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

NOMINATING PARTY:
The United States of America

NAME
USA CUN09 SOIL 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 2007 for 2009 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 (metric Tonnes)*
2009	1,336.754

*This amount includes methyl bromide needed for research.

SUMMARY OF ANY SIGNIFICANT CHANGES SINCE SUBMISSION OF PREVIOUS NOMINATIONS

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

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

Alternatives are used on a portion of land currently producing strawberries in all three regions. For the portion requiring MeBr, feasible alternatives are not available because of 1) drip application of fumigants such as 1,3-D and chloropicrin is not well developed for certain soils and conditions such that acceptable pest management is achieved. Studies with VIF-type films have produced encouraging results that may allow greater efficacy of alternatives (e.g., see 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) make implementation infeasible for the 2009 season.

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

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

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

NOMINATING PARTY CONTACT DETAILS:

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

______________________________ ________________________________ ________________

Signature Name Date

Title: ____

CONTACT OR EXPERT(S) FOR FURTHER TECHNICAL DETAILS:

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LIST OF DOCUMENTS SENT TO THE OZONE SECRETARIAT IN OFFICIAL NOMINATION PACKAGE:

1. PAPER DOCUMENTS: **Title of paper documents and appendices**	**No. of pages**	**Date sent to Ozone Secretariat**
USA CUN09 SOIL 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 CUN09 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 CUN09 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 2007 for 2009 Use Season)

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

This 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 more than 85% of the fresh market 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. The majority of growers are farming between four and 20 hectares of land with strawberry fields 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, which is discussed later in this chapter, 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 region, 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. 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 (METRIC TONNES)*
2009	**1,336.754**

*This amount includes methyl bromide needed for research.

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

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

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

TABLE A 2: EXECUTIVE SUMMARY*

Region		CA Strawberry Commission	Eastern Strawberry	Florida FFVA Strawberry	Sector Total or Average
EPA Preliminary Value	kgs	1,179,339	272,908	579,691	2,031,938
EPA Amount of All Adjustments	kgs	(114,783)	(179,420)	(403,358)	(697,561)
Most Likely Impact Value for Treated Area	kgs	1,064,556	93,488	176,333	1,334,377
	ha	5,452	534	1,008	6,994
	Rate	195	175	175	191
Sector Research Amount (kgs)		2,377	2009 Total US Sector Nomination		1,336,754

* *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):

One reason that MeBr will continue to be a critical treatment for some strawberry production land, is a lack of experience with some treatments. For example, 1,3-D and chloropicrin applied through drip irrigation require sufficient movement through soils to be effective. In some areas movement laterally into the root zone has been problematic. Research with different films indicates that efficacy might be improved, but continued research is necessary. Regulatory limitations to some important treatments (e.g., 1,3-D, virtually impermeable film) can impact use in some areas, especially in California (Trout, 2005) and Florida. Increased costs for some alternatives (e.g., additional drip lines for chemigation) reduce transition time, especially in lower profit niche markets. Market issues due to change in crop rotation and time of planting/harvesting further impact the economic feasibility. Economic analyses for California suggest that "…per acre fumigant and weed-control costs are likely to increase, relative to methyl bromide…Economic viability is also affected by the revenues growers will obtain. This suggests that the field-level economic viability of alternatives cannot be evaluated independently of market-level effects…Acreage declines and price increases are significant for all alternatives in the anticipated 10-15% yield loss range" (Goodhue et al., 2005). "Under the most likely scenario, industry revenue will decline by 6-17% due to the ban. The effects will differ by region, due to seasonal differences in demand and production, and the possibility of increased foreign competition" (Carter et al., 2005).

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	11,109 ha (NASS*, 2002 for CA= 11,538 ha)	50-60% (California Strawberry Commision) (NASS*, 2002 for CA=55% treated w/MB) (NASS*, 2004 for CA=23% treated w/MB)
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

* 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 are faced with different pest problems. In the Eastern U.S., other than Florida, the mostly small farms contend with yellow and purple nutsedges, which are significant problems in some areas more than others. Farmers with a low incidence of nutsedge use other chemicals, such as chloropicrin, 1,3-D, and metam-sodium. In Florida, a significant portion of production areas sits above karst geological formations. The porous nature of this topographical feature prevents the use of 1,3-D because of risk of ground water contamination. In California, many farms have already transitioned to alternatives, some areas are constrained from using 1,3-D, because of township caps (Trout, 2005). According to the California Strawberry Consortium approximately 47-67% of strawberry hectares cannot use 1,3-D due to regulatory restrictions. These areas rely on MeBr as a critical tool for successful strawberry production. In California, hilly fields impact the application of some alternatives (e.g., drip application of 1,3-D). Nevertheless, the latest projections are that approximately 40-50% of strawberry land is not fumigated with methyl bromide, and "…the remaining acreage is being transitioned as quickly as possible without compromising responsible production practices" (California Strawberry Commission, 2005).

