JAPAN BIG EFFORT TO PHASE-OUT OF METHYL BROMIDE BY 2013

Akio Tateya
Product Development & Regulatory Affairs Division, Syngenta Japan K.K.

Japan made clear phase out of methyl bromide for critical use for the control of soil transmitted virus of cucumber, melon, pepper and watermelon and Pythium of ginger by 2013 in revised National Management Strategy released in April 2008. Farmers are given five years grace period to replace methyl bromide for critical use with the alternatives.

For the accomplishment of this schedule, Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japanese Government has implemented innovative program on the development of cultivation manuals of alternative technology which could be applied to respective production region. Methyl bromide manufacturing will completely stop in 2013 for soil use. Farmers will be quite encouraged to use alternatives by the helpful advices from agriculture technology experts.

Pest control generally done by farmers themselves, not by pest control operation business people

Soil treatments are generally carried out by the farmers themselves in Japan, not by pest control operators in business which is quite different from overseas countries. They are expected to observe application instructions for safe use stated in the pesticide container label to avoid poisoning.

Reduction ahead of schedule of Montreal Protocol

As shown in table 1, actual amounts of methyl bromide production and consumption has accomplished with more reduction than ones in the regulated schedule of the Montreal Protocol and Japan's own target. And in 2005 methyl bromide production for regulated use was completely phased out in accordance with the Montreal Protocol. Table 2 shows significant reduction trend of methyl bromide shipment amount from manufacturing companies in soil use. Particularly methyl bromide shipment amount was found drastically decreased from 7,782 tons in 1994 to 410 tons in 2008.

Decreasing trend of MB use for quarantine treatment

Methyl bromide for quarantine use is not regulated in the Montreal Protocol. MAFF of Japan government had independently registered methyl bromide as quarantine use apart from the soil and post harvest use. Manufacturing companies are required to deliver methyl bromide for quarantine use

exclusively to the pest control operator who is engaged in the plant quarantine treatment. Those pest control operators are strictly required not to divert them to other purpose. As shown in table 2, methyl bromide for quarantine use has decreased significantly. The reasons are seemed to be attributed that import plants such as unprocessed timber from Russia have decreased significantly and frequency of interceptions of quarantine pests has decreased tremendously as well.

Less amount of the actual use than the approved critical use

As stated in table 3, amount 748 tons of critical use nomination in 2005 has been decreased significantly to 249 tons in 2011 with the rate of 4.1% of the consumption base level of 6,107 tons. Besides, as shown in table 5, actual use amount is found about 74% in average from 2005 to 2007 of the approved amount. The rest of 26% of approved amount had not been produced for the use. The several reasons are considered as follows:

1. Non use of methyl bromide in the field where no disease found occurred in the previous year
2. Non use of methyl bromide with the rotation to other crops for which methyl bromide soil fumigation is not necessary
3. Decrease by dose rate reduction
4. Decrease with the higher price

However, in 2008 actual use amount is found 92.4% of the approved one because farmers have no room to cut off any more.

Alternatives to methyl bromide for the control of soil pests and diseases

Alternative chemicals are of soil fumigants and contact chemical to the pests and diseases.

Soil fumigants: They are included chloropicrin liquid, tape and capsule, 1,3-dichloropropene, dazomet, metam sodium, mixture of metam sodium and 1,3-D, mixture of chloropicrin and 1,3-D. In order to avoid emission of pungent odor of chloropicrin and worker exposure of the gas, dose application machine has been improved with special devices of sheet covering followed immediately after dose application.

Contact chemicals: They are included fosthiazate, cadusafos, oxamyl and pyraclofos for the control of nematode and cyazofamid, propamocarb hydrochloride and metalaxyl. Metalaxyl is found less effective due to the occurrence of fungi resistance which leads the registration application of the mixture of metalaxyl M and azoxystrobin.

Sequential treatment by chloropicrin and fosthiazate is found quite effective to control the soil diseases and nematodes together. Soil pest and disease alternatives under development are of methyl iodide, amisulbrom and sodium phosphonate.

