



## QPS uses of Methyl Bromide and their alternatives



Inspecting flowers before packing and shipping helps to avoid fumigation of exported cut flowers upon entry to the destination country

### MB CONSUMPTION FOR QPS PURPOSES

At the 1992 Meeting of the Parties (MOP) in Copenhagen, methyl bromide (MB) was included as a controlled substance Ozone Depleting Substance, (ODS). Article 2H of the Protocol specifically excluded Quarantine and Pre-shipment (QPS) uses from control measures as it was considered that there were no alternatives to MB for the diverse range of treatments carried out for QPS.

Although QPS was about 10% of global MB consumption at the time, this use was nevertheless considered especially significant in allowing inter- and intra-country trade in commodities treated with MB in the absence of site-specific alternatives. Since that time Parties have nevertheless been urged to adopt alternatives to MB for QPS and reduce emissions and use of this fumigant whenever possible.

Because phase-out of controlled (non-QPS) uses of MB is so far advanced – as of 1<sup>st</sup> January 2015 only critical uses are permitted in both A5 and non-A5 Parties, exempted QPS uses now represent the highest proportion of global use of MB. QPS consumption has remained relatively stable over the past 15 years at an approximate average of 11,000 metric tonnes. However, proportions used by A5/non-A5 Parties<sup>1</sup> have changed and there is an increasing consumption tendency in A5 Parties (Fig.1)

### Definitions

*Quarantine applications*, of methyl bromide, are treatments to prevent the introduction, establishment and/or spread of quarantine pests or diseases, or to ensure their official control, where:

*Official control* is that performed by, or authorised by, a national plant, animal or environmental protection or health authority;

*Quarantine pests* are pests of potential importance to the areas endangered thereby and not yet present there, or present but not widely distributed and being officially controlled;

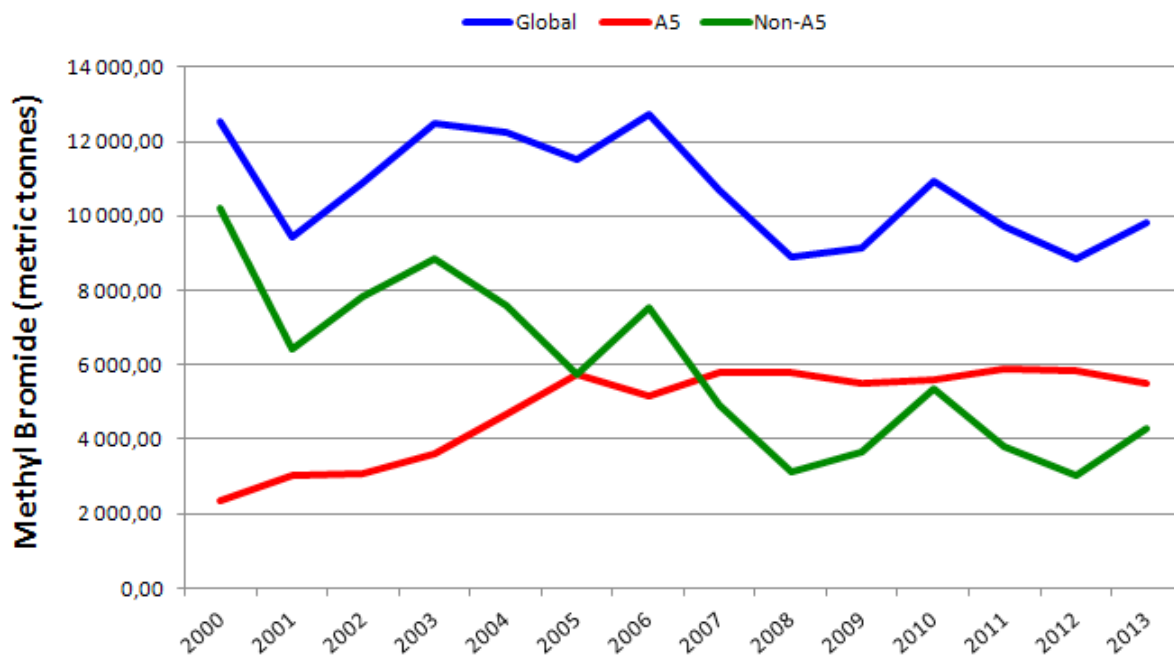
*Pre-shipment applications* are those treatments applied directly preceding and in relation to export, to meet the phytosanitary or sanitary requirements of the importing country or existing phytosanitary or sanitary requirements of the exporting country;

