Australian Government

Department of the Environment, Water, Heritage and the Arts

Update of Australia's Critical Uses of Methyl Bromide

INTRODUCTION

In 2005, a strategy to provide for phase-out of critical uses of methyl bromide was developed in order to meet Australia's international commitments under the Montreal Protocol on Substances that Deplete the Ozone Layer. This strategy is available at www.environment.gov.au/atmosphere/ozone/ods/methylbromide/pubs/critical-uses.pdf.

Since the publishing of the strategy, there has been a substantial reduction in the volume of methyl bromide used for critical uses, with only two industries remaining out of the five industries initially considered in the strategy (Table 1 and Figure 1).

This document is an update of the 2005 strategy and provides the current outlook for soil treatment for strawberry runner production and post harvest fumigation of rice, as at July 2008. It is not intended to act as a replacement for the 2005 strategy but to be read together with the 2005 strategy.

Table 1: Critical uses remaining in Australia

Year	Uses	Total tonnes[1,2]
2005	Pre-harvest (soil) uses (strawberry runners; strawberry fruit; and cut flowers) Post-harvest uses (almonds and packaged rice)	119 (147)
2006	Pre-harvest (soil) uses (strawberry runners and cut flowers) Post-harvest uses (almonds, packaged rice)	56 (75)
2007	Pre-harvest (soil) uses (strawberry runners; and cut flowers) Post-harvest uses (packaged rice)	45 (49)
2008	Pre-harvest (soil) uses (strawberry runners and cut flowers) Post-harvest uses (packaged rice)	n/a (49)
2009	Pre-harvest (soil) uses (strawberry runners) Post-harvest uses (packaged rice)	n/a (38)

1. Volumes given in parentheses are the volumes approved by the parties to the Montreal Protocol
2. n/a – not available

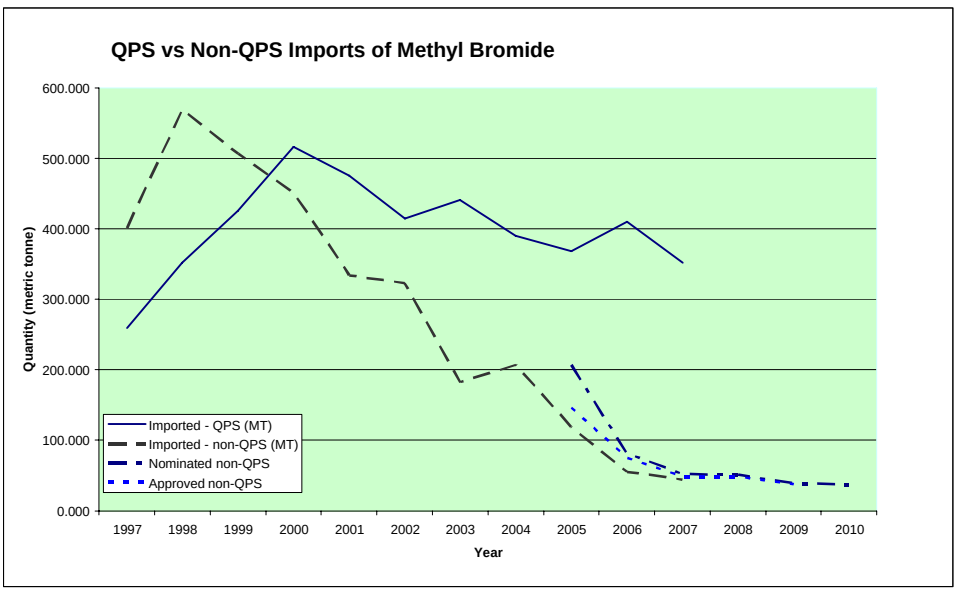

Figure 1: Decline in volume of methyl bromide used for non-QPS uses in Australia

Regulatory context

The regulatory context relating to non-QPS uses remains largely unchanged since 2005. The primary mechanism for implementing controls on the import, and subsequent use, of methyl bromide for non-QPS purposes is the Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995. These Regulations are made under the *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989* which gives effect to Australia's obligations under the Montreal Protocol.

These regulations provide a comprehensive system for the management of methyl bromide in Australia. The Regulations annually authorise non-quarantine and pre-shipment uses that have been approved by the Parties to the Montreal Protocol, together with individual approved users, approved suppliers and maximum quantities that can be supplied to each user. The Regulations put in place appropriate safeguards against methyl bromide being used for unauthorised non-quarantine and pre-shipment uses. The Regulations also provide for record keeping and/or reporting obligations for anyone selling and using methyl bromide. The Regulations create offence provisions for the illegal supply or use of methyl bromide.

