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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL

Twenty-fourth Meeting
Montreal, 25-27 March 1998

PROJECT PROPOSAL: VIETNAM

Fumigant

- Demonstration project - alternatives to the use of methyl bromide on stacked bags of rice, grain in silos, and timber on a warehouse under tarps at Vietnam Fumigation Company

UNIDO

PROJECT EVALUATION SHEET **VIETNAM**

SECTOR: Fumigant ODS use in sector (1996): 314 ODP tonnes
 (Methyl bromide)

Project Title:

Demonstration project - alternatives to the use of methyl bromide on stacked bags of rice, grain in silos, and timber on a warehouse under tarps at Vietnam Fumigation Company (VFC)

Project Data	Methyl Bromide	
	Vietnam Fumigation Company (VFC)	
ODS phase-out (ODP tonnes)	N/A	
Proposed project duration (months)	18	
Incremental capital cost (US \$)	444,180	
- including contingency (%)	10	
Incremental operational cost (US \$)	0	
Total project cost (US \$)	444,180	
Local ownership (%)	-	
Export component (%)	-	
Amount requested (US \$)	{ Original }	444,180
	{ Revised }	411,180
Cost effectiveness (US \$/kg)	N/A	
National Coordinating Agency	Vietnam National Ozone Unit	
Implementing Agency	UNIDO	
Technical review completed?	-	

Secretariat's Recommendations:

Amount recommended (US \$)	
Project impact (ODP tonnes)	N/A
Cost effectiveness (US \$/kg)	N/A
Implementing Agency support cost (US \$)	
Total cost to Multilateral Fund (US \$)	

PROJECT DESCRIPTION

Demonstration project - alternatives to the use of methyl bromide on stacked bags of rice, grain in silos, and timber on a warehouse under tarps at Vietnam Fumigation Company (VFC)

1. Rice represents about 60 per cent of all the agriculture produce in the country. The estimated production of rice for 1998 is over 4.0 millions tonnes. Yields have increased from 37.8 quintal/ha in 1990 to 44.3 quintal/ha in 1995. This rice is exported to most of the world. Many contracts for this rice request a fumigation as a pre-shipment requirement imposed by foreign trading partners. Maize is also an important crop, and is mostly grown in the northern mountain and in the midland region of the country. A 30 per cent increase in production of maize was recorded between 1990 and 1995 (from 15.5 tonnes/ha to 21.1 tonnes/ha). The project reports that methyl bromide consumption could rise three fold in the next eight years.

2. The project is to demonstrate alternatives technologies to the use of methyl bromide as a fumigant for stacked bags of rice, grain in silos, and timber in a warehouse under tarps. The alternatives selected include: phosphine (aluminum phosphide) pellets or tablets; improved uses of phosphine with liquid carbon dioxide in silos and under tarp; and diatomaceous earth as a protector and gas barrier. The alternatives will be presented in combination with implementation of Integrated Pest Management (IPM) programme.

3. Phosphine is extensively used, principally for cereals and pulses which are stored in bulk; it can replace most of the methyl bromide if the time allowed for fumigation can be increased. Currently, metal phosphide is being used on tarp fumigation of rice. The bagged commodity is tarped using polyethylene and tape, prior to processing. There are about 3-5 ship fumigation performed using methyl bromide that could possibly be replaced by phosphine.

4. Diatomaceous earth (DE) is ground up and used to control insects. This non-toxic product is becoming the preferred grain and bagged commodity protector throughout the world. A thin layer of DE on grain, bagged commodity and milling equipment will cause the insects to lose their protective hydrocarbon layer that regulates water in their system. As a result, they eventually dry out and die. It can also be used as a barrier to hold phosphine in a bin of grain (in Australia, for instance, over 25 per cent of all grain is treated with a combination of DE and cylinderized liquid phosphine fumigant).

5. The project will be co-ordinated by the Ozone Office within the Hydrometeorological Service of Vietnam. The national counterpart institution will be the Vietnam Fumigation Company (operating under the Ministry of Agriculture and Rural Development). The Department of Plant Protection and Quarantine will be involved if any new unregistered products are used on an experimental basis. It is foreseen that a company specialised in fumigation be subcontracted to implement the demonstration activities, including the participation in the training programme and the dissemination of the results to other Article 5 countries.

6. The expected results from project implementation are: (i) a technical and economic analysis of utilization of proposed three alternatives to methyl bromide, (ii) ten local fumigation experts fully trained in the alternative technologies used; and (iii) dissemination of the results of the demonstration project among Article 5 countries.

