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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: TUNISIA

Fumigant

- Demonstration project - alternatives to the use of methyl bromide in horticulture at Société Méditerranéenne Fruitière

UNIDO

PROJECT DESCRIPTION

Demonstration project - alternatives to the use of methyl bromide in horticulture at Société Méditerranéenne Fruitière

1. Methyl bromide is used in Tunisia for the fumigation of dates against the carob moth (*Ectomyelois ceratoniae* Zell) after they have been harvested and before they are delivered to stores. The annual production of dates in the country is estimated at 90,000 tonnes, 80 per cent of which are treated with methyl bromide (6.6 tonnes). Palm dates, in Tunisia, play an important role in the national economy, and provide a valuable source of foreign exchange, currently being the third largest food commodity exported by the country.
2. There are 47 palm date processing and packing plants in Tunisia, with an annual capacity of 45,000 tonnes. All are equipped with fumigation facilities for disinfestation with methyl bromide either at atmospheric pressure or under vacuum.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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 disinfected.

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 (6.6 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 Tunisia. 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, that Tunisia would completely phase out the use of methyl bromide if the proposed alternatives to methyl bromide are demonstrated to be viable.
6. UNIDO has 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: The Republic of Tunisia

PROJECT TITLE: Demonstration Project - Alternatives to the use of Methyl bromide in horticulture.

SECTOR COVERED: Horticulture: Palm dates

ODS USE BY SECTOR: Methyl bromide: 6.6 mt in 1996-97.

PROJECT DURATION: 24 months

TOTAL PROJECT COSTS: US\$ 301,730

OVERHEADS OF IMPLEMENTING AGENCY: US\$ 39,225

PROPOSED FINANCING BY MULTILATERAL FUND: US\$ 340,955

IMPLEMENTING AGENCY: UNIDO

COUNTERPART INSTITUTION: Société Méditerranéenne Fruitière
4, Zone Industrielle, Borj Cedria
2055 Tunisia

COORDINATING INSTITUTION: Ministry of the Environment, Tunis.

PROJECT IMPACT: This 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 three sites in Tunisia. Implementation will involve installation of specialised equipments at two sites to allow the demonstration to proceed. It will also include technical and economic assessment of the technologies and dissemination of the results through a national workshop.

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1. BACKGROUND

1.1 The Sector

Substantial use of methyl bromide in Tunisia is limited to disinfection of palm dates after they have been harvested. Its primary use is ridding palm dates of field infestation by the carob moth (*Ectomyelois ceratoniae* Zell) before they are taken into store as part of management of hidden infestation which emerges at point of consumption. Methyl bromide is used for this purpose because it is a proven technique, it is well tolerated, and for its speed of action.

Methyl bromide is specifically imported into Tunisia for this purpose. A small, but undefined quantity of methyl bromide is also used for plant quarantine treatments of imported plants and plant products.

Table 1. Quantity of methyl bromide used to fumigate palm dates¹

Year	1993-94	1994-95	1995-96	1996-97
Quantity (mt)	7.4	7.0	5.4	6.6

Palm dates, in Tunisia, play an important role in the national economy. In monetary terms, they provide a valuable source of foreign exchange, currently being the third largest food commodity exported from this country. In the southern provinces (governorate) of the country, the palm date is the only agricultural crop that can be grown, and provides the sole means of livelihood for the majority of the population. Almost the whole socio-economic structure of these provinces is supported by activities involved in the production of palm dates.

Tunisia produces about 90,000 mt of palm dates per year, of which 23,000-35,000 tones were exported during the 1996-97 season.

Palm date fruits are attacked by a range of field and storage pests. The most damaging being the carob moth (*Ectomyelois ceratoniae* Zell), which infests palm dates in the field before they are harvested, develops to maturity during storage and can cause serious losses, if control measures are not applied. Infestation by this insect, and also incidental stored products insects, make palm dates unacceptable to the discerning market. Palm dates exported from Tunisia, principally to European markets, are subject to stringent checks to ensure that infestation levels do not exceed established thresholds of infestation.

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

¹ Dhuibl, M.H., Medidar, S. and Ben Harath, B. (in press) Utilisation du Bromure de méthyle et méthodes alternatives en Tunisie. Unpublished report commissioned by UNDP.

is undertaken at processing plants, most of which are situated in the north of the country.

Presently, more than 80% of palm dates harvested in Tunisia (approx. 90,000 mt per year) are disinfested with methyl bromide prior to being taken into storage. Some palm dates that are exported may subsequently be fumigated to meet domestic phytosanitary standards.

The exceptions to this disinfestation process are: "bio" palm dates, and palm dates disinfested with phosphine. "Bio" (or organic) palm dates are grown and processed with or without minimal use or application of any synthetic fertilizers, chemicals, etc. A market, recently developed for this product, does not accept disinfestation with methyl bromide and demands alternative, non-chemical disinfestation processes. Limited quantities of palm dates have been treated with carbon dioxide for this market by one exporter (Société Méditerranéenne Fruitière).

