide alternatives involving 1,3 D + chloropicrin could not be used due to Karst and seepage irrigation restrictions. For details on these changes in usage requirements, please see Appendix B.

REASON OR REASONS WHY ALTERNATIVES TO METHYL BROMIDE ARE NOT TECHNICALLY AND ECONOMICALLY FEASIBLE:

The U.S. nomination is only for those areas where the alternatives are not suitable. In the U.S., Florida Georgia, and Michigan are major eggplant producing states and there are several factors that restrict the use of potential alternatives to methyl bromide. These include:

- Geographic distribution and regulatory constraints, For example, in Florida and to a lesser extent in Georgia, the use of 1,3-D is prohibited in areas overlying karst topographical features because of groundwater contamination concerns.
- Lower pest control efficacy of alternatives. In Florida and Georgia, where nutsedge is the main methyl bromide target pest, neither 1,3-D nor metam sodium, alone or in combination with chloropicrin, adequately control moderate to high nutsedge populations. The efficacy of alternatives is not comparable to methyl bromide in some regions causing the use of these alternatives technically infeasible. In Michigan, where soil-borne pathogens are the key methyl bromide target pests, neither 1,3-D nor metam sodium is effective against soil-borne fungi.
- Economical implications. In Florida and Georgia, farmers using products containing 1,3-D and metam sodium in the fall may be impractical because of the required longer waiting periods for planting following application (28 days for 1,3-D and 21 days for metam sodium, compared to 14 days for methyl bromide). In Michigan an additional delay would occur due to the requirement of high soil temperature to fumigate with alternatives. Delays in planting and harvesting may result in loosing market windows and it can reduce the farm revenues.

(Details on this page are requested under Decision Ex. I/4(7), for posting on the Ozone Secretariat website under Decision Ex. I/4(8).)

This form is to be used by holders of single-year exemptions to reapply for a subsequent year's exemption (for example, a Party holding a single-year exemption for 2005 and/or 2006 seeking further exemptions for 2007). It does not replace the format for requesting a critical-use exemption for the first time.

In assessing nominations submitted in this format, TEAP and MBTOC will also refer to the original nomination on which the Party's first-year exemption was approved, as well as any supplementary information provided by the Party in relation to that original nomination. As this earlier information is retained by MBTOC, a Party need not re-submit that earlier information.

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:

1. PAPER DOCUMENTS: **Title of paper documents and appendices**	**No. of pages**	**Date sent to Ozone Secretariat**
USA CUN09 SOIL EGG PLANT GROWN IN OPEN FIELDS		
2. ELECTRONIC COPIES OF ALL PAPER DOCUMENTS: ***Title of each electronic file (for naming convention see notes above)**	**No. of kilobytes**	**Date sent to Ozone Secretariat**
USA CUN09 SOIL EGGPLANT GROWN IN OPEN FIELDS		

* Identical to paper documents

TABLE OF CONTENTS

TABLE OF TABLES

Part A: INTRODUCTION
Renomination Part A: SUMMARY INFORMATION

1. (Renomination Form 1.) NOMINATING PARTY AND NAME:
The United States of America
USA CUN09 Soil Eggplant Grown in Open Fields.

2. (Renomination Form 2.) DESCRIPTIVE TITLE OF NOMINATION:
Methyl Bromide Critical Use Nomination for Preplant Soil Use for Eggplant Grown in Open Fields (Submitted in 2007 for 2009 Use Season)

3. CROP AND SUMMARY OF CROP SYSTEM (*e.g. open field (including tunnels added after treatment), permanent glasshouses (enclosed), open ended polyhouses, others (describe)*):

This is a request for eggplant grown in the States of Florida, Georgia, and Michigan. In Florida, eggplant is grown year-round, and often double cropped with pepper or cucumber following eggplant harvest. The vegetable crop that follows eggplant in a double cropping production system depends upon prevailing environmental and economic factors. Growers in Florida often put eggplant in as an extra crop, and grow okra, squash, or cucumbers after the eggplant has been harvested. A spring crop of eggplant may follow as a second crop after a fall crop of pepper or tomato. Eggplant does best on well-drained, fertile, sandy-loam soils at a pH of 6.0-6.5. Poorly drained soils may result in slow plant growth, reduced root systems, and low yields. Eggplant requires a long, warm, frost-free growing season, usually of 14-16 weeks. Cold temperatures below 5^{o}C injure this crop. The best temperatures are 27-32^{o}C during the day and 21-32^{o}C during the night. Plant growth is curtailed at temperatures below 16^{o}C. Additionally, soil temperature below 16^{o}C restricts germination. However, most eggplant is started in the field from transplants. Methyl bromide is always used in the full-bed mulch process. Until 1999, the chemical formulation primarily used was 98 percent methyl bromide and two percent chloropicrin. Since then, growers have shifted to formulations with lower concentrations of methyl bromide and higher amounts of chloropicrin due to the phase-out schedule of methyl bromide (USDA, 2002).

4. AMOUNT OF METHYL BROMIDE NOMINATED (*give quantity requested (metric tonnes) and years of nomination*):
(Renomination Form 3.) YEAR FOR WHICH EXEMPTION SOUGHT:

TABLE A 1: QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION

YEAR	NOMINATION AMOUNT (METRIC TONNES)*
2009	**62.789**

*This amount includes methyl bromide needed for research.

(Renomination Form 4.) SUMMARY OF ANY SIGNIFICANT CHANGES SINCE SUBMISSION OF PREVIOUS NOMINATIONS (e.g. changes to requested exemption quantities, successful trialling or commercialisation of alternatives, etc.)

Major changes to this year's nomination include a change in the karst topographical features estimate, the use rate, and reporting area in units of treated area. These changes directly impacted the nomination amount and our calculation methods. They are highlighted in Appendix A. A transition rate was applied based on the best estimate of yield losses and feasibility associated with likely methyl bromide alternatives that could be made by USG biologists and economists. In addition, a dosage rate of 150 kg/ha (for areas where disease pathogens were considered to be key pests) and 175 kg/ha (for areas where weeds were considered to be key pests) was used in calculating the amount of methyl bromide requested. USG also refined the estimates of the proportion of crop acreage to which methyl bromide alternatives involving 1,3 D + chloropicrin could not be used due to Karst and seepage irrigation restrictions. For details on these changes in usage requirements, please see Appendix B.

5. (i) BRIEF SUMMARY OF THE NEED FOR methyl bromide AS A CRITICAL USE (e.g. no registered pesticides or alternative processes for the particular circumstance, plantback period too long, lack of accessibility to glasshouse, unusual pests):

The US nomination is only for those areas where the alternatives are not suitable. There are several factors that make the potential alternatives to methyl bromide unsuitable in the U.S. eggplant production. These include:

- Efficacy of alternatives: the efficacy of alternatives may not be comparable to methyl bromide in some areas, making these alternatives technically and/or economically infeasible for use in eggplant production.
- Geographic distribution of key target pests: i.e., some alternatives may be comparable to methyl bromide as long as key pests occur at low pressure, and in such cases the US is only nominating a CUE for eggplants where the key pest pressure is moderate to high such as nutsedge in the Southeastern US.
- Regulatory constraints: e.g., Telone use is limited in Florida and Georgia due to the presence of karst topographical features.
- Delay in planting and harvesting: e.g., the plant-back interval for Telone+chloropicrin is two weeks longer than methyl bromide+chloropicrin, and in Michigan an additional delay would occur because soil temperature must be higher to fumigate with alternatives. Delays in planting and harvesting result in users missing major market windows, and affect revenues through lower prices.

Methyl bromide is the only fumigant that consistently provides reliable control of target weeds, nematodes, and pathogens. There are no technically or economically feasible alternatives. The best alternatives (e.g. 1,3-D + chloropicrin, metam sodium) are not as effective in controlling nutsedge and have a long waiting period for planting that would disrupt planting schedules and cause growers to miss key market windows. Furthermore, regulatory restrictions due to concerns over human exposure and ground water contamination, along with technical limitations, result in potential economic infeasibility of 1,3-D alone or in combination as a practical methyl bromide alternative. Major factors affecting the alternatives are a 28 day planting delay due both to label restrictions and low soil temperatures. In addition, a mandatory 30.4 m buffer zone is imposed for treated fields near the inhabited structures.

Michigan

In Michigan eggplant, the key target pest is *Phytophthora capsici*. This soil pathogen can easily destroy the entire harvest from affected areas if left uncontrolled. In small plot trials with peppers and cucurbits in Michigan (Hausbeck and Cortright 2004), the level of control provided by 1, 3 D + chloropicrin or metam-potassium was comparable to that afforded by methyl bromide. No trials were done with eggplants specifically, but since peppers are also a solanaceous crop, these results are promising. However, it is noteworthy that *P. capsici* has recently been shown to occur in irrigation water in Michigan (Gevens and Hausbeck 2003). This will increase the likelihood of repeated re-infestation of this pathogen. It is also not yet clear whether these small-scale results accurately reflect efficacy of methyl bromide alternatives in commercial fresh vegetable (peppers, eggplant, and cucurbit) production. These trials were done at a single location that only had cucurbit crops grown on it in the past, and other studies of these methyl bromide alternatives (described in the regional discussions later in this document) have not shown such promising results, suggesting that the pathogen in this Michigan study may not have adapted to solanaceous crops. Perhaps more importantly, this study used fumigants applied in June when soil temperatures are much warmer than in April, which is typically when fumigation must be done by eggplant growers who need to plant according to premium market price windows. Given the lower dissipation of these methyl bromide alternatives at temperatures around 4 ^{o}C, it is unlikely that the good efficacy seen in this trial would be consistently repeated if fumigations were timed more typically. Furthermore, regulatory restrictions (e.g., mandatory 30 m buffer zone for treated fields near inhabited structures) due to concerns over human exposure and ground water contamination, along with technical and economic limitations, result in potential infeasibility of this formulation as a practical methyl bromide alternative. Also, variations in soil temperatures or rainfall could easily cause delays in fumigation events, since the most likely methyl bromide substitutes (1,3 D + chloropicrin and metam-sodium/potassium) currently available have label restrictions or efficacy limitations permitting use only above certain temperatures or when rain is not imminent . Label restrictions on these methyl bromide alternatives also mandate planting delays based on rates used; at higher rates these delays can be as much as 2 weeks longer than those for methyl bromide itself. Therefore, this could disrupt the schedule of delivery of fresh eggplant harvest to wholesale buyers.

Florida and Georgia

Nutsedge is the key pest which requires methyl bromide in the Southeastern U.S., including Florida and Georgia. Other pest problems in this region that are managed with methyl bromide include *Pytophthora* blight, southern blight, damping-off, and *Verticillium* wilt. Of methyl bromide alternatives, only 1,3-D + chloropicrin has some efficacy against *Phytophthora*. However, 1,3-D cannot be applied in areas overlying karst topographical features which is common throughout the Southeast.

Growers in this region also face root-knot nematodes and the fungal pathogens described above as key pests. Left uncontrolled, any of these pests could completely destroy the harvests from affected areas. Halosulfuron, which is effective against nutsedges, can be applied only in row middles, but cannot be applied in raised beds, where nutsedge competition is critical (Florida CUE #03-0054).

Metam-sodium offers erratic, inconsistent control of nutsedges and nematodes, while 1,3-D +

chloropicrin provides adequate control of nematodes and diseases (Eger 2000, Noling et al. 2000). However, metam-sodium has yield losses of up to 44 percent compared to methyl bromide where weed infestations are moderate to severe (Locascio et al. 1997). Metam-sodium also creates a planting delay as long as 30 days to avoid risk of phytotoxic injury to crops compared to a 14-day delay for methyl bromide. Further, due to regulatory restrictions resulting from groundwater contamination concerns, 1,3-D + chloropicrin cannot be used in large portions of the southeastern U.S. due to the presence of karst topographical features. There is up to a 28-day planting delay (vs. 14 days for methyl bromide) due to regulatory restrictions for 1,3-D + chloropicrin. Also, Any apparent technical feasibility of metam-sodium and 1,3 D + chloropicrin (and various combinations thereof) are based on small plot research trials that done on crops other than eggplant. For fungi and nutsedge pests at least, no on-farm, large scale trials have yet been done. In a recent small-plot field study conducted in Tifton, Georgia by Culpepper and Langston (2004) on peppers, 1,3-D + chloropicrin, followed by more chloropicrin, was more effective than methyl bromide against yellow nutsedge, but less effective against purple nutsedge. Although this treatment performed as well as methyl bromide in terms of spring pepper yield, its fall yield performance was inferior to that of methyl bromide.

In a second treatment, 1,3-D by itself, followed by chloropicrin, was significantly less effective than methyl bromide for the control of both purple and yellow nutsedge, but as effective as methyl bromide for the control soil nematodes. In terms of spring and fall pepper yield, however, this treatment performed as well as methyl bromide. In a third treatment, 1,3-D + chloropicrin, followed by metam sodium, was as effective as methyl bromide against yellow nutsedge, 36% less effective than methyl bromide against purple nutsedge, and as effective as methyl bromide for the control of soil nematodes. This treatment also performed as well as methyl bromide in terms of both spring and fall pepper yield. It must be noted that nutsedge pressure in this study was relatively low and populations were composed primarily of yellow nutsedge, as opposed to the hardier purple nutsedge. Even this promising study did not use eggplants as a test crop system.

Thus, although these methyl bromide alternatives show some promise, they will require further testing and larger-scale validation.

Some researchers have reported that these methyl bromide alternatives are degraded more rapidly in areas where they are applied repeatedly due to enhanced metabolism by soil microorganisms. This phenomenon may compromise long-term efficacy of these compounds and need further scientific scrutiny.

In sum, neither of these methyl bromide alternatives is presently adequate for control of key pests, and methyl bromide remains a critical use for eggplant in the Southeastern United States.

Implications of methyl bromide loss for individual growers

If methyl bromide were to be removed as a pest control option for U.S. eggplant, the particular growers in each region cited in this nomination would have to stop crop production or suffer substantial losses. These growers would either leave agriculture entirely or switch to other crops that do not rely on pre-plant fumigation for soil pest control. The extent of this impact on the affected growers is debatable, but given the current embryonic state of commercial deployment of methyl bromide alternatives, it is possible that growers who currently treat their land routinely with methyl bromide would face this outcome.