7. A national project coordinator will be recruited for managing and supervising the demonstration project, including designing the tests, collecting and analyzing the data, supervising field activities and coordinating the services of project personnel. The total costs of human resources is US \$154,000 including a subcontract for expert services (US \$127,000), representing 41.2 per cent of the cost of the project. The total cost of the equipment is US \$199,800.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The Fund Secretariat reviewed the project in the context of the Executive Committee's interim guidelines on methyl bromide projects (adopted at the 20th Meeting), the demonstration projects approved at the 22nd and 23rd Meetings of the Committee, the report of the Methyl Bromide Technical Options Committee (MBTOC), several publications on methyl bromide and in the light of the two-day meeting held in the Fund Secretariat (3-4 February) to develop a strategy and guidelines for projects in the methyl bromide sector (to be submitted for consideration of the Executive Committee at the 24th Meeting).

2. The project concept follows the Executive Committee's guidelines and is consistent with MBTOC reports.

3. The Secretariat discussed with UNIDO issues regarding the eligibility of the project since the use of methyl bromide in the country appears to be for quarantine and pre-shipment purposes; the use of existing equipment in the country; the eligibility of some equipment items and retrofits of existing buildings needed for testing alternatives to methyl bromide; and the salaries of international and national experts. The cost of the project was adjusted accordingly.

4. The project stated that a commitment from all parties involved in the project was made during its preparation and a feeling of optimism was created about a demonstration exercise in Vietnam. Discussions between UNIDO, the Plant Protection Group in Hanoi and the Vietnam Fumigation Company in Ho Chi Minh City, led to a better understanding of environmental issues related to methyl bromide alternatives available for replacement.

5. UNIDO informed the Secretariat that the Government of Vietnam has decided to phase out completely the use of methyl bromide in the country by the year 2006. Furthermore, during the preparation of the project, government officials reiterated the Government's commitment in phasing out this fumigant regardless of whether some applications are controlled or not by the Montreal Protocol.

PROJECT DOCUMENT

COUNTRY:	VIETNAM
PROJECT TITLE:	Demonstration Project - alternatives to the use of Methyl Bromide (<i>MeBr</i>) on stacked bags of Rice , grain in Silos , and timber on a warehouse under tarps .
SECTOR COVERED:	Post harvest stored commodities protection
ODS USE BY SECTOR:	314 tons in 1996
PROJECT DURATION:	18 months
TOTAL PROJECT COST:	US\$ 444,180.
OVERHEADS OF IMPLEMENTING AGENCY:	US\$ 54,744.
PROPOSED FINANCING MULTILATERAL FUND:	US\$ 501,924.
COUNTERPART INSTITUTION:	Vietnam Fumigation Company -VFC. Ministry of Agriculture and Rural Development
IMPLEMENTING INSTITUTION:	UNIDO
COORDINATING INSTITUTION:	Vietnam National Ozone Unit (<i>Ozone Office</i>). Hydrometeorological Service of S. R. of Vietnam - HMS.

PROJECT IMPACT:

The project has been designed to demonstrate proven alternatives to the use of methyl bromide as a fumigant of stored products. The chosen alternatives are: **1)** phosphine (*aluminum phosphide*) pellets or tablets; **2)** improved uses of phosphine with cylinderized liquid phosphine in silos, and under tarp; **3)** new uses of diatomaceous earth as a protector and gas barrier. The alternatives will be presented in combination with the continued implementation of proven Integrated Pest Management (*IPM*) techniques and practices, together with educational seminars on methyl bromide alternatives.

The demonstration project will also include a technical and economic assessment of the technologies used and the dissemination of the results among the qualified specialists from Article 5. countries that are signatures to the Montreal Protocol.

INDEX

	Page
1. BACKGROUND	3
2. PROJECT OBJECTIVE	4
3. PROJECT DESCRIPTION	5
3.1 Proposed technologies	5
3.1.1 Integrated pest management	5
a. Prevention	5
b. Monitoring	5
c. Control	5
3.2 Evaluation of alternative technologies	6
3.2.1. Ship hold fumigations	6
3.2.2. Improved uses of phosphine	6
3.3 Project implementation	7
3.3.1 Location of the project	7
3.3.2 Methodology	7
3.3.3 Project coordination	8
3.3.4 Institutional arrangements	8
4. OUTPUTS	9
4.1 Outputs and activities	9
4.2 Project implementation	10
4.3 Milestones	11
5. ANNEXES	12
A. Equipment Specifications and Cost Breakdown	12
B. Preliminary TOR for Subcontract	13
C. Project budget	14
D. Job descriptions	15
E. “Proposed Short and Medium Term Methyl Bromide Phase out Strategy”	16

