

**SIGNATURE PAGE**

Country: Malaysia

UNDAF Outcome(s)/Indicator(s):

*(Link to UNDAF outcome., If no UNDAF, leave blank)*

Expected Outcome(s)/Indicator (s):

G1SG1: Accelerated phase out of Ozone Depleting Substances

*(CP outcomes linked to the SRF/MYFF goal and service line)*

Expected Output(s)/Indicator(s):

Strengthened National Capacities & phase out of Ozone Depleting

*(CP outcomes linked to the SRF/MYFF goal and service line)*

Substances by year 2010

Implementing partner:

*(designated institution/Executing agency)*

Department of Environment

Other Partners:

*(formerly implementing agencies )*

Department of Crop Protection

Programme Period: 2004 - 2007  
Programme Component: \_\_\_\_\_  
Project Title: TAS for non-OPS uses of MeBr  
Project ID: 00037265  
Project Duration: 3 years  
Management Arrangement: NEX

Budget	US\$ 200,000
General Management Support Fee:	N/A
Total budget:	US\$ 200,000
Allocated resources:	_____
• Government	_____
• Regular	_____
• Other:	_____
○ Donor	Multilateral Fund MP
○ Donor	_____
○ Donor	_____
• In kind contributions	<u>US\$66,000.00</u>
Unfunded budget:	_____

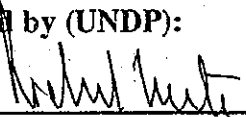
Agreed by (Government): **Economic Planning Unit**



**21 OCT 2005**

Raja Datuk Zaharaton bt Raja Zainal Abidin  
Director General  
Economic Planning Unit

Agreed by (UNDP):



**28 OCT 2005**

Richard Leete  
Resident Representative

# Government of Malaysia

## United Nations Development Programme

MAL/FUM/43/TAS/151

### Technical Assistance Programme to Install Alternatives and Phase-out All Remaining Non-QPS Uses Of Methyl Bromide in Malaysia

#### Brief description

The purpose of this project is to phase-out the remaining uses of methyl bromide, excluding quarantine and pre-shipment uses, by 31 December 2007. Average total imports of MB in the last 3 years (2000-02) stand at 133.8 metric tonnes (80.3 ODP tonnes). Of this, the 3 year average for non-QPS uses for the same period stands at 14.5 metric tonnes (8.7 ODP T). MB is used primarily for stored grains, stored timber (non-QPS) and perishable products, but also for turf nurseries and golf course maintenance. There is a growing risk that MB use will spread to other horticultural crops in future. The project will set up a National Steering Committee to coordinate the project and policy development to fully control MB use and achieve sustainable phase out. The project will transfer successful technologies from other countries, carry out pilots where necessary, conduct a training program and install alternatives at the sites where MB is used. The demonstration project implemented in Malaysia covered only stored wood, and did not cover other crops/commodities.

The Executive Committee for the Montreal Protocol Fund has approved this project on the understanding that the Government would phase-out all controlled uses of Methyl Bromide by the end of 2007 without any further assistance from the Multilateral Fund

## PROJECT COVER SHEET

**COUNTRY:** Malaysia

**PROJECT TITLE:** Technical Assistance Programme to Install Alternatives and Phase-out All Remaining Non-QPS Uses Of Methyl Bromide in Malaysia

**IMPLEMENTING AGENCY:** UNDP on all technical assistance and training components, with UNEP providing support on all policy related issues through its CAP ROAP office

**PROJECT TITLE:** Technical Assistance Programme to Install Alternatives and Phase-out All Remaining Non-QPS Uses Of Methyl Bromide in Malaysia

**SECTOR:** Postharvest and soil sectors

**ODS USE IN SECTOR:**

**Baseline (1995-1998 average):** 24.3 metric tonnes (14.6 ODP tonnes)

**Current (3 year average, 2000-2002):** 14.5 metric tonnes (8.7 ODP tonnes)

**PROJECT IMPACT:** Phase out 14.5 metric tonnes (8.7 ODP tonnes)

**PROJECT DURATION:** 3.5 years

**IN BUSINESS PLAN:** Yes

**COPENHAGEN AMENDMENT:** Ratified

**MILESTONES:** Monitoring milestones included

**TOTAL PROJECT COST:** US \$ 200,000

**AGENCY SUPPORT:** US \$ 18,000 (9%)

**NATIONAL COORDINATING AGENCY:** Ozone Protection Unit, Department of Environment, Malaysia

**NATIONAL COUNTERPART INSTITUTION:** Crop Protection and Plant Quarantine Services Division, Department of Agriculture, Malaysia

### PROJECT SUMMARY

The purpose of this project is to phase-out the remaining uses of methyl bromide, excluding quarantine and pre-shipment uses, by 31 December 2007. Average total imports of MB in the last 3 years (2000-02) stand at 133.8 metric tonnes (80.3 ODP tonnes). Of this, the 3 year average for non-QPS uses for the same period stands at 14.5 metric tonnes (8.7 ODP T). MB is used primarily for stored grains, stored timber (non-QPS) and perishable products, but also for turf nurseries and golf course maintenance. There is a growing risk that MB use will spread to other horticultural crops in future. The project will set up a National Steering Committee to coordinate the project and policy development to fully control MB use and achieve sustainable phase out. The project will transfer successful technologies from other countries, carry out pilots where necessary, conduct a training program and install alternatives at the sites where MB is used. The demonstration project implemented in Malaysia covered only stored wood, and did not cover other crops/commodities.

**PROJECT IMPACT:** The project will lead to progressive reductions in MB imports and will phase out 14.5 metric tonnes (8.7 ODP tonnes) of MB. Legislative and regulatory measures will be implemented to ensure that the alternatives will be sustainable and that MB will not be re-introduced after phase out.

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Dr Melanie Miller (UNDP consultant) October 2003, revised for re-submission April 2004  
Reviewed by: Dr Tom Bachelor October 2003

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**TECHNICAL ASSISTANCE PROGRAMME to INSTALL ALTERNATIVES  
and PHASE OUT ALL REMAINING NON-QPS USES of METHYL BROMIDE  
in MALAYSIA**

## **1. JUSTIFICATION AND BACKGROUND**

Under the Vienna Convention for the Protection of the Ozone Layer (1985) and the Montreal Protocol (1987), Signatories to the Protocol are required to control and phase out ozone depleting substances. Methyl Bromide (MB) was officially listed as an ozone depleting substance at Copenhagen in 1992 and in 1997, at the 9<sup>th</sup> Meeting of the Parties to the Montreal Protocol, control measures for methyl bromide were established in Article 5 (A5) countries. These controls required A5 countries to freeze consumption and production of methyl bromide in 2002 at average 1995-98 levels, with a 20% reduction by 2005 and total phase-out by 2015. Exemptions for 'Critical agricultural use' are presently being considered for non A5 countries, but do not apply to A5 countries until phase out. Critical use will only be granted where no viable, proven alternatives are available. Quarantine and pre-shipment (QPS) uses of MB are currently exempt from all of these controls.

