



**United Nations
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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: ALGERIA

Fumigant

- Demonstration project - Alternatives to the use of methyl bromide in horticulture

UNIDO

PROJECT EVALUATION SHEET ALGERIA

SECTOR: Fumigant ODS use in sector (1996-1997): 16.43 ODP tonnes
 (Methyl bromide)

Project Title:

Demonstration project - alternatives to the use of methyl bromide in horticulture (palm dates)

Project Data	Methyl Bromide
	Office National des Dattes (OND)
ODS phase-out (ODP tonnes)	N/A
Proposed project duration (months)	24
Incremental capital cost (US \$)	292,380
- including contingency (%)	10
Incremental operational cost (US \$)	N/A
Total project cost (US \$)	292,380
Local ownership (%)	-
Export component (%)	-
Amount requested (US \$) {Original}	292,380
{Revised}	
Cost effectiveness (US \$/kg)	
National Coordinating Agency	Direction Générale de l'Environnement (Bureau Ozone)
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 in horticulture

1. The use of methyl bromide started in Algeria in 1960 at three ports (Alger, Oran and Mostaganem) primarily for the fumigation of dates infested by the carob moth (*Ectomyelois ceratoniae* Zell) before they are delivered to stores. The annual production of dates in the country is estimated at 200,000 tonnes 25 per cent of which are disinfected with methyl bromide (15.9 to 17.0 metric tonnes per year). Some dates that are exported may subsequently be fumigated to meet importing country's phytosanitary standards.
2. The fumigation process consists of introducing dates which are placed in boxes into a vacuum autoclave. Methyl bromide in metal containers, is heated in a water bath and injected into the chamber at a dose of 80 g/cubic meter for one to two hours depending on the temperature. During the date season (4 to 6 months of the year), fumigation operations are carried out three times a day. This operation is currently undertaken at 13 fumigation chambers of the Office National des Dattes (OND).
3. The project is to demonstrate alternative technologies to methyl bromide in post-harvest disinfestation of palm dates. The selected alternatives are phosphine, carbon dioxide and integrated commodity management.
4. Phosphine will be applied at ambient atmospheric pressure either in purpose-built fumigation chambers or contained in gas-tight plastic membranes. Through the use of plastic sheets it is possible to fumigate dates at collection centres before they are transported for processing and packing. This procedure could alleviate some logistical problems due to longer exposure periods required for this fumigant. Carbon dioxide will be applied under vacuum, thus requiring fumigation chambers designed to operate under vacuum (such chambers are available at the Office National des Dattes plants).
5. The two techniques require significantly longer exposure periods (72 hours) than the four hour exposure periods for methyl bromide when applied under vacuum, and could incur some incremental operating costs.
6. The project will be complemented with the introduction of an Integrated Commodity Management (ICM) programme to replace the need for "end of pipeline" methyl bromide treatment. It will identify the critical points that influence insect infestation during processing and packaging operations, and thus, ensuring that the dates entering into the processing and packing plant are already disinfested.
7. The proposed techniques will be demonstrated at the date processing plants of the Office National des Dattes, situated in Biskra and Tolga. Carbon dioxide fumigation treatments will be conducted in the existing fumigation chambers, while treatments using phosphine will be undertaken in

modified freight containers and under gas-tight plastic sheets. Demonstration of the ICM programme will be conducted for one week at each of the plants at quarterly intervals.

8. Initially, treatments using four tonne batches of dates, will be undertaken on four separate occasions during the first harvest season. The dates will be sampled before and after treatment to determine whether it has been infested in the field as well as to monitor the efficacy of the treatments. In addition, cages containing artificially infested dates will be included in all batches to ensure that insect mortality/survival can be monitored in the absence of any field infestation. During the second harvest season of the project's operation, fumigation will be undertaken on a full-scale commercial basis.

9. Data obtained from these demonstrations will be processed and analyzed in comparison with existing disinfestation systems in terms of effectiveness, throughput and cost. This information will be published for dissemination to the Algerian date industry.

10. The Project will be coordinated by the Direction Générale de l'Environnement (Bureau Ozone) and implemented by UNIDO in cooperation with the Office National des Dattes and the Institut National de Protection des Végétaux.

