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

EXECUTIVE SUMMARY

This nomination is for methyl bromide for the production of strawberries in California, Florida, and several states in the eastern U.S. (Alabama, Arkansas, Georgia, Illinois, Kentucky, Louisiana, Maryland, Mississippi, Missouri, New Jersey, North Carolina, Ohio, South Carolina, Tennessee, and Virginia).

Strawberry growers have been replacing methyl bromide or reducing its use rates in all production areas. California growers reduced their request for methyl bromide for the 2010 use season. Over 50% of California strawberries are now produced without the use of methyl bromide and that percent likely will increase yearly. The lowest formulation of methyl bromide that is likely to be allowed in California is 57:43 (methyl bromide:chloropicrin).

California contends with some significant disease problems, but restrictions on high rates of chloropicrin, as well as 1,3-D (Trout, 2005) has resulted in a critical need for methyl bromide extending to the 2010 use season.

All of Florida's production is for fresh market in the winter. In Florida, some production areas are located above karst geological formations. Due to the porous nature of this topographical feature there are restrictions on the use of 1,3-D to prevent contamination of ground water. Fields with key disease problems have achieved good control with chloropicrin, but those with sting nematode problems require either methyl bromide or 1,3-D.

The eastern U.S. strawberry industry is highly de-centralized and primarily consists of small family farms that directly market strawberries through "U-pick", "ready-pick", roadside stands, and farmers markets (Sydorovych et al., 2006). In the eastern U.S, many of the mostly small farms contend with yellow and purple nutsedges, which are significant problems in some areas more than others. Methyl bromide is critical for these sites

NOMINATING PARTY:
The United States of America

NAME
USA CUN10 SOIL STRAWBERRY FRUIT Open Field

BRIEF DESCRIPTIVE TITLE OF NOMINATION:
Methyl Bromide Critical Use Nomination for Preplant Soil Use for Strawberry Fruit Grown in Open Fields (Submitted in 2008 for 2010 Use Season)

CROP NAME (OPEN FIELD OR PROTECTED):
Strawberry Fruit Open Field

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 (KILOGRAMS)
2010	1,191,815

NOMINATION SUMMARY

This nomination is for methyl bromide for the production of strawberries in California, Florida, and several states in the eastern U.S. (Alabama, Arkansas, Georgia, Illinois, Kentucky, Louisiana, Maryland, Mississippi, Missouri, New Jersey, North Carolina, Ohio, South Carolina, Tennessee, and Virginia). In the last several years strawberry growers have increasingly transitioned from nearly exclusive use of methyl bromide for preplant soil treatment to alternative treatments. This downward use pattern of methyl bromide by strawberry growers is exemplified by the continuing reduction in the amount of methyl bromide nominated by the United States since the inception of the critical use nomination process. The amount of methyl bromide being nominated for use in 2010 reflects both the continuing efforts by growers to reduce their reliance on methyl bromide and the reduced portion of the industry that has a critical need for methyl bromide.

Strawberry growers have been replacing methyl bromide or reducing its use rates in all production areas. California growers reduced their request for methyl bromide for the 2010 use season. Over 50% of California strawberries are now produced without the use of methyl bromide and that percent likely will increase yearly. The lowest formulation of methyl bromide that is likely to be allowed in California is 57:43 (methyl bromide:chloropicrin).

Results of several years of research trials in Florida with high barrier films indicate that an effective rate of methyl bromide with these films may be as much as 50% less than the historical use rate for some Florida strawberry production land (Noling and Botts, 2007a; Noling and Botts, 2007b). Rates that are 25-50% lower than historical methyl bromide rates are being adopted widely in Florida as the use of VIF-type films increases and allows a reduced rate of methyl bromide while maintaining efficacy. Although VIF films continue to be adopted by strawberry growers in Florida, there remain certain technical and economic issues associated with applying low rates effectively.

In the eastern U.S. strawberry production areas a transition to high barrier films should be feasible also, although possibly at a slower rate compared to Florida, primarily due to economic issues and diversity of the growing conditions (Sydorovych et al., 2006). Transition to lower rates of methyl bromide is progressing, although methyl bromide remains critical for areas with moderate to high pest pressure. For some areas, however, alternatives appear to be available for many of the region's growers (Sydorovych et al., 2006). According to the Southeast Strawberry Consortium, most growers use methyl bromide at a rate of 150 kg/ha with a 67:33 (methyl bromide: chloropicrin) formulation.

Strawberry producers in the three major U.S. production areas (California, Florida, and eastern states) face different pest management problems. California produces 88% of the fresh and processed strawberries grown in the U.S. in 2007, according to the California Strawberry Commission. It produces about 20% of the world's strawberries (ERS, 2005). Most strawberries exported from California go to Canada, Japan, and Mexico.

California contends with some significant disease problems, but restrictions on high rates of chloropicrin, as well as 1,3-D (Trout, 2005) has resulted in a critical need for methyl bromide extending to the 2010 use season. In California, township caps currently restrict the use of 1,3-D on approximately 50% of strawberry land (California Strawberry Commission, 2005). In addition, according to the California Strawberry Commission, the limitation in use of the primary alternative, 1,3-D/chloropicrin, is further limited by higher production costs due to longer production timeline for drip-applied fumigation. High rates of chloropicrin (greater than 225 kg/ha), alone and with metam-sodium, are restricted by regulation and lower rates are not optimally effective against plant pathogens.

Florida is the second largest strawberry producing state with approximately 7% of the total U.S. production (ERS, 2005). All of Florida's production is for fresh market in the winter. In Florida, some production areas are located above karst geological formations. Due to the porous nature of this topographical feature there are restrictions on the use of 1,3-D to prevent contamination of ground water. Fields with key disease problems have achieved good control with chloropicrin, but those with sting nematode problems require either methyl bromide or 1,3-D.

The eastern U.S. strawberry industry is highly de-centralized and primarily consists of small family farms that directly market strawberries through "U-pick", "ready-pick", roadside stands, and farmers markets (Sydorovych et al., 2006). In the eastern U.S, many of the mostly small farms contend with yellow and purple nutsedges, which are significant problems in some areas more than others. Methyl bromide is critical for these sites. Farmers with a low incidence of nutsedge use other chemicals, such as chloropicrin, 1,3-D, and metam-sodium to manage diseases such as black root rot, nematodes, and other weeds (Sydorovych et al., 2006). Significant uncertainties exist when a change in management strategy is considered. An economic analysis indicated that alternatives to methyl bromide can be economically feasible, but wide variability of efficacy and costs exist depending on the area within the region (Sydorovych, et al., 2006). Transition to alternatives will occur and use of high barrier films will likely increase, but diverse areas (e.g., coastal, mountain, piedmont) even within a single state will require a period of critical use for methyl bromide for the region. Reasons include phytotoxicity and plant back issues, which reduce the efficacy of alternatives in some locations.

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

Alternatives are used on a large portion of land currently producing strawberries in all three of the requesting regions. However, for the portion of production land that has a critical need for methyl bromide, alternatives currently are not feasible. Studies with VIF-type films have produced encouraging results that have allowed greater efficacy of alternatives and lower rates where methyl bromide is used (e.g., see Noling and Botts, 2007a; Noling and Botts, 2007b; Sydorovych et al., 2006; Ajwa et al., 2005; Fennimore et al., 2005; Trout et al., 2005) but regulatory issues with tarps or unacceptable costs due to additional drip lines (e.g., Gilreath et al., 2005a) will make transition to alternatives infeasible for the critical sites for the 2010 season.

Alternatives are not feasible and methyl bromide is critical where 1) application difficulties exist due to hilly terrain, 2) areas of environmental sensitivity or characteristics reducing the efficacy of alternatives and, 3) moderate and heavy pest pressure eliminates the availability of an effective alternative. The increasing adoption of high barrier films will reduce the use rates of methyl bromide significantly in many production areas that currently use methyl bromide. The relatively recent use of high barrier films in California with alternative fumigants may help improve their efficacies, but research is mixed as to this effect (Fennimore et al., 2006).

The recent Federal registration of Iodomethane has not been used to adjust the amount of methyl bromide requested in this CUE. Although iodomethane has been registered at the federal level for the period of October 1, 2007 to October 1, 2008 only certain crops are included in this registration, specifically: Strawberry, Pepper, Tomato, Ornamentals, Nurseries, Trees and Vines.

At present state registrations are in place for 18 states, many of which do not request methyl bromide under the CUE process. These states are: Delaware, Georgia, Kentucky, Louisiana, Maine, Michigan, Mississippi, Missouri, New Mexico, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Tennessee, Texas, Utah, and Virginia. Neither Florida not California, the two states that are the major users of methyl bromide have registered iodomethane.

Given the limited crops, the time-limited Federal registration (it is valid for one year only, October 2007 to October 2008), and the lack of State registrations in the major methyl bromide-using States, EPA feels that it is appropriate not to include iodomethane as a methyl bromide substitute at this time.