The Montreal Protocol has established measures of control to slowly reduce, until its elimination, a series of destructive chemical substances that are destroying the ozone layer, among them MB. In many countries, MB is used as a soil fumigant and in the conservation of grains, disinfecting of storage buildings, ships holds, etc. Its high toxicity and penetration has made it effective against a great variety of pests, plant pathogens and weeds seeds, mainly when applied to the soil, stored products and for the quarantine of agricultural products for export.

At Copenhagen in 1992, and again in 2002, the Technology and Economic Assessment Panel was requested to examine the availability of alternatives for the many uses for which MB was used, and the technical and economic viability of alternatives, considering the particular economic, geographical and agricultural differences of the developing countries. Many successful projects have already assisted A5 countries to phase out MB or helped countries work towards phase out much sooner than 2015.

The Executive Committee of the Multilateral Fund requested UNDP to develop a sectoral plan to control the growth of methyl bromide consumption and assist phase out in Malaysia in close cooperation with the Department of Environment in Malaysia.

Malaysia, along with approximately 184 other countries, has ratified the Montreal Protocol and is therefore, committed to the control and phase out schedules for ozone depleting substances.

Malaysia is particularly keen to phase out MB, but wants to ensure that appropriate alternatives are in place so that there is no economic disruption to the country. Although MB use is presently relatively small compared to other A5 countries, the use is extremely valuable for Malaysia for amenity horticulture and tourism. It is estimated to be worth 2 billion Malaysian Ringgit (about US \$ 500 million) to the GDP of the Malaysian economy. The timber sector is also very valuable to the economy, amounting to about 8 billion Ringgit (US \$ 2.6 billion) in 2000. The project has therefore, been designed to protect these important national assets by transferring effective MB alternatives from other countries so that non-QPS MB users in Malaysia will be able to control pests successfully without the use of MB.

## 2. TOTAL CONSUMPTION OF METHYL BROMIDE IN MALAYSIA

A comprehensive national survey completed in 2003 has provided the most up-to-date official figures for past and present MB uses in all sectors in Malaysia. While it was determined that complete records allowing for differentiation of consumption for QPS and non-QPS purposes are available only from 2000 onwards, not for the 1990s, from the perspective of total MB imports the survey results highlighted a growing reliance on MB since 1994, beginning at 62.59 MT in 1994 and cresting at 180 MT in 2002 for all MB uses.

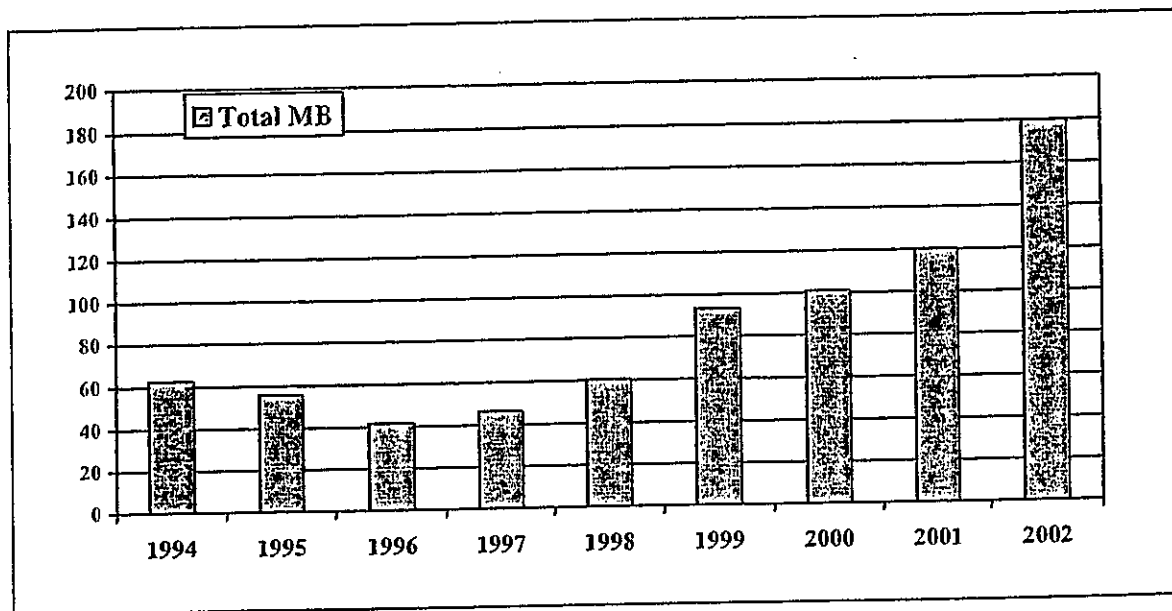


Fig 1. Total Imports of Methyl Bromide (MT) in Malaysia, 1994-2002, including QPS

One principle result of the 2003 survey is the information it generated with regard to QPS versus non-QPS use in Malaysia. Data to allow for this differentiation was found to be available from 2000 onwards. The main QPS uses in Malaysia are for exported timbers and other wood base products such as furniture, decorative doors and frames made from oil palm and rubber wood. Treatment by fumigation prior to shipment is prerequisite for these wood based products before export. Other QPS use is for the control of quarantine pests, especially Khapra beetle, and through systematic fumigation and surveillance of warehouse premises and grain processing centers to monitor and eradicate exotic pests.

MB used for non-QPS purposes was determined to include fumigation of durable commodities, timber products and structures, and soils. Use in the soil sector is currently relatively low, but there is growing concern that without identification of appropriate alternatives, accompanied by regulation and control, use in soils could expand substantially.

### 3. CONSUMPTION OF MB FOR NON-QPS USES

#### 3.1 2003 Survey Results on Malaysia's Official non-QPS Consumption

For non-QPS uses, Malaysia has reported official MB consumption as shown in the first column of Table 1 below. Malaysia's baseline (average consumption over the period 1995-1998) stands at 24.33 metric tonnes (14.6 ODP tonnes). In order to be in line with the first MB compliance

target for Article 5 countries contained in the Montreal Protocol - a freeze in MB consumption at baseline levels by 2002 – Malaysia's consumption in 2002 had to be frozen at a maximum of 14.6 ODP T, a target that the Government met. In order to meet the 20% reduction step required under the Protocol by 1 January 2005, national non-QPS consumption will need to be limited to 11.68 ODP T.

