EUROPEAN COMMUNITY MANAGEMENT STRATEGY FOR THE PHASE-OUT OF THE CRITICAL USES OF METHYL BROMIDE

This is a "living" document that will be updated regularly

MAY 2006

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Annexes 1-9 are contained in a separate document

ACRONYMS

COM	European Commission
CUE	Critical use exemption
CULA	Critical Use Licence Assessment
CUN	Critical use nomination
CUNA	Critical Use Nomination Assessment
EC	European Community
ECMS	European Community Management Strategy for Phase-out of Critical Uses of Methyl Bromide
MB	Methyl bromide
MBTOC	Methyl Bromide Technical Options Committee
MS	Member State of the European Community
NMS	National Management Strategy
PCO	Pest control operators
TEAP	Technological and Economic Assessment Panel

Executive Summary

The Executive Summary highlights key features of the European Community Management Strategy. For further details, please refer to the chapters in the main report, and the attached Annexes

Methyl bromide (MB) is a highly toxic pesticide used in the past mainly for effectively controlling soil-borne fungal and bacterial pathogens, nematodes and weeds prior to planting various crops such as strawberries, and used to some extent for controlling insects, mites and rodents in food facilities such as flour mills and in commodities such as dried fruit. MB was officially added to the Montreal Protocol in 1992 because it is a potent ozone-depleting substance. MB was phased-out on 1 January 2005 in all industrialised countries[1], except when 'critical uses' are authorised under the Protocol for specific circumstances where technically and economically feasible alternatives are not immediately available. Critical uses are therefore intended to be strictly limited and temporary derogations from the phase out of MB.

The "European Community Management Strategy for the Phase Out of the Critical Uses of Methyl Bromide" (ECMS) is submitted to the Ozone Secretariat pursuant to Decision Ex.I/4(3) of the Montreal Protocol. The ECMS is a 'living document' which will be subject to annual review. The EC will carry out further evaluation of the implementation and effectiveness of the below mentioned measures and update the ECMS as appropriate.

The ECMS describes the process and conditions put in place in the European Community for reviewing any critical use and agreeing on any amount of MB intended for CUs at the Community level with a view to reducing and eliminating MB uses as soon as possible. It also describes linkages with and implications on the development and deployment of alternatives, which is an integral and crucial part of the present strategy and, more generally, of the EC policy for the complete phase out of methyl bromide for critical uses.

The ECMS addresses all the requirements of Decision Ex.I/4(3) by providing information on procedures or actions that:

- Avoid increases in MB consumption except for unforeseen circumstances;
- Encourage the use of alternatives through the use of expedited procedures to develop, register and deploy technically and economically feasible alternatives to MB;
- Bring forward the time when MB consumption for each use can be reduced and finally phased-out as soon as technically and economically feasible alternatives are available;

[1] Methyl bromide used as feedstock, laboratory and for official quarantine and pre-shipment (QPS) purposes is exempt from this phase-out date.

- Promote the implementation of measures which ensure that any use and emissions of MB are minimised (in cases where an exemption is authorised);

Chapter 1 describes the restrictions on the use of MB contained in the Montreal Protocol and in the EC Regulation. Any critical uses require the approval of the Parties to the Montreal Protocol. In addition Articles 3(2) and 4(2) of the Regulation require the Commission to determine every year any critical uses for which the production, importation and use of MB may be permitted, in the light of the criteria contained in the relevant Decisions of the Montreal Protocol and the Regulation.

The Member States (MSs) have agreed to send their requests for critical uses to the Ozone Secretariat through the European Commission. A first review of the nominations is conducted by the Commission and the MS involved before they are included in the EC Nomination submitted to the Ozone Secretariat. After the Decision of the Parties is made on the eligible quantities of MB, a separate Commission Decision is published annually, specifying the quantity of MB that can be licensed in the EC for each critical use that meets all the necessary criteria.

The Commission Decision is based on an independent technical assessment of the amount of MB that is eligible for licensing, assessed according to the criteria contained in the EC Regulation and relevant Decisions of the Montreal Protocol, and agreed following formal consultations with Member States. Stocks of MB are deducted from the quantity of MB agreed for each category of use for each fumigator in order to minimise the amount of 'new' MB that can be imported or produced. The Regulation from 1 January 2006 onwards bans the use of stocks for uses other than those that are listed as critical in the Commission Decision.

There are 91 fumigators in the EC that are licensed 'users' of MB in 2006. The transition from MB to alternatives focuses on the adoption of the alternatives by the limited number of fumigators, rather than by thousands of individual farmers and food facilities. The use of alternatives by trained fumigators will ensure comparable economic results as with MB, thereby gaining the confidence of the farmers and industry in the alternatives.

Annex 1 contains a list of tables that need to be updated annually and Annex 2 the key parts of Decisions agreed in the Montreal Protocol that place conditions to restrict the use of MB as a critical use and that promote its phase out as soon as technically and economically feasible alternatives are available.

Chapter 2 documents the historical trends in MB consumption in the EC by 23 out of 25 Member States[2]. In 2006, eight Member States[3] were authorised to use MB for critical uses, and fifteen Member States[4] no longer use MB.

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[2] Quantities cited do not include quarantine and pre-shipment (QPS) uses of MB (which are currently exempt from phase-out in the Montreal Protocol), feedstock and laboratory uses but which are all nevertheless controlled and restricted under Regulation (EC) No 2037/2000.

[3] Member States authorised to use MB in 2006 for critical uses: Belgium, France, Ireland, Italy, Poland, Spain, the Netherlands, and the United Kingdom.

[4] 15 Member States consumed MB in the past and are not authorised to use MB for critical uses in 2006: Austria, Cyprus, Czech Republic, Denmark, Finland, Germany, Greece, Hungary, Latvia,

The amount licensed by the Commission is less than the amount authorised by the Montreal Protocol because of progress made by the Member States in the implementation of alternatives between the time the Nomination was first submitted to the Protocol, and the time when licensing occurs. For example, EC critical uses authorised by the Protocol amounted to 22%[5] of EC base level (4,292 tonnes) in 2005 and 18% (3,536 t) in 2006, but the Commission licensed 14% (2,777 t [6]) in 2005 and 8% (1,607 t before deducting stocks) in 2006 because more alternatives were found to be available at the licensing stage. Member States have phased out more than 17,640 tonnes of MB since 1991.

In 2006, 91% of the MB was licensed for use in Italy (915 t) and Spain (550 t), with the remaining 9% apportioned to Belgium (3 t), France (73 t), the Netherlands (0.1 t), Ireland (0.9 t), Poland (32 t) and the United Kingdom (33 t). Soil fumigation accounted for 92% of the authorised uses, with tomato (31%), strawberry fruit / runner plants (38%), pepper/eggplant (10%) and cut-flower and bulb production (9%) predominating. The fifth major use is for fumigation of mills, which is the principle post-harvest use. As a result of this analysis the ECMS focuses on the deployment of alternatives in these five areas which together account for more than 90% of the critical uses of MB in the EC.

Annex 3 provides details on 'MB uses trends – historical and current' that are helpful for analysing use categories that need special attention in order to phase out MB.

The needs of users (pest control operators (PCOs) and fumigators) and end users (e.g. farmers, flour mill managers) are discussed in the transition to MB alternatives. End users require cost-effective methods of pest and disease control that allow them to make a profit by producing a crop of adequate yield and market-acceptable quality. End users producing nursery crops may also need to meet national or export certification standards as these plants are sold to other growers. Mills and food companies need to maintain standards of food hygiene and they must meet customers' requirements by avoiding food contaminated by insects or rodents.

Soil sector phase-out programmes implemented in Member States have provided benefits to growers and led to phasing out of more than 15,000 tonnes of MB since 1991. These led to major technical innovations and agricultural improvements, which increased grower skills and knowledge of pest and disease control, and ultimately increased crop production.

The phase out of the relatively few remaining uses of MB offers opportunities to PCOs to diversify their operations into new methods of pest control and new areas of business, such as consultancy services involving pest monitoring, training courses on how to use alternatives, and supply of new alternatives and equipment. PCOs need

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Lithuania, Malta, Portugal, Slovakia, Sweden, and Slovenia. Estonia and Luxembourg did not report consumption in the past, and are also not authorised to use MB now.

[5] The EC's 1991 base level consumption of methyl bromide for controlled uses was 19,253 tonnes.

[6] 207 tonnes of stocks were deducted from the total of 2,777 tonnes, so that a total of 13% of base level (2,570 tonnes) MB was authorized in the EC.

cost-effective, ozone-safe pest control methods, registered and available in the locality, which they can offer their customers.

Chapter 3 summarises the alternatives available and under development for soil and post-harvest uses in the EC, many of which have been documented from 1994 in reports to the Protocol by UNEP's Technology and Economic Assessment Panel (TEAP) and its specialist Committee, the Methyl Bromide Technical Options Committee (MBTOC). It is acknowledged that most alternatives have to be applied in combination with others as individually they do not have the same technical properties as MB.

The main pest control chemicals for soil uses are combinations of 1,3-dichloropropene (1,3-D), chloropicrin (PIC), dazomet, metam sodium and a range of other nematicides, fungicides and herbicides. Some alternatives are also used in combination with Virtually Impermeable Film (VIF) to improve pest control.

The main non-chemical methods (typically used in combination with another treatment) are crop rotation, grafting on resistant rootstock, resistant varieties, soil steaming, soil-less cultivation, mulches, solarisation, biofumigation and mechanical weeding. Cultural practices such as field sanitation, balanced fertilisation, tillage, irrigation control and planting time are widespread in the EC and help to control pests.

Fundamental to the use of alternatives (and minimisation of disinfestation in general) are actions related to (a) pest monitoring, where appropriate, to determine if pests are present at potentially damaging levels, (b) use of effective application methods and (c) use of combinations of treatments or practices where necessary to control the range of pests present. In Belgium, for example, mandatory identification of soil pests reduced the use of MB for critical uses in 2005 by 70%.

Alternatives under development for soil uses include dimethyldisulfide, which is being trialled in France, Italy and Spain; optimised biofumigation techniques, propylene oxide, sodium azide and others in Spain; soil-steaming or hot-air equipment manufactured in the Netherlands and Italy; and additional resistant cultivars for many crops.

The main pest control chemicals for post-harvest applications include sulfuryl fluoride, phosphine as pure formulations or with special practices to avoid corrosion, contact insecticides and acaricides.

The main non-chemical methods for post-harvest disinfestation include heat treatments (most recently 'spot' applications), Integrated Pest Management (IPM, including cleaning, inspection, pest monitoring, trapping and selective pesticides), controlled atmospheres, high-pressure + carbon dioxide, vacuum hermetic systems, spot-freezing, mechanical control of insects, and modified atmosphere packaging. Individual alternatives, such as heat, have been used commercially for many years in some Member States, but are under development in others, indicating that procedures to transfer existing technologies between Member States need to be improved in the EC.

The Commission and Member States have invested in research programmes that phase out MB directly (one MS, for example, started large-scale specific programmes in 1997), or that phase out MB as part of larger research programmes that aim to remove chemicals from the food chain and to improve the sustainability of crop production methods. Working with the governments of Member States, and other partners such as UNEP, the Commission has co-hosted five international conferences on MB alternatives since 1997. More recently, some crop certification organisations and supermarkets have required crops to be grown free of MB as a condition of purchase.

Annex 4 provides information on available and registered alternatives in the EC.

Chapter 4 discusses the rates of adoption of MB alternatives in the EC. The rate of adoption (or its equivalent term 'market penetration') is increased when the supply of MB is reduced and linked to other activities, such as training of PCOs in the use of MB alternatives by agricultural institutes, extension workers and crop production associations; and/or changes in the economic environment that encourage the use of alternatives.

In the Netherlands, Denmark, Italy and Spain, for example, phase-out was supported by national policies or plans that promoted alternatives and minimised the amount of MB authorised. The ECMS provides information on actions taken by Member States to develop economic environments conducive to the phase out of MB and the implementation of alternatives. For example, Slovakia placed a tax on MB to discourage use and generate funds for ozone layer protection. Italy, Spain, the Netherlands and the UK have used government grants or bank loans to assist the adoption of alternative technologies. Member States still using MB have shown commitment to its phase out through research programmes and annual reductions according to the availability of the alternatives. Supermarket chains and international certification programmes that prohibit the use of MB have also encouraged farmers to adopt MB alternatives.

The registration of additional chemical alternatives would increase the range of options available to users, although the cost and complexity of registration has often deterred manufacturers from making applications and this presents a barrier particularly in Member States where the potential market for new chemical products would be small. However, the time needed for authorisation of low-toxicity pesticides is generally shorter than traditional chemical pesticides. MB and many of the pesticides in the EC are currently under re-registration on the basis of a review of the manufacturers' submissions of the latest toxicological information for pesticides, according to criteria in Directives (EC) 91/414 and 98/8.

The ECMS provides examples of technically feasible adoption rates found in various crops and countries. For example, MB was eliminated at the rate of up to 1627–2000 ha per year in strawberry fruit production by the adoption of alternative fumigants. Production of the same crop on substrates, however, produced only a rate of adoption up to 80 ha per year, mainly due to increased costs, even though yields increased. The rate of change for other crops is being quantified in the seven Member States that are

authorised to use MB for critical uses in order to define for each crop the amount of MB that can be replaced by alternatives each year.

Currently, a major chemical replacement for the post-harvest uses of MB is sulfuryl fluoride (SF). Adoption rate is promoted by registration and the licensing of PCOs that pass a training programme designed to ensure its proper use. In France, Italy and the UK this product is registered; and the private company that promotes this product has put in place programmes for training of fumigators in the application of SF. Experience in the use of SF as a result of trials in different types of food facilities continues to provide data on feasible, annual rates of MB elimination in each Member State.

Training programmes are another element in the promotion and adoption of alternatives and have been undertaken by government agencies and individual companies, growers associations or others.

Annex 5 outlines the EC registration procedures for pesticides. Annex 6 contains the current registration status of chemical and non-chemical alternatives in the EC. Annex 7 provides more detailed data on the historical rate of adoption of alternatives.

Chapter 5 describes the use of a "Decision Tree" to determine whether or not all or part of a proposed use of MB is considered critical. The Decision Tree is based on the criteria contained in Decision IX/6, other relevant Decisions and the EC Regulation. The chapter also outlines the guiding principles developed in the ECMS, and the definitions of terms used in the Decision Tree.

In cases where a critical use of MB is authorised, the steps to minimise use and emissions are provided. In the soil sector these steps include:

- Limiting the frequency of MB use;
- Allowing use of MB only when pest monitoring shows that alternatives would not provide adequate pest and disease control, as far as appropriate;
- Ensuring permits are issued before each fumigation;
- Reducing the dose of MB in cases where it is higher than technically necessary, and by combining MB with alternatives;
- Changing from hot gas to injection methods.

Steps to minimise use and emissions in the post-harvest sector include:

- Improving the gas tightness of premises;
- Continuous monitoring to avoid over-dosing;
- Increasing the temperature and time where possible;
- Using forced-air circulation to improve efficacy at lower MB doses;
- Using equipment to capture MB at the end of the fumigation period where feasible.

Future actions to eliminate the use of MB for critical uses include focussed efforts on the resources (equipment, training) required to implement an alternative, encouragement of implementation efforts and research in cases where alternatives have not yet been identified. Further actions include continuing to make stakeholders aware of alternatives and the need for immediate adoption, promoting awareness by

case studies on the cost and use of alternatives for the existing critical uses of MB, and the development of a website to promote the exchange of alternative technologies between Member States.

Chapter 6 summarises the compliance of the EC with decisions of the Montreal Protocol on critical uses of MB. The EC has put in place review procedures that have been successful in reducing the quantity of MB and number of critical uses-categories.

The EC has submitted information to the Parties on alternatives for pre- and post-harvest uses of MB; an Accounting Framework Report that includes information on the amounts approved, authorised, licensed and used, and stocks remaining; a description of the licensing procedures that ensure that the amount of MB placed on the market does not exceed the amount authorised for each category of use in each Member State; and a summary of each application in the EC Nomination to the Parties that requests MB for critical uses in 2007.

The procedures and forms used to examine requests for critical uses are summarised in Annex 8. Annex 9 contains a list of key citations for the ECMS.

Conclusion:

The ECMS demonstrates that efforts by the European Community and its Member States show their full commitment to fulfil their obligations under the Montreal Protocol and, in particular, to eliminate MB for critical uses as soon as possible. As shown through past experience and documented in this strategy, the European Community and its Member States have made significant efforts toward reducing their dependency on MB and an intention to maintain such efforts so that MB can be phased out as quickly as possible.

