# MONTREAL PROTOCOL

# ON SUBSTANCES THAT DEPLETE

# THE OZONE LAYER

## REPORT OF THE
## TECHNOLOGY AND ECONOMIC ASSESSMENT PANEL

## SEPTEMBER 2019

### VOLUME 2: EVALUATION OF 2019 CRITICAL USE NOMINATIONS FOR METHYL BROMIDE

### FINAL REPORT

UN environment
United Nations
Environment Programme

**Montreal Protocol on Substances that Deplete the Ozone Layer**

**United Nations Environment Programme (UNEP)**
**Report of the Technology and Economic Assessment Panel**

**September 2019**

# VOLUME 2: EVALUATION OF 2019 CRITICAL USE NOMINATIONS FOR METHYL BROMIDE

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Co-ordination: **Methyl Bromide Technical Options Committee**

Composition of the report: Co-chairs: Ian Porter, Marta Pizano

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# Foreword

**September 2019 TEAP Report**

The September 2019 TEAP Report consists of three volumes:

***Volume 1:*** *Decision XXX/3 Task Force Report on Unexpected Emissions of CFC-11*

***Volume 2:*** *MBTOC Final CUN Assessment Report – September 2019*

***Volume 3:*** *Decision XXX/5 Task Force Final Report on Cost and Availability of Low-GWP Technologies/Equipment that Maintain/Enhance Energy Efficiency*

This is Volume 2

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## Common Acronyms

| | |
|---|---|
| 1,3-D | 1,3-dichloropropene |
| A5 | Article 5 Party |
| ASD | Anaerobic soil disinfestation |
| CUE | Critical Use Exemption |
| CUN | Critical Use Nomination |
| DMDS | Dimethyl disulphide |
| DOI | Disclosure of Interest |
| EU | European Union |
| ExMOP | Extraordinary Meeting of the parties |
| EPA | Environmental Protection Agency |
| EPPO | European Plant Protection Organisation |
| IM | Iodomethane (methyl iodide) |
| IPM | Integrated Pest Management |
| IPPC | International Plant Protection Convention |
| ISPM | International Standard Phytosanitary Measure |
| LPBF | Low Permeability Barrier Film (including VIF films) |
| MB | Methyl Bromide |
| MBTOC | Methyl Bromide Technical Options Committee |
| MITC | Methyl isothiocyanate |
| MOP | Meeting of the parties |
| MS | Metham (metam) sodium |
| Non-A5 | Non Article 5 Party |
| OEWG | Open Ended Working Group |
| Pic | Chloropicrin |
| QPS | Quarantine and Pre-shipment |
| SF | Sulfuryl fluoride |
| TEAP | Technology and Economics Assessment Panel |
| TIF | Totally Impermeable Film |
| VIF | Virtually Impermeable Film |
| VOC | Volatile Organic Compounds |

# Evaluation of Critical Use Nominations for Methyl Bromide Submitted in 2019

## Final Report

## Table of Contents

# 1 Executive Summary

The amount of MB requested for critical use nominations has fallen from 18,700 t submitted for 2005 to 111.411 t submitted for 2020/2021. The total amount requested in this round represented a 22% reduction from the request for critical use nominations submitted in 2018.

In this round, MBTOC received six nominations for critical use from four parties for use of 82.461 t of methyl bromide (MB) in 2020 (five nominations) and 28.98 t in 2021 (one nomination).

The amount of MB nominated was 69.911 t for pre-plant soil uses and 41.5 t for structure and commodity uses. The majority of the request (63%) was for pre-plant soil use against soil-borne fungal pathogens, nematodes and weeds and the remaining 37% for structure and commodity uses against insect pests.

MBTOC made an interim recommendation of 74.427 t, but after the OEWG two parties, Australia and Canada provided further information which justified that alternatives were either not available or not sufficiently evaluated to be adopted for their nominations. For these nominations the final recommendations accepted the full amount requested.

The accounting framework information received from parties reporting under Article 7 showed that a total of 0.742 t of stocks were reported as available in both non-Article 5 (non-A5) and Article 5 (A5) parties at the end of 2018. MBTOC notes, however, that the accounting information in this report does not accurately show the stocks of MB held globally for controlled uses by A5 parties as there is no requirement for parties to report pre-2015 stocks under the Montreal Protocol. MBTOC considers these stocks may be substantial (>1,500 t).

MBTOC has not reduced its recommended amount of MB in consideration of stocks held by the party and has instead relied on parties to take this into consideration when approving the amounts recommended by TEAP for each nomination.

# 2 Scope of the Report

This 2019 final CUN report provides evaluations by MBTOC of Critical Use Nominations (CUNs) for methyl bromide (MB) submitted for 2020 and 2021 by four parties: two non-A5 (Australia and Canada) and two A5 parties (Argentina and South Africa). As per provisions set out in Decision IX/6 (Annex I, MOP16), CUNs were required to be submitted by the parties to the Ozone Secretariat in accordance with the timetable shown in paragraph 1 of Annex I, Decision XVI/4.

This report also provides: 1) Final recommendations for the CUNs for which the parties provided information as per the timelines set at the 26$^{th}$ Meeting of the parties, 2) Information from parties on stocks (Decision Ex.1/4 (9f)), 3) Partial information on actual MB consumption for critical uses (in accordance with Decision XVII/9), and 4) Indication of adoption rates of alternatives, as evidenced by trend lines on reduction of MB for CUNs (in accordance with Decisions XIX/9, XX/5). It is noted that trend lines on adoption may not necessarily indicate true adoption rates for alternatives, as the use of stocks of MB may have been available for use, although for non A5 parties stocks are now small (see Table 1-3). MBTOC notes that reported stock volumes have significantly decreased in recent years, but an unknown amount of pre-2015 stocks may be held by A5 parties as there is no reporting mechanism to account for these stocks.

Standard presumptions used in this round (2019) were the same as those used in the 2018 evaluations of the CUNs. These are subjected to continual review. However, it is required that any changes proposed by MBTOC be approved by the parties in the MOP preceding the year of assessment based on a draft Decision presented to the MOP in accordance with paragraph 2 in Annex 1 to the report of MOP16.

# 3 Critical Use Nominations for Methyl Bromide

## *3.1 Mandate*

Under Article 2H of the Montreal Protocol, parties not operating under Article 5(1) (non-A5 parties) were required to phase out all production and consumption (defined as production plus imports minus exports) of MB after 1stJanuary 2005. The same requirements applied to parties operating under Article 5(1) (A5 parties) after 1stJanuary 2015. However, the parties agreed to a provision enabling exemptions for those uses of MB that qualify as critical. Under Decision IX/6 of the Protocol parties established criteria, which all critical uses need to meet in order to qualify for an exemption (see Annex I of this report). TEAP and its MBTOC have provided guidance to the parties on recommendations regarding critical use exemptions in accordance with Decisions IX/6, Annex I of Decision XVI/2 and a number of subsequent decisions (XVI/2; XVII/9, XVIII/13, XIX/9, XX/5, XXI/11, XXII/6, XXIII/4,XXIV/5 XXV/4, XXVI/2, XXVII/3, XXVIII/7, XXIX/6 and XXX/9).

MBTOC considers that any chemical or product registered for a particular use has been through the rigours of the national local regulatory authorities and accepts that these fall within guidelines for health effects and environmental acceptability. MBTOC particularly takes note of those products, which are generally listed in any CUN application.

Under Decision Ex I/4 it is stated that amounts of MB applied for in subsequent CUNs should '*avoid any increase in methyl bromide consumption except for unforeseen circumstances*'

## *3.2 Fulfilment of Decision IX/6*

Decisions XVI/2 and XXI/11 directed MBTOC to indicate whether all CUNs fully met the requirements of Decision IX/6. When the requirements of Decision IX/6 are met, MBTOC can recommend critical uses of MB. When the requirements of Decision IX/6 are not met, MBTOC does not recommend critical uses of MB. Where some of the conditions are not fully met, MBTOC can recommend a decreased amount depending on its technical and economic evaluation, or determine the CUN as "unable to assess" and request further information from the party. When the information is submitted, MBTOC is required to re-assess the nomination, following the procedures defined in Annex 1 of the 16thMeeting of the parties.

MBTOC recommended less MB than requested in a CUN when technically and economically feasible alternatives were considered to be available, in the sense of Decision IX/6, or, when the party did not show that there was no technically and economically feasible alternative for part of the nomination. MBTOC may have accepted that some allocation was appropriate to permit timely phase-out of MB (i.e. a transition time for phase-in of alternatives). In this round of CUNs, as in previous rounds, MBTOC considered all information provided by the parties, including answers to questions from MBTOC and all additional information submitted by the parties up to the date of the evaluation.

In view of the large numbers of sectors which have moved effectively to alternatives, it was considered particularly important in this round for the parties, particularly for A5 parties submitting CUNs, to clearly identify why MB is considered critical for the specific circumstances of the nomination. Now that technically and economically feasible alternatives have been identified for virtually all applications of MB, specific regulations (either national or local) on the use of these alternatives often affect the feasibility of using these alternatives by the end users. Comparative information on the economic feasibility/infeasibility of the use of alternatives with respect to MB is also becoming more critical to the outcomes of present and future CUNs. In particular, MBTOC needs annual updates of the economics information evaluating the costs of alternatives in comparison to those with present MB usage.

## *3.3 Accounting Frameworks for Critical Use*

Under the Dec Ex 1/4 9(f) parties previously applying for Critical Uses are required to continue to submit Accounting Frameworks. MBTOC suggests that parties may wish to consider a revision to submission of frameworks to complete and accurate supply information on stocks. MBTOC suggests that accounting frameworks would be improved by information provided from those parties which

either hold any stocks of methyl bromide for controlled uses or have been granted critical uses of methyl bromide and still hold stocks. These stocks would need to be reported as of the end of the year prior to the year of reporting**.** MBTOC is concerned that existing stocks may not be reported from A5 parties applying for CUNs and also in parties not applying for CUNs.

For this 2019 round, all parties nominating CUEs submitted Accounting Frameworks except RSA. The Frameworks showed that there were approximately 0.742 t of stocks for those parties required to report stocks.

Note: The accounting information in this report does not accurately show the stocks of MB held globally for controlled uses by A5 parties as there is no requirement for parties to report pre 2015 stocks under the decisions of the Montreal Protocol. MBTOC considers these stocks may be substantial (>1,500 t)

A number of decisions (Ex.I/4 (9f); XVI/2(4); XVII/9(5) and subsequent 'Critical Use' Decisions set out provisions which request parties to submit in Accounting Frameworks by 1st February each year information on how criteria in IX/6(1) are met when licensing permitting or authorizing CUEs. Decision XVII/9 of the 17th MOP sets the timeline for reporting and also specifically requests TEAP and its MBTOC to "*report for 2005 and annually thereafter, for each agreed critical use category, the amount of MB nominated by a party, the amount of the agreed critical use and either:*

*(a) The amount licensed, permitted or authorised; or*
*(b) The amount used*

Since the start of the CUN reviews in 2003, MBTOC has provided tables of the historic amounts of MB nominated and agreed for each critical use (Annexes III and IV). Additionally, parties provide accounting frameworks on amounts used for critical uses and stocks as required under Dec Ex.1/4 (9f) (Table1-3). The same requirements apply to A5 parties after 2015.

For 2018, the Meeting of the parties (MOP) authorised Australia to use 28.98 t of MB (Table 1.3). The party reported that 29.75 t were used for the critical uses in 2017 and 0.01 t authorised but not used. For Canada in 2018, the MOP authorised 5.261 t for strawberry runners and the party in its CUNs reported that 5.062 t was used for the critical use from new imports of MB and stocks from the previous year. For A5 critical uses, the parties authorized 29.0 t for strawberry fruit and 47.7 t for tomatoes in Argentina; 68.88 t and 18.36 t for open fields and for protected cropping of ginger in China respectively and 2.9 t for mills and 42.75t for houses in South Africa. It is assumed that all was reportedly used by the party.

This is the fifth year that A5 parties have submitted CUNs. Under Decision Ex1/4 (9f) those A5 parties which are granted critical uses need to provide accounting frameworks annually, if CUNs are again submitted. Additionally, parties were requested to submit National Management Plans as required under Decision Ex. I/4(3).

MBTOC notes that no detailed management plans were received from Argentina or South Africa.

### *3.4 Trends in Methyl Bromide Use for CUEs since 2005*

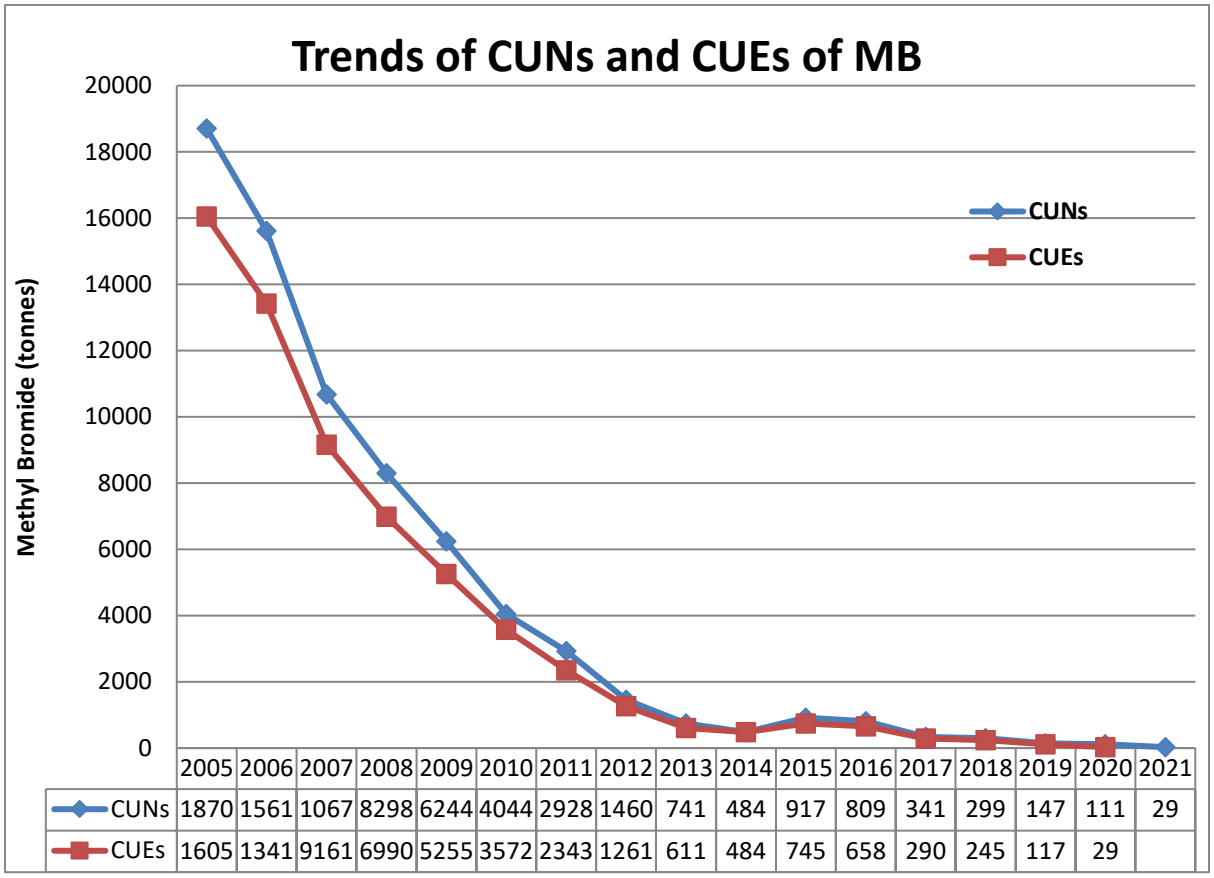
Decision XVII/9 requires TEAP to show trends in the phase-out of the critical uses of MB (Fig 1-1 to Fig 1-4, Annexes III and IV). Since 2005, there has been a progressive downward trend in the officially reported amounts of MB requested for CUNs by all parties for both soil and post- harvest uses, although this has occurred at different rates. Fig 1-1 and Tables 1.4a-1.4c shows reduction trends in amounts approved/nominated by parties for 'Critical Use' from 2005 to 2020 for all uses. Fig 1-2 shows the reduction trend for the remaining soil uses in both non-A5 parties (strawberry runners, Canada and Australia) and Figs 1-3 and 1-4 the current and past pre-plant soil and commodity uses in A5 parties (Argentina, China, Mexico and Republic of South Africa) since 2015. The complete trends in phase-out of MB by country, as indicated by change in CUE, are shown in Annexes III and IV.

The nominated amounts and the apparent rate of reduction in MB or adoption of alternatives achieved by parties are shown in Table 1-5, as well as Figures 1-1 to 1-4(a) to 1-4(c). It is noted that for those non-A5 parties that have pre-2005 stocks of MB that are being drawn down, the reductions in CUEs from year to year cannot be taken directly as evidence of adoption of alternatives since pre-2005/2015 stocks may have been used (or may still be used) in the same sectors.

### *3.5 Disclosure of Interest*

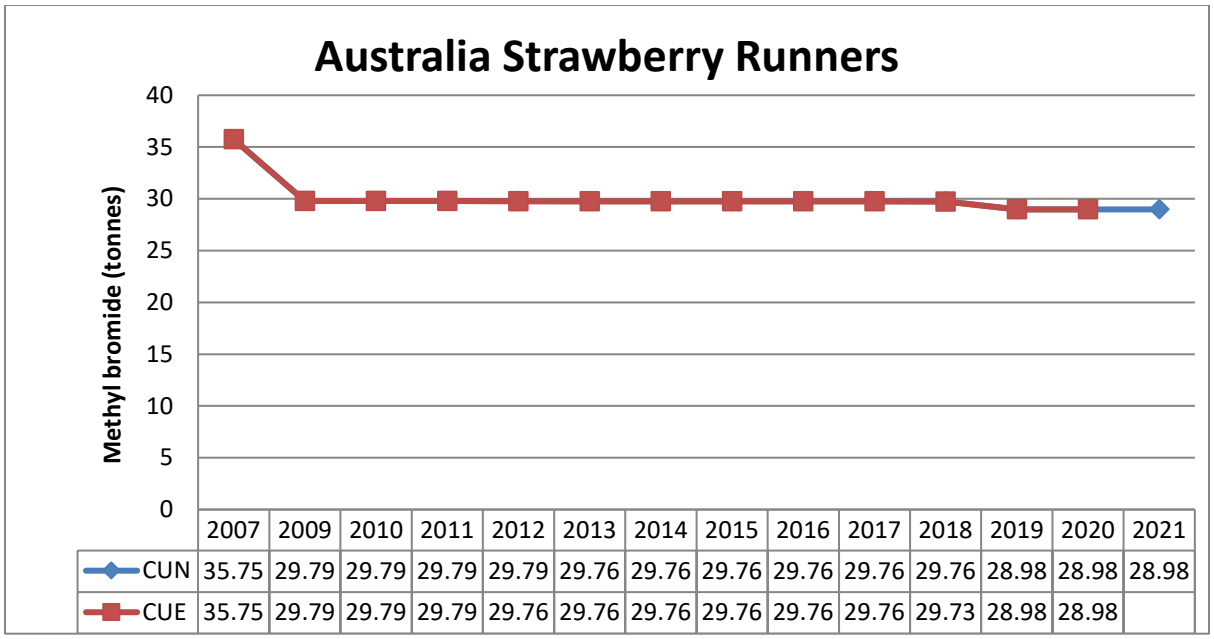
As in past assessments, MBTOC members were requested to update their disclosure of interest forms relating specifically to their level of national, regional or enterprise involvement for the 2018 CUN process. The Disclosure of Interest declarations for 2019, updated in March 2019 can be found on the Ozone Secretariat website at: https://ozone.unep.org/science/assessment/teap/methyl-bromide-toc-members and a list of members at the end of this report. As in previous rounds, some members recused from or abstained to participate in a particular CUN assessment or only provided technical advice on request, for those nominations where a potential conflict of interest was declared. Details of recusals can be found in section 1.3.2.