**Table 1: Non-QPS MB consumption**

Year	Official non-QPS MB Consumption reported under Article 7	Total MB Consumption	Non-QPS MB consumption as re-calculated following 2003 survey*	
	ODP T	M T/ODP T	M T	ODP T
Baseline	14.6 calculated by the Ozone Secretariat		24.33	14.6
2000	60.6	101.01 / 60.6	13.14	7.9
2001	72.2	120.4 / 72.2	15.65	9.4
2002	8.8	180 / 108	14.7	8.8
Average of last 3 years		133.8 / 80.3	14.5	8.7

\* Results of the 2003 consumption survey indicate that on average, over the years 2000-2002, non-QPS uses of MB in Malaysia represented 13% of total imports.

In developing the terms and scope for the 2003 consumption survey, the Government was able to launch an in-depth assessment of the breakdown of quarantine, pre-shipment and non-QPS uses of MB. In so doing, it determined that official MB consumption reported under Article 7 for non-QPS uses in 2000 and 2001 had not been accurate. These inaccuracies resulted from the difficulty, experienced by many countries, involved in obtaining data that accurately separates QPS (exempt) from non-QPS (not exempt) uses.

The 2003 survey allowed the Government of Malaysia to resolve these inaccuracies through consultation with importers and users and use of a thorough survey questionnaire. In evaluating the data gathered, it came to light that the data reported by Malaysia for the years 2000 and 2001 as non-QPS in fact reflected total MB imports. Further analysis of the data has allowed the Crop Protection and Plant Quarantine Services (CPPQS) Division of the Department of Agriculture to determine that on average, non-QPS uses of MB over the three year period covering the years 2000-2002 represented 13% of total imports, as indicated in the right-hand column of Table 1 above.

As this project proposal is being presented to the Executive Committee of the Multilateral Fund for approval, the CPPQS Division of the Department of Agriculture is working in close cooperation with the National Ozone Office of the Department of Environment to prepare official correspondence addressed to the Ozone Secretariat that will present the revised MB data collected during the 2003 survey and request that the official consumption reported for 2000 and 2001 be revised accordingly.

### 3.2 Non-QPS Uses

As aforementioned, use in the soil sector is currently relatively low but there is growing concern that without identification of appropriate alternatives, accompanied by regulation and control, use in soils will expand to other agricultural crops. At present, MB is registered and used mainly as a soil treatment for turf nurseries and golf greens to ensure production and maintenance of disease and weed-free turf for greens and fairways. There are over 200 golf courses in the country,

including 50 major golf courses in and around Kuala Lumpur and Selangor, which bring in substantial income through course fees and tourism. Treatment of turf for golf courses ensures that courses are available 365 days of the year and of a standard that supports world class golf tournaments such as the Malaysian Open. In particular, one of the major users of MB is the Shah Alam golf course which historically has hosted the Malaysian Open, an event that attracts over 60,000 visitors per tournament.

Methyl bromide in turf is applied by gas injection at a rate of 50 g per square meter (500 kg/ha) under plastic sheeting. The main pest that affects turf is reported to be root knot nematode (*Meloidogyne* spp) however, MB is also used to keep turf weed-free. The present use of MB has made it difficult to determine the extent to which fungal pathogens are also a problem for turf in Malaysia, but it is anticipated that alternatives will also be required for their control (particularly *Pythium* spp., *Rhizoctonia* spp. and *Fusarium* spp.). Accurate diagnosis is required to verify target pests to be controlled in order that the most appropriate alternatives can be selected.

MB is also used for stored products and stored timber. Stored products become infested with a wide variety of insects that require the use of control measures. A demonstration project in Malaysia, funded by the Multilateral Fund and implemented by UNDP, has been underway to identify suitable, effective alternatives for stored hardwood and rubberwood. Work to date has focussed on several timber stores in the region of Selangor Darul Ehsan. During storage, timber is subject to a wide range of pests including termites, about 16 species of beetles, and various fungi. An interim progress report that highlights the results of implementation of the nationally executed demonstration project, scheduled for completion later in 2004, is available.

The breakdown of non-QPS MB use is currently as follows:

Stored products (grain)	72 %
Timber (non-QPS)	20 %
Soil	1 %
Other	7 %
TOTAL	100 %

#### 4. POLICIES ON METHYL BROMIDE IN MALAYSIA

##### 4.1 Background

Malaysia ratified the Montreal Protocol on 29 October 1989, and the Copenhagen Amendment in 1993. Malaysia fully respects its commitments under the Protocol. The country has been proactive in its promotion of ODS elimination issues, implementing national training programs in alternative refrigeration technology, installing a permit system for importers of CFCs into Malaysia, and launching public awareness programs about the dangers of ozone depletion to human health.

Methyl bromide use in Malaysia is controlled by the Department of Agriculture (DoA) under the Pesticide Act of 1974. The current policy consists primarily of controls on imports through the issuance of permits/licenses by the Pesticide Board of the DoA. The system in place does not impose a set quota but rather, acts strictly as a monitoring tool to determine the level of imports and their provenance. The Pesticide Act of 1974 regulates all pesticides imported, manufactured, sold and stored in the country, with the main objective being to ensure that pesticides imported are effective for their intended use and have no unacceptable effects on crops to be treated.



Actual use of MB is strictly controlled by the Department of Health through registration of fumigators, who must possess a license in order to carry out fumigations. The Department assesses the toxicity of MB as it relates to human health and worker safety, but does not enforce a list of specific applications for the substance. There are two registered importers of MB who import both canisters (454g) and 20kg cylinders for use in Malaysia. Distribution is made to more than 50 pest control operators/companies.

The Ozone Protection Unit of the Department of the Environment manages Malaysia's ODS phase-out programme, wherein it is responsible for the overall management of phase-out projects approved under the Multilateral Fund and awareness-raising activities related to the elimination of ODS. In the MB sector, the Department of Agriculture implements these programs on behalf of the Government of Malaysia, in close cooperation with the Ozone Protection Unit.

## **4.2 Future Policy Options**

In order to support the sustainability of this project and the complete phase out of MB in Malaysia, it is important that the necessary policies and regulations are in place. As an initial step, a national review should be conducted to determine whether existing legislation and regulations are fully effective to support MB phase out. Based on the outcome of the review, proposed policy options may then be categorized within the short, medium and long-term contexts, in order to ensure sustainability of phase out efforts. A timetable would be included to identify ways by which such policy options could be made operational in the country. Thorough consultation with relevant national stakeholders and assessment of the impact of new policies and regulations on their business would be respected.

The following policy options could be explored:

### **Government and industry regulation and decision making**

- Strengthening the existing MB consultative/steering group by ensuring that representatives from government, research institutes and industry (incl. MB producers and users) are actively involved..
- Explore the possibility of organising sectoral subgroups (soils, post harvest, etc)
- Establish a policy by which quarantine and pre-shipment (QPS) uses of MB are clarified, and that use of MB for such applications will be properly recorded for reporting purposes.