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

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

- In Virginia and much of the mid-Atlantic, areas without high water tables and the close proximity of production to environmentally sensitive estuaries can use 1,3-D.

- In Delaware and Maryland areas without the existence of highly aggressive race 2 *Fusarium oxysporum* or high concentration of the inoculum could use some alternatives; providing they meet the criteria of water table and environmentally sensitive areas.

- In California, areas with flat terrain successfully employ 1,3-D with chloropicrin as a fumigant.

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

No, areas that use methyl bromide do so because hilly terrain, environmental sensitivity, and heavy pest pressure preclude the use of fumigants that are employed when these conditions are not present.

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	2009		
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?	Flat (90%) Strip (10%)	Strip (some broadcast)	Strip
PROPORTION OF BROADACRE AREA WHICH IS TREATED IN STRIPS; E.G. 0.54, 0.67	75%	54%	54%
FORMULATION (RATIO OF METHYL BROMIDE/PIC MIXTURE)	50:50	67:33	67:33
APPLICATION RATE* (KG/HA) FOR THE FORMULATION	See Appendix A	See Appendix A	See Appendix A
DOSAGE RATE* (G/M^2) (I.E. ACTUAL RATE OF FORMULATION APPLIED TO THE AREA TREATED)	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.

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

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

QUANTITY REQUESTED FOR PREVIOUS NOMINATION YEAR:	1,552,655 kg
QUANTITY APPROVED BY PARTIES FOR PREVIOUS NOMINATION YEAR:	1,349,575 kg
QUANTITY REQUIRED FOR YEAR TO WHICH THIS REAPPLICATION REFERS:	1,336,754 kg
TREATED AREA (HECTARES) REQUIRED FOR YEAR TO WHICH THIS REAPPLICATION REFERS:	See Appendix A

PART B: CROP CHARACTERISTICS AND METHYL BROMIDE USE

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

TABLE B 1: KEY DISEASES 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*); **Nematodes**: root knot nematode (*Meloidogyne* spp.) Sting nematode (*Belonolaimus* spp.); **Weeds**: Yellow nutsedge (*Cyperus esculentus*), purple nutsedge (*Cyperus rotundus*), ryegrass, and winter annual weeds.	For approximately 50% of land requesting MeBr, there are regulatory restrictions, such as the township caps, on 1,3-D and chloropicrin. MeBr applications in strawberries are being reduced from 67:33 to 50:50 mixtures with chloropicrin under plastic mulch. If high barrier tarps becomes available to California growers and technical problems and cost concerns can be resolved, some research suggests that fumigant rates, including MeBr, might be lowered with near efficacy of current rates under standard films
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. Extension information is slower because of the diversity and size of the farms. Transition to alternatives will occur, but these farmers require the most effective and timely treatment to make what frequently is a marginal profit.
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 also likely to be required for highest efficacy. Adopting these alternatives are problematic due to restrictions on Karst topographical features, and additional costs of 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:	2000	2001	2002	2003	2004	2005**
AREA TREATED *(hectares)*	8,248	8,456	7,912	8,245	7,156	N.A.
RATIO OF FLAT FUMIGATION METHYL BROMIDE USE TO STRIP/BED USE IF STRIP TREATMENT IS USED	Flat	Flat	Flat	Flat	Flat (90%) Strip (10%)	N.A.
AMOUNT OF METHYL BROMIDE ACTIVE INGREDIENT USED *(total kilograms)*	1,919,240	1,611,775	1,592,156	1,651,220	1,698,248	N.A.
FORMULATIONS OF METHYL BROMIDE	67:33 (43%); 57:43 (35%)	67:33 or 57:43	67:33 or 57:43	67:33 or 57:43	57:43 (58%); 67:33 (30%)	N.A.
METHOD BY WHICH METHYL BROMIDE APPLIED)	Shank injected 25 to 30 cm deep					
APPLICATION RATE OF ACTIVE INGREDIENT **(kg/ha)***	233	191	201	200	193 (flat) 145 (strip)	N.A.
ACTUAL DOSAGE RATE OF FORMULATIONS *(g/m^2)**	23.3	19.1	20.1	20.0	19.3	N.A.