This is being done through combined and convergent efforts both at Community and national level through the implementation of the framework Regulation on Ozone Depleting Substances (Regulation (EC) No 2037/2000) and through the provision of incentives aimed at moving towards alternatives. Their development is closely monitored and any findings toward their suitability and marketability is swiftly taken into account when considering critical use requests

As a result, the use of MB in many critical uses has already been phased out. Further targeted efforts vis-à-vis remaining uses will be pursued so that a full phase out can be achieved in a near future.

1 Phasing out critical uses of methyl bromide

The Montreal Protocol on "Substances that Deplete the Ozone Layer" was agreed in 1987 and aims to phase out all substances that deplete the earth's ozone layer. The Protocol has been signed by more than 180 countries and is widely regarded as the most effective international environmental agreement to date.

In the European Community, Regulation (EC) No 2037/2000 gives effect to agreements of the Parties to the Montreal Protocol. The scheduled phase-out date for methyl bromide (MB) in this Regulation was 31 December 2004. Exemptions for so-called 'critical use exemptions' (CUEs) are permitted under specific circumstances described below.

The Montreal Protocol has required Parties in the past to submit strategies as a way to promote the phase out of particular types of ODS. In 1998, the EC produced "The European Community Strategy for the Phase Out of CFCs in Metered-Dose Inhalers"[7]. In July 2000 and in response to Montreal Protocol Decision X/7, the EC submitted "The European Community Strategy for the Management and Phase Out of Halons". These strategies provided direction and guidance on the range of options available to reduce and eliminate the use and emissions of CFCs and halon. In the CFC phase out strategy, the strategy also defined the conditions for determining when CFCs should be considered as no longer essential.

This chapter describes the requirement for Parties that have nominated CUEs to produce a "Management Strategy for the Phase-out of Critical Uses of Methyl Bromide", and the content of such a Strategy. It also describes relevant decisions taken by the Parties that place conditions on methyl bromide used for critical uses which must be considered in the Strategy.

[7] OJ C 355, 20.11.98, 2-30

1.1 Restrictions on methyl bromide in the Montreal Protocol

In 1992, MB was listed as a controlled ozone depleting substance under the Montreal Protocol. Article 2H of the Protocol established a timetable of reductions in the production and consumption of MB, and most uses were due to be phased out by 1 January 2005 in industrialised countries. Temporary exemptions from the phase-out date, called "Critical Use Exemptions" (CUEs), are permitted in certain cases when technically and economically feasible alternatives to MB are not available or cannot be used.

1.2 Requirement to submit a Strategy: Decision Ex.I/4

Paragraph 3 of Decision Ex.I/4 of the Montreal Protocol requests Parties that submit critical use nominations after 2005 to develop and submit to the Ozone Secretariat, before 1 February 2006, a Management Strategy for the Phase-out of Critical Uses of Methyl Bromide. The 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."*

1.3 Restrictions on methyl bromide in the EC Regulation

In the European Community, ozone depleting substances are controlled by Regulation (EC) No. 2037/2000 on "Substances that Deplete the Ozone Layer". This Regulation covers the production, import, export, placing on the market, use and destruction of ozone depleting substances, including MB.

The EC Regulation required the phase out of MB production and importation by 31 December 2004, with the exception of MB used for industrial feedstock, for quarantine and pre-shipment (QPS) purposes, for laboratory uses, for 'inward

processing relief"[8] and for critical uses. The European Commission is permitted to licence production and importation of MB for CUEs only in cases that comply with the Montreal Protocol and the EC Regulation.

1.4 Criteria for determining Critical Uses: Decision IX/6 and other relevant Decisions

Article 3(2)(ii) of Regulation (EC) No 2037/2000 states (underlined key elements are discussed below):

> *"In the light of the proposals made by Member States, the Commission shall, in accordance with the procedure referred to in Article 18(2), apply the criteria set out in Decision IX/6 of the Parties, together with any other relevant criteria agreed by the Parties, in order to determine every year any critical uses for which the production, importation and use of methyl bromide may be permitted in the Community after 31 December 2004, the quantities and uses to be permitted and those users who may take advantage of the critical exemption. Such production and importation shall be allowed only if no adequate alternatives or recycled or reclaimed methyl bromide is available from any of the Parties."*

Article 4(2)(i) of Regulation (EC) No 2037/2000 states:

> *"Subject to paragraphs 4 and 5, each producer and importer shall ensure that:*
>
> *(d) it does not place any methyl bromide on the market or use any for its own account after 31 December 2004.*
>
> *To the extent permitted by the Protocol, the Commission shall, following a request by a competent authority of a Member State and in accordance with the procedure referred to in Article 18(2), adjust the calculated level of methyl bromide referred to in Article 3(2)(i)(c) and subparagraph (c) where it is demonstrated that this is necessary to meet the needs of that Member State, because technically and economically feasible alternatives or substitutes that are acceptable from the standpoint of environment and health are not available or cannot be used.*
>
> *The Commission, in consultation with Member States, shall encourage the development, including research, and the use of alternatives to methyl bromide as soon as possible."*

1.4.1 Article 18(2) Management Committee Procedure

Article 18(2) refers to the Management Committee which assists with the implementation of the EC Regulation and which meets annually on at least two occasions. This Committee is composed of representatives from Member States (typically from Environment ministries or departments) and is chaired by the Commission.

In relation to the critical uses of MB, the Commission seeks the opinion of the Committee on a draft Commission decision that proposes quantities of MB for specific uses that can be licensed in the coming year, based on the uses and quantities

[8] Methyl bromide that is imported, processed and repacked, and re-exported following strictly-controlled procedures

of MB for critical uses approved by the Parties; whereas the National Experts Committee is involved in the EC Nomination of the proposed quantities of MB that have been agreed with the relevant MSs to be submitted to UNEP for a subsequent year. The draft decision is based on a technical analysis of the requests from Member States. The Commission seeks the opinion of the Committee on the draft decision related to the licensing of MB through a vote decided by a qualified majority. Once agreed, the decision is adopted by the Commission and officially published.

1.4.2 Decision IX/6

Decision IX/6 of the Montreal Protocol entitled "Critical-use exemptions for methyl bromide" decided the following:

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 minimize 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, commercialize 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. […]

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;

The procedures for implementing Decision IX/6 in the Montreal Protocol and EC are described in Chapter 5.

1.4.3 Other relevant criteria agreed by the Parties

The Parties to the Protocol have recognized that critical use exemptions "*are intended to be limited, temporary derogations from the phase-out of methyl bromide*" (Decision Ex.I/3) and 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*" (Decision Ex.I/4).

Decision XVI/4[9] invites Parties to provide in their nominations information on their determination of significant market disruption. Member States therefore provide evidence to the Commission to support its view that the specific use is critical because the lack of availability of methyl bromide for that use would result in a significant market disruption. The term "significant market disruption" and other relevant terms have been defined in Chapter 5.

Paragraph 6 of Decision Ex.I/4 requests that any applications for critical uses of methyl bromide after 2004 contain a description of the methodology used to determine economic feasibility, in the event that economic feasibility is used as the criterion to justify the requirement for the critical use of methyl bromide, and to use as a guide the economic criteria contained in Part B, Section 4 of Annex 1 to the Report of the First Extraordinary Meeting of the Parties[10].

Decision XVI/4 refers to Annex 1[11] of the Report of the 16th Meeting of the Parties which in turn states that a nominating Party should inform MBTOC when registration of an alternative to methyl bromide occurs. Each Member State therefore provides information to the Commission on the registration status of an alternative, such as when registration is expected, as MBTOC is required to take this into account when recommending to the Parties a quantity of methyl bromide for critical uses.

Decision XVI/4 refers to Annex 1[12] of the Report of the 16th Meeting of the Parties which in turn states that where MBTOC recommends a nomination on the grounds that it is necessary to have a period of time for the adoption of alternatives, the basis for calculating the time period must be explained fully in the TEAP report. In order for TEAP to provide this report, each Member State, supplier, distributor or manufacturer provides information to the Commission on the relevant factors that could be used to calculate the time for the adoption of alternatives, including the number of fumigation and pest control companies that need to transition, the estimated training time assuming full effort, opportunities for importing alternative equipment and expertise if not available locally, and the costs involved.

Decision Ex.I/3(7) notes that a Party may request reconsideration of a CUE in the case of exceptional circumstances, such as unforeseen deregistration of an approved alternative when no other feasible alternatives are available or where a pest or

[9] Paragraph 21 of Annex I to the Report of the 16th Meeting of the Parties, as referenced by Dec XVI/4

[10] UNEP/OzL.Pro.ExMP/1/3

[11] Paragraph 26 of Annex I to the Report of the 16th Meeting of the Parties, as referenced by Dec XVI/4

[12] Paragraph 35 of Annex I to the Report of the 16th Meeting of the Parties, as referenced by Dec XVI/4

pathogen builds resistance to the alternative, or where the use-reduction measures on which TEAP based its recommendation as to the level necessary to satisfy a critical-use are demonstrated not to be feasible in the specific circumstances of that Party.

By having the above evidence for each crop or post-harvest use from each Member State making a submission for critical uses, the European Community as the nominating Party would be in a position to assess compliance with the relevant criteria in Decision IX/6 and other criteria that have been agreed by the Parties in more recent decisions.

Each Member State is required to provide to the Commission a critical use nomination application form (as required in the TEAP/MBTOC Handbook of CUEs) and a summary of each crop or post-harvest nomination containing the following information: (a) Name of the Member State; (b) Descriptive title of the application; (c) Crop name (open field or protected) or post-harvest use; (d) Quantity of methyl bromide requested; and (e) Reason or reasons why alternatives to methyl bromide are not technically and economically feasible. The summaries will allow the Commission as the nominating Party to supply this information to the Ozone Secretariat, pursuant to Decision Ex.I/4(7).

1.4.4 Quantities and uses

In Article 3(2) of Regulation (EC) No 2037/2000, the 'quantities' of MB refer to the kilograms of MB approved or licensed for each 'category of use' as referred to in a Decision of the Parties or Commission Decision, which are normally made annually. A category of use (also called use category) could be for 'Carrot production' in France for example, or 'Flour mills' in Italy. In the first year of critical uses in 2005 there were 78 categories of use in 10 Member States, and this was reduced to 26 categories of use in 8 Member States in 2006 due to the availability and adoption of alternatives.

1.4.5 Methyl bromide stocks

Stocks are MB "*…that has not been put to its intended use in the year in which it was produced or imported…*'[13], thereby remaining in hand with the potential to be used at a future time, avoiding the production of 'fresh' MB.

The use of stocks for CUEs is consistent with paragraph 1(b)(ii) of Decision IX/6 that "*…permits production and consumption, if any, of methyl bromide for critical uses only if methyl bromide is not available in sufficient quantity and quality from existing stocks of banked or recycled methyl bromide…*". Decision Ex.II/1(3) also emphasises the need for Parties to consider stocks and states "*That each party which has an agreed critical use shall take into full consideration all quantities of existing stocks of methyl bromide…*". The Accounting Framework for CUEs required by the Montreal Protocol (details in Annex 2) calculates the quantities of MB *"in hand"* at the beginning and end of each year.

[13] Note by the Ozone Secretariat presented to the Parties entitled *'The issue of ODS stockpiling relative to non-compliance with the Montreal Protocol'*. UNEP OzL.Pro.27/CRP3/Add 1, 10 December 2005.

In practical terms, the Commission deducts stocks of MB known to be available for critical uses in the Community, which have been notified to the Commission by the Member States, from each critical use category prior to a licence being issued for the importation of MB for that particular use. When CUEs were authorised for 2005, 207 tonnes of stocks were deducted from the total quantity that could be imported or produced.

From 1 January 2006, Regulation (EC) No 2037/2000 permits stocks of methyl bromide to be used only for critical uses listed in the Commission Decision. Methyl bromide produced or imported or in stock for QPS, for feedstock and for laboratory uses in the EC can only be used for these specific purposes. MB stocks cannot be used for any other purposes.

Another potential source of MB is from '*recycled or reclaimed*' MB. However, unlike other ODS, in practice MB is rarely captured and recycled. For example, halons (once used extensively for fire fighting and explosion suppression) can be removed from existing equipment and then cleaned to '*reclaim*' them before they could be '*recycled*' for uses that are still permitted. MB is vaporised into the soil or into a food facility where it is retained for a period of several hours to several days in order to kill pests before the gas is released to the atmosphere. In fixed facilities, it is feasible to capture a proportion of the MB, however in practice, MB is rarely captured or recycled. A facility used for disinfestation of coffee and cocoa beans in the seaport area of Szczecin in Poland is able to capture and re-use MB.

1.4.6 Users who may take advantage of the critical exemption

Article 17(2) requires Member States to define the minimum qualification requirements for personnel involved in the application of methyl bromide and, since fumigation is the only use, the Commission determined that fumigators qualified to apply methyl bromide are deemed to be the only 'users'. Fumigators are officially notified to the Commission by the Member State and authorised by the Commission to request an importer or producer to supply methyl bromide for critical uses.

MB fumigators have been trained in the application of MB, unlike most farmers or mill owners that generally are not qualified to apply methyl bromide but who own properties on which it will be applied. In addition, Member States have put in place procedures to identify MB fumigators within their territory that are permitted to use methyl bromide for critical uses. Furthermore, some Member States, such as Poland and Italy, require that in order to be eligible for taking advantage of the Commission licence for CUE, the fumigators or fumigation companies must present reports showing details of MB use for critical applications in the previous year, as well as the detailed plans for use in the year for which CUE is requested

As fumigators and fumigation companies are the only users of MB, it follows that the transition to alternatives should be accomplished by focusing on the adoption of alternatives by relatively few personnel and companies, rather than reaching out to thousands of farmers and operators of food processing facilities. In the EC, there are

91 fumigators / fumigation companies[14] registered to use MB for critical uses in 2006. Further information on fumigators is supplied in Table 3.1.

[14] BE(7); ES(7 fumigation companies and MB distributors); FR(17); IE(1); IT(42); NL(1); PL(5); UK(11).

2 Methyl bromide uses – Past and current trends

2.1 Historical methyl bromide consumption trends

All data in this chapter refers to soil and post harvest (non-QPS) uses of MB, therefore the reported data do not include QPS or feedstock. MB production in the EC was about 4195 tonnes in 1991, and was reduced to 1856 tonnes in 2004. This includes MB production for export to developing countries, which is currently limited to 479 tonnes per year (Ozone Secretariat 2005). Historically, the majority of MB has been imported into the EC.

In 1991 the European Community consumed 19,253 metric tonnes of MB for soil and post-harvest uses (excluding QPS), which represented about 30% of global consumption. Figure 2.1 shows the historical trend in MB consumption in the European Community for non-QPS purposes.

Since the official phase-out date of 31 December 2004 the production, import and export of MB has been limited by Regulation (EC) No 2037/2000 to the specific quantities shown in Table 2.1. The EC consumption has been steadily reduced over time to the current level of about 1,607 tonnes for critical uses in 2006 (that is, excluding QPS, feedstock and laboratory uses). This represents about 9% of the EC consumption in 1991.

Table 2.1 Methyl bromide nominated, approved, licensed and used in the European Community

Authorisation Step	2005		2006	
	Tonnes	Percent[1]	Tonnes	Percent[1]
Nominated to the Parties of the Montreal Protocol	5,754	29.9	4,213	21.9
Approved by the Parties to the Montreal Protocol	4,292	22.3	3,536	18.4
Licensed by the Commission for use in the European Community	2,777	14.4	1,655	8.6
Licensed by the Commission after deducting stocks	2,570	13.3	Data available March 2006	Data available March 2006
Used in the European Community, as reported by Member States	2,530	13.1	Data available January 2007	Data available January 2007

[1]Percentage of 1991 consumption of 19,253 tonnes in the European Community

Table 2.2 shows the historical consumption of MB in Member States for which data are available. In the 1970s, the Netherlands used a significant amount of MB (approx. 3,000 tonnes), but phased out the majority of MB (all soil sector uses) by 1992 (MBTOC 2002) because of water contamination, local air contamination, accidents among agricultural workers, and residues in food (Parliamentary Session 1981). Germany did not adopt MB to a great extent, largely due to national policies to prevent water contamination and limit pesticide residues (Ketzis 1992). Denmark phased out MB by 1998 as a result of national regulations for ozone layer protection (MBTOC 2002). By 1990, Italy became the major MB consumer in Europe, followed by Spain and France. In the 1980s and 1990s MB consumption declined in some parts of the EC while increasing substantially in others. Nevertheless, the progress in MB phase-out is clear in these countries because MB consumption was reduced to about 1650 t by 2006 in the EC (Table 2.2), eliminating 91% of the historical MB consumption.