The definition of '*Pre-shipment*' is unique to the Montreal Protocol and is found in Decisions VII/5 and XI/12. The latter declares that pre-shipment applications are "*those non-quarantine applications applied within 21 days prior to export to meet the official requirements of the importing country or existing official requirements of the exporting country*". This requirement needs to be in place in the corresponding country before 7 December, 1995;

Official requirements are those "*performed by, or authorized by a national plant, animal, environmental, health or stored product authority*".

Figure 1: Global, non-A5 and A5 QPS consumption 1999 - 2013

Source: Ozone Secretariat database, 2015.

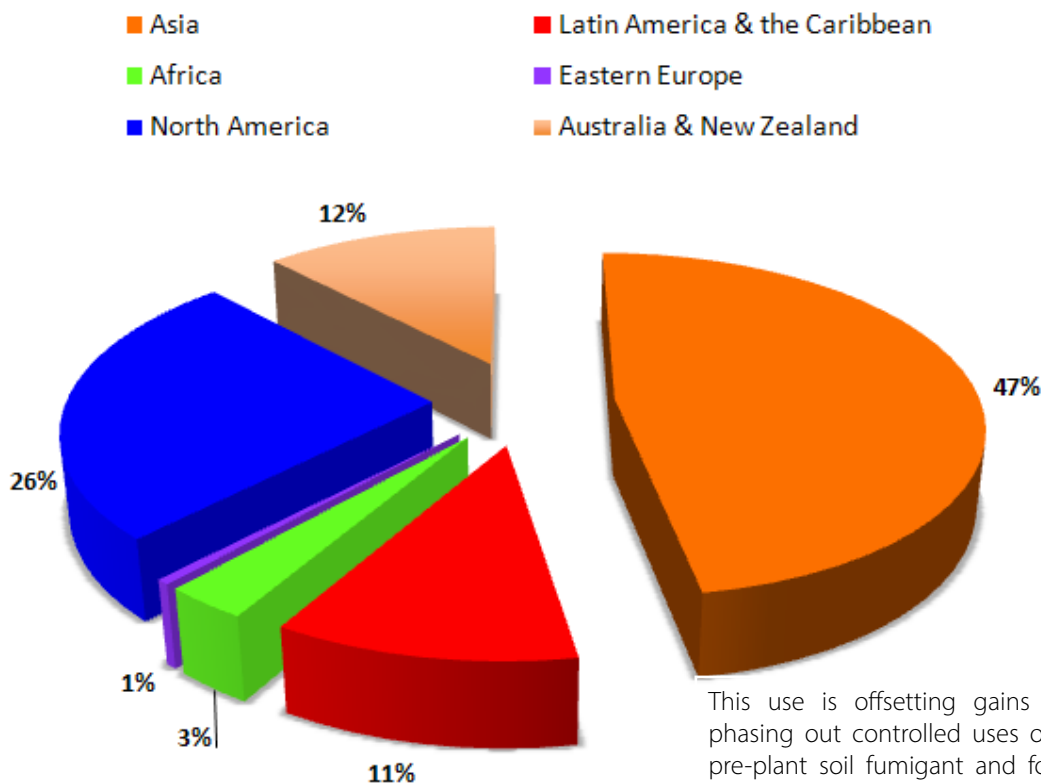


This could be due to increased trade from A5 Parties, but also incorrect classification of exempted uses or other reasons. From the regional perspective, Asia

is by far the largest consuming region, followed by North America (Fig 2).

