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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: COLOMBIA

Fumigant

- Demonstration project - alternatives to the use of methyl bromide in banana growing at Ceribanano

UNIDO

PROJECT EVALUATION SHEET **COLOMBIA**

SECTOR: Fumigant ODS use in sector (1995): 45 ODP tonnes
 (Methyl bromide)

Project Title:

Demonstration project - alternatives to the use of methyl bromide in banana growing at CENIBANANO

Project Data	Methyl Bromide
	CENIBANANO
ODS phase-out (ODP tonnes)	N/A
Proposed project duration (months)	24
Incremental capital cost (US \$)	123,200
- including contingency (%)	10
Incremental operational cost (US \$)	N/A
Total project cost (US \$)	123,200
Local ownership (%)	-
Export component (%)	-
Amount requested (US \$) {Original}	123,200
{Revised}	
Cost effectiveness (US \$/kg)	N/A
National Coordinating Agency	Colombian Ministry of the Environment
Implementing Agency	UNIDO
Technical review completed?	-

<i>Secretariat's Recommendations:</i>	
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 banana growing at CENIBANANO

1. In 1995, methyl bromide consumption in Colombia was estimated at 45 metric tonnes; by 1997, based on a survey conducted by UNDP, consumption significantly decreased to about 3 tonnes. However, the Banana Research Centre (CENIBANANO), operating in Carepa, in Urabá region, estimates a current consumption of 25 metric tonnes, solely used in growing of bananas.
2. Banana cultivation for export started in Colombia at the end of the 19th Century in the coastal region of the state of Magdalena. During the 1930's, banana production for export became a very important economic activity and in subsequent years it was established as one of the main agricultural activities of the country. Banana production also started in the state of Antioquia, Urabá region, which later became an important production area. These two regions, which function independently of each other, are still the main growing regions in the country (28,000 ha in Antioquia and 14,000 ha in Magdalena).
3. Growing of bananas can be seriously affected by a series of diseases and pests, such as black sigatoka, fusarium wilt, nematodes and several insects, as well as the bacteria *Pseudomonas solanacearum* that produce the moko disease. This disease can cause severe losses in production if control measures are not undertaken. Methyl bromide is the fumigant of choice for the control of the moko disease, although growers in the Urabá region have found some alternative methods.
4. At present there is a moko eradication campaign implemented by the Association of Banana Growers (AUGURA) and supervised by CENIBANANO, in both growing regions of Urabá and Santa Martha. This campaign has focused mainly on prevention by tool disinfection, healthy plant material and isolation of infected areas. Training and information is also provided to growers and field workers.
5. The project is to demonstrate the technical and economical feasibility of an Integrated Pest Management (IPM) programme as an alternative to the use of methyl bromide for the control of the moko disease in bananas. IPM, a combination of various control measures aimed at reducing disease inoculum (i.e., crop sanitation, hygienic practices, restriction of traffic through infected areas) will be combined with application of two chemicals in low doses: dazomet (Basamid) a soil fumigant, and glyphosate, a non-selective herbicide.
6. IPM process and pre-treatment of soil with dazomet, will be performed simultaneously and compared with an area treated with methyl bromide as the control trial. Use of glyphosate will be considered as a third treatment. Trials will be carried out over a period of one year to cover a complete growth cycle. Plots will have a surface of one hectare, which is representative of actual commercial conditions. The trials will be closely observed by the field workers and data will be registered in detail.

7. The project will be implemented in co-ordination with the organizers of the moko eradication campaign, at the CENIBANANO premises in Urabá and Santa Martha regions, where growers have expressed a big interest in the project.

8. A national project coordinator, a specialist in banana production and IPM, 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. Also, national agro-economists and agronomists will be hired. The total cost of human resources is US \$97,000 including a subcontract for fumigation (US \$85,000) and internal travel (US \$2,000), representing 86.6 per cent of the cost of the project. The total cost of the equipment is US \$10,000.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

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

2. The project document states that "implementation of this project will probably result in a substantial reduction in, if not total elimination of the use of methyl bromide in Colombian agriculture".