Similarly, in work undertaken to explore the use of alternatives to methyl bromide, small quantities of palm dates have been disinfested using phosphine.

There are 47 palm date processing and packing plants in Tunisia, with a nominal handling capacity of 45,000 tons per year. All are equipped with fumigation facilities for disinfestation with methyl bromide either at atmospheric pressure or under vacuum.

1.2 The Société Méditerranéenne Fruitière (Medifruit)

Medifruit is a medium-sized company that processes approximately 1,500 mt of palm dates per year. Its facilities include two vacuum fumigation chambers designed for use with methyl bromide, and a cold storage capacity for 1,000 mt of pal dates.

In a process typical of other palm date processing plants, raw palm dates trucked from the south of the country to Tunis are washed and then fumigated, thereafter taken into cold storage where it is stored at 0°C.

The existing fumigating facility can treat about 20 mt of palm dates in about 13 hours. However, it is not uncommon, at the height of the season, to receive 50 tones of palm dates per day. Thus some product is taken into cold storage without being disinfested. The palm dates may be fumigated later either when they are removed from cold storage to be processed and packed, or specifically disinfested and returned to cold storage.

As this firm handles a large quantity of "bio" palm dates, disinfestation is now undertaken with carbon dioxide under vacuum. The process is undertaken in the existing methyl bromide fumigation facility, which was designed for operation under vacuum.

Cold storage at 0°C, even for periods extending to 9 months, is not sufficiently insecticidal on its own to achieve adequate control for export markets. Eggs of the carob moth survive this storage period, though all other life stages are killed. Following cold storage, some palm dates are re-humidified at high temperature and dried. This process is insecticidal.

Almost all the palm dates handled and processed by Medifruit are exported. Most of the company's product is packed in small retail packs (250 g and upwards), which are enclosed in thin polythene film, then packed into unlined cartons. Thus, use of an alternative means for disinfestation, at this stage of the processing, is inapplicable without the introduction of appropriate gas-tight packing materials. However, it is reported that some processors do pack palm dates into sealed cartons. This might allow the introduction and use of such alternatives elsewhere by the industry.

2. PROJECT OBJECTIVES

The first objective of this project is 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 palm date processing and packing plants;
- (b) fumigation with phosphine at atmospheric pressure;
- (c) fumigation with carbon dioxide under vacuum.

The second objective of this project is to disseminate the results of the project to the palm date industry in Tunisia, and other 'Article 5 Countries'.

3. PROJECT DESCRIPTION

3.1 Proposed technologies for disinfestation of palm dates

3.1.1 Alternative fumigants

Phosphine and carbon dioxide are alternatives, for which basic research with respect to some dried fruit has already been undertaken. Both gases are already in limited use by the industry in Tunisia and appear to achieve infestation control to the same level and market acceptability as 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 both these techniques at the Medifruit premises.

The technique with phosphine will also be applied at a site (to be selected by the Groupement Interprofessionel des Dattes (GID) in the palm date growing area in the south of Tunisia.

3.1.2 Integrated commodity management (ICM).

Control of infestation in stored commodities, such as palm dates, is dependent on a wide range of factors ranging from pre-storage procedures, logistics of transport from field to processing centers, 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 palm 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 palm dates entering into a processing and packing plant are: first disinfested or undergone an insecticidal treatment during processing, handled in such a manner that cross infestation is avoided, and that they do not require disinfestation at the end of this process.

This demonstration will be undertaken in two palm date processing and packing plants, Medifruit and at another, to be selected by the Groupement Interprofessionnel des Dattes.

3.2 Evaluation of alternative technologies

Basically, there are two well proven alternative fumigation techniques that can be adopted by the Tunisian palm 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. Using plastic sheets, it will be possible to fumigate palm dates at collection centers 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. Two such chambers are available at the Medifruit premises.

Both techniques require significantly long 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 results compared with the 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 minimum 3 day exposure period.

