



**United Nations
Environment
Programme**



Distr.
LIMITED

UNEP/OzL.Pro/ExCom/25/39
1 July 1998

ORIGINAL: ENGLISH

EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Twenty-fifth Meeting
Montreal, 29-31 July 1998

PROJECT PROPOSALS: MEXICO

This document includes the comments and recommendations of the Fund Secretariat on the following project proposals:

Foam

- Conversion to water-based technology in the manufacture of integral skin foam at Moldecor UNDP
- Conversion to HCFC-141b technology in the manufacture of rigid foam for refrigeration systems at Refrigeracion Rodriguez UNDP

Fumigant

- Demonstration project: alternatives to the use of methyl bromide in the cultivation of tomatoes, strawberries, tobacco, melons, and cut flowers UNIDO

Refrigeration

- Phasing out of CFC-11 and CFC-12 with HCFC-141b and HFC 134a at Plasticos Tecnicos Mexicanos (PTM) in the manufacture of commercial refrigeration equipment. UNIDO

PROJECT EVALUATION SHEET **MEXICO**

SECTOR: FOAM ODS use in sector (1989): 1629 ODP tonnes

Sub-sector cost-effectiveness thresholds: Integral Skin US \$16.86/kg
Rigid US \$7.83/kg

Project Titles:

- (a) Conversion to water-based technology in the manufacture of integral skin foam at Moldecor.
- (b) Conversion to HCFC-141b technology in the manufacture of Rigid Foam for refrigeration systems at Rodriguez.

Project Data	Integral Skin	Rigid
	Moldecor	Rodriguez
ODS phase-out (ODP tonnes)	9	34.9
Proposed project duration (months)	24	24
Incremental capital cost (US \$)	71,500	143,000
- including contingency (%)	0	10
Incremental operational cost (US \$)	15,000	3,400
Total project cost (US \$)	86,500	146,400
Local ownership (%)	100	100
Export component (%)		0
Amount requested (US \$) {Original}	86,500	146,400
{Revised}		
Cost effectiveness (US \$/kg)	9.61	4.19
National Coordinating Agency	Ozone Protection Unit, National Institute of Ecology (INE)	
Implementing Agency	UNDP	
Technical review completed?	Yes	Yes

Secretariat's Recommendations:		
Amount recommended (US \$)	86,500	132,650
Project impact (ODP tonnes)	9.0	34.9
Cost effectiveness (US \$/kg)	9.61	3.80
Implementing Agency support cost (US \$)	11,245	17,244
Total cost to Multilateral Fund (US \$)	97,745	149,894

PROJECT DESCRIPTION

(a) Conversion to water-based technology in the manufacture of integral skin foam at Moldecor.

1. Mexico's reported consumption of CFCs for 1996 was 4,859 ODP tonnes. It is indicated in the project document that a recent survey showed that CFC consumption in the foam sector was 935 ODP tonnes, including, 10 tonnes for integral skin molded foam.
2. Regarding the relevance towards meeting the 1999 freeze and other Montreal Protocol requirements, the Government informed UNDP that the projects being submitted at the 25th Executive Committee meeting are considered vital in order for the Government to reach its goal of phasing out an additional 2,100 ODP tonnes by the year 1999. The Government further notes that this is also in accordance with the strategic considerations of the three year business plan of the Multilateral Fund.
3. 17 foam projects have so far been approved for Mexico to phase out 1,308 tonnes CFC-11. 127 tonnes have been phased out. The approved projects include one integral skin polyurethane foam and four flexible molded (shoe sole) foam to phase out 320 tonnes of CFC-11.
4. The project document includes a letter from Mexico's Ozone Protection Unit endorsing the project, as well as a letter of commitment from the enterprise.
5. Moldecor S.A. de C.V. is a 100% Mexican company manufacturing picture frames using molded foam with wood inserts. The company was established in 1990. It used 9 tonnes CFC-11. It operates on Kynofom low pressure dispenser.
6. It is proposed to replace the low pressure dispenser with a new one (low pressure) of equivalent capacity since the costs and logistics of retrofitting the existing low pressure dispenser for one with water-blown system would be more expensive and complicated than replacing it with a new one. The cost of the new low pressure dispenser is US \$45,000. Other capital costs are for trials, technology transfer, training (US \$20,000). There is incremental operational cost of US \$20,000.