TABLE A 2: EXECUTIVE SUMMARY*

Region		Michigan Eggplant	Florida Eggplant	Georgia Eggplant	Sector Total or Average
EPA Preliminary Value	kgs	3,799	86,999	48,868	139,666
EPA Amount of All Adjustments	kgs	(590)	(43,447)	(33,273)	(77,310)
Most Likely Impact Value for Treated Area	kgs	3,209	43,552	15,595	62,356
	ha	18	249	89	356
	Rate	175	175	175	175
Sector Research Amount (kgs)		433	2009 Total US Sector Nomination		62,789

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

(ii) STATE WHETHER THE USE COVERED BY A CERTIFICIATION STANDARD. (*Please provide a copy of the certification standard and give basis of standard (e.g. industry standard, federal legislation etc.). Is methyl bromide-based treatment required exclusively to meet the standard or are alternative treatments permitted? Is there a minimum use rate for methyl bromide? Provide data which shows that alternatives can or cannot achieve disease tolerances or other measures that form the basis of the certification standard).*

Not used to meet a certification standard.

6. SUMMARISE WHY KEY ALTERNATIVES ARE NOT FEASIBLE (Summary should address why the two to three best identified alternatives are not suitable, < 200 words):

In the Southern United States, mainly in Florida and Georgia, nutsedge is the main methyl bromide target pest and methyl bromide alternatives such as 1,3-D or metam sodium alone or in combination adequately control the high nutsedge populations. The applications of 1,3-D + chloropicrin (Talone C 35) tank mixed with herbicides (clomazone + metolachlor) at the field bed preparation or Telone C35 followd by a chloropicrin or metam sodium may be the best alternatives to methyl bromide out side the karst topographical features areas. Karst topographical feature areas which include 31 counties in Florida Telone is highly restricted and metam sodium or metam potassium are the best alternatives available to the farmers. However, further testing is required for the use of these chemicals in large scale commercial fields. Moreover, in Florida and Georgia farmers, using products containing 1,3-D and metam sodium in the fall require longer waiting periods for planting, 28 days and 21 days following the applications of metam sodium and 1,3-D, respectively. Only 14 days of waiting period is needed for methyl bromide compared to the longer waiting periods required for alternatives and such delays could miss the market windows. Furthermore, some evidence indicate that the efficacy of metam sodium declines in areas where it is applied repeatedly due to enhanced degradation of methyl isothiocyanate the active ingredient of metam sodium by soil microbes (Ashley, et al. 1963. Ou et al. 1995, Verhagen et al 1996, and Gamlied et al 2003).

In Michigan, soil-borne pathogens are the key methyl bromide target pests and only 1,3-D + chloropicrin is the only key alternative comparable to methyl bromide. Technical limitations combined with regulatory restrictions due to human exposure concerns reduce the use of this alternative. In addition, potential delays up to 28 days due to low soil temperature along with the label restrictions and mandatory 30 to 100 meter buffer zones limit the use of this alternative.

7. (i) PROPORTION OF CROP GROWN USING methyl bromide *(provide local data as well as national figures. Crop should be defined carefully so that it refers specifically to that which uses or used methyl bromide. For instance processing tomato crops should be distinguished from round tomatoes destined for the fresh market)*:

TABLE A 3: PROPORTION OF CROP GROWN USING METHYL BROMIDE

REGION WHERE METHYL BROMIDE USE IS REQUESTED	TOTAL CROP AREA (HA)**	PROPORTION OF TOTAL CROP AREA TREATED WITH METHYL BROMIDE (%)
Florida	647 (2001)	Not Available
Georgia	518 (2005)	Not Available
Michigan	84 (1997)	Not Available
National Total:*	**2,197 (2001)**	Not Available

*National total includes other regions not requesting methyl bromide
**Eggplant Statistics discontinued in 2002.
Sources: Florida: United States Department of Agriculture National Agricultural Statistics Service Vegetables 2002 Summary, January 2003 accessible online at: http://usda.mannlib.cornell.edu/usda/nass/VegeSumm//2000s/2003/VegeSumm-01-29-2003.pdf Michigan: accessible online at: http://www.hort.purdue.edu/newcrop/cropmap/michigan/michigantotals.html Georgia: The University of Georgia 2005 Georgia Farm Gate Value Report accessible online at: http://www.caed.uga.edu/publications/2006/pdf/AR-06-01.pdf

7. (ii) IF 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.

The primary reason that some eggplant may be grown without methyl bromide in all three regions is the absence of key target pests.

- In Florida, areas without karst topographical features and having low nutsedge pressure can successfully employ a fumigation system relying on 1,3-D and chloropicrin.

- In Georgia areas not treated do not have nutsedges or pathogens naturally present in cucurbit fields. Simple absence of all pests is the only reason these areas are not presently treated with methyl bromide.

- In Michigan, all acreage is treated with methyl bromide due to cool weather conditions and high pest pressure from diseases and weeds. The areas not treated apparently do not have any infestation (i.e., zero oospores or chlamydospores per unit soil) of the key fungal pests. The applicant states that soil infestation is spreading in the region annually.

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, areas that use methyl bromide do so because of environmental sensitivity and heavy pest pressure preclude the use of fumigants that are employed when these conditions are not present. The primary reason that some eggplants may be grown without methyl bromide in all three regions is the absence of key target pests and constraints to use of alternatives (i.e., absence of nutsedge in the Florida and Georgia, soil pathogens and cold soil temperatures in Michigan, and karst topographic features in Georgia and Florida).

8. AMOUNT OF methyl bromide REQUESTED FOR CRITICAL USE (*Duplicate table if a number of different methyl bromide formulations are being requested and/or the request is for more than one specified region*):

TABLE A 4: AMOUNT OF METHYL BROMIDE NOMINATED FOR CRITICAL USE

REGION	Florida	Georgia	Michigan
YEAR OF EXEMPTION REQUEST	2009		
QUANTITY OF METHYL BROMIDE NOMINATED	86,899 kg	48,868 kg	4,717 kg
TOTAL CROP AREA TO BE TREATED WITH THE METHYL BROMIDE OR METHYL BROMIDECHLOROPICRIN FORMULATION (M^2 OR HA) (NOTE: IGNORE REDUCTIONS FOR STRIP TREATMENT)	See Appendix A	See Appendix A	See Appendix A
METHYL BROMIDE USE: BROADACRE OR STRIP/BED TREATMENT?	Strip	Strip/Bed	Strip/Bed
PROPORTION OF BROADACRE AREA WHICH IS TREATED IN STRIPS; E.G. 0.54, 0.67	58%	58%	58%
FORMULATION (RATIO OF METHYL BROMIDECHLOROPICRIN MIXTURE) TO BE USED FOR CALCULATION OF THE CUE E.G. 98:2, 50:50	67/33	67/33	67/33
APPLICATION RATE* (KG/HA) FOR THE FORMULATION	See Appendix A	See Appendix A	See Appendix A
DOSAGE RATE* (G/M^2) (I.E. ACTUAL RATE OF FORMULATION APPLIED TO THE AREA TREATED WITH METHYL BROMIDECHLOROPICRIN ONLY)	See Appendix A	See Appendix A	See Appendix A

* Give here actual rate per treated area (e.g. the area directly treated under film) not rate per total area of field.

9. SUMMARISE ASSUMPTIONS USED TO CALCULATE METHYL BROMIDE QUANTITY NOMINATED FOR EACH REGION *(include any available data on historical levels of use)*:

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 methyl bromide 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 applicant 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. Not applicable in this sector.
- Only the acreage experiencing one or more of the following impacts were included in the nominated amount: moderate to heavy key pest pressure, regulatory impacts, karst topographical features, buffer zones, unsuitable terrain, and cold soil temperatures.

Renomination Form Part G: CHANGES TO QUANTITY OF METHYL BROMIDE REQUESTED

This section seeks information on any changes to the Party's requested exemption quantity.

(Renomination Form 16.) CHANGES IN USAGE REQUIREMENTS

Provide information on the nature of changes in usage requirements, including whether it is a change in dosage rates, the number of hectares or cubic metres to which the methyl bromide is to be applied, and/or any other relevant factors causing the changes.

Major changes to this year's nomination include a change in the karst topographical features estimate, the use rate, and reporting area in units of treated area. These changes directly impacted the nomination amount and our calculation methods. They are highlighted in Appendix A. A transition rate was applied based on the best estimate of yield losses and feasibility associated with likely methyl bromide alternatives that could be made by USG biologists and economists. In addition, a dosage rate of 150 kg/ha (for areas where disease pathogens were considered to be key pests) and 175 kg/ha (for areas where weeds were considered to be key pests) was used in calculating the amount of methyl bromide requested. USG also refined the estimates of the proportion of crop acreage to which methyl bromide alternatives involving 1,3 D + chloropicrin could not be used due to Karst and seepage irrigation restrictions. For details on these changes in usage requirements, please see Appendix A and B.

(Renomination Form 17) RESULTANT CHANGES TO REQUESTED EXEMPTION QUANTITIES

QUANTITY (KILOGRAMS) REQUESTED FOR PREVIOUS NOMINATION YEAR:	71,434
QUANTITY (KILOGRAMS) APPROVED BY PARTIES FOR PREVIOUS NOMINATION YEAR:	66,018
QUANTITY (KILOGRAMS) REQUIRED FOR YEAR TO WHICH THIS REAPPLICATION REFERS:	62,789
TREATED AREA (HECTARES) REQUIRED FOR YEAR TO WHICH THIS REAPPLICATION REFERS:	See Appendix A

Part B: CROP CHARACTERISTICS AND METHYL BROMIDE USE

10. KEY DISEASES AND WEEDS FOR WHICH methyl bromide IS REQUESTED AND SPECIFIC REASON FOR THIS REQUEST IN EACH REGION (*List only those target weeds and pests for which methyl bromide is the only feasible alternative and for which CUE is being requested*):

TABLE B 1: KEY DISEASES & WEEDS AND SPECIFIC REASONS WHY METHYL BROMIDE IS NEEDED

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
Florida	Weeds: yellow & purple nutsedges (*Cyperus rotundus & C. esculentus*), nightshade (*Solanum* spp.), sweet clover (*Mellilotis spp.*), ragweed (*Ambrosia artemisifolia*) Plant diseases: phytophthora blight (*Phytophthora* spp.), Southern Blight (*Sclerotinia Rolfsii spp.)*, damping-off (*Rhizoctonia solani*, *Pythium* spp.), Verticillium Wilt (Verticillium Alboatrum spp.) Nematodes: root-knot nematodes (*Meloidogyne* spp.),	Only methyl bromide can effectively control the target pests found in Florida, where pest pressures commonly exist at moderate to severe levels. Use of 1,3-D is restricted in key eggplant growing areas of Florida underlain by karst topographical features and sandy (porous) sub-soils, geological features that could lead to ground-water contamination. Approximately 40% of Florida's pepper production land has these soil constraints. For instance, 1,3-D is prohibited in Dade County, where 100% of the vegetable growing area is affected (U.S. EPA, 2002, Noling, 2003). Metam-sodium has limited pest control capabilities and is not useful as a stand-alone fumigant (Noling, 2003). Halosulfuron, which is effective against nutsedge, is only registered for use in row middles.
Georgia	Yellow and purple nutsedge (*Cyperus esculentus, C. rotundus*) *[100%];* crown and Root rot (*Phytophthora capsici*) *[40%];* plant-parasitic nematodes (*Meloidogyne incognita; Pratylenchus sp) [70%];* southern blight (*Sclerotium rolfsii*) *[70%];* Pythium root and collar rots (*P.irregulare, P. myriotylum, P. ultimum, P. aphanidermatum*) *[100%]*	Only methyl bromide can effectively control the target pests found in the southeast U.S. where pest pressures commonly exist at moderate to severe levels. Most, if not all of these states are limited in the use of the alternative 1,3-D because of underlying karst topographical features throughout the region. Halosulfuron, which is registered only for middle-of-row use, does not control nutsedge near pepper plants where most competition occurs. Metam-sodium has limited pest control capabilities and should never be used as a stand-alone fumigant (Noling, 2003). Refer to Item 13 for additional detail.
Michigan	Crown and root rots caused by soil-borne fungus *Phytophthora capsici*.	Fumigation operations need to be completed by the first week of May to allow growers to plant early and capture the early market for premium prices, as well as ensuring demand for their crop during the entire growing season (especially during the mid and late season).

11(i) CHARACTERISTICS OF CROPPING SYSTEM AND CLIMATE (Place major attention on the key characteristics that affect the uptake of alternatives):

TABLE B 2A: FLORIDA - CHARACTERISTICS OF CROPPING SYSTEM

CHARACTERISTICS	FLORIDA
CROP TYPE:	Vegetable crop for fresh market
ANNUAL OR PERENNIAL CROP:	Annual
TYPICAL CROP ROTATION AND USE OF METHYL BROMIDE FOR OTHER CROPS IN THE ROTATION:	Peppers, cucurbits
SOIL TYPES:	Sandy and sandy-loam soils
FREQUENCY OF METHYL BROMIDE FUMIGATION:	Annually
OTHER RELEVANT FACTORS:	Double-cropped with cucurbit; may be preceded by pepper.

TABLE B 3A-1: FLORIDA - CHARACTERISTICS OF CLIMATE AND CROP SCHEDULE - NOT DOUBLE-CROPPED

MONTH	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
CLIMATIC ZONE	Zones: 9a, 10a, 10b - In 1997, 80% of the state's eggplant production was in the southeast; remainder of about 20% distributed in the rest of the state, mostly in the central and northern regions.											
RAINFALL *(mm)*	65.5	50.0	72.5	134.1	175.8	193.3	152.7	65.0	42.7	158.8	62.0	66.8
OUTSIDE TEMP.(℃)	19.4	22.1	25.3	27.6	28.2	28.2	27.3	24.1	19.2	17.3	16.0	16.9
FUMIGATION SCHEDULE[A]				X	X	X	X	X	X	X	X	
PLANTING SCHEDULE[B]					**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**
KEY HARVEST WINDOW[C]	**E**	**E**	**E**	**E**	**E**				**E**	**E**	**E**	**E**

[A]Non-double cropped, earliest start date: June 15.