Fig 2. Regional QPS consumption of MB in 2013

Source: Ozone Secretariat database, 2015.



This use is offsetting gains made by phasing out controlled uses of MB as a pre-plant soil fumigant and for treating commodities and structures.

*MB use for QPS purposes has become the largest emissive use of all newly manufactured ODS that are presently controlled under the Montreal Protocol*

## CATEGORIES OF USE

Although several Decisions require Parties to report MB consumption for QPS purposes, such reporting however refers to the amount consumed (i.e. import plus production minus export) and not actual “use”. The main categories of use have thus been determined on the basis of information voluntarily submitted by various Parties in response to surveys conducted by MBTOC<sup>2</sup> and also to Decisions, for example most recently Decision XXIII/5.

Most current QPS uses of MB worldwide are highly specialised, and are well-developed systems, long in use, with a good record of success. They are aimed at avoiding the introduction of foreign, invasive pests and diseases into environments where these are not present and where they pose a very serious threat to the livelihood of specific productive sectors, including forests, croplands and others. Some examples of QPS uses include:

- Fumigation of cut flowers found to be infested with quarantine pests upon arrival at the importing country (quarantine treatment);
- Fumigation of fruit before export to meet the official phytosanitary requirements of the importing country for mandatory fumigation of an officially-listed quarantine pest (quarantine treatment);
- Fumigation of grain before export to meet the importing country’s existing import regulations that require fumigation of all export grain consignments (pre-shipment treatment);
- Fumigation of log exports and wooden materials either prior to shipment or on arrival against official quarantine pests.

Commodity treatments are mostly associated with international trade where regulations are imposed by the importing country on the exporting country. Some countries prefer to treat products upon arrival, (post-entry quarantine) and MB is often used in response to either pests found during inspection and/or mandatory treatment against risk of specific pests. The importing country usually determines which treatments are required, allowed or not allowed. There is one international standard that specifically includes MB as an allowed treatment for Wood Packaging Materials (WPM) used in trading goods (ISPM 15).

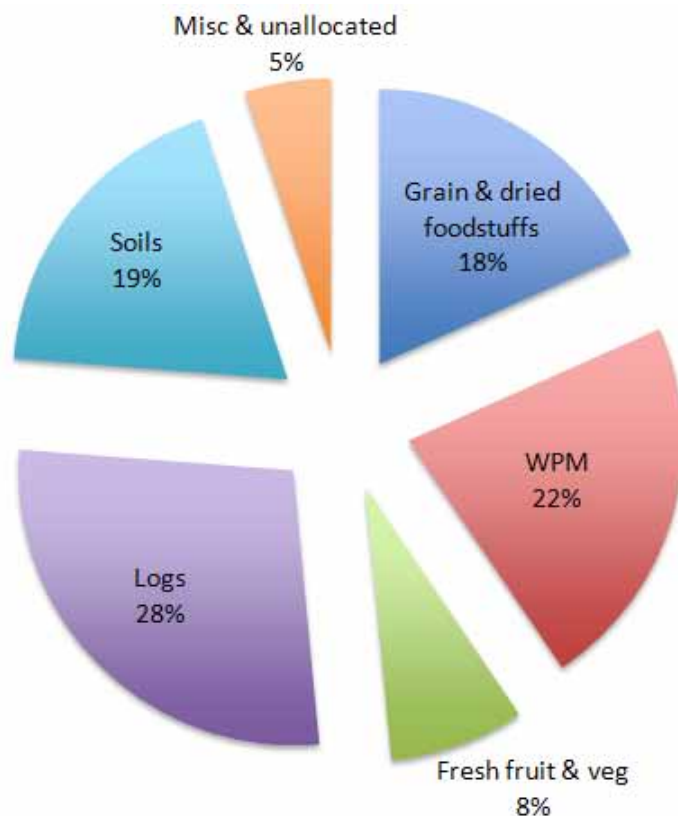
Although a wide variety of items, products and commodities are treated with MB (Table 1), MBTOC as estimated that about 75% of all uses of MB for QPS purposes fall into five categories:



A wooden pallet from Morocco with the required IPPC stamp showing it was heat treated (HT)

Figure 3. Estimated Global categories of MB use (QPS purposes) in 2013<sup>3</sup>

WPM = Wood Packaging Materials



\* One Party has determined some of its preplant soils uses of MB fall under the QPS exemption

## FEASIBLE ALTERNATIVES

On the basis of use appraisals and currently available technologies, MBTOC has further estimated that nearly 40% of these principal uses of MB could be replaced with alternatives that are technically feasible, proven and *immediately available*, with great benefit

to the ozone layer. Table 1 below includes a list of the main alternatives that can be used for the different categories of treated items, subject to approval by the importing country biosecurity and regulatory authorities.



A heat treatment facility for wooden pallets in China

**Table 1. Alternatives that can potentially replace or reduce methyl bromide use for QPS purposes**

(Brown rows correspond to the main categories of QPS use as explained above).

<b>Fumigated item</b>	<b>Examples of potential alternatives to replace or reduce methyl bromide <sup>5</sup></b>
Bulbs, corms, tubers and rhizomes (intended for planting)	Hot water, pre-plant quarantine soil sterilization (steam or chemical), pesticide dip, or a combination of these treatments
Cut flowers and branches (including foliage)	Controlled atmosphere (CO <sub>2</sub> , N <sub>2</sub> ) + combination treatment, hot water, irradiation, phosphine, phosphine/carbon dioxide mixture, pyrethroids, ethyl formate
Fresh fruit and vegetables	Cold treatment, high-temperature forced air, hot water, irradiation, quick freeze, vapour heat treatment, chemical dip, phosphine, combination of treatments, ethyl formate
Grain, cereals and oil seeds for consumption including rice (not intended for planting)	Heat treatment, irradiation, ethyl formate, carbonyl sulphide, phosphine, phosphine + carbon dioxide, sulfuryl fluoride, controlled atmosphere (CO <sub>2</sub> , N <sub>2</sub> )
Dried foodstuffs (including herbs, dried fruit, coffee, cocoa)	Heat treatment, carbon dioxide under high pressure, irradiation, ethyl formate, phosphine, phosphine + carbon dioxide, controlled atmosphere (CO <sub>2</sub> , N <sub>2</sub> ), sulfuryl fluoride, propylene oxide
Nursery stock (plants intended for planting other than seed), and associated soil and other growing media	Hot water, soil sterilisation (steam or chemical e.g. methyl isothiocyanate (MITC) fumigants), pesticides dip, phosphine, combination of any of these treatments
Seeds (intended for planting)	Hot water, pesticide dip or dusting, phosphine, combination treatments
Wood packaging materials	Heat treatment (contained in Annex 1 of ISPM No. 15). Further alternative treatments may be added in the future.
Wood (including round wood, sawn wood, Wood chips)	Heat treatment, kiln-drying, removal of bark, microwave, irradiation, MITC/sulfuryl fluoride mixture, methyl iodide, chemical impregnation or immersion, phosphine, sulfuryl fluoride
Whole logs (with or without bark)	Heat treatment, irradiation, removal of bark, phosphine, sulfuryl fluoride. MITC/sulfuryl fluoride mixture, methyl iodide.
Hay, straw, thatch grass, dried animal fodder (other than grains and cereals above)	Heat treatment, irradiation, high pressure + phosphine, phosphine, sulfuryl fluoride
Cotton and other fibre crops and products	Heat treatment, compression, irradiation, phosphine, sulfuryl fluoride CO <sub>2</sub>
Tree nuts (almonds, walnuts, hazelnuts. other)	Carbon dioxide under high pressure, controlled atmosphere (CO <sub>2</sub> , N <sub>2</sub> ), heat treatment, irradiation, ethylene oxide, ethyl formate, phosphine, phosphine + carbon dioxide, propylene oxide, sulfuryl fluoride
Buildings with quarantine pests (including elevators, dwellings, factories, storage facilities)	Controlled atmosphere (CO <sub>2</sub> , N <sub>2</sub> ), heat treatment, pesticide spray or fogging, phosphine, sulfuryl fluoride
Equipment (including used agricultural machinery and vehicles), empty shipping containers and reused packaging	Controlled atmosphere (CO <sub>2</sub> , N <sub>2</sub> ), heat treatment, steam, hot water, pesticide spray or fogging, phosphine, sulfuryl fluoride
Personal effects, furniture, crafts, artefacts, hides, fur and skins	Controlled atmosphere (CO <sub>2</sub> , N <sub>2</sub> ), heat treatment, irradiation, ethylene oxide, pesticide spray or fogging, phosphine, sulfuryl fluoride