3. The project was developed after careful examination of the prevalent growing conditions and extensive discussions with some of the larger banana growers as well as representatives of the banana growers' associations.

4. The Secretariat discussed with UNIDO issues regarding the eligibility of the project since bananas are not among the priority crops for demonstrating alternatives to methyl bromide, and alternatives to methyl bromide for the control of the moko disease have already been demonstrated in Colombia. The Secretariat also discussed issues regarding the salaries of international and national experts.

5. UNIDO indicated to the Secretariat that methyl bromide has already been phased out in banana plantations in the region of Uraba through the use of glyphosate technology. However, in Santa Martha region banana growers are still strongly against the use of this technology since it appears not to be cost-effective. By allowing CENIBANANO to fully demonstrate the proposed alternatives to methyl bromide in region of Santa Martha, the project would lead to a complete phase out of methyl bromide in Colombia.

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.

PROJECT DOCUMENT

COUNTRY: Colombia

PROJECT TITLE: Demonstration Project - Alternatives to the use of methyl bromide in banana growing.

SECTOR COVERED: Bananas

ODS USE BY SECTOR: 45 tons in 1995

PROJECT DURATION: 24 months

TOTAL PROJECT COSTS: US\$ 123,200

OVERHEADS OF
IMPLEMENTING AGENCY: US\$ 16,016

PROPOSED FINANCING BY
MULTILATERAL FUND: US\$ 139,216

IMPLEMENTING AGENCY: UNIDO

COORDINATING INSTITUTION: Unidad Técnica de Reconversión Industrial para la
Protección de la Capa de Ozono, Colombian
Ministry for the Environment

COUNTERPART INSTITUTION: CENIBANANO, Colombia

PROJECT IMPACT: A survey on methyl bromide consumption in Colombia has shown that it is used in one of the main growing banana areas for the control of the moko disease which is caused by the *Pseudomonas solanacearum* bacteria. After careful examination of the prevalent growing conditions, and extensive discussions with some of the larger banana growers as well as representatives of the two main growers' associations, it was determined that the best alternative approach to the use of MeBr would be an Integrated Disease Management Program, that is, a combination of various control measures aimed at reducing disease *inoculum*. (Crop sanitation, hygienic practices, restriction of traffic through infected areas and others.) The alternative chosen consists of the application of two chemicals in low doses: Dazomet (Basamid), a soil fumigant, and glyphosate, a non-selective herbicide. The project will also include the preparation of a technical and economic assessment of the technologies used and the dissemination of the results through the current "Moko Eradication and Prevention Campaign", organized by the Association of Banana Growers, AUGURA, through its Banana Research Center, CENIBANANO.

The implementation of this project will probably result in a substantial reduction in, if not total elimination of the use of methyl bromide in Colombian agriculture.

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1. BACKGROUND

Agriculture in Colombia is a vital and dynamic sector. It has three main components (i) coffee, (ii) flowers and (iii) bananas.

In a survey made in 1995, local methyl bromide consumption estimates gave a total of 45 mt, but according to a later survey¹, consumption had significantly decreased by 1997. However, CENIBANANO estimates suggest a much higher figure, closer to 25 mt.

ESTIMATED METHYL BROMIDE CONSUMPTION

(in metric tons)

Year	Imports	Consumption
1993	133	n.a
1994	72	50
1995	60	45
1996	0	n.a.
1997	10	3