### **Controls on Import and Export of Methyl Bromide**

- Currently there are no quotas on MB imports and exports. It is suggested that quotas be established for the importation of MB, taking into consideration the country's baseline consumption, and the volume that would need to be reduced in order to meet MB control measures
- Explore possibilities of reducing dosages of MB for areas where alternatives are already in use. This could considerably lower total MB uses and volume imported.
- Prepare a list of approved uses and develop a new policy to ban new applications
- The country currently has two main importers of MB. The regulatory body should impose a policy to allow or licence only these two importers, and not allow new ones.

### **Economic Incentives (Taxes, Levies, Duties and Subsidies)**

- Consider exempting MeBr alternatives from taxes, levies, and custom duties.

## Other

- Consider regulating approved retail containers and/or application equipment
- Labelling canisters and containers for specific uses such especially for QPS uses would help in determining how much MB is used for specific applications.
- Consider introducing eco-label requirements that would inform farmers and other users about ozone friendly nature and environmental consequences of alternatives and their costs.
- Work with companies and major traders who purchase crops grown using MB, to identify ways in which they can encourage suppliers to change production methods
- Aim for earlier phase out schedules, create additional interim reductions from a national perspective, especially within the control measures decided upon in the phase out strategy

## Technology Transfer and Awareness

- Technology transfer programmes especially on better use of alternatives such as good fumigation practices should be encouraged, and policies on how such practices can be adapted on a broader scale should be developed.
- Farmer Train the Trainers' program should also be encouraged especially for soil applications
- Broadcast radio and TV programs on MB and alternatives in local regions. The government should provide airtime free.
- Consider amending curricula of agricultural schools and universities to include ozone protection, especially the importance of MB phase out in agriculture.

## 5. ALTERNATIVES

### 5.1 TECHNICAL ALTERNATIVES FOR SOIL USE

No demonstration projects have been carried out so far in the soil sector in Malaysia, so there is need to undertake pilot technology transfers in order to identify the most suitable alternatives for turf nurseries and golf courses. In September 2003, during project preparation, a meeting in Kuala Lumpur between an international expert, national expert, MB users and stakeholders discussed alternative strategies to replace MB use for soil use in Malaysia and the benefits of this program to control of other non-QPS uses of methyl bromide. At least five alternatives, three available within Malaysia and several others being developed in other countries, were considered to have suitable characteristics for evaluation as alternatives to MB in turf. Where possible the project will use methods and technical alternatives which can be used as part of an Integrated Pest Management (IPM) programme. The development of predictive tests will also be considered to identify the pests present, as well as suitable treatments for specific sites.

MB has been used successfully for treatment of diseases in turf because of its ability to eradicate pathogens rapidly and effectively to a considerable depth in soil (>45cm). This means it provides relatively long term control. There are a number of alternatives that have similar characteristics, but to date none have been evaluated or used in place of MB in Malaysia. The most promising alternatives are listed below.

*Chemicals available in Malaysia but requiring validation for turf pests, diseases and control of weeds seeds*

- (i) **Dazomet:** Dazomet is presently registered in Malaysia and widely used for treatment of soils for growing flower crops. Dazomet has minimal odour and is a granular fumigant which allows for relatively easy application to small areas. It has excellent potential to replace MB for treatment of soil for turf production if systems can be developed to cope with the long plantback times and residues in soil which can be phytotoxic. New machinery, available in Australia, would need to be introduced to apply this fumigant in turf in Malaysia.

*Chemicals not available in Malaysia but with potential to replace MB*

- (i) **Cyanogen:** Cyanogen is a new product being developed to replace MB for use in commodities and soils. Preliminary testing in Australia indicates it has excellent potential for treatment of soils, including weed seeds. However, if found suitable for turf it will require extra time before registration is possible. It would be highly suitable for turf because of its relative safety for use in open public spaces and it has a rapid plantback time.
- (ii) **Methyl iodide:** MI is presently considered a one-to-one replacement for MB for soil use, but is extremely costly and yet to be registered in any country. If accessible in Malaysia, trials could evaluate this product as a possible longer term replacement
- (iii) **Chloropicrin used alone:** Chloropicrin is not yet registered for use in Malaysia. It may be imported into the country only with a special import permit for research and education. It is a highly effective fungicide, 20 times more effective than methyl bromide. Testing in Malaysia will be dependent on development of new machinery and odour free application methods. The major disadvantage to its use in Malaysia includes difficulty in application as the product requires injection by machinery and this limits potential for small scale treatments in Malaysia. It also cannot be applied as a gas, and it produces a chronic odour and irritates eyes if not sealed properly in soils. New capsules and emulsified formulations, which minimize odour problems, have been commercialised in several Asian countries (China, Japan) but are not registered (nor available) in Malaysia.

*Other Chemical treatments which may be considered to replace MB*

- (i) **Mixtures of 1,3 - dichloropropene and chloropicrin, or metham and chloropicrin:** These mixtures have been identified as replacements for MB in many other developed countries of the world, but are not yet available in Malaysia. Use of this product also requires specific injection machinery which is not currently available in Malaysia. Adoption of this product would require new machinery to be imported, and if necessary adapted for Malaysian conditions. Owing to the small size of the market, development of this product is not seen as a high priority but would provide a fallback option if necessary.
- (ii) **Metham-Sodium:** Inconsistent treatment effects and its putrid odour have limited uptake as an alternative to MB in many countries and similar difficulties would be anticipated when turf soils are treated. Application through drip irrigation with proper surface sealing is possible, but not considered a high priority at this stage.
- (iii) **Selective pesticides and fungicides:** Malaysia has access to a wide range of pesticides and several products may show potential for supplementing the use of alternatives to MB, but

when used alone are unlikely to replace MB. If nematodes are the sole target then specific nematicides should be considered in any program that is developed.

### *Non chemical alternatives*

- (i) Steam: Equipment for soil steaming is not currently available in Malaysia and therefore equipment would be needed for the project. Steam, however, offers great potential for treatment of small scale areas of turf, but costs will need to be determined in pilot trials. Portable steam machines require regular maintenance, and generally permits should be required to ensure that operators always maintain and operate boilers safely.
- (ii) Solarisation: Solarisation relies on application of clear plastic tarps to soil for periods of up to 4 weeks in hot conditions to heat soils to temperatures which are lethal to soilborne pests and pathogens. Unfortunately when used alone, solarisation is often too unreliable to provide the depth of control to give consistent disease free turf. It does however offer potential to be used as part of an integrated program with other treatments (biofumigants and other volatile organic amendments) but considerable research would be required to develop a suitable strategy.

### *Leading alternatives in soil sector*

The following alternatives have since been identified as the leading alternatives for turf nurseries and golf courses, and are priorities for the pilot technology transfer trials:

- a) Dazomet – this is currently registered in Malaysia. It will require hand droppers or mechanised droppers for use in turf.
- b) Cyanogen – this treatment is likely to be more effective than dazomet for weed seeds, so it offers a useful option for the future provided it can be registered. It will require injection rigs.
- c) Steam – this treatment does not require registration. It will require steam boilers and related equipment.