In addition, several other factors work to limit the adoption of iodomethane as a replacement for methyl bromide in the short run. These range from more extensive regulatory constraints vis a vis methyl bromide to the normal process of technology adoption which is not instantaneous.

Like methyl bromide, iodomethane is a restricted use pesticide. In addition to pesticide applicator training, however, a license to apply iodomethane also requires company-provided training. Once training has been provided, iodomethane application must be under the direct (observed) supervision of these trained personnel. We do not believe that classes can be organized and a sufficient number of individuals trained across registered uses so that large-scale adoption of iodomethane can occur in the short-run.

Iodomethane has other restrictions as well. Unlike the case with methyl bromide, the application area must be surrounded by a scalable buffer that increases in size as the field size and or the application rate increases. The buffer can be as much as 490 feet (150 meters) for a 40 acre (16 hectare) field. There are other restrictions as well. For example iodomethane cannot be used within 0.25 miles (over 400 meters) from a 'sensitive' occupied site such as a school or nursing home.

Furthermore, very few growers have experience using iodomethane. They will not have had experience selecting a dose and determining which cultural practices are necessary to obtain the best results for the iodomethane application. This will cause them to be reluctant to subject a significant portion of their crop to the experiment of iodomethane.

Although the company producing iodomethane does market other chemicals, it is the understanding of the USG that the company plans to develop a new distribution network. This network is not yet established and is yet another reason why growers may be reluctant to experiment with iodomethane in 2008.

Taking all of these factors into account, along with the limited time horizon of the registration, EPA believes that the appropriate method for addressing the registration of iodomethane is to reduce that amount of iodomethane allocated in the case that the registration is renewed and to adjust the reductions as other States register this compound.

This is the procedure followed for the 2008 allocation year.

(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.

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Following the requirements of Decision IX/6 paragraph (a)(1) The United States of America has determined that the specific use detailed in this Critical Use Nomination is critical because the lack of availability of methyl bromide for this use would result in a significant market disruption. X Yes ☐ No

______________________ ______________________ ____________

Signature Name Date

Title: ______________________________________

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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 CUN10 SOIL STRAWBERRY FRUIT Open Field		
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 CUN10 SOIL STRAWBERRY FRUIT Open Field		

* Identical to paper documents

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PART A: INTRODUCTION
RENOMINATION PART A: SUMMARY INFORMATION

1. (Renomination Form 1.) NOMINATING PARTY AND NAME:
The United States of America
USA CUN10 SOIL STRAWBERRY FRUIT Open Field

2. (Renomination Form 2.) DESCRIPTIVE TITLE OF NOMINATION:
Methyl Bromide Critical Use Nomination for Preplant Soil Use for Strawberry Fruit Grown in Open Fields (Submitted in 2008 for 2010 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 nomination is for methyl bromide used by farmers in the major strawberry production states of California and Florida, and the eastern U.S. (Alabama, Arkansas, Georgia, Illinois, Kentucky, Louisiana, Maryland, Mississippi, Missouri, New Jersey, North Carolina, Ohio, South Carolina, Tennessee, and Virginia).

California. California produces 88% of the fresh and processed strawberries grown in the U.S. California produces about 20% of the world's strawberries (ERS, 2005). Most strawberries exported from California go to Canada, Japan, and Mexico.

California has two distinct strawberry production areas. The southern region produces both fresh (63%) and processed (37%) strawberries. The northern region includes both rotated and non-rotated strawberry production regimes, with each producing fresh (84%) and processed (16%) strawberries. Farms range in size from a few to over 200 hectares with other crops in rotation. Because strawberry production in California is concentrated in a small geographic location due to optimal growing conditions, factors that affect this small area can be significant. An example of this is the regulatory limit on the amount of 1,3-dichloropropene (1,3-D) that can be used in each township (i.e., 36 square mile area, approximately 95 square km) in California (Trout, 2005).

Depending on the area of the state, California strawberries are planted in the summer (southern California) or fall (northern and southern California). Prior to planting, fumigation is typically performed on flat ground over the entire surface of the field. Immediately after fumigation the field is covered with plastic. At the end of the fumigation period, the plastic is removed and planting beds are formed and covered with fresh plastic. Strawberry plants are transplanted about two to six weeks after fumigation to ensure that there are no phytotoxic levels of fumigant remaining. Harvest begins about two to four months later. At the end of the first harvest, the strawberry plants are removed and the field is readied for the next crop. Rotational crops that are planted after strawberries, and that benefit from the previous fumigation, include broccoli, celery, lettuce, radish, leeks, and artichokes.

Florida. Florida is the second largest strawberry producing state with approximately 7% of the total U.S. production (ERS, 2005). All of Florida's production is for fresh market in the winter. Strawberries are grown as an annual crop in Florida using a raised-bed system. Typically, methyl bromide in combination with chloropicrin is applied to the soil during construction of raised-beds, approximately two weeks prior to planting transplants. Immediately after application, beds are covered with plastic mulch. Drip and overhead irrigation are used to help establish plants, irrigate plants, and protect plants from frost. Many strawberry growers use the existing beds and drip tubes to grow a second crop, such as cucurbits or solanaceous crops.

Eastern U.S. The eastern U.S. strawberry industry is highly de-centralized and primarily consists of small family farms that directly market strawberries through "U-pick", "ready-pick", roadside stands, and farmers markets (Sydorovych et al., 2006). Strawberry production in the eastern states differs from that in Florida because of soil type (Florida typically has sandy soils; eastern soils are heavier); topography (Florida has much karst topographical features; much less common in other states), climate (very mild winters in Florida), farm size (farms are larger in Florida), and marketing practices (Florida is typically commercial compared to small U-pick operations). In the eastern U.S., the majority of the strawberry farms use an annual cropping plasticulture production system where the berries are grown on raised beds similar to Florida strawberry production. Planting time is similar to Florida but the production peak occurs later in the season, between April and May. About 50% of the soils have textures finer than sandy loam. Nutsedge is a primary pest on about 40% of the land that typically has coarse-textured soils. Some double cropping of beds occurs.

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 (KILOGRAMS)
2010	**1,191,815**

(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.)

Methyl bromide is critical for some strawberry production fields. However, for 2010, California has reduced its request for methyl bromide to reflect the revised areas where methyl bromide is critical for strawberry production. According to the California Strawberry Commission, "due to emerging state regulations it is likely that shank bed fumigation will be banned before 2010 and so we are listing all application as broadcast. Local regulatory restrictions prevent us from suggesting MB:PIC formulations with more than 43% chloropicrin. Emerging US-EPA chloropicrin regulations are likely to make the use of higher rates of chloropicrin increasingly difficult." This complicates transition from methyl bromide to alternatives.

Methyl bromide rates that are 25-50% lower than historical methyl bromide rates are being adopted widely in Florida as the use of VIF films increases. Results of long-term trials with high barrier films in Florida indicate effective treatment with methyl bromide at use rate of as much as 50% less than the historical rates for some strawberry production land (Noling and Botts, 2007a; Noling and Botts, 2007b). While VIF films continue to be adopted by strawberry growers in Florida, there still remain some technical and economic issues associated with applying low rates effectively.

Similarly, for eastern U.S. strawberry production, a transition to high barrier films has been accomplished in some areas. A slower transition to high barrier films is primarily due to the diversity of this region of the U.S. and the economic situation and physical characteristics of the particular site (Sydorovych et al., 2006). According to the Southeast Strawberry Consortium, growers use methyl bromide at a rate of 150 kg/ha with a 67:33 (methyl bromide: chloropicrin) formulation. The methyl bromide nomination for 2010 reflects this use pattern.

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):

TABLE A 2: EXECUTIVE SUMMARY*

Region		CA Strawberry Commission	Eastern Strawberry	Florida FFVA Strawberry	Sector Total or Average
EPA Preliminary Value	kgs	952,543	272,908	579,691	1,805,142
EPA Amount of All Adjustments	kgs	-	(197,077)	(416,250)	(613,327)
Most Likely Impact Value for Treated Area	kgs	952,543	75,832	163,440	1,191,815
	ha	4,856	474	1,022	6,352
	Rate	196	160	160	188
2010 Total US Sector Nomination					1,191,815

* *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):

For the hectares considered by this nomination to have a critical need for methyl bromide, regulatory limitations and soil requirements to some important treatments (e.g., 1,3-D, virtually impermeable film) can impact use, especially in California (Trout, 2005) and Florida. Increased costs and uncertain future registration for some alternatives (e.g., iodomethane) reduce the feasibility of transitioning to an alternative. Market issues due to change in crop rotation and time of planting/harvesting further impact the economic feasibility.

In Florida, some production areas are located above karst geological formations. Due to the porous nature of this topographical feature there are restrictions on the use of 1,3-D to prevent contamination of ground water. Fields with key disease problems have achieved good control with chloropicrin, but those with sting nematode problems require either methyl bromide or 1,3-D. In the eastern U.S, many of the mostly small farms contend with yellow and purple nutsedges, which are significant problems in some areas more than others. For areas with high pest pressure, methyl bromide is critical. Areas with a low incidence of nutsedge use other chemicals, such as chloropicrin, 1,3-D, and metam-sodium to manage diseases such as black root rot, nematodes, and other weeds (Sydorovych et al., 2006).