[B] For Non-Double cropped eggplant production, planting eggplants is usually initiated around July 1; shaded cells represent variation in transplanting dates

[C]For Non-Double Cropped Eggplants; Harvest Period usually begins as early as Nov. 1, may continue until July 31, depending on when planted and weather conditions.

TABLE B 3A-2: FLORIDA - CHARACTERISTICS OF CLIMATE AND CROP SCHEDULE - DOUBLE-CROPPED

MONTH	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
CLIMATIC ZONE	Zones 9a, 10a, 10b - In 1997, 80% of the state's eggplant production was in the southeast; remainder of about 20% distributed in the rest of the state, mostly in the central and northern regions.											
RAINFALL *(mm)*	65.5	50.0	72.5	134.1	175.8	193.3	152.7	65.0	42.7	158.8	62.0	66.8
OUTSIDE TEMP.(℃)	19.4	22.1	25.3	27.6	28.2	28.2	27.3	24.1	19.2	17.3	16.0	16.9
FUMIGATION SCHEDULE[A]				**X**	**X**	**X**	**X**					
PLANTING SCHEDULE[B]					**E**	**E**	**E**	**E**				**2C**
KEY HARVEST WINDOW[F]	E	E	2C	2C	2C				E	E	E	E

[A] Double-cropped; assumed to be with cucurbits; earliest start date is June 15.

[B] For Double-Cropped eggplant production, planting (**E**) is typically initiated on July 1; variance can be until October 1. The second crop of cucurbits transplants would typically be initiated around Feb 1, and may vary until end of Feb, or 1st part of March.

[C] For Double Cropped Eggplants, Harvest Period usually begins as early as Nov. 15 (**E**), may continue until April 15, depending on when planted and weather conditions; Harvesting of second crop (**2C**) may start around May 1 and continue until mid-July

TABLE B 2B: GEORGIA - CHARACTERISTICS OF CROPPING SYSTEM

CHARACTERISTICS	GEORGIA
CROP TYPE:	Vegetable crop for the fresh market
ANNUAL OR PERENNIAL CROP:	Annual; generally 1 year
TYPICAL CROP ROTATION AND USE OF METHYL BROMIDE FOR OTHER CROPS IN THE ROTATION:	Eggplants, followed by a cucurbit crop (cucumbers, or squash) or pepper.
SOIL TYPES:	Sandy loam; clay loam
FREQUENCY OF METHYL BROMIDE FUMIGATION:	1 time per year; (either in spring or fall)
OTHER RELEVANT FACTORS:	The grower may complete two, three or even four crops in one fumigation cycle.

TABLE B 3B: GEORGIA - CHARACTERISTICS OF CLIMATE AND CROP SCHEDULE

MONTH	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
CLIMATIC ZONE "PLANT HARDINESS ZONE"	Climate zones 7a, 7b, 8a, and 8b noted in the application. Zone 7a: -15.0 to –17.7 °C (0 to 5 °F): Oklahoma City, OK; South Boston, VA Zone 7b: -12.3 to 14.9 °C (5 to 10 °F); Griffin, GA Zone 8a: -9.5 to -12.2 ° C (10 to 15 °F); Tifton, GA Zone 8b: -6.7 to –9.4 °C (15 to 20 °F); Austin, TX; Gainesville, FL Portions of GA fall into all four of these zones.											
SOIL TEMP. *(°C)*	17.8	22.5	27.1	29.9	31.0	30.4	27.9	23.3	12.2	12.2	10.6	13.1
RAINFALL *(mm)*	127	97	89	114	142	122	86	58	58	114	114	107
AMBIENT TEMP. *(°C)*	21.0	25.4	29.3	31.9	32.6	32.5	30.7	26.3	21.0	17.3	16.4	17.8
FUMIGATION SCHEDULE[A]					▶◀							
PLANTING SCHEDULE[A,B]	⇉⇇				▶◀							
KEY HARVEST (MARKET) WINDOW[A,B]			⇉		⇇			▶	◀			

Shaded areas represent typical duration of activity. Darker shaded areas represent duration of activities for the second crop.

[A] Methyl bromide applied either in the spring or fall allows the grower to economically produce at least two crops (sometimes 3 or 4), the second crop usually cucumbers, from one fumigation event.

[B] Two crops are represented from one fumigation event.

▶= initiation of fumigation or planting and/or harvest of first crop; ◀ = termination of fumigation or planting and/or harvest of first crop. ⇉ = initiation of planting and/or harvest of second crop; ⇇ = termination of planting and/or harvest of second crop.

TABLE B 2C: MICHIGAN - CHARACTERISTICS OF CROPPING SYSTEM

CHARACTERISTICS	MICHIGAN
CROP TYPE:	Vegetable crop for the fresh market
ANNUAL OR PERENNIAL CROP:	Annual -- generally 1 year
TYPICAL CROP ROTATION AND USE OF METHYL BROMIDE FOR OTHER CROPS IN THE ROTATION:	Rotation sequence commonly followed by a pepper or cucurbit crop
SOIL TYPES:	Sandy loam, clayish loam
FREQUENCY OF METHYL BROMIDE FUMIGATION:	1 time every 2 years
OTHER RELEVANT FACTORS:	Michigan's diversified vegetable crop production is designed to meet key late spring and summer market demands in Midwestern states.

TABLE B 3C: MICHIGAN - CHARACTERISTICS OF CLIMATE AND CROP SCHEDULE

MONTH	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
CLIMATIC ZONE "PLANT HARDINESS ZONE"	Generally characterized as 5b according to the USDA Hardiness Zone Map, with annual minimum temperature ranges (average) as –23.4 to –26.1 °C (-15 to –10 °F). Example cities: Columbia, Missouri and Mansfield, Pennsylvania.											
SOIL TEMP. (℃)	<10	10 - 15	15-20	20-25	20-25	20-25	20	10-15	<10	<10	<10	<10
RAINFALL (mm)	40	72	101	48	47	32	17	31	36	20	6	8
OUTSIDE TEMP. (℃)	0.2	7.4	12.1	17.5	20.6	20.9	18.1	8	2.4	-2.9	-8	-7
FUMIGATION SCHEDULE		▶◀										
PLANTING SCHEDULE			▶◀									
KEY HARVEST (MARKET) WINDOW					▶			◀				

Shaded areas represent typical duration of activity; ▶ = typical initiation of activity, ◀ = typical termination of activity.

(ii) INDICATE IF ANY OF THE ABOVE CHARACTERISTICS IN 11(i) PREVENT THE UPTAKE OF ANY RELEVANT ALTERNATIVES?

In **Florida**, karst topographical features are prevalent and this severely limits the use of 1,3-D in those States. There are also restrictions on 1,3 D use in areas in Florida that cannot support seepage irrigation. There are no atypical characteristics identified in the nomination which might prevent the utility of Devrinol™ (napropamide) and trifluralin for nutsedge control and for control of broad-leaved weed species, such as morningglory. Halosulfuron, however has several label limitations (e.g., reduced effectiveness if rain events follow within 4 hours of application), and plant-back restrictions (0 to 36 months) (U.S. EPA, CUN 2003/050).

In **Georgia**, nearly all of the vegetable production occurs on Coastal Plain Soils, which are subject to high temperatures and excess heat. In addition to weed pests, soil-borne fungal pathogens and plant-parasitic nematodes are endemic to the region and nearly all production areas have severe infestations, thereby necessitating annual treatment with a soil fumigant. To a lesser extent Georgia also faces limitations on use of 1,3 D due to karst topographical features.

Michigan experiences heavy rainfall events across the entire state at any given moment of the growing season. Heavy rain events (over 25 mm) can trigger rapid root and crown rot development, and promote dissemination of *Phytophthora capsici* via irrigation sources. Generally, there is no difference in the amount of infection depending on soil type or production area. The pathogen is widespread and indigenous on almost all soil types in Michigan (Cortwright, 2003; Gevens and Hausbeck, 2003). All fumigation practices need to be completed by the first week of May to allow growers to plant early and capture the early market (July-September). Significant rainfall events (>25.4 mm) or cold soil temperatures (<4.4 °C) could delay fumigation and planting. Such cold soil temperatures often occur in early spring (March – April) in this region (Schaetzl and Tomczak 2001). Finally, lighter soil types may make drip application difficult (Cortright, 2003).

12. HISTORIC PATTERN OF USE OF methyl bromide, AND/OR MIXTURES CONTAINING methyl bromide, FOR WHICH AN EXEMPTION IS REQUESTED (*Add separate table for each major region specified in Question 8*):

TABLE B 4a: FLORIDA - HISTORIC PATTERN OF USE OF METHYL BROMIDE

FOR AS MANY YEARS AS POSSIBLE AS SHOWN SPECIFY:	2000	2001	2002	2003	2004	2005
AREA TREATED *(hectares)*	728	728	728	647	647	647
AMOUNT OF METHYL BROMIDE ACTIVE INGREDIENT USED *(total kilograms)*	114,646	114,623	114,623	101,888	100,284	86,899
FORMULATIONS OF METHYL BROMIDE *(Methyl Bromide/ Chloropicrin)*	67:33	67:33	67:33	67:33	67:33	67:33
METHOD BY WHICH METHYL BROMIDE APPLIED	Injected 25-30 cm depth	Injected 25-30 cm depth	Injected 25-30 cm depth	Injected 25-30 cm depth	Injected 25-30 cm depth	Injected 25-30 cm depth
ACTUAL DOSAGE RATE FOR THE ACTIVE INGREDIENT *(g/m^2)**	15.7	15.7	15.7	15.7	15.5	13.9

TABLE B 4b: GEORGIA - HISTORIC PATTERN OF USE OF METHYL BROMIDE

FOR AS MANY YEARS AS POSSIBLE AS SHOWN SPECIFY:	2000	2001	2002	2003	2004	2005
AREA TREATED *(hectares)*	333	315	321	346	291	350
AMOUNT OF METHYL BROMIDE ACTIVE INGREDIENT USED *(total kilograms)*	50,023	47,288	48,139	51,968	43,763	52,515
FORMULATIONS OF METHYL BROMIDE *(Methyl Bromide/ Chloropicrin)*	67:33	67:33	67:33	67:33	67:33	67:33
METHOD BY WHICH METHYL BROMIDE APPLIED	Injected, 20.3 to 30.5 cm, under tarp	Injected, 20.3 to 30.5 cm, under tarp	Injected, 20.3 to 30.5 cm, under tarp	Injected, 20.3 to 30.5 cm, under tarp	Injected, 20.3 to 30.5 cm, under tarp	Injected, 20.3 to 30.5 cm, under tarp
ACTUAL DOSAGE RATE FOR THE ACTIVE INGREDIENT *(g/m^2)**	15.0	15.0	15.0	15.0	15.0	15.0

TABLE B 4c: MICHIGAN - HISTORIC PATTERN OF USE OF METHYL BROMIDE

FOR AS MANY YEARS AS POSSIBLE AS SHOWN SPECIFY:	2000	2001	2002	2003	2004	2005
AREA TREATED *(hectares)*	29	32	34	32	35	39
AMOUNT OF METHYL BROMIDE ACTIVE INGREDIENT USED *(total kilograms)*	3,500	3,905	4,057	3,848	4,179	4,712
FORMULATIONS OF METHYL BROMIDE *(Methyl Bromide/ Chloropicrin)*	67:33 or 50:50	67:33 or 50:50	67:33 or 50:50	67:33 or 50:50	67:33 or 50:50	67:33 or 50:50
METHOD BY WHICH METHYL BROMIDE APPLIED	Injected 20-25 cm strip treatment	Injected 20-25 cm strip treatment	Injected 20-25 cm strip treatment	Injected 20-25 cm strip treatment	Injected 20-25 cm strip treatment	Injected 20-25 cm strip treatment
ACTUAL DOSAGE RATE FOR THE ACTIVE INGREDIENT *(g/m^2)**	12.0 or 9.0	12.1 or 9.0	12.1 or 9.0	12.0 or 9.0	12.0 or 9.0	12.0 or 9.0

Part C: TECHNICAL VALIDATION
Renomination Form Part D: REGISTRATION OF ALTERNATIVES

13. REASON FOR ALTERNATIVES NOT BEING FEASIBLE (Provide detailed information on a minimum of the best two or three alternatives as identified and evaluated by the Party, and summary response data where available for other alternatives (for assistance on potential alternatives refer to MBTOC Assessment reports, available at *http://www.unep.org/ozone/teap/MBTOC* , other published literature on methyl bromide alternatives and Ozone Secretariat alternatives when available):

TABLE C 1: REASON FOR ALTERNATIVES NOT BEING FEASIBLE

NAME OF ALTERNATIVE	TECHNICAL AND REGULATORY* REASONS FOR THE ALTERNATIVE NOT BEING FEASIBLE OR AVAILABLE
CHEMICAL ALTERNATIVES	
1,3 –D (Telone™)	Limestone channels potentially leading to groundwater (karst topographical features) underlies a portion of **Florida** production areas. Label restriction states that these products cannot be used where karst topographical features exists or where seepage irrigation is not possible in Florida. In **Georgia**, about 8 % of the production area is estimated to be affected by the karst restriction. Telone is not labeled for use in Dade County in Florida. See Appendices for details on the extent of karst Regardless of karst, this product may not adequately control nutsedge. Up to 2 applications of Telone II, in-line, or EC formulations may be needed to manage moderate to severe pest population levels. Also, there is a 28-day waiting period at the time of application until planting, which could cause loss of over half of the harvest season and the higher-end market windows to be missed. These are plantings made in July and harvested in the fall (Georgia CUE # 03-0049; Kelley, 2003). This only applies to light to moderate infestations and only with Telone C-35. **In Michigan:** Inconsistently effective against soil-borne fungi. In a recent study conducted in Oceana County, Michigan by Hausbeck and Cortright (2004), yields from pepper plots treated with 1,3-D+chloropicrin were comparable to yields from control plots and plots treated with methyl bromide + chloropicrin. These results, while promising, were from fumigation conducted under the optimally warm conditions of June, and require further validation in cooler conditions and at larger scales. However, there is also a Federal label restriction of a 30.4 m buffer zone between treated fields and inhabited structures, which will reduce overall pest control in a field. 28-day waiting period for planting may be disruptive to timely eggplant production and marketing.
Halosulfuron	Registered for use on eggplant (Dec. 2002, US EPA, Aug. 2003); use restricted to the row middle only; potential crop injury; severe plant back restrictions from 3 to 36 months for most vegetables; severe restrictions when used in pest management strategy that includes soil-applied organophosphates.

