MONTREAL PROTOCOL

ON SUBSTANCES THAT DEPLETE

THE OZONE LAYER

UNEP

REPORT OF THE
TECHNOLOGY AND ECONOMIC ASSESSMENT PANEL

VOLUME 4

MAY 2018

EVALUATION OF 2018 CRITICAL USE NOMINATIONS FOR METHYL BROMIDE AND RELATED MATTERS

INTERIM REPORT

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The text of this report is composed in Times New Roman.

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Reproduction: UNON Nairobi

Date: May 2018

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UNITED NATIONS ENVIRONMENT PROGRAMME
Ozone Secretariat, P.O. Box 30552, Nairobi, Kenya

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ISBN: 978-9966-076-39-7

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Acknowledgement

The Technology and Economic Assessment Panel and its Methyl Bromide Technical Options Committee acknowledge with thanks the outstanding contributions from all of the individuals and organisations who provided support to Panel and Committee Co-Chairs and members. The opinions expressed are those of the Panel and the Committee and do not reflect the reviews of any sponsoring or supporting organisation.

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MAY 2018 REPORT OF THE TECHNOLOGY AND ECONOMIC ASSESSMENT PANEL

EVALUATION OF 2018 CRITICAL USE NOMINATIONS FOR METHYL BROMIDE AND RELATED MATTERS

INTERIM REPORT

MBTOC INTERIM CUN REPORT – MAY 2018

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

2018 Evaluation of Critical Use Nominations for Methyl Bromide and Related Matters – Interim Report

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2018 Evaluation of Critical Use Nominations for Methyl Bromide and Related Matters

1.0 Executive Summary

Since 2005 the amount of MB requested for critical use nominations has fallen from 18,700 t to 150 t for 2019/2020.

In 2018, MBTOC received six nominations for critical use from four Parties for use of 123.761 tonnes of methyl bromide (MB) in 2019 (five nominations) and 28.98 tonnes in 2020 (one nomination).

The request over the two years is a 48% reduction of the request for critical use nominations submitted in 2017.

The majority of the request (69%) was for preplant soil use against soilborne fungal pathogens, nematodes and weeds and the remaining 31% for structure and commodity uses against insect pests.

MBTOC made interim recommendations for all nominations for 102.355 tonnes, with reductions made to the nominated quantity of MB for all nominations as alternatives or modifications were considered possible which reduced the quantity required for the nomination.

China, which indicated its intent not to apply for CUNs last year, did not apply for any CUNs in this round.

The accounting framework information received from parties reporting under Article 7 showed that a total of 24.285 tonnes of stocks have been reported to be available in both non-Article 5 (non-A5) and Article 5 (A5) at the end of 2017. 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 estimates these stocks may be substantial (>2,000 tonnes).

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.

1.1 Scope of the Report

The 2018 interim report provides evaluations by MBTOC of Critical Use Nominations (CUNs) for methyl bromide (MB) submitted for 2018 and 2019 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) interim recommendations for the CUNs for which the Parties provided information as per the timelines set at the 26th 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 in 2018 were the same as those used in the 2017 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.

1.2 Critical Use Nominations for Methyl Bromide

1.2.1 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 1st January 2005. The same requirements applied to Parties operating under Article 5(1) (A5 Parties) after 1st January 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 and XXIX/6).

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*'

1.2.2 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 16th Meeting 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. 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, and 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, 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.

1.2.3 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 2018 round, all Parties nominating CUEs submitted Accounting Frameworks. The Frameworks showed that there were approximately 6 tonnes 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 estimates these stocks may be substantial (>2,000 tonnes)

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 2017, the Meeting of the Parties (MOP) authorised Australia to use 29.76 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 2017, the MOP authorised 5.261 t for strawberry runners and the Party reported that 5.166 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 38.84 t for strawberry fruit and 64.10 t for tomatoes in Argentina; 74.617 t and 18.360 t for open fields and in protected cropping of ginger in China respectively and 59.1 t for Mills (55 t) and structures (4.1 t) in South Africa and 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 plans were received from Argentina or South Africa.

1.2.4 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 2017 for all uses.

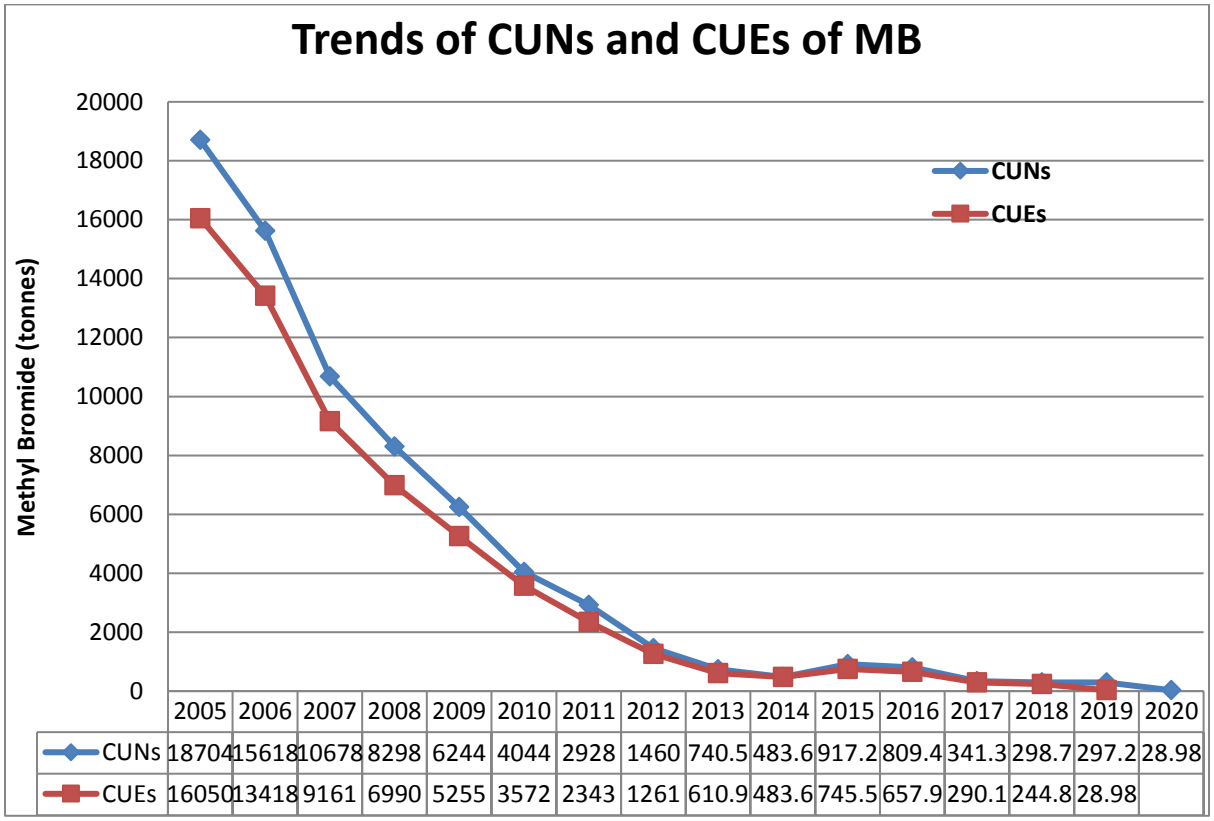
Fig 1-2 shows the reduction trend for the remaining soil uses in both non-A5 Parties (strawberry runners, Canada and Australia) and Figs 1-3 and 1-4 the current and past pre-plant soil and commodity uses in A5 Parties (Argentina, China, Mexico and Republic of South Africa) since 2015. The complete trends 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 countries 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.