Through monitoring sales and use of methyl bromide and the introduction of strict liability penalties as a deterrent for non-compliance, the Australian Government is able to ensure that non-QPS quantities imported in to Australia are only sold to approved persons.

Transition plan for packaged rice

The Australian Rice Growers Cooperative (ARGC) is pursuing phosphine fumigation in sealed silos as the most suitable alternative to methyl bromide fumigation. This requires substantial infrastructure development, costed at $47 million. Under the transition plan, new silos for phosphine would be constructed over three years at the main mill site in Leeton. The plan's delivery within the specified timeframe is dependent upon the ARGC's capacity to source sufficient infrastructure development capital, which is derived from revenue raised from satisfactory rice crop harvest yields.

Unfortunately, prolonged drought conditions in Australia have resulted in an expected 98 per cent reduction in the rice crop harvest yield for 2008 (down from an average 1,200,000 tonnes to 15,000 tonnes). Two of the three milling sites have been closed and 180 staff made redundant. The ARGC has proposed a 12-month delay in its transitional plan until improved crop yields and capital returns are restored.

The ARGC will reduce the volume of methyl bromide by 15 per cent to 7.82 tonnes in 2009 as required by the Parties to the Montreal Protocol in 2007. The ARGC will implement further reductions in 2010 if it can commence phosphine fumigation infrastructure investment in 2010, with completion in 2013. The schedule could potentially be delayed if crop yields remain below average as sufficient investment capital may not be available.

Currently the most promising alternative to methyl bromide and phosphine is ProFume®. ProFume® (sulfuryl fluoride) was registered in Australia in late 2007 although issues concerning whether the label would allow its use for packaged rice need to be resolved. Trials are to be organised for 2008 or 2009, depending on availability of rice product (current crop estimations suggest 2008 is more likely). Should trials of ProFume® prove successful and labelling issues resolved, the ARGC will review its transition plan to determine any capabilities for adopting ProFume® ahead of phosphine.

The ARGC has implemented recapture and destruction technology developed by Nordiko Quarantine Systems at one site. The Nordiko system was reviewed by the Technology and Economic Assessment Panel (a subsidiary of the Montreal Protocol) which found that the system met the efficacy criteria for destruction. The scrubbing equipment was installed in early November

2006 and trials and monitoring have indicated that 90 to 95 per cent of the methyl bromide left after fumigation (around 80 per cent of the gas introduced) is being captured and destroyed[1]. The site at which these facilities has been installed accounts for approximately 50 per cent of all non-QPS methyl bromide use (under non-drought conditions). Therefore, the ARGC has implemented measures to reduce emissions of total non-QPS methyl bromide use by 45 to 50 per cent.

Australian rice growers have also adopted a vast array of Quality Assurance programs to improve product quality and avoid unforeseen increases in methyl bromide use. Specifically, Australian rice growers have employed Good Manufacturing Practices (GMPs), Hazard Analysis and Critical Control Point (HACCP) systems, Master Cleaning Schedules and Integrated Pest Management (IPM) including chemical treatment, onto all ARGC sites, including all facets of the supply chain. Recently Australian rice growers implemented American Institute of Baking (AIB) accreditation with all mills now certified to this standard. These programs contribute to overall insect control throughout the entire ARGC supply chain.

ARGC also bases methyl bromide requirements on $20g/m^3$ as recommended by MBTOC. This represents a reduction from a historical rate of $48g/m^3$ and hence a substantial reduction in ARGC's methyl bromide emissions.

Several alternatives have been considered but were found to be neither economically or technically feasible:

- Residue problems have been experienced with ethyl formate, and the high flammability of this gas creates excessive fire risks. There are also doubts about ethyl formate's pest control efficacy for rice. The gas is registered in New South Wales for use on dried fruit only.
- Vapormate (ethyl formate:carbon dioxide 2%:98% mix) is currently only registered for adult stages of insects. Due to the reduced grain size and higher bulk density, movement of the gas is inhibited resulting in very low concentrations at the bag opening. Insect mortality rate observed during testing ranged between 0-100 per cent, confirming that all spaces in the bag were not reached using Vapormate.
- Carbonyl sulphide was found to be technically unfeasible. Sorption studies highlighted that significantly higher dosages were required for various rice commodities, as well as problems with organoleptic (taste and smell) perception due to residues.
- Cold disinfestation has also been considered. During the trial, it took three weeks to establish -20°C in 1 tonne bulkers. Costs associated with constructing sufficient cold storage facilities would require an expansion of warehouse space of up to 200 per cent. Such costs are expected to easily exceed $100 million.
- Packaging alteration with oxygen scavenging has also been considered as an alternative for rice storage. It is not considered economically feasible due to substantial increases in operating costs (from $8.88 million to $31.11 million per year).