***Figure 1.1. Amounts of MB nominated and exempted for CUE uses in nominated pre-plant soil and commodities sectors from 2005 to 2020 by non-A5 and A5 countries***

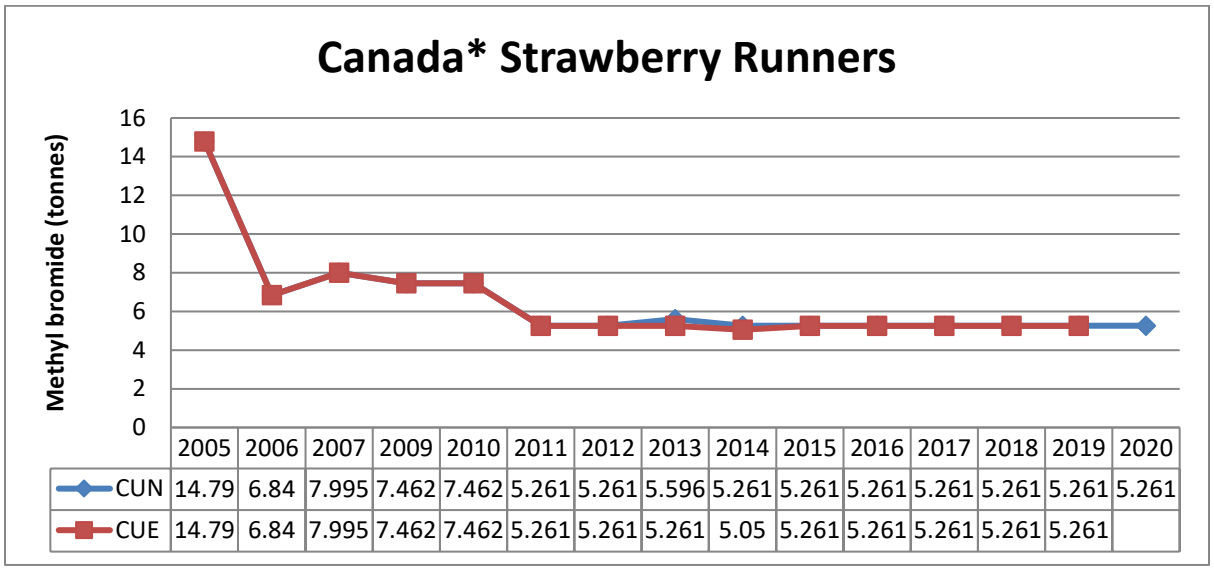



| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CUNs | 1870 | 1561 | 1067 | 8298 | 6244 | 4044 | 2928 | 1460 | 741 | 484 | 917 | 809 | 341 | 299 | 147 | 111 | 29 |
| CUEs | 1605 | 1341 | 9161 | 6990 | 5255 | 3572 | 2343 | 1261 | 611 | 484 | 745 | 658 | 290 | 245 | 117 | 29 | |

***Figure 1.2. Amounts of MB nominated (CUN) and exempted (CUE) for uses in pre-plant soil sectors from 2005 to 2021 or 2020 by non A5 countries: Australia and Canada respectively. Blue lines indicate the trend in MB nominated in the CUN and the red lines the amount of MB approved as a CUE by the parties***




| | 2007 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CUN | 35.75 | 29.79 | 29.79 | 29.79 | 29.79 | 29.76 | 29.76 | 29.76 | 29.76 | 29.76 | 29.76 | 28.98 | 28.98 | 28.98 |
| CUE | 35.75 | 29.79 | 29.79 | 29.79 | 29.76 | 29.76 | 29.76 | 29.76 | 29.76 | 29.76 | 29.73 | 28.98 | 28.98 | |




| | 2005 | 2006 | 2007 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CUN | 14.79 | 6.84 | 7.995 | 7.462 | 7.462 | 5.261 | 5.261 | 5.596 | 5.261 | 5.261 | 5.261 | 5.261 | 5.261 | 5.261 | 5.261 |
| CUE | 14.79 | 6.84 | 7.995 | 7.462 | 7.462 | 5.261 | 5.261 | 5.261 | 5.05 | 5.261 | 5.261 | 5.261 | 5.261 | 5.261 | |

* Prince Edward Island

*Figure 1.3. Amounts of MB nominated and exempted for uses in pre-plant soil sectors from 2015 to 2020 by A5 countries: Argentina and China. Blue lines indicate the trend in MB amounts nominated in the CUN and the red lines the amount of MB approved as a CUE by the parties*

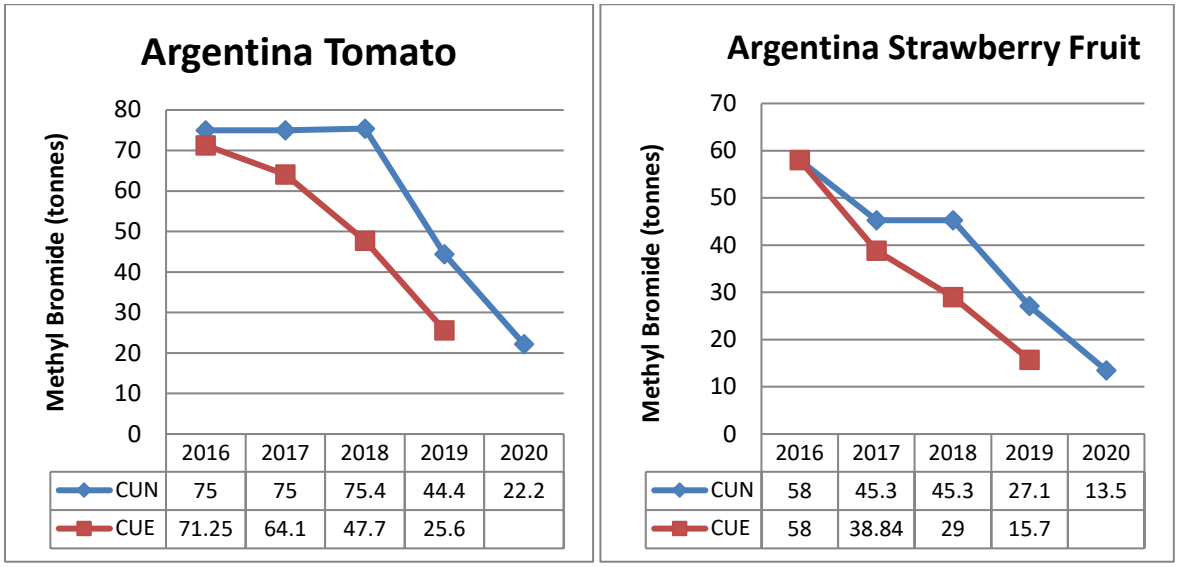
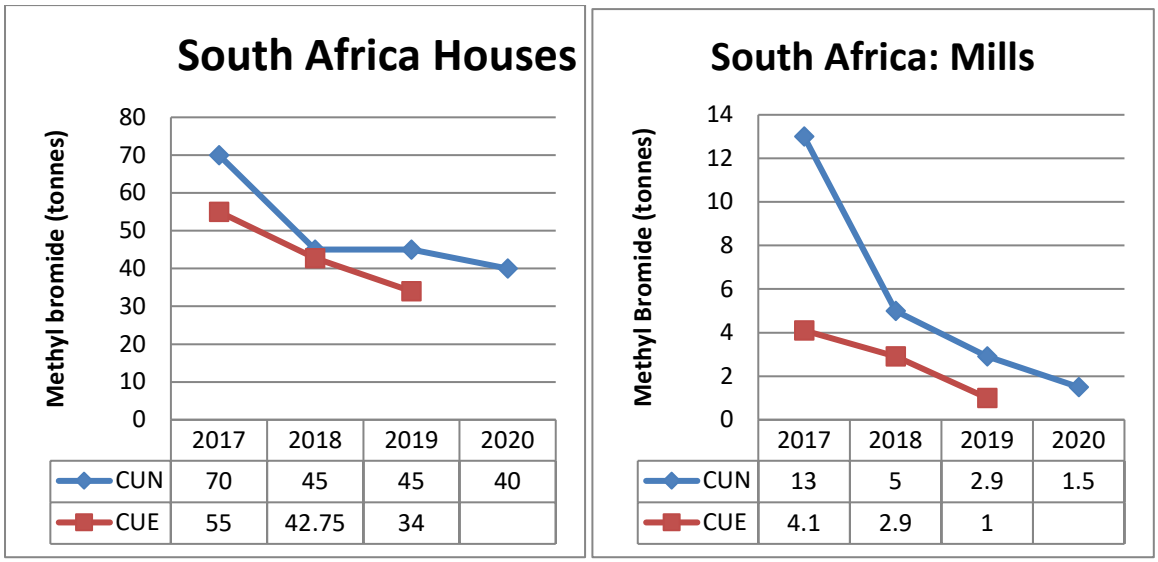



*Figure 1.4. Amounts of MB nominated (CUN) and exempted (CUE) for uses in structural and commodity sectors from 2015 to 2020 by A5 countries: South Africa (RSA). Blue lines indicate the trend in MB amounts initially nominated in the CUN and the red lines the amount of MB approved as a CUE by the parties*



### *3.6 Article 5 Party Issues*

MB was due to be fully phased out in A5 parties by January 1, 2015, 10 years after the phase-out date for non-A5 parties. In both cases, uses for feedstock and QPS are exempted from phase-out under the control measures described in Article 2H. There is also provision for exemption from phase-out for uses deemed 'critical' according to Article 2H, as complying with Decision IX/6.

By end of 2018, over 98% of the global reported consumption for non-exempt uses has been phased out. In A5 parties, 91.5% of previous controlled uses were replaced, ahead and in time for the 2015 deadline, largely as a result of investment projects implemented by the Montreal Protocol agencies with MLF funding, bilateral cooperation and also national funding. MBTOC notes that A5 parties submitting CUNs in this round (except South Africa) have received substantial funding from the Multilateral Fund (MLF) for complete phase-out of MB in their countries by 1st January 2015 at the latest, in many cases earlier.

MBTOC continues to be concerned that in some A5 countries there may be uses of MB for which there is no apparent reporting.

MBTOC is also concerned that not all parties are aware of the need to report all uses (whether controlled or not) under Article 7 of the Protocol and urges the parties to reinforce the mechanisms for reporting and if necessary, to provide assistance to parties finding difficulties with their reporting obligations.

### *3.7 Reporting requirements and agreed conditions under Decision Ex.1/4*

Decision Ex. I/4 taken at the 1st Extraordinary Meeting of the parties (2004) set forth a series of requirements from parties requesting CUNs after the phase-out date, which non-A5 parties have fulfilled over the past decade and now become relevant for A5 parties. This decision also includes some agreed conditions for requesting continuing CUNs.

Such requirements are fully considered by MBTOC during its CUN evaluations and also when preparing the 'Handbook of CUN nominations'. The following list has been prepared to assist A5 parties with the preparation of CUNs.

The full text of Dec. Ex.I/4 is included in the Appendix II of this report for reference. In synthesis, parties for which a CUE has been approved need to submit the following materials to the Ozone Secretariat (dates in brackets have been inserted by MBTOC so they apply to the A5 timeline):

1. *Information before 1 February 2005 [2015] on the alternatives available, listed according to their pre-harvest or post-harvest uses and the possible date of registration, if required, for each alternative;*

2. A ***national management strategy*** *for phase-out of critical uses of methyl bromide before 1 February 2006 [2016]. The management strategy should aim, among other things:*

   a) *To avoid any increase in methyl bromide consumption except for unforeseen circumstances;*

   b) *To encourage the use of alternatives through the use of expedited procedures, where possible, to develop, register and deploy technically and economically feasible alternatives;*

   c) *To provide information, for each current pre-harvest and post-harvest use for which a nomination is planned, 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 such uses can be reduced and/or ultimately eliminated;*

   d) *To promote the implementation of measures which ensure that any emissions of methyl bromide are minimized;*

   e) *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;*

## *3.8 Consideration of Stocks, Decision Ex.1/4 (9f)*

One criterion for granting a critical use is that MB "*is not available in sufficient quantity and quality from existing stocks of banked or recycled methyl bromide*" (paragraph 1 (b) (ii) of Decision IX/6). parties nominating critical use exemptions are requested under decision Ex I/4(9f) to submit an accounting framework with the information on stocks.

MBTOC has not reduced its recommended amounts of methyl bromide for CUNs in consideration of stocks held by the party and has instead relied on parties to take this into consideration when approving the amounts recommended by TEAP for each nomination.

To assist parties with their consideration of stocks, and in accordance with Decision XVIII/13(7), a summary of the data on stocks as reported by non-A5 parties in the first year for accounting in 2006, and then reports submitted in 2018 and 2019 are summarized in Tables 1.1 to 1.3 below.

Efficient functioning of commerce requires a certain level of available stocks and additional stocks to respond to emergencies. Additionally, stocks may be held on behalf of other parties or for exempted uses (feedstock and QPS uses). The correct or optimal level of stocks for virtually every input to production is not zero. In addition, stocks are privately owned and may not be readily available for critical uses, or there may be national regulations preventing the transfer of stocks. Despite these restrictions, parties may wish to ensure that stocks are used wherever possible in order to minimize the quantity of MB that need to be produced each year for critical uses. Tables 1-1 to 1-3 report the quantities of MB 'on hand' at the beginning and end respectively of 2005, 2017 and 2018 as required under Decision Ex. 1/4 (9f). The earlier CUN reports identified stocks for the other years.

***Table 1.1. Quantities of MB (metric tonnes) 'on hand' at the beginning and end of 2005, as first reported by parties in 2006/2007 under Decision Ex 1/4.***

| | **CUEs authorized by MOP for 2005** | **Quantity of MB as reported by parties (metric tonnes)** | | | | |
|---|---|---|---|---|---|---|
| | | **Amount on hand at start of 2005** | **Quantity acquired for CUEs in 2005 (prod. +imports)** | **Amount available for use in 2005** | **Quantity used for CUEs in 2005** | **Amount on hand at the end of 2005** |
| Australia | 146.6 | 0 | 114.912 | 114.912 | 114.912 | 0 |
| Canada | 61.792 | 0 | 48.858 | 48.858 | 45.146 | 3.712 |
| EU | 4,392.812 | 216.198 | 2,435.319 | 2,651.517 | 2,530.099 | 121.023 |
| Israel | 1,089.306 | 16.358 | 1,072.35 | 1,088.708 | 1,088.708 | 0 |
| Japan | 748 | 0 | 594.995 | 594.995 | 546.861 | 48.134 |
| New Zealand | 50 | 6.9 | 40.5 | 47.4 | 44.58 | 2.81 |
| USA(a) | 9,552.879 | | 7,613 | not reported | 7,170 | 443 |

(a) Additional information on stocks was reported on US EPA website, September 2006: MB inventory held by USA companies: 2004 = 12,994 t; 2005 = 9,974 t.

*Table 1.2. Quantities of MB 'on hand' at the beginning and end of 2017, as reported by parties in 2018*

| Party | Critical use exemption authorized by MOP for 2017 | Quantity of MB as reported by parties (metric tonnes) | | | | |
|---|---|---|---|---|---|---|
| | | Amount on hand at start of 2017 | Acquired for CUEs in 2017 (prod. +imports) | Amount available for use in 2017 | Used for CUEs in 2017 | Amount on hand at the end of 2017 |
| Australia | 29.76 | 0 | 29.75 | 29.75 | 29.75 | 0 |
| Canada | 5.261 | 0.525 | 5.167 | 5.692 | 5.132 | 0.560 |
| Argentina | 102.94 | 0 | 95.06 | 95.06 | 95.06 | 0 |
| China | 92.977 | 0 | 92.977 | 92.977 | 92.977 | 0 |
| RSA | 59.1 | 26 | 55 | 81.0 | 57.56 | 23.42 |

*Table 1.3. Quantities of MB 'on hand' at the beginning and end of 2018, as reported by parties in 2019*

| Party | Critical use exemption authorized by MOP for 2018 | Quantity of MB as reported by parties (metric tonnes) | | | | |
|---|---|---|---|---|---|---|
| | | Amount on hand at start of 2018 | Acquired for CUEs in 2018 (prod.+imports) | Amount available for use in 2018 | Used for CUEs in 2018 | Amount on hand at the end of 2018 |
| Australia | 29.73 | 29.73 | 29.73 | 29.73 | 29.73 | 0 |
| Canada | 5.261 | 0.560 | 5.140 | 5.700 | 4.958 | 0.742 |
| Argentina | 76.7 | 76.7 | 76.7 | 76.7 | 76.7 | 0 |
| China | 87.24 | 87.24 | 87.24 | 87.24 | 87.24 | 0 |
| RSA | 45.65 | Being Revised | | | | |

*Table 1-4a. Summary of critical use nominations of MB (tonnes) for non A5 countries*

| Party | Quantity of MB Nominated | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** |
| Australia | 206.950 | 81.250 | 52.145 | 52.900 | 38.990 | 37.610 | 35.450 | 34.660 | 32.164 | 30.947 | 29.79 | 29.79 | 29.79 | 29.76 | 28.98 | 28.98 | 28.98 |
| Canada | 61.992 | 53.897 | 46.745 | 42.241 | 39.115 | 35.080 | 19.368 +3.529 | 16.281 | 13.444 | 10.305 | 5.261 | 5.261 | 5.261 | 5.261 | 5.261 | 5.261 | |
| EC | 5754.361 | 4213.47 | 1239.873 | 245.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Israel | 1117.156 | 1081.506 | 1236.517 | 952.845 | 699.448 | 383.700 | 232.247 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Japan | 748.000 | 741.400 | 651.700 | 589.600 | 508.900 | 288.500 | 249.420 | 221.104 | 3.317 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| New Zealand | 53.085 | 53.085 | 32.573 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Switzerland | 8.700 | 7.000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| USA | 10753.997 | 9386.229 | 7417.999 | 6415.153 | 4958.034 | 3299.490 | 2388.128 | 1181.779 + 6.339 | 691.608 | 442.337 | 377.170 | 234.78 | 3.240 | 0 | 0 | 0 | |
| **Total** | **18704.241** | **15617.837** | **10677.552** | **8297.739** | **6244.487** | **4044.380** | **2928.142** | **1460.163** | **740.533** | **483.589** | **412.221** | **269.831** | **38.291** | **35.021** | **34.241** | **34.241** | **28.98** |

***Table 1-4b. Summary of critical use exemptions of MB (tonnes) approved by the parties for non A5 countries***

| Party | Quantity of MB Approved | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **2005 (1ExMOP and 16MOP)** | **2006 (16MOP+ 2ExMOP+ 17MOP)** | **2007 (17MOP + 18MOP)** | **2008 (18MOP+ 19MOP)** | **2009 (19MOP)** | **2010 (20MOP+ 21MOP)** | **2011 (21MOP)** | **2012 (22MOP)** | **2013 (23MOP)** | **2014 (24MOP)** | **2015 (25 MOP)** | **2016 (26 MOP)** | **2017 (27 MOP)** | **2018 (28 MOP)** | **2019 (29 MOP)** | **2020 (30 MOP)** |
| Australia | 146.600 | 75.100 | 48.517 | 48.450 | 37.610 | 36.440 | 28.710 | 31.708 | 32.134 | 30.947 | 29.79 | 29.79 | 29.79 | 29.73 | 28.98 | 28.98 |
| Canada | 61.792 | 53.897 | 52.874 | 36.112 | 39.020 | 30.340 +3.529 | 19.368 | 16.281 | 13.109 | 10.305 | 5.261 | 5.261 | 5.261 | 5.261 | 5.261 | |
| EC | 4392.812 | 3536.755 | 689.142 | 245.146 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Israel | 1089.306 | 880.295 | 966.715 | 860.580 | 610.854 | 290.878 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Japan | 748.000 | 741.400 | 636.172 | 443.775 | 305.380 | 267.000 | 239.746 | 219.609 | 3.317 | 0 | 0 | 0 | 0 | 0 | 0 | |
| New Zealand | 50.000 | 42.000 | 18.234 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Switzerland | 8.700 | 7.000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| USA | 9552.879 | 8081.753 | 6749.060 | 5355.976 | 4261.974 | 3232.856 +2.018 | 2055.200 | 993.706 | 562.328 | 442.337 | 376.900 | 234.780 | 0 | 0 | 0 | |
| **Total** | **16050.089** | **13418.200** | **9160.714** | **6990.039** | **5,254.838** | **3866.583** | **2343.024** | **1261.304** | **610.888** | **483.589** | **411.951** | **269.831** | **35.051** | **34.991** | **34.241** | **28.98** |

*Table 1-4c. Summary of Critical Use Nominations and Exemptions of Methyl Bromide (tonnes) for A5 countries*

| Party | Quantity of MB Nominated | | | | | | Quantity of MB Approved | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Argentina | 245 | 177.0 | 120.3 | 120.7 | 71.5 | 35.70 | 134.3 | 129.25 | 102.94 | 76.70 | 41.31 | |
| China | 120 | 114.0 | 99.75 | 92.977 | 0 | 0 | 114.0 | 99.75 | 92.977 | 87.24 | 0 | |
| Mexico | 140 | 120.978 | 0 | 0 | 0 | 0 | 84.96 | 84.957 | 0 | 0 | 0 | |
| South Africa | - | 81.6 | 83.0 | 50.0 | 41.5 | 41.5 | - | 74.062 | 59.10 | 45.65 | 41.00 | |
| **Total** | **505** | **411.978** | **303.05** | **263.677** | **113.0** | **77.20** | **333.26** | **388.019** | **255.017** | **209.59** | **82.31** | |

# 4 CUNs Submitted in the 2019 Round for 2020 and 2021 Exemptions

All parties requesting CUNs in 2019 for critical use exemptions in 2020 or 2021 sent information to the Ozone Secretariat around the January 24, 2019 deadline.

