AGENCY FOR INTERNATIONAL DEVELOPMENT

Washington, D. C. 20523

PROJECT PAPER

MOROCCO: Locust Control Project (608-0196)

May 11, 1988

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete) — Amendment Number: _____ — DOCUMENT CODE: 3

2. COUNTRY/ENTITY: Morocco

3. PROJECT NUMBER: 608-0196

4. BUREAU/OFFICE: ANE — 608

5. PROJECT TITLE (maximum 40 characters): The Morocco Locust Control Project

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 09 DD 30 YY 90

7. ESTIMATED DATE OF OBLIGATION (Under "B." below, enter 1, 2, 3, or 4): A. Initial FY 88 — B. Quarter 2 — C. Final FY 90

8. COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY 88 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total						
(Grant)	( )	( )	($3,500)	( )	( )	($3,500
(Loan)	( )	( )	(0)	( )	( )	(0
Other U.S. 1.						
Other U.S. 2.						
Host Country						$31,000
Other Donor(s)						$ 9,000
TOTALS						$43,500

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) FST		07C		0	0	$3,500	0	$3,500	0
(2)									
(3)									
(4)									
TOTALS				0	0	$3,500	0	$3,500	0

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

11. SECONDARY PURPOSE C

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code							
B. Amount							

13. PROJECT PURPOSE (maximum 480 characters)

To assist the GOM to control the desert locust.

14. SCHEDULED EVALUATIONS: Interim MM 02 YY 89 — MM — YY — Final MM — YY

15. SOURCE/ORIGIN OF GOODS AND SERVICES: ☐ 000 ☐ 941 ☒ Local ☐ Other (Specify) _____

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a _____ page PP Amendment)

USAID/Morocco Controller's approval of proposed methods of implementation and financing.

Richard Warin
Controller

17. APPROVED BY — Signature: Charles W. Johnson — Title: Director — Date Signed: MM 05 DD 11 YY 88

18. DATE DOCUMENT RECEI IN AID/W, OR FOR AID/W DI MENTS, DATE OF DISTRIBU MM DD YY

AID 1350-4 (6-79)

Swarms of Locusts Threatening North Africa

By Paul Delaney
New York Times Service

TUNIS — Treating it as an invading army, Tunisia, Algeria and Morocco have mobilized to fight the most serious infestation of locusts in over 30 years.

Billions of the insects have already caused extensive damage to crops and are threatening to inflict great harm to the delicate economies of North Africa. Millions of dollars have been spent in the effort, and much more — $150 million, one official estimated — will be required from meager treasuries.

"The invasion is drawing increasing worry from southern European countries, too. They fear the highly unpredictable and mobile insects will be carried across the Mediterranean Sea if not stopped in North Africa.

The European Parliament has urged members to help, and the European Community has contributed $2.5 million. Aid is being provided by at least a dozen institutions and countries, including the United States, Canada and the United Nations.

"The locusts are an immediate threat to this city. Millions are within a few miles; a few have been spotted on lawns and swarming about. But the biggest concentrations in Tunisia are southwest of here, breeding and swarming, waiting to travel wherever air currents push them.

Millions more are concentrated in the Atlas Mountain in Morocco where high peaks have acted as a barrier to the advance toward the country's

and the cities of Casablanca, Rabat, Fez and Marrakech. "We are in a state of general alert, said Edouard Saouma, director general of the United Nations Food and Agriculture Organization. "Swift and decisive action is needed to avoid a major regional food crisis."

There are also high concentrations of the locusts in the desert of Algeria. Experts say the normal pattern would be for the locusts to turn east and head back this way, threatening this country more as well as others. Some of the insects have also been spotted in Italy and Malta in recent weeks.

The threat has forced some neighboring countries who have not enjoyed the best of relations into closer cooperation, though not as close as some officials believe is necessary. Algeria and Morocco have momentarily put aside their differences over the Polisario war in the Western Sahara to join in the effort to stem the spread.