Source: ICA, Colombian Institute of Agriculture and Electrofumigaciones Toro

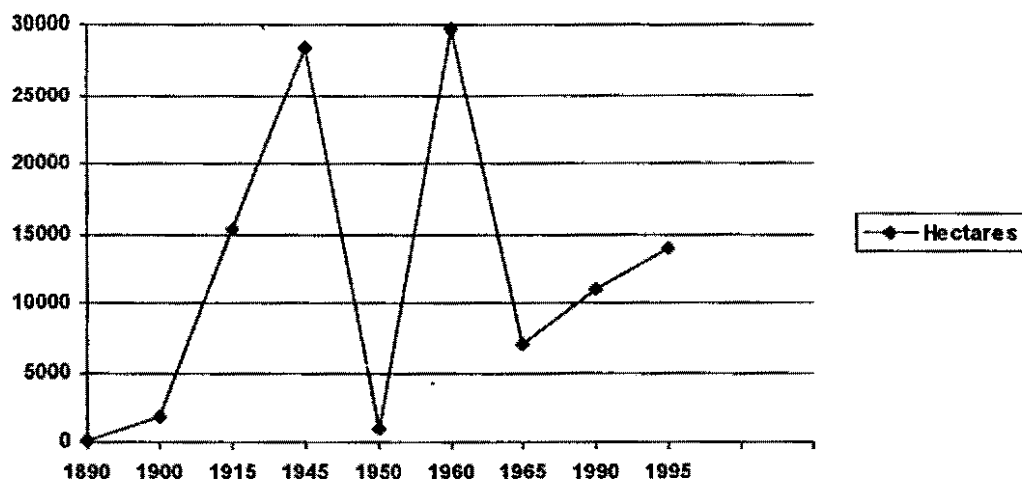
The 1995 survey has confirmed that in Colombia, methyl bromide is solely used in the production of bananas. Therefore, banana production has been the only field of activity selected for this project. For its preparation, close cooperation with banana growers, exporters, traders, researchers and other specialists of the sector has been instrumental.

Banana cultivation for export started in Colombia at the end of the nineteenth century in the coastal region of the state of Magdalena (capital, Santa Marta), when large investors from the United States helped develop production and shipping to other countries. During the 1930's, banana production for export became truly important and in subsequent years it was established as one of the main agricultural activities of Colombia.

Production was also started in the state of Antioquia (capital, Medellín), along the region of Urabá, which later became the stronger production area. These two regions, which function independently of each other, are still the main growing regions in the country. Banana production in Colombia has undergone different times of crisis due not only to local social and political problems, but also to international factors. At present, cultivation is decreasing and product diversification is being stimulated because of the fact that global banana production exceeds international demand.

¹ Marta Pizano. 1997 update for UNDP

Cultivated Area in Santa Marta Region



At present, 28,000 hectares of land used for banana cultivation in Antioquia generate over 18,000 jobs and more than 50,000 indirect ones. In Magdalena, 14,000 hectares under cultivation generate 10,000 jobs as well as 25,000 indirect ones. In 1997, Colombia exported approximately 82 million boxes of bananas worth ca. US\$ 465 million. This represents about 16% increase over the previous year. 46.5% of these exports, mainly banana Cavendish, went to the European Union.

BANANA EXPORTS (BOXES) FROM COLOMBIA

January-October 1997*

Country of destination	From Santa Marta	From Urabá	Total
Saudi Arabia	268,594		268,594
Belgium	7,097,152	20,103,320	27,200,472
Spain		9,330	9,330
Italy	1,151,909	3,617,710	4,769
Norway	9,010,812		9,010,812
Russia	2,693,777	3,282,679	5,976,456
United states	768,637	20,847,010	21,615,647
TOTAL	20,990,881	47,860,049	68,850,930
TOTAL EU	8,249,061	23,730,359	31,970,090
% EU	39.30%	49.58%	46.43%

* Preliminary data from AUGURA. (One box = 18.14 kg)

In 1963, the Association of Banana Growers, AUGURA, was formed with the aim

In 1963, the Association of Banana Growers, AUGURA, was formed with the aim of bringing growers and marketers together, working towards common objectives. For many years, members of the Association were exclusively from the Urabá area, but since 1994, many growers from Magdalena have joined. At present there are 236 members, representing 94% of banana exports and 90% of the cultivated area.