11. 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. A short-term international consultant will be recruited to prepare a detailed protocol of the experiments and the ICM programme. The total cost of human resources is US \$186,000 including a subcontract for fumigation (US \$120,00) and internal travel (US \$6,000), representing 70 per cent of the cost of the project. The total cost of the equipment is US \$57,800.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The Fund Secretariat has 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 Committee at the 24th Meeting).
2. The Secretariat discussed with UNIDO issues regarding the eligibility of the project since (i) dates are not among the priority crops for demonstrating alternatives to methyl bromide, (ii) the total methyl bromide consumption in the country is very low (16.4 metric tonnes), and (iii) the use of methyl bromide appears to be for quarantine and pre-shipment purposes. The Secretariat also discussed issues regarding the salaries of international and national experts.
3. Regarding the issue of dates crops not being on the priority list of crops, UNIDO indicated that dates are an important crop in Algeria particularly in the south and arid regions where it is the only crop cultivated and thus the only source of income. Also, methyl bromide is solely used for the treatment of dates and, due to the high demand of this commodity, the date industry is likely to expand with an increase in the consumption of methyl bromide.
4. UNIDO indicated that dates are harvested in October and November; most of the harvest is stored to be commercialized during the rest of the year and even beyond the next harvest. As dates are usually infested with insects and their eggs, they cannot be stored without treatment; thus, methyl bromide is used for storage (preservation) purposes.
5. UNIDO also informed the Secretariat that, based on the understanding from parties involved in the preparation of the project, Algeria would completely phase out the use of methyl bromide if the proposed alternatives to methyl bromide are demonstrated to be viable.
6. UNIDO indicated to the Secretariat that the national institution that would be subcontracted to implement the project is responsible for providing agricultural extension services and dissemination of agricultural technologies in the country and is also linked to other learning institutions, and in many cases, NGOs, manufacturers and distributors of pesticides. Furthermore, the knowledge acquired by the subcontracting institution will be properly incorporated into the national technical capacity.
7. UNIDO also stated that costs of the equipment items requested were carefully looked at to keep them as low as possible.

PROJECT DOCUMENT

COUNTRY: Algeria

PROJECT TITLE: Demonstration project - Alternatives to the use of methyl bromide in horticulture

SECTOR COVERED: Horticulture: Palm dates

ODS USE BY SECTOR: Methyl bromide: Average of 16.43 metric tons (mt) in 1996-97

PROJECT DURATION: 24 months

TOTAL PROJECT COSTS: US\$ 292,380

OVERHEADS OF IMPLEMENTING AGENCY: US\$ 38,009

PROPOSED FINANCING BY MULTILATERAL FUND: US\$ 330,389

IMPLEMENTING AGENCY: UNIDO

NATIONAL IMPLEMENTING AGENCY: Office National des Dattes (OND) in cooperation with INPV (Institut National pour la Protection des Végétaux)

COUNTERPART AND COORDINATING INSTITUTION: Direction Générale de l'Environnement (Bureau Ozone) Secrétariat d'Etat auprès du Ministère de l'Intérieur et des Collectivités locales et de l'Environnement.

PROJECT IMPACT:

The project will demonstrate proven alternatives to methyl bromide in post-harvest disinfestation of palm dates. The selected alternatives are phosphine, carbon dioxide and integrated commodity management. The project will be implemented at two date processing plants of the Office National des Dattes (OND) situated in Biskra and Tolga in the north-east of Algeria. Implementation will involve installation of specialized equipment at the two sites to allow the demonstration to proceed. It will also include a technical and economic assessment of the technologies and dissemination of the results through a national workshop to the date industry in Algeria.

I. BACKGROUND

1.1. The Sector

The use of methyl bromide started in Algeria in 1960 at three ports (Alger, Oran and Mostaganem) for the fumigation of agricultural commodities, particularly the disinfestation of dates before export. However, the ports' fumigation chambers have been out of service since 1967 and the OND acquired its own vacuum fumigation chambers in 1970.

At present methyl bromide is used only for a systematic fumigation of stored dates and dates exports are very important for Algeria's economy. Without this treatment the losses would be around US\$ 25 million. The primary use of methyl bromide is ridding dates of field infestation by the carob moth (*Ectomyelois ceratoniae* Zell) before they are taken to the store as part of management of hidden infestation which emerges at the point of consumption. Methyl bromide is used for this purpose because it is a proven technique, is well tolerated, and for its speed of action.