Figure 2.1 Methyl bromide consumption trends in European Community and the Montreal Protocol, 1991-2006 (tonnes, excluding QPS)

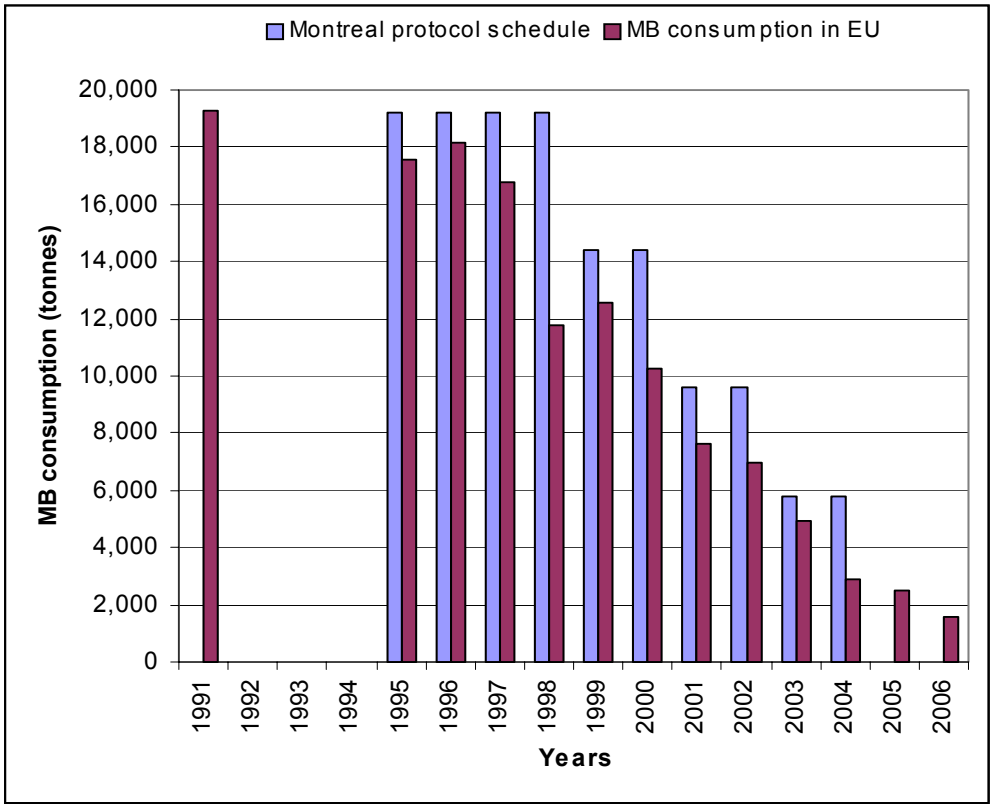


Table 2.2 Methyl bromide consumption trends in Member States for which data are available (tonnes)

Country	Before 1980	1991 (estimated)	1993/4 (estimated)	2000 (estimated)	2006 licensed
Belgium		300	400	102	3
Denmark		33	33	0	0
France		4,195	1,604	815	73
Germany		[83]	73	58	0
Greece		970	950	750	47
Hungary		53	53	40	0
Ireland		60			0.9
Italy		6,974	7,000	5,800	915
Netherlands	3,000	59	39 [15]	[30]	0.1
Poland		200	103	65	33
Spain		4,236	4,191	2,377	550
Sweden		18	[18]		0

[15] For postharvest uses only. All MB soil fumigation was phased out in the Netherlands by 1992.

Country	Before 1980	1991 (estimated)	1993/4 (estimated)	2000 (estimated)	2006 licensed
UK		629	550	344	33
Others		1,443	2,974	1,886	0
Total EC-25	**No data**	**19,253**	**17,988**	**11,051**	**1,655**

2.2 Past and current uses in the European Community

In the soil sector, MB has been used as soil treatment to control nematodes, soil-borne fungi and weeds before planting certain crops such as tomato, strawberry, peppers and cut flowers, nursery plants and strawberry runners. In the post-harvest sector, MB has been used to control insects and sometimes rodents in mills, food processing buildings and post-harvest commodities such as rice, nuts, dried fruit and spices.

Table 2.3 compares the major MB uses in the EC in the past (1991) and present. Historical information is available primarily for the soil sector. The number of crops using MB fumigation in the soil sector has been reduced from more than 40 crops in the 1990s to about 13 crops in 2006. MB uses that have been phased-out in the EC in the soil sector include vineyards, lettuce, potato, citrus, tobacco, mushrooms, potting soil, many types of nursery crops and other miscellaneous crops (a comprehensive list is provided in Annex 3, Table 3.E). MB has been used primarily in intensive cultivation and high-value cropping systems. In Spain, for example, MB was used on 3% of >235,000 ha of MB susceptible cultivations in 2004. This figure is expected to decrease to less than 1% in 2007.

In 1991, tomato and strawberry fruit were the major uses, accounting for an estimated 44% of EC MB use in more than 12 MSs. These two crops currently account for about 47% of EC use (in 4 MSs), although the actual quantity of MB has been substantially reduced since 1991. The proportion used for pepper and eggplant has decreased relative to 1991 (Table 2.3). Figure 2.2 shows the relative change in the quantity of MB used for major crops/uses in 1991 compared to 2006.

In 2005 there were 78 CUE use-categories in 10 Member States, and in 2006 this was reduced to 26 use-categories in 8 Member States, due to the availability and adoption of alternatives (for further detail, refer to Annex 3). In 2006, 17 of the 25 Member States are not authorised to use MB for CUEs [16].

The soil sector accounts for 91% of the CUEs licensed in 2006 (Table 2.3). Six uses (tomato, strawberry runners, strawberry fruit, cut flowers, pepper, mills & food processing structures) account for 91% of the 2006 CUEs in the EC (Table 2.3, details in Annex 3).

[16] EC Member States that are not authorised to use MB for critical uses in 2006: Austria, Cyprus, Czech Republic, Denmark, Estonia (never used MB), Finland, Germany, Hungary, Latvia, Lithuania, Luxembourg (never used MB), Malta, Portugal, Slovakia, Sweden and Slovenia. Greece has applied for 2006 and is under review. All Member States except Estonia and Luxembourg consumed MB in the past.

Table 2.3 Comparison of major methyl bromide uses in European Community in 1991 and 2006

MB Use Category	1991 (estimates)			2006 (CUEs)		
	MB tonnes	MB %	No. Member States	MB licensed tonnes	MB %	No. Member States
Crop production						
Tomato	4,980	26%	>12	532*	32%	2 (EL, IT)
Strawberry fruit	3,420	18%	>12	265	16 %	3 (ES, IT, UK)
Peppers	2,410	13%	>12	123	7 %	2 (ES, IT)
Cut flowers	1,610	8%	13	140	9 %	3 (ES, FR, IT)
Melons	1,270	7%	7	38	2 %	1 (IT)
Eggplant	690	4%	10	40	3 %	1 (IT)
Other crops	2,050	10%	14	14	1 %	2 (FR, UK)
Sub-total	**16,430**	**85%**	**14**	**1,115**	**70 %**	**4**
Nursery						
Strawberry runners	740	4%	5	353	21 %	4 (ES, FR, IT, PL)
Other nursery	940	5%	10	6	< 1 %	2 (FR, UK)
Sub-total	**1,680**	**9%**	**11**	**359**	**22 %**	**5**
Post-harvest						
Mills, structures	640	3%	15	91	5 %	6 (BE, EL, FR, IE, IT, UK)
Commodities, artefacts	490	3%	16	52	3 %	8 (BE, EL, ES, FR, IT, NL, PL, UK)
Sub-total	**1130**	**6%**	**18**	**134**	**8 %**	**9**
TOTAL	**19,253**	**100%**	**22**	**1,607**	**100 %**	**9**

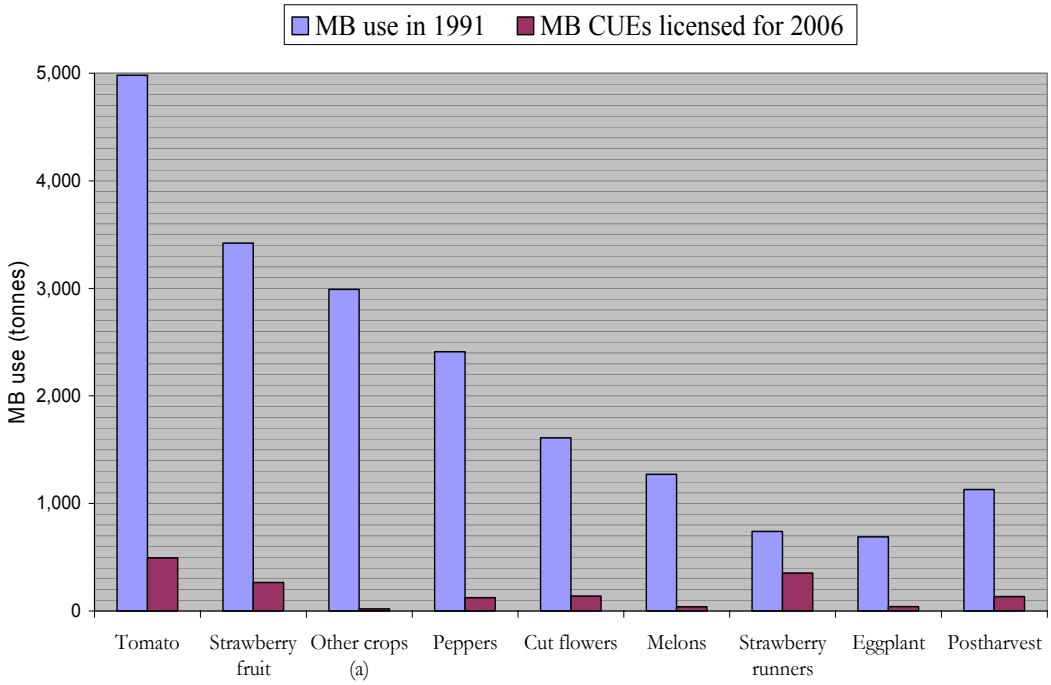
*Includes Greece CUE of 36.5 tonnes for tomato-cucumber cropping system.

2.3 Methyl bromide users and pest control operators

In the EC licensing system, MB fumigators are considered to be the MB 'users' (see section 1.4.6). MB fumigators provide a contracted service to growers or food companies, supplying MB gas and carrying out the fumigations on behalf of end-users. In 2005 there were 128 registered[17] fumigation enterprises eligible to use MB

[17] BE(11); DE(1); EL(36); ES(7 distributors and fumigation companies); FR(16); IT(39); NL(1); PL(4); PT(2);UK(11).

Figure 2.2: Major MB uses in the EC in 1991 and 2006



Note (a): 'Other crops' includes aromatic plants, artichoke, asparagus, basil, beans, carrot, celery, chicory, citrus replant, courgette (zucchini), cucumber, endive, forest tree nurseries, fruit tree nurseries and replant, herbs, lettuce, mushroom, nut trees, onion, ornamental trees, potato, pot plants, potting soil, radish, raspberry, seedbeds, substrate disinfestation, tobacco, vineyard replant, and other fruit and vegetable crops, and other nursery crops.

Table 2.4 Number of fumigators authorised by Member States to use methyl bromide in 2005 and 2006

Use Category	2005		2006	
	Member States	Fumigators	Member States	Fumigators
Crop production				
Tomato	4	59	1	16
Strawberry fruit	5	23	3	15
Cut flowers	6	39	3	18
Peppers	4	27	2	15
Melons			1	16
Eggplant	2	19	1	16
Others: orchard replant, carrots, raspberries	4	58	2	18
Nursery				
Strawberry runners	5	27	4	21
Others nursery: ornamental trees, orchard, forest trees	2	8	2	3
Post-harvest				
Mills and structures	6	46	5	27
Commodities and artefacts	7	30	7	24
Total all sectors	**10**	**128**	**8**	**91**

for CUEs in 10 Member States of the EC, while in 2006 this was reduced to 91 registered fumigation enterprises in 8 Member States (Table 2.4). As more alternatives have become available, the number of fumigators authorised by the Member States to use MB for critical uses has been reduced (Table 2.4).

2.4 Methyl bromide users and pest control operators

The business of some pest control operators (PCOs) including fumigators, has relied primarily on sales of MB for fumigations, while other have developed more diverse activities (e.g. disinfestation and pest control services that use a wide variety of fumigants, pesticides, IPM and non-chemical methods).

As a result of MB consumption reduction, diversification of services is becoming necessary for those willing to pursue pest control activities. When doing so, new services can be offered to their current customers, with the potential to expand their customer base to new areas and, thereby, to expand to new customers.

Some PCOs, including fumigators, offer alternative fumigants or alternative methods (steam/heat systems), supply of equipment, products and materials related to the use of alternatives, skilled pest identification and monitoring services, user training and consultancy services. Some former MB PCOs report that sales of pest monitoring and advisory services are as profitable as selling MB fumigations alone (H. Lange*, pers. comm*.).

2.5 Pest control needs of growers in the soil sector

Growers value MB because it has been a cost-effective and familiar tool for controlling pests in soil. MB has been used for such a wide variety of crop situations that it may appear to be indispensable to some growers. However, MB is just one pest control tool amongst many available. The worldwide experience in phasing out MB has demonstrated that there is no one-for-one direct substitute and that growers need to use combinations of alternative techniques (chemical and/or non-chemical) to replace MB. The EC Databases on MB alternatives indicate many of the existing alternatives. Rather than needing MB itself, growers require cost-effective methods for controlling or managing soil-borne pests so that adequate yield, market-acceptable quality, and profit can be achieved.

In the case of nursery crops, some growers also need to meet national or export certification standards that require products to be free from certain categories of pests or diseases. In various EC Member States, strawberry runners are certified as "pure varieties" that are substantially free from pests (including weeds) that can reduce the quality of the planting material. Annex 4.D provides details on certification standards for strawberry runners in the Netherlands and Poland.

Many growers have benefited from the conversion to MB alternatives in horticultural production. The Netherlands, which used to be the largest MB user in Europe in the 1970s, implemented a policy in the early 1980s to phase-out MB. The elimination of MB benefited growers because it stimulated the widespread development of new and modified production techniques; it enhanced technical innovation and modernisation (De Barro 1995, MBTOC 2002). Official statistics showed that the production of

horticultural crops was maintained and increased during and after the phase-out period (UNEP 1992). Denmark, which phased out MB in 1998, also experienced improvements, finding that certain alternatives provide higher yields and greater profitability (Gyldenkaerne *et al*. 1997; Rasmussen *pers. comm*.). In the Valencia Region in Spain in the 1990s, plastic for solarisation was subsidized, and this technique was spread avoiding MB use. Although plastics are no longer subsidised, solarisation is currently still being implemented and profitable. Annex 4 provides examples of the main alternatives adopted in the European Community considering that pest control and agriculture in southern Europe are in some respect different from agriculture in northern Europe (e.g. soil conditions , use of land and water).

2.6 Pest control needs of food companies, mill owners and other users in the post harvest sector including aircraft fumigations

Similar to growers, mill operators and food companies mainly require cost-effective pest control methods/systems which will enable them to achieve health standards and to provide food products of the quality demanded by supermarkets or purchasing companies. These standards must be met with minimal disruption to their ongoing operations which need to be almost continuous as profit margins are reported to be very small on a per kilogram quantity of product produced.

The standard of one major customer of the UK milling industry demands less than 4 rodent hairs per 500 g of flour and less than 4 insect fragments per 50 g of flour. HACCP requires companies to operate systems and procedures to prevent and minimize contamination, including the use of good hygienic practices.

The French domestic and international trade dictates less than 50 debris for two samples and no rodent hairs in six samples of 50 g flour (P. Ducom, *pers. comm.*). In Greece, some mill customers aim for no dead or alive insects and no sign of rodent activity (V. Sotiroudas, *pers. comm*.). Also in Greece, the tolerance for contamination in dried fruit is 0% in raisins & sultanas and 5% in figs.

In the aviation industry in the UK, if a rodent is found on board, aircraft are taken out of service until the rodent is proved to have been removed.

3 Methyl bromide alternatives in the soil and post-harvest sectors

3.1 Introduction

The 4-yearly, comprehensive reports of MBTOC have identified a wide range of alternatives to MB, documented in several hundred pages in each report (MBTOC 1994, 1998, 2002), in addition to update reports that are provided annually by the Technology and Economic Assessment Panel[18]. These alternatives include other fumigants and chemicals, cultural practices, biological controls, physical methods such as solarisation and steam, and combinations of these alternatives.