1.2.5 Disclosure of Interest

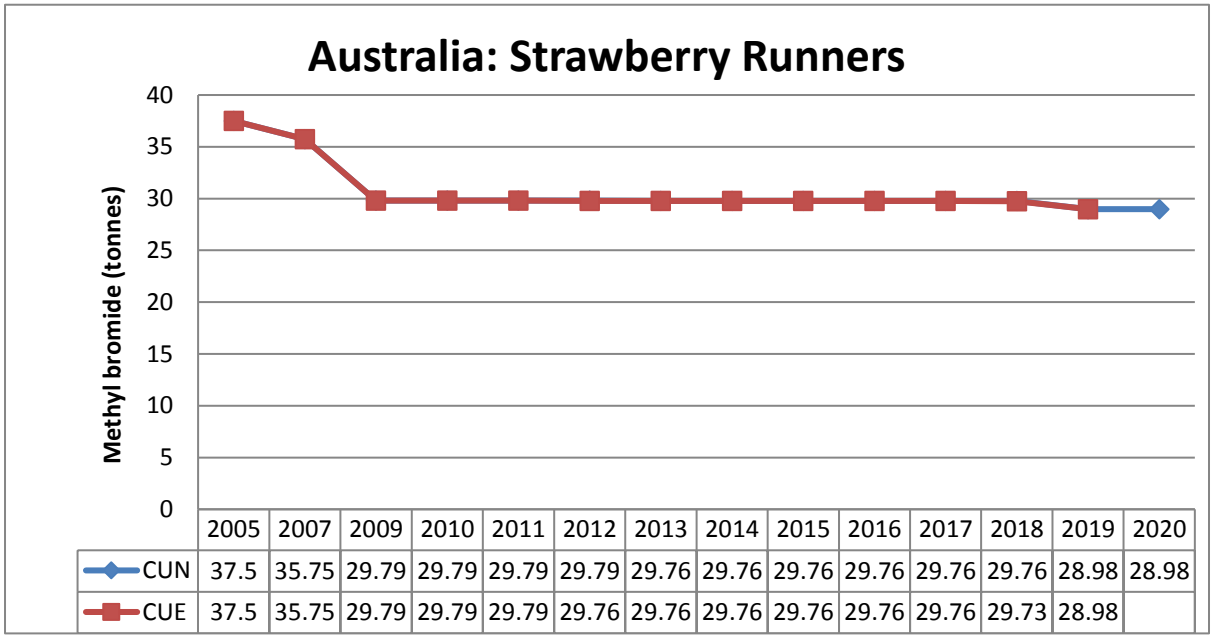
As in past assessments, MBTOC members were requested to update their disclosure of interest forms relating specifically to their level of national, regional or enterprise involvement for the 2017 CUN process. The Disclosure of Interest declarations for 2018, updated in February 2018 can be found on the Ozone Secretariat website at: http://ozone.unep.org/en/assessment-panels/383/disclosure-interest?field_subsidiary_body=391 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 preplant soil and commodities sectors from 2005 to 2020 by non-A5 and A5 countries

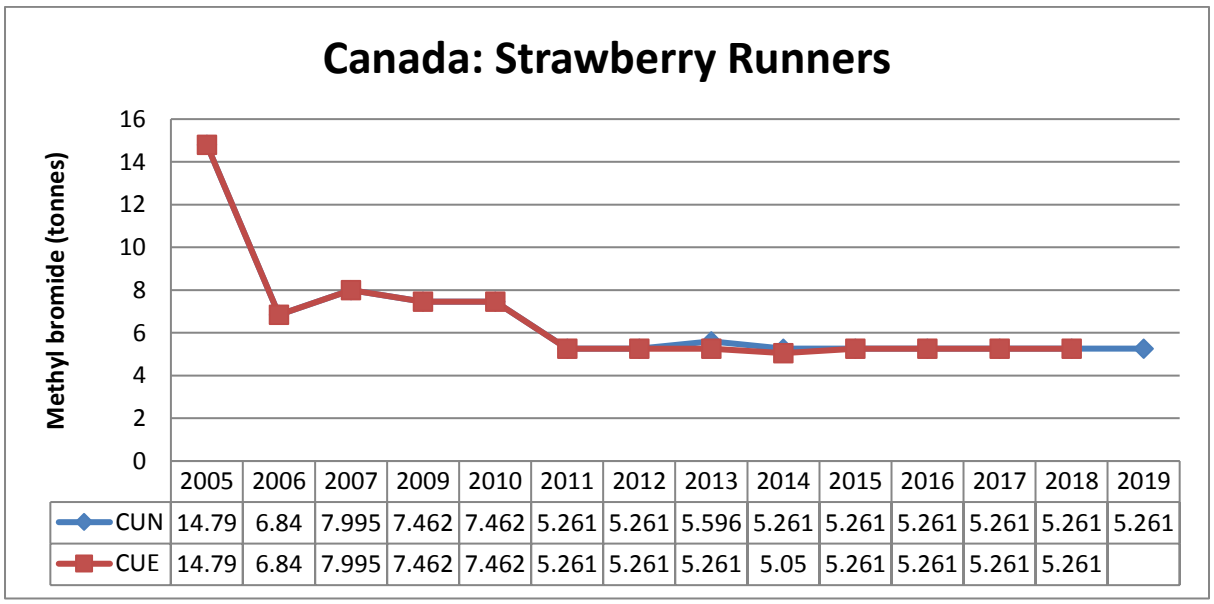


	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
CUNs	18704	15618	10678	8298	6244	4044	2928	1460	740.5	483.6	917.2	809.4	341.3	298.7	297.2	28.98
CUEs	16050	13418	9161	6990	5255	3572	2343	1261	610.9	483.6	745.5	657.9	290.1	244.8	28.98	

Figure 1.2. Amounts of MB nominated and exempted for CUE uses in nominated preplant soil sectors from 2005 to 2020 or 2019 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



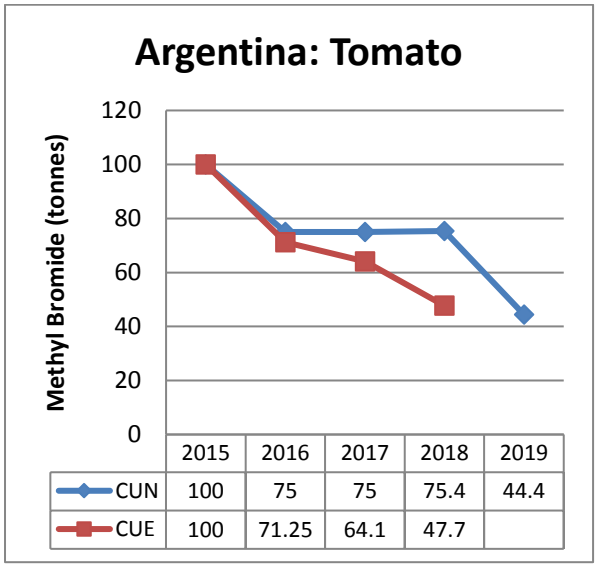
	2005	2007	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
CUN	37.5	35.75	29.79	29.79	29.79	29.79	29.76	29.76	29.76	29.76	29.76	29.76	28.98	28.98
CUE	37.5	35.75	29.79	29.79	29.79	29.76	29.76	29.76	29.76	29.76	29.76	29.73	28.98	

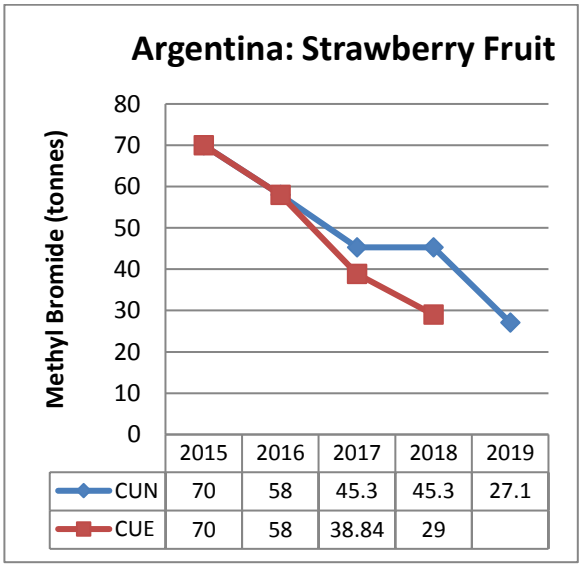


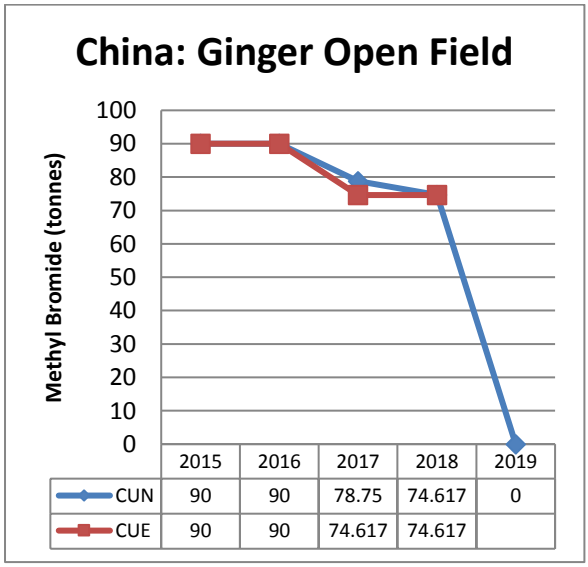
	2005	2006	2007	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
CUN	14.79	6.84	7.995	7.462	7.462	5.261	5.261	5.596	5.261	5.261	5.261	5.261	5.261	5.261
CUE	14.79	6.84	7.995	7.462	7.462	5.261	5.261	5.261	5.05	5.261	5.261	5.261	5.261	