As MB is used for two specific reasons in golf courses, production of turf in nursery situations and replant of golf course greens, trials will be conducted in two stages. Firstly the production of turf in dedicated nursery sites on or near golf courses and trials at golf courses using 'simulated' greens. Effective training will be a high priority, owing to the need for safe use of all chemical products, the restrictions to public access required, and the requirement that alternatives must give 100% control of pests. Thorough training is essential.

The pilot program will focus on products or techniques which can be immediately implemented as alternatives (eg. steam and dazomet, which do not require registration) and parallel evaluation of several non-registered alternative products (cyanogen, possibly others) which may be required for the longer term. In the case of the long-term alternatives, the market size will also influence the likelihood that new alternatives, being developed in other countries, will be registered and available commercially.

Several pilots will need to be conducted at specifically dedicated sites at golf courses to evaluate the chemical and non chemical treatments across at least three seasons. Three seasons of pilots will be required at minimum to ensure that treatments give the same long term control in turf compared to MB. The pilots need to be conducted in randomized replicated blocks in specifically

dedicated turf production areas. Owing to the difficulty in finding sites with restricted public access, a dedicated site may need to be developed at a golf course. This will be expensive.

The successful establishment of alternatives will depend on the availability of trained technicians who can effectively address problems associated with soil-borne pest control and assure successful crop production. As MB for soils is presently applied only by Pest Control Operators and not growers, training will concentrate on the Pest Control Operators, and will include safe use training, as well as effective methods of application. The project will also assist with the commercial availability of chemical and non-chemical products, and assistance for the incremental costs of technology transfer.

## 5.2 TECHNICAL ALTERNATIVES FOR POSTHARVEST USE

### 5.2.1 Stored timber

The demonstration project carried out to date in Malaysia has identified the following treatments for stored timber:

- a) Kiln heat treatment, which can take about 40 days; and
- b) Cyanogen or sulfuryl fluoride or phosphine combined with kiln heat treatment, for cases where a faster treatment is required.

The installation of these alternatives for stored timber would require improved sealing (improved airtightness) of existing kiln facilities so that fumigants can be used in them. The project would also need to provide thermo sensors, gas control and distribution systems.

### 5.2.2 Other stored products

The alternative options for stored products include the following :

**Phosphine:** is currently registered and available for situations where a longer treatment time is feasible. It is a colourless gas, which is about 3 times lighter in weight than MB and provides better penetration of products. Phosphine fumigation, when conducted properly, provides complete mortality of the relevant insect pests and rodents. It requires investment for better sealing and training, to ensure effective use and avoid the development of resistance. It takes about 3 to 10 days treatment time, depending on the temperature and pest species present. However, it can be combined with other techniques in order to reduce the treatment time, with consequent increase in cost.

**Contact insecticides:** include organophosphates (eg. chlorpyrifos methyl, perimiphos-methyl) and pyrethroids (eg. permethrin). They can be applied as liquid formulations added directly to bulk grain and as preventative sprays on bagged grain. In some situations neem extracts can be suitable as insecticides.

**Cold treatments:** can kill many pests. Museums in many countries now use cold treatments of minus 18°C for 6 days or more, depending on pest species.

**Heat treatments:** Raised temperatures can also be used for killing or inactivating insect pests. Heat treatment systems have been developed for grain and similar stored products, but are not

available for large volumes of grain. Heat combined with controlled humidity is used for the disinfection of delicate museum items, antiques and other historical artifacts in Europe.

**Controlled and modified atmospheres:** Oxygen can be reduced to levels at which insects stop activity and reproduction. This can be achieved by placing stored products in gas-tight storage vessels, such as flexible cocoons or by covering with gas-tight sheeting. The oxygen is largely replaced by carbon dioxide and/or nitrogen. These treatments are generally slow, although this is not a problem in cases where products remain in storage for several months. In cases where fumigation needs to be achieved more rapidly, a vacuum-hermetic treatment can be applied in a flexible PVC container.

**Combination treatments:** For situations where a rapid treatment is necessary (eg. certain nuts, cocoa beans) products can be treated with pressure plus CO<sub>2</sub> in a chamber (20-30 bars of pressure, at 230°C, for 2-4 hours), or with heat or heat plus controlled humidity.

For structures specifically, combinations of phosphine + CO<sub>2</sub> + heat, and heat treatments + IPM (comprising improved cleaning programmes, use of spot treatments, fogging with pyrethrins and insect growth regulators, and phosphine fumigation of inbound raw ingredients) are used in about 10% of food facilities in the USA. Sulfuryl fluoride has recently been registered for food facilities in Switzerland and mills in the USA, is in the process of registration in a number of other countries.

The project will introduce alternatives relevant to the stored products that use MB in Malaysia. The leading alternatives are phosphine (only in cases where a slow treatment is feasible) and fast-acting alternative fumigants (eg. cyanogens, carbonyl sulphide) and combination treatments.

## 6. PROJECT OBJECTIVES

### 6.1 Project aim

This project will transfer existing, successful alternatives from other countries and adapt them as necessary to the needs of MB users in Malaysia. The project will also prevent the expansion of MB to new uses in other crops and regions. It will implement a program of technology transfer, training, extension and policy regulations which enable adoption of alternatives to replace MB. The project is designed to ensure that alternatives will be effective, economically feasible and suitable to the needs of MB users. This will allow MB imports to be reduced in a step-wise manner, so that MB can be phased out successfully.

### 6.2 Objectives

- (i) Set up a National Steering Committee on substitution of MB made up of relevant stakeholders who will coordinate and guide the project's implementation;
- (ii) Ensure that legislation/regulations under consideration effectively addresses control over MB imports and support an appropriate MB reduction and phase-out schedule, as per the terms of this project;
- (iii) Transfer effective alternatives from other countries, and implement pilots in strategically selected sites as necessary;
- (iv) Procure and disburse necessary alternative equipment and materials for the installation of alternatives;

- (v) Extend the alternative technologies to all MB users, through a program of training and extension; the target audience will also include relevant stored product managers and golf course managers, and relevant departments in agricultural institutes;
- (vi) Raise awareness among the industry about the need to phase-out MB;
- (vii) Develop a policy package within the context of the MB action plan to ensure that the alternatives will be sustainable, to assist the sustained phase out of MB, and ensure that MB will not be re-introduced after it has been phased-out.

## 7. PROJECT DESCRIPTION

The most appropriate strategy for phase out of MB in Malaysia will consist of: pilot trials to verify alternatives, a training program, and policy development to ensure that future use of MB does not increase and is actually phased out. As can be seen in Table 1 MB use has been expanding in Malaysia, however immediate implementation of this project is considered the best possible means of restricting future use.