* *For Flat Fumigation treatment application rate and dosage rate may be the same.*
***Not available (N.A.)—Data for 2005 will be available in January, 2007, from California Department of Pesticide Regulation.*

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

FOR AS MANY YEARS AS POSSIBLE AS SHOWN SPECIFY:	2000	2001	2002	2003	2004	2005
AREA TREATED *(hectares)****	1694	1823	1879	2121	2166	2235
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)*	254,689	274,405	283,530	320,128	327,323	337,792
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)***	224 (strip) 392 (broadcast)	224 (strip) 392 (broadcast)	224 (strip) 392 (broadcast)	224 (strip) 392 (broadcast)	224 (strip) 392 (broadcast)	224 (strip) 392 (broadcast)
ACTUAL DOSAGE RATE OF ACTIVE INGREDIENT *(g/m^2)**	22.4	22.4	22.4	22.4	22.4	22.4

* *For Flat Fumigation treatment application rate and dosage rate may be the same.*
** *Strip treatment occupies approximately 58% 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:	2000	2001	2002	2003	2004	2005
AREA TREATED *(hectares)***	2509	2630	2792	2873	2873	2,955
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)*	471,282	486,477	516,414	708,511	694,340	695,982
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)*	188	185	185	247	242	235
DOSAGE RATE OF ACTIVE INGREDIENT IN kg/ha*	18.8	18.5	18.5	24.7	24.2	23.5

** 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	Effective nematicide, but not for weed control or pathogens.[1] Source:
Chloropicrin	Effective fungicide, but not for areas with severe weed problems. Regulatory restrictions on use in California.[1] Source:
Metam-sodium	May be effective in some soils, but inconsistent movement in heavy soils makes this (and other MITC generators) infeasible for many locations.[1]
NON CHEMICAL ALTERNATIVES	
Tarps	Research is being conducted to determine what films with what fumigants can act together to achieve acceptable pest control. Tarps that allow reduced rates of alternatives are used in some locations. However, the nomination is for areas unable to transition to other fumigants for 2009. Some tarps may help reduce rates of MeBr until alternatives can be implemented. Research on weed management suggests that various colors of tarps can interfere with weed growth through disruption of photosynthesis. Choice of tarps is determined by weed pressure and soil warming requirements with maximum consideration given to strawberry production requirements. Research indicates that tarp type strongly impacts production and further work is needed on commercial fields.[2]
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	These provide effective nematicidal and fungicidal management. Additional treatment to manage nutsedge may be required. Regulatory restrictions for each of the chemicals may further limit their use. Low permeability tarps may improve efficacy.[4]
1,3-D + chloropicrin +metam-sodium	These provide effective nematicidal and fungicidal management. Additional treatment to manage nutsedge may be required. Regulatory restrictions for each of the chemicals may further limit their use. Low permeability tarps may improve efficacy. Experiments with VIF and 1,3-D/chloropicrin indicate nutsedge control may be achievable in some locations if metam-sodium application follows treatment. However, costs of additional drip tubes and technical and regulatory issues may impede transition to those who currently require MeBr.[4]

[1] Gilreath et al., 2005a; Fennimore et al., 2005; Ajwa et al., 2005
[2] 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-Dichloropropene	Township caps restrict the use in California. Where available, if used alone 1,3-D is not a 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., 2005), with the smaller cost estimates coming from VIF mulch treatments (not currently available due to regulatory constraints).
Chloropicrin	Chloropicrin alone is not a technically feasible alternative because it provides poor nematode and weed control, although it provides good disease control
Metam sodium	Metam-sodium alone is not a technically 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. Metam sodium is not technically feasible in California because it has limited activity against soilborne pathogens in strawberry fields.
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).

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 MeBr) and is not very effective on nutsedge.
Chloropicrin	The alternative does not give effective control of nutsedge. It also produces objectionable odors (a serious issue in urban fringe areas where strawberries are grown.) Insufficient root knot nematode control.
1,3-D	The alternative does not give effective control of nutsedge. Restrictive PPE requirements, and set or buffer space requirements.
1,3-D, chloropicrin	The alternative does not give effective control of nutsedge. Restrictive PPE requirements, and set or buffer space requirements.
1,3-D, chloropicrin, metam sodium	This combination is considered feasible as an alternative where weed pressure is low. Together they provide good nematicidal and fungicidal capabilities, but may require an herbicide partner to control weeds such as nutsedge. Regulatory restrictions may limit their use. 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 may improve efficacy, if technological and cost issues are resolved.
Metam sodium, chloropicrin	Will not effectively control nematodes.
Nematicides	None registered except 1,3-D.

TABLE C 2C: FLORIDA – ALTERNATIVES DISCUSSION

NAME OF ALTERNATIVE	DISCUSSION
1,3-Dichloropropene	Drip applications of 1,3-D in Florida 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 drip fumigations are used production costs are increased due to the need for herbicide applications, or metam sodium, or hand weeding. Add in Florida Citation – why is there a CA citation for FL? Recent studies in California found that fruit production costs were 20-212% higher than with MB/chloropicrin (Goodhue et al., 2005), with the smaller cost estimates coming from VIF mulch treatments that are not currently available due to technical issues.
Chloropicrin	Chloropicrin alone is not a technically feasible alternative because it provides poor nematode and weed control, although it provides good disease control. 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).
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 considered feasible as an alternative where weed pressure is low. 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)

Add more rows if necessary

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

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*):

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

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

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

Propargyl bromide: Under proprietary development for future registration submission.