Table 2. Feasible alternatives to MB for sawn wood and Wood Packaging Materials (WPM)

Alternative	Market penetration	Remarks
Heat	In use in many countries, including A5 Parties, economically feasible	Only alternative to MB approved by IPPC to comply with ISPM-15*, includes kiln drying and dielectric heating (microwaves)
Non-wood pallets	In use in various countries, particularly EU, Australia, NZ, USA	Cost may be a constraint in A5 countries, however there may be added benefits (ie forest preservation)
Alternative fumigants	Unknown	Sulfuryl fluoride and phosphine under consideration by IPPC

\*ISPM-15 is an international standard issued under the International Plant Protection Convention (IPPC) regulating the use of wood packaging material in international trade (see references section for full text).

Table 3. Feasible alternatives to MB for grain and other foodstuffs\*

Alternative	Market penetration	Remarks
Phosphine - PH <sub>3</sub>	High. In wide use around the world.	Development of resistant pests is of concern. Slower speed action can be compensated with in-transit treatments (in suitable shipholds) or logistic changes
Controlled atmospheres	Implemented in some non A5 countries and increasingly used in A5 countries	Good potential, can be combined with PH <sub>3</sub> to improve efficacy and reduce treatment time
Sulfuryl fluoride, cyanogen, carbonyl sulfide, ethyl formate	Not registered in many countries, this limits their adoption	Efficient where registered
Irradiation	Specialised equipment and logistics required limit adoption, however use has increased significantly in some countries ie the USA	May be affected by consumer concerns. Unsuitable for seeds requiring germination.

\* Although sometimes aimed at controlling quarantine pests (e.g. Khapra beetle) these treatments are, for the most part, pre-shipment uses. The suitability of the selected treatment thus depends on the target pests to be controlled (whether cosmopolitan or quarantine), and sometimes MB treatment is required by authorities.



Heat treatment of Wood Packaging Materials (WPM) in China

Table 4. Alternatives to MB for logs

Alternative	Market penetration	Remarks
Sawn timber (lumber)	Many Parties including A5	Sawing timber will rid the logs of unwanted pests. However, the process increases costs, so is feasible where there is demand for higher value products
Debarking	Some Parties, including A5	Often mandatory as a component of an integrated system
Heat	Some Parties, including A5	Only economically justified for high-grade logs
Phosphine	Some Parties, including A5	May be applied in transit in suitable ship holds against some pests



Irradiation facility for treating exported mangoes and other fruits in The Philippines

Table 5. Alternatives for pre-plant soil fumigation (nurseries, propagation plant material)\*

Alternative	Market penetration	Remarks
Fumigants (i.e. 1,3-Dichloropropene, Chloropicrin, Metham Sodium and others, or combined treatments)	High, in use as alternatives for many pre-plant soil (controlled) uses	The alternative must meet official certification standards and be accepted by regulatory authorities. May need inspection.
Substrates	Acceptable and in use in some countries both A5 and non-A5. Sometimes used only for a part of the propagation process	May be higher cost than MB treatment.
Steam	In use in some countries both A5 and non-A5	Recent research is yielding more efficient, economically feasible application systems

\* One Party has determined some of its preplant soils uses of MB fall under the QPS exemption

In addition best application practices should always be followed when MB is used. These include proper containment to avoid or reduce possible leakage, appropriate dosage adjustment and use of low permeability barrier films (for soils uses in particular).