Background for the remarkable reduction of methyl bromide use and

notable development of alternative technology

Methyl bromide use reduction and replacement with the alternative technologies are thought to be attributed to the following backgrounds. MAFF has taken strong leadership to replace methyl bromide with the alternatives in the various fields.

(1) Approaches to the farmers: MAFF has launched strong campaign to minimize methyl bromide use and to replace methyl bromide with existing chemical substitute as much as possible, if technically and economically feasible, for the crops such as tomato, strawberry, spinach and flower which are easily got damaged with the soil disease and nematode.

(2) Encouragement of development of alternatives to manufacturing companies: MAFF has encouraged to expand spectrum of applied crops and diseases for the existing alternative chemicals in the registration and to develop the innovative alternatives. Chloropicrin emulsion was newly registered for the control of soil diseases. Ginger was added to the applied crops for the mixture of MITC and 1,3-D.

(3) Preferential inspection review by FAMIC of the pesticide registration authority

The authority has been involved in preferential review to the registration application for the alternative pesticides of soil treatment. In addition, registration application requirements have been lightened for the encouragement of more registration application for soil treatment.

(4) Encouragement of development of physical treatment to agricultural research institutes: They are involved of the treatment by solar energy, hot water, vapor, soil reduction redox, resistant variety, grafting of resistant stock and IPM sanitation and root humus acceleration.

As a result of systematic application of these technologies, it has led significant development of alternative technology and use reduction of methyl bromide.

Critical use nomination

Control of soil transmitted virus of pepper, melon, watermelon and cucumber: It is only registered methyl bromide to control Pepper Mild Mottle Virus(PMMoV) to pepper, Cucumber Green Mottle Mosaic Virus (CGMMV) to melon and watermelon, Kyuri Green Mottle Mosaic Virus (KGMMV) to cucumber and Melon Necrotic Spotted Virus (MNSV) to melon which might give serious damage to those crops. Methyl bromide use is critical to control those soil transmitted virus.

Control of Pythium to ginger: It is also methyl bromide as critical use to control Pythium disease of ginger because it is quite infectious to all other ginger plants in the field to lose commodity value once occurred in the field. Alternatives such as chloropicrin liquid need much longer plant back time

which is not economically feasible. Ginger is planted after completion of the previous crop harvest. Because of the longer plant back time of alternatives treatment, harvest of previous crop could be cut off earlier or planting of ginger is delayed, causing that either crops yield goes down with economic loss. Therefore, alternatives could not be applied with the reason of economical unfeasibility. That is the reason why critical use nomination has been applied to ginger.

Phase-out of methyl bromide as critical use nomination with the development of transition technology

MAFF has launched special program of the development of cultivation manuals on the alternative technologies applicable in the respective production regions for the control of soil transmitted virus and Pythium in the critical use nomination with the complete replacement of methyl bromide. Those alternatives are reviewed and established as the prototype from 2008 to 2010 in the agricultural research institutes in the respective production regions and put to the demonstration trails whether they are applicable to control those pest and disease in the practical farming in 2011 and 2012. The control reference value of alternative technology is aimed 80% compared with methyl bromide and yield is aimed 90%. Transition means to phase out of methyl bromide is as follows.

Alternative technologies as transition means to phase-out to control soil transmitted virus: Candidates of alternative technologies to control soil transmitted virus are of grafting to resistant stock, rotation to tomato with the use of resistant variety of melon, humus acceleration of remaining root in the field, isolated bed from the previous crop with the use of root expansion proof and water permeating sheet, inoculation of attenuated virus vaccine and bio decomposing pot to prevent from root damage in the transplantation work and bag culture of vermiculite, rock wool and timber and coconuts bark of soil less culture. Attenuated virus is now under review of formulation process for the field use and is undertaken various tests of toxicology and environmental impact for the registration application.