* Prince Edward Island

Figure 1.3. Amounts of MB nominated and exempted for CUE uses in nominated preplant soil sectors from 2015 to 2019 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







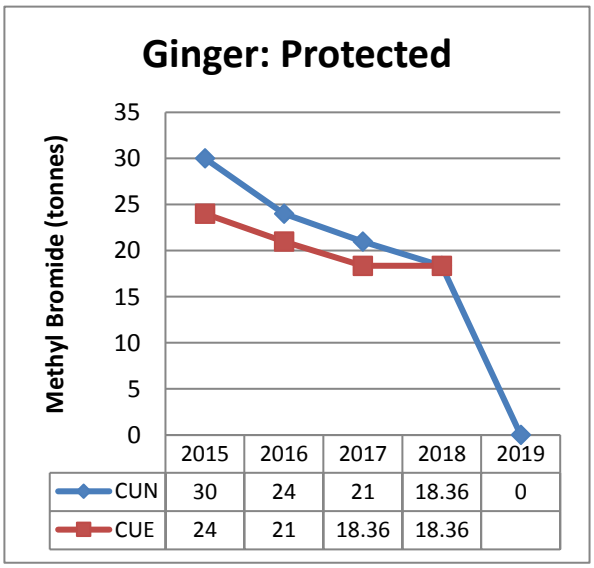
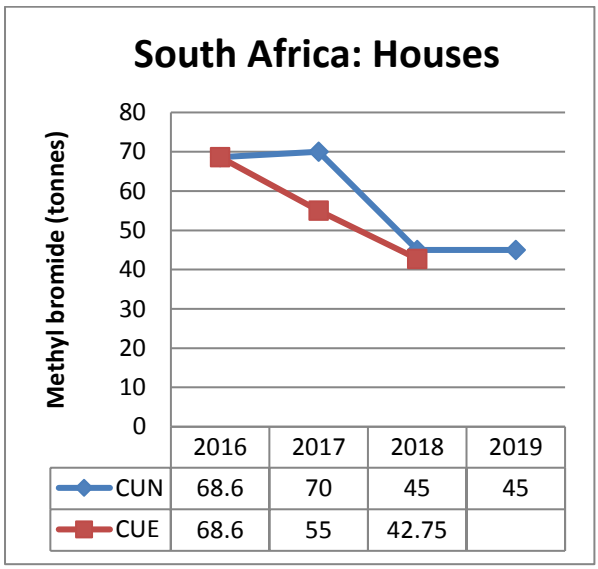
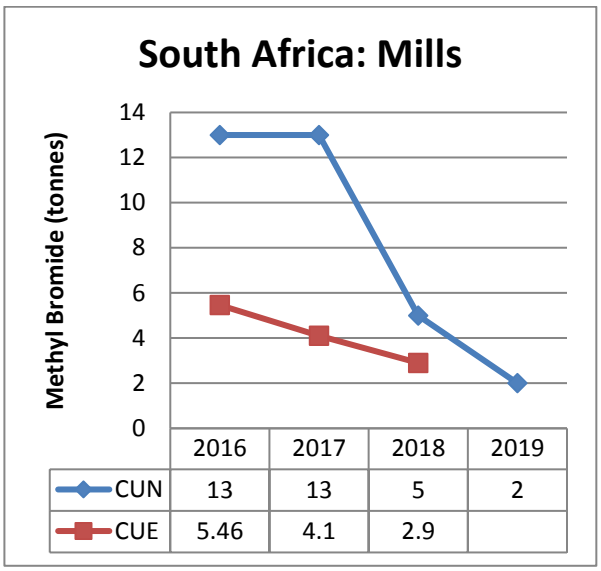


Figure 1.4. Amounts of MB nominated and exempted for CUE uses in structural and commodity uses from 2015 to 2019 by A5 countries: South Africa (RSA). Blue lines indicate the trend in MB amounts nominated in the CUN and the red lines the amount of MB approved as a CUE by the Parties





1.2.6 Article 5 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 2017, over 98% of the global consumption for non-exempt uses has been phased out. In A5 Parties, 91.5% of previous controlled uses had been replaced, ahead and in time for the 2015 deadline. This was achieved 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 all 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 there may be uses of MB for which there is no apparent reporting.

As previously reported by MBTOC, there appears to be a discrepancy, possibly up to 15,000 t in the emissions determined from the natural and reported uses for controlled uses and the global emissions of methyl bromide (See TEAP Progress Report, 2017). If uses are unreported they could impact the number of critical uses nominated in the future.

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.

1.2.6.1. 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;*

1.2.7 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 amount of methyl bromide 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 the 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 2016 and 2017 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, 2016 and 2017 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.

Party	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 tonnes; 2005 = 9,974 tonnes.

Table 1.2. Quantities of MB 'on hand' at the beginning and end of 2016, as reported by Parties in 2017

Party	Critical use exemption authorized by MOP for 2016	Quantity of MB as reported by Parties (metric tonnes)				
		Amount on hand at start of 2016	Acquired for CUEs in 2016 (prod.+imports)	Amount available for use in 2016	Used for CUEs in 2016	Amount on hand at the end of 2016
Australia	29.76	0	29.75	29.75	29.75	0
Canada	5.261	1.349	4.349	5.598	4.844	0.854
Argentina	129.25	0	129.15	129.15	129.15	0
China	99.75	0	99.75	99.75	99.75	0
RSA	74.062	32	74.062	106.062	65.94	26*
USA	141	137#	130	267	130	50.0

**RSA MB stock amount at end of 2016 being clarified*

Table 1.3. 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	0.854	5.177	6.031	5.166	0.865
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 1-4a. Summary of Critical Use Nominations of Methyl Bromide (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**
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
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	
EC	5754.361	4213.47	1239.873	245.00	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	
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	
New Zealand	53.085	53.085	32.573	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	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	
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**	**[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	
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		
EC	4392.812	3536.755	689.142	245.146	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		
Japan	748.000	741.400	636.172	443.775	305.380	267.000	239.746	219.609	3.317	0	0	0	0	0		
New Zealand	50.000	42.000	18.234	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		
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		
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**	**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**	**2015**	**2016**	**2017**	**2018**	**2019**
Argentina	245	177.0	120.3	120.7	71.5	134.3	129.25	102.94	76.70	
China	120	114.0	99.75	92.977	0	114.0	99.75	92.977	87.24	
Mexico	140	120.978	0	0	0	84.96	84.957	0	0	
South Africa	-	81.6	83.0	50.0	47.0	-	74.062	59.10	45.65	
Total	**505**	**411.978**	**303.05**	**263.677**	**118.50**	**333.26**	**388.019**	**255.017**	**209.59**	

1.3 Evaluations of CUNs in the 2018 Round for 2019 and 2020 Exemptions

All Parties requesting CUNs in 2018 for critical use exemptions in 2019 or 2020 sent information to the Ozone Secretariat around the January 24, 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 preplant 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. With respect to A5 Parties, Argentina submitted CUNs for the strawberry fruit (open field) and tomato sectors (protected). China who applied for CUNs for protected and field production of ginger in previous years did not apply for any CUNs in this round.

For MB use in the postharvest and structure sectors, two CUNs were received from South Africa for Mills and House disinfestation.

The total nominated amount for all countries for 2019 was 123.761 tonnes of which MBTOC made an interim recommendation for 76.275 tonnes and for 2020 an amount of 28.98 t of which MBTOC recommended 26.08 t (Tables 1.5,and 1.11).

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 Party's economic statement relating to CUNs. Tables 1.10 and 1.12 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.

1.3.1 Critical Use Nomination Review Process

Detailed interim assessments of all CUNs were conducted by MBTOC at a meeting in Melbourne, Australia from 5-9 March, 2018. The meeting was held in accordance with the time schedule for the consideration of CUNs as required by Decision XVI/4 (see Annex 1). The majority (15 out of 16) of MBTOC members with expertise in soils, SC and QPS applications of methyl bromide attended the meeting. MBTOC worked as a single committee, not in sub-committees. The co-chairs appointed working groups to address the different tasks assigned to MBTOC including CUNs, the annual Progress Report and preliminary preparation of the 2018 Assessment Report. Recommendations were discussed and signed off in plenary and by consensus. This scheme 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.

MBTOC conducted a field visit to a strawberry runner production facility requiring pre-plant soil fumigation and was presented with extensive information on research presently underway to test a range of alternatives. During the meeting in Melbourne, presentations were given by the industry on recapture and recycling of methyl bromide from post-harvest applications. MBTOC also held a bilateral meeting with the Canadian delegation to further clarify the particular circumstances of their CUN.