Strategies for alternatives where weed pressure is strong include additional herbicides to provide acceptable weed management. However, this may require a 30-day period prior to planting (Noling and Botts, 2007a). Additional technical problems may be encountered, such as proper distribution of low rates of methyl bromide, which relies on back pressure measured at the flow divider (Noling and Botts, 2007a; Gilreath et al., 2005c). As methyl bromide rates are reduced, back pressure decreases and non-uniform distribution to the rig knives occurs. To compensate a decreased flow capacity must be calibrated. Florida growers apply fumigants themselves unlike in California where professional application services are used. Effective application of low rates is not an insurmountable problem, but does require experience to achieve optimal coverage and fruit yields. In addition, Noling and Botts (2007a) pointed out that taller and narrower beds required significantly more hand labor to lay the VIF film due to slippage during the laying operation. Newer formulations of VIF films may help adjust for this problem.

In California, township caps currently restrict the use of 1,3-D on approximately 50% of strawberry land (California Strawberry Commission, 2005). In addition, according to the California Strawberry Commission, the limitation in use of the primary alternative, 1,3-D/chloropicrin, is further limited by higher production costs due to longer production timeline for drip-applied fumigation. High rates of chloropicrin (greater than 225 kg/ha), alone and with metam-sodium, are restricted by regulation and lower rates are not optimally effective against plant pathogens.

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 (%)
California[1]	6,478 ha (of 13,211 ha)	50%
Eastern U.S.	(NASS*, 2000 for NC= 729 ha)	(region estimate, 80%; Ferguson et al., 2003) (NASS*, 2000 for NC=35% treated w/MB)
Florida	2,873 (NASS*, 2002 for FL= 2,794 ha)	100% (Florida Fruit & Vegetable Association) (NASS*, 2002 for FL=100% treated w/MB) NASS*, 2004 for FL=96% treated w/MB
National Total:	19,486	65

[1] Source: California Strawberry Commission (CSC) based on California Department of Pesticide Regulation data of 2005.
* National Agricultural Statistics Service, U.S. Department of Agriculture, 2002 and 2004 Vegetable Crops Reports (http://www.pestmanagement.info/nass/app_usage.cfm)
** National total includes other regions not requesting methyl bromide.

(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.

Strawberry producers in the three regions face different pest management problems. In the eastern U.S. many of the mostly small farms contend with yellow and purple nutsedges, which are significant problems in some areas more than others. Farmers with significant weed problems require methyl bromide. Farmers with a low incidence of nutsedge use other chemicals, such as chloropicrin, 1,3-D, and metam-sodium to manage diseases such as black root rot, nematodes, and other weeds. In Florida, a significant portion of production land sits above karst geological formations. These areas have a critical need for methyl bromide. The porous nature of this topographical feature increases the risk of ground water contamination with the use of 1,3-D.

In California, while many farms have already transitioned to alternatives, some areas are constrained from using 1,3-D, because of township caps (Trout, 2005). These areas have a critical need for methyl bromide. Township caps currently restrict the use of 1,3-D for 50% of strawberry land (California Strawberry Commission, 2005). In addition, according to the California Strawberry Commission, the limitation in use of 1,3-D + chloropicrin, is further limited by higher production costs due to longer production timeline for drip-applied fumigation. High rates of chloropicrin (greater than 225 kg/ha) are restricted by regulation.

Because VIF-type films are not permitted with methyl bromide applications in California, a reduction in use rates of methyl bromide will not result in effective pest management. Recent research with innovative drip-applied methyl bromide + chloropicrin (67:33) has been used to provide weed control under both standard and VIF films in research plots (Shem-Tov et al., 2006a; Shem-Tov et al., 2006b). However, drip application of methyl bromide has not been the standard application method and a transition to this method likely will not be available for 2010. Comparable treatments where conditions are amenable are a drip-applied formulation of 1,3-D and chloropicrin.

In the eastern U.S., an area-wide research program (Welker et al., 2007) has described some successes with alternatives (e.g., InLine®, chloropicrin) and reduced rates of methyl bromide (150 kg ai/ha). Preliminary research conducted on a commercial farm in North Carolina where black root rot and winter weeds were the key pests (with low nutsedge pressure) indicated that in some situations the efficacy of alternative treatments with a high barrier films was similar to a treatment of 300 kg methyl bromide/ha with a standard film. The nomination for 2010 is for areas where these alternatives have not been shown to be effective.

(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?

Areas that continue to have a critical need for methyl bromide do so because hilly terrain, environmental sensitivity, and moderate or heavy pest pressure reduce the use of alternative fumigants that can be used. Wider adoption of high barrier films will reduce the use rates of methyl bromide significantly in many production areas currently using methyl bromide. Use of high barrier films in California for alternatives may help improve efficacy, but research is mixed as to this effect (Fennimore et al., 2006).

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 REQUESTED BY APPLICANTS FOR CRITICAL USE

REGION	California	Eastern U.S.	Florida
YEAR OF EXEMPTION REQUEST	2010		
QUANTITY OF METHYL BROMIDE NOMINATED (METRIC TONNES)	See Appendix A	See Appendix A	See Appendix A
TOTAL CROP AREA TO BE TREATED	See Appendix A	See Appendix A	See Appendix A
METHYL BROMIDE USE: BROADACRE OR STRIP/BED TREATMENT?	Broadcast (100%)	Strip (some broadcast)	Strip
PROPORTION OF BROADACRE AREA WHICH IS TREATED IN STRIPS; E.G. 0.54, 0.67	0	50%	54%
FORMULATION (RATIO OF METHYL BROMIDE/PIC MIXTURE)	57:43	67:33	67:33 or 50:50
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)	See Appendix A	See Appendix A	See Appendix A

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

** Typical FL strawberry bed is 71 cm wide and 132 cm from bed center to center. CA request adjusted for strip treatment.

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 hectares affected by 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.

Rate reduction of methyl bromide is forthcoming in some production fields as a result of increased use of VIF in Florida and the eastern U.S. The transition to high barrier films will depend on cost factors and expertise in applying low dose rates effectively.

The California consortium has reduced its request for methyl bromide hectares to be treated for 2010. This was based on growers' increasing experiences with methods that improve the efficacy of alternatives.

(Renomination Form 17.) RESULTANT CHANGES TO REQUESTED EXEMPTION QUANTITIES

QUANTITY REQUESTED FOR PREVIOUS NOMINATION YEAR:	1,336,754
QUANTITY APPROVED BY PARTIES FOR PREVIOUS NOMINATION YEAR:	1,269,321
QUANTITY REQUIRED FOR YEAR TO WHICH THIS REAPPLICATION REFERS:	1,191,815
TREATED AREA (HECTARES) REQUIRED FOR YEAR TO WHICH THIS REAPPLICATION REFERS:	6,352

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 AND WEEDS

REGION WHERE METHYL BROMIDE USE IS REQUESTED	KEY DISEASE(S) AND WEED(S) TO SPECIES AND, IF KNOWN, TO LEVEL OF RACE	SPECIFIC REASONS WHY METHYL BROMIDE NEEDED (E.G. EFFECTIVE HERBICIDE AVAILABLE, BUT NOT REGISTERED FOR THIS CROP; MANDATORY REQUIREMENT TO MEET CERTIFICATION FOR DISEASE TOLERANCE; NO HOST RESISTANCE FOR A SPECIFIC RACE)
California	**Diseases**: Black root rot *(Rhizoctinia* and *Pythium* spp.), crown rot (*Phytophthora cactorum*); Emerging diseases on lands transitioned to alternatives: *Macrophominia*, *Pythium*, *Cylindrocarpon*. **Nematodes**: root knot nematode (*Meloidogyne* spp.) Sting nematode (*Belonolaimus* spp.); **Weeds**: Yellow nutsedge (*Cyperus esculentus*),	Approximately 50% of strawberry land is projected to be impacted by township caps on 1,3-D for 2010 (Trout, 2005; California Strawberry Commission request for 2010). Therefore, methyl bromide is critical for the portion where alternatives are not effective or allowed. Methyl bromide:chloropicrin formulation is being reduced from 67:33 to 57:43 (used on 50% of strawberry land, according to the California Strawberry Commission request), but no replacements for critical areas are currently available. According to the California Strawberry Commission, new pathogens, such as *Macrophominia* are being found commonly on land fumigated with alternatives, thus, new pest management issues must be addressed.
Eastern U.S.	**Diseases**: Black root rot (*Pythium, Rhizoctonia*), Crown rot (*Phytopthora cactorum*); **Nematodes**: Root knot nematode (*Meloidogyne* spp.); **Weeds**: Yellow nutsedge (*Cyperus escultentus*), Purple nutsedge (*Cyperus rotundus),* Ryegrass (*Lolium* spp.)	Farms in this region are typically small family farms requiring transition adjustment to newer technologies. Significant uncertainties exist when a change in management strategy is considered. Economic analysis indicates that alternatives to methyl bromide can be economically feasible, but wide variability of efficacy and costs exist depending on the area within the region (Sydorovych, et al., 2006). Transition to alternatives will occur, but diverse areas (e.g., coastal, mountain, piedmont) even within a single state will require a period of critical use for methyl bromide. Reasons include phytotoxicity and plant back issues, which reduce the feasibility in alternatives in some locations.
Florida	**Diseases**: Crown rot, (*Phytophthora citricola, P. cactorum*); **Nematodes**: Sting (*Belonolaimus longicaudatus*); Root-knot (*Meloidogyne* spp.); **Weeds**: Yellow nutsedge (*Cyperus esculentus*); Purple nutsedge (*Cyperus rotundus*); Carolina Geranium (*G. carolinianum*); Cut-leaf Evening Primrose (*Onoethera laciniata*)	The best alternatives identified are 1,3-D with chloropicrin, possibly followed by metam-sodium or metam-potassium (for nutsedge management). Low permeable films are being widely adopted by growers and rates have been reduced (see Noling and Botts, 2007a). Adopting these alternatives requires a transitional period due to restrictions on Karst topographical features, and additional costs for application and labor.