1. BACKGROUND

1. Vietnam is an industrious developing country. Most of the 80 million people who live in Vietnam eat rice for at least two meals each day. The rice farmers provide enough for their domestic consumption and over 3.5 million tons surplus to export in 1997. They estimate over 4.0 millions tons in 1998. This rice is exported to most of the world including, their premium trading partner, Japan. Many contracts for this rice request a fumigation as a pre-shipment requirement imposed by foreign trading partners. **“Ninety percent of the customers ask in their contract for a methyl bromide fumigation.”**

2. In a survey of methyl bromide use in Vietnam, it is estimated that there will be a 300+% increase in methyl bromide consumption in the next eight years. Coffee, cocoa beans and timber are increasing in production, need for fumigation, and export. The 1997 Statistical Yearbook for Vietnam showed tobacco, peanuts, corn (*maize*), paddy, coffee, tea, pepper, cocoa and wood as stored products produced by Vietnam. By comparing the increases in these stored products, one can anticipate the need to find alternatives for methyl bromide in these various groups.

a) **Rice** represented almost 60% of all the agriculture in Vietnam in 1996. Much of the rice is grown in the south (62%) with the Mekong River Delta producing half of the total. Yields have increased from 37.8 quintal/ha in 1990 to 44.3 quintal/ha in 1995; 292,180,000 tons for 1996. There are two or three paddy crops per year in Vietnam;

b) **Maize** is mostly grown in the north mountain and midland region. A 30% increase in production of corn was recorded in Vietnam from 1990 to 1995. In the same period, the yield has increased from 15.5 tonnes/ha to 21.1 tonnes/ha (28%). There is one crop of maize per year in Vietnam.

c) **Peanuts** are grown mostly in the south (59%). 334,400 tonnes were recorded in 1995 (26% increase since 1990).

d) 27,703 tonness of **tobacco** was recorded in 1995 with 80% produced in the south.

e) **Forestry**: Wood was the third most fumigated product with methyl bromide. Vietnam exported US\$273 million of wood and wood products in 1995.

f) **Coffee** showed a 236% increase in coffee export in 1995 compared to 1990. Total acreage increase four fold for coffee in these years.

g) **Pepper** has increased 8% to 9.3 tonnes/year.

h) **Tea (dry)** showed a 20% increase in production in 1995 of 40.2 tonnes.

3. **Methyl bromide** use is increasing as stored product production and exports increase. A survey showed from 1995 to 2006 an estimated **314%** projected increase in Vietnam.

4. **Phosphine** can replace most of methyl bromide if the time allowed for fumigation can be relaxed from 1 day to 2-3 days. After discussions with the Plant Protection (*PPD*) group in Hanoi

and the Vietnam Fumigation Company (VFC) in Ho Chi Minh City, a better understanding of what methyl bromide is doing to the ozone layer and what alternatives are available to replace methyl bromide was expressed. **Much misinformation was given to the Vietnamese fumigators in the recent past from manufacturers and industry representatives.**

5. However, a commitment from all parties was made during the preparation of the project document and a feeling of optimism was created about a demonstration exercise in Vietnam.

6. In Vietnam, about 85% of all fumigations of stored products are carried out by **one** company. **Vietnam Fumigation Company (VFC)** was established in 1967. Over the last thirty years they have grown to over 300 people in nine regional offices throughout Vietnam. They fumigated over 300 ships in 1996. These ships were loaded with bagged and bulk rice. The methyl bromide that they use is from Israel (*Dead Sea Bromide Company*) and a Belgium company. Most of this methyl bromide contains 2% chloropicrin (*warning agent/tear gas*). This is a safety feature that warns anyone near by that methyl bromide can be present. This warning agent is not allowed on processed food or raw agricultural products (*rice*) in North America and possibly other areas of the world.

7. Vietnam Fumigation Company has the management and basic expertise required for carrying out all activities related to different types of fumigation. VFC is the “Degesch” distributor for Vietnam. They have access to different formulations of phosphine including magnesium phosphide and aluminum phosphide. They have some training in “J System” recirculation fumigations for silo fumigations and ship fumigations with phosphine. With the assistance to be provided by the demonstration project, the company would be able to adjust and react accordingly.

8. Due to the technical-economic characteristics of the project and the impact of the decision to phase-out MeBr in the country, some key requirements have been identified during the project formulation phase and it is recommended that they be followed in order to achieve the expected results. They are summarized at **Annex E.**, as “Proposed Short and Medium Term Methyl Bromide Phase out Strategy”.