AUGURA, a non-profit organization, represents the banana sector both in Colombia and abroad. It has developed many programs, social and technical. The organization has offices in Medellín and Bogotá and holds a most important position within the country's agricultural associations. AUGURA has created CENIBANANO, a banana research center that operates in Carepa, in the region of Urabá. In recent years, CENIBANANO has been actively working in sustainable and environment-friendly production practices to help this sector reduce the amounts of pesticides used; give a better destination to residues; and, in general, reduce levels of contamination in all production areas.

Production of bananas can be seriously affected by a series of diseases and pests, such as black sigatoka, fusarium wilt, nematodes and several insects, as well as bacteria that produce the Moko disease. This disease can cause severe losses if control measures are not undertaken. Methyl Bromide is the fumigant of choice for moko control, although, at present, growers in Urabá have found some alternative methods. But it is still widely used in the Santa Marta area and in 1994, the estimated consumption was 32,000 kg. All persons contacted felt that demonstrations and research on alternative methods would be most useful, helping not only to achieve a definitive substitution but also to improve current control methods. At present there is a moko eradication campaign being conducted by AUGURA and supervised by CENIBANANO, in the Urabá and the Santa Marta areas, which could very well serve as a starting point for this demonstration project.

2. PROJECT OBJECTIVE

The objective of the project is to demonstrate the technical and economical feasibility of an Integrated Pest Management (IPM) program as an alternative to the use of methyl bromide for the control of moko disease in bananas. IPM will include the use of two chemicals but in very low doses.

Demonstrations will be carried out in coordination with the organizers of the moko eradication campaign already under way, both at the CENIBANANO premises in Urabá, and in the Santa Marta area, where growers have expressed a big interest in the project.

3. PROJECT DESCRIPTION

3.1 Proposed technology: Integrated Pest Management for Moko Disease in Bananas

Moko is a serious disease that affects bananas and plantains. Specifically, it is caused by *Pseudomonas solanacearum* bacteria, race 2. It is widespread in tropical America, but practically non-existent in Asia. It affects all plants of the *Musaceae* family and the *Heliconia*, a tropical ornamental plant that belongs to the same order as the bananas. Bacteria causing this disease are extremely aggressive and spread easily, completely destroying vast areas quickly if left untreated.

Infected plants wilt, young shoots dry out and bacterial ooze clearly exudates from affected tissues. Fruits tend to ripen prematurely and are generally abnormal. When pseudostems or fruit are cut open, a reddish discoloration is observed.

Although restricted in host range, *P. solanacearum* race 2 may prevail in the soil for six months, and sometimes longer, after its hosts have been eradicated. It has also been found at depths of over 1.50m in the soil. The bacteria are transmitted by insects, at what has been called an explosive rate, when they come in contact with flowers of infected plants. They also spread easily through infected plant material used for propagation, tools and vehicles, irrigation waters, workers performing cultural tasks, and even through domestic animals and children wandering about the cultivated fields. The disease can also spread through root grafts between adjacent plants.

The high incidence of the disease, combined with the susceptibility of the banana and plantain varieties used in Colombia, has led AUGURA to organize the "Moko Eradication and Prevention Campaign", in cooperation with the Colombian Institute of Agriculture (ICA), which declared a phytosanitary state of emergency in 1996 that is still in force.

The program is based on the work of phytosanitary brigades, made up of 50 inspectors (25 each for the Urabá and Santa Marta areas) trained to recognize the disease at its earlier stages, give growers adequate control instructions and apply and supervise eradication measures. Training and information is also provided to growers and workers by means of workshops, newsletters, etc. 50% of the program costs are covered by the growers through AUGURA, the other 50% by the Colombian Government through ICA.

Growers may join the eradication campaign on a voluntary basis, thus making an economic contribution through AUGURA. Growers must also cover costs associated with eradication and non-productive waiting periods necessary for eradication. But it is clear that farms will not be productive at all if disease is left untreated.