Add extra rows if necessary

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

TABLE B 2A: CALIFORNIA - CHARACTERISTICS OF CROPPING SYSTEM

CHARACTERISTICS	CALIFORNIA
CROP TYPE: *(e.g. transplants, bulbs, trees or cuttings)*	Fruiting plants grown from transplants
ANNUAL OR PERENNIAL CROP: *(# of years between replanting)*	Cultured as annual
TYPICAL CROP ROTATION *(if any)* **AND USE OF METHYL BROMIDE FOR OTHER CROPS IN THE ROTATION:** *(if any)*	Vegetables (e.g. broccoli, celery, lettuce, radish, leeks, cauliflower, artichokes)
SOIL TYPES: *(Sand, loam, clay, etc.)*	Light and medium soils
FREQUENCY OF METHYL BROMIDE FUMIGATION: *(e.g. every two years)*	Yearly
OTHER RELEVANT FACTORS:	None identified

TABLE B 3A: CALIFORNIA - CHARACTERISTICS OF CLIMATE AND CROP SCHEDULE

MONTH	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
CLIMATIC ZONE	9B											
RAINFALL *(mm)*	trace	1.0	trace	0	44.7	56.9	9.9	30.5	16	72.1	17.3	0
OUTSIDE TEMP. *(℃)**	30.3	27.4	25.1	18.4	13.4	9.6	10.3	10.6	14.4	14.8	20.8	25.7
FUMIGATION SCHEDULE		X										
PLANTING IN NORTH**			X	X	X	X						
PLANTING IN SOUTH**	X		X	X								

*For Fresno, California.
** In Northern California the crop is planted in the fall and harvested from December through June/July. In Northern California rotational crop planting occurs in October/November and harvesting occurs from April thru October; average farm size is 24 ha; rotational crops include lettuce, strawberries, broccoli and cauliflower. In Southern California the crop is planted in both the summer and fall. The rotational crop, often celery, lettuce, or broccoli, is grown from March thru May. Average farm size in this area is about 12 ha, all of which is treated.

TABLE B 2B: EASTERN US - CHARACTERISTICS OF CROPPING SYSTEM

CHARACTERISTICS	EASTERN US
CROP TYPE: *(e.g. transplants, bulbs, trees or cuttings)*	Fruiting plants grown from transplants.
ANNUAL OR PERENNIAL CROP: *(# of years between replanting)*	Cultured as annual.
TYPICAL CROP ROTATION *(if any)* **AND USE OF METHYL BROMIDE FOR OTHER CROPS IN THE ROTATION:** *(if any)*	Varies
SOIL TYPES: *(Sand, loam, clay, etc.)*	50% light, 45% medium, 5% heavy
FREQUENCY OF METHYL BROMIDE FUMIGATION: *(e.g. every two years)*	Yearly
OTHER RELEVANT FACTORS:	None identified

TABLE B 3B: EASTERN US - CHARACTERISTICS OF CLIMATE AND CROP SCHEDULE

MONTH	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
CLIMATIC ZONE	5b – 8b (Alabama, Arkansas, Georgia, Illinois, Kentucky, Louisiana, Maryland, Mississippi, Missouri, New Jersey, North Carolina, Ohio, South Carolina, Tennessee, and Virginia)											
RAINFALL *(mm)**	248.2	trace	158	84.3	121.9	108.7	136.9	36.6	131.3	206	107.7	147.8
OUTSIDE TEMP. *(℃)**	25.6	27.2	27.5	25.1	20.0	11.4	7.5	6.2	9.7	15.1	17.7	22.9
FUMIGATION SCHEDULE			X	X								
PLANTING SCHEDULE				X	X							

* Macon, GA

TABLE B 2C: FLORIDA - CHARACTERISTICS OF CROPPING SYSTEM

CHARACTERISTICS	FLORIDA
CROP TYPE: *(e.g. transplants, bulbs, trees or cuttings)*	Transplants
ANNUAL OR PERENNIAL CROP: *(# of years between replanting)*	Cultured as annual.
TYPICAL CROP ROTATION *(if any)* **AND USE OF METHYL BROMIDE FOR OTHER CROPS IN THE ROTATION:** *(if any)*	Cucurbits and peppers
SOIL TYPES: *(Sand, loam, clay, etc.)*	Sandy to loam soil
FREQUENCY OF METHYL BROMIDE FUMIGATION: *(e.g. every two years)*	Annually
OTHER RELEVANT FACTORS:	None identified

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

MONTH	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
CLIMATIC ZONE	9a, 10b											
RAINFALL *(mm)*	65.5	50	72.6	134.1	175.8	193.3	152.7	65	42.7	158.8	62	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	16.9
FUMIGATION SCHEDULE						X	X					
PLANTING SCHEDULE							X	X				

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

Soil structure and texture can impact transition to alternatives (e.g., metam-sodium does not consistently dissipate in heavy soils due to low vapour pressure). Delay in planting can occur with some alternatives due to longer fumigation time required under tarp.

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: CALIFORNIA - HISTORIC PATTERN OF USE OF METHYL BROMIDE

FOR AS MANY YEARS AS POSSIBLE AS SHOWN SPECIFY:	2001	2002	2003	2004	2005	2006
AREA TREATED *(hectares)*	8,456	7,912	8,245	7,156	6,477	N/A
RATIO OF FLAT FUMIGATION METHYL BROMIDE USE TO STRIP/BED USE IF STRIP TREATMENT IS USED	Flat	Flat	Flat	Flat (90%) Strip (10%)	Flat (92%) Strip (8% at 75% of ha)	N/A
AMOUNT OF METHYL BROMIDE ACTIVE INGREDIENT USED *(total kilograms)*	1,611,775	1,592,156	1,651,220	1,698,248	1,291,969	N/A
FORMULATIONS OF METHYL BROMIDE	67:33 or 57:43	67:33 or 57:43	67:33 or 57:43	57:43 (58%); 67:33 (30%)	57:43	N/A
METHOD BY WHICH METHYL BROMIDE APPLIED)	Shank injected 25 to 30 cm deep					
APPLICATION RATE OF ACTIVE INGREDIENT (kg/ha)*	191	201	200	193 145 (strip)	200 (150 strip)	N/A
ACTUAL DOSAGE RATE OF FORMULATIONS *(g/m^2)**	19.1	20.1	20.0	19.3	20.0	N/A

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

TABLE B 4B: EASTERN U.S. - HISTORIC PATTERN OF USE OF METHYL BROMIDE

FOR AS MANY YEARS AS POSSIBLE AS SHOWN SPECIFY:	2001	2002	2003	2004	2005	2006
AREA TREATED *(hectares)****	1,823	1,879	2,121	2,166	2,235	2,341
RATIO OF FLAT FUMIGATION METHYL BROMIDE USE TO STRIP/BED USE IF STRIP TREATMENT IS USED	Mostly Strip/bed (some broadcast)**					
AMOUNT OF METHYL BROMIDE ACTIVE INGREDIENT USED *(total kg)*	274,405	283,530	320,128	327,323	337,792	354,181
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	Pressurized injection at 20 cm depth – two shanks/bed (approximately 76 cm wide bed; 25 cm height at crown of bed)					
APPLICATION RATE OF ACTIVE INGREDIENT (kg/ha)*	131 (strip) 262 (broadcast)	131 (strip) 262 (broadcast)	131 (strip) 262 (broadcast)	131 (strip) 262 (broadcast)	131 (strip) 262 (broadcast)	131 (strip) 262 (broadcast)
ACTUAL DOSAGE RATE OF ACTIVE INGREDIENT *(g/m^2)**	26.2	26.2	26.2	26.2	26.2	26.2

** For Flat Fumigation treatment application rate and dosage rate may be the same.*
*** Strip treatment occupies approximately 50% of a hectare.*
***Hectares and Use Rates presented are for the treated strip.