The most recent MBTOC Assessment report of 2002 notes that alternatives exist for more than 93% of the controlled uses of MB including those recorded as CUEs. The Committee noted that significant effort should be undertaken to implement the alternatives (including registration where necessary) and to optimise their use. It is recognised worldwide that there is no one-for-one substitute that has the same technical properties as MB, that can totally replace MB on its own. In order to replace MB, in particular in the circumstances of nominations, it is normally necessary to use combinations of several alternative techniques (chemical and/or non-chemical).

3.2 Existing alternatives in soil sector

The use of MB for soil treatments accounted for 92% of the MB licensed by the European Community in 2006. However, exemptions allowing the critical uses of MB account for a small proportion of the total production of these crops in the EC where alternatives are not technically or economically feasible.

[18] http://hq.unep.org/ozone/teap/Reports/index.asp for both TEAP and MBTOC reports

In crops for which there is an exemption granted due to the specific circumstances of the production, many growers are using alternative methods for controlling the soil-borne pests, but their conditions (e.g. soil type, climate) are different from those of the nominations.

Table 3.1 provides an overview of existing pest management tools that are the basis for avoiding MB in the soil sector. Annex 4 provides details of alternatives for each major crop in the EC. Normally these pest control methods need to be used in combination in order to control the full range of pests covered by MB. To get effective results comparable with MB it is also necessary to use appropriate methods e.g., effective application equipment, relevant soil preparation.

Table 3.1: Summary of main pest management components used in commercial practice as MB alternatives in the soil sector

Pest management tool	Pest group(s) controlled in general[(a)]
Chemical	
1,3-D	Nematodes
Chloropicrin	Soil borne fungi
Dazomet	Nematodes, soil borne fungi, weeds
Metam Sodium	Nematodes, soil borne fungi, weeds
Nematicides	Nematodes
Fungicides	Soil borne fungi
Herbicides	Weeds
Non-Chemical	
Rotation of crops	Nematodes, soil borne fungi and bacteria, weeds
Biofumigation	Nematodes, soil borne fungi and bacteria, weeds
Grafting on resistant rootstock	Nematodes, soil borne fungi and bacteria
Resistant varieties	Nematodes, soil borne fungi and bacteria
Soil steaming	Nematodes, soil borne fungi and bacteria, weeds
Hydroponics, soil less cultivation	Nematodes, soil borne fungi and bacteria, weeds
Substrates, growing media	Nematodes, soil borne fungi and bacteria, weeds
Soil solarisation	Nematodes, soil borne fungi and bacteria, weeds
Mulches	Weeds
Mechanical weeding, cultural practices to reduce weeds	Weeds

[(a)] Pest groups controlled when the pest management tool is applied in an appropriate manner, using effective application equipment, soil preparation, etc. There may be exceptions for certain specific species.

Not included in Table 3.1 is pest monitoring, which according to good agricultural practice guidelines should be the basis for any pest control activity. Belgium implemented a system of soil sampling and testing for soil pathogens in 2005 which reduced MB use by approximately 70%. In the Netherlands, soil sampling and testing is done as a standard practice prior to growing various nematode susceptible crops, to avoid unnecessary (expensive) treatment of fields with chemical pesticides. In Spain, any treatment has to be authorised by a technical supervisor based on infestation levels in cultivations under IPM programmes, so avoiding unnecessary treatments.

It should be stressed that, in addition to the pest management tools listed here, many other (cultural) practices are widespread. These, integrated with other crop

management measures, contribute to the management of soil pests in general, such as sanitation, various methods of tillage, balanced fertilisation, irrigation control, optimising planting time, choice of seed / planting material, planting distance and habitat management, and the timing of pest control activities. IPM integrates the available pest control methods to achieve a grower's most effective, economical, and sustainable combination for a particular local situation, and is based on good knowledge of the pest spectrum as well as the impact of combining various tools to control pests.

3.3 Alternatives under development in soil sector

Several new products are under development. New chemical products would require registration by the EC and national pesticide authorities before they can be used, a process that has traditionally been very slow unless fast-track procedures are implemented (refer to section 4.2). However, non-chemical products, such as the steam/heat treatments listed below, can start commercial production much sooner because they are not required to be registered as pesticides.

Chemical products are being trialled *in the EC* and would require pesticide registration before use:

- France, Italy and Spain are in the process of testing Dimethyldisulfide (DMDS). Preliminary results indicate that DMDS can provide yield equal to MB when combined with other treatments such as chloropicrin (PIC) plus Virtually Impermeable Film (VIF) (PIC+VIF) (Lopez-Aranda *et al*. 2004);

- Spain is in the process of testing propylene oxide, ethanadinitrile (EDN), sodium azide and iodomethane.

Non-chemical products that are being trialled in the EC for which no registration is required include:

- Equipment for carrying out hot air treatment of soil, which has been tested in the Netherlands and Cyprus. Commercial production of equipment has commenced in 2006;

- New steam equipment is under development in Italy;

- Solarisation, antagonists, biofumigation and other techniques are under further development in Spain and Italy;

- Additional resistant cultivars are under development in many countries.

The following chemical products are being tested *outside the EC*:

- Iodomethane alone or combined with PIC (MBTOC 2005);

- Ethanedinitrile (EDN) that shows equivalent weed / disease control and crop yield compared to MB in for strawberry runners for example (Porter 2004a, MBTOC 2005);

- Sodium azide that gives good control of weeds and nematodes using some application methods (MBTOC 2005).

3.4 Existing alternatives in post-harvest sector

Exemptions in the post-harvest sector account for 8% of the methyl bromide licensed in 2006. In the majority of food premises, pests are managed using pest control techniques other than MB. Table 3.2 provides an overview of the pest management techniques available as alternatives to MB in the post harvest sector. Annex 4 provides details on alternatives for each major post-harvest use in the EC.

Often these tools need to be used in combination in order to control the full range of pests. Correct application methods and know-how are necessary for achieving results comparable with MB.

Table 3.2: Summary of main pest management components used in commercial practice as methyl bromide alternatives in the post harvest sector

Pest management tool	Pest group(s) controlled
Chemical	
Phosphine[19]	Insects, mites (may require 2nd treatment), rodents
Sulfuryl fluoride	Insects, termites, rodents
Hydrogen cyanide	Rodents, insects
Various contact insecticides	Insects
Various acaricides	Mites
Non-Chemical	
Heat	Rodents, insects, mites, fungi
IPM (including intensive cleaning programmes, inspections, monitoring, trapping and selected use of compatible pesticides)	Rodents, insects, mites, fungi
Controlled atmosphere	Rodents, insects
Nitrogen	Insects, rodents
High pressure + CO2	Insects, rodents
Vacuum-hermetic systems	Insects, rodents
Freezing with liquid air or liquid nitrogen	Insects
Aeration and cooling of stored grain during cold/dry winter days	Insects
Entoleters, similar mechanical methods	Insects
Packaging under modified atmospheres or vacuum, insect-resistant packaging	Insects
Sanitation (as required under Good Hygiene Practice)	Rodents, insects, mites, fungi, bacteria
Trapping and monitoring	Insects, rodents
Hot water	Insects, mites, bacteria
Steam	Insects
Ozone	Cheese mites
UV light	Cheese mites

[19] Needs to be combined with corrosion avoidance practices when necessary

Not included in Table 3.2 is pest monitoring which, according to standard IPM guidelines in food industries such as milling, should be the basis for any pest control activity. Several booklets and case studies have illustrated the importance of IPM as the basis for MB alternatives in milling and food processing (e.g. Methyl Bromide Industry Government Working Group (Canada) 1998; Asthon & Lange 2000; MBTOC 2002; and UNEP 2002).

3.5 Alternatives under development in the post-harvest sector

Several new products are under development outside the EC in the post-harvest sector. Example of interesting developments in chemical product registration in other regions, which would require pesticide registration before use in the EC (refer to section 4.2):

- Ethyl formate plus CO_2 was recently registered in Australia for the disinfestation of stored grain, oilseed, grain storage premises and equipment and fumigation of horticultural products (MBTOC 2005);

Non-chemical products or methods that are being trialled in the EC, which do not normally require registration:

- Hot water dipping for dried fruits (figs) in Greece and strawberry runners in the Netherlands;
- Controlled atmospheres for strawberry runners in the Netherlands;
- Cold treatments for dried fruits (figs) in Greece;
- CO_2 and N_2 in vacuum for dried fruits (figs) in Greece;
- CO_2 and vacuum packing in rice in Spain;
- Heat treatment for large mills in Poland (currently successfully in use for smaller empty structures).

3.6 Awareness raising

A very important factor is awareness raising among MB fumigators and importers who continue promoting the use of MB even though some also provide alternatives. MB end-users have often relied strongly on MB and their fumigators for many years and are not familiar with the other methods available for controlling pests. Fumigators can play a key role in spreading information about alternatives. The lack of know-how and necessary equipment can be solved in a relatively short period of time. But encouraging users to adopt an alternative can be difficult in situations where a commercial infrastructure involving importers, producers, distributors, PCOs and end users has been in place for decades, and today continues to promote and support the use of MB.

Academic papers about alternatives do not provide the type of information that PCOs and end-users need, because such papers normally discuss only the results of trials, and rarely give details about practical use at the commercial level, the cost of the treatments or information that would convince local MB users.

As a result, growers often do not have ready access to tailor-made information on specific MB alternatives. Yet, growers are dealing with increasingly competitive markets that demand high quality produce for a low price and, at the same time, with more pressing production problems related to, for example, reduced soil fertility and pest resistance. In addition, novel technologies are often perceived as being beyond the reach of many growers that cannot afford the investment in time and money to adopt better crop production systems. More attention is needed to improve the knowledge system of MB users and end-users.

Member States have organised local conferences with their stakeholders to promote the use of alternatives. Working with partners such as UNEP and national governments, the European Commission has also organised and/or co-hosted several conferences on MB and alternatives, in Spain in 1997 (Bello *et al.* 1998), Italy in 1998 (UNEP 2000), Greece in 1999 (Arvanitakis *et al.* 1999), Spain in 2002 (Bolivar & Batchelor 2002), and Portugal in 2004 (Batchelor & Alfarroba 2004). These have led to useful publications and discussions and undoubtedly contributed to awareness raising and the dissemination of knowledge about alternatives and their use.

In addition, case studies on alternatives have been published by MBTOC, UNEP and others. Examples of regional information provision include the Nordic Council publications on MB alternatives relevant to Scandinavia in the 1990s. Furthermore, pest control companies (including MB users) that seek new business opportunities can play an important role in advertising and developing markets for alternative methods.

Despite the above awareness-raising activities carried out by MSs and the Commission, information transfer is most important and needs to continue at the practical level, relevant to the specific pest species and circumstances that are faced by growers and users at local level.

Knowledge of farming is not only held by growers, PCOs, extension and research groups, but also by stakeholders such as supermarkets, other companies that purchase farm products, consumers and credit suppliers. For the efficient adoption of technically and economically suitable MB alternatives, the most important stakeholders will need to support the transfer and further dissemination of alternatives that are used successfully.

4 Adoption of alternatives

4.1 Development of alternatives

Research programmes have been carried out in a number of Member States. In some cases they aimed to develop new or novel alternatives. More commonly they aim to improve the application methods of existing alternatives, or to make existing alternatives suitable for a wider range of uses.

In Spain, for example, a specific soil MB alternatives programme has been conducted since 1997, involving scientists, agronomists, fumigators, growers and government departments. Headed by teams that were trusted by the agricultural sectors, quick MB reductions were immediately achieved through dose reductions and pic mixtures. Several chemical options were considered, e.g. 1,3-D, pic, metham sodium, dazomet, DMDS, propylene oxide, enzone, EDN, etc. Non-chemical options considered included solarisation, biofumigation, grafting, steam, substrates, biological antagonists, microwaves, etc. Alternative fumigants have been adopted and emphasis has been put on non-chemical options, mainly biofumigation and grafting.

4.2 Registration of chemical alternatives

4.2.1 Types of alternatives that are subject to registration

Chemical products and biological control products are generally required to be registered as pesticides or biocides under EC and Member State legislation before

they can be sold or used. Registration may occur for specific crops/uses or for general categories such as 'soil fumigation'.

Tables 4.1 and 4.2 list the main chemicals that are registered in the EC for soil and post-harvest uses, in comparison to other industrialised countries that still use MB (also refer to Annex 6). The tables indicate that, within the EC, a number of products are registered and that a few additional products are in the process of registration. Outside the EC, registration of fumigants and combinations appears more common or widespread.

Table 4.1 Regulatory status of chemical alternatives in soil sector, in the EC and selected Third Countries[20]

Product	EC	Australia	Canada	Japan	USA
1,3-Dichloropropene (1,3-D)	R in 8 MS	R	R	R	R
Chloropicrin (Pic)	R in 6 MS I in 1 MS	R	R	R	R
Dazomet	R in 10 MS	R	R	R	R, I [21]
DMDS	I in 1 MS				
Ethanedinitrile		I			
Sodium tetrathiocarbonate (Enzone)	R in 3 MS				R
Iodomethane					I
Metam potassium	R in 1 MS				R
Metam sodium	R in 11 MS	R	R	R	R
1,3-D + Pic	R(a) in 3 MS; I in 1 MS	R	R	R	R
1,3-D + Methyl isothiocyanate (MITC)			R	R	
Nematicides (various, e.g. oxamyl)	R in 25 MS	R	R	R	R
Fungicides (various)	R in 25 MS	R	R	R	R
Herbicides (various)	R in 25 MS	R	R	R	R

R = Registered; I = In process of registration; MS = Member States; R(a) = provisional registration

[20] Table summarizes available data from TEAP May 2005, TEAP Oct 2005, Annex 4 and other relevant sources; Some products are registered for specific crops or situations; in other cases they are registered for general soil fumigation. Annex 6 provides details.

[21] Registered for non-food crops, in process of registration for food crops

Table 4.2 Regulatory status of chemical alternatives in post-harvest sector[22]

Product	EC	Australia	Canada	Japan	USA
Ethyl formate		R[23]			
Ethane dinitrile (cyanogen)		I			
Hydrogen cyanide, calcium or sodium cyanides	R in 4 MS[24]		R[25]	R	
Iodomethane				R	
Methyl isothiocyanate (MITC)				R	
Phosphine (solid)	R in 12 MS	R	R	R	R
Phosphine (gas)	R in 2 MS	R	R		R
Phosphine gas in carbon dioxide or nitrogen (cylinders)	R in 2 MS	R	R		R
Propylene oxide					R[26]
Sulfuryl fluoride	R in 6 MS I in 3 MS		R	R	R[27]
Insecticides (residual or aerosol, suitable for use in IPM programmes)	R in 25 MS	R	R	R	R

R = Registered; I = In process of registration

4.2.2 Types of alternatives that are not subject to registration

The registration of non-chemical and physical methods is not generally required in the EC as they are not considered to be pesticides or biocides. Examples in the soil sector include heat, substrates, grafted plants and other cultural practices (Smeets, 2004). In the post-harvest sector, some 'physical procedures' are included on a 'basic substances list' and are not required to follow the full registration procedure. Examples in the post-harvest sector include controlled atmospheres (CA) / nitrogen, cold, sanitation, heat, pressure and vacuum. Most non-chemical alternatives are widely permitted in the EC (see Annex 4).

4.2.3 EC legislation related to pesticides

Two EC Directives regulate pesticide products, with the aim of harmonising the European market for pesticide active substances and products, while providing protection for humans, animals and the environment:

- Plant Protection Products Directive 91/414/EEC covers active substances intended to control pests that damage plants or plant products (mainly agricultural pesticides).

[22] Refer to Annex 6 for details of permitted uses. Table summarizes available data from TEAP May 2005, TEAP Oct 2005, Annex 4 and other relevant sources. Some products are registered for specific situations. Annex 6 provides details.
[23] Stored grains, oilseeds, grain storage premises, equipment, horticultural products.
[24] Empty food structures, non-food structures, aircraft.
[25] Beehives, and control of fungi and bacteria
[26] Stored agricultural commodities, nutmeats, cocoa, spices.
[27] Non-food structures, mills, food processing sites, dried fruits, tree nuts, cereal grains

- Biocides Directive 98/8/EC covers active substances intended to control pests that damage items that are not plants or plant products (mainly non-agricultural pesticides, commonly called biocides).

Active substances can be registered only if they are (a) effective and (b) do not have unacceptable effects on health or the environment.