[1] ie, of the introduced volume, around 80% is left and of that 80%, 90-95% is recaptured (ie 72-76% of total volume introduced).

Strawberry runner production

Strawberry runner growers use methyl bromide as a soil fumigant. This minimises the risk of pest infestations and disease because methyl bromide creates a partially sterile soil matrix. Pests, weeds and pathogens in the soil are reduced to a very low level. Without this treatment, pest, weed and disease infestations can cause significant production and quality losses in fruit production.

In Queensland, the strawberry runner industry stopped using methyl bromide in 2008. The primary chemical alternative is Telone[2] (1,3-dichloropropene, Dow Agrosciences).

Victorian growers have indicated that they have reservations in the use of Telone in their cooler and wetter climate with trials showing phytotoxicity on plant back. Trials of Telone C-35 have revealed unacceptable variability in plant growth and pest control, particularly under cool climatic conditions. Runner yields from soils treated with Telone C-35 varied within a range of a 10 per cent increase to a 30 per cent decrease. It is considered that the variability in plant growth may be due to phytotoxic residues remaining in soil after treatment at lower temperatures. Furthermore, additional data have demonstrated that the treatment does not effectively kill the pathogens *Phytophthora* and *Sclerotium* and certain weed species.

This variability in plant growth and pest control has thus far prevented runner crops grown in soils treated with Telone C-35 from meeting industry certification standards. Consequently, further research into improving the efficacy of Telone C-35 for cool climate applications is required, and the associated problems resolved, before Telone C-35 can be considered an acceptable alternative for use by the Victorian runner industry.

The chemical alternative of most interest to them is iodomethane (IM; methyl iodide) which is being trialled under permit by strawberry runner growers, pending registration of products in Australia by Arysta LifeScience North America Corporation with the Australian Pesticide and Veterinary Medicine Authority (APVMA). The products also contain chloropicrin (Pic).

Two formulations are being considered:

1. **Iodane 500 Soil Fumigant:** 500 g/kg chloropicrin (Pic) and 500g/kg iodomethane liquid fumigant product (Application Summary at www.apvma.gov.au/data_protection/39862.pdf).
2. **Iodane 330 Soil Fumigant** 670 g/kg chloropicrin and 330 g/kg iodomethane liquid fumigant product (Application Summary at www.apvma.gov.au/data_protection/39861.pdf).

Trials from 2007 indicate "Formulations of IM:Pic (30:70 and 50:50, 500 kg/ha) controlled weeds to the same levels as MB:Pic(50:50). IM:Pic (30:70 and 50:50, 500 kg / ha) also gave equivalent control of key strawberry pathogens to MB:Pic (50:50)" (Mann et al, 2007)[3].

Projects to further assess and improve the comparative efficacy of iodomethane:chloropicrin (IM:Pic 50:50) are continuing over 2008-2009. Data are also being analysed by the runner industry and other stakeholders in order to determine whether a further reduction in the rate of methyl bromide formulations (ie mixed with chloropicrin) is possible. Any rate reduction will have to be approved by the APVMA in order to change the label rate. Industry considers that, subject to APVMA approval, this will result in a reduced requirement for methyl bromide in 2010/11 if alternatives have not yet been made commercially available.

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[2] Also Telone C35, a mixture of 1,3-dichloropropene (615g/kg) and chloropicrin (345g/kg)

[3] R.C. Mann, S.W. Mattner, R.K. Gounder, and I.J. Porter. 2007 Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions, San Diego, USA. "Iodomethane offers opportunities for methyl bromide phase out and soil disinfestation in Australia". www.mbao.org/

Results from previously conducted trials have suggested ethanedinitrile (EDN, Linde AG) may be a promising possible alternative to methyl bromide. An Application Summary for EDN in the product STERIGAS 1000 was lodged by Linde AG with the APVMA in September 2007 (www.apvma.gov.au/data_protection/37416.pdf).

A two-year research program investigating the possible use of soil-less systems to produce strawberry runner foundation stock commenced in 2007. The program aims to provide data for development of the biological, biosecurity, hygiene and economic protocols necessary to design of a full-scale system. The program is a joint initiative between Horticulture Australia Ltd, and the Victorian Strawberry Industry Certification Authority. Current financial and logistical impediments prevent the adoption of this approach to the vastly more numerous commercial production stocks.