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

FOR AS MANY YEARS AS POSSIBLE AS SHOWN SPECIFY:	2001	2002	2003	2004	2005	2006
AREA TREATED *(hectares)***	2630	2792	2873	2873	2,954	2,995
RATIO OF FLAT FUMIGATION METHYL BROMIDE USE TO STRIP/BED USE IF STRIP TREATMENT IS USED	All strip treatments					
AMOUNT OF METHYL BROMIDE ACTIVE INGREDIENT USED *(total kg)*	486,477	516,414	708,511	694,340	695,357	604,185
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	Chiseled into soil 30-45 cm below surface of bed					
APPLICATION RATE OF ACTIVE INGREDIENT (kg/ha)*	185	185	247	242	235	202
DOSAGE RATE OF ACTIVE INGREDIENT IN kg/ha*	18.5	18.5	24.7	24.2	23.5	20.2

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

**Hectares and use rate presented are for the treated strip.

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	Not allowed for approximately 50% of area due to regulation
Chloropicrin	Not allowed at high enough rate to be effective alone
Metam-sodium	May be effective in some soils, but inconsistent movement in heavy soils makes this (and other MITC generators) infeasible for some locations.[1] In addition, requires additional fumigant applications. Listed as a volatile organic compound and restricted in California.
NON CHEMICAL ALTERNATIVES	
Tarps	High barrier films are being adopted where allowed and technically feasible.[2] Low permeable films are not allowed for use with methyl bromide in California.
Solarization/ Cover crop/fallow/ rotation/water management/ resistance breeding	These methods are currently used by nearly all growers to maximize production and profits. Solarization studies have been conducted on research plots and have achieved acceptable weed control in warm areas of California. Most growers require additional means of pest control. Research has been conducted to study application of surface water as a means of reducing emissions of fumigants, but water availability and use regulations in these areas (especially California and Florida) make this measure unlikely in the near future. Breeding programs are ongoing but have yet to reduce the need for fumigation in commercial production.[3]
COMBINATION OF ALTERNATIVES	
1,3-D + chloropicrin	Commonly used on lands where regulation and topography permits (approximately 50% of area).[4]
1,3-D + chloropicrin +metam-sodium	May provide additional pest management, especially for weeds, although this accounts for additional environmental burden.[4] Regulatory restrictions in California as a volatile organic compound.

[1] Gilreath et al., 2005a; Fennimore et al., 2005; Ajwa et al., 2005
[2] Noling and Botts, 2007a; Gilreath et al., 2005a; Fennimore et al., 2005; Ajwa et al., 2005; Johnson and Fennimore, 2005
[3] Stapleton et al., 2005; Gao and Trout, 2006; Sances, 2003; Sances, 2004
[4] Gilreath et al., 2005a; Fennimore et al., 2005; Ajwa et al., 2005; Trout, 2005.

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)*:

TABLE C 2A: CALIFORNIA – ALTERNATIVES DISCUSSION

NAME OF ALTERNATIVE	DISCUSSION
1,3-	Township caps restrict the use in California. Where available, if used alone 1,3-D is not a

Dichloropropene	sufficiently effective weed or disease control treatment. Drip applications of 1,3-D in California, are less expensive and require smaller buffer zones than broadcast applications, making it the preferred application method for this alternative (drip, 90%; broadcast, 10%). However, when 1,3-D fumigations by drip are used other production costs are significantly higher due to the need for herbicide applications (i.e., metam sodium) and hand weeding operations. Recent studies in California found that fruit production costs were 20-212% higher than with methyl bromide/chloropicrin (Goodhue, et al., 2006), with the smaller cost estimates coming from VIF mulch treatments (not currently available due to regulatory constraints).
Chloropicrin	Chloropicrin may be useful for disease management, but at greater rates than allowed in California (>225 kg/ha). Chloropicrin is regulated as a volatile organic compound and very likely will not be allowed at high concentrations in California, and possibly elsewhere. For strawberries, some research indicated that high rates of chloropicrin in soil encourages vegetative growth at the expensive of fruit (e.g., Klose et al., 2006).
Metam sodium	Metam sodium may be effective as an additional pest management tool following 1,3-D/chloropicrin. Requires additional fumigant application and is listed as a volatile organic compound with regulatory restrictions.
1,3-D/chloropicrin/ metam-sodium	This combination is being researched as a possible alternative treatment to MB in areas where township caps and label restrictions are not restrictive. Together they provide good nematicidal, weed, and fungicidal capabilities. Research studies are examining the appropriate rates and water amounts required (Ajwa et al., 2005). Research suggests yields may be improved with a sequential treatment of metam-sodium or –potassium (Ajwa et al., 2005). Requires additional fumigant application and is listed as a volatile organic compound with regulatory restrictions.

TABLE C 2B: EASTERN U.S. – ALTERNATIVES DISCUSSION

NAME OF ALTERNATIVE	DISCUSSION
Metam sodium	This potential alternative has an extended time between application and crop planting (compared to methyl bromide). May have use in some areas (Sydorovych et al., 2006).
Chloropicrin	Not effective for weed control when used alone. May provide acceptable monetary returns where diseases are key pests (Sydorovych et al., 2006). Uncertain future as a stand-alone treatment as registration reviews proceed.
1,3-D	The alternative does not give effective control of nutsedge.
1,3-D, chloropicrin	For many areas an effective alternative.
1,3-D, chloropicrin, metam sodium	This combination is a feasible alternative although weed control may be erratic (Noling and Botts, 2007b). Together they provide good nematicidal and fungicidal capabilities, but may require an herbicide partner to control weeds such as nutsedge. Experiments (Gilreath et al., 2005a) with VIF and 1,3-D/chloropicrin indicate nutsedge control may be achievable but rates and formulations are still be investigated for optimal efficacy. VIF can improve efficacy, if technological and cost issues are resolved (Noling and Botts, 2007a).
Metam sodium, chloropicrin	May not effectively control nematodes, but may be an alternative in many areas.
Nematicides	None registered except 1,3-D.

TABLE C 2C: FLORIDA – ALTERNATIVES DISCUSSION

NAME OF ALTERNATIVE	DISCUSSION
1,3-Dichloropropene	Generally effective when used with chloropicrin (where allowed) (Noling and Botts, 2007b).

Chloropicrin	Chloropicrin alone has been studied as a stand-alone treatment. Some research suggests that a tendency of nutsedge to sprout when exposed to chloropicrin can be exploited by treatment with metam-sodium or metam-potassium five days after chloropicrin (Gilreath et al., 2005a). High rates of chloropicrin faces an uncertain future as registration reviews proceed.
Metam sodium	Metam-sodium alone is not a feasible alternative because it provides unpredictable disease, nematode, and weed control. Metam sodium suffers from erratic efficacy most likely due to irregular distribution of the product through soil.
1,3-D/chloropicrin/ metam-sodium	This combination is an effective alternative for many areas (where allowed) although weed control may be erratic (Noling and Botts, 2007a). Together they provide good nematicidal and fungicidal capabilities, but may require a herbicide partner to control weeds such as nutsedge. Research (Gilreath et al., 2005a) is ongoing testing chloropicrin followed by metam-sodium to control nutsedge. Regulatory restrictions may limit their use.

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

TABLE C 3: COMPARATIVE STUDY OF CALIFORNIA STRAWBERRY YIELDS AND TREATMENTS WITH CHLOROPICRIN AND 1,3-D.

METHYL BROMIDE AND ALTERNATIVES	COMPARATIVE DISEASE % OR RATING AND YIELDS OF CROPS WITH ALTERNATIVES AND METHYL BROMIDE TREATMENTS IN TRIALS SINCE 1995					
	YEAR	TRIAL	DISEASE (% OR RATING)	ACTUAL YIELDS (T/HA)*	STATISTICAL SIGNIFICANCE**	CITATION
Control (untreated) [1] Chloropicrin (drip): [2] (56 kg/ha) [3] (112 kg/ha) [4] (224 kg/ha) [5] (336 kg/ha) [6] (448 kg/ha) 1,3-D/Chloropicrin (Inline® drip): [7] (56 kg/ha) [8] (112 kg/ha) [9] (224 kg/ha) [10] (336 kg/ha) [11] (448 kg/ha) MB/Chloropicrin (shank): [12] 392 kg/ha	2003, published (ongoing study with similar results reported in 2004 and 2005)	3 (data from Oxnard, CA trial)	No pests were identified—this was a comparative study of treatments.	Strawberry yield (%) relative to MB/Pic treatment w/VIF [1] 87 [2] 104 [3] 105 [4] 112 [5] 120 [6] 116 [7] 98 [8] 107 [9] 117 [10] 120 [11] 120 [12] 111	Strawberry yield (%) relative to MB/Pic treatment w/HDPE [1] 83 [2] 103 [3] 106 [4] 108 [5] 115 [6] 112 [7] 99 [8] 108 [9] 105 [10] 121 [11] 115 [12] **100 (=44,751 kg/ha)**	Ajwa et al., 2003 (similar results have been found in follow-up studies—Ajwa et al., 2004, 2005)

* *No significant difference between chemical trts; untreated significantly different from other trts (P=0.05).*

** *No significant difference between chemical trts; untreated significantly different from other trts (P=0.05).*

B: KEY WEEDS

TABLE C 4. NATIVE WEEDS IN STRAWBERRY FIELDS IN CALIFORNIA.