2. PROJECT OBJECTIVE

9. The objective of the project is to demonstrate the technical and economic feasibility of **three** alternative methods to the use of methyl bromide in the protection of : **a)** bagged grain in stacks; **b)** silos containing bulk grains; **c)** timber in an warehouse under tarps, all in combination with an integrated pest management system, and to disseminate the results among qualified specialists from Article 5 countries. **This programme of accelerated Phase-out of methyl bromide can be an example to developed and developing countries.**

The main stored products targeted are **rice, coffee, maize and timber.**

3. PROJECT DESCRIPTION

3.1 Proposed Technology

3.1.1 Integrated pest management

10. Integrated pest management is the ability to create an environment that the pest(s) cannot tolerate and they will leave or they will die. These can be toxic or non-toxic techniques. The combination of these approaches and techniques will offer conditions that are harsh for the pest(s) to survive. The three major components of a Integrated Pest Management program are a) Prevention; b) Monitoring; and c) Control.

a) **Prevention** can consist of several activities: lighting, positive pressure on a storage area, moisture control, screens on windows and doors, weeds and old equipment removed from near the storage areas, fix leaky roof, stack all bags off the ground, close doors, caulk cracks, clean up spilled product, etc. By doing some or all of these, populations of pest insects and rodents have a difficult time propagating.

b) **Monitoring** can help detect an outbreak of pests before it becomes economically important. By setting minor economic thresholds for defects, an IPM programme can calculate when it is time to spend time and money to reduce or eliminate a pest population. This can be done with visual inspection or with the many monitoring techniques using pheromone traps, plain glue boards, inspection of window sills, watching for tracks in the dust. The presence of caste skins from insects, trails from beetles, or droppings from rodents can lead one to some conclusions to when it is time to treat a storage area and with what;

c) **Control** can be toxic or non-toxic. Control measures should be implemented only after other combinations of pest management have being investigated. Scheduled applications of toxic chemicals in not using good IPM strategies. Starting with the least toxic control methods and proceeding to the most toxic methods:

Cold temperature (-18 C for 6 days)

Often cold temperate is used to kill pests in commodities, structures and museum objects. It should not be used on liquid items.

Refrigerated truck trailers that carry meat and other frozen food items are readily available and mobile for treating infested goods.

Heat (45-55 C for 16-24 hours)

Heating structures to 45-55 C for 16 to 24 hours can help control pests in mills, termite infestations, food processing plants, and other structures. Similar to a hot water bath for citrus, this method can be effective if care is taken to prepare the structure for the harsh environment that can kill all stages of insect life. Approximately 10% of the flour mills in the United States are treated with heat 3-6 times per year.

Diatomaceous earth (DE)

These microscopic fossilized shells from ancient oceans and lake beds are ground up and used to control insects. This non-toxic product is widely becoming the preferred grain and

bagged commodity protector throughout the world. A thin layer of DE on grain, bagged commodity and milling equipment will cause the insect to lose their protective hydrocarbon layer that regulates water in their system. They eventually dry out and die from the DE. It can also be used as a barrier to hold phosphine in a bin of grain. (*In Australia, for instance, over 25% of all grain is treated with a combination of DE and cylinderized liquid phosphine fumigant*).

The Combination Fumigation Method¹

3.2 Evaluation of Alternative Technologies

3.2.1 Ship Hold Fumigations

11. Over 300 ships were fumigated in 1996 by the Vietnam Fumigation Company. Ship fumigation can be dangerous if not performed properly. Several human deaths have occurred recently from methyl bromide fumigations from developing countries. Pure methyl bromide is colourless and odourless. This can kill a person before realizing they are breathing the fumigant. Chloropicrin is often used with methyl bromide to act as a marker for the gas. Unfortunately, many countries will not allow chloropicrin to be used on grain or processed food. **Vietnam still uses chloropicrin on their ships.**

12. Phosphine has a distinct odor that smells like garlic or carbide. The human nose can detect phosphine 200 times below what is considered a health risk. Phosphine is a better penetrating gas in ship holds. Phosphine penetrates about 4 m (*meters*) per day under natural conditions. If the patented "J-System" is placed in the hold of the ship prior to filling the hold, the gas can be recirculated from top to bottom in hours. (*Some Russian ships that have a 17 meter depth of grain can be successfully fumigated in transit*). Phosphine is designed for in transit fumigations of railcars and ships. (*Over 1000 phosphine ship fumigations are performed in North America each year*). Only a few empty holds are fumigated with methyl bromide.