The existing pesticides (active substances or active ingredients) are undergoing a process of review under this legislation in the EC. This review covers both MB (section 4.2.5) and alternatives. The review includes a scientific assessment of the safety and environmental data submitted by applicants, leading to inclusion in a positive list following a detailed decision-making procedure. Decisions are expected in 2006/2007 for 1.3D and in 2008 for MB, PIC, MethamNa and Dazomet. Progress on the status of the evaluation of each chemical is available in Annex 5 and on the website of DG SANCO.

Also new application methods have to be registered (e.g. pellets of Phosphine or Phosphine from generators).

4.2.4 Registration of new pesticides

Annex 5 outlines the main procedures for registration of new pesticide active ingredients in the EC. Applications for registration of chemical products are submitted by the manufacturers of products, not by governments.

The registration of new chemical products is normally a very expensive and time-consuming procedure. The registration of sulfuryl fluoride for use in flour mills, for example, took several years and required substantial financial and scientific investment from the manufacturer, with input from research institutes and users in several countries.

The cost and complexity of registration has often deterred manufacturers from making applications to register new chemical products, in particular in Member States where the potential market for those new products would be small. This is an obstacle since it is necessary to increase the range of chemical alternatives available to users.

However, the EC has made efforts to speed up the registration of new products that have lower toxicity compared to traditional products. This has substantially reduced the registration processing period and cost for some products, and thus makes registration/authorisation more feasible, even for SMEs.

For example, a new nematicide (a suspension concentrate containing xanthan gum) was reviewed and authorised for use in the EC in about 12 months. This indicates that products with lower human toxicity have a much greater potential for rapid registration than more hazardous chemicals. Manufacturers are strongly encouraged to register such less hazardous products for use in the EC.

4.2.5 Registration status of MB

In the European Union, MB is being evaluated as part of the EC's general review of pesticide active ingredients.

Under the EC Plant Protection Products Directive (91/414/EC) a dossier on MB is being reviewed and a decision is due to be taken, by the end of 2008 at the latest, for pesticide uses that are regulated under this Directive. Decisions are due at the same time on other soil fumigants that are considered major chemical alternatives to MB such as metam sodium, dazomet and chloropicrin.

Under the Biocides Directive (98/8/EC) MB has been "identified" which means that biocidal products containing MB can only be placed on the EU market until 1 September 2006 at the latest, according to Article 4(2) of Regulation 2032/2003. Two[28] uses of MB in 2006 are categorised as 'biocidal' uses in three Member States for which additional restrictions apply from 1 September 2006.

The Commission may potentially authorise a Member State to use MB for biocidal uses after this date if the Member State demonstrates compliance with the criteria for an "essential use" for pesticides under Article 4a of Regulation (EC) No 2032/2003.

4.3 Rates of adoption of alternatives and market penetration

The 16th Meeting of the Parties in Prague provided guidance to MBTOC in the "Working Procedures for MBTOC" (Decision XVI/4, paragraph 35 of Annex I) requires MBTOC to calculate the likely time period for the adoption of alternatives based on factors such as number of fumigation/PCO companies, estimated training time assuming full effort, and opportunities for importing alternative equipment and expertise if not available locally (see Annex 2).

Available MB alternatives can be adopted at a rapid rate when encouraged by certain factors. Such factors include training (organised by PCOs, agricultural institutes, extension, governments or grower / miller associations), market pressures (see section 6) or a reduced supply of MB, for example. A summary of experienced, and therefore feasible, rates of adoption of alternatives in major crops in the soil sector is given in Table 4.3 (further details in Annex 7.A).

Table 4.3 Examples of rates of adoption of methyl bromide alternatives in individual Member States of the European Community

Alternative technology	Crop	Actual rates of adoption in individual MSs (ha/year in individual countries)
Fumigants (e.g. 1,3-D, pic, metam, various combinations)	Strawberry fruit	up to 1627 – 2000 ha/year
	Strawberry runners	up to 870 ha/year
	Tomato (a)	up to 838 ha/year
	Peppers (b)	up to 400 ha/year
	Cut flowers (b)	up to 313 ha/year
Grafting on resistant rootstock (e)	Tomato	>10 million plants/year, approx. 1000 ha/year (c)

[28] Fumigation of museum artefacts in Italy and Belgium, and the fumigation of farmhouse cheese stores in the United Kingdom to control cheese mites.

	Eggplant	4.3 million plants/year, approx. 130 ha/year (d)
Substrates and hydroponics	Strawberry fruit	up to 60 – 80 ha/year
	Tomato	up to 1570 ha/year
	Pepper	up to 175 ha/year
	Cucumber	up to 507 ha/year
All types of soil alternatives (unspecified)	Cut flowers, bulbs (f)	up to 268 ha/year (several MSs)
Sulfuryl fluoride and heat + IPM	Mills and food processing facilities	up to 3,500,000 – 4,600,000 m3 / year

(a) Adopted mainly fumigants, possibly also grafted plants
(b) Adopted mainly fumigants, possibly also other types of alternatives
(c) Assuming 10 million grafted plants = 1000 ha (Miguel 2004)
(d) Assuming planting distance of 40 * 75 cm.
(e) Usually combined with other treatment or used as part of IPM programme.
(f) Adopted mainly fumigants and substrates

4.4 Promoting adoption of alternatives

4.4.1 National plans and restrictions on methyl bromide

In addition to the controls implemented under the Montreal Protocol and the EC Regulation, a number of countries have adopted national plans for MB phase-out, which specified regulatory requirements, policies, adaptive research, technology transfer and other activities.

Examples of Member States that developed national plans include the Netherlands, Denmark (section 3.2), Italy and many developing countries that are implementing Montreal Protocol projects. In Italy, a national ordinance that was issued by the Health Ministry in 1994 limited the frequency of MB soil fumigation to once every two years at the most, to reduce the use of MB. Spain adopted high-Pic formulations and reduced MB doses to achieve significant MB reductions.

The EC and national authorities responsible for registration or controls on pesticides are strongly encouraged to urgently de-register all uses of MB with the exception of uses for which adequate alternatives are not available. This will help to prevent potential illegal use of MB by growers or enterprises that are probably not aware that the use of MB is no longer permitted except when authorised by a Commission Decision.

4.4.2 Stimulating a conducive economic environment

As described in Chapter 3, MB alternatives are available in most cases. However, existing market forces often do not allow for rapid adoption, particularly where supplies of MB are available to users. One of the arguments made in continuing reliance on MB is the potential cost of switching to MB alternatives. Some countries or organisations have addressed this issue by aiming to create a more conducive economic environment, as illustrated by the following examples:

- In the Slovak Republic, MB was used regularly to the tune of 10 tonnes annually for post harvest treatment up until 1998 when a tax was imposed on imports of MB (and other ODS) to (1) create an economic disincentive for use, and (2) to generate revenue for the state Environmental Fund for ozone layer protection work. As a result, phase-out became complete in 1999, with phosphine as the cheaper MB alternative (Slovak Republic survey report for UNEP, 2000). The same action was taken by the Czech Republic.

- Agricultural government grants or bank loans have also worked to promote the adoption of MB alternatives. In Italy, the regional government of Ragusa in Sicily in the 1990s promoted new agricultural technologies by subsidising the cost of plastic used as solarisation sheets (25% of costs reimbursed), machinery (13% of costs reimbursed) and irrigation systems. The Valencia region of Spain subsidised plastics for solarisation in the 1990s, which helped to spread the use of this technique, avoiding some MB use. Now solarisation is implemented it is profitable although the plastics are no longer subsidised;

- Sector associations can also play an active role in the promotion of MB alternative adoption. In Spain, the Association of Exporters of Fruit and Vegetables (COEXPHAL), requested growers to stop the use of MB as part of a requirement to meet environmental quality standards for exports. As a result by 2002, the majority of MB users on 1430 ha in the intensive horticultural region of Almería adopted alternatives in a relatively short period of time. Almería is the main region in Spain that supplies fresh vegetables to large supermarket chains in northern Europe.

- Similarly, supermarkets and food manufacturers have set company specifications for product quality. In the UK, the "CO-OP" supermarket chain banned the use of MB on farms owned by the supermarket in the mid-1990s. 'CO-OP' and 'Marks and Spencer' developed some codes of practice that excluded the use of MB by growers for supply to these supermarket chains.

- Several international agricultural certification programmes determine standards and procedures for 'Good Agricultural Practices' in crops grown to supply supermarkets. The standards of EurepGAP, and MPS-GAP, for example, do not permit the use of MB in the production of cut flowers and ornamental plants. Thousands of growers in the EC and around the world comply with these standards.

4.4.3 Training and technology transfer

As described in Section 3.5, MB users need practical information relevant to the control of local pests in their circumstances. Technology transfer is substantially more successful when MB users become convinced of the benefits of MB alternatives, which can happen, for example, through:

- Hands-on training sessions, that allow for building local, successful experiences;

- Information exchange through field days, study visits, workshops;

- Provision of practical materials, illustrated step-by-step training manuals, information / fact sheets, background information websites, regular newsletters.

One of the key elements of programmes in the EC for implementing MB alternatives is the transfer of technology – transferring the results of research and development. Field visits, conferences, workshops, demonstrations and technical training have been the usual tools of these programmes, leading to the phase-out of more than 17,500 tonnes MB in Member States.

Training in MB alternative methods for MB users has been carried out in some sectors in the EC, as illustrated by the following examples:

- Some training sessions have been carried out in Poland, Hungary, Latvia and Lithuania as part of an on-going regional GEF project 'Total MB Sector Phase out in CEITs'. They plan to carry out a comprehensive training programme on the use of MB alternatives in 2006 and 2007, focussing on non-chemical methods.

- Spain has carried out training as a part of programmes on MB alternatives started in the soil sector in 1997.

5 Procedures and principles to determine the quantity of methyl bromide eligible for a critical use

Methyl bromide consumption was phased out in 2005 with the exception of certain authorised CUEs. The Parties to the Protocol have recognized that CUEs *"are intended to be limited, temporary derogations from the phase-out of methyl bromide"* (Decision Ex.I/3) and that *"each Party should aim to significantly and progressively decrease 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"* (Decision Ex.I/4). The remaining CUEs for methyl bromide in the soil and post harvest sectors should therefore be phased out as soon as technically and economically feasible alternatives are available.

The strategy for achieving this phase-out needs to allow a user access to methyl bromide for very specific, limited uses for which alternatives are not available but, at the same time, to ensure that MB use is eliminated where an adequate alternative is available.

This chapter defines stepwise procedures for determining when all or part of a request for methyl bromide meets the criteria for a critical use. The proposed approach incorporates into a "Decision Tree" the criteria for eligibility that are contained in the Decisions of the Montreal Protocol and in Regulation (EC) No 2037/2000.

5.1 Decision Tree for deciding the eligibility of methyl bromide for critical uses

The Decision Tree presented in Figure 5.1 will be used for determining the quantity of methyl bromide eligible for a critical use exemption in both the soil and post-harvest sectors. It is primarily based on the criteria of Decision IX/6 and other relevant

Decisions described in Chapter 1 and Annex 2, and Articles 3(2) and 4(2) in Regulation (EC) No 2037/2000.

5.2 Guiding Principles and Definitions

Tables 5.1 and 5.2 provide "Guiding principles" and "Definitions" for particular terms used in the Decision Tree. These terms and definitions will apply to any applications for critical uses of methyl bromide to be included in the EC Nomination to the Parties, and to the licensing of methyl bromide for critical uses by the European Commission. Annex 1 provides a list of relevant tables that will be updated annually, such as the EC database on registered and available alternatives.

Table 5.1: Guiding principles

Principles
Exemptions must comply fully with Regulation (EC) No 2037/2000, Decision IX/6 of the Montreal Protocol and other relevant Decisions
The following uses of methyl bromide are not normally expected to be permitted, unless in exceptional circumstances: • Uses that are new or have already been found not to comply with the criteria for CUE; • Increase in methyl bromide compared to previous year that methyl bromide was used; • Any increase in crop area or volume that increases MB consumption must be achieved with the use of alternatives, if available
Methyl bromide should only be used: • As a last resort when no other alternative is available; • At the lowest possible dose; • As infrequently as possible in combination with other alternatives;

Figure 5.1: Decision Tree to determine the quantity of methyl bromide eligible for a critical use. Underlined terms are defined in Table 5.2.

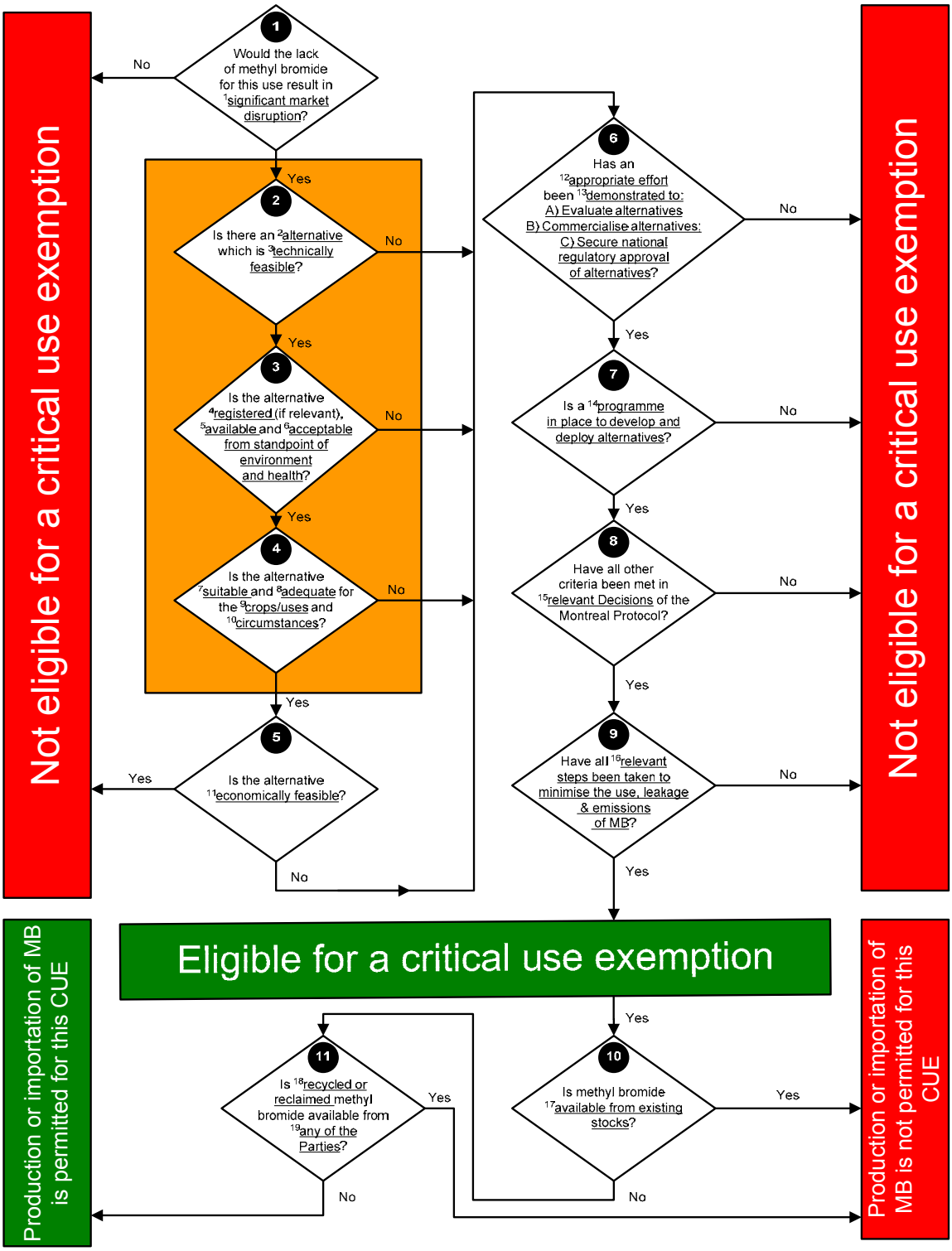


Table 5.2 Definitions relating to alternatives and the use of the Decision Tree shown in Figure 5.1. Underlined terms are also defined at the end of this Table.