Methyl bromide is not homologated by the phytosanitary authority and was classified as "particularly dangerous" by the Decree 95-405 dated 2 December 1995. It is specifically directly imported by the users for the above purpose. A small quantity was used in the fruit and vegetable sector by a state owned company (ENAFILA), which was dissolved in 1996.

Algeria produces an estimated quantity of dates of 200,000 mt per year and the annual consumption of methyl bromide varies from 15,860 mt to 17 mt depending on the volume of dates fumigated and the infestation level of the dates. There are operating in the sector a state owned enterprise (OND) with 13 fumigation units (type Mallet France) and seven private enterprises equipped with 10 fumigation units (type Mallet France and Viter Vacuum Italy).

Date fruits are attacked by a range of field and storage pests. The most damaging is the carob moth (*Ectomyelois ceratoniae* Zell), which infests dates in the field before harvest, develops to maturity during storage and can cause serious losses, if no control measures are applied. Infestation by this insect, and also incidental stored products insects render dates unacceptable to the discerning market. Dates exported from Algeria, principally to European markets, are subject to stringent checks to ensure that infestation levels do not exceed established thresholds of infestation.

All dates purchased by date processors and packers are disinfested before they are taken into storage in their processing and packing plants. The procedure is undertaken at the processing plants.

Presently 25% of the dates harvested in Algeria (approx. 40,000 tons per year) are disinfested with methyl bromide prior to being taken into storage. Some dates that are exported may subsequently be fumigated to meet domestic phytosanitary standards.

1.2. The OND (Office National des Dattes)

It is the only enterprise which is state owned. Its activities include harvesting, product selection, packaging and marketing. It has seven plants equipped with 13 fumigation chambers which employ 3,000 people. OND puts in the market an average of 10,000 mt of dates of superior quality called "Djebel Nour", "Deglat Beida" and "Tafezouine".

OND introduced in 1970 the first vacuum autoclaves for dates disinfestation using methyl bromide. Its 7 plants are situated in Biskra, Tolga, Mghaier, Djemaa, Touggourt, El Oued and Ouargla. OND has a total of 13 fumigation units. The dates are introduced in the autoclave which is the single entrance for the dates in the plant. The autoclave is equipped with a metallic chamber with two doors, one for the introduction of the dates and the second for the exit. The dates are put in boxes of 22 kg capacity. Each chamber has a volume of 20 m³ and allows the fumigation of 4 to 6 mt of dates per batch. The vacuum is obtained through a pump. Methyl bromide, in metal containers, is heated in a water bath and the gas produced is sent through a special device to the chamber. Methyl bromide is injected at a dose of 80g/m³ in a fumigation time of one to two hours depending on the temperature (20°C: 1 hour, 15°C: 1 hour 30 minutes, 10°C: 2 hours). During the date season (4 to 6 months) fumigation operations are carried out three times a day.

During the last 10 years OND has imported 350 bottles of methyl bromide containing each 125 kg, which makes a total of 43,750 kg. According to this amount the estimated quantity of methyl bromide used by OND each year is between 4 and 4.5 mt. The methyl bromide used is imported from France (GALLEX and SPAM).

2. PROJECT OBJECTIVES

2.1. Objective 1

To demonstrate the technical and economic feasibility of three alternatives to methyl bromide for disinfestation of palm dates by:

- (a) Implementation of an integrated pest control and commodity management (ICM) program in date processing and packing plants;
- (b) Fumigation with phosphine at atmospheric pressure;
- (c) Fumigation with carbon dioxide under vacuum.

2.2. Objective 2

To disseminate the results of the project to the palm date industry in Algeria.

3. PROJECT DESCRIPTION

3.1. Proposed technologies for disinfestation of dates

3.1.1. Alternative fumigants

Phosphine and carbon dioxide are alternatives, for which basic research with respect to some dried fruits has already been undertaken. Both gases are already in limited use by the industry in Algeria for cereals and appear to achieve infestation control at the same level and market acceptability as that provided by methyl bromide.

Phosphine applied as a gas from cylinder sources will be applied at ambient atmospheric pressure either in purpose-built fumigation chambers or contained in gas-tight plastic sheets. Carbon dioxide will be applied under vacuum.