Information on CUNs was forwarded by the Secretariat to MBTOC co-chairs, who in turn, provided this information to MBTOC members for preliminary assessment and to confirm that it complied with requirements of Decision IX/6 and Annex 1 of the 16th MOP. Where some evidence was missing, or MBTOC required clarification, a request of the information required was sent to the parties, via the Secretariat, prior to the interim assessment.

For pre-plant soil uses of MB, Australia and Canada submitted CUNs for similar amounts as in previous rounds, highlighting difficulties with phase-out of MB for the strawberry runners sector specifically. After the 41st OEWG, Australia and Canada requested MBTOC to reassess the nominations based on new information identifying that alternatives were not available to be used for the nominations. With respect to A5 parties, Argentina submitted CUNs for the strawberry fruit (open field) and tomato sectors (protected) which showed that substantial reductions to the previous round had been made by the party. No further request for reassessment was made after the interim recommendations were presented to the OEWG.

For MB use in the postharvest and structure sectors, two CUNs were received from South Africa. These were for 1.5 t for disinfestation of three old grain mills, and 40.0 t for disinfestations of domestic houses and similar premises against specific noxious pests. No further request for reassessment was made after the interim recommendations were presented to the OEWG.

The amount of MB nominated for all parties for 2020 was 82.461 t of which MBTOC made a final recommendation of 59.937 t. For 2021, one party nominated an amount of 28.98 t of which MBTOC recommended the full amount (Tables 1.5 and 1.9 - 1.12).

In general the justification for CUNs being submitted by parties related to the following alleged issues: environmental conditions and regulatory restrictions did not allow partial or full use of alternatives, difficulties in the scale-up of alternatives and that potential alternatives were considered uneconomical, insufficiently effective and/or were unavailable. In paragraph 20 of Annex 1 referred to in Decision XVI/4, parties specifically requested MBTOC to explicitly state the specific basis for the parties economic statement relating to CUNs. Tables 1.09 -1.11 provide this information for each CUN as prepared by the MBTOC economist and the MBTOC members. MBTOC notes the standard of the economic information supplied by the nominating parties varied.

## *4.1 Critical Use Nomination Review Process*

After the 41st OEWG in Bangkok, two parties requested re-evaluation of the CUNs submitted in this round and to support this reassessment new detailed information was provided. MBTOC conducted its final assessment via email exchange where each individual member reviewed all the information and provided in the first instance their evaluation only to the cochairs. The consolidated comments from each member was sent back to the committee for review in order to reach a consensus position for each nomination. In reaching its final decisions, MBTOC used all the information previously supplied for the interim assessment at a meeting in Qingdao, China from 9 -14 March, 2019. This meeting was held in accordance with the time schedule for the consideration of CUNs as required by Decision XVI/4 (see Annex 1). During the meeting in Qingdao, MBTOC held a field trip to ginger production in a nearby production area in Anqiu and visited the Shandong Quarantine Treatment Service Co. Ltd to get an overview of MB used for QPS uses in China at the port of Qingdao.

The majority (12 out of 16) of MBTOC members with expertise in MB pre-plant soil use against soil-borne pathogens and weeds, pests in structures and commodities (SC) and in quarantine and pre-shipment (QPS) applications of MB attended the meeting. MBTOC worked as a single committee, not in sub-committees and members who could not attend the meeting provided their advice by email. Recommendations were discussed and signed off in plenary and by consensus. This schedule allowed

members with specific expertise to make contributions where they were most useful and for all the committee to fully participate in the decision-making process.

In assessing the CUNs submitted in 2019, as in previous rounds, MBTOC applied as much as possible the standards contained in Annex I of the final report of the 16$^{th}$MOP and, where relevant, the standard presumptions given below. In particular, MBTOC sought to provide consistent treatment of CUNs within and between parties while at the same time taking local circumstances into consideration. The most recent CUE approved by the parties for a particular CUN was used as baseline for consideration of continuing nominations. In evaluating CUNs for soil treatments, MBTOC assumed that the presence of a technically feasible alternative to MB would need to provide sufficient pest and/or weed control to allow for continued production of that crop within existing market standards. The economic viability of production was also considered.

For structural applications, it was assumed that technically and economically feasible alternatives would provide disinfestation to a level that met the objectives of a MB treatment, e.g. meeting disinfestation standards in treated structures or mills. It was confirmed that methyl bromide fumigation was not specifically required for disinfestation of houses against wood-destroying insects in RSA (a CUN for this round of nominations) to obtain a valid `Beetle Certificate of Compliance', a requirement when selling a house there. MBTOC considers that sulfuryl fluoride should be trialled to determine if it can also be used to rid houses of insects and thus justify the sale of houses under the same certificate.

The outcome of evaluations of CUNs for the soil and structural treatments are presented in Table 1.9 - 1.11 below.

## *4.2 Achieving Consensus*

In accordance with Decision XX/5(9) and subsequent Decisions (XXI/11(4), XXII/6(4) and XXIII/4(3) and XXIV/5 and 8) the parties have indicated that MBTOC '*should ensure that it develops its recommendations in a consensus process that includes full discussion among all available members of the Committee….'*

In keeping with this mandate as well as the new working scheme put in place by the co-chairs, all members were given access to the information and were able to discuss issues related to all nominations (either in person or by electronic means), but only those members able to physically participate in the meeting formed consensus. All views were discussed fully in plenary and issues debated until a consensus position was reached. No minority positions arose during the meetings.

Two members recused from recommendations on nominations as required by MBTOC's working procedures. These included Alejandro Valeiro (recusing from Argentina strawberry fruit and tomato), and Ian Porter (Australian strawberry nurseries). In this round, recusals took place due to a voluntary self-recusal to avoid any perceived conflict of interest. Recused members were still available to MBTOC for clarifying technical issues arising during assessment of the CUNs.

# 5 Final Evaluation of 2019 Critical Use Nominations for Methyl Bromide for Pre-plant Soil Use in 2020 and 2021

## *5.1 Critical Use Nomination Assessment*

Table 1-5 identifies the quantities recommended by MBTOC after consideration of all the information provided by the parties requesting critical uses.

In summary, after the OEWG Australia and Canada provided further information to justify that the interim recommendations by MBTOC could not be met and that further time was required to uptake alternatives considered suitable for the nominations. For the tomato and strawberry nominations from Argentina, the MBTOC final recommendation is for a reduced CUE to conform with MBTOCs standard presumptions for application rates of MB under barrier films.

Detailed information on the nominations can be found in Table 1-9 and 1.10.

***Table 1-5. Summary of the final recommendations (in square brackets) for CUE's for pre-plant use of MB (tonnes) submitted in 2019 for 2020 or 2021 use***

| Country and Sector | Non Article 5 Party Nomination | A5 Party Nomination | Interim Recommendation (tonnes) | Final Recommendation (tonnes) |
|---|---|---|---|---|
| **1. Australia (2021)*** | | | | |
| Strawberry runners | 28.98 | | [14.49] | [28.98] |
| **2. Canada (2020)*** | | | | |
| Strawberry runners | 5.261 | | [5.017] | [5.261] |
| **3. Argentina (2020)** | | | | |
| Strawberry fruit | | 13.50 | [7.83] | [7.83] |
| Tomato | | 22.20 | [12.79] | [12.79] |
| **TOTAL** | **34.241** | **35.70** | **[40.137]** | **[54.861]** |

*Australia and Canada provided further information after the OEWG which required MBTOC to reassess the nomination.

## *5.2 Issues Related to CUN Assessment for Pre-plant Soil Use*

Key issues which influenced assessment and the need for MB for pre-plant soil use of MB in the 2019 round were:

i) For all nominations, except Australia, barrier films were considered as a technology to reduce rates and emissions of methyl bromide. For the strawberry runner industry in Australia, the party presented data demonstrating that heavy soil types trap methyl bromide as effectively with LDPE films as barrier films under the circumstances of the nomination. MBTOC still considers barrier films should be adopted as a treatment to reduce emissions, however this has no impact on the assessment as Australia has a regulation preventing a reduction in dosage rates of MB for the specific use and has presented data that lower rates are less effective.

ii) The Australian research program continues to trial many options for replacement of MB in strawberry runner production. Australia has put forward a transition plan based on the registration of MI (methyl iodide), which would lead to complete phase-out of MB by 2022, and a transition use of 50% in 2021, if MI becomes registered in time".

iii) When using alternative fumigants that are available for fruit production, the Australian strawberry fruit industry has reported significant losses due to charcoal rot (*Macrophomina phaseolina)* and concern exists about its potential increased prevalence in nursery industries after use of some alternatives to MB (Chamorro *et al*., 2016). *Macrophomina* has a large host range and is reported in crops that have never used MB (soybean, cotton, sunflower, cassava,

etc) (Gulya *et al.*, 2002) and even in strawberry before the MB phase-out deadlines, or when MB was still in use under CUEs (Zveibil *et al.*, 2005; Koike, 2008; Baino *et al.*, 2011). Although problems are still reported with most alternatives under study, the party reports that MI has proven effective to control these pathogens, as well as other pests controlled with MB.

iv) The Canadian nomination had in the past been relying on a groundwater study to determine whether chloropicrin (Pic), a key alternative, can be granted a permit for use on Prince Edward Island, but this study has not gone ahead and the grounds for banning Pic as a groundwater contaminant (whilst its mixtures with MB are permitted) are difficult to understand fully. Owing to this situation, MBTOC considers that soilless technologies which are presently adopted for certain stages of production are suitable as a technical alternative and have suggested to the party a number of technologies which should be considered for use in Canada which will impact future nominations, if sought.

v) The Argentinian nominations are for sectors where a number of alternatives have been adopted in all A5 and non-A5 parties, however according to the party, specific issues with cold soils and market windows are of concern for uptake of the major chemical alternatives. A key pest of tomato, the *Nacobbus aberrans* (false root-knot) nematode is requiring specific consideration as no resistant varieties or rootstocks have been identified for this pest.

MBTOC acknowledges that China is no longer submitting CUNs and therefore appears to have phased out MB for all controlled uses.

MBTOC has noted more specific issues related to requests for CUNs below and also information contained in the CUN text boxes (Table 1.9).

### *5.3 General Comments on the Assessment for Pre-plant Soil Use*

MBTOC continues to encourage parties to consider a review of regulations covering the registration, use and adoption of alternatives. MBTOC notes that a proportion of MB has been nominated for uses where regulations or legislation prevent reductions of MB dosage, and encourages parties to review such regulations where possible. For a particular case, the mandatory use of MB is specified at a high dosage for treatment of certified propagation material. Also, regulations on the use of alternatives or their lack of registration are preventing their uptake for a substantial proportion of the remaining CUNs for pre-plant soil use.

### *5.4 Registration of Alternatives for all Controlled MB Uses - Decision Ex I/4 (9i) and (9j)*

Decision Ex. I/4 (9i) requires MBTOC, "*To report annually on the status of re-registration and review of methyl bromide uses for the applications reflected in the critical-use exemptions, including any information on health effects and environmental acceptability*". Further, Decision Ex I/4 (9j) requires MBTOC "*To report annually on the status of registration of alternatives and substitutes for methyl bromide, with particular emphasis on possible regulatory actions that will increase or decrease dependence on methyl bromide*".

Where these have impacted a nomination, the party or MBTOC may have adjusted quantities to allow for effective use of the alternative. A description of any changes has been made available in the CUN text boxes (Tables1.9, 1.10 and 1.12).

Any future nominations submitted by any party should include information on expected rates of adoption of alternatives following registration, in accordance with paragraphs 34-35 of Annex 1 of the 16$^{th}$MOP, as this information would assist MBTOC in its evaluation of these CUNs.

### *5.5 Decision XXV/4 Regulations Impacting the Use of Alternatives*

In response to Decision XXV/4 from the 25th MOP, MBTOC notes that all of the non-A5 nominations contained a discussion of national, subnational or local regulations impacting the

potential use of alternatives to MB. In addition, both Non-A5 and A5 nominations contained information on the status of the registration of alternatives and substitutes for MB. These comments are summarized below for each party.

### 5.5.1 Regulations impacting use of alternatives by country

- **Australia:** Several promising alternatives have been identified. TriForm-80® (1,3-D/Pic, 20:80) showed great promise in trials in reducing the risk of phytotoxicity occurring in strawberry runners in Toolangi, Victoria, but is not technically feasible on its own as it does not control pathogens and weeds as effectively as MB/Pic. Co-application with herbicides, i.e. isoxaben and phenmedipham gave excellent results but these are not yet registered for strawberry runners in Australia. The industry has taken steps towards the registration of methyl iodide (MI), which has been previously been identified as a feasible alternative. If registered successfully, adoption of MI would lead to MB phase-out by 2022 (see Table 1.9)

- **Canada**: Groundwater warning statements are currently on Canadian pesticide labels for all key fumigant replacements to MB and also for MB/Pic formulations, but the government of PEI only accepts MB/Pic mixtures to be used for soil disinfestation.

- **Argentina**: Chloropicrin is not registered as a stand-alone product in Argentina, but combinations of 1,3-D/Pic products are registered. Dazomet is not registered for edible crops. A decree currently in force in Mar del Plata prohibits use of alternatives and allows only MB for soil fumigation. For several years the party has reported that reviews are ongoing to change this situation in the near future, however MBTOC is not aware of any progress in this respect.

- **South Africa**: Sulfuryl fluoride received registration for mills and houses in January 2018. The party has argued for some time being needed for adoption and market penetration of this alternative. EDN registration is under consideration.

### 5.5.2 Health effects of MB use and environmental acceptability

Over the past two decades numerous studies have characterised the health hazards resulting from exposure to methyl bromide. Its acute and chronic toxicities are very high and in many countries it is classified as “toxicity class I”. It is known as a developmental, neurologic and respiratory toxin (Gemmill *et al*., 2013, De Souza *et al*., 2013, Bulathsinghala and Shaw, 2014). Other known target organs are the heart, adrenal glands, liver, kidneys and testis (Gemmill *et al*., 2013).

Accidental exposure to high concentrations of MB has been reported in many instances including fumigation of museums in Japan (Yamano and Nakadate, 2006), when handling the fumigant in a manufacturing facility in India (De Souza *et al*., 2013), when opening imported freight containers (Baur *et al*., 2010a and 2010b) and even in a home used for vacations (Sass, 2015).

Research findings reinforce suggested links between exposure to MB and health problems, including increased risk of developing prostate cancer, derived from occupational and community exposure (Budnik *et al*., 2012, Cockburn *et al.*, 2011). In another study (Gemmill *et al*., 2013), a correlation was found between impaired foetal growth during the third trimester of human pregnancies and exposure to methyl bromide in residential areas. A recent study focused on toxicity effects from chronic use of methyl bromide, finding that effects of exposure at what are believed to be safe and appropriate concentrations of methyl bromide under federal guidelines are under-reported and not previously present in the literature. Patients included in this study developed similar syndromes of ataxia, urinary retention and psychiatric symptoms that were matched by unique abnormalities on MR imaging of the brain and serum lab abnormalities (McCall *et al*, 2016).

Risk of exposure is especially high when small disposable canisters (i.e. 500 to 750 g) are used for MB fumigation for pre plant soil under plastic sheets (Yamano *et al*., 2001). Canister applications have been eliminated for soil use in all non-A 5 and in many A5 countries as this application is considered to be less efficient than other methods for the control of soil borne pathogens. Besides, this

treatment is considered to be more dangerous to workers than injection methods, because trained contractors are not generally involved in MB application. Also, canister applications are not considered as effective for pathogen control as injection of MB/Pic mixtures, such applications are more likely to lead to high emissions of MB as the gas is released immediately beneath plastic barrier sheets. MBTOC also notes that, in some circumstances, MB can leak out from the canister. MBTOC notes with concern that canister use is still allowed for pre-plant use and/or quarantine uses in a number of A5 countries e.g. China, Egypt, Jordan and Mexico, sometimes for QPS situations.

The environmental acceptability of MB is handled by national regulatory authorities in each country**.**

## *5.6 Sustainable Alternatives for Pre-plant Uses*

MBTOC urges parties to consider the long-term sustainability of treatments adopted as alternatives to MB. The combination of chemical and non-chemical alternatives in an IPM program provides excellent results in the longer term. Decision IX/6 1(a)(ii) refers to alternatives that are '*acceptable from the standpoint of environment and health'*. MBTOC has visited various regions where successful non-chemical alternatives e.g. soil less culture, grafting, solarisation, steam, bio-disinfestation (biofumigation) and anaerobic soil disinfestation, are used as sustainable alternatives to MB. Several parties consider these techniques as viable alternatives, particularly when an integrated approach that combines different options is adopted.

## *5.7 Standard Presumptions Used in Assessment of Nominated Quantities*

The tables below (Tables 1-6 and 1-7) present the standard presumptions applied by MBTOC for this round of CUNs for pre-plant soil uses. These standard presumptions were first proposed in the MBTOC report of October 2005 and were presented to the parties at the 17$^{th}$ MOP. Studies and reports to support them have been provided in previous reports and were revised for some sectors after consideration by the parties at the 19$^{th}$ MOP. The rates and practices adopted by MBTOC as standard presumptions are based on maximum rates considered acceptable by published literature and actual commercial practice.

As in the evaluations in previous years, MBTOC considered reductions to quantities of MB in particular nominations to a standard rate per treated area where technical evidence supported its use. As a special case, MBTOC continues to accept a maximum rate of 200 kg/ ha (20 g/m$^2$) in MB/Pic formulations with high Pic-containing mixtures with or without barrier films for certified nursery production, unless regulations prescribe lower or higher rates. However, MBTOC notes that most studies have shown that rates of 200 kg/ha (20g/m$^2$) or less of MB: Pic 50:50 to be effective with barrier films for production of 'certified' nursery material and urge parties to consider regulations which permit these lower rates. MBTOC also notes that certified runner production sometimes involves regulations specifying the mandatory use of a specific fumigant, such as MB, or an alternative, in order for the runners to be "certified runners".

The indicative rates used by MBTOC were maximum guideline rates, for the purpose of calculation only. MBTOC recognises that the actual rate appropriate for a specific use may vary with local circumstances, soil conditions and the target pest situation. Some nominations were based on rates lower than these indicative rates.

***Table 1.6. Standard presumptions used in assessment of CUNs for pre-plant soil use of MB***

| | Comment | CUN adjustment | Exceptions |
|---|---|---|---|
| **1. Dosage rates** | Maximum guideline rates for MB:Pic 98:2 are 25 to 35 g/m$^2$ with barrier films (VIF or equivalent); for mixtures of MB/Pic are 12.5 to 17.5 g MB/m$^2$ for pathogens and nutsedge respectively, under barrier films depending on the sector. All rates are on a 'per treated hectare' basis. | Amount adjusted to maximum guideline rates. Maximum rates set dependent on formulation and soil type and film availability. | Higher rates accepted if specified under national legislation or where the party had justified otherwise. |
| **2. Barrier films** | All treatments to be carried out under low permeability barrier film (e.g. VIF, TIF) | Nomination reduced proportionately to conform to barrier film use. | Where barrier film prohibited or restricted by legislative or regulatory reasons |
| **3. MB/Pic Formulation: Pathogens control** | Unless otherwise specified, MB/Pic 50:50 (or similar) was considered to be the standard effective formulation for pathogen control, as a transitional strategy to replace MB/Pic 98:2. | Nominated amount adjusted for use with MB/Pic 50:50 (or similar). | Where MB/Pic 50:50 is not registered, or Pic (Pic) is not registered |
| **4. MB/Pic Formulation: Weeds/nutsedge ass control** | Unless otherwise specified, MB/Pic 67:33 (or similar) was used as the standard effective formulation for control of resistant (tolerant) weeds, as a transitional strategy to replace MB/Pic 98:2. | Nominated amount adjusted for use with MB/Pic 67:33 (or similar). | Where Pic or Pic-containing mixtures are not registered |
| **5. Strip vs. Broadacre** | Fumigation with MB and mixtures to be carried out under strip | Where rates were shown in broad acre hectares, the CUN was adjusted to the MB rate relative to strip treatment (i.e. treated area). If not specified, the area under strip treatment was considered to represent 67% of the total area. | Where strip treatment was not feasible e.g. some protected cultivation, emission regulations on MB, or open field production of high health propagative material |

***Table 1.7. Maximum dosage rates for pre-plant soil use of MB by sector used since 2009 (standard presumptions).***

| Film Type | Maximum MB Dosage Rate (g/m$^2$) in MB/Pic mixtures (67:33, 50:50) considered effective for: | | | |
|---|---|---|---|---|
| | Strawberries and Vegetables | Plant Nurseries* | Orchard Replant | Ornamentals |
| **Barrier films - Pathogens** | 12.5 | 15 | 15 | 15 |
| **Barrier films – Nutsedge** | 15.0 | 17.5 | 17.5 | 17.5 |
| **No Barrier films – Pathogens** | 20 | 20 | 20 | 20 |
| **No Barrier films - Nut sedge** | 26 | 26 | 26 | 26 |

* Maximum rate unless certification specifies otherwise

## *5.8 Adjustments for Standard Dosage Rates using MB/Pic Formulations*

As in previous assessments, one key transitional strategy to reduce MB dosage has been the adoption of MB/Pic formulations with lower concentrations of MB (e.g. MB/Pic 50:50, 33:67 or less). These formulations are considered to be equally as effective in controlling soil-borne pathogens as formulations containing higher quantities of MB (e.g. 98:2, 67:33) (Porter *et al.*, 2006; Santos *et al*., 2007; Hamill *et al.*, 2004; Hanson *et al.*, 2006), (Table 1.8).