The project will focus on the following strategic actions:

**Stage 1 – Coordination, through the expansion of Malaysia’s MB Technical Committee (MBTC), of all issues related to phase out.**

This group consists of relevant government Ministries, MB users, importers, suppliers of alternatives, and other major stakeholders who are involved in the use and regulation of MB and alternatives. This group will review and approve all project activities, as well as evaluate the results of the pilot technology transfers and make recommendations.

A meeting to discuss the project development and expansion of the existing MB Technical Committee (MBTC) was held in September, 2003. Relevant experts agreed that the Committee should consist of members from:

- Department of the Environment
- Department of Agriculture
- Pest Control Association of Malaysia
- Licensed fumigators (Flick Pest Control)
- UNDP
- National experts

**Stage 2 – Conduct of a pilot technology transfer program to identify the most suitable alternatives.**

In the stored timber sector, demonstrations are already being carried out and the leading alternatives have been identified. These will be scaled up to commercial level and adjusted as necessary to suit local conditions.

For other stored products and in the soil sector, effective alternatives will be transferred from other countries and piloted in sites that represent typical MB uses.

### **Stage 3 - Implementation of a training program for MB users**

Funds are requested for three aspects: initial training for the pilot stage, training of trainers, and training of all MB users, including relevant golf and nursery managers, store managers. This program will include the production of training materials, technical brochures (operating manuals) for alternatives.

After training, each MeBr user will be visited during the extension phase to monitor results of training and provide additional technical assistance to ensure the correct implementation of the selected alternatives. Agricultural training programme in academic institutions will be involved and encouraged to adopt as part of their curricula, training in alternative techniques, so that the new generations of students (future agricultural technicians) will have the know-how for using alternatives effectively.

### **Stage 4 – Development and implementation of policy options that restrict the use and then phaseout the use of MB for soils.**

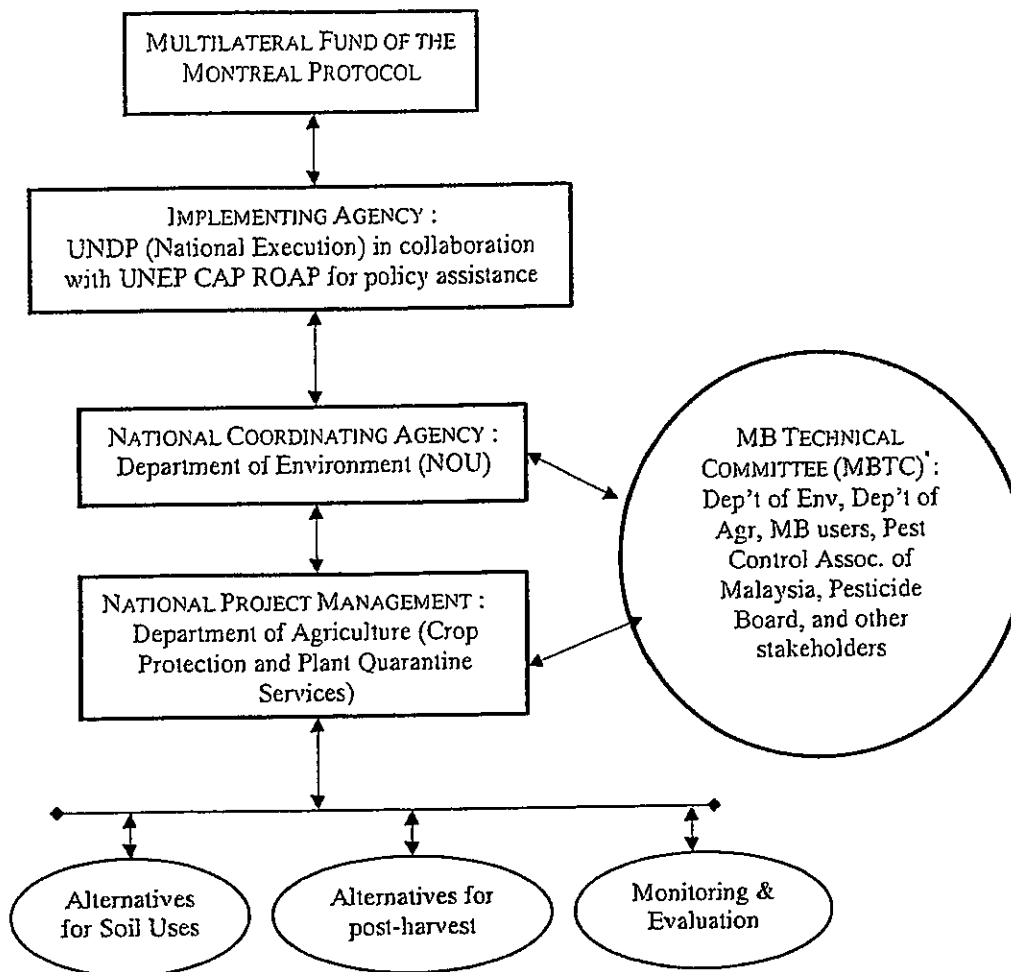
Various policy options will be considered. The policy and legislative/regulatory framework will be reviewed so as to guarantee that MB imports will be controlled and then steadily decreased and phased out. In tandem, a MB Action Plan will be developed to define specific actions that will promote the adoption of alternatives and discourage the use of MB. This will be developed in collaboration with MB users and stakeholders. Implementation of the Action Plan will be promoted and monitored by the members of the national MB Technical Committee (MBTC), a consultative body coordinated by the Department of Agriculture. Policies will be put in place, consistent with the uptake of alternatives. They will support further MB reductions, prevent new uses of MB, and ensure that the MB phase-out will be permanent, as required under MLF guidelines for MB projects. The project will pay special attention to the timing of coordination and resultant economic impact of any decisions.

## **8. ORGANIZATION AND ADMINISTRATION**

Stakeholders will play an integral role in the evolution and implementation of this project. Overall project management will be conducted through national execution modality by the National Ozone Unit of the Environmental Protection Agency, in cooperation with UNDP-MPU and UNDP-Malaysia. UNEP CAP/ROAP will oversee implementation of the policy component of the project. An expanded coordination procedure will occur, whereby the Directorate of Agricultural Extension Services and the Plant Protection & Regulatory Service (PPRS), MB users, customs officials and other major stakeholders including, agricultural associations, national agricultural research centres, suppliers of alternatives, and non-governmental organisations (NGOs), will be invited to become members of the government's existing MB Technical Committee (MBTC).

The national coordinating agency of the project will be the Department of Environment, while the responsibility for execution will lie with the Department of Agriculture and its management will be coordinated by Dr Mokhtarud-Din Bin Husain of the Department's Crop Protection and Plant Quarantine Services Division. Dr Husain is a member of the Montreal Protocol's MBTOC and has considerable experience in implementing research and extension programs for methyl bromide alternatives.