METHYL BROMIDE AND ALTERNATIVES (INCLUDE DOSAGE RATES AND APPLICATION METHOD)	COMPARATIVE WEED NUMBER, BIOMASS AND YIELDS OF CROPS WITH ALTERNATIVES AND METHYL BROMIDE TREATMENTS IN TRIALS SINCE 1995					
	YEAR	TRIAL	CONTROL OF TARGET WEED (NO. PER M^2), BIOMASS	ACTUAL YIELDS	STATISTICAL SIGNIFICANCE	CITATION **
Control (untreated) [1] Chloropicrin (drip): [2] (56 kg/ha) [3] (112 kg/ha) [4] (224 kg/ha) [5] (336 kg/ha) [6] (448 kg/ha) 1,3-D/Chloropicrin (Inline® drip): [7] (56 kg/ha) [8] (112 kg/ha) [9] (224 kg/ha) [10] (336 kg/ha) [11] (448 kg/ha) MB/Chloropicrin (shank): [12] 392 kg/ha	2003, published (similar results have been found in follow-up studies in 2004 and 2005)	2 (4 reps each) (data from Oxnard, CA trial)	**Native weed biomass (kg/ha) w/VIF** [1] 1350 a [2] 600 bcdef [3] 696 bcdef [4] 957 b [5] 398 ef [6] 369 ef [7] 832 bcde [8] 537 bcdef [9] 302 f [10] 319 f [11] 334 f [12] 919 bc *Means within column followed by the same letter do not differ at 0.05 according to Duncan's multiple range test*	**Native weed biomass (kg/ha) w/HDPE** [1] 1435 a [2] 822 bcde [3] 658 bcdef [4] 490 cdef [5] 391 ef [6] 520 bcdef [7] 891 bcd [8] 694 bcdef [9] 586 bcdef [10] 565 bcdef [11] 427 ef [12] 440 def *Means within column followed by the same letter do not differ at 0.05 according to Duncan's multiple range test*	[See within column data]	Fennimore et al., 2003 (similar results have been found in follow-up studies—Fennimore et al., 2004, 2005)

TABLE C 5. EFFECTIVENESS OF ALTERNATIVES – FIELD TRIALS IN FLORIDA WITH VIRTUALLY IMPERMEABLE FILM[1].

FARM LOCATION	MB FORMULATION	% MB RATE REDUCTION FROM TYPICAL RATE (392 kg/ha) w/LDPE[2]	NUMBER DEAD PLANTS/15 m ROW	NUMBER PLANT DECLINE/15 m ROW	WEED DENSITY/15 m ROW	NUMBER CROWN DIAMETER (cm)
Fall 2000						
1	67/33	0	0.640	0.325	0.737	0.425
2	67/33	50	ns[3]	ns	ns	nvd
3	67/33	50,100	0.281	0.441	0.001	0.001
4	98/0	0	ns	ns	ns	nvd[4]
5	98/2	0	--	--	0.508	0.379
6	67/33	50	ns	ns	ns	nvd
7	67/33	50	ns	ns	0.662	nvd
Fall 2001						
8	67/33	30,50	0.648	0.867	0.340	0.327
9	67/33	50,66	0.238	0.557	0.056	0.262
10	67/33	50	ns	ns	0.011	nvd
11	67/33	20,40	--	--	0.006	0.118
Fall 2002						
12	67/33	50	ns	ns	0.347	0.664
13	67/33	40	0.606	0.543	ns	nvd
14	67/33	50	0.389	0.717	0.808	nvd
Fall 2003						
15	67/33	45	0.804	0.559	0.371	nvd
16	67/33	25	0.292	0.156	ns	0.500
17	67/33	50	0.587	0.441	0.001	0.623

[1] Summary of the effect of reduced soil application rates of methyl bromide (MeBr) and chloropicrin used concurrently with virtually impermeable plastic mulch film (VIF) on subsequent plant growth, mortality, and pest control in 17 strawberry field demonstration trials from Fall, 2000 through Fall, 2004. From Noling, J. W., and Gilreath, J. P. 2004. Use of virtually impermeable plastic mulches (VIF) in Florida strawberry. Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions, 2004. http://www.mbao.org/2004/Proceedings04/001%20Noling%20paper.pdf.
[2] Low Density Polyethylene film
[3] NS-not statistically significant (probabilities could not be calculated), with no recorded incidence for measured plant parameter.
[3] NVD-general observations recorded for site visit to indicate no visual difference between rate and mulch treatments apparent.

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*):

Iodomethane, may be a drop-in replacement for MeBr but regulatory and cost restrictions will limit its use in the near future. Adoption of high barrier films is proceeding and will likely result in reduced use rates of several fumigants.

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: The recent one-year registration of iodomethane may provide additional support in the future for soils currently treated with methyl bromide. Research has indicated that this fumigant may be an effective replacement for methyl bromide (e.g., Poling and Schiavone, 2007; Shem-Tov and Ajwa, 2007). However, the uncertain future of iodomethane registrations and its high cost has reduced its usefulness as a replacement for methyl bromide.

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):*

In California in 2005, approximately 50% of strawberry land was treated without methyl bromide. The amount of land treated with alternatives is likely higher today. The majority of this land is treated with 1,3-D and chloropicrin, sometimes followed by metam-sodium. Regulatory restrictions, soil type, pest pressure, topography affect the choices for treatments. Regulatory issues with 1,3-D, chloropicrin, metam-sodium, and low permeable films reduce the ability of farmers to transition additional land to alternatives in California. Nevertheless, extension and research are continuing (e.g., Fennimore, 2004) to develop strategies for transition to alternatives including work with 1,3-D, chloropicrin, metam-sodium, and different films and fumigant rates.

In Florida, a rapid transition to high barrier films has been accomplished over the last year. This nomination reflects the reduction in use rates of methyl bromide as a result. Research is ongoing to continue to identify alternatives and ways to reduce the use of methyl bromide while maintaining effective pest management (e.g., Noling and Botts, 2007a; Noling and Botts, 2007b; Noling et al., 2006a, 2006b) to assess the most effective means of transitioning to MeBr-alternatives.

In the strawberry farms in the eastern U.S., approximately 80% of the land is treated with methyl bromide. Many of the farms are small, “pick your own”, or for local distribution. Transitioning additional land to alternatives is requiring a great deal of extension input to identify local pest and crop management problems and solutions. Extension outreach has been funded and transition programs are being conducted (e.g., Louws and Welker, 2005;

(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 SOILESS SYSTEMS NOT A SUITABLE ALTERNATIVE TO PRODUCE THE CROP IN THE NOMINATION?

Production in California and Florida is too large for overall transition to soilless production. Production in the several eastern states is derived from small farms with small profit margins that would generally be unable to transition to production requiring large economic investments.

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 U.S. 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.

As an example, according to the California DPR (Segawa, 2007):

> The main SIP action is DPR's regulation to reduce volatile organic compound (VOC) emissions from field fumigations. This regulation includes requirements for use of methyl bromide, chloropicrin, 1,3-D, metam, dazomet, and sodium tetrathiocarbonate. The regulation achieves VOC reductions in two ways: changing application methods, and establishing fumigant emission limits.
>
> Beginning in 2008, the regulation requires applicators to use certain "low-emission" application methods within ozone nonattainment areas during May * Oct. The San Joaquin Valley where sweet potatoes are grown is one of the nonattaninment areas affected. However, most sweet potato fumigations occur outside the May * Oct window. For sweet potato fumigations during May * Oct, applicators will most likely need to use post-application water treatments for metam or 1,3-D, or chemigate using drip irrigation systems. Methyl bromide sweet potato fumigations will probably be unchanged. Their current method is likely considered low-emission.
>
> If a certain emissions trigger is met, fumigant limits go into effect. San Joaquin Valley is almost certain to meet this trigger in 2009. The fumigant limit applies to the entire nonattainment area during May * Oct. DPR enforces the fumigant limit using allowances issued to growers. It's likely that fumigated acreage will be reduced beginning in 2009, but I'm not able to estimate what the reduction might be. The reduction will be proportional for all growers and crops. That is, everybody will be reduced the same percentage amount.
>
> The above description is the easy part. We're still in litigation regarding the needed fumigant reductions in Ventura. We also have major uncertainties what the fumigant reductions will look for 2010 and beyond in all nonattainment areas due to possible actions by EPA's air program.