***Table 1.8. Actual dosage rates applied during pre-plant fumigation when different rates and formulations of MB/Pic mixtures are applied with and without barrier films. Rates of application reflect standard commercial applications rates.***

| Commercial application rates (kg/ha) of MB/Pic formulation | MB/Pic formulation (dose of MB in g/m$^2$) | | | |
|---|---|---|---|---|
| | **98:2** | **67:33** | **50:50** | **30:70** |
| **A. With Standard Polyethylene Films** | | | | |
| 400 | 39.2 | 26.8 | 20.0 | 12.0 |
| 350 | 34.3 | 23.5 | 17.5 | 10.5 |
| 300 | 29.4 | 20.1 | 15.0 | 9.0 |
| **B. With Low Permeability Barrier Films (LPBF)** | | | | |
| 250 | 24.5 | 16.8 | 12.5 | 7.5 |
| 200 | 19.6 | 13.4 | **10.0*** | 6.0 |
| 175 | 17.2 | 11.8 | 8.8 | 5.3 |

** Note: Trials from 1996 to 2008 (see previous MBTOC CUN reports: http://ozone.unep.org/en/assessment-panels/documents) show that a dosage of 10g/m$^2$ (e.g. MB/Pic 50:50 at 200kg/ha with Low Permeability Barrier Films) is technically feasible for many situations and equivalent to the standard dosage of >20g/m$^2$ using standard PE films*

## *5.9 Use/Emission Reduction Technologies - Barrier films and Dosage Reduction*

Decision XXI/11 (para. 9) requested further reporting on Decision IX/6 to ensure parties adopted emission controls where possible. For pre-plant soil use, this includes the use of barrier films or other mitigation strategies such as high moisture sealing and the lowest effective dose of MB with mixtures of chloropicrin. Other methods include deep shanking and use of ammonium thiosulphate and different irrigation technologies (Yates *et al.,* 2009). These latter technologies have not been reported or adopted widely by parties.

In southeast USA, the reported use of barrier films in vegetable crops expanded rapidly to over 20,000 hectares in a few years. MBTOC notes that barrier films particularly more recently developed totally impermeable (TIF) films can be used with alternatives and this is consistently improving the performance of alternatives at lower dosage rates (Driver *et al*. 2011; Cabrera *et al.,* 2015; Weilland *et al,* 2016) and making them more acceptable as a replacement to MB. For example, effectiveness at lower dosages can allow for greater areas to be treated with 1,3-D under township cap regulations in the US.

*Table 1-9. Final recommendations for CUNs from non A5 parties for pre-plant soil fumigation submitted in 2019 for use in 2020 and 2021.*

| Country | Industry | CUE for 2005[1] | CUE for 2006[2] | CUE for 2007[3] | CUE for 2008[4] | CUE for 2009[5] | CUE for 2010[6] | CUE for 2011[7] | CUE for 2012[8] | CUE for 2013[9] | CUE for 2014[10] | CUE for 2015[11] | CUE for 2016[12] | CUE for 2017[13] | CUE for 2018[14] | CUE for 2019[15] | CUE for 2020[16] | CUN for 2021 | Final recommendation for 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | Strawberry runners | 35.750 | 37.500 | 35.750 | 35.750 | 29.790 | 29.790 | 29.790 | 29.760 | 29.760 | 29.760 | 29.760 | 29.760 | 29.760 | 29.760 | 28.98 | 28.98 | 28.98 | [28.98] |

**MBTOC final recommendation for 2021:**

MBTOC recommends 28.98 tonnes of MB for this use in 2021. The party nominated 28.98 tonnes, stating that they will reduce the licensed amount to 14.49 tonnes if Methyl Iodide (MI) is registered and accessible for the treatments that year. Last year In the 2018 nomination, the party put forward a transition plan for phasing-out MB, based on the registration and availability of methyl iodide (MI), stating that if registration is achieved by 2021, then that year the nomination amount will be reduced by 50% (to 14.49 from 28.98 tonnes), and CUN requests will cease entirely from 2022 onwards.

In its interim recommendation, MBTOC had made a 50% reduction on the nominated amount, thus supporting the phase-out plan put forward by Australia. At the OEWG in Bangkok and thereafter however, the party provided a timeline for MB authorization and subsequent import into the country and sale to strawberry runner growers, showing how it is not possible to have MI available for growers even if registration occurs by 2021. Thus it will not be possible to abide by the 50% reduction within the short timeframe of one growing season. The party further provided evidence that unavailability of MB arising from the 50% would cause severe market disruption.

MBTOC notes the party's reiteration that if MI becomes registered in time or another feasible alternative becomes available then the Australian government will ensure only 50% of the requested MB is made available to growers.

In view of these facts MBTOC has reinstated its recommendation to the full amount nominated by Australia for 2021.

**Nomination by the Party:**
The party nominated 28.98 t for 2021 to treat 119 ha (at a dose rate of 25 g/m$^2$). However, the party commits to reduce this amount to 14.49 tonnes of MB in 2021 if methyl iodide (MI) is registered by then or research shows that there is a (are) registered substitute product(s) that is (are) as effective as MB/Pic in controlling soil-borne pathogens at that time. The nomination states that MI/Pic is "…*a one-to-one replacement for MB/Pic. Research showed that soil treatment with MI/Pic controlled pathogens as effectively as MB/Pic*" and that "*The VSICA Board will change the rules to accept MI/Pic as alternative to MB because extensive research at Toolangi clearly shows that it controls soil-borne pathogens as effectively as MB/Pic…"..* Previously, lack of acceptance by the certification authority has been grounds for not recommending potential alternatives.

**Circumstances of the nomination by the Party:**

The combination of the particular environmental conditions of Toolangi, Victoria, (i.e. heavy soil type, soil temperatures, wind), together with a small-size economic sector (10 growers producing on an area of 119 ha) and stringent regulations (e.g. registration requirements, minimum dosages, a strict certification system) constitute barriers for implementing alternatives. This region is suited for runner production because of its high elevation and climate, allowing for production of runners in the correct physiological state for fruit production. The heavy clay soils there are difficult to fumigate to the depth required to produce pathogen-free runners at the appropriate standard level, plus cold soil temperatures negatively impact the performance of some alternatives. Elsewhere in Australia, where conditions are different, runners are produced without recourse to MB, using alternative fumigants.

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| | Key pests affecting strawberry runner production are fungi (*Phytophthora, Pythium, Rhizoctonia* and *Verticillium* spp.) and weeds (*Senecio arvensis, Agrostis tenuis, Raphanus* spp., *Poa annua*, *Cyperus* spp).<br><br>In its CUN, the party states that runner production under the conditions described, requires treatment with MB: Pic (50:50 at a MB dosage of 25 g/m$^2$) to meet certification standards. Other registered soil fumigants, such as 1,3-dichloropropene (1,3-D)/Pic (65:35), cause crop phytotoxicity and yield losses of up to 40%. Phytotoxicity is related to the high organic matter (5-10%) and clay content (> 50%) of soils at Toolangi, and the long residual times of alternative fumigants in these soils (Mattner *et al*., 2014).<br><br>Presently, the Victorian runner industry only produces runners in soils treated with MB: Pic, except for the foundation stock production stage, which is produced in soilless substrates (Mattner *et a*l., 2015). The party has found other non-chemical alternatives unfeasible. Plant resistance is unreliable as an alternative to MB: Pic for delivering certified runners (Fang *et a*l., 2012). Integrated soil disinfestation with combinations of existing registered fumigants and herbicides that are not yet registered is presently the most likely approach for replacing MB in the runner industry. This strategy entails applying low dosages of registered fumigants (e.g. Pic, 1,3-D, and MITC generators) and herbicides (e.g. isoxaben, metolachlor, napropamide) in combinations that avoid crop phytotoxicity.<br><br>An alternative 1,3-D/Pic, 20:80 (Triform,TF80®), which was recently registered, showed promise in trials as the its low concentration of 1,3-D reduced the risk of phytotoxicity in the strawberry runners; however, the party indicates that this fumigant is not technically feasible on its own, as it does not control pathogens to the same soil depth, or weeds as effectively, as MB/Pic. Runners produced in soils treated with TriForm-80 later produced fruit yields 15% lower than runners produced in soils treated with MB/Pic. Co-application of alternative fumigants (Pic Plus® and TF-80®) with herbicides (isoxaben and phenmedipham) increased weed control and runner yields in replicated trials to levels equivalent to MB/Pic, but these herbicides are not yet registered for the Australian strawberry industry, nor have they been approved by VSICA (certification authority). Historically, VSICA has only approved MB/Pic as a treatment for runners, arguing that high levels of pathogen control are essential for production of certified high health runners with reduced risk of litigation. Although the MB dosage rate exceeds MBTOC's standard presumption of 20 g/m$^2$, lower rates are not registered in Australia; the party has put forward evidence that three years of trials with lower MB rates do not support bio-equivalency of such rates.<br><br>According to the CUN, recent results also confirm that pathogen control at greater soil depths is inadequate using other promising substitutes (viz. ethane dinitrile (EDN), EDN + chloropicrin(Pic), Pic). Further research is therefore being conducted from 2019 to 2021. Current trials are investigating treatments with EDN +Pic and TF-80® with improved application technologies, and outdoor for soil-less production systems of runner tips.<br><br>Trials continue with microwave and steaming for soil disinfestation. An analysis of their economic feasibility (Brodie and Davidson, 2018) showed that microwave is less costly than MB/Pic and steam for treating soil, but further work is necessary to develop and test a prototype unit capable of treating soils to the depths required in the runner industry. Trials with a small steam unit have however not resulted in significant control of soil-borne pathogens and weeds as required.<br><br>Mixtures of methyl iodide (MI) and chloropicrin (Pic) have previously been shown to consistently control soil-borne pathogens as effectively as MB/Pic in runner trials. The runner industry has become the registrant for MI in Australia and is aiming to achieve registration of this fumigant in 2021 and full commercial use by 2022, subject to the independent processes of the regulatory authorities. In the 2018 nomination, the party put forward a transition plan for phasing-out MB, based on the registration and availability of methyl iodide (MI), stating that if registration is achieved by 2021, then that year the nomination amount will be reduced by 50% (of 28.98 tonnes), and CUN requests will cease entirely in 2022.<br><br>**MBTOC assessment for MB use in this sector in 2021:**<br><br>MBTOC accepts the party´s submission that MI/Pic is an efficient alternative to MB for control of pathogens and weeds on strawberry runners under the circumstances of this nomination. Mixtures of MI + Pic have been shown to control soil-borne pathogens consistently and as effectively as MB/Pic in runner trials, making this the most viable alternative, but which is yet not registered. MBTOC notes previous experiences with MI use in other countries where public perception and concerns over its environmental or health impacts led to its market withdrawal, and encourages the party to continue researching other alternatives.<br><br>MBTOC once again recognises the party's continued efforts in researching and developing an array of MB alternatives (Mattner, 2017) in line with Decisions IX/6 and XXV/4. |

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| | Soilless substrates in protected production systems are now in place for the Foundation stocks and will be implemented in 2019 in the Mother Stock. According to the economic assessments conducted by the party, this option cannot be expanded to the final two certified runner generations as it is not economically feasible. Other countries that produce strawberry runners find that soilless culture systems - including outdoors – can prove technically and economically suitable for a portion of certified nursery production operations as well as stock plants, and allow for production of healthy nursery material (López-Galarza *et al.*, 2010, Rodríguez-Delfín, 2012).<br><br>MBTOC understands that certification authorities require at least two years of data demonstrating alternatives deliver equivalent efficacy to MB/Pic before changes to the rules of the Certification Scheme can be introduced. Other chemical and non-chemical alternatives should continue to be trialled but results that would allow acceptance of the key chemical alternatives by the certification body (VSICA) and their uptake by the industry will probably not be available before 2021.<br><br>**MBTOC comments on economics provided in CUN for 2021:**<br>The party reports that accurate data on the cost of production of mother stock in soilless systems is in the process of being produced and will be available after the end of the current season (October 2019). The party is urged to provide a comprehensive partial budget rather than only a comparison of costs, as net revenue is a better indicator of economic feasibility.<br><br>In an economic assessment of steam and microwave it was found that the latter was less costly than methyl bromide or steam, which was more expensive than methyl bromide. However, further technical work was required to confirm the technical feasibility of microwave as it currently provided inadequate control of soil-borne pathogens. The development of a new prototype applicator that could operate with different wavelengths and at greater depths has now been prioritised for future trials. This could obviously affect its cost of operation. In this case, the party is again urged to provide a comprehensive partial budget, unless the argument is that the yield and prices remain unchanged from when methyl bromide is used.<br><br>**Comments Requested in Dec. XX1/11 (para 9):**<br><br>• **Dec. IX/6 b (i) Emission reduction:** Over the past years, improved agronomic practices implemented by Toolangi runner growers have significantly increased yield per hectare. MBTOC understands that improved productivity could have been used to reduce the area treated with MB, which would have reduced emissions. New approaches and products are available to reduce emissions, such as the use of TIF. MBTOC recognizes the party is working on their use, and looks forward to the results coming out in October 2018. TIF has contributed to reduce emissions of fumigants in many other parts of the world.<br>• **Dec. IX/6 b (ii) Research program:** An approved and funded research program is currently in place at the time of this nomination.<br>• **Dec. IX/6 b (iii) Appropriate effort:** There is a funded research program currently in place at the time of this nomination. |

| Country | Industry | CUE for 2005[1] | CUE for 2006[2] | CUE for 2007[3] | CUE for 2008[4] | CUE for 2009[5] | CUE for 2010[6] | CUE for 2011[7] | CUE for 2012[8] | CUE for 2013[9] | CUE for 2014[10] | CUE for 2015[11] | CUE for 2016[12] | CUE for 2017[14] | CUE for 2018[15] | CUN for 2019[16] | CUN for 2020 | Final recommendation for 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Canada | Strawberry runners (PEI) | 6.840 | 6.840 | 7.995 | 7.462 | 7.462 | 7.462 | 5.261 | 5.261 | 5.261 | 5.261 | 5.261 | 5.261 | 5.261 | 5.261 | 5.261 | 5.261 | [5.261] |

**MBTOC final recommendation for 2020:**

MBTOC recommends 5.261 tonnes for this use in 2020. After the OEWG the party provided further information which justified that alternatives were technically and economically unfeasible for the following reasons: Yields of nursery plants grown in substrates were delayed by 3 weeks compared to those grown in soil, trials had been affected by bird damage and therefore results to prove effectiveness of soilless substrates were delayed, and increased costs for soilless bags made their use uneconomical at the moment.

The party supplied a revised CUN with figures corrected for historic amounts of MB allocated to the grower at PEI and this showed that since 2015 these amounts now align with the accounting framework information provided to the Secretariat. MBTOC notes that the amount used by the grower in the last 5 years has been below that requested by Canada and also that stocks have been available but not completely used to offset amounts acquired for critical use. Under Decision Ex II/1 parties may wish to address this issue.

MBTOC notes information submitted by the party indicating that a small greenhouse is presently under construction, which will be used in future studies aimed at overcoming the 3 week delay in plants grown in soilless production and to evaluate further the economic costs in comparison to the present production in open fields.

MBTOC acknowledges that an effective chemical alternative, chloropicrin, is registered in Canada, but not permitted in PEI because of potential groundwater contamination concerns by the government of Prince Edward Island. However, groundwater contamination with chloropicrin has not been determined in PEI. MBTOC notes the same groundwater contamination concerns exist for methyl bromide and several alternatives like metham sodium or metham potassium. The label for these products approved by Health Canada's *Pest Management Regulatory Agency* contains a warning of potential of groundwater contamination. In applying a risk-averse approach and in the absence of any routine groundwater monitoring, the authorities in Prince Edward Island will not issue permits to use the alternative substances, even for the purposes of trialling/testing, but will continue to allow use of the MB/Pic mixture despite the concerns. In view of this situation, MBTOC considers that the party's approach to adopt open field soilless substrate production is suitable to replace MB and should be rapidly implemented to phase out MB as soon as possible.

The party has adopted VIF or TIF and uses a rate of MB (i.e. <20 g/m$^2$), which meets MBTOC standard presumption for certification of propagation material. The label supplied for the fumigant does not allow lower rates of formulations of MB: Pic (such as MB/Pic 50:50) to be used for this purpose and thus rates of MB cannot be further reduced.

MBTOC acknowledges that soilless production is a non-chemical alternative to MB widely used in strawberry runner production (López-Galarza *et al*., 2010, Rodríguez-Delfín 2012)). The party confirmed that Botanicoir soilless systems tested in 2018 gave satisfactory results and that consideration could be given to phasing in its use for a portion of the G2 runner tip production in future growing seasons. MBTOC recognizes the need for time for scale up of this technology.

**Nomination by the Party for 2020:**

The party nominated 5.261 t of MB, which is the same amount granted as a CUE for 2018 and all previous CUEs since 2011. It is for strawberry runner production on 26.3 ha of land, including the two stages ((G1: 2 ha, G2-RT: 12.15 ha, G2-BR: 12.15 ha). of multiplication of plants, which are exported from PEI. The nomination is based on a reduced rate of MB of 20 g/m$^2$ (instead of 50 g/m$^2$) under high barrier f of the entire cropping area, which is consistent with MBTOC's standard presumptions for certify propagate materials.

**Circumstances of the nomination by the Party**:

Chloropicrin is registered for use in Canada and thus can be used as a pre-plant fumigant for strawberry runners under certain conditions, however, the government of PEI does not allow its use due to concerns regarding groundwater contamination (the Island relies on groundwater for their potable water and the soil are sandy). Metham sodium or metham potassium are also prohibited due to the same concerns. In applying a risk-averse approach, the authorities in Prince Edward Island will not issue permits for trialling or use of these alternative fumigant products, nevertheless use of Terr-O-Gas (MB/Pic 67:33) as a pre-plant fumigant in strawberry runner production is permitted because it has been successfully used by the grower for over 30 years and has not resulted in the contamination of groundwater.