No.[29]	Terms	Definitions and explanations
1	Significant market disruption	*Refers to significant disruption to the market, not disruption to individual users or enterprises, unless the individual or end-user is the predominant supplier to the market.* *Significant market disruption is unlikely:* • *If MB is used on less than 5% of the relevant crop area (soil sector) or less than 10% of the volume (post harvest sector) that used MB or alternatives in the MS in the year prior to the CUE year;* *or* • *If the calculated percentage reduction of the crop/product on the market, due to the lack of MB and alternatives, is less than the typical percentage fluctuation in production/quantity placed on the market over the past five years.* The "market" refers to an international, national or regional market.
2	Alternative	[30]*Non-chemical or chemical treatments and/or procedures, which are technically feasible for controlling pests, thus avoiding or replacing the use of MB.*
3a	Technically feasible (for soil sector)	*An alternative pest control product or procedure that provides a statistically similar crop yield (kg/ha) of commercially acceptable quality, compared with MB fumigation. Statistically similar crop yield will be within about 5-10% of the yield provided by MB fumigation over 3 years, or a yield that is within the typical range (fluctuation) of crop yield that has occurred from year to year over the past 5 years.*
3b	Technically feasible (post-harvest sector)	*An alternative pest control product or procedure that provides a level of pest control that meets typical health standards and commercial requirements.*
4	Registered	*Officially authorised and/or permitted by the relevant competent authority for a specific crop/use and therefore acceptable from the standpoint of environment and health. All products including non-chemical ones must be registered in the EC if so required under* Directive 98/8/EC ("Biocidal Products Directive", BPD) or Directive 91/414/EEC ("Plant Protection Products Directive", PPPD)
5	Available (alternative)	*A suitable alternative obtainable in the EC or imported from third countries, which, at the time of licensing or during the operational period of the exemption, is ready for use in the specific use-category.*

[29] Numbers in this column refer to superscript numbers in the Decision Tree (Figure 5.1)

[30] Handbook on Critical Use Nominations for Methyl Bromide, 2005, pp 8: http://hq.unep.org/ozone/Information_for_the_Parties/Handbooksandforms_for_CUNandEUN.asp

No.[29]	Terms	Definitions and explanations
6	Acceptable from the standpoint of environment and health	*Officially authorised and/or permitted by the relevant competent authority for a specific crop/use and therefore acceptable from the standpoint of environment and health..*
7	Suitable (alternative)	*A pest control method or procedure that, when applied optimally, produces a crop/product of adequate quality and quantity in the circumstances of the nomination.*
8	Adequate	*Sufficient for one or more specific requirements.*
9	Crops / Uses	'*Crops'* refers to soil applications of alternatives. '*Uses'* refers to post-harvest applications of alternatives.
10	Circumstances	*The sum of factors that contribute towards the production of a crop or product.* Examples to illustrate the definition include soil type, target pest species, temperature when fumigation is carried out, sequence of crops.
11	Economically feasible alternative	*A pest control method/procedure, when examined over a 3-year period, which provides adequate net annual revenue within the range (fluctuation) of annual revenues obtained in the last 4-5 years for the crop/use.*
12	Appropriate Effort	*Deployment of an alternative in the minimum feasible time under the circumstances of the nomination.* Since MB is intended to be completely phased out as soon as technically/economically feasible alternatives are available[31], applicants and MSs are expected to encourage the development, deployment and adoption of alternatives in the minimum time that is feasible.
13	[Applicant has] … demonstrated appropriate effort to (a) evaluate, (b) commercialise and (c) secure national regulatory approval of alternatives	*Evidence, such as publications of research, a description of the appropriate activities that have been carried out to achieve the elimination of methyl bromide in the specific circumstances of the application, including the progress achieved to date, the activities planned for near future, the date when regulatory approval is likely to be forthcoming, and when commercialisation of the alternative is likely.* This definition acknowledges that the manufacturer is the prime proponent of the registration process, but that national governments and the Commission also have a responsibility to encourage a company to register a new product.
14	Programme to develop and deploy an alternative	*Carefully-defined applied research and development to identify and implement one or more alternatives to methyl bromide.*
15	Relevant Decisions	*Decisions related to critical uses that have been agreed by the Parties that seek to reduce and eventually eliminate any critical uses of methyl bromide.*

[31] Parties recognise that CUEs are '*intended to be limited, temporary derogations from the phase-out of methyl bromide*', and 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*' (Decisions Ex.I/3 and Ex.I/4). CUEs are intended to be '*…temporary derogations from the phase-out of methyl bromide in that they are to apply only until there are technically and economically feasible alternatives that otherwise meet the criteria in Decision IX/6*' (Decision XVI/4, Annex I, para.32)

No.[29]	Terms	Definitions and explanations
		'*Parties*' refers to *'Parties to the Montreal Protocol'*. Each of the Member States is a Party. The European Community itself is a Party to the Protocol. There are more than 180 Parties to the Montreal Protocol.
16a	All relevant steps to minimise the use and emissions of methyl bromide (Soil uses)	*Actions that limit both use and emissions of methyl bromide to the smallest amount possible.* It includes "*all the precautionary measures practicable to prevent and minimise leakages of methyl bromide from fumigation installations and operations in which methyl bromide is used*"[32]. *"*To limit emissions*, the use of virtually impermeable film (VIF) for sufficient time, or other techniques ensuring at least the same level of environmental protection, is mandatory in the European Community*."[26] *VIF is defined as a type of film that has a permeability of less than 0.2 g/m^2 of pure methyl bromide equivalent to 0.05 ml/hour/m^2/1000 ppm methyl bromide*. By retaining methyl bromide and its alternatives in the soil, the pest control properties of both are enhanced with the use of VIF, thereby allowing reductions in dose and consequent emissions. Refer to Section 5.4.
16b	All relevant steps to minimise the use and emissions of methyl bromide (Post-harvest uses)	*Actions that limit both use and emissions of methyl bromide to the smallest amount possible.* It includes *"all the precautionary measures practicable to prevent and minimise leakages of methyl bromide from fumigation installations and operations in which methyl bromide is used"*[33]. The eligible MB dose is the minimum needed to achieve the necessary "Concentration-x-Time" Product (CTP) as shown on the product label for the target pest Refer to Section 5.4.
17	Available from existing stocks	*MB that has not been put to its intended use in the year in which it was produced or imported, thereby remaining on the market with the potential to be used at a future time, thereby avoiding the production of 'fresh' MB. Stocks from critical uses that are not ready for use in the circumstance of the exemption are considered to be 'unavailable'.* The EC Regulation does not permit MB stocks to be used from 1 January 2006 in the EC, except for approved critical uses. Stocks of MB that were imported for feedstock, laboratory, inward processing or QPS uses can only be used for those

[32] Article 17(2) of Regulation (EC) No 2037/2000

[33] Article 17(2) of Regulation (EC) No 2037/2000

No.[29]	Terms	Definitions and explanations
		specific uses and not for critical uses.
18	Recycled or reclaimed methyl bromide	*Methyl bromide that has been recovered from recovered after fumigation, typically from a fixed facility, and available to be used again in another fumigation. Impure methyl bromide could be 'cleaned' or reclaimed before being used again.* In practice, there are not many facilities worldwide that recover methyl bromide after fumigation and there are few in the EC. Recovery is not applicable to soil treatments using methyl bromide which is where more than 90% of it is currently authorised for critical uses in the EC.
19	Methyl bromide formulations (soil treatments)	*Dilution of methyl bromide with chloropicrin thereby allowing an increase in area treated without increasing the overall amount of methyl bromide authorised.* Any methyl bromide contained in formulations is considered a controlled substance and must be phased out.
	Strip application	*Application of methyl bromide to only the area where the crop is planted which is typically a raised bed of soil called a 'strip'.* Since the crop is grown only in this bed and not over the entire area, methyl bromide need only be applied to control pests in this strip, thereby reducing the overall amount of methyl bromide required. Strip application is considered not feasible where the MB treatment is done every other year or less.
	Injection method	*Application of methyl bromide directly into the soil.* The injection method is more efficient at distributing methyl bromide than the hot-gas method, thereby allowing less methyl bromide to be used.
	Monitoring	*Checking for the presence of key pests prior to issuing a permit for soil fumigation using methyl bromide, and checking the concentration of methyl bromide during a post-harvest fumigation.* Both actions can significantly reduce the amount of MB used.
	Good level of gas tightness (post-harvest)	*A standard of gas tightness that results in less than 25% of the methyl bromide being released from a facility over a 24 hour period, or less than half the pressure being reduced (e.g. 20 to 9 Pa) in greater than one minute.*

5.3 Methyl bromide use and emissions

In cases where an alternative is not available and the use is eligible for methyl bromide, Decision IX/6 requires Parties to take all technically and economically feasible steps to minimise the critical use and any associated emissions of methyl bromide.

Article 17 of Regulation (EC) No 2037/2000 also requires *"all precautionary measures practicable [to be taken] to prevent and minimise leakages of methyl bromide from fumigation installations and operations in which methyl bromide is used. Whenever methyl bromide is used in soil fumigation, the use of virtually*

impermeable films for a sufficient time, or other techniques ensuring at least the same level of environmental protection shall be mandatory".

5.4.1 Soil Treatments

To limit use and subsequent emissions of methyl bromide from soil treatments, the following criteria will be applied to determine the quantity of methyl eligible for a critical use according to the methyl bromide formulation (see definition 18) and its use with VIF (see definition 15a):

1. MBTOC standard doses (which will be updated when MBTOC proposes revised doses):

    - MBTOC standard presumption is MB:PIC 50:50, 15 gm^{-2} in all soil types for pathogen control, or 17.5 gm^{-2} in cases where nutgrass (*Cyperus* spp.) is present;
    - For MB:PIC 67:33, 20 gm^{-2} in all soil types;
    - For MB:PIC 98:2, 35 gm^{-2} (sandy soils), or 45 gm^{-2} (cold heavy soils).

2. Virtually impermeable film (VIF) has to be used for sufficient time, or other techniques ensuring at least the same level of environmental protection.

3. Methyl bromide must be applied to the minimum area possible by, for example, using a strip application (see definition 19) wherever feasible. Where a strip application is considered feasible, the quantity nominated or licensed should be the proportionally reduced amount (33 – 50% less compared to full area treatment)[34].

4. Methyl bromide must be applied using the injection method (see definition 20) where feasible, rather than using the hot gas. Where the injection application is considered feasible, the quantity nominated or licensed should be the proportionally reduced amount (33% – 57% less than when hot gas was used).

5. The frequency of methyl bromide applied to the soil must be reduced, where feasible, to one year in two, three or longer. Strip application may be more difficult when the frequency of application is reduced, except where an alternative treatment can control the target pests in rotation with the MB-treatment.

6. Fumigations shall continue to be permitted only on the basis of prior approval to the fumigator.

7. Monitoring of pests and diseases encourages methyl bromide to be used only when strictly necessary and offers the potential to significantly reduce methyl bromide use and emissions.

[34] Handbook on Critical Use Nominations for Methyl Bromide, 2005.

8. Fumigation using methyl bromide from disposable cans is banned under paragraph 4 of Article 16 in Regulation (EC) No 2037/2000.

Few techniques can reduce methyl bromide leakage as effectively as VIF. For example, MBTOC (2002) estimates that deep soil injection (60 cm) without coverage of the soil gives greater emissions of methyl bromide than soil treatment using VIF. Article 17 in Regulation (EC) No 2037/2000 requires the use of "all precautionary measures practicable" to prevent and minimize leakages of methyl bromide, which includes consideration of the following measures:

- Limiting the frequency of methyl bromide fumigation to once every 12 – 60 months. Reductions of methyl bromide by more than 75% are feasible when other methods of pest control are used in the interval between methyl bromide fumigations. .
- Monitoring/identifying key pests present in soil/commodities prior to any use of methyl bromide as this can result in significantly reduce its use by 80 – 90%;
- In conjunction with monitoring, permitting or authorising methyl bromide prior to each use and only when its use is strictly necessary. This system was used in the Netherlands in the 1980s and in Belgium in 2005. Methyl bromide should only be permitted when no alternative is available;
- Reducing doses of methyl bromide by combining it with other treatments such as other fumigants and non-chemical methods such as grafted plants and solarisation. The dose should not exceed the national limit and, when the national amount is higher than necessary, it should be reduced to the minimum known to control the pest. Spain introduced maximum limits on methyl bromide doses in 1998 and Italy in 1994;
- Applying methyl bromide by soil injection rather than hot gas using registered formulations that are diluted with chloropicrin. Spain, for example, made substantial MB reductions by changing to MB:pic 50:50 and recently introducing 33:67 for strawberry fruit.

5.4.2 Post-harvest Treatments

To limit the use and subsequent emissions of methyl bromide from postharvest treatments, the following criteria will be applied to determine the quantity of methyl eligible:

1. A dose of 20 gm^{-2} is the maximum recommended dose. The use of accurate measuring equipment to weigh methyl bromide avoids excessive use;
2. The EPPO standard dose is the maximum permitted for bulk commodities;
3. Good levels of gas tightness (see definition 22) achieved by effective sealing of the facility. Improvements to control leaks will also facilitate the use of alternative gases;
4. Raised temperature and increased time, where possible, in order to reduce the dose;

5. Effective air circulation to promote pest control in areas of the facility that are difficult to reach during MB fumigation;
6. Continuous monitoring (see definition 21) during MB fumigation to prevent over dosing);
7. Higher doses may be used in practice provided that the total quantity of MB used in each use-category does not exceed the minimal quantity licensed for each use-category.

Combining methyl bromide with carbon dioxide, phosphine and/or heat reduces the amount of methyl bromide required. Sansone (1994) reported the "MAKR[35]" structural fumigation treatment, which applies methyl bromide with carbon dioxide, uses 67% less methyl bromide than when it is used alone.

Worldwide there are very few facilities that have the operational capability to capture methyl bromide that would otherwise be vented to the environment after fumigation. Even when such equipment is in place, it can only capture the methyl bromide that remains free in the fumigation chamber or facility, as often a significant quantity remains in the wood, packaging, or the commodity, which is then slowly released to the environment weeks or months after fumigation. For this reason, capture equipment is not able to reduce methyl bromide emissions to zero or even very low levels.

5.5 Historical data on Methyl bromide use reduction trends

The graph below describes historical trends in MB used in the EC. Following standard statistical procedures, a polynomial line of best fit was applied based on the actual historical use data. An R^2 of e.g. 0.97 indicates that the polynomial line explains 97% of the variation.

5.5.1 Cut flowers

In the past MB was used widely for cut flower production in many parts of the EC. Figure 5.2 shows the results of an analysis of the historical MB-treated area (hectares) for cut flowers in the EC, indicating a sharp decline particularly since 2002.

In the subsequent graph, Figure 5.3 shows the results of an analysis of trends in MB use (kg) over the same period[36].

In the best case scenario, namely in the event the trend and reductions remain of a similar magnitude in the next years, the phase out of MB use for the production of cut flowers within the EC will occur in 2007/2008.

[35] Trademark of Integrated Environments Ltd. MAKR is registered in registered in California, Texas and Florida.
[36] The polynomial line of best fit for Figure 5.2 is $y = 11.72x^2 + 46763x - 5*10^7$ ($R^2 = 0.97$) and for Figure 5.3 $y = -3533.4x^2 + 10^7x - 1*10^{10}$ ($R^2 = 0.998$).