Sodium azide: Under proprietary development for future registration submission.

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

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

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

In California, approximately 40-50% of strawberry land is currently treated without MeBr. 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, approximately 100% of strawberry land is currently treated with MeBr. As of the Fall 2006 crop, an increasing number of farmers are experimenting with metalized and other low permeable films to reduce MeBr rates. Prior to Fall 2006 high barrier dark plastic mulch was unavailable but is now available. Karst topography limits the use of 1,3-D in a large portion of production land. Research and extension work is being funded (e.g., 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 MeBr. 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.

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?	1. Unreliable supplies of the VIF film since no U.S. source of VIF film exists (only European sources); 2. U.S. requires season-long UV protection in film vs. Europe's two weeks; and 3. Difficulty applying VIF under U.S. production systems without damaging film.	Where VIF can be implemented, MB rates should decrease. Between 1997 and 2000 the U.S. has reduced the use of methyl bromide in strawberries grown for fruit production by 24%.	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.	Will not control pathogens in root zone.	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)	California growers have reduced dosage to 50:50. Reduction may be possible with low permeable films.	California growers have reduced dosage to 50:50.	Not feasible because fumigant would not be located in the area of heavy pest pressure.	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:

Techniques to minimize emission include the use of low-permeability films, the application of water seals, and the "top dressing" application of fertilizer. 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.

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, each party is required to describe ways in which it strives to minimize use and emissions of methyl bromide. The use of methyl bromide in the United States is minimized in several ways. First, because of its toxicity, methyl bromide has, for the last 40 years, been regulated as a restricted use pesticide in the United States. As a consequence, methyl bromide can only be used by certified applicators who are trained at handling these hazardous pesticides. In practice, this means that methyl bromide is applied by a limited number of very experienced applicators with the knowledge and expertise to minimize dosage to the lowest level possible to achieve the needed results. In keeping with both local requirements to avoid "drift" of methyl bromide into inhabited areas, as well as to preserve methyl bromide and keep related emissions to the lowest level possible, methyl bromide application for tomatoes is most often machine injected into soil to specific depths.

As methyl bromide has become more scarce, users in the United States have, where possible, experimented with different mixes of methyl bromide and chloropicrin. Specifically, in the early

1990s, methyl bromide was typically sold and used in methyl bromide mixtures made up of 98% methyl bromide and 2% chloropicrin, with the chloropicrin being included solely to give the chemical a smell enabling those in the area to be alerted if there was a risk. However, with the outset of very significant controls on methyl bromide, users have been experimenting with significant increases in the level of chloropicrin and reductions in the level of methyl bromide. While these new mixtures have generally been effective at controlling target pests, at low to moderate levels of infestation, it must be stressed that the long term efficacy of these mixtures is unknown.

Tarpaulin (high density polyethylene) is also used to minimize use and emissions of methyl bromide. In addition, cultural practices are utilized by tomato growers.

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

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

Additional, specific, measures are provided in Table D 1.

Narrative on the California Strawberry Fruit Growers Commitment to the Phase Out of Methyl Bromide

> The California strawberry fruit production industry has been a leader in the adoption of alternative fumigants, having adopted them on 40-50% of our production acreage (approx. 15,000 acres). This represents a significant adoption rate of 10-15% per year. This rate of adoption is limited primarily by a combination of transitional and regulatory issues. The continuing transition of our industry to alternative fumigants has been slowed by a number of factors and the future rate of adoption is difficult to project due to the uncertain regulatory environment in California. The regulatory uncertainty is the result of recent accidents during drip application of alternative fumigants in each of the primary strawberry production districts and uncertainty associated with the federal and state reregistration of chloropicrin.
>
> In 1992, the California Strawberry Commission made a decision to support research in the development of alternatives for methyl bromide and we continue to lead the world in funding research focused on strawberry. The Commission approved the funding of $1.5 million in production research for 2006 and has historically spent $1 million annually in support of production based research with grower derived funds.

In response to increasingly restrictive regulations on the use of fumigants in California, the Commission has taken a leadership role in organizing and funding (for $500,000) research focused on reducing fumigant emissions. The goal of this imitative is to develop technologies and production practices that will reduce potentially harmful emissions during pre-plant soil fumigation thereby preserving the availability of alternative fumigants as replacements for methyl bromide.

The Commission also continues to fund ongoing research in the development of technology to improve the effectiveness of methyl bromide alternatives in collaboration with the University of California and the USDA. The scientists we fund have already evaluated a large number of chemical and non-chemical alternatives that were found not to be suitable replacements for methyl bromide in strawberry fruit production. However, this research did identify that emulsified formulations of 1,3-D / chloropicrin and iodomethane (methyl iodide) are promising alternatives for strawberry production.