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| | The analysis by the party shows that shifts to Haygrove soilless cultivation would carry significant changes in production methods and that higher associated costs would result in significant market disruption in the near term, while only serving to address methyl bromide used for G1 foundation stock (405kgs). This represents only a small fraction of the problem as, due to the lack of alternatives, the grower would continue to require a chemical fumigant to produce G2 runner tips (2,430kg) and bare roots (2,430kg). The label for the fumigant does not allow to use lower rate for the MB use for this purpose.<br><br>**MBTOC assessment for MB use in this sector in 2020:**<br>MBTOC is of the opinion that soilless production is a suitable alternative for strawberry runner production and encourages the party to adopt the soilless cultivation system to phase out MB use. MBTOC considers soilless production to be technically feasible for all stages of production (López-Galarza *et al.*, 2010, Rodríguez-Delfín; 2012; Miranda *et al*., 2014), however the party has not yet trialled soilless production for the G1 generation in the context of PEI or the G2 Bare rooted production. MBTOC recognizes efforts to expand adoption of substrates for some stages of production and urges the party to consider expansion for all stages in the absence of chemical alternatives being available or adopted for pre-plant soil treatment as indicated by Dec. IX/6 b (iii). MBTOC is aware that chloropicrin (Pic), although an effective alternative, cannot be used in PEI due to groundwater concerns, and continues to be unclear as to why PEI allows the use of Pic in mixtures with MB, urging the party and regulators in PEI to use a consistent regulatory approach to all alternatives. The label for all key alternatives and MB is approved by Health Canada's *Pest Management Regulatory Agency* and contains a similar warning on all of potential to contaminate groundwater. In applying a risk-averse approach and in the absence of any routine groundwater monitoring, the authorities in Prince Edward Island will not issue permits to use these substances, even for the purposes of trialling/testing but do allow use of the MB/Pic mixture despite the concerns. In view of this, MBTOC considers that the parties' approach to adopt open field soilless substrate production is a suitable option to replace MB and should be fully implemented to accelerate MB phase out. This approach is more sustainable and safer than chemical fumigants. The open field substrate production scheme evaluated offers a less costly option than protected production in greenhouses, which is also being considered. Low plastic tunnels to cover outdoor soilless production rows may offer a further low cost option to help reduce the impact of excess rain.<br><br>**MBTOC comments on economics provided in CUN for 2019:**<br>• After the OEWG the party provided further economic information showing that the soilless system has an additional variable cost of CAD 31,694 per hectare (CAD12826 per acre). MBTOC accepted that unless they can increase yields by a commensurate amount, soilless will be uneconomical – and that more time is needed to complete the research to establish whether this is possible.<br>• In the past, the party has provided the cost of producing G2 runner tips with the Haygrove soilless system, but has argued that the cost is 3.15 times that of the use of methyl bromide. Unless the party contends that the yield and the price at which the tips are sold remains unchanged, a comprehensive partial budget is required, as the impact on net revenue is the important variable, not merely the cost increase.<br>• In the CUN for 2020, the party has also provided cost data for the use of "Botanicor Precision Plus" growbags. While trials show some evidence of technical feasibility for two varieties of strawberries (Chandler and Camarosa) at certain plant densities, one variety did not perform to expectations. From an economic point of view, the party shows that the costs of using the growbags are considerably higher than for MB, but that greater efficiencies were possible as more was learned about the best way of introducing them, e.g. of reducing costs or improving productivity.<br><br>**Comments requested in Dec. XX1/11 (para 9):**<br>• **Dec. IX/6 b(i) Emission Reduction:** Yes, uses barrier films with a reduced application rate of MB conforming to MBTOC's presumptions.<br>• **Dec. IX/6 b (iii) Research Program:** A new research program focussed on substrate production as a key alternative to MB has been operational for two years.<br>• **Dec. IX/6 b (iii) Appropriate Effort:** MBTOC recognizes the efforts to research substrates for later production stages and urges the party to expedite these research efforts to secure alternatives as indicated by Dec. IX/6 b (iii). MBTOC is concerned that no groundwater measurements are being conducted on PEI, yet its use is allowed with mixtures of MB/Pic, but accept that local regulations prevent use of the fumigant alternatives. |

[1]1ExMOP and 16MOP; [2]16MOP+2ExMOP+17MOP; [3]MOP17+MOP18; [4]MOP18+MOP19; [5]MOP19+MOP20; [6]MOP20+MOP21; [7]MOP21+MOP22; [8]MOP22, [9]MOP23, [10]MOP24, [11]MOP25, [12]MOP26, [12]MOP26**,** [13]MOP27, [14]MOP28, [15]MOP29, [16]MOP30

*Table 1.10 Final recommendations for CUNs from A5 parties for pre-plant soil fumigation submitted in 2019 for use in 2020.*

| Country | Industry | CUE for 2015[1] | CUE for 2016[2] | CUE for 2017[3] | CUE for 2018[4] | CUE for 2019 | CUN for 2020 | Final recommendation for 2020 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Argentina | Strawberry Fruit | 70 | 58 | 38.84 | 29.00 | 15.7 | 13.5 | [7.83] | | | |

**MBTOC final recommendation for 2020:**

MBTOC recommends 7.83 t for strawberry fruit use in 2020. This includes 2.61 t for Mar del Plata [(30 ha x 58% X 15 g/m$^2$) and 5.22 t for Lules [(60 ha x 58% x 15 g/m$^2$). The rate of 15 g/m$^2$ is based on MBTOCs standard presumptions for the dosage rate needed for MB with VIF or TIF and row treatments that make up 58% of the field area.

MBTOC recognizes the efforts by the party to steadily reduce MB use from 77.0 t in 2015 to 15.7 t and 13.5 t respectively in 2019 and 2020. No further request for reassessment was made after the OEWG.

**Nomination by the Party for 2020**

The party nominated 13.5 t for a total of 90 ha, with 4.5 t for Mar Del Plata (30 ha) and 9.0 t for Lules (60 ha) using a rate of 26 g/m$^2$ of 70:30 MB/PIC within rows that make up 58% of the area of the open fields.

MBTOC has recommended in the last three CUN rounds, the use of VIF/TIF in strawberry fruit to reduce dosage rates from 26 g/m$^2$ to 15 g/m$^2$ of MB/PIC. Growers all over the world have benefited greatly from using barrier technology to reduce the MB dosage, reducing MB emissions, and minimizing the legal requirement for large buffer zones which are in place in many countries (Chow and Scholten, 2016).

The target pests in Mar del Plata are the weeds, *Cyperus esculentus* and *Cyperus rotundus* (nutsedges), and several strawberry pathogens (Phytophthora root and crown rots, *Verticillium*, Anthracnose, and Black root rot) and several insects pests (root weevils, white grubs, strawberry rootworm, cutworms, and nematodes). The target pests in Lules, Tucumán Province are primarily the plant pathogens *Phytophthora* root and crown rots, *Verticillium*, Anthracnose, *Rhizoctonia, Fusarium, Pythium and Macrophomina*.

**Circumstances of the nomination by the Party:**

The party states that 1,3-D/Pic does not control the entire pest spectrum attacking strawberries and has a longer plant back time or a phytotoxic effect, which leads to missed market windows. Metham sodium at the registered rate does not achieve yields comparable to MB treatments. According to the party, low soil temperatures and heavy rainfall typically present at the time when fumigation needs to happen to ensure optimum yields and a timely harvest, challenge the adoption of alternatives. Chloropicrin alone is not registered and does not control weeds. Methyl iodide, which proved effective in trials, is no longer being considered for registration. Solarization and biofumigation are not considered practical in the critical areas, and VIF and TIF are fairly new products that need to be imported.

According to the party, results of trials conducted from 2001 to 2013 showed that 1,3-D/PIC, an alternative that is widely adopted in strawberry fruit crops worldwide, gave variable results in the Mar del Plata region, but good yields in the Lules region. Dazomet is not registered for edible crops. Metham sodium at a rate of 0.25 l/m$^2$ with two drip tapes obtained similar yields as MB:PIC (70:30) at a rate of 40 g/m$^2$, but that rate is not registered. According to the party, Pic is a technically and economically feasible alternative to MB, but Pic alone is not registered in Argentina. DMDS is a promising alternative to MB, but it is also not available. Non-chemical alternatives, in particular solarisation, are widely used in the North, East and West of Argentina, but cannot be used in the central areas.

MBTOC accepts that 1,3-D/Pic may be more difficult to use in cooler regions such as in some areas of Mar del Plata and recognizes the issues with commercial scale-up in some regions of the nomination. The party showed MBTOC the impact of high disease pressure caused by leasing soils cropped recently with vegetables, particularly potatoes, which harbour some strawberry pathogens (e.g. *Rhizoctonia sp.*, *Verticillium sp.*). MBTOC suggests that this practice should be avoided where possible to improve the performance of alternatives. The party also indicated that most growers get a two-year crop from one application of MB/Pic, however yields can be 50% less in the second year.

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| | **MBTOC assessment for MB use in this sector in 2020:**<br><br>MBTOC has assessed that in the absence of alternatives being available that barrier films should be used for the remaining use. MBTOC notes that alternatives are available for strawberry fruit in other regions of Argentina and around the world, however this may require some improvements in application methods in order to be effective in these regions of Argentina. MBTOC encourages the party to consider registration of Pic, DMDS, dazomet and further adoption of metham sodium and 1,3D/Pic to assist with phasing out this nomination.<br><br>Any future nominations should provide a phase out plan and the results of scientific studies demonstrating the effects of the length of the plant back periods for 1,3-D/Pic in Mar del Plata (cooler conditions) and in Lules (warm conditions), as compared to MB (70:30), in accordance with Decision IX/6. Further validation is required to support the longer plant back times for 1,3-D/Pic in the heavy rainfall region of Lules. MBTOC also noted that a high proportion of the present MB/Pic use is applied through drip irrigation lines used to irrigate strawberry crops, however shank application of MB/Pic formulations is considered a more effective application method. Shank injection of methyl bromide has been shown to improve the performance of both MB/Pic mixtures and that of alternatives and could provide better yields in the second-year crop.<br><br>MBTOC is also aware of references indicating that some alternatives may be effective, such as metham ammonium, 1,3-D/Pic, metham sodium and metham potassium in critical regions. Del Huerto, (2013) found no difference between the performance of MB and 1,3-D/Pic. Jaldo *et al*. (2007) showed that 1,3-D/Pic injected in the soil gave better yields than MB in Lules/Tucumán. Aldercreutz and Szczesny, (2008, 2010), showed that yields obtained in Mar del Plata with metham sodium and metham ammonium were comparable to those produced when fumigating with MB. Bórquez and Agüero (2007) found that weed control achieved with metham ammonium, metham sodium and metham potassium in Lules, was comparable to that obtained with MB 70:30 and that there were no significant differences in the total yields obtained with these treatments. Other studies confirmed these results (Bórquez and Mollinedo, 2009, 2010; Aldercreutz and Szczesny, 2008; Bórquez and Agüero, 2007). MBTOC is interested in receiving updates of trial results being conducted in the regions nominated.<br><br>**MBTOC comments on economics provided in CUN for 2020:**<br><br>The economic analysis provided by the party has not changed from the previous CUN. The analysis shows that treatment with 1,3-D/Pic results in a missed market window. 1,3-D/Pic fetches lower gross revenues than MB (US $118 000/ha as opposed to US $177 000/ha in Mar del Plata, and US $31 600/ha and US $63 400/ha in Lules, respectively), mainly as a result of the decline in revenue in the second year.<br><br>**For Mar del Plata**<br><br>The nomination assumes a yield reduction from 93 to 62 t/ha using 1.3-D + Pic because of heavy clay soils and low soil temperatures.<br>From the yield reduction the nomination calculates a symmetrical gross revenue reduction as prices are assumed to be the same for the two treatments.<br>The nomination argues that operating costs for the two treatments are similar, but this is not shown. It then argues that weed control costs of 1.3-D Pic would be greater than for methyl bromide, as will conversion to a one year production system. In this case yields are still assumed to be lower (15-20%) and the costs of fumigants, tarps and transplants will be higher. However, these costs are not given.<br><br>**For Lules**<br><br>Provides data on the movement in prices from the early harvest to late harvest. Prices start at $6/kg and end at <$1.<br>Argues that weed control is insufficient with 1.3-D Pic and that the planting time is short because of soil temperature and rainy conditions and prolonged plant back time. As a result, the strawberries miss the market window and are sold at the high-season price rather than the early-season price.<br>In this case, yield is expected to increase with 1.3-D Pic, but despite this, the fall in prices results in a loss in revenue of around 50%.<br>The “with methyl bromide” price is taken as $1.69/kg and the “with 1.3-D Pic” as $0.72<br>Again, costs of production are expected to be similar for the two treatments, in this case without the caveats. |

**Comments requested in Dec. XX1/11 (para 9):**

- **Dec. IX/6 b (i) Emission Reduction:** Barrier films are available but to date have not been adopted on a commercial scale.
- **Dec. IX/6 b (iii) MLF Assistance/Adoption of Effective Alternatives:** Trials and research have been conducted through the MLF projects implemented in Argentina and also directly by national institutions (e.g. INTA, EEAOC) and various universities.
- **Dec. IX/6 b(iii) Appropriate Effort:** MBTOC notes that considerable research has been conducted during the MLF funded projects and provided references. MBTOC is however unaware of present trials and results within the specific areas of the nominations.
- **Dec. Ex 1(4) Annex 1 National Management Strategies:** No detailed plan was provided, however the Party noted a few dot points of potentially suitable alternatives, including TIF mulching, resistant varieties and DMDS/Pic.

| Country | Industry | CUE for 2015[1] | CUE for 2016[2] | CUE for 2017[3] | CUE for 2018[4] | CUE for 2019 | CUN for 2020 | Final recommendation for 2020 | |
|---|---|---|---|---|---|---|---|---|---|
| Argentina | Tomatoes | 100 | 71.25 | 64.10 | 47.70 | 25.6 | 22.2 | [12.79] | |

**MBTOC final recommendation for 2020:**

MBTOC recommends a reduced amount of 12.79 t for use in this sector in 2020. MBTOC recommends a reduction in the dosage rate from 26.0 to 15.0 g/m$^2$ for adoption of barrier films (e.g. TIF) for the treated area (i.e. 58%) of the 147 ha nominated (147 ha x 58% x 15 g/m$^2$), in accordance with MBTOC's standard presumptions. No further request for reassessment was made after the OEWG.

**Nomination by the Party for 2020**

The Party nominated 17.75 t for La Plata (117 ha x 0,58 %= 67.86 ha treated) and 4.4 t for Mar Del Plata (30 ha x 0.58 = 17.4) for a total of 22.2 t (147 ha x0.58= 85.26 ha).

Since the first CUN in 2014 and In order to conform to standard presumptions, MBTOC has recommended, the use of VIF/TIF in tomato protected cultivation to reduce dosage rates from 26 g/m$^2$ to 15 g/m$^2$ of MB and emissions of MB,. Growers all over the world have benefited greatly from this barrier technology by reducing the MB dosage and minimizing the legal requirement for large buffer zones which are in place in many countries (Chow and Scholten, 2016).

The target pests are nematodes (*Nacobbus* spp. and *Meloidogyne* spp.), fungi (*Rhizoctonia* sp., *Sclerotinia* spp., *Phytophthora* spp.), soil fungi disease complex (damping off) in seedbeds and crops, weeds (*Cynodon* spp., *Cyperus* spp., etc.) and soil insects (*Agrotis* sp., *Agriotes* sp., *Melolontha* sp.). The Party reported root stock resistance to some pathogens, *F.oxysporum* f.sp *lycopercisi* race 3, *V.alboatrum*, *P. lycopercisi* and other non-soilborne pathogens, even if these are not reported as key pathogens. MB is used in regions where cold and heavy clay soil conditions prevail, representing 31.25% of the total protected tomato production area.

**Circumstances of the nomination by the Party:**

The Party states that 1,3-D/Pic does not provide sufficient control of key pests in the critical areas, mainly due to soil types (i.e. heavy clays) and to low soil temperatures. Chloropicrin alone did not control the entire pest complex especially weeds and is not registered for single application in Argentina. Metham sodium gave erratic and insufficient performance for weed and disease control, because the heavy clay soils restricts movement of this fumigant throughout the soil. Dazomet is not registered for edible crops, plus trials with this fumigant showed insufficient nematode control and required a long plant back period. Long-term efficacy of the above alternatives was not sufficient to last the entire year to cover pathogen control for the dual cropping system (tomato and pepper). Application of steam is very costly and time consuming. Application with currently available steam equipment is extremely slow and size of equipment too large for use inside greenhouses. Although potential production of grafted plants is high, no rootstocks resistant to *Nacobbus* are presently commercially available. According to the Party, cold climate, heavy soil conditions and overlapping key production period make solarisation and biofumigation unsuitable for the nominated regions of La Plata and Mar del Plata.

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| | **MBTOC assessment for MB use in this sector in 2020:**<br><br>MBTOC recognizes that there are difficulties with the adoption of alternatives. Therefore it has recommended a reduced amount of MB and the use of VIF for the full requested area of the nomination.<br><br>MBTOC notes that no phase-out plan has been provided and this is inconsistent with the requirements of Decision IX/6. The Party is encouraged to continue efforts to change local regulations preventing use of alternatives in Mar del Plata and to provide data of recent trials in all regions on steam, methyl iodide, 1,3 D+ Pic, solarisation, biosolarisation, grafting on local and imported root stocks to support their use. MBTOC urges the Party to provide such data if future nominations are submitted. MBTOC encourages the Party to consider researching other non-chemical methods such as soil-less production methods, biofumigation, crop rotations that can prevent or inhibit many pests, pathogens, and weeds.<br><br>According to the Party, growers in both production areas have been actively involved and supported by INTA and other institutions in the study of methyl bromide alternatives for many years, but to date the results have not been provided to MBTOC.<br><br>The Party reports use of about 90,000 grafted tomato plants during the past growing season and declares that grafting is becoming increasingly popular in commercial plantings. MBTOC notes that the number of grafted plants adopted has not increased since the first nominations and MBTOC encourages wider adoption of this technology. MBTOC notes promising research results on grafting susceptible tomato varieties onto rootstocks with some tolerance to false root-knot nematode, *Nacobbus aberrans* (Mitideri *et al.,* 2013; Chale *et al.*, 2013; Ducasse *et al.*, 2013; Gutiérrez *et al.*, 2013, 2014; Andreau *et al.*, 2014). The Party reported that grafted plants are produced and commercially available in various tomato-growing regions such as Mendoza, Corrientes and Buenos Aires. MBTOC notes that the Party also suggests that nominated regions in the CUN also have the potential of producing *Nacobbus* tolerant plants.<br><br>In La Plata biosolarisation, using broccoli as organic matter has been evaluated with good results to control tomato soil borne pathogens, including *Nacobbus aberrans* (Martinez *et al*., 2014). At INTA San Pedro, many biosolarisation experiences have been conducted since 2003. The organic amendments tested are chicken manure, broccoli, tomato and pepper crop debris, brassicas (rapeseed, broccoli, mustard and others ) (Mitidieri *et al*., 2005, 2009, 2011, 2015, 2017ab; Brambilla *et al*., 2017ab; Pagliaricci *et al*., 2015)**.** The fungal pathogens controlled in these experiences were *Pyrenochaeta lycopersici*, *Fusarium solani*, *Sclerotium rolfsii* and *Sclerotinia sclerotiorum*, as well as nematodes like *Nacobbus aberrans*, *Helycotylenchus* and *Criconemella.*<br><br>MBTOC considers that chemical alternatives may be available for the control of *N. aberrans* and other parasitic nematodes. For example, Fluensulfone (Nimitz®) is a contact nematicide with low human and environmental restrictions that targets nematodes including *Nacobbus.* Hidalgo *et al.,* (2015) reported a significant reduction in population density, reproduction rate, and root galling of *N. aberrans* after fluensulfone applications on tomato. The reduction was similar to that obtained with 1,3 D/Pic. They concluded that fluensulfone use in tomato and cucumber crops affected by *N. aberrans* could be considered as a good alternative to methyl bromide and other non-fumigant nematicides. Fluensulfone has also been identified as a key alternative to MB for nematode control on many crops (berries, cucurbit, leafy and fruiting vegetables). Mixtures of 1,3-D/Pic (e.g. 40/60%) combined with fluensulfone showed lower galling index as compared to the fumigant alone (Castillo *et al*., 2016). Gilma *et al.* (2017) demonstrated that fluensulfone in combination with 1,3-D plus Pic 40:60 (w/w) can be an effective tool to manage root knot nematodes in drip-irrigated fresh-market tomatoes with high *Meloidogyne spp.* infestation.<br><br>Successful research on combined alternatives (biofumigation, solarisation) has also been conducted and promising results have been obtained (Garbi *et al.*, 2013; Mezquíriz *et al.*, 2013; Martínez *et al.*, 2013; Quiroga *et al.*, 2014). Vasquez Shanchez *et al.,* (2018) reported that extracts of *Tagetes lunulata* and other wild plants (foliage tissue) have shown a significant nematicidal effect on *N.aberrans* because of the high concentration of nematotoxic compounds (total phenolic and flavonoids) in their tissue. Biological control of *N. abberans* has also been tested in Argentina. Caccia *et al.* (2018) have shown respectively that three Argentinean isolates of entomopathogenic nematodes of the genera *Steinernema* and *Heterorhabditis* controlled efficiently *N. aberrans* and *M. hapla* in tomato green house. Marro *et al.* (2018) reported that arbuscular mycorrhizal fungi species (*Rhizophagus intraradices* and *Funneliformis mosseae*) reduced tomato root penetration by false root-knot nematode *N. aberrans.*<br><br>An integrated program for *N. aberrans* has been developed by Cristobal-Alejo*et al.* (2006) in Mexico, including fertilization, nematicide application (ethoprop) and biofumigation with chicken manure. It resulted in significant increases of plant height, foliage dry weight, stem diameter and crop yield, as compared to other treatments.<br><br>*Nacobbus* is widely distributed in North and South America. It has been reported in Mexico, USA (California, Colorado, Nebraska, Utah, Wyoming), Bolivia, Chile, Ecuador and Peru. All these countries are producing tomato without MB (EPPO 2009, Stone and Burrows, 1985). In Mexico, *N. aberrans* attacking greenhouse peppers is controlled with various chemical and non-chemical control methods (Pérez-Rodríguez et al., 2010). |

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| | These potential alternative technologies will require time for scale-up in Argentina. However, MBTOC anticipates that it is possible to implement these and other alternatives to fully replace MB in the near future. Argentina is also encouraged to consider registration of herbicides for controlling nutsedge which are used in other countries as part of integrated control schemes.<br><br>MBTOC notes that the party has been supported by the MLF with a number of demonstrations, investment and technical assistance projects since 1997 and that many alternatives have been trialed and found successful in this sector (MLF, 2014 a, b).<br><br>**MBTOC comments on economics provided in CUN for 2020:**<br><br>• Data provided in the CUN considers only impacts on revenues, as the magnitude of the revenue impacts is sufficient to overshadow differences in operating costs between double cropping with MB and single cropping with 1,3-D + Pic. This comes about because of the inability to double crop, because 1,3-D + Pic requires a longer plant back interval in a winter application, which makes two harvests per year impossible. Data on the cost of production (and gross margin) is also provided. The party states further that steam is more costly than MB.<br><br>**Comments requested in Dec. XX1/11 (para 9):**<br><br>• **Dec. IX/6 b (i) Emission Reduction:** Barrier films are available.<br>• **Dec. IX/6 b (iii) MLF Assistance/Adoption of Effective Alternatives:** The party states that recent trials have been conducted, but results have not yet been provided to MBTOC. Previous trials and research were conducted through the MLF projects implemented in Argentina and also directly by national institutions (e.g. INTA, EEAOC) and various universities, but have not been adopted.<br>• **Dec. IX/6 b (iii) Appropriate Effort:** MBTOC notes that since the finalization of the MLF project there has been no trials results reported.<br>• **Dec. Ex.1/4 Annex 1 National Management Plan**: Argentina did not provide a NMP. |

# 6 Final Evaluation of Critical Use Nominations of Methyl Bromide for Commodities and Structures Use in 2020

## *6.1 Standard Rate Presumptions*

MBTOC received SC CUNs from only one party, South Africa, which consisted of two nominations as shown in Table 1.11.