NAME OF ALTERNATIVE	TECHNICAL AND REGULATORY* REASONS FOR THE ALTERNATIVE NOT BEING FEASIBLE OR AVAILABLE
Metam-sodium (Vapam™)	Does not work under high weed pest pressure. Limited niche as a complementary treatment with other fumigants and herbicides, never stand alone (Noling, 2003). Considered as best available alternative for Dade County only (Aerts, 2003). Also, there is a 21-day waiting period at the time of application until planting (40% of harvest season missed), which may cause part of the higher-end market windows to be missed. These are plantings made in July and harvested in the fall. Beginning the application cycle earlier is not an option, since crops from the previous fumigation cycle must be terminated and cleaned up prior to metam application (Georgia CUE # 03-0049; Kelley, 2003). Repeated applications of MITC (the breakdown product of metam sodium) are known to enhance its biodegradation as a result of adapted microorganisms (Duncan and Yates, 2003). **For Michigan:** Poor fumigant with erratic results and inconsistent distribution in soil profiles; does not control *Phytophthora* (California Pepper Commission, CUE 02-0017; CUE03-0017). Repeated applications of MITC (the breakdown product of metam sodium) are known to enhance its biodegradation as a result of adapted microorganisms (Duncan and Yates, 2003). Phytotoxicity has been reported with this fumigant. 21-day day waiting period for planting may be disruptive to timely eggplant production and marketing. In a recent study conducted in Oceana County, Michigan by Hausbeck and Cortright (2004), yields from pepper plots treated with metam potassium (K-Pam) were comparable to yields from control plots and plots treated with methyl bromide + chloropicrin. These results, while promising, were from fumigation conducted under the optimally warm conditions of June, and require further validation in cooler conditions and at larger scales.
Napropamide (Devrinol™)	Weak in terms of nutsedge efficacy; does not control established weeds (CUE 03-0017); waste of money (Noling, 2003).
Trifluralin	Aids in control of annual grasses; does not manage broadleaf weeds. May cause excessive crop stress leading to reductions in stands and yields.
Chloropicrin	Does not distribute evenly throughout the soil profile when used by itself, resulting in poor efficacy. Does not control *Phytophthora capsici* when used at maximum label rates. (California Pepper Commission, CUE 02-0017; CUE03-0017). Not effective as a stand-alone product against weeds such as nutsedge.
NON CHEMICAL ALTERNATIVES	
Solarization	Weed density (yellow and purple nutsedge was greater in the solarized treatments compared to the methyl bromide treatment. Worked for the 1st year in FL peppers; if pest threshold is low (Chellemi, et al., 1997)
Myrothecium verrucaria (Ditera™)	Biological nematicide; registered on broad range of crops, field efficacy is untested
COMBINATION OF ALTERNATIVES	
1,3-D + chloropicrin (Telone II or Telone C-35) + Devrinol + trifluralin	Strategy involves applying 1,3-D Flat Fumigation, followed by chloropicrin 3-4 wks post fumigation + both herbicides before laying plastic. Chloropicrin may not be efficacious in managing white mold (*Sclerotium rolfsii*). Producers in Dade County are prohibited from using Telone products.
Solarization + 1,3-D	May work in areas with low weed, pest or disease pressure. Eliminated root galling and high density of root-knot nematodes. (Chellemi, D.O., et al. 1997. Application of soil solarization to Fall Production of cucurbits and pepper. Proc. Fla. State Hort. 110:333-336.)
Solarization + biocontrol fungus, *Gliocladium virens*	Ristaino, J.B., Perry, K.B. and R. D. Lumsden. 1996. Soil solarization and *Gliocladium virens* reduce the incidence of southern blight (*Sclerotium rolfsii*) in bell pepper in the field. Biocon.Sci. and Tech. 6:583-593.

NAME OF ALTERNATIVE	TECHNICAL AND REGULATORY* REASONS FOR THE ALTERNATIVE NOT BEING FEASIBLE OR AVAILABLE
1,3 dichloropropene followed by chloropicrin	Culpepper and Langston (2004) have tested the effectiveness of several soil fumigant combinations for the management of nutsedges and nematodes affecting peppers in Tifton, Georgia. Results show that 1,3-D followed by chloropicrin was significantly less effective than methyl bromide for the control of both purple and yellow nutsedge, but as effective as methyl bromide for the control soil nematodes. In terms of spring and fall crop yield, however, this combination performed as well as methyl bromide. This treatment is promising and will require further testing and validation in commercial fields. **For Michigan**: The 28-day waiting period for planting caused by low soil temperatures could disrupt the eggplant production and marketing timing. Regulatory restrictions due to concerns over human exposure and ground water contamination, along with technical limitations, result in potential economic infeasibility of this formulation as a practical methyl bromide alternative. In a recent study conducted in Oceana County, Michigan by Hausbeck and Cortright (2004), yields from pepper plots treated with 1,3-D+chloropicrin were comparable to yields from control plots and plots treated with methyl bromide + chloropicrin. These results, while promising, were from fumigation conducted under the optimally warm conditions of June, and require further validation in cooler conditions and at larger scales.
1,3 dichloropropene + chloropicrin (Telone C35) followed by chloropicrin	Culpepper and Langston (2004) have tested the effectiveness of several soil fumigant combinations for the management of nutsedges and nematodes affecting peppers in Tifton, Georgia. In this study, 1,3-D + chloropicrin, followed by more chloropicrin was more effective than methyl bromide for the control of yellow nutsedge, but less effective against purple nutsedge. This treatment performed as well as methyl bromide in terms of spring crop yield, but poorly in terms of fall yield. This combination does not appear to show promise as a methyl bromide alternative.
1,3 dichloropropene + chloropicrin (Telone C35) followed by metam sodium	Culpepper and Langston (2004) have tested the effectiveness of several soil fumigant combinations for the management of nutsedges and nematodes affecting peppers in Tifton, Georgia. In this study, 1,3-D + chloropicrin, followed by metam sodium was 36% less effective than methyl bromide for the control of purple nutsedge, but as effective as methyl bromide for the control of yellow nutsedge and soil nematodes. In terms of spring and fall crop yield, this treatment performed as well as methyl bromide. This combination is promising and will require further testing and validation in commercial fields.
Metam Sodium/Crop Rotation	The limitations of metam-sodium/potassium have been discussed previously (above). As regards rotation, A 4-5 year rotation cycle is necessary to reduce inoculum levels. The economic threshold of *Phytophthora capsici* is presumed to be 1 oospore/ft^2 (Michigan CUE 03-0061). Because of high land costs, very few crops are of high enough economic value to be rotated with eggplants. Also, 21-day day waiting period for planting after metam sodium fumigation may be disruptive to timely eggplant production and marketing.
Metam Sodium/Furfural (Multigard™)	Results of a 2003 small plot field study demonstrated practically equivalent soil pest control of targeted pests (plot vigor) and slightly lesser yields than methyl bromide. (Hausbeck and Cortright, 2004). However, furfural is not yet registered by the U.S.EPA, though it is under consideration by federal authorities.

Add more rows if necessary

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

** Citations should be recorded by a number only, to indicate citations listed in Question 22.

14. LIST AND DISCUSS WHY REGISTERED PESTICIDES AND HERBICIDES ARE CONSIDERED NOT EFFECTIVE AS TECHNICAL ALTERNATIVES TO METHYL BROMIDE (*Provide information on a minimum of two best alternatives and summary response data where available for other alternatives)*:

The U.S. EPA only considered those technically feasible registered alternatives which are relevant for managing severe pathogen and pest pressures.
Paraquat and glyphosate will suppress emerged nutsedge, but cannot be used in the crop row because of potential crop injury (SE Pepper Consortium CUE for 2004).

Fumigation of products containing 1,3-D and metam sodium (Vapam and/or K-pam) in the summer or fall is practically impossible because of the waiting periods for planting following application under plastic mulch. For 1,3-D there is a 28-day waiting period; for metam sodium, there is a 21-day waiting period. Such delays may cause reduction in yields and market windows missed. Thus, since the fall crop is dependent upon timely planting, a long waiting period (e.g., 28 days) would cost growers at least half of the harvest season, thereby missing the higher market windows (Kelley, 2003).

A number of effective fungicides are available for treatment of these diseases when they infect aerial portions of crops. However, these infections are not the focus of methyl bromide use, which is meant to keep newly planted transplants free of these fungi. Potential yield losses to *Phytophthora capsici* affect up to 10% of the production area, especially if the plants are infected early in the growing season. The pest situation is exacerbated by the widespread occurrence of indigenous populations of *P. capsici*, (Michigan CUE #03-0061; Gevens and Hausbeck, 2003), significant rainfall events (greater than 254 mm) which trigger rapid disease development (Cortright, personal communication, 2003), metalaxyl and mefenoxam-insensitivity reported among *Phytophthora* spp. populations in several vegetable production areas (Lamour and Hausbeck, 2003; Parra and Ristaino, 1998), and planting restrictions for registered alternative fumigants (e.g. 1,3-D + chloropicrin and metam-sodium).

Label-mandated planted delays of up to 30 days for the alternative fumigants 1,3 D or metam-sodium/potassium + chloropicrin imply that, if growers who must plant eggplant early in the season are forced to use only these options, they would face losses of their target markets even if pests were adequately controlled. For these growers, fumigation needs to be completed by the first week of May to allow them to plant early and capture the early market (July - September) in order to have their product available for premium prices, as well as to ensure demand for their crop during the entire growing season (especially during the mid and late season). According to the applicant, Michigan’s diversified vegetable crop industry is designed to meet market demands in the late spring and through the summer for Midwestern market and therefore requires carefully-timed planting and harvesting schedules. The fumigation with methyl bromide and planting schedule allow growers to maintain market diversity, as well.

15. STATE RELATIVE EFFECTIVENESS OF RELEVANT ALTERNATIVES COMPARED TO methyl bromide FOR THE SPECIFIC KEY TARGET PESTS AND WEEDS FOR WHICH IT IS BEING REQUESTED (*Use the same regions as in Section 10 and provide a separate table for each target pest or disease for which methyl bromide is*

considered critical. Provide information in relation to a minimum of the best two or three alternatives.):

A: KEY PATHOGENS: *Phytophthora capsici*, *Pythium* spp. and nematodes (*Meloidogyne* spp.)

Narrative description of studies relevant to key pathogens

A field trial was conducted in small plots in 2004 in Michigan by Hausbeck and Cortright (2004) of Michigan State University. This study examined a number of vegetable crops including eggplant. Results, submitted with their 2004 CUE request, indicated that 1,3 D + 35 % chloropicrin treatments (shank-injected at 56.7 liters/ha) showed an average of 44% yield loss compared to methyl bromide (due to both *Phytophthora* and *Fusarium* combined). Chloropicrin alone (shank-injected at 233.6 l/ha) showed an average 15.5% loss compared to methyl bromide. Metam-potassium + chloropicrin showed yields similar to those seen with methyl bromide. Metam-sodium was not tested, but can reasonably be assumed to be equivalent to metam-potassium (since the active ingredient is identical). Methyl iodide (currently unregistered for eggplant) with 33% chloropicrin (shank-injected, at 36.8 kg/ha, respectively), also showed yields similar to that of methyl bromide. It should be noted that even large differences in average yields across various treatments were often not statistically significant, suggesting that there was high variability in the data. Thus far, no new data have been generated to complement this work, though further research is planned (see Section 17 below).

In studies with other vegetable crops, 1, 3 D + chloropicrin has generally shown better control of fungi than metam-sodium formulations (though still not as good as control with methyl bromide). For example, in a study using a bell pepper/squash rotation in small plots, Webster et al. (2001) found significantly lower fungal populations with 1,3 D + 35 % chloropicrin (drip applied, 146 kg/ha of 1,3 D), as compared to the untreated control. However, methyl bromide (440 kg/ha, shank-injected) reduced fungal populations even more. It should be noted that *P. capsici* was not present in test plots, though *Fusarium* spp. were. Methyl iodide had no significant suppressive effect, as compared to the untreated control. However, neither of these methyl bromide alternatives increased squash fruit weight significantly over the untreated control. Indeed, as compared to the methyl bromide standard treatment plots, squash fruit weight was 63 % lower in the 1,3 D plots, and 41 % lower in the methyl iodide plots. The proportion of marketable squash fruit (defined only as those fruit so bad as to have to be discarded) in the 1,3 D plots was 30 % lower than that in the methyl bromide plots, although in the methyl iodide plots it was equivalent to methyl bromide. In another study, conducted on tomatoes, Gilreath et al. (1994) found that metam-sodium treatments did not match methyl bromide in terms of plant vigor at the end of the season; again, *Fusarium* (but not *P. capsici*) was one of several pests present.

Taken together, these studies indicate that, while the recent trials in Michigan are promising for the use of metam-sodium/potassium + chloropicrin, there is still great inconsistency in efficacy and protection from yield losses. However, the Michigan trials were conducted in the warm conditions of June, so growers cannot be confident that similar results would be seen if fumigation were done in the cooler conditions of springtime in this region. Further, no large scale field trials have yet been performed to demonstrate reliable, consistent pest control similar to that of methyl bromide in the eggplant growing regions of Michigan. Given the highly variable results with this methyl bromide alternative, EPA decided that the best case yield loss scenario would be a level similar to what was assessed in the 2003 Critical Use Nomination.