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?	Being widely adopted in areas where permitted.	In Florida and the eastern U.S. states, methyl bromide rates have decreased.	Reduction of MB/Pic in mixtures, i.e. changes from 98:2 to 67:33– this may have some promise, but nutsedge is a primary pest in the Eastern region and Florida. Chloropicrin at high rates may reduce yields of strawberry, but protocols are being developed to compensate (see e.g., Klose et al., 2006)	Deep injection may not solve pathogen problems. Drip application of methyl bromide has been experimented with in California (e.g., Shem-Tov et al., 2006a; Ajwa et al., 2006; Fennimore et al., 2007) but only in research phase. Worker safety issues are particularly of concern for drip applications.	The U.S. anticipates that the decreasing supply of methyl bromide will motivate growers to try less frequent applications.
WHAT FURTHER USE/EMISSION REDUCTION STEPS WILL BE TAKEN FOR THE METHYL BROMIDE USED FOR CRITICAL USES?	Research is ongoing in CA, FL and other states (e.g., Gilreath et al., 2003, 2005b; Duniway et al., 2003; Ajwa et al., 2003)	Changes in formulation and use rates are being adopted and research is continuing to address application and efficacy issues.	California regulations are not likely to allow chloropicrin above 43% of the formulation. Other areas may be able to use 50:50 with high barrier films.	Research is ongoing.	Prior to planting fumigation is conducted. Most rotate land to other crops for several seasons.

OTHER MEASURES (PLEASE DESCRIBE)	Combination methods using two or three chemicals and effective tarps (low permeability and/or various colors) are being studied to develop the most effective regimes for pest management. Research studies have been conducted examining the use of water to "seal" a fumigated field to reduce emissions (e.g., Gao and Trout, 2006)—although water regulations and availability of water likely will be issues.

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

Emission reduction is a key priority for methyl bromide and all volatile organic compounds. As such regulations to reduce emissions and technology to implement effective and safe processes are ongoing. Techniques to minimize emissions include the use of low-permeability films, the application of water seals, and the "top dressing" application of fertilizer. High barrier films are being adopted in Florida and the eastern states. In California, however, there is a performance standard for films that require a minimum level of permeability to methyl bromide to protect workers so low barrier films cannot be used with methyl bromide.

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. Thiosulfate formulations are being tested as well.

The Methyl Bromide Technical Options Committee and the Technology and Economic Assessment Panel may recommended 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 process, each party is required to describe ways in which it intends to minimize use and emissions of methyl bromide. The use of methyl bromide in the U.S. is minimized in several ways. First, because of its toxicity, methyl bromide and most fumigants are regulated as a restricted use pesticide in the U.S. As a consequence, methyl bromide can only be used by certified applicators trained in handling these hazardous pesticides. In practice, this means that methyl bromide is applied by a limited number of 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 levels, methyl bromide applications are injected into soil to specific depths.

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. Films with greater retention are being increasingly adopted by growers who are finding that reduced rates of methyl bromide are feasible.

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.

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;
(g) Percentage change in profit margin if alternatives are used.

The measures and indicators outlined above are illustrated below in the Tables E.1, E.2, and E.3.

For this analysis, net revenue is calculated as gross revenue minus operating costs. This is a good measure of the direct losses of income that may be suffered by the users. 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. Fixed costs were not included because they are often difficult to measure and verify.

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

CALIFORNIA	METHYL BROMIDE	METAM SODIUM	1,3-D+PIC
YIELD LOSS (%)	0%	30%	14%
YIELD PER HECTARE (KG/HA)	41,066	28,746	35,316
* PRICE PER UNIT (US$)	$1.94	$1.94	$1.94
= GROSS REVENUE PER HECTARE (US$)	$87,414	$59,173	$75,176
- OPERATING COSTS PER HECTARE (US$)	$63,039	$64,028	$64,244
= NET REVENUE PER HECTARE (US$)	$24,376	$(4,855)	$10,952
LOSS MEASURES			
1. LOSS PER HECTARE (US$)	$0	$29,231	$13,423
2. LOSS PER KILOGRAM OF METHYL BROMIDE (US$)	$0	$149.02	$68.43
3. LOSS AS A PERCENTAGE OF GROSS REVENUE (%)	0%	33%	15%
4. LOSS AS A PERCENTAGE OF NET REVENUE (%)	0%	120%	55%

TABLE E 2: EASTERN U.S. - ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES

EASTERN STRAWBERRY	METHYL BROMIDE	METAM SODIUM	1,3-D+PIC
YIELD LOSS (%)	0%	30%	14%
YIELD PER HECTARE (KG/HA)	22,417	15,692	19,270
* PRICE PER UNIT (US$ KG)	$2.31	$2.31	$2.31
= GROSS REVENUE PER HECTARE (US$)	$51,892	$36,324	$44,608
- OPERATING COSTS PER HECTARE (US$)	$29,482	$30,122	$31,509
= NET REVENUE PER HECTARE (US$)	$22,410	$6,203	$13,099
LOSS MEASURE			
1. LOSS PER HECTARE (US$)	$0	$16,207	$9,311
2. LOSS PER KILOGRAM OF METHYL BROMIDE (US$)	$0	$72.30	$41.53
3. LOSS AS A PERCENTAGE OF GROSS REVENUE (%)	0%	31%	18%
4. LOSS AS A PERCENTAGE OF NET REVENUE (%)	0%	72%	42%

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

FLORIDA	METHYL BROMIDE	METAM SODIUM	1,3-D+PIC
YIELD LOSS (%)	0%	30%	10%
YIELD PER HECTARE (KG/HA)	2,289	1,607	1,671
* PRICE PER UNIT (US$)	$29.10	$29.10	$29.10
= GROSS REVENUE PER HECTARE (US$)	$66,606	$46,757	$48,622
- OPERATING COSTS PER HECTARE (US$)	$44,254	$38,818	$39,584
= NET REVENUE PER HECTARE (US$)	$22,351	$7,939	$9,038
LOSS MEASURE			
1. LOSS PER HECTARE (US$)	$0	$14,413	$13,313
2. LOSS PER KILOGRAM OF METHYL BROMIDE (US$)	$0	$61.23	$35.55
3. LOSS AS A PERCENTAGE OF GROSS REVENUE (%)	0%	22%	13%
4. LOSS AS A PERCENTAGE OF NET REVENUE (%)	0%	64%	37%

Summary of Economic Feasibility

The economic assessment of feasibility for pre-plant uses of methyl bromide included an evaluation of economic losses from three basic sources: (1) yield losses, referring to reductions in the quantity produced, (2) quality losses, which generally affect the price received for the goods, and (3) increased production costs, which may be due to the higher-cost of using an alternative, additional pest control requirements, and/or resulting shifts in other production or harvesting practices.

The economic reviewers then analyzed crop budgets for pre-plant sectors to determine the likely economic impact if methyl bromide were unavailable. Various measures were used to quantify the impacts, including the following:

(1) Losses as a percent of gross revenues. This measure has the advantage that gross revenues are usually easy to measure, at least over some unit, *e.g.*, a hectare of land or a storage operation. However, high value commodities or crops may provide high revenues but may also entail high costs. Losses of even a small percentage of gross revenues could have important impacts on the profitability of the activity.

(2) Absolute losses per hectare. For crops, this measure is closely tied to income. It is relatively easy to measure, but may be difficult to interpret in isolation.

(3) Losses per kilogram of methyl bromide requested. This measure indicates the value of methyl bromide to crop production but is also useful for structural and post-harvest uses.

(4) Losses as a percent of net revenues. We define net revenues as gross revenues minus operating costs. This is a very good indicator as to the direct losses of income that may be suffered by the owners or operators of an enterprise. However, operating costs can often be difficult to measure and verify.

These measures represent differ methyl bromide users, who are strawberry fruit producers in this case. Because producers (suppliers) represent an integral part of any definition of a market, we interpret the threshold of significant market disruption to be met if there is a significant impact on commodity suppliers using methyl bromide. The economic measures provide the basis for making that determination.

The economic analysis compared the costs of methyl bromide alternative control scenarios for the Florida Fruit and Vegetable Growers, the Southeastern Strawberry Consortium and the California Strawberry Growers Association to the baseline costs for methyl bromide. The economic estimates were first calculated in pounds and acres and then converted to kilograms and hectares. The costs for the alternatives are based on market price for the control products multiplied by the number of pounds of active ingredient that would be applied. The baseline costs were based on the average number of applications to treat strawberry plants (boxes) with methyl bromide per year. The loss per hectare measures the value of methyl bromide based on changes in operating costs and changes in yield. The loss expressed as a percentage of the gross revenue is based on the ratio of the loss to the gross revenue using methyl bromide. A similar calculation was used for the loss as a percentage of net revenue. These losses are shown in Tables E.1, E.2 and E.3.

The values to derive gross revenue and the operating costs for each alternative were derived from the baseline methyl bromide costs compared to the costs of changes under two fumigation scenarios in the Southeastern States: 1) metam sodium; and 2) 1,3-D + chloropicrin.