A Moroccan official said the nations of the region were discussing establishing a permanent agency specially trained in the latest techniques and utilizing the most modern equipment to battle the locusts. Representatives of the three countries along with those from Libya and Mauritania, have held meetings, although backbiting has been evident. For officials of each have

In Tunisia, the government

others are making enough of

central coordinating committee

THE MOROCCO LOCUST CONTROL PROJECT PAPER

(608-0196)

USAID/Rabat

May, 1988

C

ACTION MEMORANDUM TO THE MISSION DIRECTOR

FROM: Kenneth G. Schofield, Supervisory Program Officer

SUBJECT: The Morocco Locust Control Project, 608-0196

PROBLEM: Your approval is required for the Project Paper and the Project Authorization for the Morocco Locust Control Project.

DISCUSSION: For the first time in twenty years, in 1987, desert locusts (Schistocerca gregoria) entered Morocco, threatening disaster and significant agricultural losses. As a consequence of the severity of the influx of locusts and their threat to agriculture, on November 4, 1987 the Government of Morocco (GOM) requested that USAID join in an attack against them. AID's Office of Foreign Disaster Assistance (OFDA) worked with USAID Morocco to obtain immediate technical assistance, airplanes, and malathion to assist the GOM. Since USAID contracted entomologists predicted that Morocco would again face a serious locust infestation in October, 1988, the Mission decided to design the Locust Control Project. A PID was submitted to AID/Washington and approved on February 9, 1988, delegating to you approval of the project paper under Redelegation of Authority No. 113.3A, as amended April 4, 1985. Subsequent to the PID, Morocco was again hit by an unexpected locust attack of potential plague proportions in March 1988. The GOM again requested emergency assistance from USAID on March 10, 1988. The Mission turned to OFDA for assistance. Expected to last until the end of June, 1988, the current locust invasion is approximately five times more severe than the 1987 invasion and has affected all Maghrebian countries. It has required both GOM and donor emergency assistance. USAID has worked with OFDA to procure 100,000 liters of malathion, 183,200 liters of carboryl and to initiate spray operations with two Turbo Thrush aircraft.

Because of the unexpected infestation, the Morocco Locust Control Project will begin procurement immediately after project authorization in order to obtain more inputs for the current campaign as well as to make sure USAID is ready to assist the GOM when the locusts return in October, 1988.

The goal of the Morocco Locust Control Project is to save agricultural and livestock production from physical destruction and enormous monetary losses. The purpose of the project is to assist the GOM control the desert locust.

The outputs of the project include: (1) increased GOM capacity to treat desert locust invasions with appropriate aircraft and pesticides; (2) trained Moroccan personnel for proper handling and use of pesticides and the provision

of pesticide safety equipment; and (3) improved efficiency of control operations including ground surveillance, ground to air communication, and control strategies.

Inputs include pesticides, flight time of two turbo thrushes, test kits, pesticide safety equipment, ground marking equipment, radios, spray systems for Moroccan helicopters, and technical assistance.

Issues raised by the ANPAC are laid out in the Summary and Recommendations Section of the Project Paper and addressed in appropriate sections of the paper.

The Mission review was held on Monday, May 2, 1988. At that meeting, the Mission Review Committee recommended that the project be approved, subject to some small corrections in the project text.

The Congressional Notification expired on April 14, 1988.

RECOMMENDATION:

(1) That you approve the Morocco Locust Control Project by signing the facesheet of the Project Paper.

(2) That you sign the attached Project Authorization for a life-of-project total of $3,500,000.

DRAFTER:RTHOMPSON:ub:5/4/88

CLEARANCES:
Ronald Stryker, DADO
Richard Warin, CONT
Janet C. Ballantyne, D/DIR

PROJECT AUTHORIZATION

Name of Country:

Name of Project: Locust Control Project

Number of Project: 608-0196

1. Pursuant to Section 531 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Morocco Locust Control Project for Morocco (the "Cooperating Country" involving planned obligations of not to exceed $3,500,000 in Economic Support Grant Funds over a two and one half year period from date of authorization, subject to the availability of funds in accordance with the AID OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The project will assist the Government of Morocco to control the desert locust and hence to save agricultural and livestock production from physical destruction and enormous monetary losses.