Culpepper and Langston (2004) recently compared the effectiveness of several soil fumigants in managing nematode soil pests affecting peppers in Tifton, Georgia. Eggplants were not used as a test crop, so here, again, data from peppers are used to "bridge" a discussion. Results show that 1,3-D followed by chloropicrin was significantly less effective than methyl bromide for the control of both purple and yellow nutsedge, but as effective as methyl bromide for the control soil nematodes. In terms of spring and fall crop yield, this treatment performed as well as methyl bromide. 1,3-D + chloropicrin, followed by more chloropicrin was more effective than methyl bromide for the control of yellow nutsedge, but less effective against purple nutsedge. This treatment performed as well as methyl bromide in terms of spring crop yield, but poorly in terms of fall yield. 1,3-D + chloropicrin, followed by metam sodium was 36% less effective than methyl bromide for the control of purple nutsedge, but as effective as methyl bromide for the control of yellow nutsedge. This combination was as effective as methyl bromide against soil nematodes. In terms of spring and fall crop yield, this treatment performed as well as methyl bromide. This suggests that these treatments are showing promise and will require further testing and validation in commercial fields. However, it should also be noted that nutsedge populations were relatively low and predominantly composed of yellow nutsedge, which may be easier to control than purple nutsedge.

Nematode pests, such as the root knot nematode species of *Meloidogyne*, were third to nutsedge and fungal pathogens in terms of priority of pest management strategies in Georgia eggplant production. Pre-plant control of nematodes is critical since nematode root feeding and damage may predispose plant tissues to invasion by fungal pathogens, potentially leading to wilt, loss of plant vigor, and significant yield losses. Fumigant alternatives such as metam-sodium have proven inconsistent (Noling, 2003; FFVA, 2002).

Diseases caused by soil-borne plant pathogenic fungi, (e.g., *Phytophthora* spp., *Pythium* spp. and *Sclerotium rolfsii*) are endemic in many vegetable production areas in Georgia. Fungicides such as chlorothalonil, and azoxystrobilurin are considered to be only prophylactic, and may not offer sufficient pest management. Resistance of *Phytophthora* spp to metalaxyl and mefenoxam (Ridomil and Ridomil Gold, respectively) has been reported in tomato crop areas, and most recently pepper (Lamour and Hausbeck, 2003)

The use of products containing 1,3-D and metam sodium in the fall is impractical because of the long waiting periods for planting following application under plastic mulch. For 1,3-D there is a 28 day waiting period; for metam sodium, there is a 21-day waiting period. Such delays would cost growers at least half of the harvest season, thereby missing the higher market windows.

Thus, since the fall crop is dependent upon timely planting, the required waiting period would cost growers at least half of the harvest season, thereby missing the higher market windows (Kelley, 2003).

B: KEY WEEDs: Nutsedges

TABLE C 2: DATA ON TRIALS OF FUMIGANT ALTERNATIVES TO METHYL BROMIDE FOR POLYETHYLENE-MULCHED TOMATO (LOCASCIO ET AL. 1997)

Chemicals	Rate (kg/ha)	Average Nutsedge Density (#/m^2)	Average Marketable Yield (ton/ha)	% Yield Loss (compared to methyl bromide)
Untreated (control)	-	300 [ab]	20.1 [a]	59.1
methyl bromide + Pic (67-33), chisel-injected	390 kg	90 [c]	49.1 [b]	---
1,3 D + Pic (83-17), chisel-injected	327 l	340 [a]	34.6 [c]	29.5
Metam Na, Flat Fumigation	300 l	320 [a]	22.6 [a]	54.0
Metam Na, drip irrigated	300 l	220 [b]	32.3 [c]	34.2

Add more rows if necessary
** Citations should be recorded by a number only, to indicate citations listed in Question 22.

Narrative description of studies relevant to key weeds

For nutsedge pests, which are widespread in all requesting regions except Michigan, cucurbit growers do not currently have technically feasible alternatives to methyl bromide use at planting. Metam-sodium and 1,3 D + chloropicrin have shown some efficacy in small-plot trials in other vegetable crops (e.g, tomato). However, at best, metam sodium may allow at least 44 % yield loss, while 1,3 D may allow at least 29 % loss. Both often show less control than methyl bromide (in terms of population suppression) of nutsedges. These factors suggest that even this alternative will not be economically feasible even in the best-case technical scenario. It should be noted that there is evidence that both 1,3 D and methyl isothiocynate levels decline more rapidly, thus further compromising efficacy, in areas where these are repeatedly applied (Smelt et al., 1989; Ou et al., 1995; Gamliel et al., 2003). This is due to enhanced degradation of these chemicals by soil microbes (Dungan and Yates, 2003).

Other chemical alternatives to methyl bromide that have shown promise against nutsedges (e.g., pebulate) are currently unregistered for cucurbits, and are often not being developed for registration by any commercial entity.

In one recent study, Culpepper and Langston (2004) conducted studies at 2 sites in spring 2003 and one site in Fall, 2004. Plot sizes were 20 feet X 32 inches (4.94 m^2). Treatments were: Methyl bromide standard (67:33 formulation), untreated control, 2 formulations of Telone (1,3 D + chloropicrin) at various doses, followed by an additional application of either chloropicrin or metam-sodium, a third formulation of 1,3 D + chloropicrin ("Inline"), and methyl iodide. An additional set of plots received the same fumigant treatments but also received an herbicide treatment (clomazone + halosulfuron) later in the season.

Furthermore, a number of important caveats must be mentioned when considering these results:

(1) Plots used were quite small, and it is not at all clear if the promising results will hold reliably in larger commercial fields. This is particularly worrisome given the highly variable results reported by other researchers for the same methyl bromide alternatives.

(2) The nutsedge populations in this study were dominated by yellow nutsedge (90 % of the total number). It is not clear if populations where purple nutsedge is dominant will be controlled as effectively. A number of other studies have indicated that purple nutsedge is a hardier species, and even in Culpepper and Langston's study, it appeared more resistant to the methyl bromide alternatives. For example, methyl iodide gave "77 % control" of yellow nutsedge, but only "37 % control" of purple nutsedge. Control in this case was apparently defined as the reduction in nutsedge populations as compared to populations in the untreated control.

(3) A custom-built applicator had to be used for the metam-sodium applications to eliminate worker exposure risks, according to the authors. It is not yet clear if such an applicator can be mass-produced and/or used reliably in a commercial setting.

Another recent study of methyl bromide alternatives involving key weed pests was done by Gilreath et al. 2005 also (Crop Prot (24): 903-908, though once again not in eggplants. One of 3 trials in that study showed an average of 30 % lower bell pepper yields with nustedges and nematodes as the key pests present. In the other 2 trials yields were not significantly different across different fumigant treatments, but nutsedge pressure was lower in those trials as compared to the third. Important caveats to these results are - this was a small-plot study and was done in Florida. Thus it is not clear how applicable the results are to the more northern regions requesting methyl bromide for vegetable crops.

16. ARE THERE ANY OTHER POTENTIAL ALTERNATIVES UNDER DEVELOPMENT THAT THE PARTY IS AWARE OF WHICH ARE BEING CONSIDERED TO REPLACE METHYL BROMIDE? (*If so, please specify*):

There are a number of possibilities, including both chemical and non-chemical alternatives, which are being investigated for use as possible methyl bromide replacements. These range from iodo-methane, which has some potential to become a drop-in replacement for methyl bromide in pre-plant uses, to radio waves which may one day be used to sterilize the soil.

Until a chemical is registered, and only after efficacy against key pests is demonstrated in repeated trials at commercial scales, does the USG consider that a chemical or technology is a bona fide replacement for methyl bromide.

Methyl iodide: ONLY has an 'experimental use permit' that allows field trials on about 2,000 acres (combined) of several crops (none of which are cucurbits). Under development for future registration submission

Propargyl bromide: Under proprietary development for future registration submission.

Sodium azide: Under proprietary development for future registration submission.

Furfural: registered for greenhouse ornamentals only. Under proprietary development for other registration submission.

DMDS (dimethyl disulfide): Under proprietary development for future registration submission.

17. (i) ARE THERE TECHNOLOGIES BEING USED TO PRODUCE THE CROP WITHOUT METHYL BROMIDE? (e.g. soilless systems, plug plants, containerised plants. State proportion of crop already grown in such systems nationally and if any constraints exist to adoption of these systems to replace methyl bromide use. State whether such technologies could replace a proportion of proposed methyl bromide use):

No. Areas where methyl bromide is not used in this region do not face moderate to severe populations of the key pests.

(ii) IF SOILLESS SYSTEMS ARE CONSIDERED FEASIBLE, STATE PROPORTION OF CROP BEING PRODUCED IN SOILLESS SYSTEMS WITHIN REGION APPLYING FOR THE NOMINATION AND NATIONALLY:

Not feasible for large production and/or limited resources.

(iii) WHY ARE SOILLESS SYSTEMS NOT A SUITABLE ALTERNATIVE TO PRODUCE THE CROP IN THE NOMINATION?

No studies have been done to demonstrate technical and economic feasibility of such systems in open field eggplant crops in the US. None appear to be planned by US researchers for the near future.

Progress in registration of a product will often be beyond the control of an individual exemption holder as the registration process may be undertaken by the manufacturer or supplier of the product. The speed with which registration applications are processed also can falls outside the exemption holder's control, resting with the nominating Party. Consequently, this section requests the nominating Party to report on any efforts it has taken to assist the registration process, but noting that the scope for expediting registration will vary from Party to Party.

(Renomination Form 11.) PROGRESS IN REGISTRATION

Where the original nomination identified that an alternative's registration was pending, but it was anticipated that one would be subsequently registered, provide information on progress with its registration. Where applicable, include any efforts by the Party to "fast track" or otherwise assist the registration of the alternative.

USG endeavors to identify methyl bromide alternatives in order to move them forward in the registration queue. However USG has no legal authority to compel registrations; it can only act on registrations requested by private entities. The timely submission of data to support a registration decision is at the sole discretion of the registrant.

(Renomination Form 12.) DELAYS IN REGISTRATION

Where significant delays or obstacles have been encountered to the anticipated registration of an alternative, the exemption holder should identify the scope for any new/alternative efforts that could be undertaken to maintain the momentum of transition efforts, and identify a time frame for undertaking such efforts.

USG has no legal authority to compel registrations; it can only act on registrations requested by private entities. The timely submission of data to support a registration decision is at the sole discretion of the registrant. Please see table above for additional detail.

(Renomination Form 13.) DEREGISTRATION OF ALTERNATIVES

Describe new regulatory constraints that limit the availability of alternatives. For example, changes in buffer zones, new township caps, new safety requirements (affecting costs and feasibility), and new environmental restrictions such as to protect ground water or other natural resources. Where a potential alternative identified in the original nomination's transition plan has subsequently been deregistered, the nominating Party would report the deregistration, including reasons for it. The nominating Party would also report on the deregistration's impact (if any) on the exemption holder's transition plan and on the proposed new or alternative efforts that will be undertaken by the exemption holder to maintain the momentum of transition efforts.

Six fumigants are undergoing a review of risks and benefits at present. A likely outcome of this review will be the imposition of additional restriction on the use of some or all of these chemicals. This process will not lead to proposed restrictions until 2008, at which point the process to modify labels will start. This process can take several years to complete. It is not possible to forecast the outcome of the soil fumigant analysis at this time.

An additional complication in forecasting changes in the registration of alternatives is that under the US federal system individual states may impose restrictions above those imposed at the Federal level. Examples of these additional restrictions include the township caps on Telone® in California and the "SLN" (Special Local Needs) restrictions on the same chemical in 31 Florida counties.

In addition, the California Department of Pesticide Regulation (DPR) may impose use restrictions and water seal requirements on all soil fumigants to reduce their contributions to volatile organic compounds as part of the efforts to meet the Federal Clean Air Standards for ground level ozone. DPR plans to finalize regulations in the next 2-3 months to meet a deadline imposed by a lawsuit concerning compliance with the 1994 pesticide component of the State Implementation Plan (SIP) on ozone. They are also in the process of devising what measures will be included in the next SIP (for June, 2007) to meet the new lower ozone standards.

Part D: EMISSION CONTROL
Renomination Form Part E: IMPLEMENTATION OF MBTOC/TEAP RECOMMENDATIONS

18. TECHNIQUES THAT HAVE AND WILL BE USED TO MINIMISE methyl bromide USE AND EMISSIONS IN THE PARTICULAR USE (*State % adoption or describe change*):

TABLE D 1: TECHNIQUES USED TO MINIMIZE METHYL BROMIDE USE AND EMISSIONS

TECHNIQUE OR STEP TAKEN	LOW PERMEABILITY BARRIER FILMS	METHYL BROMIDE DOSAGE REDUCTION	INCREASED % CHLOROPICRIN IN METHYL BROMIDE FORMULATION	DEEP INJECTION	LESS FREQUENT APPLICATION
WHAT USE/EMISSION REDUCTION METHODS ARE PRESENTLY ADOPTED?	Currently some growers use HDPE tarps.	Growers have switched from a 98% methyl bromide formulation to a 67 % formulation. Between 1997 and 2001, the U.S. has achieved a 36 % reduction in use rates.	From 2 % to 33 %	Will not control pathogens in root zone.	No
WHAT FURTHER USE/EMISSION REDUCTION STEPS WILL BE TAKEN FOR THE METHYL BROMIDE USED FOR CRITICAL USES?	Research is underway to develop use in commercial production systems	Research is underway to develop use of a 50 % methyl bromide formulation in Michigan commercial production systems. Not known if other regions are planning similar work.	Research is underway to develop use of a 50 % methyl bromide formulation in Michigan commercial production systems. Not known if other regions are planning similar work.	Not feasible because fumigant would not be located in the area of heavy pest pressure.	The U.S. anticipates that the decreasing supply of methyl bromide will motivate growers to try less frequent applications.
OTHER MEASURES (PLEASE DESCRIBE)	Examination of promising but presently unregistered alternative fumigants and herbicides, alone or in combination with non-chemical methods, is planned in all regions. Measures adopted in Michigan will likely be used in the other regions when fungi are the only key pests involved				

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

Techniques to minimize emission include the use of low-permeability films, the application of water seals, and the "top dressing" application of fertilizer. The application of water seals is dependent on the availability of adequate supplies of water and a lack of restrictions on water use as well as irrigation systems that will allow the application of sufficient quantities of water to effect the seal. Therefore, these methods have been deemed currently infeasible for use in the acreage requesting methyl bromide in this nomination.