(b) Conversion to HCFC-141b technology in the manufacture of Rigid Foam for refrigeration systems at Rodriguez.

1. Refrigeracion Rodriguez is a 100% Mexican owned enterprise which manufactures commercial refrigerators, panels, water coolers, display cabinets and refrigerated trucks. Rodriguez was established in 1977. CFC 11 consumption in 1996 was 37.5 MT (accounting for 25% evaporation losses in the foam blending operation). The enterprise used 12.5 of CFC-12, HCFC-22 and R-502 mainly in servicing operations.
2. Under this project, Rodriguez will phase out the use of CFC-11 in its rigid foam manufacturing by replacement with HCFC-141b as an interim solution. A subsequent

conversion to a zero-ODP technology will be made at the enterprise's expense. Since the service projects require a national approach, this project deals strictly with the rigid foam operations.

3. Several substitute technologies have been considered to replace CFC-11 in foaming operation, including cyclopentane. Rodriguez has chosen to implement HCFC-141b as an interim solution until a permanent solution technology (probably water based or HFCs) becomes commercially available in Mexico. Costs associated with the conversion to the zero-ODP technology will be borne by the company. Letters from the enterprise indicating its agreement with the technology choice and justifying the use of HCFC-141b is provided as part of the proposal.
4. The letter of commitment regarding counterpart funding, disposal of the replaced equipment is also provided by UNDP.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

(a) Conversion to water-based technology in the manufacture of integral skin foam at Moldecor.

1. The project and the associated costs have been agreed.

(b) Conversion to HCFC-141b technology in the manufacture of Rigid Foam for refrigeration systems at Rodriguez.

1. The Secretariat discussed with UNDP incremental operating costs and the cost of replacement of a locally made low pressure foaming machine of 1979 with a new high pressure foaming machine from an international supplier, the cost of retrofitting another high pressure machine and the cost of technology transfer. Capital costs have been reduced accordingly.

RECOMMENDATION

1. The Fund Secretariat recommends blanket approval of the Moldecor and Rodriguez projects with the level of funding and associated support cost as indicated below.

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
Conversion to water-based technology in the manufacture of integral skin foam at Moldecor.	86,500	11,245	UNDP
Conversion to HCFC-141b technology in the manufacture of Rigid Foam for refrigeration systems at Rodriguez.	132,650	17,244	UNDP

PROJECT EVALUATION SHEET **MEXICO**

SECTOR: FUMIGANT ODS use in sector (1997): 3,130 ODP tonnes

Sub-sector cost-effectiveness thresholds: N/A

Project Title:

Demonstration project - alternatives to the use of methyl bromide in the cultivation of tomatoes, strawberries, tobacco, melons, and cut flowers (horticulture)

Project Data	Methyl Bromide
ODS phase-out (ODP tonnes)	-
Proposed project duration (months)	36
Total incremental costs (US \$)	970,750
- including contingency (%)	10
Total project cost (US \$)	970,750
Local ownership (%)	100
Export component (%)	-
Amount requested (US \$) {Original}	970,750
{Revised}	
Cost effectiveness (US \$/kg)	-
National Coordinating Agency	Instituto de Ecología (INE))
Implementing Agency	UNIDO
Technical review completed?	n/a

<i>Secretariat's Recommendations:</i>	
Amount recommended (US \$)	Pending decision of the Executive Committee
Project impact (ODP tonnes)	
Cost effectiveness (US \$/kg)	
Implementing Agency support cost (US \$)	
Total cost to Multilateral Fund (US \$)	