3.3 Project implementation

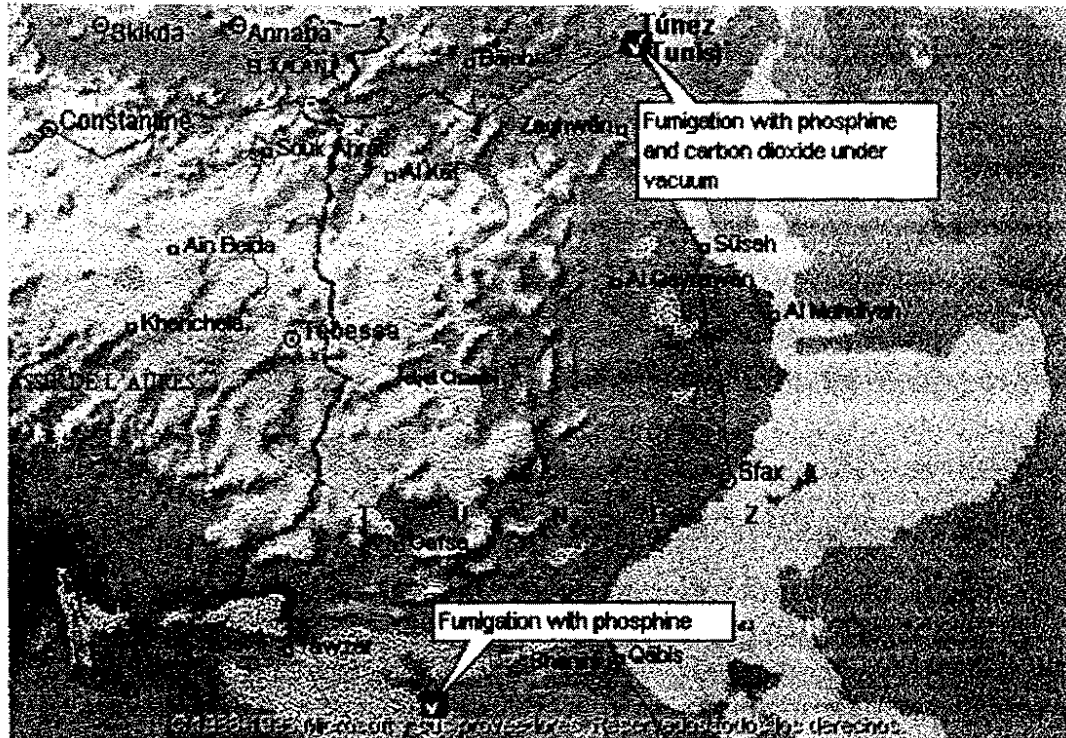
3.3.1 Location of the project

The project demonstrations will be undertaken at two sites, indicated in the table below. The southern site is selected in collaboration with Groupement Interprofessionnel des Dattes (GID) and with the agreement of the Counterpart Institution in this project, Société Méditerranéenne Fruitière.

Table 2. Project demonstration sites

Site	Company	Alternatives
Tunis (Northern Tunisia)	Medifruit	Phosphine Carbon dioxide ICM
Kebili (Southern Tunisia)	GID and others.	Phosphine ICM

PROJECT SITES



3.3.2 Methodology

a) Fumigation treatments

Methyl bromide and carbon dioxide fumigation treatments carried out at the Medifruit 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 five tones batches of palm 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 palm dates fumigated during the demonstrations, will also be undertaken to validate these observations.

Fumigation treatments undertaken with phosphine in the south of Tunisia will be carried out in a fumigation chamber provided by GID, 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 and cost.

b) Integrated Commodity Management

A demonstration will be undertaken in two palm date processing and packing plants to identify the critical points (operations, equipment, management policy, etc.) that affect infestation in palm dates as they enter palm date processing and packing plants. The demonstration will include the Medifruit premises because of the more rigorous demands imposed by "bio" palm dates for non chemical disinfestation treatments. The second site, which will be more representative of the industry, will be selected by Groupement Interprofessionnel des Dattes.

The demonstration, in both premises, 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 palm dates. The objective is to integrate existing procedures with the new techniques of fumigation into rational systems of pest and quality management that are compatible with the production systems in the palm date industry.

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

3.3.3 Project Coordination

The Project will be coordinated by the Agence Nationale de la Protection de l'Environnement, and implemented by UNIDO in cooperation with the Institut National Agronomique de Tunisie. UNIDO will draw up a subcontract for implementation of the demonstration of alternate technologies for palm date fumigation.

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

A National Project Coordinator (NPC) will be recruited to interact between the

local government institutions, the Groupement Interprofessionnel des Dattes, and the palm date processors and packers. The National Project Coordinator will be responsible for managing and supervising the entire demonstration project and evaluating the results. He 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 Agence Nationale de la Protection de l'Environnement of the Ministry of the Environment will be the Coordinating Institution. Final specifications for equipment required and a work plan will be elaborated after an agreement has been reached with the Ministry of the Environment 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 disinfection of palm dates, namely: phosphine, carbon dioxide and an integrated commodity management system.

ACTIVITIES	MONTH OF COMPLETION	RESPONSIBLE PARTY
Equipment - purchase, delivery & installation as per Annex A.	3	NPC + UNIDO
Preparation of an ICM program	12	Subcontractor + NPC
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 by 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 of successful implementation of 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 twenty fumigators fully trained in the technologies implemented during the course of the demonstration project.