The Methyl Bromide Technical Options Committee and the Technology and Economic Assessment Panel may recommend that a Party explore and, where appropriate, implement alternative systems for deployment of alternatives or reduction of methyl bromide emissions.

Where the exemptions granted by a previous Meeting of the Parties included conditions (for example, where the Parties approved a reduced quantity for a nomination), the exemption holder should report on progress in exploring or implementing recommendations.

Information on any trialling or other exploration of particular alternatives identified in TEAP recommendations should be addressed in Part C.

(Renomination Form 14.) USE/EMISSION MINIMISATION MEASURES

Where a condition requested the testing of an alternative or adoption of an emission or use minimisation measure, information is needed on the status of efforts to implement the recommendation. Information should also be provided on any resultant decrease in the exemption quantity arising if the recommendations have been successfully implemented. Information is required on what actions are being, or will be, undertaken to address any delays or obstacles that have prevented implementation.

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 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 who 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. In keeping with both local requirements to avoid “drift” of methyl bromide into inhabited areas, as well as to preserve methyl bromide and keep related emissions to the lowest level possible, methyl bromide application for tomatoes is most often machine injected into soil to specific depths.

As methyl bromide has become more scarce, 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 98% methyl bromide and 2% 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. In addition, cultural practices are utilized by tomato growers.

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.

USDA has several grant programs that support research into overcoming obstacles that have prevented the implementation of methyl bromide alternatives. In addition, USEPA and USDA jointly fund an annual meeting on methyl bromide alternatives. At this year's meeting (held in November in Orlando, Florida) sessions were to assess and prioritize research needs and to develop a use/emission minimization agenda for methyl bromide alternatives research.

Additional specific measures are provided above in Table D 1.

Part E: ECONOMIC ASSESSMENT
Renomination Form Part F: ECONOMIC ASSESSMENT

20. (Renomination Form 15.) ECONOMIC INFEASIBILITY OF ALTERNATIVES – METHODOLOGY *(MBTOC will assess economic infeasibility based on the methodology submitted by the nominating Party. Partial budget analysis showing per hectare gross and net returns for methyl bromide and the next best alternatives is a widely accepted approach. Analysis should be supported by discussions identifying what costs and revenues change and why. The following measures may be useful descriptors of the economic outcome using methyl bromide or alternatives. Parties may identify additional measures. Regardless of the measures used by the methodology, it is important to state why the Party has concluded that a particular level of the measure demonstrates a lack of economic feasibility):*

The following measures or indicators may be used as a guide for providing such a description:

(a) The purchase cost per kilogram of methyl bromide and of the alternative;
(b) Gross and net revenue with and without methyl bromide, and with the next best alternative;
(c) Percentage change in gross revenues if alternatives are used;
(d) Absolute losses per hectare relative to methyl bromide if alternatives are used;
(e) Losses per kilogram of methyl bromide requested if alternatives are used;
(f) Losses as a percentage of net cash revenue if alternatives are used;

Economic data for the 2006 methyl bromide critical use renomination were taken from applications for methyl bromide critical use and were updated from previous nominations when newer information was available in the 2006 application. The following economic assessment is organized by methyl bromide critical use application. Expected impacts when using methyl bromide alternatives are given in tables E1 through E3 by geographic location.

Readers please note that in this study 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 study. We did not include fixed costs because it is often difficult to measure and verify.

TABLE E 1: FLORIDA - ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES

FLORIDA EGGPLANT	METHYL BROMIDE	1,3-D + CHLOROPICRIN	METAM-SODIUM
YIELD LOSS (%)	0%	29%	44%
YIELD PER HECTARE	1,893	1,344	1,060
* PRICE PER UNIT (US$)	$11.33	$11.33	$11.33
= GROSS REVENUE PER HECTARE (US$)	$21,445.71	$15,227	$12,010
- OPERATING COSTS PER HECTARE (US$)	$14,951.49	$13,902	$13,186
= NET REVENUE PER HECTARE (US$)	$6,494.22	$1,325	$(1,178)
FIVE LOSS MEASURES *			
1. LOSS PER HECTARE (US$)	$0	$5,170	$7,671
2. LOSS PER KILOGRAM OF METHYL BROMIDE (US$)	$0	$34	$51
3. LOSS AS A PERCENTAGE OF GROSS REVENUE (%)	0%	24%	36%
4. LOSS AS A PERCENTAGE OF NET REVENUE (%)	0%	80%	118%
5. PROFIT MARGIN (%)	30%	9%	-10%

TABLE E 2: GEORGIA - ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES

GEORGIA EGGPLANT	METHYL BROMIDE	1,3-D + CHLOROPICRIN	METAM-SODIUM
YIELD LOSS (%)	0%	29%	44%
YIELD PER HECTARE	6,023	4,276	3,373
* PRICE PER UNIT (US$)	$7	$7	$7
= GROSS REVENUE PER HECTARE (US$)	$42,359	$30,075	$23,721
- OPERATING COSTS PER HECTARE (US$)	$34,976	$30,289	$27,794
= NET REVENUE PER HECTARE (US$)	$7,383	$(214)	$(4,073)
FIVE LOSS MEASURES *			
1. LOSS PER HECTARE (US$)	$0	$7,598	$11,456
2. LOSS PER KILOGRAM OF METHYL BROMIDE (US$)	$0	$51	$76
3. LOSS AS A PERCENTAGE OF GROSS REVENUE (%)	0%	18%	27%
4. LOSS AS A PERCENTAGE OF NET REVENUE (%)	0%	103%	155%
5. PROFIT MARGIN (%)	17%	-1%	-17%

Note: Georgia eggplant revenue and cost measures were calculated using data from a two crop per growing season production system.

TABLE E 3: MICHIGAN - ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES

MICHIGAN EGGPLANT	METHYL BROMIDE	1,3-D + CHLOROPICRIN
YIELD LOSS (%)	0%	6%
YIELD PER HECTARE	4,445	4,179
* PRICE PER UNIT (US$)	$8	$8
= GROSS REVENUE PER HECTARE (US$)	$37,475	$32,584
- OPERATING COSTS PER HECTARE (US$)	$26,981	$26,085
= NET REVENUE PER HECTARE (US$)	$10,494	$6,500
FIVE LOSS MEASURES *		
1. LOSS PER HECTARE (US$)	$0	$3,9974
2. LOSS PER KILOGRAM OF METHYL BROMIDE (US$)	$0	$33
3. LOSS AS A PERCENTAGE OF GROSS REVENUE (%)	0%	11%
4. LOSS AS A PERCENTAGE OF NET REVENUE (%)	0%	38%
5. PROFIT MARGIN (%)	28%	20%

Note: The unit price of eggplant was reduced by 7.5% in the analysis of economic feasibility of the alternatives to reflect price reduction that could occur if 1,3-D + chloropicrin were used in place of methyl bromide.

Summary of Economic Feasibility

There are currently few alternatives to methyl bromide for use in eggplant, and there are factors that limit existing alternatives' usability and efficacy. These include pest complex, climate, and regulatory restrictions. As shown above, the two most promising alternatives to methyl bromide in Florida and Georgia for control of nut-sedge in eggplant (1,3-D + chloropicrin and metam-sodium) are considered not technically feasible. This derives from regulatory restrictions and the magnitude of expected yield losses when they are used. Economic data representing the Florida and Georgia eggplant growing conditions are included in this section as a supplement to the biological review to illustrate the impacts of using methyl bromide alternatives, not to gauge them with respect to economic feasibility. However, in Michigan 1,3-D + chloropicrin is considered technically feasible.

Michigan

The US concludes that, at present, no economically feasible alternatives to methyl bromide exist for use in Michigan eggplant production. Yield losses and missed market windows are the factors that have proven most important in these conclusions, which are discussed individually below:

- Yield Loss: The US anticipates yield losses of 6% throughout Michigan eggplant production.

- Missed Market Windows: The US agrees with Michigan's assertion that growers will likely receive significantly lower prices for their produce if they switch to 1,3-D + chloropicrin. This is due to changes in the harvest schedule caused by the above described soil temperature complications and extended plant back intervals when using 1,3-D + chloropicrin.

  The analysis of this effect is based on the fact that prices farmers receive for their eggplants vary widely over the course of the growing season. Driving these fluctuations are the forces of supply and demand. Early in the growing season, when relatively few eggplants are harvested, the supply is at is lowest and the market price is at its highest.

As harvested quantities increase, the price declines. In order to maximize their revenues, eggplant growers manage their production systems with the goal of harvesting the largest possible quantity of eggplants when the prices are at their highs. The ability to sell produce at these higher prices makes a significant contribution toward the profitability of eggplant operations.

Specific data representing these market fluctuations are not available for Michigan eggplant. However, because of the similar production system and growing conditions, Michigan pepper price data was used to represent price fluctuations in Michigan eggplant and their impact on growers' gross revenues. Though data availability is limiting, it was assumed that if eggplant growers adjust the timing of their production system, as required when using 1,3-D + chloropicrin, that they will, over the course of the growing season, receive gross revenues reduced by approximately 7.5%. The season average price was reduced by 7.5% in analysis of the alternatives to reflect this. Based on currently available information, the US believes this reduction in gross revenues serves as a reasonable indicator of the typical effect of planting delays resulting when methyl bromide alternatives are used in Michigan eggplant production.

Florida

No technically (and thus economically) feasible alternatives to methyl bromide are presently available to the effected eggplant growers. As such, the US concludes that use of methyl bromide is critical in Florida eggplant production.

Florida's application for methyl bromide critical use indicated that more than one crop is typically grown per growing season but did not provide specific production and sales data for this crop. As a result of this gap in data, economic assessment of Florida eggplant production was based on a single crop production system. This characterization of growing conditions could result in the critical need for methyl bromide appearing smaller than it actually is, because the value the second crop derives from methyl bromide is not included in the analysis.

Other potentially significant economic factors, such as price reductions due to missed market windows, were not analyzed for this region, as the case for critical use of methyl bromide is sufficiently strong based solely on yield loss.

Georgia

No technically (and thus economically) feasible alternatives to methyl bromide are presently available to the effected eggplant growers. As such, the US concludes that use of methyl bromide is critical in Georgia eggplant production.

Other potentially significant economic factors, such as price reductions due to missed market windows, were not analyzed for this region, as the case for critical use of methyl bromide is sufficiently strong based solely on yield loss. Note that data describing Georgia eggplant production is based on double cropping production practices.

Part F: NATIONAL MANAGEMENT STRATEGY FOR PHASE-OUT OF THIS NOMINATED CRITICAL USE
Renomination Form Part B: TRANSITION PLANS

Provision of a National Management Strategy for Phase-out of Methyl Bromide is a requirement under Decision Ex. I/4(3) for nominations after 2005. The time schedule for this Plan is different than for CUNs. Parties may wish to submit Section 21 separately to the nomination.

21. DESCRIBE MANAGEMENT STRATEGIES THAT ARE IN PLACE OR PROPOSED TO PHASE OUT THE USE OF METHYL BROMIDE FOR THE NOMINATED CRITICAL USE, INCLUDING:

1. Measures to avoid any increase in methyl bromide consumption except for unforeseen circumstances;
2. Measures to encourage the use of alternatives through the use of expedited procedures, where possible, to develop, register and deploy technically and economically feasible alternatives;
3. Provision of information on the potential market penetration of newly deployed alternatives and alternatives which may be used in the near future, to bring forward the time when it is estimated that methyl bromide consumption for the nominated use can be reduced and/or ultimately eliminated;
4. Promotion of the implementation of measures which ensure that any emissions of methyl bromide are minimized;
5. Actions to show how the management strategy will be implemented to promote the phase-out of uses of methyl bromide as soon as technically and economically feasible alternatives are available, in particular describing the steps which the Party is taking in regard to subparagraph (b) (iii) of paragraph 1 of Decision IX/6 in respect of research programmes in non-Article 5 Parties and the adoption of alternatives by Article 5 Parties.

These issues are discussed in the US Management Plan for Methyl Bromide, submitted previously.

Renomination Form Part C: TRANSITION ACTIONS

Responses should be consistent with information set out in the applicant's previously-approved nominations regarding their transition plans, and provide an update of progress in the implementation of those plans.

In developing recommendations on exemption nominations submitted in 2003 and 2004, the Technology and Economic Assessment Panel in some cases recommended that a Party should explore the use of particular alternatives not identified in a nomination' transition plans. Where the Party has subsequently taken steps to explore use of those alternatives, information should also be provided in this section on those steps taken.

Questions 5 - 9 should be completed where applicable to the nomination. Where a question is not applicable to the nomination, write "N/A".

(Renomination Form 6.) TRIALS OF ALTERNATIVES
Where available, attach copies of trial reports. Where possible, trials should be comparative, showing performance of alternative(s) against a methyl bromide-based standard

(i) DESCRIPTION AND IMPLEMENTATION STATUS:

See Question 15 for selected trial results and citations. Many research projects are ongoing and considerable funding are being used in this effort.

(ii) OUTCOMES OF TRIALS: (*Include any available data on outcomes from trials that are still underway. Where applicable, complete the table included at Appendix I identifying comparative disease ratings and yields with the use of methyl bromide formulations and alternatives.*)

See Question 15 for selected trial results and citations. Many research projects are ongoing and considerable funding are being used in this effort.

(iii) IMPACT ON CRITICAL USE NOMINATION/REQUIRED QUANTITIES: *(For example, provide advice on any reductions to the required quantity resulting from successful results of trials.)*

During the preparation of this nomination the USG has accounted for all identifiable means to reduce the request. Specifically, approximately 15 million kilograms of methyl bromide were requested by methyl bromide users across all sectors. USG carefully scrutinized requests and made subtractions to ensure that no growth, double counting, inappropriate use rates on a treated hectare basis was incorporated into the final request. Use when the requestor qualified under some other provision (QPS, for example) was also removed and appropriate transition given yields obtained by alternatives and the associated cost differentials were factored in. As a result of all these changes, the USG is requesting roughly 1/3 of that amount.