3.2.2 Improved uses of Phosphine

13. Presently metal phosphides are used in Vietnam for stored product protection. Products from China and Germany are available. The majority of this metal phosphine is used on tarp fumigations of rice. The bagged commodity is tarped using polyethylene and tape, also in the silos of imported wheat prior to processing. There are about 3-5 ship fumigations performed using methyl bromide that could possibly be replaced by phosphine. This transfer of technology and alternative know how could be made in Vietnam.

¹ The menu of potential alternatives to methyl bromide can be very long and specific. The key to finding alternatives to methyl bromide is paramount to the ability of the pest manager to create an environment that the pest cannot tolerate and it will leave or die. The list of traditional alternatives to MeBr would include: natural pyrethrum; synthetic pyrethrum; insect growth regulators (*JGR*); microbials; modified atmospheres; pressure and carbon dioxide; and improved uses of phosphine. **Combination of alternative methods** would consist, for instance, of: a) heat, carbon dioxide, and phosphine; b) cool temperatures and baculovirus; c) DE and phosphine; d) horn generator, carbonyl sulfide, cyanide, irradiation.

3.3 Project Implementation

3.3.1 Location of the Project

14. The project will be implemented at the following sites:

- Ho Chi Minh City - HCMC; STEPC Feed Mill
 - 4 identical bins of 5,000 tonnes each
 - 1 stacked feed bags
- Harbor;
 - a) silo fumigation
 - b) ship hold (*Optional. To be conducted by the government, alone!*)
 - 2 holds (*recirculated and normal*)

3.3.2 Methodology

15. a) Silo fumigation; and b) Ship hold fumigation (*Optional. To be conducted by the government, alone!*);

- a. Class room training
- b. Live demonstration

Contact: Mr. Son, VFC

Size: 5,000 m³ / hold, 15 m deep, five holds/ ship

Dosage rate: 1.0 g phosphine per tonne - "J-System": recirculation

Bioassays: Live insects in each chamber, mixed stages, *Ephestia spp.* (moth), *Oryzaephilus surinamensis* (beetles), *Rhyzopertha dominica* (borer).

Gas Readings

Hours	#1	#2	Control
1			
2			
3			
4			
every 4 hours thereafter			

Conclusions and observations and mortality: Check bioassays immediately upon completion of fumigation and place bioassays in incubator for 15-30 days for egg mortality.

16. Tarp Fumigation (*flour mill*)

Two stacks of bagged feed with identical volumes can be treated with phosphine and compared with methyl bromide. Gas readings and insect bioassays should be taken:

Phosphine dosage rate: 33 g/1000 cu.ft.

Methyl bromide dosage rate: 1.36 kg/ 1000 cu.ft.

Bioassays: mixed stages of *Tribolium* sp. (beetles), *Ephestia* spp. (moths), and *Lasioderma serricorne* (beetles)

Materials: polyethylene tarps (4 mm thickness), gas reading hoses, phosphine and methyl bromide detection equipment (electronic "PortaSens" and "Draeger" tubes), "Armak" sealing tape (3 inch), scales, SCBA respiratory equipment.

Gas readings

Hours	#1	#2	Control
1			
2			
3			
4			
and every four hours thereafter			

17. Tarp, and silo fumigations can be implemented by experts that are familiar with improved uses of phosphine.

3.3.3 Project Coordination

18. The project will be coordinated [at the institutional level] by HMS (*Ozone Office*) and will have as national counterpart institution the Vietnam Fumigation Company - VFC (*Ministry of Agriculture and Rural Development*). All activities will be coordinated [at the operational level] by the National Project Coordinator - NPC, who shall have a technical background and experience in fumigation. The NTC shall work as the project [operational] focal point, and will be responsible for managing and supervising the entire demonstration project, including the evaluation of the results. (*Please, refer to the Job Description attached as Annex D.*)

19. Since several international experts are required and a coordination among themselves becomes essential, it is foreseen that a company specialized in fumigation be subcontracted to implement the demonstration activities, including the participation in the training programme and the dissemination of the results to other Article 5. countries. (*Please, refer to the preliminary Terms of Reference for the assignment, attached herewith as Annex B.*)

3.3.4 Institutional Arrangements

20. The project will have as the direct counterpart institution, the Vietnam Fumigation Company (VFC), which although independent since 1994, still operates as part of the Ministry of Agriculture and Rural Development. The project activities will be coordinated by the Ozone Office (*Vietnam National Ozone Unit*), which is linked to the Hydrometeorological Service of the Socialist Republic of Vietnam - HMS. The Department of Plant Protection and Quarantine will be involved if any new unregistered products are used on an experimental basis.