In assessing the CUNs submitted in 2018, as in previous rounds, MBTOC applied as much as possible the standards contained in Annex I of the final report of the 16thMOP 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 the certification accreditation requirements for the grain mills requesting a CUE did not specifically require the use of methyl bromide. Similarly, methyl bromide fumigation is 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, a requirement when selling a house there.

The outcome of evaluations of CUNs for the soil and structural treatments are presented in Table 1.9 - – 1.12 below.

1.3.2 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 meeting.

Several 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). Recusals took place either as a result of a member's disclosure in observance of MBTOC's guidelines or due to a voluntary self-recusal to avoid any perceived conflict of interest.

1.4 Interim Evaluation of 2018 Critical Use Nominations for Methyl Bromide for Preplant soil use in 2019 and 2020

1.4.1 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, the Australian nomination was reduced by 10% as it was considered that the Party could expand adoption of soilless substrates, partially replacing the MB requested in the CUN. The Canadian nomination was reduced by 10% as substrate technologies are considered suitable for a proportion of the nomination. The Argentinean tomato and strawberry nominations were reduced because it was considered that dosage rates could be reduced to conform with MBTOC's standard presumptions, with barrier films.

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

Table 1-5. Summary of the interim recommendations (in square brackets) for CUE's for preplant use of MB (tonnes) submitted in 2018 for 2019 or 2020 use

Country and Sector	Article 5 Parties		Non A5 Parties	
	Nomination by Party for 2019	**Interim Recommendation for 2019**	**Nomination by the Party for 2020**	**Interim Recommendation for 2020**
1. Australia (2020) Strawberry runners			28.98	[26.08]
2. Canada (2019) Strawberry runners			5.261	[4.735]
3. Argentina Strawberry fruit Tomato	27.10 44.40	[15.71] [25.60]		
TOTAL	**71.50**	**[41.31]**	**34.241**	**[30.815]**

1.4.2 Issues Related to CUN Assessment for Preplant Soil Use

Key issues which influenced assessment and the need for MB for preplant soil use of MB in the 2018 round were:

i) For all nominations, except Australia, barrier films were considered as a technology to reduce rates and emissions of methyl bromide. For Australia, the Party presented data illustrating that heavy soil types trap methyl bromide as effectively with LDPE films as barrier films under the circumstances of the nomination.

ii) The Australian research program is trialling many options for replacement of MB in strawberry runner production.

iii) The Canadian nomination has 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 unclear. 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 recommended adoption on a proportion of the nomination.

iv) 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.

MBTOC acknowledges Argentina's review of a Decree which presently prevents use of chemical alternatives, but this situation is expected to change. A key pest of tomato, the *Nacobbus* (false root-knot) nematode is requiring specific consideration as no resistant varieties or highly resistant rootstocks with good commercial potential have been identified for this pest.

MBTOC acknowledges that China has not submitted CUNs in this round and has phased out MB for all controlled uses.

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

1.4.3 General Comments on the Assessment for Preplant 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 several cases, the mandatory use of MB is specified at a high dosage, in some cases 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 preplant soil use.

1.4.4 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 16thMOP, as this information would assist MBTOC in its evaluation of these CUNs.

1.4.5 Decision XXV/4

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.

1.4.5.1 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.

- **Canada**: Groundwater warning statements are currently on Canadian pesticide labels for all key fumigants including MB, but the government of PEI only allows 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, however this is expected to change in the near future.

- **South Africa**: Sulfuryl fluoride received registration for mills and houses in January 2018. EDN registration is under consideration.

1.4.5.2 Health effects of MB use and environmental acceptability

Over the past two decades numerous studies have characterized 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 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-Article 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. This practice is not considered as effective for pathogens' control as injection of MB/Pic mixtures and also can lead to high emissions of MB as the gas is released immediately beneath the plastic sheets. MB also notes that in some circumstances, MB can sometimes leak out from the canister. MBTOC notes with concern that canister use is still allowed for preplant use and /or quarantine uses in a number of A5 countries e.g. China, Egypt, Jordan and Mexico, sometimes including for QPS situations.

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

1.4.6 Sustainable Alternatives for Preplant 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.

1.4.7 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 preplant soil uses. These standard presumptions were first proposed in the MBTOC report of October 2005 and were presented to the Parties at the 17th 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 19th 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 studies have shown that rates of 200 kg/ha (20g/m^2) or less of MB: Pic 50:50 are 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 may involve regulations which specify the mandatory use of a 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 Preplant 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 preplant 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

1.4.8 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 soilborne 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 preplant 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*

1.4.9 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 preplant 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. Interim recommendations for CUNs from non A5 Parties for preplant soil fumigation submitted in 2018 for use in 2019 and 2020.

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]	CUN for 2020	Interim Rec. for 2020
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	[26.08]

MBTOC interim recommendation for 2020:

MBTOC recommends 26.08 tonnes which is a 10% reduction from the nominated amount of recognising that the CUN is for 2020 and that non-chemical alternatives (soilless culture) for runner production are in widespread use in many countries for production of high plant health status runners. Chemical alternatives continue to be trialled but results sufficient to allow acceptance by the certification authorities (VSICA) will not probably be available until after 2020.

MBTOC acknowledges that the transition plan for phasing-out MB put forward by the Party, represents good progress as it states that if MI is registered by 2021, then in 2021 the nomination could be cut by half, and that there will be no more requests in 2022. MBTOC acknowledges that significant progress has been made with adoption of soilless culture by the industry and considers that in the absence of adoption of any other control methods, that this technology be considered for all generations of the runner production. MBTOC notes that outdoor soilless systems are available in other parts of the world and that their technical and economic feasibility should be considered for this nomination. MBTOC also notes the significant progress with TF80 (1,3-D/Pic 20:80) and encourages continuation of this promising research to replace MB.

Nomination by the Party:
The Party nominated 28.98 t to treat 119 ha (at a dose rate of 25 g/m^2). The party states that the mother stock (2 million plants) will be produced on substrates without MB by 2019, but the fourth generation of certified runners (60 million plants) will still be produced in soil treated with MB because no feasible alternatives are presently available.

Circumstances of the nomination by the Party:
The combination of the particular environmental conditions of Toolangi, Victoria, (e.g. soil type, temperatures, wind), together with a small-size economic sector (10 growers spanning 119 ha) and very stringent regulations (e.g. registration requirements, minimum dosages, runners´ certification system) constitute a huge barrier for implementing alternatives. The region is uniquely suited for runner production in Victoria. Its climate and elevation allow production of runners in the correct physiological state for fruit production, however heavy clay soils that are difficult to fumigate to required depth to produce pathogen-free runners at the appropriate standard level plus cold soil temperatures negatively impact the performance of alternatives. Elsewhere in Australia where conditions are different, runners are produced without recourse to MB, usually using alternative fumigants; however these runners are also not certified to the Victorian standard. Nevertheless, after 15 years of CUEs for MB for this use in Australia, MBTOC feels that the continuous recommendation of MB could have in itself become a barrier for technological change and adoption of alternatives – since it almost certainly guarantees a MB supply to the growers involved.

Key pests affecting strawberry runner production are fungi (*Phytophthora, Pythium, Rhizoctonia* and *Verticillium* spp.) and weeds (*S. arvensis, Agrostis tenuis, Raphanus* spp., *Poa annua*, *Cyperus* spp). The nomination is based on a particular soil type and temperature situation: soils with very high clay and organic matter content requiring fumigation at cold temperatures.

In its CUN, the Party states that runner production under such conditions, 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).