Through the California strawberry industry support of research into the development of alternatives to methyl bromide, we have made significant progress in reducing our use of methyl bromide. As alternatives have became commercially available (emulsified 1,3-D/chloropicrin), our industry has been adopting them for use in their production systems. The use of chloropicrin and 1,3-D has increased in California since 1999 (see appendix KK.09 Tables 1 and 2) as the primary replacements for methyl bromide and the combination of 1,3-D + chloropicrin has emerged as the most widely used alternative. However, the continued increase in the use of 1,3-D + chloropicrin is limited by technical, regulatory and economic issues. The telone township caps and higher production cost related to reduced revenue associated with an increased turn around time when using drip versus broadcast fumigation (see 2008 CUE, Appendix KK.08 section 2) present real and significant barriers to the complete transition to this alternative. Straight chloropicrin and chloropicrin + metam sodium applications face significant barriers for their use due to local regulatory concerns over the use of high chloropicrin rates.

PART E: 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 MeBr 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 MeBr requested. This measure indicates the value of MeBr 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 MeBr 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 MeBr 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 MeBr per year. The loss per hectare measures the value of MeBr 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. Likewise 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 MeBr 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 MeBr 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.

<u>PART F:</u> NATIONAL MANAGEMENT STRATEGY FOR PHASE-OUT OF THIS NOMINATED CRITICAL USE
<u>RENOMINATION FORM PART B:</u> 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.

Currently, 40-50% of the strawberry fruit production acreage in California is fumigated with alternatives to methyl bromide. As our industry continues to transition to methyl bromide it has become apparent that there are serious regulatory and safety barriers to our full and complete adoption of the alternative fumigants. Telone township caps present significant barriers to our continued transition to 1,3-D based fumigants like Inline and safety concerns associated with recent strawberry accidents may lead to severe restrictions on drip fumigation (see Appendix 3.09). But the greatest barrier to our complete transition to alternatives may be the reregistration of chloropicrin and the resulting state and federal use restrictions.

Due to chloropicrin's excellent disease control properties, it has long been a key component in the fumigants used by strawberry growers in California. Since the 1990s, chloropicrin has become increasingly important as restrictions on methyl bromide use increased due to California regulations and the Montreal Protocol. Since 2001, chloropicrin has been used on more acres for preplant soil fumigation for California strawberry fruit production than methyl bromide (Table 1). In 2004, more pounds of chloropicrin were used for preplant fumigantion than methyl bromide (and other fumigants) for strawberry fruit production in California (Table 2).

Chloropicrin is also the fumigant that local regulators (County Agricultural Commissioners) have become most concerned about in the main strawberry production counties of Ventura, Santa Barbara, Monterey and Santa Cruz. This close proximity to the homes and offices creates serious issues whenever there is an off-gassing accident involving fumigants. Most of the fumigant accidents that result in public exposure in these counties are almost always due to chloropicrin because of the easily detected eye blink and tearing effects of chloropicrin exposure.

Much of the California industry is convinced that they can produce 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 (see Appendix 3.09) that may lead to severe restrictions on the preferred method for applying the alternative fumigants. However, the main issue that may prevent our 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, 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 the [sic] 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.

The transition to alternatives will require appropriate application of alternatives that may be unfamiliar after years of MeBr 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 effect 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).

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

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

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

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

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

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

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

As noted in our previous nomination, the USG provides a great deal of funding and other support for agricultural research, and in particular, for research into alternatives for methyl bromide. This support takes the form of direct research conducted by the Agricultural Research Service (ARS) of USDA, through grants by ARS and CSREES, by IR-4, the national USDA-funded project that facilitates research needed to support registration of pesticides for specialty crop vegetables, fruits and ornamentals, through funding of conferences such as 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 USG feels that no additional change in methyl bromide quantity requested is necessary. The U.S. nomination for this sector reflects the commitment by this sector and the U.S. to reduce MeBr use to only the most critical needs. See Appendix A.

(iv) ACTIONS TO ADDRESS ANY DELAYS/OBSTACLES:

See above.

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

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

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

(i) DESCRIPTION AND IMPLEMENTATION STATUS:

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

As discussed above, a significant portion of the largest strawberry producing region (California) has transitioned in recent years to alternatives (approximately 40-50% of production land, according to the California Strawberry Commission). This is an achievement considering the technical and regulatory situation. Florida and growers in the eastern U.S. produce on smaller number of hectares and have more limited ability to transition such a high portion of land to alternatives. For Florida, karst topography and high density of population in the major strawberry region reduces the ability to use alternatives that require low water contamination results and large buffer zones. Nevertheless, growers are experimenting with newer tarps (e.g., metalized films) that can reduce rates and increase efficacy with MeBr and alternatives where allowed. The eastern U.S. production is frequently on small farms and extension and technical difficulties are required to improve experience in using different pest management techniques. 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 USG feels that no additional change in methyl bromide quantity requested is necessary. The U.S. nomination for this sector reflects the commitment by this sector and the U.S. to reduce MeBr use to only the most critical needs. See Appendix A.