PROJECT DESCRIPTION

Demonstration project - alternatives to the use of methyl bromide in the cultivation of tomatoes, strawberries, tobacco, melons, and cut flowers (horticulture)

1. The average consumption of methyl bromide in Mexico in the period 1992-1995 has been estimated in 4,092 metric tonnes, mainly used in strawberries, tomatoes, melons, tobacco and other horticultural products. Methyl bromide consumption data reported to the Ozone Secretariat in 1996 was 750.6 tonnes.
2. In October 1997, the Government of Mexico organized a workshop on methyl bromide alternatives for the purpose of ascertaining technologies and agricultural practices in use; feasibility of using alternative technologies to methyl bromide, such as solarization, bio-fumigation, steam pasteurization, low-dose chemicals and soilless techniques; and to assess the interest of farmers and enterprises in conducting demonstration projects on methyl bromide alternatives. The workshop concluded with a recommendation to implement a demonstration project concentrating on strawberries, tomatoes, melons/watermelons and tobacco, to test alternatives in at least three climatological areas with different production cycles and cultivation methods.
3. This project is to demonstrate the technical and economic feasibility of five alternative methods to the use of methyl bromide, namely, steam pasteurization, non-soil cultivation, bio-fumigation, solarization, and application of low doses of other pesticides and use of resistant varieties, all in combination with an Integrated Pest Management (IPM) programme.
4. Integrated Pest Management (IPM) programme for crop protection utilizes a combination of cultural practices, including crop rotation, cover crops, fertilization and plant nutrition; physical methods, including steam, solarization, and heat, and use of chemical compounds. A combination of soil pasteurization and IPM has proven to be an effective approach for the control of pests and diseases in horticulture (annual losses of only 1-2% due to bacterial and fungal diseases, as compared to much higher losses when relying on soil fumigation with methyl bromide only). Also, an IPM programme could improve the effectiveness of mixtures of certified pesticides, nematodes, herbicides and fungicides.
5. The project will be implemented in the following climatological regions: (i) Baja California Norte (horticultural crops); (ii) Nayarit (Burley and Virginia tobacco); and (iii) Colima, Jalisco, Michoacán and Sinaloa (horticultural crops); and (iv) State of Mexico (cut flowers).
6. Soil preparation will be carried out using the same methodology the growers use. All tests will be carried out in duplicate using each of the alternative technologies to methyl bromide previously selected. During the first cultivation season, the alternate technologies will be tested in relatively small surfaces ranging from 0.2 to 0.5 hectares. The most

promising technologies will be tested on a larger scale in the second and third year. The data will be processed and analyzed in terms of effectiveness, productivity and cost. The monitoring phase and collection of data will start with soil preparation and will end after the harvest. Soil samples will be analyzed before and after soil treatment and during the entire crop cycle. Levels of pathogens and pest counts will be the indicators used in assessing the effectiveness of the treatment. During the second and third cultivation season, the area of the most successful trials will be considerably expanded to at least 10 hectares.

7. The project will be implemented by UNIDO in close co-ordination with the Ozone Protection Unit and in cooperation with two national institutions.
8. The expected results from project implementation are: (i) a technical and economic analysis of utilization of proposed alternatives to methyl bromide, (ii) a number of local specialists from at least two agricultural institutions fully trained in the alternative technologies used; and (iii) dissemination of the results of the demonstration project to qualified representatives of Article 5 countries.
9. Two national project coordinators will be recruited for managing and supervising the demonstration projects, including designing the tests, collecting and analyzing the data, supervising field activities and coordinating the services of project personnel. The total cost for human resources is US \$262,000 including a subcontract for field work (US \$247,500), and the cost of the equipment is US \$314,000, including a compact mobile steam injection system and expendable expenses (trays, substrates, chemicals, plastic films, etc.), for a total of 97 ha. A cost breakdown is attached to the project evaluation sheet.