Integrated Pest Management is the modern approach to control different phytosanitary problems. It makes use of all available alternatives, not only chemical, to reduce pest populations and is a proven technique. In Colombia, the flower sector has many examples of success with IPM. The IPM programme will comprise:

Monitoring or scouting is also instrumental in determining a damage threshold upon which the decision to apply chemicals is made. It is also important as, over time, it generates a history of the disease in association to environmental conditions such as climate, soil pH, plant age, variety susceptibility and others. Finally, through adequate monitoring is possible to treat only infected areas when disease incidence warrants treatment, thus reducing quantities of chemicals needed.

- b. Cultural control, rouging infected plants, eliminating all plant residues and possible alternate hosts (weeds and others).
- c. Physical and mechanical control, by disinfecting tools, restricting worker, vehicle and animal circulation between infected and healthy areas and using only irrigation water that is not contaminated. Construction of pools containing disinfectants for treating feet and/or vehicles is considered useful.
- d. Biological control, mainly through the use of disease-free (certified) plant material for propagation. This is of utmost importance and is essential for the success of the project. Non-resistant varieties or successful predators have been reported so far for this disease.
- e. Chemical control, when needed, with appropriate chemicals, such as Basamid, and to treat problem areas only. Insecticides may be indicated to eliminate disease vectors.

Control of moko disease, as part of the CENIBANANO campaign, has focused mainly on prevention by tool disinfection, healthy plant material and isolation of infected areas. If infestation is severe, all plants around the focus of the disease, in a 5- to 10-m radius, will be treated. Treated plant material is then pulled out and placed in piles which are treated with herbicides and covered with a polyethylene film to prevent dissemination by insects. Infected areas are only replanted with bananas after the six-month waiting period required for the bacteria to die.

In this demonstration project, herbicides and soil fumigants, mainly glifosate and Dazomet (Basamid) but also metham sodium (Vapam), will be used both as pre-planting and disease treatment. Use of these chemicals should be included as part of a comprehensive IPM program for moko disease. Amounts used (measured in kg of active ingredient per hectare) will be carefully monitored, as over time, one of the main objectives of IPM is to maintain this quantity at its lowest possible effective level. In Colombian flower nurseries, for example, it has been demonstrated that, with an adequate IPM, 75% less pesticides can be used.

3.2 Project Implementation

3.2.1 Project location

The project will be implemented at the following sites:

- The CENIBANANO facility at Carepa, which is adequately equipped and has well-trained staff.
- The BANACOL and PROBAN facilities near Santa Marta. These are two large production and marketing firms which have offered their cooperation through ASBAMA, a producers association.

It is important to perform the demonstrations in both production areas in Colombia, not only due to geographical considerations but because environmental conditions are not the same and disease incidence and behaviour may vary. The demonstrations at Santa Marta will be supervised by CENIBANANO to ensure similar conditions, comparable methodology and subsequent evaluation.

3.2.2. Methodology

To this project's benefit, actual costs of treating with MeBr as compared to glyphosate as an alternative method have already been calculated by CENIBANANO with encouraging results. Furthermore, CENIBANANO is well on its way to persuade growers not to use MeBr as a soil fumigant, specially in the Urabá area.

Trials with the IPM alternative, pre-treatment of soil with dazomet, will be performed simultaneously with trials using methyl bromide in order to have a control trial. The glyphosate alternative will be considered as a third treatment, also subject to comparison. Trials will be carried out over a period of one year, with one full replicate in order to cover a complete production cycle. Plots will have a surface of one hectare, which is representative of actual commercial conditions. The trials will be closely observed by the field workers and data will be registered in detail. Close coordination with the Moko Eradication Campaign will be important, as it will be instrumental for the purpose of transferring the new technology and gathering important information.