	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 al*., 2015). The Party has found other non-chemical alternatives infeasible. 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 doses 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. TF-80® (1,3-D/Pic, 20:80), which was recently registered, showed promise in trials by reducing the risk of phytotoxicity in strawberry runners in Toolangi due to its low concentration of 1,3-D; however, 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 15% lower fruit yields than runners produced in soils treated with MB/Pic. Co-application of alternative fumigants (Pic Plus® and TF-80®) with the 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 the been approved by VSICA (Victorian Strawberry Industry 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. MBTOC notes that these trials were conducted over a decade ago, with no updates since that time. Trials conducted since 2014 in Australia have shown that treatment with dimethyl disuphide (DMDS) and DMDS/Pic significantly reduced the total populations of soil borne pathogens (up to 95%), restricted weed emergence (up to 70%) and increased runner yields by up to 45%. The plant-back time required for DMDS and DMDS/Pic was 3 weeks which is comparable to MB/Pic and Pic (2.5 weeks), and shorter than 1,3-D-/Pic and Pic + Dazomet (6-12 weeks) (Mattner *et al.,* 2015). These results show that in Australia, DMDS and DMDS/Pic have good potential for soil disinfestation in runner production. Application of dazomet well in advance of DMDS fumigants shows higher efficacy. In California, steam is currently considered as alternative soil disinfestation method for strawberry production, providing similar pest and weed control efficacy to chemical and non-chemical soil disinfestation methods, and new options are making this alternative economically feasible (Hoffman *et al.,* 2015). **MBTOC final assessment for MB use in this sector in 2019:** During the MBTOC meeting in Melbourne, the VSICA showed recent results indicating that control of pathogens at greater soil depths is still not adequate to meet the requirements of their Certification standard, and could thus lead to economic losses too large for growers. As a result, further R&D is required in 2019 and 2020. MBTOC notes that changing the MB/Pic label to allow lower dosage rates (which are not registered at present) would require an application through the State Government of Victoria and would take two years of field trials demonstrating equivalent efficacy (bioequivalence) between the registered application rate (25 g MB/m^2) and the lower application rate (20 g MB/m^2). The party has shown in the past that lower rates are not totally effective. 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 crop phytotoxicity subsequent to MB phase out. However, MBTOC understands that there is not enough evidence (in Australia or elsewhere) of a strong correlation between MB phase out and the appearance of this disease. Soilless substrates in protected production systems are now in place for the Nucleus stocks and will be implemented in 2019 for the Mother Stock. This option is however not economically feasible for Certified runner generations according to the economic assessments conducted by the Party. MBTOC still considers that simplified soilless culture systems - including outdoors – are widely used around the world for producing strawberry runners and prove technically and economically suitable for certified nursery production operations as well as stock plants, resulting in healthy nursery material (López-Galarza *et al*., 2010, Rodríguez-Delfín, 2012).

	MBTOC was unclear on the source of MB used for conducting trials and the Party clarified that the allocation of MB to VSICA previously used for soil disinfestation in the production of Foundation stock is now used for research purposes, so this is not a contingency use. In a recent paper, Lopez Aranda *et al*. (2016) conducted a comprehensive survey of 41 strawberry industries, mostly in Europe but also other countries, comprising more than 5,755 ha of strawberry nurseries with different soil and climate situations. Results showed that 32% of the area is fumigated with metham sodium (spading), 31% uses crop rotation (with cereals, grasses, oilseed crops, legumes, and other crops as green manure, such as oil radish, mustards, winter rye, and buckwheat) and/or a change of location; 19.3% is fumigated with 1,3D:Pic and/or 1,3D+Chloropicrin; 8.6% relies on non-chemical methods (cover/catch crops, soil solarisation, and ASD), 7.2% on fumigation with dazomet (Mix-Tiller), and the remaining 1.9% on other chemical solutions. None of the nurseries presently use MB. While MBTOC once more recognizes the Party's continued efforts in researching and developing an array of MB alternatives (Mattner, 2017), it is also noted that these efforts have not resulted in commercial uptake of alternatives, so there has been no significant reduction in MB use in this sector since 2005 and no change in the VSICA certification standard. MBTOC commends Australia for renewed research efforts (in line with Decision XXV/4), which are showing promising results. The combination of particular environmental conditions of Toolangi (e.g. soils, temperatures, winds), the sector's small size (10 growers and 119 ha[1]) and very strict regulations (e.g. registration requirements, minimum dosages, runners´ certification system) continue to be a huge barrier for the implementation of alternatives for this particular use. After 15 years of granting MB exemptions for this use in Australia, MBTOC feels that its continuous recommendation virtually guarantees a MB supply to these growers and could in itself be becoming a barrier for technological change and adoption of alternatives. A recent study (Guthman, 2016) in reference to the California strawberry industry suggested that "*CUEs induced complacency in the industry, giving growers hope that the exemptions would persist and slowing down the development and testing of other alternatives, including less toxic alternatives*", even putting the industry in a weak position, with no scalable solutions for the near future. MBTOC is aware that EDN was just recently registered in Australia for soil disinfestation including for strawberry fruit production, so the Party may have another available alternative that when mixed with Pic may render good results equivalent to MB. MBTOC urges the Party to review regulations and other hurdles to the adoption of alternatives, to set forth the phase-out process. Although the nomination is in line with Decision IX/6, MBTOC strongly encourages the Party to work on a reduction of MB in future nominations, particularly since these are submitted two years ahead, with time for implementation of the selected options. 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, but urges the Party to be more flexible with regulations and accelerate the schedule in order to phase out MB as soon as possible. A revision of certification rules, to allow for greater adoption of any effective alternatives, plus new technologies with barrier films etc. may need to be considered. This will be in line with the situation of various countries around the world who phased-out MB use in strawberry runners in the past and have implemented alternatives successfully (García-Sinovas *et al*., 2014; López-Aranda, 2016).

[1] During the field visit, MBTOC asked the Party to clarify technical parameters that could explain how a growing demand of runners (the strawberry fruit area has more than doubled in these years) could be supplied with a an unchanged 119 hectares along this period.

	MBTOC acknowledges that the transition plan for phasing-out MB put forward by the Party represents good progress: if MI is registered by 2021, then in 2021 the nomination could be cut by half, and there will be no more requests in 2022, however MBTOC notes that MI registration is not guaranteed. Significant progress has been made with adoption of soilless culture and MBTOC considers that in the absence of any other alternative control methods, this technology could be considered for all generations of the runner production, particularly outdoor soilless systems currently used in other parts of the world. Significant progress with TF80 is also noted and continuation of this promising research to replace MB is encouraged. **MBTOC comments on economics provided in CUN for 2020:** Previously, it was believed that while the Foundation stock can be grown in a soilless system, the Mother and Certified stock stages could not. However new research shows that improved soilless production methods can increase runner yields. Such systems are based on hydroponic tip production and plug plants for transplant production, inside screen houses. Previous partial budget analyses were based on soilless substrates in large bins for production of bare-rooted transplants. Under the current price of runners, production of Mother Stock as plug plants would result in a net revenue loss per hectare of A$920,000. The price of Mother Stock needs to increase from A$0.34 per runner to A$1.01 for hydroponic production systems to break even. However, the increased cost for Mother stock could be absorbed into the cost of Certified stock runners. Results show that adoption of the hydroponics system in the Mother generation would require a price increase of A$0.01 per runner in the Certified generation. Therefore, the use of the hydroponic system is considered economically feasible for the Mother generation of runners. **Comments Requested in Dec. XX1/11 (para 9):** • **Dec. IX/6 b (i) Emission reduction:** No, but the Party states that standard films perform the same as VIF for the reduction of emissions in the cold temperatures and heavy wet soils typical for strawberry runner production in Victoria. The Party also states that use of VIF did not improve the efficacy of reduced rates of MB to an acceptable level for the strawberry runner industry. • **Dec. IX/6 b (ii) Research program:** Approved and funded research program is currently in place at the time of this nomination. • **Dec. IX/6 b (Iii) Appropriate effort:** Research effort is adequate - 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	Interim rec. for 2019
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	4.735

MBTOC interim recommendation for 2019:

MBTOC recommends a reduced amount of 4.735 tonnes, which represents a 10% reduction on the nominated amount, for adoption of substrate production for foundation stock and adoption of suitable varieties that positively impact subsequent generations.
MBTOC acknowledges that an effective chemical alternative, chloropicrin, is registered in Canada, but not permitted to be used in PEI because of potential groundwater contamination concerns by the government of Prince Edward Island. These same concerns exist for methyl bromide and several alternatives like metam sodium or metam 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 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 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.

Since 2016, the grower has received funding to conduct research on soilless media and determine the efficiency and viability of adopting this approach in its commercial operation. The Party indicated that the shift to soilless cultivation would mean a significant change in production methods and that strawberry runners production costs would increase, but that transition to soilless cultures for foundation stock presents an option, which can eliminate the use of MB for the sector.

MBTOC acknowledges that soilless production is a non-chemical alternative to MB widely used in strawberry runner (López-Galarza et al., 2010, Rodríguez-Delfín 2012). Trials being performed in PEI are showing that excellent progress is being made with the evaluation of a soilless outdoor system for runner production with performance presently being comparable to existing soil-based production systems for some varieties.

Nomination by the Party for 2019:

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 final stages (G2 and G3) of multiplication of plants, which are exported from PEI. The nomination is based on a reduced rate of MB of 20 g/m² (instead of 50 g/m^2) under high barrier films of the entire cropping area, which is consistent with MBTOC's standard presumptions.

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). Metam sodium or metam 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 Terr-O-Gas (MB/Pic 67:33) use by the strawberry runner grower as a pre-plant fumigant is permitted because it has been successfully used by the grower for over 30 years and has not resulted in the contamination of groundwater.