Decision IX/6 requires that critical uses should be permitted only if '*all technically and economically feasible steps have been taken to minimise the critical use and any associated emission of methyl bromide*'. Decision Ex.II/1 also mentions emission minimisation techniques, requesting parties "…*to ensure, wherever methyl bromide is authorised for critical-use exemptions, the use of emission minimisation techniques that improve gas tightness or the use equipment that captures, destroys and/or reuses the methyl bromide and other techniques that promote environmental protection, whenever technically and economically feasible.*"

At the beginning of the CUN process in 2005, MBTOC published its standard presumptions for structures (20g $m^{-3}$) and indicated that the European Plant Protection Organization's (EPPO) published dosage rates for commodities should be considered standard best practice for fumigation worldwide. Since that time most parties submitting CUNs stated their adherence to those practices. The EPPO dosage rates for commodity treatment vary by commodity, sorption rate and environmental conditions. They can be found in annexes to the MBTOC 2006 Assessment Report (MBTOC, 2007). Where possible, reduced dosages, combined with longer exposure periods, can reduce MB consumption, while maintaining efficacy (MBTOC 2007, 2011, 2017).

## *6.2 General Comments on the Assessment for Structure and Commodity Use*

MBTOC continues to encourage parties to consider a review of regulations covering the registration, use and adoption of alternatives. For MB structure and commodity uses, MBTOC has endorsed the efforts of the Party to try to phase out MB by encouraging companies to register alternative chemicals for this sector. Sulfuryl fluoride was registered in January 2018 in RSA and this will assist with full adoption of in-kind alternatives to assist with the phase out of all the remaining MB use for both sectors applying for critical use. MBTOC is aware that the implementation of any alternative will require time for logistics of use and the training of fumigators to get full adoption the market.

## *6.3 Details of the Evaluation*

The total MB volume nominated in 2019 for post-harvest uses in 2020 was 41.5 t. MBTOC's final assessment has recommended 34.30 t for South Africa for 2020 (Table 1.11). Table 1-12 provides detail of the final recommendation for structural and commodity uses for the CUNs submitted in this round.

***Table 1.11. Summary of final recommendations for the CUNs for postharvest uses of MB (tonnes) for 2020 submitted in the 2019 round.***

| Country and Sector | Nomination for 2020 (tonnes) | Final Recommendation for 2020 (tonnes) |
|---|---|---|
| South Africa - Mills | 1.50 | [0.30] |
| South Africa - Houses | 40.0 | [34.0] |
| **Total** | **41.5** | **[34.3]** |

*Table 1-12. Final Recommendations for CUNs from A5 parties for structures and commodities submitted in 2019 for use in 2020.*

| Country | Industry | CUE for 2015[2] | CUN for 2016 | CUE for 2016[3] | CUE for 2017[4] | CUE for 2018[5] | CUE for 2019[6] | CUN for 2020 | Final recommendation for 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|
| South Africa | Mills | -- | 13.0 | 5.462 | 4.10 | 2.90 | 1.0 | 1.5 | [0.3] | |

**MBTOC recommendation for 2020:**

MBTOC recommends a reduced amount of 0.3 tonnes for MB use in 2020, for pest control in three specific nominated mills. This recommendation represents a reduction of 66% from the approved amount of the CUE for 2019 and is for a reduced number of treated mills. The reduction is based on fewer mills and lower number of treatments with an amount of MB sufficient for only one fumigation per year per mill at approximately 20 g/m$^3$ (MBTOC standard presumption) as a further transitional measure to allow time for adoption and optimisation of alternatives in an IPM system, with phase-in of alternative whole-site fumigant, sulfuryl fluoride, if desired, in these small, old mills. No further request for reassessment was made after the OEWG so this recommendation is final.

**Nomination by the Party for 2020:**

The party nominated 1.5 tonnes methyl bromide for fumigation of three specific mills, producing maize grits.

**Circumstances of the nomination:**

In the modified CUN submitted in last year's round (i.e. in 2018 for use in 2019), the party nominated 1.5 t of MB for the fumigation of 8 grain mills, total capacity of 148,540 m$^3$, for pest control against common stored product insect pests. Individual mills were then treated at least once a year, usually at about 25 g/m$^3$. This is a reduction from the 48 g/m$^3$ used by the party in the past. Use of methyl bromide fumigation was on a routine calendar basis, and not according to prevalence of pests. This is to ensure output of un-infested product from the mills and to comply with certification accreditation.

The CUN submitted in this round for use in 2020 was for 1.5 tonnes of methyl bromide to treat three old and small remaining mills, total capacity 11,851 m$^3$. This is sufficient for fumigation five times a year for each mill.

Grain mills in South Africa have to comply with stringent requirements for hygiene to attain insect and pest free conditions during production and storage. These relate to both local and international insect control and quality assurance standards. The party is no longer applying for methyl bromide for the routine fumigations of the other grain mills formerly included in their CUNs. The alternatives used have not been specified in detail. Full site treatments with heat or phosphine were considered as alternatives (full-site treatments) by the party, but were found not currently feasible. According to the party, SF was registered in January 2018 for mill fumigation. Phosphine fumigation was considered inappropriate because of cost of downtime, the associated corrosion and risk of damage to sensitive electrical and electronic apparatus in mill machinery. Heat treatment was considered not feasible because of the high capital cost of imported equipment needed to carry out the heating.

**MBTOC assessment for MB use in this sector in 2020:**

As with last year's recommendation MBTOC considers that various suitable alternatives are available and feasible for the necessary disinfestation of all mills in the CUN. Details are unchanged from the 2018 final assessment (TEAP 2018).

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| | The current recommendation takes into account the conditions and constraints of the RSA (Decision IX/6 para C which take into account the special needs of Article 5 countries). Change from an established system of periodic routine MB treatment requires some time to trial, refine and implement, hence a partial recommendation is made for this CUN, despite the general availability of alternatives for this situation and the transition of the large modern RSA grain mills, no longer included in the nomination. The recommendation acknowledges the current commercial difficulties in supply of sulfuryl fluoride for methyl bromide replacement in this particular situation. while providing sufficient insect control in the form of a fumigation plus IPM measures if SF remains unavailable in 2020. The quantity of methyl bromide has been rounded up to allow use of whole 100 kg cylinders for each mill treatment and to avoid the need for storage of part filled cylinders.<br><br>MBTOC information from outside RSA suggests whole heat treatments may be similar in running cost to existing MB use with moderate capital investment requirements, significantly less than indicated in correspondence about this CUN. Heat treatments may also be used in localised situations to treat particular machines, difficult to fully clean and to treat by other methods, as a component of an IPM approach.<br><br>**MBTOC comments on economics provided in CUN for 2020:**<br><br>• The cost of fumigation using MB compared to using phosphine is provided for the AFGRI mills. The latter is considerably cheaper in every instance, but the party states that it does not yet know the impact of longer fumigation times on revenues. The party also states that heat treatment is too expensive due to the cost of importing equipment. No further economic analysis is provided.<br><br>**Comments requested in Dec. XX1/11 (para 9)**<br>• **Dec. IX/6 b (i) Emission Reduction:** The CUN states that a high level of fumigant containment has been achieved.<br>• **Dec. IX/6 b (iii) Research Program:** MBTOC welcomes the registration of sulfuryl fluoride and ethyl formate as alternative fumigants for mills.<br>• **Dec. IX/6 b (iii) Appropriate Effort:** See previous paragraph.<br>• **Dec. Ex 1(4) Annex 1 National Management Strategy:** No detailed Management Strategy has been provided. |

| Country | Industry | CUE for 2015[11] | CUN for 2016 | CUE for 2016 | CUE for 2017 | CUE for 2018 | CUE for 2019 | CUN for 2020 | Final recommendation for 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|
| South Africa | **Houses** | -- | 68.6 | 68.6 | 55.0 | 42.75 | 40.0 | 40.0 | [34.0] | |

**MBTOC final recommendation for 2020:**

MBTOC recommends a reduced amount of 34 tonnes of MB for use in houses/structures in 2020, which represents a 15% reduction of the amount requested by the party and a reduction of 15 % of the approved amount in 2019 (40 tonnes) for this sector. No further request for reassessment was made after the OEWG.

MBTOC adjusted the nomination to a total 85% of the requested amount to account for 15% of the requested amount for the implementation of control with application of heat – especially in attics or roof space - and first experimental trials and commercial treatments with SF.

MBTOC urges the party to present more details on its development and demonstration program with alternatives against wood destroying pests in houses and similar structures and supports the approach to phase in SF as quickly as possible after its registration in January 2018.

**Nomination by the Party for 2020:**

This Methyl Bromide Critical Use Nomination for Structures (excluding food processing structures) of 40 tonnes covers the fumigation of residential houses and industrial premises for control of wood destroying insect pests.

**Circumstances of the nomination:**
The party applied for 40 t of MB for annual disinfestation treatments against wood destroying insects of different structures (2,560 facilities and houses, mainly brick, mortar and iron structures) along coastal areas and partly inland at a treated volume of av. 600 m³ to 850 m³. The indicated traditional dose of MB is 48 g/m³ for 24 hours and in some certain circumstances only 36 g/m³ for 36 hours. Five target pests in the described situation are presented in the nomination: *Cryptotermes brevis*, the West Indian drywood termite; *Hylotrupes bajalus*, the European house borer, and the small wood and furniture beetles, *Anobium punctatum*, *Lyctus brunneus* and *Nicobiumca staneum*.

The gas tightness of the houses corresponds to the scale value 'A': less than 25% gas-loss within 24 hours or half-loss-time of pressure difference (e.g. 20 to 10 Pa ($t_{1/2}$)) greater than 1 minute.

The party states that the primary pest that needs to be dealt with in house fumigation's is the drywood termite (*Cryptotermis brevis*). The envisaged alternative treatment with sulfuryl fluoride (SF) should therefore be carried out at 15-30°C to obtain good efficacy of the SF treatment.

The treatments are carried out either on whole houses under PVC 450 µm tarpaulin or on gas tight sealed parts of structures. The party stated in their answer to MBTOC's question in January 2019, that about 10-15% of the house contain attics or roof space that can be treated without using MB.

Application of heat, a worldwide used technique under similar circumstances was regarded by the party as not feasible due to very high necessary investment for heating units and excessive running costs compared with costs for MB treatment. Heat treatment for control of wood boring pests would not be acceptable in the case of selling a house and obtain a "Free of Insects Certificate". Sale agreements and legal requirements for houses along the East coast of RSA stipulate that the structure be apparently free of "timber destroying insects" and that should such insects be found then the structure must be made apparently insect free. A Certificate of Clearance is required for a sale to proceed and this can only be produced once an inspection has been undertaken and treatment if the wood is found to be infested. Treatments are not undertaken if wood destroying insects are not detected.

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| | In the answers to the questions asked by MBTOC in this round, the party mentions to have recently considered the option of recapturing MB. MBTOC supports this idea and recommends approaching appropriate companies.<br><br>The party states in their answers of questions asked by MBTOC that the registration of SF, is released in 2018 for houses. The party indicated that time is needed to set up supply and training systems. The party states in the answer to MBTOC's questions that once SF has been commercially launched in RSA and once all the training and accreditation has been undertaken there will be little need for MB. There would however be the need of a few months transition between MB and SF in order to have those involved in house fumigation's purchase the testing equipment which is in turn imported.<br><br>**MBTOC assessment for MB use in this sector in 2020:**<br><br>MBTOC notes that control of wood boring insects, even in in heavily infested houses within highly infested areas, with heat has been common practice for many years around the world (Hammond, 2015). Phosphine, without added heat, is unlikely to be feasible because of its slower action, with fully effective treatments taking several days against wood boring pests without added heat.<br><br>Five target pests in the described situation are mentioned in the nomination: *Cryptotermes brevis*, the West Indian drywood termite; *Hylotrupes bajalus*, the European house borer, and the small wood and furniture beetles, *Anobium punctatum*, *Lyctus brunneus* and *Nicobium castaneum*. MBTOC notes that lethal ct levels against these pests differ significantly and are also dependent on temperature in the structure. Some particular, specified insects, Lyctids powderpost beetles and *Hylotrupes bajulus*, a woodboring beetle, may require more than the regular label rate for control. While the termite can typically be controlled at 36 g/m³ or less particularly at higher temperature (>25°C).<br><br>In the nomination the party distinguished between treatments for low level infestations of drywood termite, versus infestations of other wood destroying insects, particularly *Hylotrupes bajulus* (wood boring beetles), or multiple infestations of drywood termite (with or without *Hylotrupes bajulus*). Similar situations in the US, formerly treated with MB, are now mainly fumigated with SF (MBTOC Assessment reports 2014 and 2018), but heat has also been used. Drywood termite infestations can typically be treated using the 'search-and-destroy' system, where access is possible. In this process, the nests are located acoustically, electronically or with detector dogs and the located nests are eliminated by injection with appropriate, registered insecticide formulation. Baiting is not normally use as, unlike subterranean termites, drywood termite nest in walls and ceilings and do not touch the soil. Established infestations of *Hylotrupes bajulus*, and other wood boring insects, in structural timber are likely to require whole site treatment. Alternatives to MB include heat treatments at moderately elevated temperatures around 56°C (Dreger, 2007; Lewis and Haverty, 1996).<br><br>MBTOC notes that for controlling termites the ensured killing of the queens could be sufficient and can be achieved with SF with fairly low ct products in the range of 500 gh/m³ (20 g/m³ for 25 h) and exposure under sheeted and well-sealed houses. These conditions are commonly known to control of drywood termites (Osbrink *et al.,* 1987; Stewart, 1957).<br><br>Based on party`s information on the time line of the phase in of SF after its registration in 2018, MBTOC presumes that a significant phase in of SF would be possible in 2019 and 2020, leading to the reduction of the nominated amount for 2020.<br><br>**MBTOC comments on economics for 2020:**<br><br>• The party states that heat treatments are sub-economic due to the costs of importation of equipment, especially for heating equipment for entire house and factory treatments. Furthermore, Profume is registered and is undergoing commercialisation, but concerns have been raised about its commercial supply.<br><br>**Comments requested in Dec. XX1/11 (para 9):**<br><br>• **Dec. IX/6 b(i) Emission Reduction:** The CUN states that particularly in the sheeted houses, a high level of fumigant containment has been achieved. |

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| | • **Dec. IX/6 b(iii) Research Program:** MBTOC notes the recent, favourable adoption of heat, but very limited work is presented in the CUN on testing promising alternatives. According to the CUN and additional correspondence, the party is undertaking investigations in the suitability of heat disinfestation as possible alternative in South Africa for the described control of infestation.<br>• **Dec. IX/6 b(iii) Appropriate Effort: Registration of SF has been released in January 2018.**<br>• **Dec. Ex 1(4) Annex 1 National Management Strategy:** No detailed Management Strategy was presented. The party indicated to phase out the MB use shortly after SF as an alternative will be fully accessible to the market. |

[1]MOP25, [2]MOP26**,** [3]MOP27, [4]MOP28, [5]MOP29, [6]MOP30

# 7 Activity Report 2019 and Workplan for 2020

## *7.1 Activity report for 2019*

As of September 2019, MBTOC has 16 members, including 2 co-chairs. The current list of members together with individual terms of appointment can be found in the TEAP Progress Report of May 2019. The main activities conducted by the committee in the current year are listed below:

- Initial summarisation of the 2019 CUNs which consisted of requests for 2020 and 2021
- Preparation of questions for parties submitting CUNs. Assessment of responses received from parties.
- MBTOC meeting in March 2019 (Qingdao, China) for assessment of CUNs (soils and SC). The meeting included a field trip to visit new technologies being used for ginger production and a review of MB use for quarantine treatments at the ports.
- Finalization of the MBTOC 2018 Assessment Report
- Interim recommendations were agreed by consensus. The committee prepared the 2019 CUN Interim Report and the 2019 Progress Report (including QPS) for consideration by the 41st OEWG.
- At the 41thOEWG (Bangkok, July 1-5, 2019) the MBTOC co-chairs presented interim recommendations for CUNs and Progress Report outcomes, and conducted bilateral meetings with Australia and Canada.
- Final assessment for the CUNs (Soils and SC) was conducted by email exchange in August 2019. Further information was provided by Australia and Canada for two pre-plant soil nominations. Formal reassessments were requested from these two parties.
- MBTOC prepared the final CUN report by September for consideration by the parties at their 31st Meeting in November 2019.

The following "Actions" and "Indicative Completion Dates" are the *"Working procedures of MBTOC relating to the evaluation of nominations for critical uses of MB"*, as described in Annex 1 of the 16th Meeting of the parties. The annual work plan is required to be drawn up by MBTOC (supported by the Ozone Secretariat) in consultation with TEAP, which shall submit it to the Meeting of the parties each year.