4. OUTPUTS

4.1 Outputs and Activities

OUTPUT 1: A practical technical and economic analysis of three alternative methods to methyl bromide: a) Improved phosphine fumigations in silos with grains; b) tarp fumigation of finished food products fumigated onsite in a warehouse near HCMC; and c) timber in a warehouse under tarps.		
ACTIVITIES	MONTH OF COMPLETION	RESPONSIBILITY
Equipment - purchase, delivery & installation as per Annex A.	3	NPC; UNIDO
Preparation of IPM programme.	3	Subcontract
Training of the trainer seminar for IPM.	6	Subcontract
Application of alternative in silos with recirculated phosphine.	6	Subcontract
Appl. of alternative in tarp fumigation of processed food.	6	Subcontract
Implementation of IPM practices and its monitoring throughout the entire demonstration project	12	Subcontract
Implementation of full scale replacement of methyl bromide	12	Subcontract
Preparation of technical/economic analysis of the results.	14	Subcontract

OUTPUT 2: At least ten local fumigation experts trained during the course of the demonstration project.		
ACTIVITIES	MONTH OF COMPLETION	RESPONSIBILITY
One week study tour and preliminary preparations (<i>including visit to institutions, experts and key manufacturers as for instance: a) cylinderized phosphine manufacturer; b) diatomaceous earth manufacturer</i>)	4	NPC; UNIDO
On-the job training in IPM and educational training	6	Subcontract
On the Job training in silos with recirculated phosphine	6	Subcontract
On the job training in tarp fumigations	6	Subcontract

OUTPUT 3: Dissemination of the results of the demonstration project (<i>locally and among representatives of other Article 5. countries</i>).		
ACTIVITIES	MONTH OF COMPLETION	RESPONSIBILITY
Preparation of a publication in English with the results of the project experiences (<i>by Oct. of 1999; Meeting of the Parties</i>)	16	Subcontract
Editing and distribution of 100 copies of the final report	18	NPC;UNIDO; Subcontract
Organization of one two-day workshop for representatives from other Article 5. countries from Asia	18	Subcontract
Present results at the next "Meeting of the Parties of the Montreal Protocol"	18	UNIDO/ Subcontract

4.2 Project Implementation

21. As implementing agency, UNIDO has the necessary experience and capabilities for the successful implementation of projects at the enterprise level. Upon approval by the Multilateral Fund for Implementation of the Montreal Protocol (*MFMP*), the project budget will be transferred to UNIDO. The corresponding project allotment document will then be issued by UNIDO's Finance Section. Any substantive or financial deviation will be subject to approval by the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol.

4.3 Milestones

YEAR	1				2	
QUARTER	1	2	3	4	1	2
1. Equipment purchase delivery & installation	✕					
2. Preparation for IPM programme	✕					
3. Training for IPM		✕				
4. Application of alternative in silos with recirculated phosphine		✕				
5. Application of alternative in tarp fumigation of processed food		✕				
6. Impl. in transit ship hold fumigation (optional to be conducted by the Gov. alone!)		✕				
7. Study tour		✕				
8. On-the-Job training in IPM and educational training		✕				
9. On-the-Job training in silos w/ recirculated phosphine		✕				
10. On-the-Job training in tarp fumigations		✕				
11. Impl. of IPM practices and its monitoring throughout the entire demonstration project				✕		
12. Preparation of technical/economic analysis of the results					✕	
13. Preparation of a publication in English with the results of the project experiences						✕
14. Editing and distribution of 100 copies of the final report						✕
15. Organization of one two-day workshop for representatives from other Article 5. countries from Asia						✕
16. Present results at the next "Meeting of the Parties of the Montreal Protocol"						✕

ANNEX A
PRELIMINARY EQUIPMENT SPECIFICATIONS AND COST

Item	Description	US\$
1.	2 Self Contained Breathing Apparatus (SCBA)	3,000.
2.	2 PortaSen (PH_3 gas monitoring); plus spare parts (2 sensors for PortaSen) and calibration kit	3,800.
3.	Draeger Gas monitoring equipment (2) Model 31; plus (30) boxes phosphine tubes (10 tubes per box), #CH31101 & CH21201	1,000.
4.	Sealing materials, 10 rolls of 40' x 100' 4 mm poly sheeting, 3' "Armak", adhesive	1,000.
5.	03 "J-System" electric recirculation fans (1/3 hp, explosion proof)	3,000.
6.	Flexible tubing for "J-System" installation	1,000.
	TOTAL	12,800.