(iii) ACTIONS TO ADDRESS ANY DELAYS/OBSTACLES:

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

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

(Renomination Form 9.) CHANGES TO TRANSITION PROGRAM

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

See Appendix A.

(Renomination Form 10.) OTHER BROADER TRANSITION ACTIVITIES

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

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

PART G: CITATIONS

Ajwa, H. A., Fennimore, S., Browne, G., Martin, F., Trout, T., Duniway, J., Shem-Tov, S., and Daugovish, O. 2005. Strawberry yield with various rates of chloropicrin and Inline applied under VIF. Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions, 2005. http://mbao.org/2005/05Proceedings/053AjwaH%20MBAO-ajwa05-VIF%20mta.pdf

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California Strawberry Commission. 2005. The facts about methyl bromide. http://www.calstrawberry.com/research/mbromide.asp

Carter, C. A., Chalfant, J. A., Goodhue, R. E., Han, F. M., and DeSantis, M. 2005. The methyl bromide ban: Economic impacts on the California strawberry industry. Review of Agricultural Economics 27 (2):181-197.

Duniway, J. M., Hao, J. J., Dopkins, D. M., Ajwa, H., and Browne, G. T. 2003. Soil fumigant, plastic mulch, and variety effects on Verticillium wilt and yield of strawberry. www.mbao.org.

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Fennimore, S., Kabir, Z., Ajwa, H., Daugovish, O., and Roth, K. 2005. Chloropicrin and Inline lethal dose on nutsedge and knotweed under impermeable film. Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions, 2005. http://mbao.org/2005/05Proceedings/054Fennimore%20abstract1.pdf

Fennimore, S., Kabir, Z., Ajwa, H., Daugovish, O., Roth, K., and Rachuy, J. 2004. Weed response to chloropicrin and INLINE dose under VIF and standard film. Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions, 2004. www.mbao.org.

Fennimore, S., Kabir, Z., Ajwa, H., Daugovish, O., Roth, K., and Valdez, J. 2003. Chloropicrin and INLINE dose-response under VIF and HDPE film: weed control results. Submitted by the California Strawberry Commission, CUE Request for 2007 (Part 2). Appendix EE.07.A.

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

2009 Methyl Bromide Usage Newer Numerical Index - BUNNIE							Strawberry Fruit	
December 18, 2006		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	decrease	same	decrease	
Most Likely Combined Impacts (%)		Florida Telone Restrictions	%	0%	0%	56%		
		100 ft Buffer Zones	%	0%	40%	1%		
		Key Pest Distribution	%	100%	33%	33%		
		Regulatory Issues	%	43%	0%	0%		
		Unsuitable Terrain	%	15%	0%	0%		
		Cold Soil Temperature	%	0%	0%	0%		
		Total Combined Impacts	**%**	**100%**	**60%**	**70%**		
Most Likely Baseline Transition		(%) Able to Transition		0%	42%	42%		
		Minimum # of Years Required		0	7	7		
		(%) Able to Transition / Year		**0%**	**6%**	**6%**		
Joint Adjusted Use Rate			kg/ha	**195**	**183**	**183**		*
Joint Adjusted Dosage Rate			g/m2	19.5	18.3	18.3		
2009 US CUE Application Information		*Amount - Pounds*	*Pounds*	*2,600,000*	*830,666*	*1,278,000*	*4,708,666*	
		Area - Acres		*14,926*	*6,118*	*7,100*	*28,144*	
		Rate (lb/A)		*174.19*	*135.77*	*180.00*	*167*	
		Amount - Kilograms	Metric	**1,179,339**	**376,783**	**579,691**	**2,135,813**	
		Treated Area - Hectares		6,040	2,476	2,873	11,389	
		Rate (kg/ha)		195	152	202	188	
EPA Preliminary Value			**kgs**	**1,179,339**	**272,908**	**579,691**	**2,031,938**	
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	1,179,339	105,918	199,372	1,484,629	*
EPA Transition Amount			kgs	(114,783)	(12,429)	(23,039)	(150,252)	*
EPA Amount of All Adjustments			kgs	**(114,783)**	**(179,420)**	**(403,358)**	**(697,561)**	
Most Likely Impact Value for Treated Area			kgs	**1,064,556**	**93,488**	**176,333**	**1,334,377**	*
			ha	**5,452**	**534**	**1,008**	**6,994**	
			Rate	**195**	**175**	**175**	**191**	*
Sector Research Amount (kgs)				**2,377**	**2009 Total US Sector Nomination**		**1,336,754**	*