3.2.3. Project Coordination

The project will be coordinated by a National Project Coordinator, a specialist in banana production and IPM, who will be responsible for the implementation of the demonstrations in cooperation with the implementing Agency. He/she will also be responsible for designing the trials; collecting and analysing the data and evaluating the results; and coordinating the services of project personnel. The following local project personnel will be required:

- 1 National Project Director, specialist in banana production and IPM (24 months on a part-time basis)

- 1 National Agronomist (working mainly in the Santa Marta area but also attending demonstrations at Urabá) 24 months

3.2.4. Institutional Arrangements

CENIBANANO, a banana research center, will be the counterpart institution, in charge of field demonstrations and logistic aspects. ASBAMA will also be kept closely informed of the progress of this project. *The Unidad Técnica de Reconversión Industrial para la Protección de la Capa de Ozono* (Technical Industrial Reconversion Unit for the Protection of the Ozone Layer), an agency of the Colombian Ministry for the Environment will be the coordinating institution.

4. OUTPUTS

4.1 Outputs and Activities

Output 1: A practical, technical and economical analysis of the implementation of an IPM as an alternative to methyl bromide using a) Glyphosate for host eradication and b) Dazomet or Vapam as a soil fumigant. Demonstration cases will be carried out under the same local conditions in two sites

ACTIVITIES	MONTH OF COMPLETION	RESPONSIBLE
Materials and chemicals - purchase and installation	2	UNIDO
Preparation of an IPM programme	2	Subcontract
Application of herbicide	12	Subcontract
Application of soil fumigant	12	Subcontract
Application of IPM principles and data collecting and interpretation	12	Subcontract
Replication of tests on full scale economic basis	24	Subcontract
Preparation of technical/economic analysis of results	12	Subcontract

Output 2: Training of project personnel in the technologies implemented during the demonstration project

ACTIVITIES	MONTH OF COMPLETION	RESPONSIBLE
On the job training on IPM	12	Subcontract
On-the-job training on soil fumigation with low dosage chemicals	12	Subcontract

Output 3: Dissemination of the results of the demonstration project (locally and among qualified representatives of Article 5 countries)

ACTIVITIES	MONTH OF COMPLETION	RESPONSIBLE
Preparation of a publication with the results of the project experiences	2	UNIDO
Editing and distribution of 200 copies of the report	2	Subcontract
Organization of two 3-day seminars to present the results to local growers from the two regions	24	Subcontract
Organization of a three day workshop to make a presentation of the results to qualified specialists from Article 5 countries	24	Subcontract

4.2 Project Implementation

The project will be coordinated by the Ozone Office in Colombia. The project will be implemented by UNIDO in close cooperation with CENIBANANO.

Final specifications for the materials and products needed can only be elaborated after an agreement of the project proposal has been reached between the Ozone Office and CENIBANANO.

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

4.3 Milestones

PROJECT MILESTONES

YEAR	ONE				TWO			
QUARTER	1	2	3	4	1	2	3	4
1. Purchase of materials and supplies	###							
2. IPM demonstration and implementation		###	###	###				
3. IPM plus glyphosate		###	###	###				
4. IPM plus dazomet		###	###	###				
5. On-the-job training		###	###	###				
6. Replication on full-scale commercial basis						###	###	###
7. Preparation of publication						###	###	
8. Editing and distribution of publication							###	###
9. Workshop								###

5. PROJECT COSTS

Total project costs are as follows:

TOTAL INCREMENTAL COSTS	112,000
Contingency allowance (10%)	11,200
TOTAL PROJECT COSTS	123,200
Overhead costs (13%)	16,016
FUNDING FROM THE MULTILATERAL FUND REQUESTED	139,216

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 construction works, provision of additional equipment, machinery, tools, services, instrumentation, raw materials, germplasm, chemical or microbiological analysis, fuel, transportation of experts, etc, will have to be covered by the counterpart.

Therefore, prior to the implementation of the project, a memorandum of understanding has to be prepared and approved by the project/government authorities concerned and UNIDO. The memorandum will specify all responsibilities of the counterpart and will be considered as an integral part of the project document.