Figure 5.2: Area treated with methyl bromide for cut-flower production in the EC

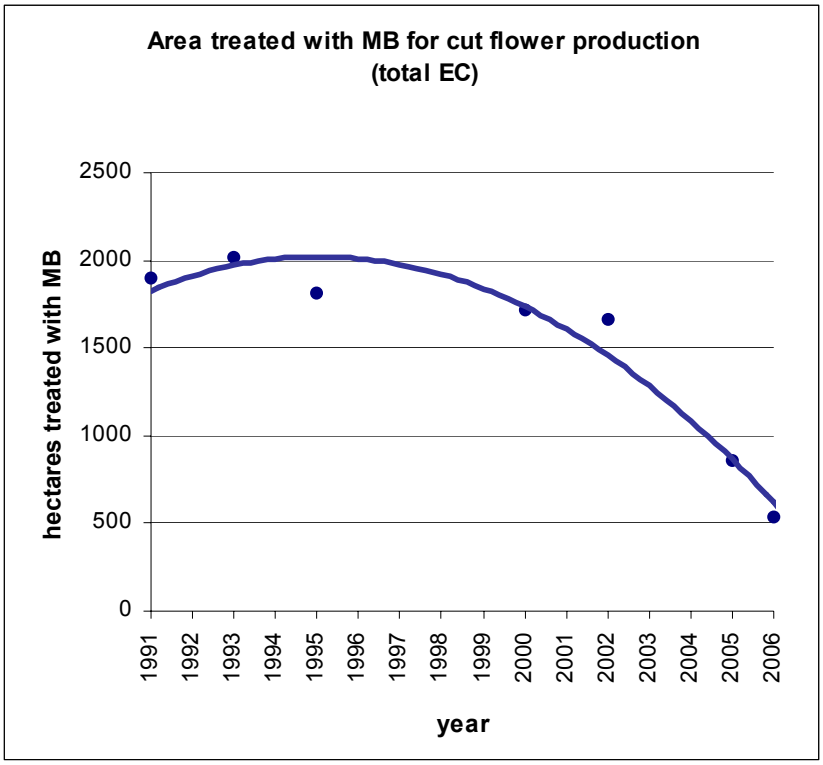
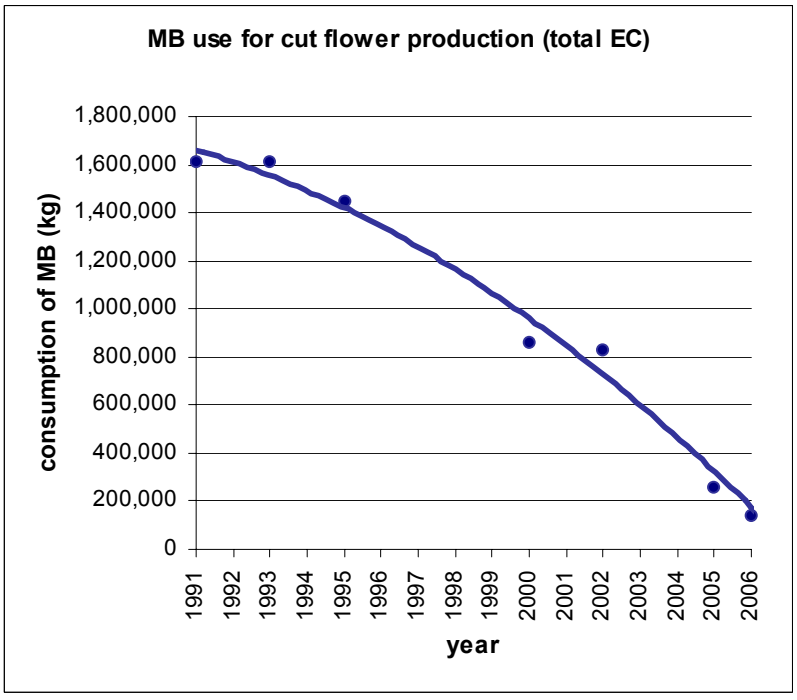
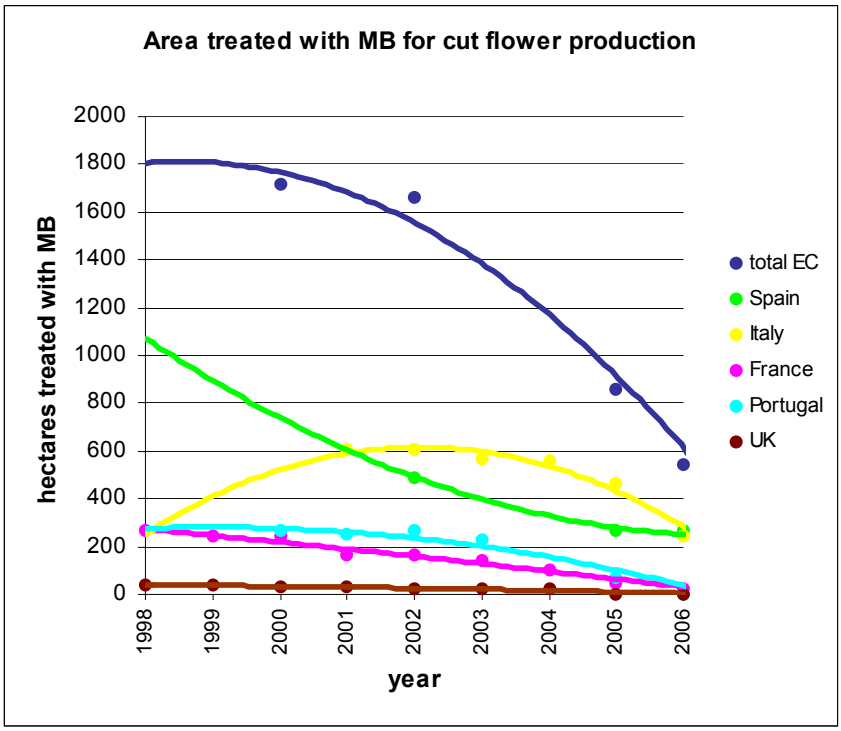


Figure 5.3: Methyl bromide consumption for cut flower production in the EC



As an illustration of progress to date in individual Member States, Figure 5.4 presents the area treated with MB for cut-flower production in MSs that applied for CUEs, showing individual lines of best fit. The data indicate that some MSs made rapid reductions, while others have experienced more difficulties in achieving faster reductions. Italy, for example, has since 2003 achieved faster MB reductions in this crop than other Member States.

Figure 5.4: Area treated with methyl bromide for cut-flower production in Member States that applied for critical uses



5.5.2 Peppers

In the past MB was widely used for pepper production in the EC. There was a steep decline in the MB-treated area from about 2001. Figure 5.5 shows the historical trend in MB-treated area (hectares) for peppers in the EC. In the best case scenario, namely if the trend is confirmed over the next years, the phase out of the MB-treated area used for the production of peppers within the EC could occur before 2008.

Subsequently, Figure 5.6 shows the trend in MB use for peppers in the EC.[37] MB use was high in relation to the MB-treated area in the early years due to higher MB doses used at that time.

[37] The polynomial line of best fit for Figure 5.5 is $y = -27.4x^2 + 109578x - 10^8$ ($R^2 = 0.97$) and for Figure 5.6 $y = -4632.5x^2 + 2*10^7x - 2*10^{10}$ ($R^2 = 0.95$).

Figure 5.5: Area treated with methyl bromide for pepper production in the EC

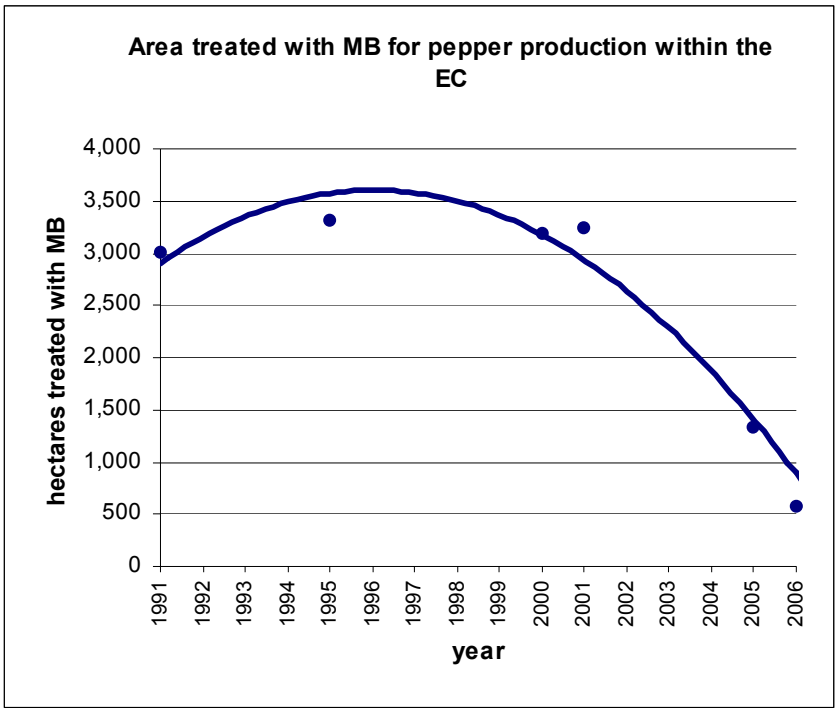


Figure 5.6: Methyl bromide consumption (kg) for pepper production in the EC

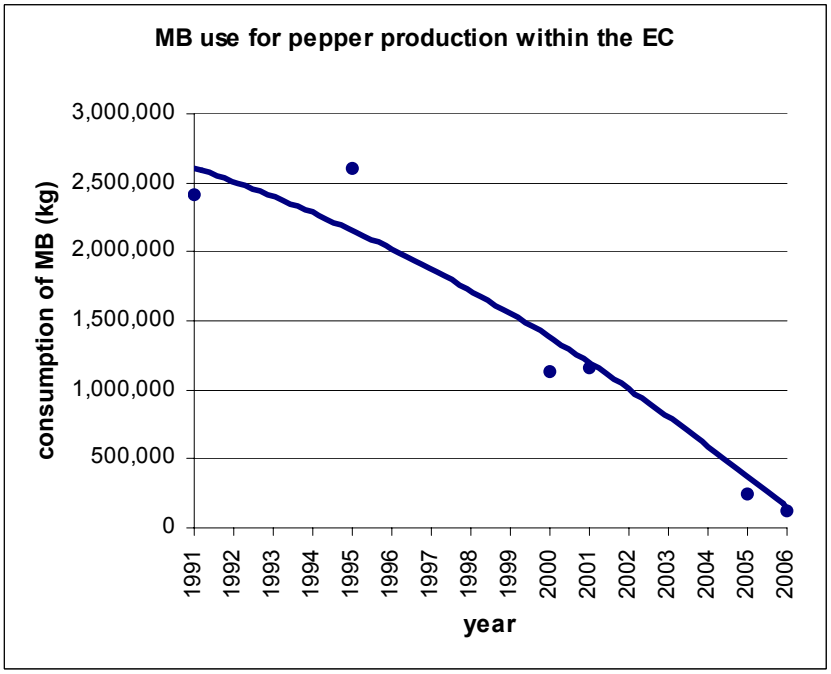
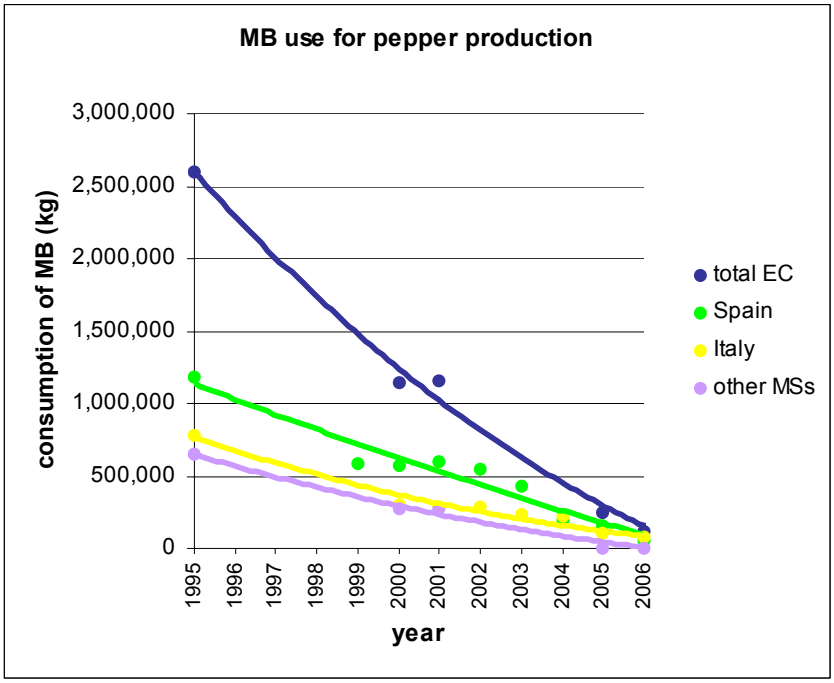


Figure 5.7 shows the historical trend in MB consumption (kg) for pepper in the MSs that have CUEs[38]. The lines of best fit indicate a phase out in 2007. The angle of slope varies between MSs. It is notable that Spain, once the largest single user of MB for this crop, has reduced MB to lower levels than other Member States.

Figure 5.7: Methyl bromide consumption (kg) for pepper production, EC total and largest users



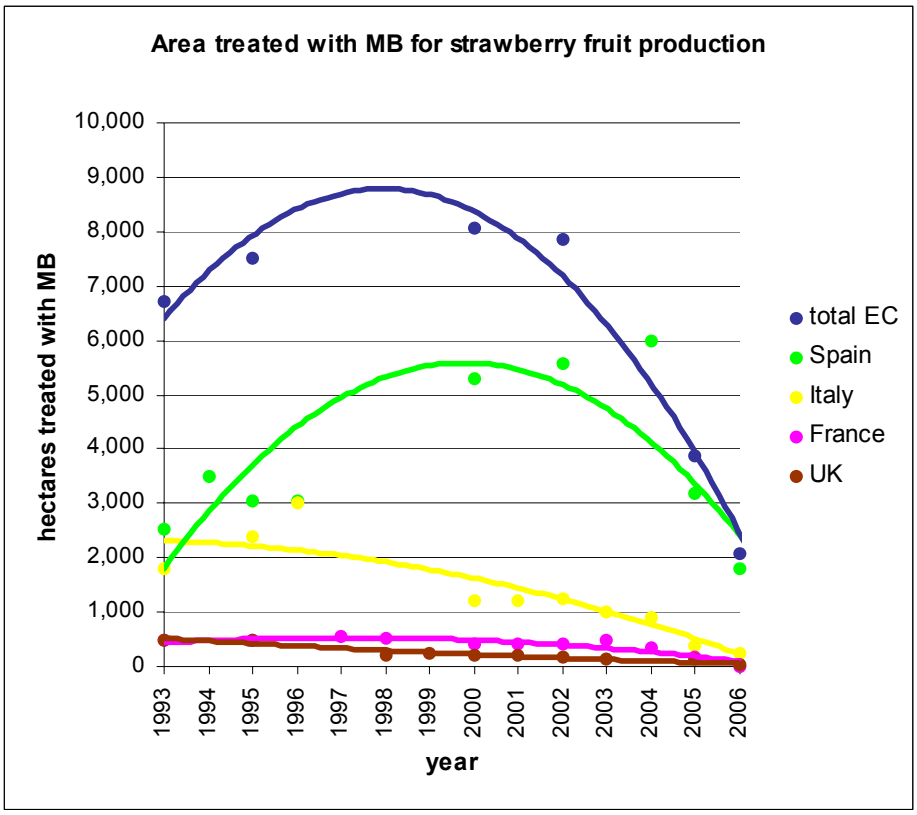
5.5.3 Strawberry fruit

Figure 5.8 shows the MB-treated area for strawberry fruit in MSs that have CUEs.[39] The arched curves show an increase in treated area in parts of the EC until recently. The current sharp decline in the use of MB for strawberry fruit is mostly due to reductions in Spain and Italy and to a lesser extent by France and the UK.

[38] The polynomial line of best fit for Figure 5.7 is for the EC data $y = 827x^2 - 3*10^7x - 3*10^{10}$, $R^2 = 0.99$.

[39] The polynomial line of best fit for Figure 5.8 is for the EC data $y = -97.8x^2 + 390968x - 4*10^8$, $R^2 = 0.98$.

Figure 5.8: Area treated with MB for strawberry fruit production in MSs that have CUEs

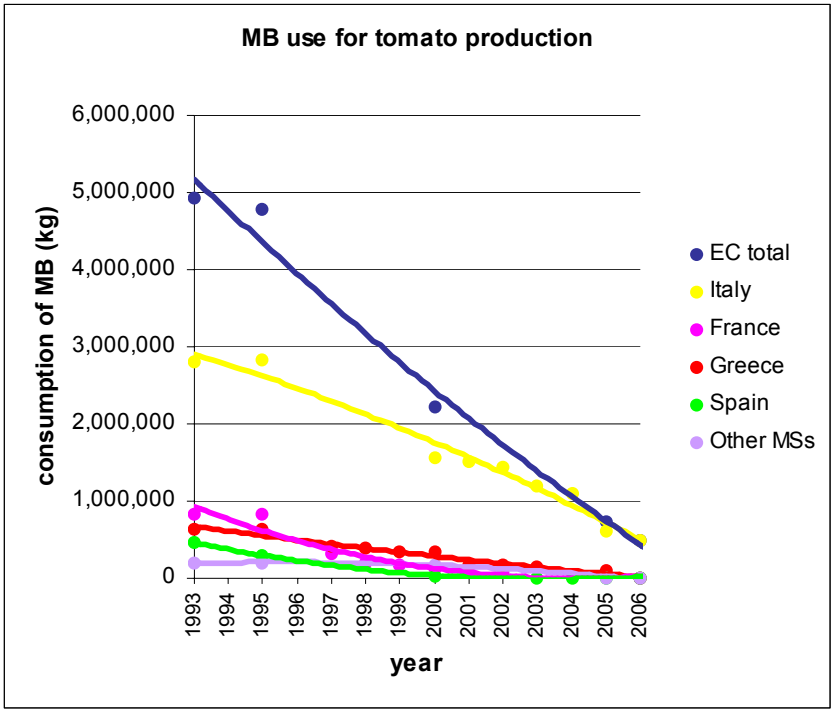


5.5.4. Tomato

Figure 5.9 presents historical data on MB consumption for tomato in the EC and MSs that have CUEs.[40] Italy historically is the largest MB consumer in this crop. Very substantial MB reductions were achieved throughout the EC between 1995 and 2005.