\* MBTC is an existing national committee, coordinated by the Department of Agriculture

## 9. PROJECT OUTCOMES

- (i) Alternatives successfully utilised at all sites that presently use MB (except for QPS);
- (ii) All MB applicators trained so they can successfully use alternatives;
- (iii) MB Action Plan developed by stakeholders and government, and fully implemented before end of project;
- (iv) Legal controls introduced by end 2005 to reduce and then prohibit the importation of MB (except for QPS) and also to prevent new agricultural uses of MB;
- (v) Efficient system of review and control of project progress and MB consumption/imports; and,
- (vi) Agricultural institutions have adopted use of alternative within their curricula and are able to teach effective alternative techniques to future and practicing agricultural technicians.

The installation of alternatives at sites that use MB, combined with the training of all MB users, will allow the imports of MB to be gradually reduced as follows:

Year	Soil sector		Postharvest (non-QPS) sector	
	Training and installation of alternatives (per year)	MB reductions per year	Training and installation of alternatives (per year)	MB reductions per year
2004	2%	0%	20%	5%
2005	15%	15%	25%	20%
2006	35%	35%	30%	35%
2007	48%	50%	25%	40%
Total	100%	100%	100%	100%

*N.B. MB used for QPS is excluded from this project.*

## 10. PROJECT BUDGET SUMMARY

The funding requested is to allow for the conversion to the use of effective alternatives, the development of training materials, supporting policy instruments and a comprehensive training program, in order to allow Malaysia to phase out MB use in a timely and accelerated fashion. MB users and participating institutions involved in the project will provide counterpart funding contributions, some of which can be classified as eligible incremental costs including, provision of extension services support, purchase of chemicals and materials for demonstration and training purposes, agricultural land to initiate demonstration of alternatives, laboratories and laboratory equipment to conduct soil and pest analysis, office space and equipment.

An overview of total project costs is as follows:

Item	Project cost US\$
<b>1. PROJECT PERSONNEL</b>	
1.1 Technical personnel, including engagement of a national coordinator	20,000
1.2 International experts in MB alternatives (for technical assistance, training of trainers, technology selection and adoption)	30,000
<b>Subtotal</b>	<b>50,000</b>
<b>2. TRAINING AND TECHNOLOGY TRANSFER/EXTENSION PROGRAMME (including equipment and materials)</b>	
2.1 Technology transfer/training programme, including:	50,000
a. training of national experts on effective use of alternatives through collaborative technical exchange with regional experts (Australia) [includes travel, DSA]	25,000
b. organization of national training programme and soils/post-harvest sessions	20,000
c. development, publication and distribution of effective MB alternatives manuals *	5,000
2.2 Equipment and materials for pilots and adoption of MB alternatives	90,000
<b>Subtotal</b>	<b>140,000</b>
<b>3. POLICY DEVELOPMENT PROGRAMME and NATIONAL CONSULTATION MEETINGS</b>	
3.1 Development of policy framework (policy development and adoption, engagement of a national policy/legal consultant and. monitoring and follow-up	10,000

of MB consumption over 4 year period)	
<b>Subtotal</b>	<b>10,000</b>
<b>PROJECT TOTAL</b>	<b>200,000</b>

*\* training manuals produced will be shared with UNEP CAP ROAP for further use in other countries at regional level.*

*\*\* UNDP-MPU and the National Coordinating Agency will have the flexibility to adjust the budget components in order to better meet the agreed upon schedule for training, alternatives installation and MB reductions*

## PROJECT BUDGET SUMMARY

A review of the project budget was necessary to accommodate the need for a project staff to assist the Technical Coordinator in implementing the project. This decision came about after a meeting with the Department of Crop Protection, Department of Environment and UNDP. In view of this the budget was revised without affecting the overall project costs. The revised budget is as follows:

Item	Project Cost US\$
<b>1. PROJECT PERSONNEL</b>	
1.1 Technical personnel, including engagement of a national coordinator	35,000
1.2 International experts in MB alternatives (for technical assistance, training of trainers, technology selection and adoption)	30,000
<b>Subtotal</b>	<b>60,000</b>
<b>2. TRAINING AND TECHNOLOGY TRANSFER/EXTENSION PROGRAMME (including equipment and materials)</b>	
2.1 Technology transfer/training programme, including:	55,000
a. training of national experts on effective use of alternatives through collaborative technical exchange with regional experts (Australia) [includes travel, DSA]	25,000
b. organization of national training programme and soils/post-harvest sessions	15,000
c. development, publication and distribution of effective MB alternatives manuals *	10,000
2.2 Equipment and materials for pilots and adoption of MB alternatives	65,000
<b>Subtotal</b>	<b>110,000</b>
<b>3. POLICY DEVELOPMENT PROGRAMME and NATIONAL CONSULTATION MEETINGS</b>	15,000
3.1 Development of policy framework (policy development and adoption, engagement of a national policy/legal consultant and, monitoring and follow-up of MB consumption over 4 year period)	15,000
3.2 National Consultative meetings (1 technical, 1 policy)	5,000
<b>Subtotal</b>	<b>20,000</b>
<b>PROJECT TOTAL</b>	<b>200,000</b>



## Terms of Reference

## National Steering Committee (NSC)

The National Steering Committee (NSC) will provide the overall guidance to the implementation of the project. The Chairman of the National Steering Committee will be the Deputy Director-General (Sectoral) of the Economic Planning Unit (EPU). Its members will consist of representatives of relevant ministries and UNDP. The Economic Planning Unit will act as the secretariat to the NSC.

The NSC will meet after the receipt of each project report and/or twice a year, whichever is more, and have the following responsibilities:

1. Provide Policy guidance on matters pertaining to the implementation of the project.
2. Monitor and evaluate the implementation of the project towards fulfilment of the objectives stated in the project document.
3. Coordinate and manage overall project activities and budget.
4. Review and comment on each year's proposed work plan and budget.
5. Initiate remedial actions to overcome all constraints in progress of the project;
6. Review and approve relevant changes to the project design.
7. Coordinate the roles of the various organisations involved in the execution of the project and ensure harmony with related activities.
8. Review and approve progress and technical reports.

The NSC may choose to co-opt other members, such as NGOs, the private health sector and professional body representatives, as may be necessary.

Terms of Reference  
Methyl Bromide Technical Committee (MBTC)

The Methyl Bromide Technical Committee will be chaired by the Director-of Crop Protection and Plant Quarantine Division, Department of Agriculture and will report to the NSC chaired by EPU. Administratively, the Head of the Entomology Unit, Department of Agriculture will act as the secretariat to the MBTC.