ACTIVITIES	MONTH OF COMPLETION	RESPONSIBLE PARTY
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 and international date industry.

ACTIVITIES	MONTH OF COMPLETION	RESPONSIBLE PARTY
Preparation of a publication with the results of the project experiences	20	Subcontractor + NPC
Editing and distributing 60 copies of the publication	22	Subcontractor + NPC
Organization of a two day workshop to present the results to local and international representatives of the palm date industry.	24	Subcontractor + NPC

4.2 Project milestones

PROJECT MILESTONES

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

4.3 Project Implementation

The project will be coordinated by the Agence Nationale de la Protection de l'Environnement of the Ministry of the Environment. The project will be implemented by UNIDO in close cooperation with the Counterpart, Société Méditerranéenne Fruitière.

Final specifications for the equipment and work plan can only be elaborated after an agreement of the project proposal has been reached with INE and the collaborative 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	257,300
Contingency allowances (10%)	25,730
TOTAL PROJECT COSTS	283,030
Overhead Costs (13%)	36,794
FUNDING FROM THE MULTILATERAL FUND REQUESTED	319,824

6. PRE-REQUISITES

In accordance with the rules and regulations of the Executive Committee of 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 Société Méditerranéenne Fruitière, and UNIDO.

The Memorandum will specify all responsibilities of the Counterpart, Société Méditerranéenne Fruitière, in the construction of two concrete plinths at its own costs on which the fumigation containers 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.

ANNEX A

PRELIMINARY EQUIPMENT SPECIFICATIONS

Preliminary equipment specifications and breakdown of costs are as follows:

ITEM	DESCRIPTION	TOTAL COST (in US\$)
42.00	Two new and unused steel 20 ft freight containers built to Japanese specifications for gas-tightness, exclusive of carriage to Tunis.	18,000
42.00	Two sealed (gas-tight) heaters to be installed into the containers.	3,000
41.00	Two sets of PVC piping for gas recirculation.	1,000
42.00	Two explosion proof fans for recirculating fumigant gases.	1,800
42.00	Three electronic phosphine detectors, calibrated for fumigation concentrations, without cross sensitivity to carbon monoxide.	6,000
42.00	Three electronic phosphine detectors, calibrated for work space concentrations, specific to hydrides or known cross sensitivities.	3,000
42.00	Two electronic carbon dioxide detectors, calibrated for fumigation concentrations.	15,000
42.00	Three hand pump sets for detecting fumigants with detector tubes.	1,500
41.00	500 phosphine detector tubes.	5,000
41.00	500 carbon dioxide detector tubes.	5,000
41.00	Insect mortality analysis	2,000
	TOTAL	61,300

ANNEX B**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 m/m (five 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, according to the protocol which will be provided by the international expert, with phosphine at one palm date packing and processing plant in Tunis, and at Kebili site in the palm date growing area in south Tunisia.
7. Provide an adequate supply of cylinder phosphine (carbon dioxide/phosphine) with which the demonstrations to undertake .
8. Conduct a series of demonstrations of fumigation with carbon dioxide, according to the protocol which will be provided by the international expert, at one palm date packing and processing plant in Tunis.
9. Provide an adequate supply of food grade carbon dioxide with which the demonstrations to undertake.
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 Experts.
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 economical analysis of the results obtained.
15. Provide facilities and organize a national workshop to present and disseminate the results of the demonstration project.

ANNEX C

PROJECT BUDGET

BUDGET LINE	DESCRIPTION	W/M	US\$
11-50	International expert on ICM and fumigation	1	17,000
15-00	Internal travel		6,000
17-01	National Coordinator	24	60,000
21-00	Subcontract for fumigation as per Annex B		125,000
35-01	Workshop		5,000
41-00	Expendable equipment as per Annex A		13,000
42-00	Non expendble equipment as per Annex A		48,300
	Subtotal		274,300
51.00	Contingencies (10%)		27,430
	TOTAL PROJECT COSTS		301,730
	Overhead costs		39,225
	TOTAL PROJECT BUDGET		340,955

ANNEX D

**UNIDO
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION**

JOB DESCRIPTION

MP/TUN/98/XXX/11-50

Post title:	Consultant, specialist in ICM and commodities fumigation
Duration:	One month
Date required:	1998
Duty station:	Tunis (Tunisia) and home country
Purpose of project:	This 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 three sites in Tunisia.
Duties:	The Consultant is expected to: 1. Document the flow of 'palm dates' in the two demonstration plants and prepare a complete ICM programme. 2. Prepare the exact protocol for the demonstration fumigation experiments with phosphine. 3. Prepare the exact protocol for the demonstration fumigation experiments with carbon dioxide. 4. Prepare the comprehensive terms of reference for the subcontract.
Qualifications:	University degree in entomology or related fields with a large experience in commodities fumigation.
Language requirements:	English, French will be an asset.