SECRETARIAT'S COMMENTS

1. The project concept follows the Executive Committee's guidelines. Mexico ratified the Copenhagen Amendment on 16 September 1994.
2. Mexico is the largest consumer of methyl bromide among Article 5 countries.
3. The project states that "adequate care has been taken by the National Institute of Ecology (INE) and a UNIDO team to identify the most relevant crops and the climatological areas representative of Mexico's ecological conditions. A number of growers/crops have been identified in each of the areas selected, as shown after".
4. UNIDO informed the Secretariat that, during project preparation, special emphasis has been put in working with the institutions, organizations, professionals and agro-industries which are transferring the technology to the farmers.
5. The Secretariat asked if UNIDO had contacted Article 2 countries with a view to recruiting government experts from those countries (as per Decision 24/18). In this regard, UNIDO indicated that "the use of external expertise is needed only when the local institutions require advice in using state of the art techniques of which there is only a theoretical knowledge in Article 5 countries".
6. The Fund Secretariat has sought clarification from UNIDO on issues regarding the size of testing area in 92 hectares and number of sites to applied the proposed alternatives for the same crop (e.g., demonstration on melon crops will be conducted in Mexicali (Baja California), La Paz (Baja California Sur) and Colima; alternatives will be tested on strawberries in Baja California, Jalisco and Michoacán, and on tomatoes in Baja California and Sinaloa).
7. UNIDO informed the Secretariat that the horticultural sector using methyl bromide covers an area of 120,000 ha permanently (360,000 ha with rotations), generates 33 million workdays, and US\$ 546 million revenue. Based on this considerations, testing alternatives to methyl bromide on a full commercial scale and at least during several crop cycles is needed in order to be sure that (a) resistance to some pathogens is not building up after several cultivation cycles, and (b) the tests are conducted as close as possible to the commercial scale. The proposed testing area represents 0.07% of the total cultivated area.
8. The project proposes testing each crop in three different latitudes and climatic regions, namely, wet Mediterranean, dry Mediterranean and sub-tropical. Strawberry tests in the subtropical area will be duplicated because of the different soil conditions in Zamora, where soils contain an unusual high amount of organic matter and, thus, the pathogens are different from those to be found in Jalisco.

9. Notwithstanding the emphasis placed by UNIDO on working with local institutions and on seeking to reduce salary costs, the concept and cost structure of this project is similar to projects initially approved by the Executive Committee. Taking this into consideration, the Executive Committee may consider whether it wishes to approve the project with associated support costs at the funding level shown in the table below:

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
Demonstration project - alternatives to the use of methyl bromide in the cultivation of tomatoes, strawberries, tobacco, melons, and cut flowers (horticulture)	970,750	126,198	UNIDO

ANNEX A

PRELIMINARY EQUIPMENT SPECIFICATIONS

Budget line	Item	Description	US\$
42.00	1	One compact mobile steam injection system at 1 bar, temperature 200 Celsius , with a capacity of 400 kg/h (250.000 kcal/hr), complete with fittings and a 400 l/h water softening system	33,000
42.00	2	One 10,000-litre, steel-plated tank, to store fuel	5,000
42.00	3	One portable data logger	5,000
41.00		Expendables for a total of 97 hectares as follows: Trays, substrates and polyethylene films Seeds and seedlings of resistant varieties Chemicals Selective wavelength plastic films and thermal protective films Compost, manure and agro-industrial residues	271,000
		TOTAL	314,000

ANNEX B

PRELIMINARY TERMS OF REFERENCE FOR THE SUBCONTRACT

The subcontractor is expected to:

1. Provide the services of field agronomists and one agro-economist to carry out the tasks described below, for the entire duration of the project
2. Provide transportation for the international experts, the two agronomists and the two technicians to the demonstration sites during the entire duration of the project.
3. Provide transportation to the project sites and installation of the supplies and equipment (steam boiler, etc.) purchased.
4. Make available, during the first year, an area of at least 1.3 hectares of covered land (low and high plastic-houses/plastic tunnels) at the selected farmer sites
5. Provide the necessary preparatory work at each of the sites selected for the demonstration tests and trials: soil preparation, planting and implementation of alternative pest control technologies.
6. Provide service of all the necessary manual workers to implement the above and for the regular maintenance of the plots.
7. The first year, organise and perform 25 demonstration trials, at small scale (100 m²), using all the proposed technologies and in accordance to the timetable and methodology given by the international experts in close co-operation with the two local agronomists, as per Table B.1.
8. The second year, organise and perform 15 demonstration trials of the two most promising alternative technologies at medium scale (1 hectare) in the premises made available by the farmers mentioned in page 9 of this project document, as per table B.2
9. The third year, organise and perform 10 demonstration trials of the best alternative in plots of 5 Hectares each in the premises made available by the farmers mentioned in page 9 of this project document, as per table B.3
10. Compensate the farmers for the eventual losses or reduced yields.
11. Provide at least 6.000 liters of fuel-oil for the steam boiler used in the steam pasteurisation tests.
12. Prior to initiating any activity, provide the analytical protocols for monitoring, on a quantitative and qualitative basis, the populations of nematocides, fungi, bacteria and insects.
13. Provide the most suitable protocol to monitor the incidence of weeds.

14. At each project site, perform soil, water and biological analysis as specified in **B.4**, up to a maximum of 2,000 analysis.
15. Collect, record, process, analyse and consolidate the field data of each trial in a daily report.
16. Prepare and submit every three months a progress report, in English, of the activities performed and the results obtained at each project site. The report should include a fact sheet with the results of each of the demonstration test performed
17. At the end of the second and third years, prepare and submit a consolidate report containing a technical and economical analysis of the results obtained.
18. Throughout the entire duration of the project activities, cover communications costs between the Institutions selected and UNIDO headquarters in Vienna (Austria) and between these Institutions and the different project sites.
19. At the end of the third year, organise a regional workshop to present to the farmers and growers the project activities and the results obtained. This includes providing the venue and all facilities.
20. Prepare a paper back publication containing a description of the results obtained.
21. Prepare and submit a final report at the end of the contract.

ANNEX C

PROJECT BUDGET

Budget Line	Description	W/M	US\$
11-01	International Expert IPM specialist	5	85,000
11-02	International Expert on alternatives	2	34,000
15-00	Internal travel		35,000
17-01	Regional Coordinator	36	54,000
17-02	Regional coordinator	36	54,000
21-00	Subcontract for field trials as per Annex B		247,500
32-00	Study tour for four participants		24,000
35-01	International workshop		35,000
41-00	Expendables as per Annex A		271,000
42-00	Equipment as per Annex A		43,000
	Subtotal		882,500
71-00	Contingencies (10%)		88,250
	TOTAL PROJECT COSTS		970,750
	Overhead costs		126,198
	TOTAL PROJECT BUDGET		1,096,948

PROJECT EVALUATION SHEET **MEXICO**

SECTOR: REFRIGERATION ODS use in sector (1995): 1,600 ODP tonnes

Sub-sector cost-effectiveness thresholds: Commercial US \$15.21/kg

Project Titles:

Phasing out CFC-11 and CFC-12 with HCFC-141b and HFC-134a in the manufacture of commercial refrigeration equipment at Plasticos Tecnicos Mexicanos (PTM).