3. The Project Agreement shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as AID may deem appropriate.

a. Source and Origin of Commodities, Nationality of Services

Commodities financed by AID with grant funds shall have their source and origin in Morocco or in the United States except as AID may otherwise agree in writing. Except for ocean shipping, the suppliers of commodities or services financed by grant funds shall have Morocco or the Unites States as their place of nationality, except as AID may otherwise agree in writing.

Ocean shipping financed by AID under the project shall, except as AID may otherwise agree in writing, be financed only on flag vessels of the United States. The requirements of the Cargo Preference Act will be met with respect to all commodities financed by AID that are transported on ocean vessels.

b. Conditions Precedent and Covenants

The Project Agreement will contain the standard condition precedent as follows:

> Prior to the first disbursement under the Grant, or to the issuance by AID of documentation pursuant to which disbursement will be made, the Grantee will, except as the Parties may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

A statement of the function and the name of the person holding or acting in the office of the Grantee and of any additional representatives, together with a specimen signature of each person specified in such statement.

The Project Agreement will contain special covenants as follows:

(a) The GOM agrees to utilize only U.S. registered and approved insecticides in U.S. financed aircraft and equipment and to follow recommended procedures for each insecticides in spray operations.

(b) The GOM agrees to follow AID policy regarding the disposal of empty drums and containers of insecticides that are AID financed.

Charles W. Johnson, Director

May 11, 1988
Date

LIST OF PROJECT AND MISSION REVIEW COMMITTEE MEMBERS

USAID Project Design Committee

Ronald Stryker	Deputy Agricultural Officer
Robert Hellyer	Agriculture Project Officer
Randal Thompson	Project Development/Evaluation Officer
James Smith	Program Economist
M'Hamed Hanafi	Agriculture Program Advisor

Mission Review Committee

Charles Johnson	Director
Janet Ballantyne	Deputy Director
Kenneth Schofield	Supervisory Program Officer
Rollo Ehrich	Agricultural Development Officer
Richard Warin	Controller
Barnett Chessin	Executive Officer

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I. SUMMARY AND RECOMMENDATIONS

A. Summary Background

For the first time in twenty years, in 1987, desert locusts (Schistocerca gregoria) entered Morocco, threatening disaster and significant agricultural losses. Swarms of desert locusts, which had migrated from Chad, invaded Niger in early summer, 1987. Breeding occurred and a large new generation was produced. At the same time, locust hatching was apparently taking place in Northern Mali, Mauritania, and Southern Algeria. In October, massive swarms of locusts moved northwest across the Sahara on a vast front. They reached Tindouf, in western Algeria, Djanet, in south-eastern Algeria, and Sidi Bel-Abbes, close to the Mediterranean coast of Algeria. Swarms moved into eastern Morocco where they were first sighted in late October. The first confirmed sightings were made south of the Anti Atlas and High Atlas mountain ranges. Soon after the first sightings, additional swarms began arriving from Northern Mauritania and the Western Sahara. Numerous swarms were sighted the last week of October along a front from Tan Tan in the southwest, along the Oued Draa River Valley, to Bouafra (approximate distance of 1000 kilometers).

As a consequence of the severity of the influx of locusts and their threat to agriculture, on November 4, 1987 the Government of Morocco (GOM) requested that USAID join in an attack against them. AID's Office of Foreign Disaster Assistance (OFDA) worked with USAID Morocco to obtain immediate technical assistance, airplanes, and malathion to assist the GOM. The EEC, the Portuguese, the Spanish, the Germans, and the French also assisted the GOM during the 1987 campaign. The Moroccans stood very much alone in the region in developing a strategy against the locusts, obtaining very little information or guidance from other countries to the south, from which the locusts originated, nor from organizations such as the FAO. Hence the American assistance was especially critical to the GOM in that the response was both immediate and appropriate to meet the problem.