For the past two growing seasons the Party has focussed on large scale trials with local and imported substrates which appear successful. Previous data and analysis on different soilless systems have shown that the annual estimated cost per G2b foundation stock plant is $0.425, which was at the time 3.15 times higher than the grower's annual production cost for bare rooted runners ($0.135). An update on the newer systems is anticipated as the Party has recently stated that these systems are likely to be more productive than traditional soil production systems.

	The company at PEI also tested organic production from 2006 - 2009 with different varieties, but found significant reductions in yield ranging from 40% to 70%, with only one variety comparing favourably to conventional production. MB: Pic 67:33 at 50 g/m^2 is the only formulation and rate registered for use in strawberry runners in PEI, and although this exceeds MBTOC's standard presumption of 20 g/m^2, the grower petitioned PMRA to use a lower rate under barrier films, albeit at the company's own risk and liability. As in previous occasions, the CUN for 2019 is based on a reduced rate for MB of 20 g/m^2 for the entire critical area (26.3 ha). **MBTOC assessment for MB use in this sector in 2019: [update]** MBTOC is aware that chloropicrin (Pic) although an effective alternative, will not 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. MBTOC acknowledges that soilless is a suitable alternative for runner production and encourages the Party to continue testing and adopting the soilless cultivation system to phase out MB in this sector. MBTOC understands that using micro-propagated plants, and scaling up soilless substrates, are geared at the first stage of multiplication, to produce approximately 75,000 runners, and that 420kg MB included in previous nominations could be replaced or avoided if soilless was effectively adopted for this stage. MBTOC considers soilless production is technically feasible for all stages of production (López-Galarza *et al.*, 2010, Rodríguez-Delfín; 2012; Miranda *et al*., 2014). MBTOC recognizes the efforts to expand adoption of substrates for subsequent production stages and urges the Party to expedite these efforts to secure alternatives as indicated by Dec. IX/6 b (iii). **MBTOC comments on economics provided in CUN for 2019:** The economic information has not been updated in this year's nomination. **Comments requested in Dec. XX1/11 (para 9):OK** • **Dec. IX/6 b(i) Emission Reduction:** Yes, uses barrier films with a reduced application rate of MB conforming to MBTOC's presumptions. • **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. • **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

Table 1.10 Interim recommendations for CUNs from A5 Parties for preplant soil fumigation submitted in 2018 for use in 2019.

Country	Industry	CUE for 2015[1]	CUE for 2016[2]	CUE for 2017[3]	CUN for 2018	CUE for 2018[4]	CUN for 2019	Interim recommendation for 2019			
Argentina	Strawberry Fruit	70	58	38.84	45.30	29.00	27.1	[15.71]			

MBTOC interim recommendation for 2019:
MBTOC recommends a reduced amount of 15.71 tonnes for this use in 2019. This reduction is based on the adoption of barrier films (e.g. TIF) on one third of the nominated area, which results in a decrease in dosage rates recommended for the nomination from 26 to 15.0 g/m^2. The reduced amount is 15.71 t [27.1 t x (15/26) =15.71 t]. MBTOC considers barrier films to be consistent with efforts to minimize emissions of MB, and for this reason, has made a reduction of MB for a final year of a three-year adoption period.

MBTOC is concerned that the Party has not provided data from any recent field trials in its CUN nominations. Of particular concern is that recent data showing the ineffectiveness of alternatives has not been provided and this lack of effort is inconsistent with the requirements of Decision IX/6. In the absence of such data, MBTOC has relied on data from trials in similar sectors and situations worldwide (Lopez Aranda *et al*., 2016) when making its recommendation. MBTOC urges the Party to provide such data if future nominations are submitted. The Party states that the climate of the critical areas is too cold and wet for effective anaerobic soil disinfection (ASD) or soil solarisation. MBTOC encourages the Party to consider researching other non-chemical methods such as soil-less or hydroponic production methods, cover crops and crop rotations that can prevent or inhibit many pests, pathogens, and weeds (MBTOC 2014).

MBTOC reiterates that efficient use of alternatives may require change in the agronomic practices presently in place in the sectors involved. In further urges the Party to provide technical or economic evidence showing that properly applied alternatives (i.e. with soil injection methods for 1,3-D/Pic) do not perform as effectively as MB. MBTOC is concerned that a regulation (Decree) is in place in the Mar del Plata region making MB (70:30) use mandatory, whilst banning alternative fumigants, as this goes against the intent of the Montreal Protocol. MBTOC welcomes comments in the CUN that this decree is being considered for revocation by the current government. Additionally there is evidence that growers are currently using some chemical alternatives to MB illegally, as the decree is still in place. If this decree is to continue, then MBTOC urges the party to focus research into non-chemical alternatives.

Nomination by the Party for 2019:
The Party nominated 27.1 t of MB for critical uses for field production of strawberry fruit in the critical regions of Mar del Plata and Lules. When considering the nominated rates and critical areas (hectares) supplied in the nomination, the amount of MB required equated to 22.62 t.

The nomination is based on a dosage rate of 26 g/m^2 of MB with standard polyethylene films (not barrier films). This includes 50 ha for Mar del Plata and 100 ha for Lules, with 58% of the area effectively fumigated. The key pests in Mar del Plata are fungi (*Phytophthora, Verticillium*), soil insects, nematodes and nutsedge weeds (*Cyperus*). Key pests in Lules are fungi (*Phytophthora, Verticillium*, Anthracnose, *Rhizoctonia, Fusarium, Pythium, Macrophomina*). A MB:Pic 70:30 formulation is shank applied to the total beds (i.e 58% of land area). The nomination bases the need for MB on the fact that alternatives, particularly 1,3-D/Pic, are not effective for high moisture soils and heavy clay soils in warmer regions (Lules) and that phytotoxicity occurs in the cold soil conditions of Mar del Plata. Missing specific market windows is also of concern.

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 and/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 required time of fumigation, challenge the adoption of ASD and solarisation alternatives. Chloropicrin alone, although technically and economically feasible is not registered and does not control weeds. Methyl iodide, which proved effective in trials, is no longer being considered for registration in Argentina. 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 high 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. 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 assessment for MB use in this sector in 2019:** The Party stated that 1,3-D/Pic and other alternatives (i.e. metham sodium, metham potassium, metham ammonium) are ineffective under the particular circumstances of the nomination, however the nomination shows that higher yields can be obtained with 1,3-D/Pic in Lules. The Party shows economic information which assumes an 11-week delay in plant back times for 1,3-D/Pic, but this is inconsistent with results reported in other regions of the world where similar sub-tropical conditions prevail. MBTOC considers that 1, 3-D/Pic or Pic alone, which are the major chemical alternatives adopted worldwide, would be suitable for this sector, and considers uptake of shank applied 1,3-D/Pic part of the reduced recommendation. 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 notes the issues with commercial scale up in this region of the nomination. The Party showed MBTOC the impact of high disease pressure caused by leasing land recently cropped with vegetables, particularly potatoes, which harbour strawberry pathogens (*Rhizoctonia* sp., *Verticillium* sp.) - MBTOC suggests that this practice be avoided where possible to improve the performance of alternatives. The Party also indicated that most growers aim to get a two-year crop from one application of MB/Pic, however yields can be 50% less in the second year. MBTOC suggests that annual treatment with an alternative product and adoption of a more suitable crop rotation scheme may be a more suitable approach. Crop rotations with brassica crops for weed and disease control have not been explored by the applicants, although these crops are listed among those grown in the area. MBTOC further encourages the Party to consider other non-chemical methods of production, such as open field soil-less production or covered hydroponic systems, which produce good results around the world. In previous assessments MBTOC has requested detailed scientific studies from the party to determine the effects of 1,3-D/Pic on the length of the plant back periods for strawberries in Lules (warm conditions) and Mar del Plata (cooler conditions), as compared to methyl bromide and in accordance with Decision IX/6. MBTOC again reiterates this request. In particular, 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 MBTOC reiterates that 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, therefore providing better yields in the second-year crop. MBTOC notes that research is underway in Argentina on non-chemical alternatives, such as biosolarisation and biofumigation with promising results (Gabriel, 2014). MBTOC is aware of references indicating positive results with alternatives, such as metham ammonium, 1,3-D/Pic, metham sodium and metham potassium in the 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 that 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). As with previous assessments, MBTOC is unclear why these results are not applicable to the regions nominated. MBTOC acknowledges that alternatives are available for strawberry fruit, and notes that their adoption may require significant changes in agronomic practices and application methods in order for them to be effective in Argentina. MBTOC encourages the Party to consider further adoption of one or more of these options to assist with phasing out the MB requested in this nomination. **MBTOC comments on economics provided in CUN for 2019:** The economic analysis provided by the Party shows that treatment with 1,3-D/Pic leads to missing the market window and fetches lower revenues than MB. **For Mar del Plata** 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.