For California, the baseline methyl bromide costs were compared to two scenarios: 1) 1,3-D + metam sodium; and 2) 1,3-D + chloropicrin. The differences in the cost of production were primarily attributable to changes in fumigation costs.

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 U.S. 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.

In California, more than 50% of the strawberry fruit production hectares are fumigated with alternatives to methyl bromide. While this industry continues to transition to methyl bromide there are regulatory and safety barriers to the adoption of alternative fumigants in some production areas. Township caps on the use of 1,3-D present barriers to the continued transition to 1,3-D-based fumigants. Another barrier to the complete transition to alternatives may be reregistration restrictions on chloropicrin by state and federal regulations.

Due to chloropicrin's disease control properties, it has long been a key component of the fumigants used by strawberry growers. Since the 1990s, chloropicrin has become increasingly important as restrictions on the use of methyl bromide have increased. Since 2001, chloropicrin has been used on more acres for preplant soil fumigation for California strawberry fruit production than methyl bromide. In 2004, more kilograms of chloropicrin were used for preplant fumigation than methyl bromide and other fumigants for strawberry fruit production in California.

Much of the California industry is dedicated to producing strawberry fruit using alternative fumigants. There are concerns about the emergence of new soil borne disease problems (*Cylindrocarpon* spp, *Macrophominia* spp.) in some fields where alternatives have been used, but these have yet to emerge as widespread problems. There are also safety concerns associated with the use of drip fumigation that may lead to severe restrictions on the preferred method for applying the alternative fumigants. However, the main concerns that may prevent the full transition away from methyl bromide are the current and future regulatory restrictions on chloropicrin.

Florida, the other major strawberry producer in the U.S. is developing a strategy for transition to alternatives (see Noling et al., 2006a; Noling et al.,2006b). The plan (Noling et al., 2006b) suggests that a "projected transition timeline would indicate a need for Florida growers to commit 30 to 40% of their acreage to alternatives by the end of calendar year 2006, and to 70% and 90% by the end of 2007 and 2008, respectively". Furthermore, "use of VIF or high barrier plastic mulch films will be a required component of any methyl bromide transition strategy". Standards for permeability coefficients of less than 14 $g/m^2/hr$ are recommended, as is the putting in place a monitoring program to assess residual gases in soil. Some Florida growers have rapidly transitioned to use of VIF-type films and reduction in methyl bromide rates are already becoming a standard practice for many growers as experience improves pest management effectiveness (Noling and Botts, 2007a).

The transition to alternatives will require appropriate application of alternatives that may be unfamiliar after years of methyl bromide use. However, "…some factors that affect the success or failure of the various tactics, such as the environment, may not be completely manageable or resolvable. For example, seasonal differences in temperature and rainfall patterns can adversely affect fumigant dissipation from soil, and herbicide efficacy and thus reduce the value of the alternatives by causing treatment inconsistency. Growers can also cause significant response variability due to inappropriate land preparation or substandard application procedures" (Noling et al, 2006b). In conclusion, the Florida plan suggests that "Florida fruit and vegetable growers actively begin the transition, to increased reliance upon the alternative fumigants as a percentage of their total farmed acreage" (Noling et al., 2006b).

While methyl bromide is critical for some areas, alternatives appear to be available for some of the region's growers. According to the Southeast Strawberry Consortium, most growers use methyl bromide at a rate of 150 kg/ha with a 67:33 (methyl bromide:chloropicrin) formulation. A transition to high barrier films should be feasible in the eastern U.S. strawberry production areas, although possibly at a slower transition rate compared to Florida, primarily due to economic issues and diversity of the region (Sydorovych et al., 2006). An area-wide research program (Welker et al., 2007) has described successes in using alternatives (InLine®, chloropicrin) and reduced rates of methyl bromide (150 kg ai/ha). Preliminary research conducted on a commercial farm in North Carolina where black root rot and winter weeds were the most problematic (with low nutsedge pressure) has indicated that efficacy was similar for some alternatives compared to 300 kg methyl bromide/ha with standard films.

(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.)*

This nomination (see Appendix A) reflects the critical use and required quantities for strawberry production.

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

The U.S. government can authorize Experimental Use Permits (EUPs) for large scale field trials for methyl bromide alternatives, as has been done for iodomethane. A recent change has been to allow the use of iodomethane without having to destroy the crop, thus encouraging more growers to participate in field trials. As with other activities connected with registration of a pesticide, the U.S. has no authority either to compel a registrant to seek an EUP or to require growers to participate.

As noted in our previous nomination, the U.S. provides 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 MBAO, 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 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:

Iodomethane has received a one-year registration and is currently being reviewed by state regulators for use in their respective states. The future of iodomethane as a commercially feasible treatment is unknown due to the registration review outcomes and due to current high costs.

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.

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

(i) DESCRIPTION AND IMPLEMENTATION STATUS:

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

As discussed above, a significant portion of the largest strawberry producing region (California) has transitioned an extensive area of land in recent years to alternatives. Greater than 50% of production land was treated with alternatives in 2005, according to the California Strawberry Commission. Florida and growers in the eastern U.S. are currently shifting to alternatives or lower rates of methyl bromide as high barrier films are adopted and as experience is gained in their uses. For Florida, karst topography and high density of population in the major strawberry region may reduce the rate of transition to alternatives. Nevertheless, growers in Florida are rapidly adopting high barrier films (e.g., VIF) that have reduced use rates and increased efficacy of methyl bromide and alternatives. The eastern U.S. is also beginning to transition to alternatives and lower rates of methyl bromide as high barrier films are adopted. Costs are additionally important to this region because of the low margin of profits most growers face.

(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 decrease in the U.S. nomination for methyl bromide 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:

The U.S. government 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 U.S. Management Plan for Methyl Bromide, submitted previously.

PART G: CITATIONS

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APPENDIX A: METHYL BROMIDE USAGE NEWER NUMERICAL INDEX EXTRACTED (BUNNIE)

2010 Methyl Bromide Usage Newer Numerical Index - BUNNIE							Strawberry Fruit	
January 23, 2008		Region		CA Strawberry Commission	Eastern Strawberry	Florida FFVA Strawberry	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)		14% Yield Loss	14% Yield Loss	14% Yield Loss		
		Loss per Hectare (US$/ha)		$ 11,817	$ 9,319	$ 6,720		
		Loss per Kg of MeBr (US$/kg)		$ 59	$ 62	$ 33		
		Loss as a % of Gross Revenue		16%	18%	12%		
		Loss as a % of Net Op Revenue		87%	42%	62%		
	Dichotomous Variables (Y/N)	Strip or Bed Treatment?		Flat Fumigation	Strip	Strip		
		Currently Use Alternatives?		Yes	Yes	Yes		
		Tarps / Deep Injection Used?			Tarp	Tarp		
	Other Issues	Frequency of Treatment (x/ yr)		1x per year	1x per year	1x per year		
		Change in CUE Request		decrease	increase	same	decrease	
Most Likely Combined Impacts (%)		Florida Telone Restrictions	%	0%	0%	63%		
		100 ft Buffer Zones	%	0%	40%	1%		
		Key Pest Distribution	%	100%	37%	37%		
		Regulatory Issues	%	52%	0%	0%		
		Unsuitable Terrain	%	15%	0%	0%		
		Cold Soil Temperature	%	0%	0%	0%		
		Total Combined Impacts	**%**	**100%**	**62%**	**77%**		
Most Likely Baseline Transition		(%) Able to Transition		0%	31%	31%		
		Minimum # of Years Required		0	7	7		
		(%) Able to Transition / Year		**0%**	**4%**	**4%**		
Joint Adjusted Use Rate			kg/ha	**196**	**160**	**160**		*
Joint Adjusted Dosage Rate			g/m2	19.6	16.0	16.0		
2010 US CUE Application Information		*Amount - Pounds*	*Pounds*	*2,100,000*	*846,411*	*1,278,000*	*4,224,411*	
		Area - Acres		*12,000*	*6,228*	*7,100*	*25,328*	
		Rate (lb/A)		*175.00*	*135.90*	*180.00*	*167*	
		Amount - Kilograms	Metric	**952,543**	**383,925**	**579,691**	**1,916,159**	
		Treated Area - Hectares		4,856	2,520	2,873	10,250	
		Rate (kg/ha)		196	152	202	187	
EPA Preliminary Value			**kgs**	**952,543**	**272,908**	**579,691**	**1,805,142**	
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	952,543	89,484	190,524	1,232,551	*
EPA Transition Amount			kgs	-	(13,653)	(27,083)	(40,736)	*
EPA Amount of All Adjustments			kgs	**-**	**(197,077)**	**(416,250)**	**(613,327)**	
Most Likely Impact Value for Treated Area			kgs	**952,543**	**75,832**	**163,440**	**1,191,815**	*
			ha	**4,856**	**474**	**1,022**	**6,352**	
			Rate	**196**	**160**	**160**	**188**	*
Sector Research Amount (kgs)				**-**	**2010 Total US Sector Nomination**		**1,191,815**	*