The USG feels that no additional reduction in methyl bromide quantities is necessary, given the significant adjustments described above. See Appendix A.

(iv) ACTIONS TO ADDRESS ANY DELAYS/OBSTACLES IN CONDUCTING OR FINALISING TRIALS:

The USG has the ability to authorize Experimental Use Permits (EUPs) for large scale field trials for methyl bromide alternatives, as has been done for methyl iodide. A recent change has been to allow the EUP for methyl iodide without the previously required destruction of the crop, thus encouraging more growers to participate in field trials. As with other activities connected with registration of a pesticide, the USG has no legal authority either to compel a registrant to seek an EUP or to require growers to participate.

As noted in our previous nomination, the USG provides a great deal of funding and other support for agricultural research, and in particular, for research into alternatives for methyl bromide. This support takes the form of direct research conducted by the Agricultural Research Service (ARS) of USDA, through grants by ARS and CSREES, by IR-4, the national USDA-funded project that facilitates research needed to support registration of pesticides for specialty crop vegetables, fruits and ornamentals, through funding of conferences such as methyl bromideAO, and through the land grant university system

(Renomination Form 7.) TECHNOLOGY TRANSFER, SCALE-UP, REGULATORY APPROVAL FOR ALTERNATIVES

The USDA maintains an extensive technology transfer system, the Agricultural Extension Service. This Service is comprised of researchers at land grant universities and county extension agents in addition to private pest management consultants. In addition to these sources of assistance for technology transfer, there are trade organizations and grower groups, some of which are purely voluntary but most with some element of institutional compulsion, that exist to conduct research, provide marketing assistance, and to disseminate "best practices". The California Strawberry Commission is one example of such a grower group.

(i) DESCRIPTION AND IMPLEMENTATION STATUS:

See above.

(ii) OUTCOMES ACHIEVED TO DATE FROM TECHNOLOGY TRANSFER, SCALE-UP, REGULATORY APPROVAL:

See Question 15 for selected trial results and citations. Many research projects are ongoing and considerable funding are being used in this effort.

(iii) IMPACT ON CRITICAL USE NOMINATION/REQUIRED QUANTITIES:
(*For example, provide advice on any reductions to the required quantity resulting from successful progress in technology transfer, scale-up, and/or regulatory approval.*)

The USG feels that no additional change in methyl bromide quantity requested is necessary. The U.S. nomination for this sector reflects the commitment by this sector and the U.S. to reduce methyl bromide use to only the most critical needs. See Appendix A.

(iv) ACTIONS TO ADDRESS ANY DELAYS/OBSTACLES:

See above.

Ongoing field trials require results to be validated for commercial application. Therefore, some period of time after publication of field trials is needed for commercial testing and implementation.

USG endeavors to identify methyl bromide alternatives to move them forward in the registration queue. However USG has no legal authority to compel registrations; it can only act on registrations requested by private entities. The timely submission of data to support a registration decision is at the sole discretion of the registrant.

(Renomination Form 8.) COMMERCIAL SCALE-UP/DEPLOYMENT, MARKET PENETRATION OF ALTERNATIVES

(i) DESCRIPTION AND IMPLEMENTATION STATUS:

These issues are discussed in the US Management Plan for Methyl Bromide, submitted previously.

(ii) IMPACT ON CRITICAL USE NOMINATION/REQUIRED QUANTITIES: (*For example, provide advice on any reductions to the required quantity resulting from successful commercial scale-up/deployment and/or market penetration*.)

The USG feels that no additional change in methyl bromide quantity requested is necessary. The U.S. nomination for this sector reflects the commitment by this sector and the U.S. to reduce methyl bromide use to only the most critical needs. See Appendix A.

(iii) ACTIONS TO ADDRESS ANY DELAYS/OBSTACLES:

USG endeavors to identify methyl bromide alternatives to move them forward in the registration queue. However USG has no legal authority to compel registrations; it can only act on registrations requested by private entities. The timely submission of data to support a registration decision is at the sole discretion of the registrant.

The USDA maintains an extensive technology transfer system, the Agricultural Extension Service. This Service is comprised of researchers at land grant universities and county extension agents in addition to private pest management consultants. In addition to these sources of assistance for technology transfer, there are trade organizations and grower groups, some of which are purely voluntary but most with some element of institutional compulsion, that exist to conduct research, provide marketing assistance, and to disseminate “best practices”. The California Strawberry Commission is one example of such a grower group.

(Renomination Form 9.) CHANGES TO TRANSITION PROGRAM

If the transition program outlined in the Party’s original nomination has been changed, provide information on the nature of those changes and the reasons for them. Where the changes are significant, attach a full description of the revised transition program.

See Appendix A.

(Renomination Form 10.) OTHER BROADER TRANSITION ACTIVITIES

Provide information in this section on any other transitional activities that are not addressed elsewhere. This section provides a nominating Party with the opportunity to report, where applicable, on any additional activities which it may have undertaken to encourage a transition, but need not be restricted to the circumstances and activities of the individual nomination. Without prescribing specific activities that a nominating Party should address, and noting that individual Parties are best placed to identify the most appropriate approach to achieve a swift transition in their own circumstances, such activities could include market incentives, financial support to exemption holders, labelling, product prohibitions, public awareness and information campaigns, etc.

These issues are discussed in the US Management Plan for Methyl Bromide, submitted previously.

Part G: CITATIONS

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Appendix A: Methyl Bromide Usage Newer Numerical Index Extracted (BUNNIE)

2009 Methyl Bromide Usage Newer Numerical Index - BUNNIE						Eggplant	
December 18, 2006		Region	Michigan Eggplant	Florida Eggplant	Georgia Eggplant	Sector Total or Average	Notes
Other Considerations	Marginal Strategy - Among Best Strategies & Economic Analysis (See Chapter)	Possible Regime	Telone+Pic	Telone+Pic	Telone+Pic		
		Loss Estimate (%) - Yield (Y), Quality (Q), Market Window (M), Time (T)	22% Y + T	29% Y + T	29% Y + T		
		Loss per Hectare (US$/ha)	$ 4,034	$ 5,252	$ 7,593		
		Loss per Kg of MeBr (US$/kg)	$ 34	$ 35	$ 51		
		Loss as a % of Gross Revenue	12%	24%	18%		
		Loss as a % of Net Op Revenue	39%	82%	72%		
	Dichotomous Variables (Y/N)	Strip or Bed Treatment?	Strip	Strip	Strip		
		Currently Use Alternatives?	Yes	Yes	Yes		
		Tarps / Deep Injection Used?	Tarp	Tarp	Tarp		
	Other Issues	Frequency of Treatment (x/ yr)	1x per year	1x per year	1x per year		
		Change in CUE Request	increase	decrease	same	decrease	
Most Likely Combined Impacts (%)		Florida Telone Restrictions (%)	0%	62%	8%		
		100 ft Buffer Zones (%)	0%	1%	0%		
		Key Pest Distribution (%)	75%	45%	45%		
		Regulatory Issues (%)	0%	0%	0%		
		Unsuitable Terrain (%)	0%	0%	0%		
		Cold Soil Temperature (%)	100%	0%	0%		
		Total Combined Impacts (%)	**100%**	**79%**	50%		
Most Likely Baseline Transition		(%) Able to Transition	0%	33%	33%		
		Minimum # of Years Required	0	7	7		
		(%) Able to Transition / Year	**0%**	**5%**	**5%**		
Joint Adjusted Use Rate		kg/ha	175	184	187		*
Joint Adjusted Dosage Rate		g/m2	17.5	18.4	18.7		
2009 US CUE Application Information	Pounds	*Amount - Pounds*	*10,400*	*191,800*	*107,736*	*309,936*	
		Area - Acres	*97*	*1,400*	*804*	*2,301*	
		Rate (lb/A)	*107.22*	*137.00*	*134.00*	*135*	
	Metric	**Amount - Kilograms**	**4,717**	**86,999**	**48,868**	**140,584**	
		Treated Area - Hectares	39	567	325	931	
		Rate (kg/ha)	120	154	150	151	
EPA Preliminary Value		kgs	**3,799**	**86,999**	**48,868**	**139,666**	
EPA Baseline Adjusted Value has been adjusted for:			Double Counting, Growth, EPA Use Rate Adjustment, Joint Use Rate Adjustment, and Combined Impacts				*
EPA Baseline Adjusted Value		kgs	3,209	47,957	17,121	68,286	*
EPA Transition Amount		kgs	-	(4,405)	(1,525)	(5,930)	*
EPA Amount of All Adjustments		kgs	**(590)**	**(43,447)**	**(33,273)**	**(77,310)**	
Most Likely Impact Value for Treated Area		kgs	**3,209**	**43,552**	**15,595**	**62,356**	*
		ha	**18**	**249**	**89**	**356**	
		Rate	**175**	**175**	**175**	**175**	*
Sector Research Amount (kgs)			**433**	**2009 Total US Sector Nomination**		**62,789**	

APPENDIX B FLORIDA TELONE® (1,3-D) REGULATORY RESTRICTIONS

BACKGROUND

Telone® (1,3-dichloropropene or 1,3-D) is a restricted use pesticide which is available for use by Florida fruit and vegetable growers through a special local need (SLN) registration. This registration includes specific use restrictions for certain Florida counties. In these counties, Telone® can only be used on soils having restrictive layers to downward water movement that support seepage irrigation. This is in addition to nationwide use restrictions that state that Telone® cannot be used within 100 feet of wells used for potable water or karst topographic features.

This document estimates the area in key Florida agricultural counties that cannot use Telone® based on karst and soil restrictions. The data sources and methods used to make these estimates are described below. Telone® use restrictions are an important consideration because Telone® is a potential replacement for methyl bromide. The agricultural counties considered in this analysis grow crops that have submitted methyl bromide critical use exemptions (CUE). These counties correspond to the counties listed as having additional use restrictions on the Telone® SLN label. Estimating the area not suitable for Telone® use is part of the analysis conducted by the United States to determine the amount of methyl bromide that has a critical need in Florida. Fumigation with 1,3-D is an alternative to fumigation with methyl bromide, and one that results in smaller yield loss differences with methyl bromide than some of the other alternatives.

CROP INFORMATION

Methyl bromide CUEs for 2008 were submitted for several field grown specialty crops grown in Florida, including strawberry, tomato, pepper, and eggplant. This analysis focuses on these crops because Telone® is a potential alternative to methyl bromide on these crops. County level acreage for these four crops was obtained from the Census of Agriculture (USDA, 2002). Table 1 presents the major producing counties in terms of harvested acres for each crop. Figure 1 illustrates the distribution of harvested acres for each crop by each county. Figure 2 is a map of Florida counties and also indicates which counties are the major producers of these four crops. The highlighted counties account for a significant portion, generally 90% or more, of the crops' acreages and were therefore selected for this analysis.

KARST RESTRICTION

Telone® is a restricted use pesticide that cannot be used within 100 feet of karst topological features. Soil physiographic divisions in Florida having karst characteristics were used to identify karst topography in Florida. Definitions of the physiographic divisions were obtained from Brooks (1981). These physiographic divisions are associated to the Physiographic Divisions Map of Florida. The Physiographic Divisions Map of Florida, originally created by Brooks (1981), was converted to a digital format by the United States Geologic Service (USGS) et al. (2000). It is a general reference map of Florida physiographic divisions (districts, subdistricts, subdivisions) defined by Brooks (1981). USG used this map in a geographic information system (GIS) to estimate the area within each county having karst features (Appendix Table 1 and Appendix Figure 3).

Soil physiographic division characteristics used to estimate locations of karst topography may not define all karst features in Florida due to the scale and uncertainties associated with the conversion of the map into a digital format. The scale issue means that small units of karst topographical features may not be included in the physiographic divisions map, thus the proportion of land area affected by karst features is likely to be under- rather than over-estimated. Because this map was produced before GIS mapping tools were available, it was not designed for GIS use. It was converted to digital format but when overlaid on newer and more accurate GIS maps of Florida; its land area differs by approximately 3%, although not every aspect differs by this amount. The physiographic divisions map is, however, the best available information on the physiographic divisions of Florida. Currently, USG is unable to account for the magnitude of the variability associated with this map. Therefore, Table Appendix B 1 provides our best estimates of the areas in Florida with karst topographical features.

SPECIAL LOCAL NEED RESTRICTION

In addition to the Telone® use restriction related to karst topography, certain Florida counties[1] have additional soil restrictions as stated on the Telone® supplemental label. Telone® can only be used on soils having restrictive layers to downward water movement that can support seepage irrigation in specified counties. Most strawberry, tomato, pepper, and eggplant are grown in counties that have this restrictive soil layer.

Soils potentially having these restrictive layers, such as argillic or spodic horizons, are of the following taxonomic soil orders: Alfisol, Ultisol, Mollisol, and Spodosol. Electronic soil survey data for each county were downloaded from the Soil Data Mart maintained by the USDA Natural Resource Conservation Service (NRCS). County soil surveys delineate soil map units containing multiple soil types. For this analysis, the map units containing at least 50 percent of the required soils were identified as locations that meet the label requirements. The remaining map units were considered to contain soils unsuitable for Telone® use.

Electronic soil survey data were used to quantify the area within each county not suitable for Telone® use based on the soil criteria of the Florida Special Local Need (SLN) registration. Tabular data of soil surveys for each county were used as follows. First, soils series (components of soil map units) that have at least one of the four above mentioned soil orders were identified using the "Taxonomic Classification of Soils" table of the soil survey. This step identified the soil series potentially having the required restrictive layers. Second, soil map units were selected in the "Component Legend" table of the soil survey if they contained the identified soil series. The "Component Legend" table provides the percentage of each soil component in a

[1] These counties include Brevard, Broward, Charlotte, Citrus, Collier, Dade, De Soto, Glades, Hardee, Hendry, Hernando, Highlands, Hillsborough, Indian River, Lake, Lee, Manatee, Martin, Monroe, Okeechobee, Orange, Osceola, Palm Beach, Pasco, Pinellas, Polk, St. Lucie, Sarasota, Seminole, Sumter, and Volusia

map unit. If at least 50 percent of the map unit contains the identified soils, soils meeting the SLN restriction, then those map units were selected. Next, the “Acreage and Proportionate Extent of Soils” table of the soil survey was used to calculate the total acreage of the suitable map units in a county. Finally, the area not represented by these suitable soils was calculated to estimate the area not suitable for Telone® use. The areas not meeting the SLN soil requirements are presented in Table 1.