Project Data	Commercial Refrigeration	
	Plasticos Tecnicos Mexicanos (PTM)	
ODS phase-out (ODP tonnes)		50.6
Proposed project duration (months)		18
Incremental capital cost (US \$)		93,122
- including contingency (%)		10
Incremental operational cost (US \$)		305,317
Total project cost (US \$)		398,439
Local ownership (%)		100
Export component (%)		0
Amount requested (US \$) {Original}		763,197
{Revised}		398,439
Cost effectiveness (US \$/kg)		7.88
National Coordinating Agency	Instituto Nacional de Ecologia (I.N.E.)	
Implementing Agency	UNIDO	
Technical review completed?	Yes	

Secretariat's Recommendations:		
Amount recommended (US \$)		398,439
Project impact (ODP tonnes)		50.6
Cost effectiveness (US \$/kg)		7.88
Implementing Agency support cost (US \$)		51,797
Total cost to Multilateral Fund (US \$)		450,236

PROJECT DESCRIPTION

Phasing out CFC-11 and CFC-12 with HFC-141b and HFC-134a in the manufacture of commercial refrigeration equipment at Plasticos Tecnicos Mexicanos (PTM).

1. The ODS consumption in the commercial refrigeration sub-sector in Mexico in 1995 was 1,600 ODP tonnes (300 tonnes of CFC-11 and CFC-12 for new equipment, and 1,300 tonnes of CFC-12 refrigerant for servicing operations). The Executive Committee approved 7 projects in the sub-sector phasing out 72.1 ODP tonnes
2. The project is expected to be completed by end 1999 with an impact of 50.6 ODP tonnes phased-out. It is considered among the priorities of the country to meet the 1999 freeze target.
3. PTM started its operation in 1976. The enterprise manufactures commercial coolers, and horizontal and vertical display cabinets. The company, with four production and assembling lines, has an installed capacity of 120,000 units per year at present and is producing 100,000 refrigeration units per year for commercial purposes, mainly for the domestic market with small exports to other Article 5 countries in Latin America.
4. PTM S.A. has selected to replace CFC-12 by HFC-134a as a refrigerant for the cooling system. The company is presently using unspecified locally made charging boards and leak detectors of unidentified age. New charging boards, leak detectors and vacuum pumps designed for HFC-134a are requested in the proposal. The refrigeration circuit will have to be redesigned and tested; test instruments are requested for the performance testing. The proposal also seeks funding for retrofitting of one high pressure foaming machine, as well as for training of personnel in refrigerant and foam operations. Incremental operating costs are requested for two years.
5. All the available alternatives to CFC-11 have been considered by the enterprise. As the local authorities are reluctant to issue license for storage and application of cyclopentane, HCFC 141b has been selected by the company as an interim technology to replace CFC-11 blowing agent. The enterprise is equipped with two high pressure foaming machines. No funds are requested for conversion to the interim HCFC-141b technology. PTM has expressed its commitment to bear the expenses of the conversion of the factory to a zero-ODP non-hydrocarbon when available in the market.
6. Incremental operating costs are requested for one year, including incremental costs for HFC-134a compressors.
7. The proposal describes the implementation procedure, including the respective obligations of UNIDO and the enterprise.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The Secretariat discussed with UNIDO cost of replacement of refrigerant charging boards and vacuum pumps, as well as cost of plastic liner and compressors in calculation of incremental operating costs. Capital and operating costs have been adjusted accordingly.
2. IOC for compressors is included in the calculated operating costs at US \$3.00 per unit. Mexico has received funds for conversion of its compressor manufacturing facilities at the 15th Meeting of the Executive Committee. The Secretariat informed UNIDO that this cost cannot be considered in the absence of a decision of the Executive Committee on incremental operating cost for compressors. Subsequently, IOC for compressors have been excluded from the requested IOC.

RECOMMENDATION

1. The Fund Secretariat recommends blanket approval of the project with associated support costs at the funding level shown in the table below:

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
Phasing out CFC-11 and CFC-12 with HFC-141b and HFC-134a in the manufacture of commercial refrigeration equipment at Plasticos Tecnicos Mexicanos (PTM).	398,439	51,797	UNIDO