## *7.2 Work plan and indicative budget for 2020*

| **Tasks and actions** | **Indicative budget needs where applicable** | **Indicative completion date** | **Dates of meetings** |
|---|---|---|---|
| **1.** parties submit their nominations for critical-use exemptions to the Secretariat | - | 24 January 2020 | |
| **2.** The nominations are forwarded to MBTOC co-chairs for distribution to the subgroups of appointed members | - | 7 February 2020 | |
| **3.** Nominations in full are assessed by the subgroups of appointed members. The initial findings of the subgroups, and any requests for additional information are forwarded to the MBTOC co-chairs for clearance | - | 21 February 2020 | |

| Tasks and actions | Indicative budget needs where applicable | Indicative completion date | Dates of meetings |
|---|---|---|---|
| **4.** MBTOC co-chairs forward the cleared advice on initial findings and may request additional information on to the nominating party concerned and consult with the party on the possible presumption therein | - | 28 February 2020 | |
| **5.** Nominating party develops and submits its response to the MBTOC co-chairs | - | 7 March 2020 | |
| **6.** MBTOC Meeting<br>• To assess nominations, including any additional information provided by the nominating party prior to the MBTOC meeting under action 5 and any additional information provided by nominating party through pre-arranged teleconference, or through meetings with national experts, in accordance with paragraph 3.4 of the terms of reference of TEAP (see Annex I of MOP16, Dec XVI/4)<br>• Bilateral meetings if requested by parties<br>• To discuss and finalise the CUN evaluation process<br>• If necessary, discussed any new or standard presumptions that MBTOC seeks to apply in its future assessment of critical-use nominations, for approval by the Meeting of the parties<br>• Draft the 2020 Progress Report<br>• Work on the 2020 MBTOC Assessment Report<br>• Any other tasks assigned by the parties at the 31st MOP | Funds for travel of 1non-A5 member: US$3,000*<br><br>Meeting Costs $3,000 | March 2020 | TBD Mumbai, India (tentative) |
| **7.** MBTOC provides its draft recommendations on the CUNs to TEAP for review | | April, 2020 | |
| **8.** TEAP Meeting: To assess the MBTOC report on critical-use nominations and submits the finalised interim report on recommendations and findings to the Secretariat. | | April 2020 | Australia (tentative) |
| **9.** The Secretariat posts the finalised report on its web site and circulates it to the parties | - | May 2020 | |
| **10.** OEWG Bilateral Discussions: Nominating party has the opportunity to consult with MBTOC on a bilateral basis in conjunction with the Open-ended Working Group meetings | | 13-17 July 2020 | Montreal |
| **11.** The nominating party submits further clarification for the critical-use nomination requested by MBTOC or if requested to do so by the Open-ended Working Group, and provides additional information should it wish to appeal against a critical-use nomination recommendation by MBTOC/TEAP | - | August, 2020 | |

| Tasks and actions | Indicative budget needs where applicable | Indicative completion date | Dates of meetings |
|---|---|---|---|
| • MBTOC meets to reassess only those critical-use nominations where additional information has been submitted by the nominating party and any critical-use nominations for which additional information has been requested by the Open-ended Working Group (see Annex I of MOP16, Dec XVI/4)<br>• Finalise the report, including notice of any proposed new standard presumptions to be applied by MBTOC<br>• Conduct any bilateral consultations requested by parties<br>• Draft work plan and budget for MBTOC for 2021 | Funds for travel of 1 non-A5 member*: US$3,000<br><br>Meeting costs: $US 3,000 | Late August-September 2020 | (tentative, may not be needed) |
| **12.** MBTOC drafts final report considered by TEAP, finalised and made available to parties through the Secretariat | - | September 2020 | |
| **13.** 32nd Meeting of the parties | | 23-27 November 2020 | To be confirmed) |
| **Total budget:** | **US $: 12,000***<br><br>US$ 6,000 (Travel of Non Article 5 member)<br>Meeting Costs $6,000 | | |

** Travel funds for non-A5 members have been requested in the past but not granted. Attendance of some non-A5 MBTOC members support is getting increasingly difficult due to lack of funding

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# ANNEX I: Decision IX/6. Critical use exemptions for methyl bromide

*1.* To apply the following criteria and procedure in assessing a critical methyl bromide use for the purposes of control measures in Article 2 of the Protocol:

(a) That a use of methyl bromide should qualify as "critical" only if the nominating party determines that:

(i) The specific use is critical because the lack of availability of methyl bromide for that use would result in a significant market disruption; and

(ii) There are no technically and economically feasible alternatives or substitutes available to the user that are acceptable from the standpoint of environment and health and are suitable to the crops and circumstances of the nomination;

(b) That production and consumption, if any, of methyl bromide for critical uses should be permitted only if:

(i) All technically and economically feasible steps have been taken to minimise the critical use and any associated emission of methyl bromide;

(ii) Methyl bromide is not available in sufficient quantity and quality from existing stocks of banked or recycled methyl bromide, also bearing in mind the developing countries' need for methyl bromide;

(iii) It is demonstrated that an appropriate effort is being made to evaluate, commercialise and secure national regulatory approval of alternatives and substitutes, taking into consideration the circumstances of the particular nomination and the special needs of Article 5 parties, including lack of financial and expert resources, institutional capacity, and information. Non-Article 5 parties must demonstrate that research programmes are in place to develop and deploy alternatives and substitutes. Article 5 parties must demonstrate that feasible alternatives shall be adopted as soon as they are confirmed as suitable to the party's specific conditions and/or that they have applied to the Multilateral Fund or other sources for assistance in identifying, evaluating, adapting and demonstrating such options;

2. To request the Technology and Economic Assessment Panel to review nominations and make recommendations based on the criteria established in paragraphs 1 (a) (ii) and 1 (b) of the present decision;

3. That the present decision will apply to parties operating under Article 5 and parties not so operating only after the phase-out date applicable to those parties.

Para. 2 of Decision IX/6 does not assign TEAP the responsibility for determining the existence of "significant market disruption" specified in paragraph 1a (i).

TEAP assigned its Methyl Bromide Technical Options Committee (MBTOC) to determine whether there are no technically and economically feasible alternatives or substitutes available to the user that are acceptable from the standpoint of environment and health and are suitable to the crops and circumstances of the nomination, and to address the criteria listed in Decision IX/6 1(b).

# ANNEX II: Decision Ex. I/4. Conditions for granting and reporting critical-use exemptions for methyl bromide

*Mindful* of the principles set forth in the report[1] by the chair of the informal consultation on methyl bromide held in Buenos Aires on 4 and 5 March 2004, namely, fairness, certainty and confidence, practicality and flexibility, and transparency,

*Recognizing* that technically and economically feasible alternatives exist for most uses of methyl bromide,

*Noting* that those alternatives are not always technically and economically feasible in the circumstances of nominations,

*Noting* that Article 5 and non-Article 5 parties have made substantial progress in the adoption of effective alternatives,

*Mindful* that exemptions must comply fully with decision IX/6 and are intended to be limited, temporary derogations from the phase-out of methyl bromide,

*Recognizing* the desirability of a transparent presentation of data on alternatives to methyl bromide to assist the parties to understand better the critical-use volumes and to gauge progress on and impediments to the transition from methyl bromide,

*Resolved* that each party should aim at significantly and progressively decreasing its production and consumption of methyl bromide for critical uses with the intention of completely phasing out methyl bromide as soon as technically and economically feasible alternatives are available,

*Recognizing* that parties should revert to methyl bromide only as a last resort, in the event that a technically and economically feasible alternative to methyl bromide which is in use ceases to be available as a result of de-registration or for other reasons,

3. That each party which has an agreed critical use under the present decision should submit available information to the Ozone Secretariat before 1 February 2005 on the alternatives available, listed according to their pre-harvest or post-harvest uses and the possible date of registration, if required, for each alternative; and on the alternatives which the parties can disclose to be under development, listed according to their pre-harvest or post-harvest uses and the likely date of registration, if required and known, for those alternatives, and that the Ozone Secretariat shall be requested to provide a template for that information and to post the said information in a database entitled “Methyl Bromide Alternatives” on its web site;

4. That each party which submits a nomination for the production and consumption of methyl bromide for years after 2005 should also submit information listed in paragraph 1 to the Ozone Secretariat to include in its Methyl Bromide Alternatives database and that any other party which no longer consumes methyl bromide should also submit information on alternatives to the Secretariat for inclusion in that database;

5. To request each party which makes a critical-use nomination after 2005 to submit a national management strategy for phase-out of critical uses of methyl bromide to the Ozone Secretariat before 1 February 2006. The management strategy should aim, among other things:

(a) To avoid any increase in methyl bromide consumption except for unforeseen circumstances;

(b) To encourage the use of alternatives through the use of expedited procedures, where possible, to develop, register and deploy technically and economically feasible alternatives;

(c) To provide information, for each current pre-harvest and post-harvest use for which a

[1] UNEP/OzL.Pro.ExMP/1/INF/1, para. 11.

nomination is planned, 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 such uses can be reduced and/or ultimately eliminated;

(d) To promote the implementation of measures which ensure that any emissions of methyl bromide are minimized;

(e) 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;

6. To request the Meeting of the parties to take into account information submitted pursuant to paragraphs 1 and 3 of the present decision when it considers permitting a party to produce or consume methyl bromide for critical uses after 2006;

7. To request a party that has submitted a request for a critical use exemption to consider and implement, if feasible, Technology and Economic Assessment Panel and Methyl Bromide Technical Options Committee recommendations on actions which a party may take to reduce critical uses of methyl bromide;

8. To request any party submitting a critical-use nomination after 2004 to describe in its nomination the methodology used to determine economic feasibility in the event that economic feasibility is used as a criterion to justify the requirement for the critical use of methyl bromide, using as a guide the economic criteria contained in section 4 of annex I to the present report;

9. To request each party from 1 January 2005 to provide to the Ozone Secretariat a summary of each crop or post-harvest nomination containing the following information:

(a) Name of the nominating party;

(b) Descriptive title of the nomination;

(c) Crop name (open field or protected) or post-harvest use;

(d) Quantity of methyl bromide requested in each year;

(e) Reason or reasons why alternatives to methyl bromide are not technically and economically feasible;

10. To request the Ozone Secretariat to post the information submitted pursuant to paragraph 7 above, categorized according to the year in which it was received, on its web site within 10 days of receiving the nomination;

11. To request the Technology and Economic Assessment Panel:

(a) To identify options which parties may consider for preventing potential harmful trade of methyl bromide stocks to Article 5 parties as consumption is reduced in non-Article 5 parties and to publish its evaluation in 2005 to enable the Seventeenth Meeting of the parties to decide if suitable mitigating steps are necessary;

(b) To identify factors which Article 5 parties may wish to take into account in evaluating whether they should either undertake new accelerated phase-out commitments through the Multilateral Fund for the Implementation of the Montreal Protocol or seek changes to already agreed accelerated phase-outs of methyl bromide under the Multilateral Fund;

(c) To assess economic infeasibility, based on the methodology submitted by the nominating party under paragraph 6 above, in making its recommendations on each critical-use nomination. The report by the Technology and Economic Assessment Panel should be made with a view to encouraging nominating parties to adopt a common approach in assessing the economic feasibility of alternatives;

(d) To submit a report to the Open-ended Working Group at its twenty-sixth session on the possible need for methyl bromide critical uses over the next few years, based on a review of the management strategies submitted by parties pursuant to paragraph 3 of the present decision;

(e) To review critical-use nominations on an annual basis and apply the criteria set forth in decision IX/6 and of other relevant criteria agreed by the parties;

(f) To recommend an accounting framework for adoption by the Sixteenth Meeting of the parties which can be used for reporting quantities of methyl bromide produced, imported and exported by parties under the terms of critical-use exemptions, and after the end of 2005 to request each party which has been granted a critical-use exemption to submit information together with its nomination using the agreed format;

(g) To provide, in consultation with interested parties, a format for a critical-use exemption report, based on the content of annex I to the present report, for adoption by the Sixteenth Meeting of the parties, and to request each party which reapplies for a methyl bromide critical-use exemption after the end of 2005 to submit a critical-use exemption report in the agreed format;

(h) To assess, annually where appropriate, any critical-use nomination made after the end of 2006 in the light of the Methyl Bromide Alternatives database information submitted pursuant to paragraph 1 of the present decision, and to compare, annually where appropriate, the quantity, in the nomination, of methyl bromide requested and recommended for each pre-harvest and post-harvest use with the management strategy submitted by the party pursuant to paragraph 3 of the present decision;

(i) To report annually on the status of re-registration and review of methyl bromide uses for the applications reflected in the critical-use exemptions, including any information on health effects and environmental acceptability;

(j) To report annually on the status of registration of alternatives and substitutes for methyl bromide, with particular emphasis on possible regulatory actions that will increase or decrease dependence on methyl bromide;

(k) To modify the handbook on critical-use nominations for methyl bromide to take the present decision and other relevant information into account, for submission to the Sixteenth Meeting of the parties.

# ANNEX III: Trends in Non-A5 Pre-plant Soil Nominations and Exemptions for Uses of MB reported to have been phased out

(Includes list of nominated (2005 – 2016) and exempted (2005 – 2016) amounts of MB granted by parties under the CUE process for each industry sector).

| Party | Industry | Total CUN MB Quantities | | | | | | | | | | | | Total CUE Quantities | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Australia | Cut Flowers – field | 40.000 | 22.350 | | | | | | | | | | | 18.375 | 22.350 | | | | | | | | | | |
| Australia | Cut flowers – protected | 20.000 | | | | | | | | | | | | 10.425 | | | | | | | | | | | |
| Australia | Cut flowers, bulbs – protected Vic | 7.000 | 7.000 | 6.170 | 6.150 | | | | | | | | | 7.000 | 7.000 | 3.598 | 3.500 | | | | | | | | |
| Australia | Strawberry Fruit | 90.000 | | | | | | | | | | | | 67.000 | | | | | | | | | | | |
| Australia | Strawberry runners | See Section 1.2.4 | | | | | | | | | | | | | | | | | | | | | | | |
| Belgium | Asparagus | 0.630 | 0.225 | | | | | | | | | | | 0.630 | 0.225 | | | | | | | | | | |
| Belgium | Chicory | 0.600 | 0.180 | | | | | | | | | | | 0.180 | 0.180 | | | | | | | | | | |
| Belgium | Chrysanthemums | 1.800 | 0.720 | | | | | | | | | | | 1.120 | | | | | | | | | | | |
| Belgium | Cucumber | 0.610 | 0.545 | | | | | | | | | | | 0.610 | 0.545 | | | | | | | | | | |
| Belgium | Cut flowers – other | 6.110 | 1.956 | | | | | | | | | | | 4.000 | 1.956 | | | | | | | | | | |
| Belgium | Cut flowers – roses | 1.640 | | | | | | | | | | | | | | | | | | | | | | | |
| Belgium | Endive (sep from lettuce) | | 1.650 | | | | | | | | | | | | 1.650 | | | | | | | | | | |
| Belgium | Leek & onion seeds | 1.220 | 0.155 | | | | | | | | | | | 0.660 | | | | | | | | | | | |
| Belgium | Lettuce(& endive) | 42.250 | 22.425 | | | | | | | | | | | 25.190 | | | | | | | | | | | |

| Party | Industry | Total CUN MB Quantities | | | | | | | | | | | | Total CUE Quantities | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Belgium | Nursery | Not Predictable | 0.384 | | | | | | | | | | | 0.900 | 0.384 | | | | | | | | | | |
| Belgium | Orchard pome & berry | 1.350 | 0.621 | | | | | | | | | | | 1.350 | 0.621 | | | | | | | | | | |
| Belgium | Ornamental plants | 5.660 | | | | | | | | | | | | 0.000 | | | | | | | | | | | |
| Belgium | Pepper & egg plant | 5.270 | 1.350 | | | | | | | | | | | 3.000 | 1.350 | | | | | | | | | | |
| Belgium | Strawberry runners | 3.400 | 0.900 | | | | | | | | | | | 3.400 | 0.900 | | | | | | | | | | |
| Belgium | Tomato (protected) | 17.170 | 4.500 | | | | | | | | | | | 5.700 | 4.500 | | | | | | | | | | |
| Belgium | Tree nursery | 0.230 | 0.155 | | | | | | | | | | | 0.230 | 0.155 | | | | | | | | | | |
| Canada | Strawberry runners (PEI) | See Section 1.2.4 | | | | | | | | | | | | | | | | | | | | | | | |
| Canada | Strawberry runners (Quebec) | | 1.826 | 1.826 | | | | | | | | | | (a) | 1.826 | 1.826 | | | | | | | | | |
| Canada | Strawberry runners (Ontario) | | | 6.129 | | | | | | | | | | | | 6.129 | | | | | | | | | |
| France | Carrots | 10.000 | 8.000 | 5.000 | | | | | | | | | | 8.000 | 8.000 | 1.400 | | | | | | | | | |
| France | Cucumber | 85 revised to 60 | 60.000 | 15.000 | | | | | | | | | | 60.000 | 60.000 | 12.500 | | | | | | | | | |
| France | Cut-flowers | 75.000 | 60.250 | 12.000 | | | | | | | | | | 60.000 | 52.000 | 9.600 | | | | | | | | | |
| France | Forest tree nursery | 10.000 | 10.000 | 1.500 | | | | | | | | | | 10.000 | 10.000 | 1.500 | | | | | | | | | |
| France | Melon | 10.000 | 10.000 | | | | | | | | | | | 7.500 | 6.000 | | | | | | | | | | |
| France | Nursery: orchard, raspberry | 5.000 | 5.000 | 2.000 | | | | | | | | | | 5.000 | 5.000 | 2.000 | | | | | | | | | |
| France | Orchard replant | 25.000 | 25.000 | 7.500 | | | | | | | | | | 25.000 | 25.000 | 7.000 | | | | | | | | | |

| Party | Industry | Total CUN MB Quantities | | | | | | | | | | | | Total CUE Quantities | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| France | Pepper | Inclin.tomato cun | 27.500 | 6.000 | | | | | | | | | | | 27.500 | 6.000 | | | | | | | | | |
| France | Strawberry fruit | 90.000 | 86.000 | 34.000 | | | | | | | | | | 90.000 | 86.000 | | | | | | | | | | |
| France | Strawberry runners | 40.000 | 4.000 | 35.000 | | | | | | | | | | 40.000 | 40.000 | 28.000 | | | | | | | | | |
| France | Tomato (and eggplant for 2005 only) | 150(all solanaceous) | 60.500 | 33.250 | | | | | | | | | | 125.000 | 48.400 | | | | | | | | | | |
| France | Eggplant | | 27.500 | 33.250 | | | | | | | | | | | 48.400 | | | | | | | | | | |
| Greece | Cucurbits | 30.000 | 19.200 | | | | | | | | | | | 30.000 | 19.200 | | | | | | | | | | |
| Greece | Cut flowers | 14.000 | 6.000 | | | | | | | | | | | 14.000 | 6.000 | | | | | | | | | | |
| Greece | Tomatoes | 180.000 | 73.600 | | | | | | | | | | | 156.000 | 73.600 | | | | | | | | | | |
| Israel | Broomrape | | | 250.000 | 250.000 | 125.000 | 12.500 | 12.500 | | | | | | | | 250.000 | 250.000 | 125.000 | 12.500 | | | | | | |
| Israel | Cucumber - protected new 2007 | | | 25.000 | 18.750 | | 18.750 | 12.500 | | | | | | | | 25.000 | 18.750 | - | 15.937 | | | | | | |
| Israel | Cut flowers – open field | 77.000 | 67.000 | 80.755 | 53.345 | 42.777 | 42.554 | 23.292 | | | | | | 77.000 | 67.000 | 74.540 | 44.750 | 34.698 | 28.554 | | | | | | |
| Israel | Cut flowers – protected | 303.000 | 303.000 | 321.330 | 163.400 | 113.821 | 72.266 | 52.955 | | | | | | 303.000 | 240.000 | 220.185 | 114.450 | 85.431 | 63.464 | | | | | | |
| Israel | Fruit tree nurseries | 50.000 | 45.000 | 10.000 | | | | | | | | | | 50.000 | 45.000 | 7.500 | | | | | | | | | |
| Israel | Melon – protected & field | 148.000 | 142.000 | 140.000 | 87.500 | 87.500 | 87.500 | 35.000 | | | | | | 125.650 | 99.400 | 105.000 | 87.500 | 87.500 | 70.000 | | | | | | |
| Israel | Potato | 239.000 | 231.000 | 137.500 | 93.750 | 75.000 | | | | | | | | 239.000 | 165.000 | 137.500 | 93.750 | 75.000 | | | | | | | |
| Israel | Seed production | 56.000 | 50.000 | | | 22.400 | | | | | | | | 56.000 | 28.000 | | | NR | | | | | | | |
| Israel | Strawberries – fruit (Sharon) | 196.000 | 196.000 | 176.200 | 64.125 | 52.250 | 47.500 | 28.500 | | | | | | 196.000 | 196.000 | 93.000 | 105.960 | 42.750 | | | | | | | |

| Party | Industry | Total CUN MB Quantities | | | | | | | | | | | | Total CUE Quantities | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Israel | Strawberries – fruit (Sharon &Ghaza) | | | | | | | | | | | | | | | | | | 57.063 | | | | | | |
| Israel | Strawberry runners (Sharon) | 35.000 | 35.000 | | 20.000 | 15.800 | 13.570 | 13.500 | | | | | | 35.000 | 35.000 | 28.000 | 31.900 | 15.825 | | | | | | | |
| Israel | Strawberry runners and fruit Ghaza | | | | 87.875 | 67.500 | 67.500 | 34.000 | | | | | | | | | | 47.250 | | | | | | | |
| Israel | Strawberry runners (Sharon &Ghaza) | | | | | | | | | | | | | | | | | | 22.320 | | | | | | |
| Israel | Tomatoes | | | 90.000 | | | | | | | | | | | | 22.750 | | | | | | | | | |
| Israel | Sweet potato | | | | | 95.000 | 20.000 | 20.000 | | | | | | | | | 111.500 | 95.000 | 20.000 | | | | | | |
| Italy | Cut flowers (protected) | 250.000 | 250.000 | 30.000 | | | | | | | | | | 250.000 | 187.000 | 30.000 | | | | | | | | | |
| Italy | Eggplant (protected) | 280.000 | 200.000 | 15.000 | | | | | | | | | | 194.000 | 156.000 | | | | | | | | | | |
| Italy | Melon (protected) | 180.000 | 135.000 | 10.000 | | | | | | | | | | 131.000 | 131.000 | 10.000 | | | | | | | | | |
| Italy | Pepper (protected) | 220.000 | 160.000 | 67.000 | | | | | | | | | | 160.000 | 130.000 | 67.000 | | | | | | | | | |
| Italy | Strawberry Fruit (Protected) | 510.000 | 400.000 | 35.000 | | | | | | | | | | 407.000 | 320.000 | | | | | | | | | | |
| Italy | Strawberry Runners | 100.000 | 120.000 | 35.000 | | | | | | | | | | 120.000 | 120.000 | 35.000 | | | | | | | | | |
| Italy | Tomato (protected) | 1300.000 | 1030.00 | 418.000 | | | | | | | | | | 871.000 | 697.000 | 80.000 | | | | | | | | | |
| Japan | Cucumber | 88.300 | 88.800 | 72.400 | 68.600 | 61.400 | 34.100 | 29.120 | 26.162 | | | | | 88.300 | 88.800 | 72.400 | 51.450 | 34.300 | 30.690 | 27.621 | | | | | |
| Japan | Ginger – field | 119.400 | 119.400 | 112.200 | 112.100 | 102.200 | 53.400 | 47.450 | 42.235 | | | | | 119.400 | 119.400 | 109.701 | 84.075 | 63.056 | 53.400 | 47.450 | | | | | |