The project intends to apply these techniques at the date processing plants of OND situated in Biskra and Tolga.

3.1.2. Integrated commodity management (ICM)

Control of infestation in stored commodities such as dates is dependent on a wide range of factors, from pre-storage procedures, logistics of transport from field to processing centres, through storage design, hygiene and stock management, to effect of processing and market requirements.

The project will demonstrate the ICM process to replace the need for "end of pipeline" methyl bromide treatment by maintaining a "clean pipeline".

This will be done by identifying the stages through which dates pass as they are processed and packed, and defining the critical points that influence insect infestation.

This information will be applied to ensure that all dates entering into a processing and packing plant are first disinfested or subjected to an insecticidal treatment during processing, handled in such a manner so that cross infestation is avoided, and that they do not require disinfestation at the end of this process.

This demonstration will be undertaken in the two above-mentioned date processing and packing plants of the OND situated in Biskra and Tolga.

3.2 Evaluation of alternative technologies

Basically there are two well proven alternative fumigation techniques that can be adopted by the Algerian date industry:

- (a) Phosphine at ambient atmospheric pressure either contained in purpose-built fumigation chambers or under gas-proof plastic membranes on a gas-proof substrate. The technique using this gas has the potential for industry-wide application. Through the use of plastic sheets it will be possible to fumigate dates at collection centres in the south of the country before they are transported to the north for processing and packing. This procedure, if adopted, could alleviate some of the logistic problems anticipated to result from the longer exposure periods required for this fumigant.
- (b) Carbon dioxide under vacuum: This technique requires fumigation chambers designed to operate under vacuum. Such chambers are available at the OND plants.

The two techniques require significantly longer exposure periods (72 hours) than the 4 hour exposure periods for methyl bromide when applied under vacuum. These exposure periods appear to provide satisfactory insect control.

The requirement for longer exposure periods has logistic implications that the industry, in general, has considerable difficulty in accepting. This may incur some incremental costs to achieve the same throughput as that achieved by existing methyl bromide systems.

These techniques will be supported by an ICM program developed for palm date storage in processing and packing plants. This can provide:

- a. a basis for certification for freedom from infestation;
- b. a basis from which a more stringent HACCP program could be implemented, which can provide an advantage for an industry that exports a large proportion of its production;
- c. an accurate insight into the effects of the logistical requirements of a disinfestation system that requires a 3 day minimum exposure period.

3.3 Project implementation

3.3.1 Location of the project

Project demonstrations will be undertaken at two date processing plants of OND situated in Biskra and Tolga.

BISKRA PLANT

Annual production:
2,000 mt (average)

Exports:
800 to 1,300 mt.

Cold storage capacity:

3,280 m³ with a capacity of 1,068 tons of dates.

Fumigation equipment:

One unit type Mallet (France) with a volume of 20 m³ for fumigation of dates between 4 and 6 tons per fumigation operation.

Annual consumption of methyl bromide:

Between 680 and 880 kg.

Human resources:

The unit employs around 500 people, 12 in the fumigation unit.

TOLGA PLANTAnnual production:

Estimated between 3,000 and 3,500 tons.

Cold storage capacity:

7,248 m³ with a capacity of 1,420 tons of dates.

Fumigation equipment:

Two units type Mallet similar to the one in Biskra.

Annual consumption of methyl bromide:

Between 1,200 and 1,400 kg.

Human resources:

700 people, 20 in fumigation operations.

Site	Owner	Alternatives
First site	OND (Tolga Unit)	Phosphine, carbon dioxide and ICM
Second site	OND (Biskra Unit)	Phosphine and ICM

3.3.2 Methodology

- **Fumigation treatments**

Methyl bromide and carbon dioxide fumigation treatments carried out at the OND plant premises will be undertaken in the existing fumigation chambers. These will require prior maintenance to ensure that they are gas-tight and meet the pressure test standard for these fumigations. Treatments using phosphine will be undertaken in modified freight containers and under gas-tight plastic sheets.

The efficacy of all treatments undertaken with phosphine and carbon dioxide will be compared against treatments undertaken with methyl bromide, which is the current standard fumigation treatment.