ANNEX A

PRELIMINARY EQUIPMENT SPECIFICATIONS

BU-LI	DESCRIPTION	US\$
41-00	Chemicals, such as herbicides, fumigants, insecticides and formaldehyde	1,000
41-00	Protective application gear (masks, gloves, etc.)	1,000
41-00	Miscellaneous small equipment, such as tents and tools for sample collection	2,000
42-00	Pesticide application equipment (injectors)	1,000
42-00	Irrigation/fertilizer system	5,000
	TOTAL	10,000

ANNEX B**PRELIMINARY TERMS OF REFERENCE FOR THE SUBCONTRACT**

The subcontractor is expected to provide the following services:

1. The services of 3 local experts as described in Annex E, namely:
 - 1 Project Coordinator, specialist in banana production and IPM (8 m/m over a period of 24 months)
 - 1 Agro-economist (2 months)
 - 1 Agronomist (24 months, working mainly in the Santa Marta area, but also present at the demonstrations in Urabá)
2. Daily transportation for the local experts, from the premises to the demonstration fields.
3. Transportation for the international (external) experts, from the premises to the demonstration fields.
4. Transportation of the equipment and supplies to the project sites.
5. Execution of 9 demonstration trials.
6. Adequate supply of disease-free planting material (preferably obtained by in vitro shoot-tip culture); preparation of soil and implementation of the IPM, following indications of the international expert.
7. The services of manual workers to implement the above (i.e. to do the scouting and monitoring, record pertinent data, etc.) and for regular maintenance of the plots.
8. Construction and maintenance of pools for feet and vehicle disinfection at entrance of demonstration units.
9. Preparation of a paperback publication containing a description of the results obtained.
10. Organization of a 2-day workshop, including visits to the field, for 15 to 20 individuals, of which, 5-8 from Article 5 countries which will be invited by UNIDO

ANNEX C

PROJECT BUDGET

BUDGET LINE	DESCRIPTION	W/M	US\$
11-01	Consultant on IPM	0.5	10,000
15-00	Internal travel		2,000
21-00	Subcontract as per Annex B		85,000
35-01	Workshop		5,000
41-00	Expendable equipment as per Annex A		10,000
	Subtotal		112,000
51.00	Contingencies (10%)		11,200
	TOTAL PROJECT COSTS		123,200
	Overhead costs		16,016
	TOTAL PROJECT BUDGET		139,216

ANNEX D
JOB DESCRIPTION

UNIDO
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

JOB DESCRIPTION

MP/COL/98/11-51

Post title:	Consultant, specialist in Integrated Pest Management
Duration:	0.5 months
Date required:	1998
Duty station:	Bogotá, with travel to Santa Marta, Colombia
Purpose of the project:	To demonstrate the technical and economical feasibility of Integrated Pest Management as an alternative to methyl bromide in the control of moko disease in bananas, using a) glyphosate (a non-selective herbicide) and b) dazomet (a soil fumigant) as chemical components. To disseminate the results among qualified specialists from top banana producers in Article 5 countries.
Duties:	The Consultant is expected to: 1. In cooperation with the local experts and the staff of CENIBANANO, give the right orientation to the entire demonstration programme and monitor it. 2. Prepare an IPM programme for implementation using the two alternative chemicals chosen. It is essential to establish a damage threshold on which to base the decision to apply chemicals, and to measure carefully the amount of active ingredients used. 3. Monitor the implementation of chemical control measures alternative to methyl bromide for the control of moko disease within the framework of the IPM concept. 4. Design and monitor the implementation of the demonstration tests on a full-scale commercial basis.

6. Review the draft document with the technical and economic data resulting from the demonstration cases of the alternative technologies.

7. Prepare a succinct mission report.

Qualifications: University degree in agriculture or related field, with experience in Integrated Pest Management in open field crops.