Transition means to control Pythium: It is under registration review of mixture of metalaxyl M and azoxystrobin. Three alternatives of methyl iodide, amisulbrom and sodium phosphanate are under development to prepare efficacy data and phytotoxicity for the registration application.

Technology transfer to A5 countries

Alternative technologies developed in Japan could be applied not only domestically but also abroad. They are highly expected to be employed in the developing countries which might be appreciated as a technology transfer. In the 21st Meeting of the Parties in Sham el Sheikh of Egypt, Japan will hold workshop on the feasibility of those alternatives.

Table 1: Non A 5 Parties Schedule of Montreal Protocol, Japan own target and reduction accomplishment for the phase-out of methyl bromide

	Schedule of Montreal Protocol	Japan own target	Japan accomplishment	
			Production**	Consumption**
1995	Freeze*	Freeze*	- 6%	- 2%
1996		- 5%	- 11%	- 7%
1997		- 10%	- 14%	- 9%
1998		- 15%	- 19%	- 15%
1999	- 25%	- 25%	- 28%	- 25%
2000		- 30%	- 33%	- 30%
2001	- 50%	- 50%	- 52%	- 53%
2002		- 50%	- 53%	- 52%
2003	- 70%	- 70%	- 74%	- 77%
2004		- 70%	- 73%	- 72%
2005	- 100%	- 100%	- 100%	- 100%

* Freezing at the level of 1991

** The production and consumption of critical use exemption are not included.

Table 2: Methyl bromide shipment amount from the manufacturing companies (tones)

Use pattern	1991	1994	2002	2004	2005	2006	2007	2008
Soil	6,269	7,782	2,764	2,419	547	540	485	410
Quarantine	2,848	2,703	1,430	1,306	1,165	1,039	867	706

Table 3: Quantity of critical use nomination from Japan (tons)

	2005	2006	2007	2008	2009	2010	2011
Cucumber	88.300	88.800	72.400	68.600	61.400	34.100	29.120
Ginger (field)	119.400	119.400	112.200	112.100	102.200	53.400	47.450
Ginger (protected)	22.900	22.900	14.800	14.800	12.900	8.300	7.770
Melon	194.100	203.900	182.200	182.200	168.000	90.800	77.600
Peppers	187.200	200.700	169.400	162.300	134.400	81.100	68.260
Watermelon	129.000	98.900	94.200	43.300	23.700	15.400	13.870
Chestnut	7.100	6.800	6.500	6.300	5.800	5.400	5.350
Total Amount	748.000	741.400	651.700	589.600	508.400	288.500	249.420
Ratio (%) *	12.2	12.1	10.7	9.6	8.3	4.7	4.1

* To the reference values of 6,107 tons of the consumption level in 1991

Table 4: Quantity of critical use exemption to Japan (tons)

	2005	2006	2007	2008	2009	2010	2011**
Cucumber	88.300	88.800	72.400	51.450	34.300	30.690	27.621
Ginger (field)	119.400	119.400	109.701	84.075	63.056	53.400	47.450
Ginger (protected)	22.900	22.900	14.471	11.100	8.325	8.300	7.036
Melon	194.100	203.900	182.200	136.650	91.100	81.720	73.548
Peppers	187.200	200.700	156.700	121.725	81.149	72.990	65.691
Watermelon	129.000	98.900	94.200	32.475	21.650	14.500	13.050
Chestnut	7.100	6.800	6.500	6.300	5.800	5.400	5.350
Total Amount	748.000	741.400	636.172	443.775	305.380	267.000	239.746
Ratio (%) *	12.2	12.1	10.4	7.3	5.0	4.4	3.9

*To the reference values of 6,107 tons of the consumption level in 1991

** Quantity for 2011 is of the recommendation from MBTOC

Table 5: Trend of the amount of critical use nomination, approval and use

	2005	2006	2007	2008
Nomination	748.000	741.400	651.700	589.600
Approval	748.000	741.400	636.172	443.775
Use*	546.861	540.207	485.113	409.937
Use rate to approval (%)	73.1	72.9	76.3	92.4

*Production amount for the actual use.