The members of the MBTC will consist of members appointed by the chairperson. These members should include representatives from the Department of Environment, the Pest Control Division (Department of Agriculture), the Fumigation Operators, the Pest Management Section (Department of Agriculture), and the Diagnostic and Advisory Section, Entomology Unit and Vertebrate & Mollusc Unit (Department of Agriculture). Other ad-hoc members may be invited to sit on the MBTC where appropriate.

The MBTC will specifically be responsible for:

1. Provide guidance and decisions on matters pertaining to the technical aspects of the project;
2. Monitor and evaluate the technical implementation of the project towards fulfilment of the objectives stated in the project document;
3. To appoint consultants to develop research methodologies for the selected chemical and non chemical treatments;
4. To identify potential chemical and non chemical alternative to Methyl Bromide for non-QPS Pest treatments of soil and storage;
5. To evaluate research methodologies developed by consultants;
6. To develop overall workplan of the project;
7. Review and advice on access and release of information/statement pertaining to the technical aspects of the project;
8. To review policy on status of methyl bromide

## Terms of Reference

## Technical Coordinator

The Technical Coordinator is a staff member of the Government, implementing the project. His/her main responsibility is to ensure that the project proceeds according to the designated objectives, schedule and within the budget planned and also to provide the expected output and activities. He/she will also facilitate the co-ordination of project activities among the main parties to the project: the Economic Planning Unit (EPU), the Department of Environment and UNDP.

Technical Coordinator will work in close collaboration with the international consultants, local consultants and other staff recruited for the project, including the project team members and the UNDP officer concerned. His/Her duties include the following:

1. He/she will act as the secretary to the Methyl Bromide Technical Committee (MBTC) and hence responsible for organising the MBTC meeting;
2. He/she will provide the overall direction to the project team members and resource persons on the conduct of the project;
3. The Technical Coordinator is part of the project team and will be heavily involved in the coordination and provision of support to the consultancy team at all stages of the project, assures the smooth progress of the project, coordinating its implementation; manages the project funds and ensures that capacity development activities are consistent with the requirements of the project;
4. In this regard, he/she calls for meetings and arranges seminars and workshops, visits and briefing when necessary; monitors the work done by the consultants, project team members; and facilitates interactions with the NSC and the MBTC and UNDP representative;
5. Mobilizes national institutional mechanisms for smooth progress of the project;
6. Prepare report on the work progress of the consultants, to include the deliverables according to the scheduled time frame.
7. Ensure that the project staff, office equipment and other facilities are in place for the execution of the project;
8. Ensure that when the project document and project revisions requiring Government's approval are processed through the Government coordinating authority, in accordance with established procedures;
9. Maintains close contact with officers from UNDP and EPU, indicating any estimated changes to the work plan.
10. Ensure that the requisite project reports are written and submitted on time by the consultancy team.



Terms of Reference  
International/National Consultant

**Background**

The Montreal Protocol has established measures of control to slowly reduce, until its elimination, a series of destructive chemical substances that are destroying (deplete) the ozone layer, among them MB. In many countries, MB is used as a soil fumigant and in the conservation of grains, disinfecting of storage buildings, ships holds, etc. Its high toxicity and penetration has made it effective against a great variety of pests, plant pathogens and weeds seeds, mainly when applied to the soil, stored products and for the quarantine of agricultural products for export and import.

In this regard, the Executive Committee of the Multilateral Fund requested UNDP to develop a sectoral plan to control the increase of methyl bromide consumption and assist phase out in Malaysia in close cooperation with the Department of Environment in Malaysia.

Malaysia, along with approximately 187 other countries, has ratified the Montreal Protocol and is therefore, committed to the control and phase out schedules for ozone depleting substances.

Malaysia is particularly keen to phase out MB, but wants to ensure that appropriate alternatives are in place so that there is no economic disruption to the country. Although MB use is presently relatively small compared to other A5 countries, the use is extremely valuable for Malaysia for amenity horticulture and tourism. It is estimated to be worth 2 billion Malaysian Ringgit (about US \$ 500 million) to the GDP of the Malaysian economy. The timber sector is also very valuable to the economy, amounting to about 8 billion Ringgit (US \$ 2.6 billion) in 2000. The project has therefore, been designed to protect these important national assets by transferring effective MB alternatives from other countries so that non-QPS MB users in Malaysia will be able to control pests successfully without the use of MB.

**Objectives of the Project**

This project will transfer existing, successful alternatives from other countries and adapt them as necessary to the needs of MB users in Malaysia. The project will also prevent the expansion of MB to new uses in other crops and regions. It will implement a program of technology transfer, training, extension and policy regulations which enable adoption of alternatives to replace MB. The project is designed to ensure that alternatives will be effective, economically feasible and suitable to the needs of MB users. This will allow MB imports to be reduced in a step-wise manner, so that MB can be phased out successfully.

**Scope of Work**

The consultant will work closely with the Technical Coordinator and the MBTC and ensure timely delivery of project outputs. His/her job entails the following duties and responsibilities:

- To prepare detail protocol of the project;
- To provide expert advice on the overall assembly of equipment, fumigation techniques and fumigation facilities on soil treatment, both chemical like dazomet, cynogen methyl-iodide, chloropicrin, metam + chloropicrin and metam+sodium) and non-chemical like steam and solarization and post harvest stored product, (phospine, contact insecticide, cold treatment, heat treatment, controlled atmosphere and combination treatment);
- To provide training and advice the MBTC on selection of suitable operator to implement and carry out the demonstration programme;
- To provide advice on possible alternatives to Methyl Bromide, and project

implementation;

- To coordinate with the Technical Coordinator on matters pertaining to procurement of equipment for the demonstration programme and technical advice on 'handling' of equipment, such as, gas application technique and proper monitoring of steam and solarisation;
- Preparation of the project report with consultation and agreement of the Technical Coordinator;
- Provide recommendations on aspects of technical and economic feasibility on the alternatives for methyl bromide;
- Any other tasks as when required by the MBTC

The successful candidate should have the following qualifications:

- Min. Masters Degree from a recognised university, in Applied Sciences or equivalent;
- At least 7 years experience in project management or similar capacity;
- Vast experience on MB alternative on soil fumigation and stored products fumigation
- Fluent in the English language, both written and oral
- Computer illiterates

## Terms of Reference

## Project Assistant

The project assistant will provide administrative support to the Technical Coordinator of the project. The incumbent is expected to perform the following functions.

Administrative support

- Assists in providing logistical support to the project by organising meetings and other project related workshops and events, working closely with members of the project team;
- Assists the Technical Coordinator with and finance related processes;
- Provide general administrative support in project, implementation, monitoring and evaluation;
- Performs routine operational duties as in maintaining the working files and secretarial support.

The successful candidate should have the following qualifications:

- Degree from a recognised university, in Social Science, Economics, Administration or Management
- Proven skills in organisational arrangements, and use of standard computer packages and financial record keeping.
- Ability to type and handle documents.
- Computer literate
- Fluent in English and Bahasa Malaysia.