CALCULATING THE AREA OF TELONE® RESTRICTION

The areas deemed unsuitable for Telone® use due to soil restrictions may not be additive to the karst areas because locations of restricted soils and karst topography may overlap. Further spatial analysis is required to determine the total area in a county not suitable for Telone® use. In using the available information to estimate areas, therefore, USG used two assumptions: the most restrictive (in the sense of allowing the greatest use of Telone®) is that areas of karst and areas where seepage irrigation is not feasible overlap to the greatest extent possible[2]; and the less restrictive, standard statistical assumption, that both areas of karst and areas lacking a restrictive layer (areas where seepage irrigation are not feasible) are identically and independently distributed[3].

The assumption that would have resulted in the lowest level of allowable Telone® use, that the areas of karst topography and the areas where seepage irrigation is not feasible are mutually exclusive, was not used to derive estimates for the purposes of these analyses.[4]

In all instances the agricultural areas were assumed to be identically and independently distributed across soil types within the county. To make any other assumption would require a survey of each county where any one of these crops is grown. Further, growers do move areas of cultivation and also rotate crops as a means of maintaining lower pest pressures so that from year to year the results may change.

CONCLUSION

It is important to note that soil orders are the broadest class in the soil taxonomic system. Therefore, this analysis aims to identify soils that potentially have the required restrictive layers. This leads to an underestimate rather than an overestimate of areas where seepage irrigation is not feasible. Further investigation such as onsite field testing and more detailed soil survey analysis may be required to more accurately determine if a soil is suitable for Telone® use. However, USG believes this analysis provides a more quantitative understanding of Telone® use restrictions in Florida than that previously used in the methyl bromide CUE process.

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[2] In other words, if 20% of a county has karst topographical features and 30% lacks a restrictive layer so that seepage irrigation is not feasible, a total of 30%, the larger of the two numbers, of the county area cannot use telone®.

[3] Using the assumption of identical and independently distributed soil features, a county that had 20% of its area with karst topographical features and 30% lacking a restrictive layer, the total county area that could not use Telone® would be 44%, 30% and 20% of the remaining 70%.

[4] Using the assumption that the two restrictions are mutually exclusive, and in using the example of 20% karst and 30% lacking a restrictive layer, Telone® use would not be allowed in 50% of the are of the county.

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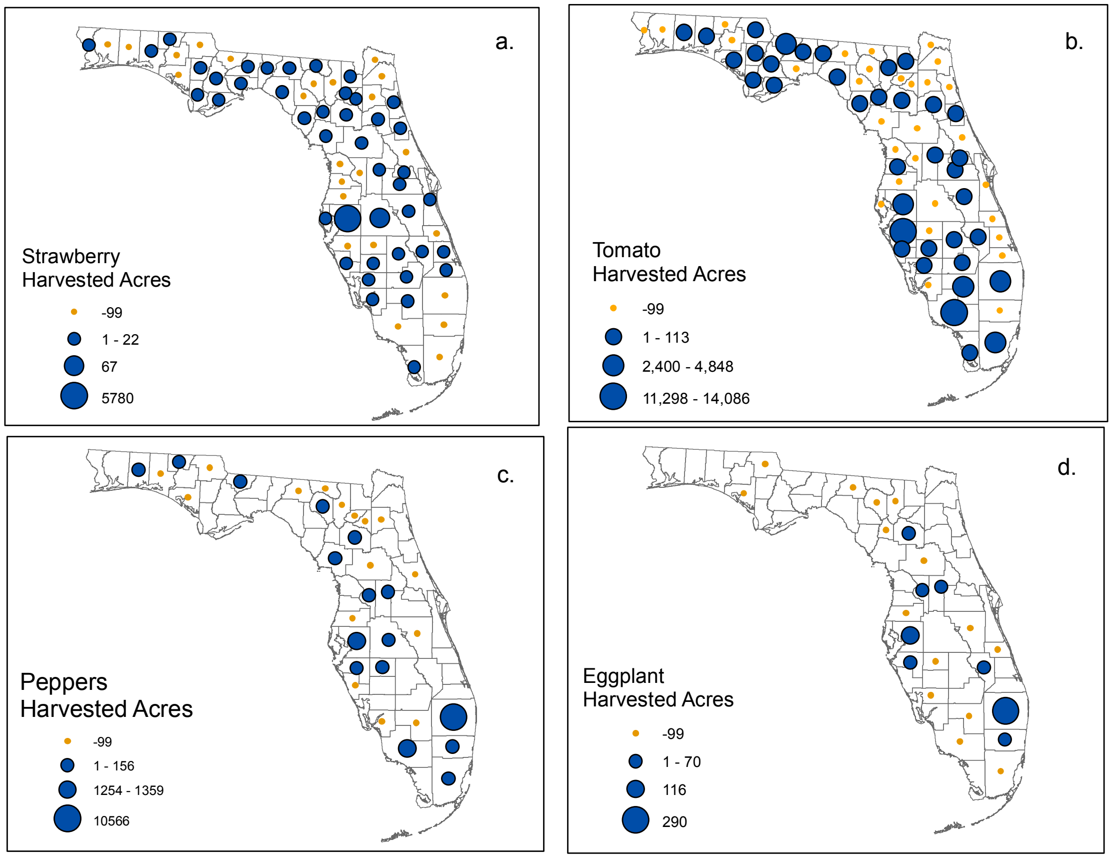
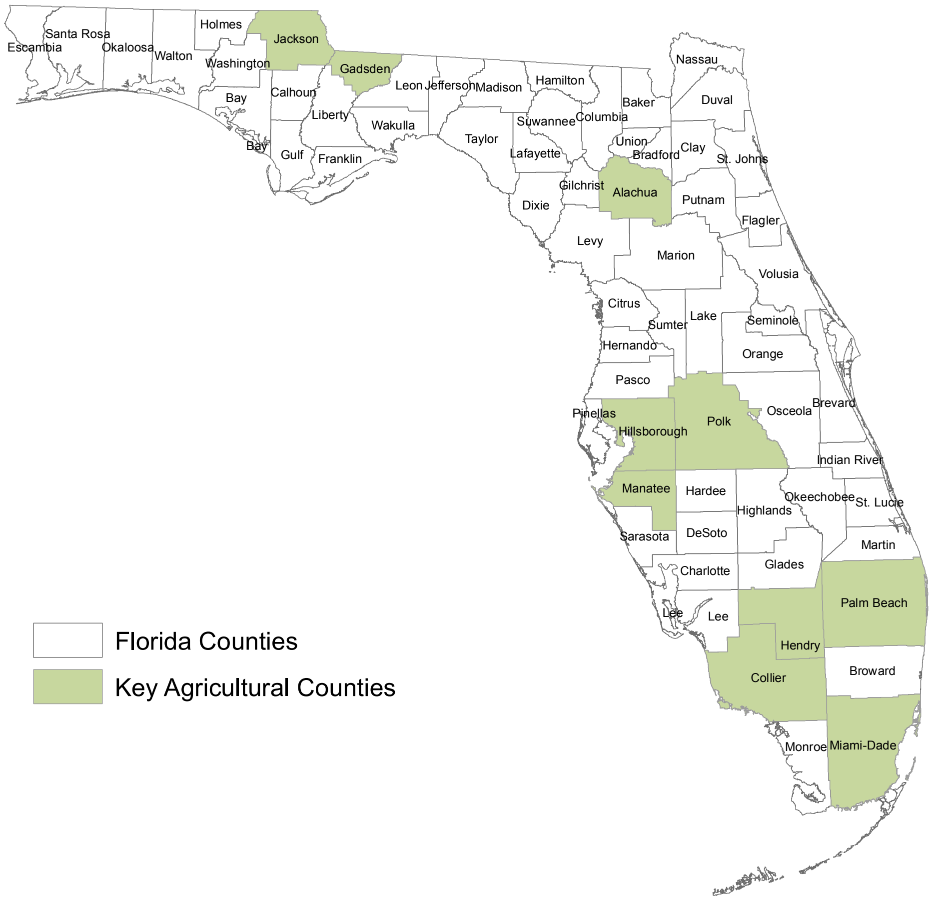
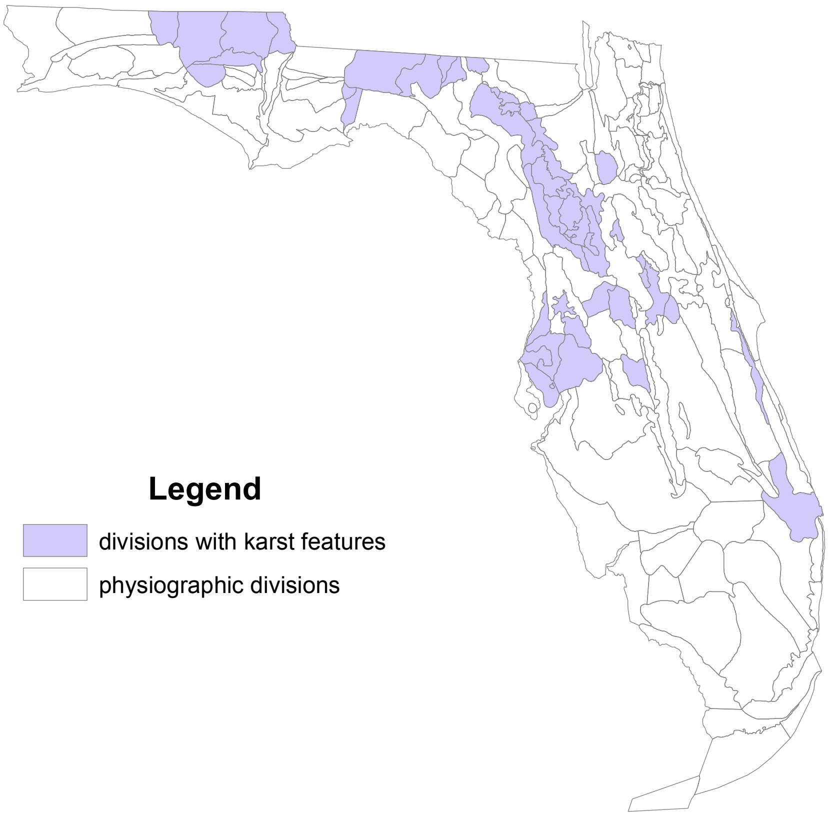
USGS, University of Florida, and St. Johns River Water Management District, 2000. Physiographic divisions map of Florida. Online: http://www.sjrwmd.com/programs/data.html



Appendix B, Figure 1. Acres Harvested for strawberry (a), tomatoes (b), pepper (c), and eggplant (d) in Florida. Data are from USDA Census of Agriculture, 2002. A county where a crop is grown but acreage is not reported is represented by -99. Florida map obtained from ESRI (2005).



Appendix B, Figure 2. Map of Florida counties. The highlighted **counties were selected for this analysis because these counties grow the bulk (generally 90% or more)of tomato, strawberry, pepper, and eggplant crops. Florida map obtained from ESRI (2005).**



Appendix B Figure 3. The Karst Area of Florida. The karst area is an estimate based on selected map divisions described to have karst feature in the Physiographic Divisions Map of Florida. The Physiographic Divisions Map of FL is a generalized map created by the USGS, University of Florida Institute of Food and Agricultural Sciences, and the St Johns River Water management District in 2000.

Appendix B Table 1. Major producing Florida counties in terms of acres harvested for strawberry, tomato, pepper, and eggplant, The areas in each county that are unsuitable for Telone® use based on soil and karst restrictions.

a. Strawberry

County[1]	Acres Harvested[2]	Karst Area[3] in County (%)	SLN Restriction of Unsuitable Soils[4] (%)
Hillsborough	5,780	50	35
Polk	67	9	55
Alachua	22	62	100*

b. Tomato

County[1]	Acres Harvested[2]	Karst Area[3] in County (%)	SLN Restriction of Unsuitable Soils[4] (%)
Collier	14,086	0	32
Manatee	11,298	0	23
Hillsborough	4,848	50	35
Hendry	4,805	0	27
Palm Beach	3,308	17	73
Miami-Dade	2,932	NA*	NA*
Gadsden	2,400	<1	100*
Jackson	113	93	100*

c. Pepper

County[1]	Acres Harvested[2]	Karst Area[3] in County (%)	SLN Restriction of Unsuitable Soils[4] (%)
Palm Beach	10,566	17	73
Hillsborough	1,359	50	35
Collier	1,254	0	32
Manatee	156	0	23

d. Eggplant

County[1]	Acres Harvested[2]	Karst Area[3] in County (%)	SLN Restriction of Unsuitable Soils[4] (%)
Palm Beach	290	17	73
Hillsborough	116	50	35
Manatee	70	0	23

1. Counties included in tables account for at least 80% of the acres harvested for each crop. The remaining acreage is scattered across other counties and no single county accounts for a significant portion.
2. Acres Harvested data are from USDA Census of Agriculture, 2002.
3. The percent Karst Area is an estimate based on selected map divisions described to have karst feature in the physiographic divisions map of Florida. The physiographic divisions map of FL is a generalized map created by the USGS, University of Florida Institute of Food and Agricultural Sciences, and the St Johns River Water management District in 2000.
4. County area based on soils not capable of supporting seepage irrigation as mandated by the SLN or special local need registration.

* Florida state agricultural experts informed US EPA that seepage irrigation is not used in the Northern Florida counties (S. Olson, personal communication via C. Augustyniak, Nov/Dec 2006). Additionally, Telone® cannot be used in Miami-Dade County and therefore, the karst and SLN area analyses were not conducted for this county (E. McAvoy, personal communication via C. Augustyniak, Nov/Dec, 2006).