1 Pound = 0.453592 kgs 1 Acre = 0.404686 ha

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

BACKGROUND

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

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

CROP INFORMATION

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

KARST RESTRICTION

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

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

SPECIAL LOCAL NEED RESTRICTION

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

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

Electronic soil survey data were used to quantify the area within each county not suitable for Telone® use based on the soil criteria of the Florida Special Local Need (SLN) registration. Tabular data of soil surveys for each county were used as follows. First, soils series (components of soil map units) that have at least one of the four above mentioned soil orders were identified using the "Taxonomic Classification of Soils" table of the soil survey. This step identified the soil series potentially having the required restrictive layers. Second, soil map units were selected in the "Component Legend" table of the soil survey if they contained the identified soil series. The "Component Legend" table provides the percentage of each soil component in a map unit. If at least 50 percent of the map unit contains the identified soils, soils meeting the SLN restriction, then those map units were selected. Next, the "Acreage and Proportionate

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

Extent of Soils" table of the soil survey was used to calculate the total acreage of the suitable map units in a county. Finally, the area not represented by these suitable soils was calculated to estimate the area not suitable for Telone® use. The areas not meeting the SLN soil requirements are presented in Table 1.

CALCULATING THE AREA OF TELONE® RESTRICTION

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

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

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

CONCLUSION

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

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

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

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

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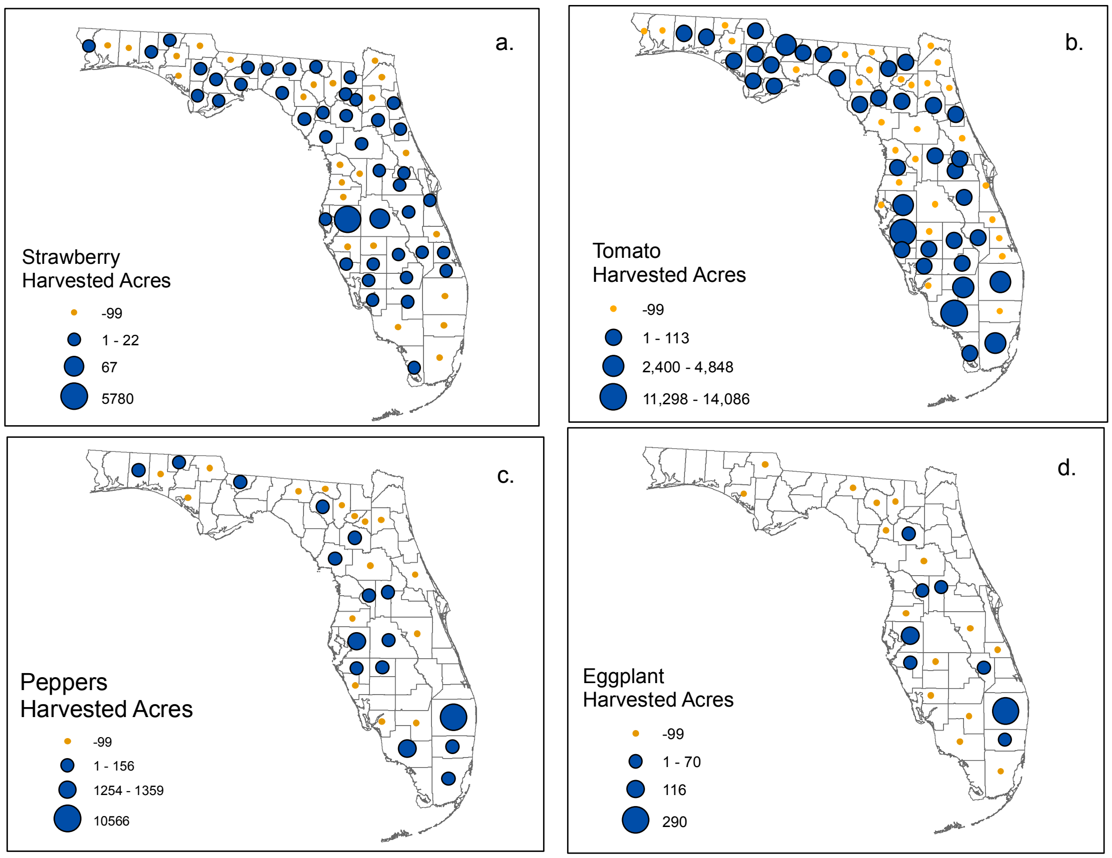
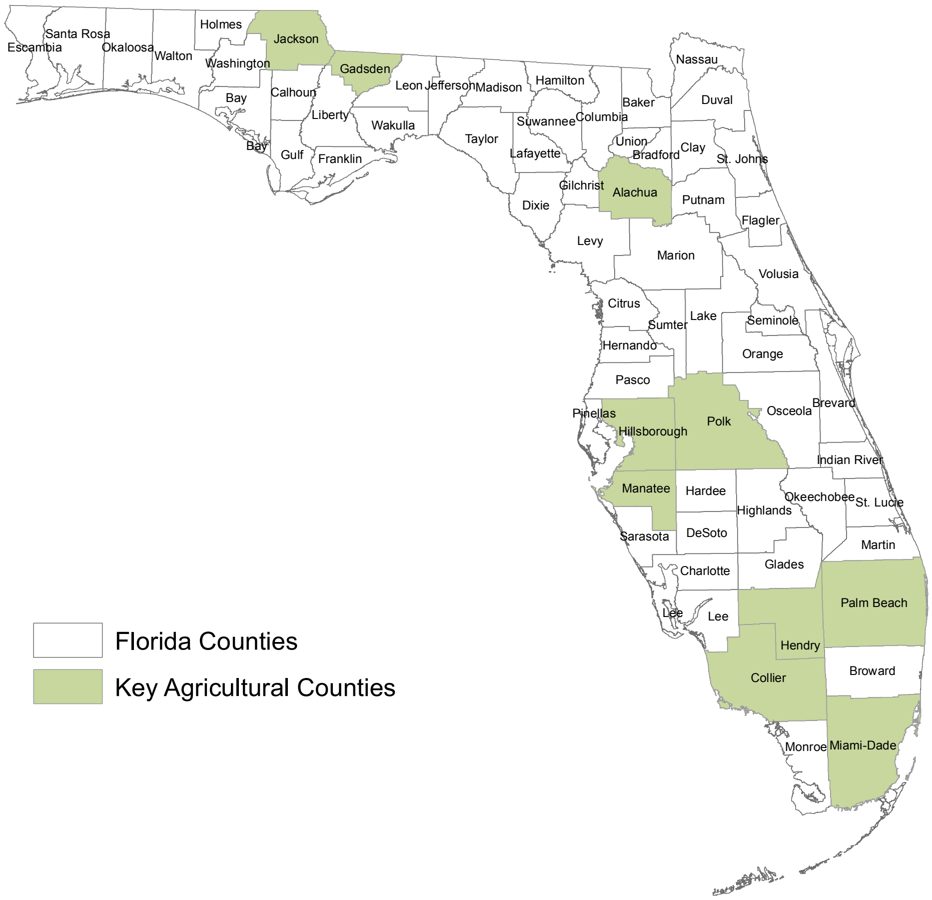
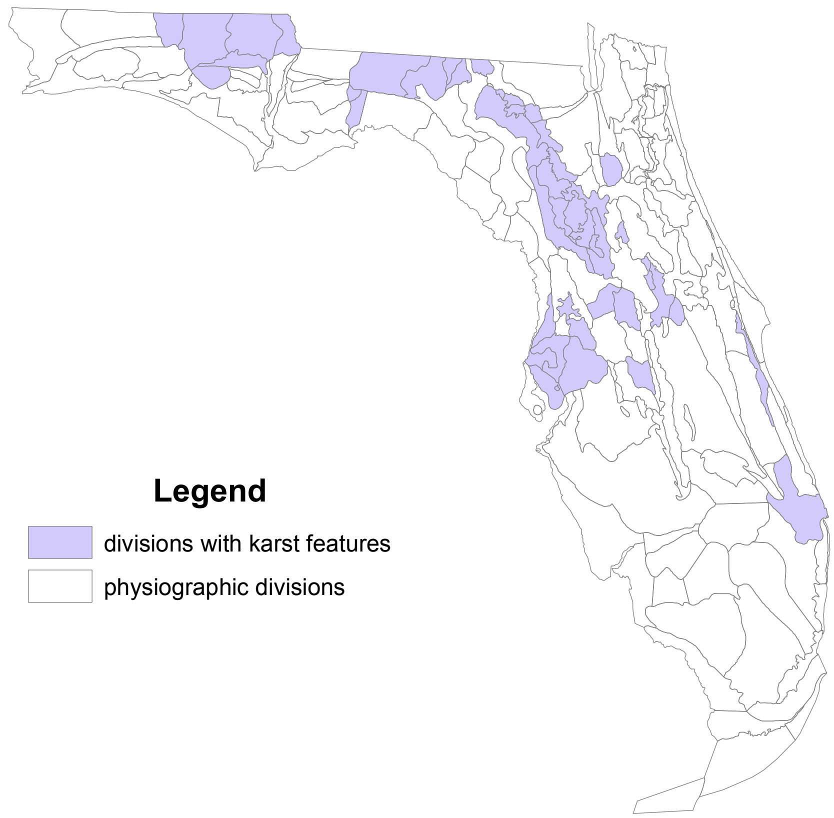
USGS, University of Florida, and St. Johns River Water Management District, 2000. Physiographic divisions map of Florida. Online: http://www.sjrwmd.com/programs/data.html



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



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



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

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

a. Strawberry

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

b. Tomato

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

c. Pepper

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

d. Eggplant

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

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

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