Sealing and Adptation of a Fumigation Warehouse² in Ho Chi Minh City		
a)	Retro-fit existng metal building with concrete floors near the docks	75,000.
b)	Fumigation Management System with heated feedback boxes and data logging capabilities	20,000.
c)	Safety cage for storing fumigant	2,000.
d)	Special high volume aeration (2)	20,000.
e)	10 circulating fans (5 amp) for indoors	10,000.
f)	Mastic covering on roof and sides of building	40,000.
g)	Special doors to seal completely (2)	15,000.
h)	Heaters (10)	5,000.
i)	Electrical wiring and corrosion resistant lighting	10,000.
	TOTAL	197,000.

² **Sealing and Adptation of a Fumigation Warehouse in Ho Chi Minh City**

a) The objective of adapting a fumigation warehouse in HCMC as part of this demonstration project is to prove that the best alternative for phasing out MeBr is to make the most appropriate use of the present technology available for fumigation chamber. In the adapted fumigation warehouse the use of special materials that would hold the fumigants in and degass the warehouse and bagged commodity quickly, will be used. These warehouses can have a thin layer of mastic plastic coating that expands and contracts with the weather. *(The Australians used these special building materials on their grain storage bunkers. This would be similar to the Australian style buildings. CSIRO could provide additional specific details on such fumigation warehouse!)*.

b) A fumigation management system could be installed for state of the art gas monitoring. Safety to the community would be monitored along with the levels of gas in and around the outside of the building. The use of the fumigation warehouse would allow for the quick movement of the palletized bags of rice.

ANNEX B

PRELIMINARY TERMS OF REFERENCE FOR THE SUBCONTRACT

The subcontractor is expected to provide the following services:

1. The services of **one** "International Expert in Integrated Pest Management - IPM" (*in four split missions of 0.5 w/m each*) to: **a)** design and follow up the implementation of the IPM programme; **b)** carry out the training programme in IPM for Vietnamese technical staff; and **c)** to participate in the international workshop for presentation to other Article 5. countries, the results of the demonstration project.
2. The services of **one** "International Expert in Fumigation Management System" (*in two split missions of 0.5 w/m each*) for: **a)** demonstration of the operational aspects of the fumigation management system to be installed in the fumigation warehouse in Ho Chi Min City; **b)** carrying out the training programme in fumigation management systems for Vietnamese technical staff; and **c)** certifying [towards the end of the project] that the proposed fumigation management system is fully operational.
3. The services of **one** "International Expert in Grain Silo Fumigation" (*in two split missions of 0.5 w/m each*) for: **a)** demonstration of the operations of the "J-System" recirculation and "Siroflo"; **b)** participation in the international workshop for presentation to other Article 5. countries, the results of the demonstration project.
4. The services of **one** "International Expert in Fumigation" (*in two split missions of 0.5 w/m each*) for: **a)** providing technical advise during the adaptation/sealing of the existing warehouse; and **b)** certifying [towards the end of the project] that the fumigation warehouse has been properly adapted/sealed and is fully operational.
5. The preparation of a technical and economical analysis of the results.
6. The preparation of a publication containing a description of the results obtained. (*100 copies*).

ANNEX C

PROJECT BUDGET

Budget Line	Description	M/M	US\$
17-01	National Coordinator (<i>part-time</i>)	18.0	27,000.
21-00	Subcontract for expert services as per Annex B.		127,000.
35-01	International workshop (<i>20-25 people</i>)		40,000.
42-00	Test Equipment as per Annex A.		12,800.
42-00	Equipment for Sealing of a Fumigation Warehouse equipped with a Fumigation Management System		197,000.
	Subtotal		403,800.
51-00	Contingencies (<i>10%</i>)		40,380.
	Total Project Costs		444,180.
	Overhead Costs (<i>13%</i>)		57,744.
	TOTAL PROJECT BUDGET		501,924.

ANNEX D

UNIDO
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
JOB DESCRIPTION

MP/VIE/98/xxx/17-01

Post title: National Project Coordinator - NPC

Duration: 18 Months (*part-time*)

Date required: 1998

Duty station: Ho Chi Min City and Hanoi, Vietnam.