Language requirements: Spanish and English

ANNEX E
JOB DESCRIPTIONS
(Subcontract)

JOB DESCRIPTION #1

Post title:	National Project Coordinator, specialist in banana production and Integrated Pest Management
Duration:	Eight months over a period of two years
Date required:	1998
Duty station:	Colombia
Purpose of the project:	To demonstrate the technical and economical feasibility of Integrated Pest Management as an alternative to methyl bromide in the control of moko disease in bananas, using a) glyphosate (a non-selective herbicide) and b) dazomet (a soil fumigant) as chemical components. To disseminate the results among qualified specialists from top banana producers in Article 5 countries.
Duties:	The national expert is expected to: 1. In cooperation with the local and international experts and the staff of CENIBANANO, direct the execution of the entire demonstration programme. 2. Cooperate in the preparation of an IPM programme for the control of moko disease in bananas, for implementation using the two chemicals chosen as alternatives to methyl bromide. 3. Monitor the implementation of alternative chemical control measures for the control of moko disease within the framework of the IPM concept . Ideally, establish a damage threshold on which to base the pesticide applications. 4. Implement the demonstration tests on a full-scale commercial basis. 5. Participate in the training programmes. 6. Prepare a comprehensive document with the chemical and economic data resulting from the demonstration cases of the alternative technologies. 7. Organize and conduct a seminar, directed to Article 5 countries, where results obtained are presented.

Qualifications:	University degree in agriculture or related field, with large experience in banana production and knowledge of Integrated Pest Management in open field crops.
Language requirements:	Spanish and working knowledge of English

JOB DESCRIPTION #2

Post title:	National Expert, agro-economist
Duration:	2 months
Date required:	1998
Duty station:	Santa Marta, Colombia, with travel inside the country.
Purpose of the project:	To demonstrate the technical and economical feasibility of Integrated Pest Management as an alternative to methyl bromide in the control of moko disease in bananas, using a) glyphosate (a non-selective herbicide) and b) dazomet (a soil fumigant) as chemical components. To disseminate the results among qualified specialists from top banana producers in Article 5 countries.
Duties:	The National Expert is expected to: 1. Prepare a study of the real costs of each of the alternative methods chosen, as compared to the real cost of using methyl bromide, based on the demonstration tests carried out by the project. 2. Cooperate in the preparation of a comprehensive document with the technical and economic data resulting from the demonstration cases of the alternative technologies. 3. Participate in the international workshop for article 5 countries.
Qualifications:	University degree in agricultural economics. Familiarity with banana production would be desirable.
Language requirements:	Spanish and working knowledge of English

JOB DESCRIPTION # 3

Post title:	National Expert, field agronomist
Duration:	Two years
Date required:	1998
Duty station:	Santa Marta, with travel to Urabá, Colombia
Purpose of the project:	To demonstrate the technical and economical feasibility of Integrated Pest Management as an alternative to methyl bromide in the control of moko disease in bananas, using a) glyphosate (a non-selective herbicide) and b) dazomet (a soil fumigant) as chemical components. To disseminate the results among qualified specialists from top banana producers in Article 5 countries.
Duties:	The National Expert is expected to: 1. In coordination with the other local and international experts, execute the entire demonstration programme in the field. 2. Participate in the technical discussions and in the training programmes on alternatives to the use of MeBr in agriculture. 3. Participate in the preparation of a report on the tests done on a full commercial basis. 5. Participate in the international workshop for Article 5 countries.
Qualifications:	University degree in agriculture, with experience in banana production.
Language requirements:	Spanish and working knowledge of English

ANNEX E
GOVERNMENT REQUEST



16 JAN 1998
S/T/AGRO

UNIDAD TECNICA DE RECONVERSION INDUSTRIAL PARA LA PROTECCION DE LA CAPA DE OZONO

Santafé de Bogotá, Enero 15 de 1998

Doctor
ANTONIO SABATER
UNIDO
Fax # 90 431 211316849
Viena-Austria

Distinguido Doctor Sabater:

Después de haber revisado el documento recibido en la Unidad de Ozono relacionado con el proyecto de demostración "Alternativas del uso del bromuro de Metilo en la producción de Banano", nos manifestamos en acuerdo con la propuesta elaborada.

Esperamos se logre la aprobación de este proyecto, para una mejor implementación del Protocolo de Montreal en el país.

Cordialmente,


Ing. Marco Aurelio Pinzón
Coproductor Nacional