Equipment for recapturing MB is commercially available and is considered a feasible transitional option for those uses for which no alternatives are available. The IPPC has published guidelines in this respect (see IPPC 2008 in Reference list).

## ADDITIONAL INFORMATION

The following reports contain detailed information of QPS uses of methyl bromide and their alternatives. They can be downloaded at the Ozone Secretariat website, at the following link:

[http://ozone.unep.org/en/assessment\\_docs.php?committee\\_id=6&committee=Technology%20and%20Economic%20Assessment%20Panel&committee\\_acronym=TEAP](http://ozone.unep.org/en/assessment_docs.php?committee_id=6&committee=Technology%20and%20Economic%20Assessment%20Panel&committee_acronym=TEAP)

MBTOC Assessment Report of the Methyl Bromide Technical Options Committee. 1994, 1998, 2002, 2006, 2010, 2014. UNEP, Nairobi. Available at the Ozone Secretariat website [www.ozone.unep.org](http://www.ozone.unep.org)

TEAP. (1999). Report of the Technology and Economic Assessment Panel April 1999, Volume 2: Essential Use Exemptions, QPS Applications for Methyl Bromide, Progress and Control of Substances and other Reporting Issues. UNEP:Nairobi: 227pp.

TEAP..Progress Reports of the Technology and Economic Assessment Panel 2002, 2003, 2006, 2007, 2009, 2010, 2012. UNEP Nairobi. Available at the Ozone Secretariat website [www.ozone.unep.org](http://www.ozone.unep.org)

TEAP (2009). Report of the Technology and Economic Assessment Panel. Quarantine and Pre-Shipment Task Force Report. UNEP, Nairobi.

## ADDITIONAL INFORMATION

UNEP/IPPC, (2008). Methyl Bromide: Quarantine and Preshipment uses. United Nations Environment Programme, Nairobi, Kenya, 16 pp.

IPPC (2008). CPM Recommendation CPM-3/2008. Replacement or reduction of the use of methyl bromide as a phytosanitary measure. <https://cbnyuv4411z4cuuf4csy.portal.unep.fr/en/core-activities/governance/cpm-recommendations/replacement-or-reduction-of-the-use-of-methyl-bromide-as-a-phytosanitary-measure/>

IPPC (2013) International Plant Protection Convention. ISPM 15. International Standards for Phytosanitary Measures. Regulation of Wood Packaging Material in international trade. <http://www.ispm15.com/IPPC%20ISPM15%20draft%20Apr%202013.pdf>

### Footnotes

<sup>1</sup> Parties to the Montreal Protocol are classified as Article 5 (A5) or Non-Article 5 (Non-A5) in relation to their consumption of ODS. In general terms, A5 Parties are developing countries whilst Non-As are industrialised.

<sup>2</sup> The Methyl Bromide Technical Options Committee (MBTOC) is the technical committee of TEAP assisting the Parties to the Montreal Protocol with matters related to MB, including alternatives for controlled and exempted uses, critical use nominations and others.

<sup>3</sup> Sources: MBTOC survey of QPS uses in A5 parties with reported consumption at or above 100 tonnes; 2014 and 2010 MBTOC Assessment Reports; 2009 report of QPSTF; NOUs, regional networks and national experts.

<sup>4</sup> Methyl Bromide is one of the treatments authorized by the International Plant Protection Convention (IPPC) to treat Wood Packaging Materials (WPM) in compliance with the standard ISPM-15, which seeks to avoid dispersal of quarantine pests that may be associated with pests of standing timber (forest pests).

<sup>5</sup> Examples are given that are generally applicable and likely to meet prevailing standards for treatment or disinfection. Some alternatives may not be appropriate on particular commodities within the general category or in specific situations. (Source: MBTOC 2014 Assessment Report)

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