[40] The polynomial line of best fit for Figure 5.9 is for the EC data: $y = 4616x^2 - 2*10^{7x} + 2*10^{10}$; $R^2 = 0.98$

Figure 5.9: Methyl bromide consumption for tomato production in the EC and Member States that have critical uses

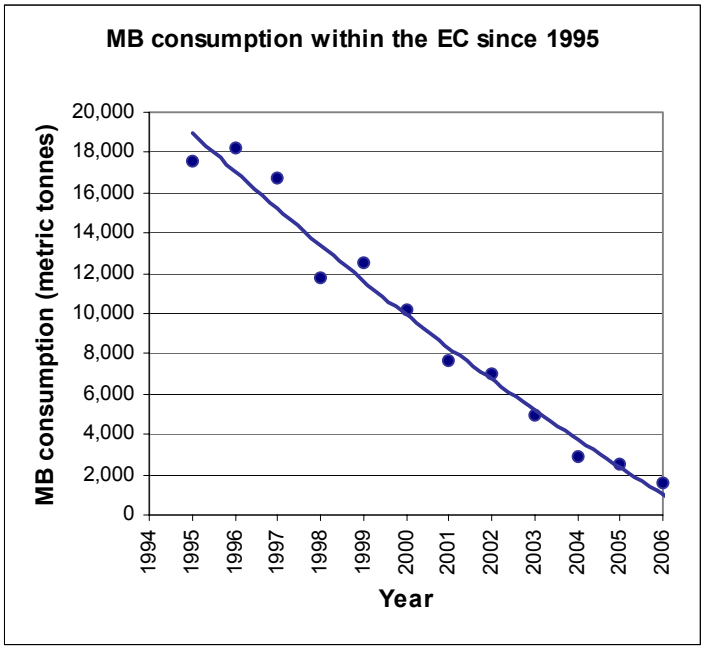


5.5.5 Total methyl bromide use in European Community

Figure 5.10 shows the total MB consumption in the EC since 1995.[41]

Figure 5.10: Total methyl bromide consumption in the European Community since 1995

[41] The polynomial line of best fit is $y = 29.6x^2 - 120368x + 10^8$ ($R^2 = 0.97$).



5.6 Methyl bromide use reduction trends, based on historical rates of adoption of MB alternatives

Table 5.3 provides information on the six major use-categories: tomato, strawberry fruit, cutflowers, pepper, strawberry runners, mills and food processing structures. As background information, it indicates the very substantial tonnages of MB that have been eliminated to date in the EC. In the past > 4980 tonnes MB was used for tomato in more than 12 Member States. By 2005 this was reduced to 733 tonnes in 4 MSs; while in 2006 it is 495 tonnes in one MS. Similarly, 12 MSs consumed about 3,400 tonnes of MB for strawberry fruit production in the past, but this was reduced to 265 tonnes in 2 MSs in 2006.

The analysis in Table 5.3 summarises a "best case scenario" of adoption of different types of alternatives and crops (hectares per year in individual Member States), based on actual examples of rates of adoption achieved in EC MSs (Table 4.3 and Annex 7.A). Alternative fumigants have been adopted at the rate of up to 838 ha/year/MS for tomato, and up to 1,627 ha/year/MS for strawberry fruit production, for example. The final column of Table 5.3 uses these rates of adoption to calculate the adoption time that would be needed in the best case for the remaining MB use-categories. Accordingly, this is a projection based on the premise that current trends will continue and thereby assuming that adequate alternatives will be adopted for the remaining uses which, in some cases, may be more difficult than expected in these very last steps of the phase-out.

Table 5.3. Methyl bromide reduction trends, based on historical rates of adoption in the EC (refer to Table 4.3 and Annex 7A)

Major MB CUEs in 2006	1991 MB use estimate[42] (tonnes) (ha) (No. MSs)	2005 MB use[43] (tonnes) (ha) (No. MSs)	2006 MB licensed (tonnes) (ha) (No. MSs)	Short-listed existing MB alternatives[44]	Historical rates of adoption in individual MSs from Table 4.3, Annex 7.A (ha/year per MS)	Predicted adoption trend, from 2006 [45]
Tomato	> 4980 t > 7000 ha > 12 MS	733 t 2423 ha 4 MS	532 t 1772 ha 2 MS	Fumigants: 1,3-D, Pic, Metam Sodium, Dazomet	up to 838 ha/year/MS	Rate of up to 838 to 1000 plus 1570 ha/year/MS 1 year adoption time
				Grafting on resistant root stock	up to 1000 ha/year/MS	
				Substrates	up to 1570 ha/year/MS	
Strawberry fruit	~ 3420 t ~ 5200 ha (>8000 ha in yr 2000) > 12 MS	497 t 3879 ha 4 MS	265 t 2075 ha (900 ha in 2007) 2 MS	Fumigants: 1,3-D, Chloropicrin, Metam Sodium	up to 1627 – 2000 ha/year/MS	Rate of up to 1627 to 2000 plus 60 – 80 ha/year/MS 1 year adoption time
				Substrates	up to 60 – 80 ha / year/MS	
				Resistant varieties	?	
Cut flowers	~ 1610 t ~ 1,800 ha > 12 MS	259 t 855 ha 6 MS	140 t 540 ha 3 MS	Fumigants: 1,3-D, Chloropicrin, Metam Sodium, Dazomet	up to 313 ha/year/MS	Rate of up to 313 plus 60 plus 917 ha/year/MS 1 year adoption time
				Substrates	up to 60 ha/year/MS	
				Steam	up to 917 ha/year/MS	

[42] Refer to Section 3 for data.

[43] Use data from Accounting Framework. Hectares calculated on doses stated in CUNs and CUNAs. If not stated, estimated based on mean dosage of MB for this use (tomato: 300 kg/ha; strawberry runners: 300 – 470 kg/ha; strawberry fruit: 100 – 300 kg/ha; cutflowers: 200 – 500 kg/ha; peppers: 150 – 300 kg/ha; mills and food processors: 20 g/m^3)

[44] Further details and alternatives in Annex 4.C.

Major MB CUEs in 2006	1991 MB use estimate[42] (tonnes) (ha) (No. MSs)	2005 MB use[43] (tonnes) (ha) (No. MSs)	2006 MB licensed (tonnes) (ha) (No. MSs)	Short-listed existing MB alternatives[44]	Historical rates of adoption in individual MSs from Table 4.3, Annex 7.A (ha/year per MS)	Predicted adoption trend, from 2006 [45]
				Resistant varieties	?	
Pepper	~ 2410 t ~ 3,000 ha > 11 MSs	250 t 1336 ha 3 MSs	123 t 577 ha 2 MSs	Fumigants: 1,3-D, Metam Sodium, Dazomet	up to 400 ha/year/MS	Rate of up to 400 plus 175 ha/year/MS 1 year adoption time
				Substrates	175 ha / year/MS	
Strawberry runners	~ 740 t ~ 930 ha ~ 5 MSs	346 t ~ 1500 ha 4 MSs	353 t ~ 1500 ha 4 MSs	Fumigants: 1,3-D, Chloropicrin, Metam Sodium	up to 870 ha/year/MS	Rate of up to 870 plus ? ha/year/MS 2 years adoption time
				Plug plants	?	
Mills and food processing structures	640t 12,800,000 m3 [46] ~ 15 MSs	150 t ~7,500,000 m3 [47] 5 MSs	91 t 4,536,000 m3 6 MSs	Heat + IPM	up to 3,500,000 – 4,600,000 m3 / year/ MS	Rate of up to 3.5 to 4.6 plus ? plus ?? plus 0.2 million m3/year/MS 1 year adoption time
				Sulfuryl fluoride		
				Phosphine	?	
				Controlled atmosphere	??	
				Modified atmosphere (structures)	200.000 m^3 / year	

[46] Assuming average dose was about 50 g/m^3 in 1991
[47] Assuming dose of about 20 g/m3

5.6 Further action to eliminate methyl bromide

The time to eliminate methyl bromide is difficult to estimate in a few cases where further research is needed on alternatives e.g. strawberry runners. If a new chemical product has to be registered, the registration time can also be difficult to estimate.

However, for many methyl bromide uses, one or more alternatives are available and the main factor limiting its elimination is the rate at which the alternative can be adopted (Table 5.4). In such cases, the time to eliminate methyl bromide will be related to the time that would be necessary for methyl bromide users to adopt the 'best available' alternative, based on a consideration of:

- The time remaining to complete the evaluation of an alternative when the application for registration has already been made;
- The time for companies and technicians (in the MS and/or other Parties) to supply equipment, materials and know-how; and
- The number of PCOs/applicators that supply or use this alternative at present in the MS, and the number of additional PCOs/applicators that would need to be trained as soon as possible. The time needed to train end-users may be relevant if they use the alternative rather than the PCOs/applicator.

As a result of the soil sector MB alternatives programme implemented in Spain since 1997, for example, phase out of 756 t (licensed in 2005) is expected in two years based on the use of alternatives (such as 1,3-D+PIC, biofumigation and grafting).

Table 5.4 Specific technology transfer activities and supporting activities

Technology transfer activities	Examples of supporting activities
Awareness-raising and improved knowledge-system of MB users and end-users	• Information transfer at the practical level, including tailor-made information about MB alternatives for end-users, relevant to specific pests species and local circumstances (section 3.6) • Information sheets, fact sheets, information websites, regular newsletters (section 4.4.3) • Role of fumigators in disseminating know-how to end-users (section 3.6) • Role for growers, PCOs, extension and research groups, supermarkets, companies that purchase farm products, consumers and credit suppliers (section 3.6) • Information exchange through workshops or conferences (section 4.4.3)
Training in the use of MB alternatives	• Practical, illustrated step-by-step training manuals (section 4.4.3) • Technical training in MB alternatives organised by

	PCOs, agricultural institutes, companies, growers/millers associations, governments, etc. (section 4.3), particularly hands-on training sessions (section 4.4.3) • Demonstrations, field days, study visits, workshops (section 4.3.3)
Creation of conducive economic environment	• Taxes on MB imports, used to promote alternatives (section 4.4.2) • Agricultural grants or bank loans to promote adoption of MB alternatives (section 4.4.2)
Restrictions on MB use	• Regulations limiting frequency of MB use (section 4.4.1) • De-registration of all uses of MB for which alternatives are not available (section 4.4.1) • Measures to prevent illegal trade in MB (section 4.4.1)
Market signals	• Agricultural production standards and certification systems that do not permit use of MB, such as MPS, EUREP cut flower standards, and COEXPHAL growers association production standard (section 4.4.2) • Supermarket specifications that do not allow use of MB (section 4.4.2)

6 Compliance by the European Community with Montreal Protocol Decisions on critical uses

The European Community has fulfilled its obligations relating to the use and phase out of the critical uses of methyl bromide in the Montreal Protocol.

Prior 1 January 2005, Regulation (EC) No 2037/2000 required initial MB reduction steps to be implemented earlier than required in the control measure described in Article 2H of the Montreal Protocol. Some reduction steps were also greater than required in that control measure. As a result, methyl bromide consumption in the EC was reduced substantially each year from 1998 (Figure 2.1).

Based on review procedures implemented by the European Community, the quantity of methyl bromide for CUEs has been reduced substantially from year to year: the quantity initially nominated for 2005 and 2006 was respectively 30% and 22 % of 1991 base level, the quantity approved by the Protocol was 22% and 18%, while the quantity finally licensed 14% and 8% (Table 2.1). The quantity nominated to the Montreal Protocol for 2007 is 6.5% of 1991 EC consumption.

In fulfilment of its obligations, the European Community has submitted the following information to the Montreal Protocol:

1. Alternatives listed according to their pre- and post-harvest uses (pursuant to paragraphs 1 & 2 of Decision Ex.I/4);

2. The 2005 Accounting Framework Report detailing the quantities of methyl bromide authorised, produced, imported, consumed, destroyed and the amount remaining at the end of the year (pursuant to paragraph 9(f) of Decision Ex.I/4);

3. A description of the application of the criteria in paragraph 1 of Decision IX/6 used to license critical uses (pursuant to paragraph 4 of Decision XVI/2, and paragraph 5 of Decision XVII/9); and

4. A summary of each application that describes the quantity of methyl bromide requested and the reasons that methyl bromide is considered critical (pursuant to paragraph 7 of Decision Ex.I/4).

Member States are currently compiling information on the impact of the transition effort and activities carried out in 2005 on the amount of methyl bromide that was included in the EC Nomination for 2007, pursuant to paragraph 9(g) of Decision Ex.I/4.

Finally, paragraph 9 of Decision XVII/9 requires each Party to ensure that the Management Strategy for the phase out of the critical uses of methyl bromide addresses the aims specified in paragraph 3 of Decision Ex.I/4, namely that the Strategy aims to:

- Avoid increases in methyl bromide consumption even for unforeseen circumstances;

- Encourage the use of alternatives through the use of expedited procedures to develop, register and deploy technically and economically feasible alternatives;

- Bring forward the time when methyl bromide consumption for each use can be reduced and/or ultimately eliminated, based on information such as the potential market penetration of alternatives;

- Promote the implementation of measures which ensure that any use and emissions of methyl bromide are minimised (in cases where an exemption is authorised); and

- To show how the Strategy will be implemented to promote the phase-out of the uses of methyl bromide as soon as technically and economically feasible alternatives are available, taking into consideration the particular circumstances of the nomination.

These measures are summarised in the sections below.

6.1 Measures to avoid increases in methyl bromide consumption

The ECMS has described procedures to avoid increases in methyl bromide consumption, unless exceptional circumstances occur. The ECMS requires:

- Methyl bromide to be eliminated as soon as technically and economically feasible alternatives are available;
- No increase in methyl bromide compared to previous year that methyl bromide was used, unless exceptional circumstances arise, such as unexpected

deregistration of an alternative where no other suitable alternative is available. The eligibility of the use will be assessed using the Decision Tree based on the criteria contained in the EC Regulation and relevant Decisions described in Section 5. Uses should not be authorised in cases where similar enterprises use alternatives in the same circumstances and sell to the same markets as methyl bromide users;

- Any increase in crop area or production to be achieved with the use of alternatives, whenever feasible;
- Methyl bromide to be used only as a 'last resort' when an alternative is not available in the circumstances of the nomination;
- Use and emission reduction practices (Section 5.4) to be implemented.

6.2 Measures to encourage the use of alternatives

The ECMS describes procedures to encourage the use of alternatives, such as:

- Expedited procedures in cases where alternatives need to be developed (Chapter 4), in particular Section 4.2.4 for products that have lower toxicity than traditional chemicals;
- Methyl bromide will be permitted only in cases where the applicant has demonstrated that appropriate programmes are in place to develop alternatives (Figure 5.1 and definition 12 in Table 5.2);
- Expedited procedures to deploy technically and economically feasible alternatives to MB (Chapter 5). Methyl bromide will be permitted only in cases where the applicant has demonstrated that appropriate plans are in place to deploy alternatives (as described in Table 5.2);
- Procedures for assessing the eligibility of methyl bromide for critical uses based on the minimum time necessary to deploy alternatives, the number of weeks needed for purchasing products/equipment, and other necessary measures, with the intention of completely phasing out methyl bromide as soon as technically and economically feasible alternatives are available (Table 4.3, and Chapter 5).

6.3 Measures to bring forward the time when each MB use can be eliminated

The ECMS describes procedures that will bring forward the time when methyl bromide consumption for each use can be reduced and/or ultimately eliminated, based on information such as potential market penetration of alternatives and other relevant information.

Section 4.3 provides examples of the rate of adoption of alternatives and Chapter 5 outlines conditions and principles that will be considered in order to assess the eligibility of any exemptions of MB for CU and illustrates the historic use of MB for some applications until 2006.

6.4 Measures to ensure that any use and emissions of MB are minimised

Section 5.4 describes the procedures to ensure that any use and emissions of methyl bromide are minimised (in cases where an exemption is authorised). Sections 5.4 and 5.5 contain detailed definitions of measures that are intended to minimise leakage of methyl bromide.

6.5 Measures to phase-out uses of MB as soon as technically and economically feasible alternatives are available

The ECMS describes actions to phase out methyl bromide as soon as technically and economically feasible alternatives are available.

The review carried out by the Commission prior to licensing of any critical uses of methyl bromide, following earlier assessment by MBTOC, provides an important opportunity to take account of the latest progress made in the availability in alternatives.