| Party | Industry | Total CUN MB Quantities | | | | | | | | | | | | Total CUE Quantities | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Japan | Ginger – protected | 22.900 | 22.900 | 14.800 | 14.800 | 12.900 | 8.300 | 7.770 | 6.558 | | | | | 22.900 | 22.900 | 14.471 | 11.100 | 8.325 | 8.300 | 7.036 | | | | | |
| Japan | Melon | 194.100 | 203.900 | 182.200 | 182.200 | 168.000 | 90.800 | 77.600 | 67.936 | | | | | 194.100 | 203.900 | 182.200 | 136.650 | 91.100 | 81.720 | 73.548 | | | | | |
| Japan | Peppers (green and hot) | 189.900 | 200.700 | 169.400 | 162.300 | 134.400 | 81.100 | 68.260 | 61.101 | | | | | 187.200 | 200.700 | 156.700 | 121.725 | 81.149 | 72.990 | 65.691 | | | | | |
| Japan | Watermelon | 126.300 | 96.200 | 94.200 | 43.300 | 23.700 | 15.400 | 13.870 | 12.075 | | | | | 129.000 | 98.900 | 94.200 | 32.475 | 21.650 | 14.500 | 13.050 | | | | | |
| Malta | Cucumber | | 0.096 | | | | | | | | | | | | 0.127 | | | | | | | | | | |
| Malta | Eggplant | | 0.128 | | | | | | | | | | | | 0.170 | | | | | | | | | | |
| Malta | Strawberry | | 0.160 | | | | | | | | | | | | 0.212 | | | | | | | | | | |
| Malta | Tomatoes | | 0.475 | | | | | | | | | | | | 0.594 | | | | | | | | | | |
| New Zealand | Nursery material | 1.085 | 1.085 | | | | | | | | | | | | 0 | | | | | | | | | | |
| New Zealand | Strawberry fruit | 42.000 | 42.000 | 24.78 | | | | | | | | | | 42.000 | 34.000 | 12.000 | | | | | | | | | |
| New Zealand | Strawberry runners | 10.000 | 10.000 | 5.720 | | | | | | | | | | 8.000 | 8.000 | 6.234 | | | | | | | | | |
| Poland | Strawberry Runners | 40.000 | 40.000 | 25.000 | 12.000 | | | | | | | | | 40.000 | 40.000 | 24.500 | | | | | | | | | |
| Portugal | Cut flowers | 130.000 | 8.750 | | | | | | | | | | | 50.000 | 8.750 | | | | | | | | | | |
| Spain | Cut Flowers – Cadiz | 53.000 | 53.000 | 35.000 | | | | | | | | | | 53.000 | 42.000 | | | | | | | | | | |
| Spain | Cut Flowers – Catalonia | 20.000 | 18.600 | 12.840 | 17<br>(+Andalucia) | | | | | | | | | 20.000 | 15.000<br>(+Andalucia) | 43.490 | | | | | | | | | |
| Spain | Pepper | 200.000 | 155.000 | 45.000 | | | | | | | | | | 200.000 | 155.000 | 45.000 | | | | | | | | | |
| Spain | Strawberry Fruit | 556.000 | 499.290 | 80.000 | | | | | | | | | | 556.000 | 499.290 | 0.0796 | | | | | | | | | |
| Spain | Strawberry Runners | 230.000 | 230.000 | 230.000 | 215.000 | | | | | | | | | 230.000 | 230.000 | 230.000 | | | | | | | | | |
| UK | Cut flowers | | 7.560 | | | | | | | | | | | | 6.050 | | | | | | | | | | |
| UK | Ornamental tree nursery | 12.000 | 6.000 | | | | | | | | | | | 6.000 | 6.000 | | | | | | | | | | |

| Party | Industry | Total CUN MB Quantities | | | | | | | | | | | | Total CUE Quantities | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| UK | Strawberry (& raspberry in 2005) | 80.000 | 63.600 | | | | | | | | | | | 68.000 | 54.500 | | | | | | | | | | |
| UK | Raspberry nursery | | 4.400 | | | | | | | | | | | 4.400 | 54.500 | | | | | | | | | | |
| USA | Chrys. Cuttings/roses | 29.412 | | | | | | | | | | | | 29.412 | 0 | | | | | | | | | | |
| USA | Cucurbits – field | 1187.8 | 747.839 | 598.927 | 588.949 | 411.757 | 340.405 | 218.032 | 59.500 | 11.899 | | | | 1187.800 | 747.839 | 592.891 | 486.757 | 407.091 | 302.974 | 195.698 | 59.500 | | | | |
| USA | Eggplant – field | 76.761 | 101.245 | 96.48 | 79.546 | 62.789 | 34.732 | 21.561 | 6.904 | 1.381 | | | | 76.721 | 82.167 | 85.363 | 66.018 | 48.691 | 32.820 | 19.725 | 6.904 | | | | |
| USA | Forest nursery seedlings | 192.515 | 157.694 | 152.629 | 133.140 | 125.758 | 120.853 | 106.043 | | | | | | 192.515 | 157.694 | 122.032 | 131.208 | 122.060 | 117.826 | 93.547 | | | | | |
| USA | Ginger | 9.2 | | | | | | | | | | | | 9.2 | 0 | | | | | | | | | | |
| USA | Orchard replant | 706.176 | 827.994 | 405.415 | 405.666 | 314.007 | 226.021 | 203.591 | 18.324 | 6.230 | | | | 706.176 | 527.600 | 405.400 | 393.720 | 292.756 | 215.800 | 183.232 | 18.324 | | | | |
| USA | Ornamentals | 210.949 | 162.817 | 149.965 | 138.538 | 137.776 | 95.204 | 70.178 | 48.164 | 48.164 | | | | 154.000 | 148.483 | 137.835 | 138.538 | 107.136 | 84.617 | 64.307 | 48.164 | | | | |
| USA | Nursery stock - fruit trees, raspberries, roses | 45.789 | 64.528 | 12.684 | 51.102 | 27.663 | 17.954 | 7.955 | 1.591 | 0.541 | | | | 45.800 | 64.528 | 28.275 | 51.102 | 25.326 | 17.363 | 7.955 | 1.591 | | | | |
| USA | Peppers – field | 1094.782 | 1498.53 | 1151.751 | 919.006 | 783.821 | 463.282 | 212.775 | 28.366 | | | | | 1094.782 | 1243.542 | 1106.753 | 756.339 | 548.984 | 463.282 | 206.234 | | | | | |
| USA | Strawberry fruit – field | 2468.873 | 1918.40 | 1733.901 | 1604.669 | 1336.754 | 1103.422 | 1023.471 | 753.974 | 610.339 | 415.067 | 373.660 | 231.540 | 2052.846 | 1730.828 | 1476.019 | 1349.575 | 1269.321 | 1007.477 | 812.709 | 678.004 | 532.442 | 415.067 | 373.660 | 231.540 |
| USA | Strawberry runners | 54.988 | 56.291 | 4.483 | 8.838 | 8.837 | 7.381 | 7.381 | 3.752 | 3.752 | | | | 54.988 | 56.291 | 4.483 | 8.838 | 7.944 | 4.690 + 2.018 | 6.036 | 3.752 | | | | |
| USA | Tomato – field | 2876.046 | 2844.985 | 2334.047 | 1840.1 | 1406.484 | 994.582 | 336.191 | 54.423 | 10.741 | | | | 737.584 | 2476.365 | 2065.246 | 1406.484 | 1003.876 | 737.584 | 292.751 | 54.423 | | | | |
| USA | Turfgrass | 352.194 | 131.600 | 78.040 | 52.189 | 0 | | | | | | | | | 131.600 | 78.04 | 0 | | | | | | | | |

| Party | Industry | Total CUN MB Quantities | | | | | | | | | | | | Total CUE Quantities | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| USA | Sweet potato | 224.528 | | | 18.144 | 18.144 | 18.144 | 14.515 | 8.709 | | | | | | | | 18.144 | 18.144 | 14.515 | 11.612 | | | | | |
| USA | Research | | | | | | | | 2.768 | 2.768 | | | | | | | | | | | | | | | |

# ANNEX IV: Trends in Non-A5 Structural and Commodity Nominations and Exemptions for Uses of MB reported to have been phased out

(Includes list of nominated (2005 – 2016) and exempted (2005 – 2016) amounts of MB granted by parties under the CUE process for each industry sector)

| Party | Industry | Total CUN MB Quantities | | | | | | | | | | | | Total CUE Quantities | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Australia | Almonds | 1.900 | 2.100 | | | | | | | | | | | 1.900 | 2.100 | | | | | | | | | | |
| Australia | Rice consumer packs | 12.300 | 12.300 | 10.225 | 9.200 +1.8 | 9.2 | 7.82 | 5.66 | 3.653 | 2.374 | 1.187 | 1.187 | | 6.150 | 6.150 | 9.205 | 9.200 | 7.820 | 6.650 | 4.870 | 3.653 | 1.187 | 1.187 | | |
| Belgium | Artefacts and structures | 0.600 | 0.307 | | | | | | | | | | | 0.590 | 0.307 | | | | | | | | | | |
| Belgium | Antique structure & furniture | 0.750 | 0.199 | | | | | | | | | | | 0.319 | 0.199 | | | | | | | | | | |
| Belgium | Churches, monuments and ships' quarters | 0.150 | 0.059 | | | | | | | | | | | 0.150 | 0.059 | | | | | | | | | | |
| Belgium | Electronic equipment | 0.100 | 0.035 | | | | | | | | | | | 0.100 | 0.035 | | | | | | | | | | |
| Belgium | Empty silo | 0.050 | 0.043 | | | | | | | | | | | 0.050 | 0.043 | | | | | | | | | | |
| Belgium | Flour mill see mills below | 0.125 | 0.072 | | | | | | | | | | | See mills below | 0.072 | | | | | | | | | | |
| Belgium | Flour mills | 10.000 | 4.170 | | | | | | | | | | | 9.515 | 4.170 | | | | | | | | | | |
| Belgium | Mills | 0.200 | 0.200 | | | | | | | | | | | 0.200 | 0.200 | | | | | | | | | | |
| Belgium | Food processing facilities | 0.300 | 0.300 | | | | | | | | | | | 0.300 | 0.300 | | | | | | | | | | |
| Belgium | Food Processing premises | 0.030 | 0.030 | | | | | | | | | | | 0.030 | 0.030 | | | | | | | | | | |

| Party | Industry | Total CUN MB Quantities | | | | | | | | | | | | Total CUE Quantities | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Belgium | Food storage (dry) structure | 0.120 | 0.120 | | | | | | | | | | | 0.120 | 0 | | | | | | | | | | |
| Belgium | Old buildings | 7.000 | 0 .306 | | | | | | | | | | | 1.150 | 0.306 | | | | | | | | | | |
| Belgium | Old buildings and objects | 0.450 | 0.282 | | | | | | | | | | | 0 | 0.282 | | | | | | | | | | |
| Belgium | Woodworking premises | 0.300 | 0.101 | | | | | | | | | | | 0.300 | 0.101 | | | | | | | | | | |
| Canada | Flour mills | 47.200 | 34.774 | 30.167 | 28.650 | 26.913 | 22.878 | 14.107 | 11.020 | 7.848 | 5.044 | **5.044** | | (a)47 | 34.774 | 30.167 | 28.65 | 26.913 | 22.878 | 14.107 | 11.020 | 5.044 | **5.044** | | |
| Canada | Pasta manufacturing facilities | (a) | 10.457 | 6.757 | 6.067 | 4.740 | 4.740 | 2.084 | | | | | | (a) | 10.457 | 6.757 | 6.067 | 4.740 | 3.529 | | | | | | |
| Canada | Commodities | | | | | 0.068 | | | | | | | | | | | | | | | | | | | |
| France | Seeds sold by PLAN-SPG company | 0.135 | 0.135 | 0.100 | | | | | | | | | | 0.135 | 0.135 | 0.096 | | | | | | | | | |
| France | Mills | 55.000 | 40.000 | 8.000 | | | | | | | | | | 40.000 | 35.000 | 8.000 | | | | | | | | | |
| France | Rice consumer packs | 2.000 | 2.000 | | | | | | | | | | | 2.000 | 2.000 | | | | | | | | | | |
| France | Chestnuts | 2.000 | 2.000 | 1.800 | | | | | | | | | | 2.000 | 2.000 | 1.800 | | | | | | | | | |
| Germany | Artefacts | 0.250 | 0.100 | | | | | | | | | | | 0.250 | 0.100 | | | | | | | | | | |
| Germany | Mills and Processors | 45.000 | 19.350 | | | | | | | | | | | 45.000 | 19.350 | | | | | | | | | | |
| Greece | Dried fruit | 4.280 | 3.081 | 0.900 | | | | | | | | | | 4.280 | 3.081 | 0.450 | | | | | | | | | |
| Greece | Mills and Processors | 23.000 | 16.000 | 1.340 | | | | | | | | | | 23.000 | 15.445 | 1.340 | | | | | | | | | |
| Greece | Rice and legumes | | 2.355 | | | | | | | | | | | | 2.355 | | | | | | | | | | |
| Ireland | Mills | | 0.888 | 0.611 | | | | | | | | | | | 0.888 | | | | | | | | | | |

| Party | Industry | Total CUN MB Quantities | | | | | | | | | | | | Total CUE Quantities | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Israel | Artefacts | 0.650 | 0.650 | 0.600 | | | | | | | | | | 0.650 | 0.6500 | | | | | | | | | | |
| Israel | Dates (post harvest) | 3.444 | 3.444 | 2.200 | 1.800 | 2.100 | | | | | | | | 3.444 | 2.755 | 2.200 | 1.800 | 2.100 | 1.040 | | | | | | |
| Israel | Flour mills (machinery & storage) | 2.140 | 1.490 | 1.490 | 0.800 | 0.300 | | | | | | | | 2.140 | 1.490 | 1.040 | 0.312 | 0.300 | | | | | | | |
| Israel | Furniture– imported | 1.4220 | 1.4220 | 2.0420 | | | | | | | | | | 1.4220 | 0 | | | | | | | | | | |
| Italy | Artefacts | 5.500 | 5.500 | 5.000 | | | | | | | | | | 5.225 | 0 | 5.000 | | | | | | | | | |
| Italy | Mills and Processors | 160.000 | 130.000 | 25.000 | | | | | | | | | | 160.000 | 65.000 | 25.000 | | | | | | | | | |
| Japan | Chestnuts | 7.100 | 6.500 | 6.500 | 6.300 | 5.800 | 5.400 | 5.350 | 3.489 | 3.317 | | | | 7.100 | 6.800 | 6.500 | 6.300 | 5.800 | 5.400 | 5.350 | 3.489 | | | | |
| Latvia | Grains | | 2.502 | | | | | | | | | | | | 2.502 | | | | | | | | | | |
| Netherlands | Strawberry runners post harvest | | 0.120 | 0.120 | | 0.120 | | | | | | | | | 0 | 0.120 | | | | | | | | | |
| Poland | Medicinal herbs & dried mushrooms as dry commodities | 4.000 | 3.560 | 1.800 | 0.500 | | | | | | | | | 4.100 | 3.560 | 1.800 | 1.800 | | | | | | | | |
| Poland | Coffee, cocoa beans | (a) | 2.160 | 2.000 | 0.500 | | | | | | | | | | 2.160 | 1.420 | 1.420 | | | | | | | | |
| Spain | Rice | | 50.000 | | | | | | | | | | | | 42.065 | | | | | | | | | | |
| Switzerland | Mills & Processors | 8.700 | 7.000 | | | | | | | | | | | 8.700 | 7.000 | | | | | | | | | | |
| UK | Aircraft | | | 0.165 | | | | | | | | | | | | 0.165 | | | | | | | | | |
| UK | Mills and Processors | 47.130 | 10.195 | 4.509 | | | | | | | | | | 47.130 | 10.195 | 4.509 | | | | | | | | | |
| UK | Cereal processing plants | | 8.131 | 3.480 | | | | | (a) | | | | | | 8.131 | | | | | | | | | | |
| UK | Cheese stores | 1.640 | 1.248 | 1.248 | | | | | | | | | | 1.640 | 1.248 | 1.248 | | | | | | | | | |

| Party | Industry | Total CUN MB Quantities | | | | | | | | | | | | Total CUE Quantities | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| UK | Dried commodities (rice, fruits and nuts) Whitworths | 2.400 | 1.256 | | | | | | | | | | | 2.400 | 1.256 | | | | | | | | | | |
| UK | Herbs and spices | 0.035 | 0.037 | 0.030 | | | | | | | | | | 0.035 | 0.037 | | | | | | | | | | |
| UK | Mills and Processors (biscuits) | 2.525 | 1.787 | 0.479 | | | | | | | | | | 2.525 | 1.787 | | | | | | | | | | |
| UK | Spices structural equip. | 1.728 | | | | | | | | | | | | 1.728 | 0 | 0.479 | | | | | | | | | |
| UK | Spices stored | 0.030 | | | | | | | | | | | | 0.030 | 0 | | | | | | | | | | |
| UK | Structures buildings (herbs and spices) | 3.000 | 1.872 | 0.908 | | | | | | | | | | 3.000 | 1.872 | 0.908 | | | | | | | | | |
| UK | Structures, processors and storage (Whitworths) | 1.100 | 0.880 | 0.257 | | | | | | | | | | 1.100 | 0.880 | 0.257 | | | | | | | | | |
| UK | Tobacco equipment | 0.523 | | | | | | | | | | | | 0.050 | | | | | | | | | | | |
| UK | Woven baskets | 0.770 | | | | | | | | | | | | 0.770 | | | | | | | | | | | |
| USA | Dried fruit and nuts (walnuts, pistachios, dried fruit and dates and dried beans) | 89.166 | 87.719 | 91.299 | 67.699 | 58.912 | 19.242 | 10.041 | 2.419 | 0.822 | 0.740 | 0.310 | | 89.166 | 87.719 | 78.983 | 58.921 | 45.623 | 19.242 | 5.000 | 2.419 | 0.740 | 0.740 | | |

| Party | Industry | Total CUN MB Quantities | | | | | | | | | | | | Total CUE Quantities | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| USA | Dry commodities/ structures (cocoa beans) | 61.519 | 61.519 | 64.028 | 52.256 | 51.002 | | | | | | | | 61.519 | 55.367 | 64.082 | 53.188 | | | | | | | | |
| USA | Dry commodities/ structures (processed foods, herbs and spices, dried milk and cheese processing facilities) NPMA | 83.344 | 83.344 | 85.801 | 72.693 | 66.777 | 37.778 | 17.365 | 0.200 | | | | | 83.344 | 69.118 | 82.771 | 69.208 | 54.606 | 37.778 | 17.365 | | | | | |
| USA | Smokehouse hams (Dry cure pork products) (building and product) | 136.304 | 135.742 | 40.854 | 19.669 | 19.699 | 4.465 | 3.730 | 3.730 | 3.730 | 3.730 | 3.730 | 3.240 | 67.907 | 81.708 | 18.998 | 19.699 | 18.998 | 4.465 | 3.730 | 3.730 | 3.730 | 3.730 | 3.730 | 3.240 |
| USA | Mills and Processors | 536.328 | 505.982 | 401.889 | 362.952 | 291.418 | 173.023 | 135.299 | 74.51 | 25.334 | 22.800 | | | 483.000 | 461.758 | 401.889 | 348.237 | 291.418 | 173.023 | 135.299 | 74.510 | 22.800 | **22.800** | | |
| USA | Research | | | | | | | | 0.159 | 0.159 | | | | | | | | | | | | | | | |