Purpose of project: The project has been designed to demonstrate proven alternatives to the use of methyl bromide as a fumigant of stored products. The chosen alternatives are: 1) phosphine (*aluminum phosphide*) pellets or tablets; 2) improved uses of phosphine with cylinderized liquid phosphine in silos, and under tarp; 3) new uses of diatomaceous earth as a protector and gas barrier. The alternatives will be presented in combination with the continued implementation of proven Integrated Pest Management (*IPM*) techniques and practices, together with educational seminars on methyl bromide alternatives. It will also include the preparation of a technical and economic assessment of the technologies used and the dissemination of the results in the country.

Duties: The National Expert is expected to:

- a) Interact between UNIDO, Government Institutions: (*HMS - Hydrometeorological Services of the S. R. of Vietnam*), Ministry of Agriculture and Natural Resources, and (*Vietnam Fumigation Company - VFC*), and other institutions representatives of the productive sector where the demonstrations will be conducted;
- b) Execute and coordinate the entire demonstration programme designed by the international experts;
- c) Coordinate and arrange the administrative aspects concerning equipment, project personnel, etc., in order to have the project implemented within the established time;
- d) Organize and participate in the training programmes;
- e) Supervise field activities and coordinate the services of project personnel;
- f) Prepare a comprehensive document with the technical and economic data resulting from all the demonstration cases of the alternative technologies;
- g) Organize and conduct a national workshop where a presentation of the results will be made.

Qualifications: University degree, with large experience in fumigation.

Language requirements: English

ANNEX E.

“Proposed Short and Medium Term Methyl Bromide Phase out Strategy”

I. Commitment to a project.

There needs to be a commitment to phase out methyl bromide in a timely manner from all parts involved (UNIDO, The Ozone Office, Plant Protection and Quarantine (PPQ), Vietnam Fumigation, the five small fumigation companies in Vietnam, Cooperators from industrialized countries like Fumigation Service & Supply, Inc. Hedley Ltd., BOC Gases, etc).

II. Stewardship Programme

A strong stewardship programme to train the trainers is needed in Vietnam. Over the years the isolated fumigators have learned one way to fumigate stored products. They are willing to accept new approaches. However, there will be a need for reinforced training methods that proven alternatives to methyl bromide can be successful. If they are not enforced, it is possible that the fumigators may return to their old ways of using conventional methods.

III. Replacing Methyl Bromide

The easy part of replacing methyl bromide will be to remove the need for fumigating with better pest management standards. Fumigations by the calendar or by the contract should be questioned and alternatives substituted when possible. Such practices as better sealing, pressure testing, bioassays, gas monitoring equipment, and common sense can help to replace 25-40% of the uses of methyl bromide in the country.

IV. ODS Tariff

The anticipated increase of methyl bromide usage in Vietnam can be stopped with economic pressure. This can be accomplished with an increase in price of the inexpensive methyl bromide fumigant. Presently the cost of methyl bromide is: \$1.14/lb. or \$2.86/kg. If a “ODS” tariff of 100-300% was added to the cost of the gas, this fumigant would not be as attractive as phosphine or other alternatives. The price of the fumigant will then dictate its demand.

V. Contracts

Pressure will be needed to be put on shipping contractors to allow alternative methods to methyl bromide to be used on their shipments. Since 90% of the present fumigations have contracts that require the fumigation of the rice in ships, it will be necessary to offer alternatives at reasonable prices and time constraints. Some countries and companies are becoming more aware of the problem with methyl bromide and requesting alternatives to their products. More countries and companies will want to be in compliance with the Montreal Protocol and co-operate with allowing alternatives in the future.

VI. Accelerated Phase-out Schedule for Vietnam

- 1998** *Voluntary phase out commitment. Train-the-trainer and demonstration project on silos, ships, and stacked commodities in warehouse.*
- 1999** *Survey total amounts used in Vietnam in 1998. Publish a report for this year's Meeting of the Parties.*
- 2000** *25% mandatory phase out with less MeBr allowed to be imported. Revisit the new alternatives emerging throughout the world.*
- 2001** *Re-survey the total consumption of MeBr for Vietnam. Publish a report to be distributed at this year's Meeting of the Parties.*
- 2002** *50% mandatory phase out of MeBr to be imported. Use a ticket or billet system (e.g. Canada) to allocate MeBr to various distributors.*
- 2003** *Re-survey the total consumption of MB to be imported. Report the successes of this program to the Montreal Protocol. (20% phase out system for Article 5 countries due at this time).*
- 2004** *75% mandatory phase out of MeBr in Vietnam.*
- 2005** *Re-Survey the total consumption of MeBr imported in 2004. Report the successes of this program to the Montreal Protocol.*
- 2006** *Phase out of methyl bromide in Vietnam except quarantine and essential uses. Nine years ahead of 2015 phase out schedule.*