- From the yield reduction the nomination calculates a symmetrical gross revenue reduction as prices are assumed to be the same for the two treatments.
- 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.

For Lules
Provides data on the movement in prices from the early harvest to late harvest. Prices start at $6/kg and end at <$1.
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.
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%.
The "with methyl bromide" price is taken as $1.69/kg and the "with 1.3-D Pic" as $0.72
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 for commercial adoption. The party has indicated that it is reducing the area where MB is applied rather than reducing dosage rates through the adoption of barrier films.
- **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]	CUN for 2018	CUE for 2018[4]	CUN for 2019	Interim recommendation for 2019	
Argentina	Tomatoes	100	71.25	64.10	75.40	47.70	44.4	[25.6]	

MBTOC interim recommendation for 2019:
MBTOC recommends a reduced amount of 25.6 tonnes for use in this sector in 2019. MBTOC reduced for the third year, the dosage rate from 26.0 to 15.0 g/m^2 for adoption of barrier films (e.g. TIF) for the 258 ha nominated, in accordance with MBTOC's standard presumptions. The final amount represents a reduction of 42.3 % over the nominated (44.4 t x0.577 = 25.6 t).

Nomination by the Party for 2019
The Party nominated 35.5 t for La Plata and 8.9 t for Mar Del Plata for a total of 44.4 t.

MBOTOC has recommended the use of VIF/TIF in tomato protected cultivation in order 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 minimising the legal requirement for large buffer zones which are in place in many countries (Chow and Scholten, 2016).

The Party reports using about 90,000 grafted tomato plants during the past growing season, and declares that grafting is becoming increasingly popular in commercial plantings. Rootstocks and tomato cultivars resistant to *Nacobbus* are not yet commercially available (Verimis *et al.*, 1997; Manzanilla-Lopez *et al*., 2002; Lax *et al*., 2016, however MBTOC notes promising research results on grafting susceptible tomato varieties onto rootstocks with some resistance to this nematode (Mitideri *et al.,* 2013; Chale *et al.*, 2013; Ducasse *et al.*, 2013; Gutiérrez *et al.*, 2013, 2014; Andreau *et al.*, 2014) and to *Meloidogyne* (Lobos *et al.*, 2013). The nominated regions have the potential of

	producing *Nacobbus* tolerant plants when available. Grafting robots for vegetable crops, particularly for tomatoes and cucurbits have been developed to increase productivity and rooting success rate while reducing costs. These robots are currently used in many countries (Kubota *et al.,* 2008, Lee *et al.,* 2010, Ashraf *et al.,* 2011, Comba *et al.,* 2016) 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). These technologies will require time for scale-up, 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. 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.albo atrum*, *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. However, despite of new information provided by the Party in response to MBTOC's questions, MBTOC is still concerned with the temperature information provided and urges the Party to further clarify soil and ambient temperatures inside and outside green houses in any future nominations. **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, which were heavy clays and to soil temperatures (5°C to 23º C). 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. Long-term efficacy is not enough for the dual cropping system (tomato and pepper). Steam was very costly and time consuming. Application with currently available equipment is extremely slow and size of equipment too large for use inside greenhouses. Although potential production of grafted plants is high, no resistant rootstocks 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. **MBTOC assessment for MB use in this sector in 2019:** The Party provided sufficient information on the historic cropping areas (except for 2015 and 2016), MB usage, specific definition of the critical area, and reasons why alternatives to methyl bromide were not technically and economically feasible. Using the information provided in the nomination, MBTOC is recommending 25.4 t of MB. Grafting tomato onto resistant rootstocks to various pathogens (*Fusarium, Verticillium, Meloidogyne* spp.) is an effective disease control method presently in use in many A5 countries such as China, Egypt, Lebanon, Mexico, Morocco, Romania, Tunisia and Turkey (MBTOC, 2011; 2015). Although rootstocks with high resistance to *Nacobbus* have not been identified (Veremis *et al*., 1997), encouraging results have been obtained (Mitideri *et al.,* 2005; 2013, Garbi *et al,* 2013).The Party reported that grafted plants are produced and commercially available in various tomato-growing regions such as Mendoza, Corrientes and Buenos Aires. Use of resistant cultivars is an effective strategy used to increase yield and manage soil borne diseases and nematodes in vegetables around the world (Devran and Sogut, 2010; Christos *et al*., 2011; Fery *et al*, 2011; Jari *et al*., 2011). No resistant tomato variety to the false nematode (*Naccobus*) is currently available (Lax *et al.,* 2011, Lax *et al.,* 2016, Sisler and Casaurang, 1983). 1,3-D/Pic is a key alternative to MB, which is widely accepted commercially for controlling soil nematodes and fungi and has consistently shown to be as effective as MB (Minuto *et al*., 2006; Porter *et al*., 2006, Ji *et al.*, 2013), however, results under Argentinean CUN conditions have proven inconsistent. Chloropicrin does not control the entire soil borne pathogen complex, including nematodes and weeds. This fumigant is not registered as a single product in Argentina. Metham sodium gives erratic and insufficient performance for control of weeds and soil borne pathogens. Dazomet is not registered for edible crops and does not control nematodes. Steam is not available and is considered to be costly. 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 keyalternative to MB for nematode control on many crops (berries, cucurbit, leafy and fruiting vegetables.) Pic-Clor 60 combined with fluensulfone showed lower galling index as compared to Pic-Clor 60 alone (Castillo *et al*., 2016). Gilma *et al.,* (2017) demonstrated that fluensulfone in combination with Pic-Clor 60 (1,3-dichloropropene plus chloropicrin 40:60, w/w) can be an effective tool to manage root knot nematodes in drip-irrigated fresh-market tomatoes with high *Meloidogyne* infestation. An Integrated program 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. *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). 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). **MBTOC comments on economics provided in CUN for 2019:** • The CUN assumes a substantial yield reduction with 1,3-D/Pic compared to MB/Pic while prices and costs remain the same for both treatments for both crops**.** A corresponding reduction in revenue for this treatment is 28%. • The reduction in revenue is partly due to a smaller drop in yield on the early crop but mostly due to the impossibility of a late crop because of the waiting time between applications and planting. **Comments requested in Dec. XX1/11 (para 9):** • **Dec. IX/6 b (i) Emission Reduction:** Barrier films are available. • **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 since the finalization of the MLF project there has been no research and commercial trials results reported. • **Dec. Ex 1(4) Annex 1 National Management Strategies:** Argentina did not provide a NMS plan confirming that MB will be phased out ~~in 2019.~~

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

1.5. Interim Evaluation of Critical Use Nominations of Methyl Bromide for Commodities and Structures in 2019

1.5.1 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 all 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).

1.5.2 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 finally 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.

1.5.3. Details of the Evaluation

The total MB volume nominated in 2018 for post-harvest uses in 2019 was 50 tonnes. MBTOC recommended 30.23 tonnes for South Africa for 2019 (Table 1.11). Table 1-12 provides MBTOC-SC final recommendation for the CUN submitted.

Table 1.11. Summary of the interim recommendations for a CUE for postharvest uses of MB (tonnes) for 2019 submitted in the 2018 round.

Country and Sector	Nomination for 2019 (tonnes)	Interim Recommendation for 2019 (tonnes)
South Africa - Mills	2.0	0.30
South Africa - Houses	45.0	29.93
Total	**47.0**	**30.23**

Table 1-12. Interim Recommendations for CUNs from A5 Parties for structures and commodities submitted in 2017 for use in 2018.

Country	Industry	CUE for 2015[1]	CUN for 2016	CUE for 2016[2]	CUE for 2017[3]	CUE for 2018[4]	CUN for 2019	Interim recommendation for 2019		
South Africa	Mills	--	13.0	5.462	4.10	2.90	**2.00**	**[0.3]**		

MBTOC interim recommendation for 2019:

MBTOC recommends a reduced amount of 0.3 tonnes for MB use in 2019, for pest control in the three specific nominated mills. This recommendation represents a reduction of 90% from the approved amount of the CUE for 2018. It is based on an amount of MB sufficient for a single fumigation per year per mill at 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 SF if desired.

Nomination by the Party for 2019:

The Party nominated 2.0 tonnes methyl bromide for fumigation of three specific mills, producing maize grits. At the rates and frequency of treatment given in the CUN, annual consumption by the three mills is shown to be 1.8 tonnes (CUN p16). The difference between this use and the quantity nominated was not specified.

Circumstances of the nomination:

In the CUN submitted in 2017 for use in 2018, the Party nominated 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 uninfested product from the mills and to comply with certification accreditation.

The CUN submitted this year for use in 2019 was for 2.0 tonnes of methyl bromide to treat three old and small remaining mills, total capacity 11,851 m^3, at high dosage rates and three times a year, possibly with other unspecified uses.