Initially treatments, using four tonne batches of dates, will be undertaken on four separate occasions during the first harvest season of the project's operation. During the second harvest season of the project's operation, fumigations will be undertaken on a full-scale commercial basis.

The fruit will be sampled before and after treatment to determine whether it has been infested in the field and to monitor the efficacy of the treatments. In addition cages containing artificially infested fruit will be included in all batches of fruit that are fumigated to ensure that insect mortality/survival can be monitored in the absence of any field infestation.

Fumigant concentrations in all the fumigation chambers/enclosures will be monitored during the exposure periods, and thereafter during the ventilation/airing process to ensure that gas concentrations have declined to the threshold limit value (TLV) before they are handled. Supporting laboratory studies, using dates fumigated during the demonstrations, will also be undertaken to validate these observations.

Fumigation treatments undertaken with phosphine will be carried out in a fumigation chamber, in modified freight containers and under gas-tight plastic sheets. The sampling protocol outlined above will also be used.

Data obtained from these demonstrations will be processed and analyzed in comparison to existing disinfestation systems in terms of effectiveness, throughput and cost.

- **Integrated Commodity Management**

A demonstration will be undertaken in two date processing and packing plants of OND to identify the critical points (operations, equipment, management policy, etc.) that affect infestation in palm dates as they enter date processing and packing plants.

The demonstration will be conducted for one week at each of the two premises at quarterly intervals. It will identify constraints to effective pest control that may increase pest infestation, and factors that minimize pest infestation in dates. The objective is to integrate existing procedures with the new techniques of fumigation in rational systems of pest and quality management that are compatible with the production systems in the date industry.

This information will be published for dissemination to the Algerian date industry.

3.3.3 Project coordination

The Project will be coordinated by the Direction Générale de l'Environnement (Bureau Ozone) and implemented by UNIDO in cooperation with the Office National des Dattes (OND) and the Institut National de Protection des Végétaux (INPV). UNIDO will prepare a subcontract for implementation of the demonstration of alternate technologies for date fumigation.

A short-term international consultant will be recruited to prepare a detailed protocol of the experiments and the ICM programme.

A National Project Coordinator (NPC) will be recruited and will be responsible for managing and supervising the entire demonstration project and evaluating the results. This person will also be responsible for designing the tests, collecting and analyzing the data, supervising field activities and coordinating the services of project personnel.

3.3.4. Institutional arrangements

The Direction Générale de l'Environnement will, through the Bureau Ozone, be the coordinator and counterpart institution. Final specifications for the equipment required and a work plan will be elaborated after an agreement has been reached with the Direction Générale de l' Environnement, OND, INPV and UNIDO.

4. OUTPUTS

4.1. Outputs and Activities

OUTPUT 1: A practical technical and economic analysis, at full commercial scale, of the utilization of three alternatives to methyl bromide in disinfestation of palm dates, namely phosphine, carbon dioxide and an integrated commodity management system.		
ACTIVITIES	MONTH OF COMPLETION	RESPONSIBILITY
Preparation of the ICM and fumigation programme.	3	NPC/11-51
Preparation of detailed TOR for the subcontract.	3	NPC/11-51
Preparation of detailed list of equipment with specifications.	3	NPC/11-51/UNIDO
Demonstration application of phosphine in fumigation chambers and under plastic sheets with monitoring of pest survival rates.	12	Subcontractor/NPC
Demonstration application of carbon dioxide in vacuum chambers with monitoring of pest survival rates.	12	Subcontractor/NPC
Monitoring successful implementation of technology application of ICM and replication of application of phosphine on full-scale commercial basis in fumigation chambers and under plastic sheets with monitoring of pest survival rates.	22	Subcontractor/NPC
Monitoring successful implementation technology by application of ICM and replication of application of carbon dioxide on full-scale commercial basis in vacuum chambers with monitoring of pest survival rates.	22	Subcontractor/NPC
Preparation of technical and economic analysis of the results.	24	Subcontractor/NPC

OUTPUT 2: At least 12 fumigators fully trained in the technologies implemented during the course of the demonstration project.		
ACTIVITIES	MONTH OF COMPLETION	RESPONSIBILITY
On-the-job training in phosphine fumigation.	18	Subcontractor/NPC
On-the-job training in carbon dioxide fumigation.	18	Subcontractor/NPC