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. Full site treatments with heat, SF or phosphine were considered as alternatives by the Party, but were found not currently feasible. According to the Party, SF has only recently been registered 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 notes that heat treatment may be similar in running costs to the existing MB use with moderate capital investment requirements, significantly less than indicted in correspondence with this CUN ((Hofmeir, 2018; Kroll, 2018). Heat treatments may also be used to treat particular machines difficult to fully clean by other methods.

MBTOC assessment for MB use in this sector in 2018:

In the 2017 assessment of the RSA CUN for treatment of mills, MBTOC considered that various suitable alternatives were available and feasible for the necessary disinfestation of all mills in the CUN. Whole site fumigation of flour mills with methyl bromide has been discontinued in other countries. Where whole site treatment is still practiced, periodic applications have been carried out with heat or various other fumigants, principally SF (Drinkall *et al*., 1996, 2003; Ducom *et al*., 2003; Reichmuth *et al*., 2003) and hydrogen cyanide (Rambeau, 2001). Some mills have never been fumigated with MB as whole site fumigations. Alternative targeted approaches may in some circumstances provide adequate insect infestation control (Belda *et al*., 2011). Effective pest control in mills in general requires a combination of measures applied rationally including, as circumstances and registration permit, localised and full-site heat treatment, fumigation with alternatives, as possible

	according to local registration and circumstances, and various diverse insect control measures applied as an IPM system. Pest control intervention may be guided by appropriate pest monitoring. Schuh *et al*., (2008) describe in detail the combined use of SF and heat in a big mill in Germany. By applying the fumigant at elevated temperatures, a significant reduction of SF emission is possible since the increased metabolic rate of the pest insects and all their stages including eggs allow full control with fairly low ct products of the fumigant. The computer program FUMIGUIDE - supplied by the registrant - contains the lethality data for various insects and stages for the temperature range between 20°C and 40°C, enabling the fumigator to adjust the dosage to the target temperature within the treated premise. Change from an established system of periodic routine MB treatment requires some time to trial, refine and implement, hence the continued partial MBTOC recommendation for this nominated CUE, despite the general availability of alternatives for this situation and transition of other mills, no longer included in the nomination. This recommendation is based on MB sufficient for one fumigation per year per mill as a transitional measure to allow further timely optimisation of alternatives in the remaining mills. The recommendation is based on a dosage of 20 g/m³ (MBTOC standard presumptions) applied to well-sealed structures. MBTOC anticipates that the frequency of whole site treatments can be further reduced, or even eliminated, by well-planned specific IPM programs for each mill. 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. MBTOC information 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 to treat particular machines, difficult to fully clean and to treat by other methods. **MBTOC comments on economics provided in CUN for 2019:** No economic information relevant to the evaluation of the CUN has been provided. **Comments requested in Dec. XX1/11 (para 9)** • **Dec. IX/6 b (i) Emission Reduction:** The CUN states that a high level of fumigant containment has been achieved. • **Dec. IX/6 b (iii) Research Program:** MBTOC welcomes the registration of sulfuryl fluoride and ethyl formate as alternative fumigants for mills. • **Dec. IX/6 b (iii) Appropriate Effort:** see previous paragraph. • **Dec. Ex 1(4) Annex 1 National Management Strategy:** No detailed Management Strategy was provided, however MB use in this sector will gradually be replaced by SF within the next few years. SF was recently in January 2018 registered alternative fumigant.

Country	Industry	CUE for 2015[11]	CUN for 2016	CUE for 2016	CUE for 2017	CUE for 2018	CUN for 2019	Interim recommendation for 2019		
South Africa	**Houses**	**--**	68.6	68.6	55.0	42.75	**45**	[**29.93**]		

MBTOC final recommendation for 2019:

MBTOC recommends a reduced amount of 29.93 t of MB for use in houses/structures in 2019, which represents a 33.49 % reduction of the amount requested by the Party and a reduction of 30% of the approved amount in 2018 for this sector.

Nomination by the Party for 2019:

The Party nominated 45 t for control of wood boring pests and pest termites in domestic and industrial premises

Circumstances of the nomination:

The Party applied for 45 t of MB for disinfestations treatment against wood destroying pests. These insects were found attacking wooden components in various structures, mainly houses and residential units (2,560 facilities and houses, mainly brick, mortar and iron structures with wooden frames) along coastal areas and partly inland with a typical volume of 600 m³ to 850 m³, and some much larger buildings. About 75% are complete structure fumigations for about 1,152,000 m³ and 25% partial fumigations (individual rooms, individual flats, calculated with about 1/5 of a 600 m³-structure) for 384,000 m³ leading to 41.47 t plus 3.53 t, resulting in a total of 45 t used. About 200 structures are fumigated per month. 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*.

Some of the MB tonnes requested is for the control of *Lyctus brunneus* and *Hylotrupes bajulus*, which require higher dosages and possibly smaller parts of treated structures. However, the amount is not specified. In the future, for the use of SF, the computer program (FUMIGUIDE, provided by the registrant) will determine the necessary dosage for full control of the specific pest species.

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 that attics are never fumigated separately in RSA.

Application of heat, a technique used under similar circumstances in many countries was regarded by the Party as not feasible due to very high investment needed for heating units from abroad and excessive running costs compared with costs for MB treatment and lack of access of the heat into some parts of the roof spaces. Heat treatment for control of wood boring pests would not be acceptable in the case of selling a house and obtaining 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.
The applicant states that the application of MB combined with additional gas such as carbon dioxide will be investigated to determine the effectiveness and economic feasibility of such application.

	The label for MB use for this sector to achieve control of the mentioned insect species states that an initial dosage of 48 g/m³ at temperatures above 15°C must be applied with exposure period of 24 h. The Party states in their answers of questions asked by MBTOC that the registration of sulfuryl fluoride (SF), is now released in RSA for both houses and mills in the applications. In correspondence from the Party they indicated that in January 2018 SF gained registration in SA and time is needed to set up supply and training systems. According to information of the Party, this release of the registration would be followed by about another two years of preparation for the fumigating companies to fully enter with SF into the practice of fumigation. MBTOC presumes that a significant phase in of SF of about 30% could happen in 2019, leading to the described reduction of the nominated amount. With the wood boring pest insects, the control of the egg stage will require higher ct products than those being necessary to control termites since the control of the queens is sufficient to wipe out the infestation of termites. Even with fairly low ct products in the range of 500 g h/m³ (20 g/m³ for 25 h), the exposure under sheeted and well-sealed houses will lead to complete control. These conditions are commonly known to control drywood termites (Stewart, 1957; Osbrink *et al.,* 1987). **MBTOC assessment for MB use in this sector in 2018:** 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. 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. The existing MB label does not address these differences. 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). Part of the nomination 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 1998, 2002, 2006, 2010 and 2014), 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 used.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). MBTOC found two suppliers of heat producing machines that are also prepared to demonstrate the technique (Hofmeir, 2018; Kroll, 2018). The web links also contain technical details and prices. MBTOC recommends an amount of 29.93 t. MBTOC adjusted the nomination to 33.49 % of the requested amount, for the party to begin the implementation of control with SF in 2019, since the registration has been released in 2018. 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 according to decision IX/6.

	MBTOC comments on economics for 2019: No economic information relevant to the evaluation of the CUN has been provided. **Comments requested in Dec. XX1/11 (para 9):** • **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. • **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. • **Dec. IX/6 b(iii) Appropriate Effort:** Registration of SF has been released in January 2018. • **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

1.6 References:

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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 1(a)(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[2] 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;

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

(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;

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 - Part A: Historic Trends in non A5 Preplant Soil Nominations and Exemptions for Uses of MB reported to have been phased out

List of nominated (2005 – 2015) and exempted (2005 – 2015) amounts of MB granted by Parties under the CUE process for each crop.

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	Chrysanthem ums	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											
Belgium	Nursery	Not Predictable	0.384											0.900	0.384										

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	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							
Israel	Strawberries – fruit (Sharon &Ghaza)																		57.063						

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	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					
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					

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	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 (+Andalucia)									20.000	15.000	43.490 (+Andalucia)									
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				

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	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								
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– Part B: Historic Trends in non A5 Structural and Commodity Nominations and Exemptions for Uses of MB reported to have been phased out

List of nominated (2005- 2016) and exempted (2005 - 2016) amounts of MB granted by Parties under the CUE process for each commodity.

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	Woodworkin g 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 manufacturin g 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										
Israel	Artefacts	0.650	0.650	0.600										0.650	0.6500										

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	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		
USA	Dry commodities/ structures (cocoa beans)	61.519	61.519	64.028	52.256	51.002								61.519	55.367	64.082	53.188								

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 (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															