OUTPUT 3: Dissemination of the results of the demonstration project among qualified representatives of the local date industry.		
ACTIVITIES	MONTH OF COMPLETION	RESPONSIBILITY
Preparation of a publication with the results of the project experiences.	20	Subcontractor/NPC
Editing and distribution of 60 copies of the report.	20	Subcontractor/NPC
Organization of a 3 day- workshop to present the results to local and international representatives of the date industry.	24	Subcontractor/NPC

4.2. Project Milestones

YEAR	ONE				TWO			
QUARTER	1	2	3	4	1	2	3	4
1. Preparation of project workplan	4							
2. Equipment purchase and installation	4							
3. Preparation of the ICM programme		4	4	4				
4. Execution of demonstration fumigations			4	4				
5. On-the-job training		4	4	4	4	4		
6. Replication of fumigations on full-scale commercial basis					4	4	4	4
7. Extension of ICM program during commercial-scale fumigation						4	4	4
8. Preparation of technical and economic analysis					4	4	4	
9. Terminal workshop to present the project's results								4

4.3. Project implementation

The project will be coordinated by the Bureau Ozone of the Secrétariat d'Etat à l'Environnement. The project will be implemented by UNIDO in close cooperation with the OND and INPV.

Final specifications for the equipment and the workplan can only be elaborated after an agreement of the project proposal has been reached with INE and the collaborating institutions.

As the 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 the 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.

5. PROJECT COSTS

Total project costs (in US\$) are as follows:

TOTAL INCREMENTAL COSTS	265,800
Contingency allowances (10%)	26,580
TOTAL PROJECT COSTS	292,380
Overhead costs (13%)	38,009
FUNDING FROM THE MULTILATERAL FUND REQUESTED	330,389

6. PRE-REQUISITES

In accordance with the rules and regulations of the Executive Committee for the Multilateral Fund for the Implementation of the Montreal Protocol, project funds will cover only incremental capital costs related to the project. All other expenses, particularly those related to civil and construction works, provision of additional equipment, machinery, tools, services, instrumentation, etc., will have to be covered by the counterpart.

Therefore, prior to the start of the implementation of the project, a Memorandum of Understanding has to be prepared and approved by the project/Government authorities concerned, the OND and UNIDO.

The Memorandum will specify all responsibilities of the counterpart, OND, in the construction of two concrete plinths at its own costs on which the fumigation containers are to place, and two more concrete plinths on which fumigations will be undertaken under the plastic sheeting. This Memorandum will be considered as an integral part of the project document.

PRELIMINARY EQUIPMENT SPECIFICATIONS

Preliminary equipment specifications and breakdown of costs are as follows:

Item	DESCRIPTION	TOTAL COST US\$
1	2 new and unused steel 20 ft freight containers built to Japanese specifications for gas-tightness. Exclusive of carriage to Algeria.	18,000
2	2 sealed (gas-tight) heaters to be installed in the containers.	3,000
3	2 sets of PVC piping for gas recirculation.	1,000
4	2 explosion-proof fans for recirculating fumigant gases.	1,800
5	2 electronic phosphine detectors, calibrated for fumigation concentrations, without cross sensitivity to carbon monoxide.	4,000
6	2 electronic phosphine detectors, calibrated for workspace concentrations, specific to hydrides or known cross sensitivities.	2,000
7	2 electronic carbon dioxide detectors, calibrated for fumigation concentrations.	15,000
8	2 hand pump sets for detecting fumigants with detector tubes.	1,000
9	500 phosphine detector tubes.	5,000
10	500 carbon dioxide detector tubes.	5,000
11	Insect mortality analyses.	2,000
	TOTAL	57,800

PRELIMINARY TERMS OF REFERENCE FOR THE SUBCONTRACT

The subcontractor is expected to provide the following services or inputs:

1. The services of an international expert for a duration of 5 w/m (5 split missions) to execute the entire demonstration programme.
2. Organize all the necessary preparatory work at each of the sites selected for the demonstration trials.
3. Make the necessary arrangements to transport the equipment and supplies purchased by the project from the customs warehouse to the site.
4. Provide free transportation for international experts from the central premises to the demonstration fields.
5. Introduce and implement an integrated commodity management plan in two palm date processing and packing plants, according to the programme prepared by the UNIDO expert.
6. Conduct a series of demonstrations with phosphine at one palm date packing and processing plant of OND, according to the protocol which will be provided by the international expert.
7. Provide an adequate supply of cylinder phosphine (carbon dioxide/phosphine) with which the demonstrations will be undertaken.
8. Conduct a series of demonstrations of fumigation with carbon dioxide, according to the protocol which will be provided by the international expert.
9. Provide an adequate supply of food grade carbon dioxide with which the demonstrations will be undertaken.
10. Install two 20 ft freight containers to be used as fumigation chambers for the fumigation demonstrations.
11. Install four fumigation sheets (42 x 35 ft) manufactured using double side PVC membrane supported on a scrim or mesh. The PVC sheeting must be UV proofed and meet the standard required for fumigation sheeting.
12. Collect the samples and perform the insect mortality analysis in all of its phases according to the protocol specified by the international expert.

13. Submit every six months a detailed report in English, of the activities performed and the results obtained.
14. Submit a consolidated report containing a technical and an economic analysis of the results obtained.
15. Provide facilities and organize a national workshop to present and disseminate the results of the demonstration project.

PROJECT BUDGET

BUDGET LINE	DESCRIPTION	W/M	US\$
11-51	International expert in ICM and fumigation	1.0	17,000
15-00	Internal travel		6,000
17-01	National coordinator	24.0	60,000
21-00	Subcontract for fumigation as per Annex B		120,000
35-01	Workshop		5,000
41-00	Expendable equipment as per Annex A		3,000
42-00	Non-expendable equipment as per Annex A		54,800
	Subtotal	25.0	265,800
71-00	Contingencies (10%)		26,580
	TOTAL PROJECT COSTS		292,380
	Overhead costs (13%)		38,009
99-99	TOTAL PROJECT BUDGET	25.0	330,389

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION**UNIDO**

January 1998

Job Description

MP/ALG/98/XXX/11-51/07-20AD

- Post title:** Consultant, specialist in ICM and commodities fumigation
- Duration:** 1.0 month
- Duty station:** Algiers, with travels to Biskra and Tolga and home country
- Date required:** 1998
- Purpose of project:** To demonstrate proven alternatives to methyl bromide in post-harvest disinfestation of palm dates. The selected alternatives are phosphine, carbon dioxide and integrated commodity management. The project will be implemented at two date processing plants selected among those belonging to the Office National des Dates (OND) in Algeria.
- Duties:** The consultant is expected to carry out the following duties:
- Document the flow of palm dates in the two date processing and packing plants and prepare a complete ICM programme;
 - Prepare an exact protocol for the demonstration fumigation experiments with phosphine;
 - Prepare an exact protocol for the demonstration fumigation experiments with carbon dioxide;
 - Prepare comprehensive terms of reference for the subcontract;
 - Prepare a short report on the mission and submit it in two copies along with the diskette using WP WIN 5.2 or 6.1.
- Qualifications:** University degree in entomology or related fields with a large experience in commodities fumigation.
- Language:** English, French will be an asset.

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

January 1998

Job Description

MP/ALG/98/XXX/17-01/07-20AD

- Post title: National Project Coordinator
- Duration: 24.0 w/m
- Duty station: Algiers with travels to Biskra and Tolga
- Date required: As soon as possible
- Purpose of project: To demonstrate proven alternatives to methyl bromide in post-harvest disinfestation of palm dates. The selected alternatives are phosphine, carbon dioxide and integrated commodity management. The project will be implemented at two date processing plants selected among those belonging to the Office National des Dates (OND) in Algeria.
- Duties: In cooperation with the counterpart (OND), INPV and the subcontractor the NPC will is expected to provide the following services:
- Assist the subcontractor in the coordination of the project activities;
 - Manage and supervise the entire demonstration project;
 - Design the tests, collect and analyze the data;
 - Supervise the field activities and coordinate the services of the project personnel;
 - Prepare a report for presentation at the workshop to be held at the end of the project;
 - Prepare a report on the activities undertaken and submit it in two copies along with the diskette using WP WIN 5.2. or 6.1.

Qualifications: University degree in agronomy/entomology with at least five years experience in commodity fumigation.

Language: French, English will be an asset.