Two American aircraft (Turbo Thrush) were moved from Dakar, Senegal to Guelmin, Morocco, and 40,000 liters of malathion insecticide were air-lifted from the United States to Agadir shortly thereafter. A logistical ground support team of three persons was assembled to support the operation. Subsequently, three American entomologists assisted the GOM and USAID to assess the biological aspects of the locust infestation and to advise the GOM on spray operations. The GOM provided overall coordination for spray operations and provided the USAID Turbo Thrush aircraft with pesticides and fuel. The USAID aircraft operation was assisted by AID-funded ground to air communication radios and strobe lights. Motor pumps (used to transfer malathion from barrels to planes) and other logistical needs were also provided by USAID. The total amount of AID support was $650,000. The U.S. provided approximately 125 hours out of a total 1,325 hours of donor provided spray aircraft flight time. Moroccan helicopters and fixed-wing aircraft provided an additional 650 hours of flight time. A total of about 200,000 hectares were sprayed during the November to January campaign. 180,000 of these hectares were sprayed from the air, of which the U.S. sprayed 30,000. AID provided a total of 5.5 person months of technical assistance.

Due to the prediction by entomologists that the locust threat would repeat itself during October, 1988 and possibly October, 1989, and due to the GOM's expressed need for further support, USAID/Morocco decided to design a longer term bilateral project to assist the GOM with a locust control strategy that would be in place by October 1988. Consequently, a PID was drafted and approved by AID/Washington on February 9, 1988. However, Morocco was again hit by an unexpected locust attack of potential plague proportions in March 1988. The GOM again requested emergency assistance from USAID on March 10, 1988. The Mission turned to OFDA for assistance, and on March 22, 1988, the AID Administrator signed the waiver determination which allowed the procurement of pesticides.

The current locust invasion is approximately five times more severe than the 1987 invasion and has affected all Maghrebian countries. It is expected to last through June of 1988 and has required both GOM and donor emergency assistance. USAID has worked with OFDA to procure 100,000 liters of malathion, 183,200 liters of carboryl and to initiate spray operations with two Turbo Thrush aircraft. The two Turbo Thrush aircraft sprayed about 30,000 hectares and clocked about 120 hours between March 27, and April 20, and will continue to work through the end of June, 1988. USAID does not anticipate the need for additional pesticides during this campaign.

Entomologists still predict that the locusts will return to Morocco in potentially plague proportions in October, 1988 and create a serious threat until January, 1989. Depending on the success of continuing control procedures both in Morocco and in other countries, the locusts could again return in March to June, 1989, and again in October, 1989 and March, 1990. There is even a chance that the locust problem could continue over the next seven to eight years. This project will specify USAID's control strategy through January, 1989 and allow flexibility for future U.S. support for the GOM control efforts over the period until the project's PACD of September 30, 1990. Due to the historical unpredictability of the locust, it is virtually impossible to plan with certainty USAID's contributions over the forseeeable future. USAID will utilize periodic assessments and continuous monitoring of the problem both in Morocco and on a regional level to determine specific needs for assistance after January, 1989.

USAID assistance provided during each successive campaign is expected to progressively augment the overall capability of the GOM to control the locust problem. For example, assisting the GOM to equip its own helicopters with spray systems will increase its capacity to deal with future campaigns and hopefully decrease the need for donor assisted aircraft. Likewise, other commodities such as radios, health testing kits and technical assistance provided now are expected to have a longer term impact that progressively improves the efficiency and capacity of the GOM to control the locust problem.

B. Summary Project Description

The goal of the Morocco Locust Control Project is to save agricultural and livestock production from physical destruction and enormous monetary losses. The purpose of the project is to assist the GOM control the desert locust.

The project will provide technical assistance, airplane flight hours, commodities, spray systems for GOM helicopters, logistical equipment, and pesticides to assist the GOM in its battle against the desert locust. Based on the strategy currently employed in fighting the locust, the project will provide an assistance package for each campaign. However, because it is extremely difficult to predict the magnitude of locust invasions in the future, and hence, the specific nature of USAID assistance, the project will utilize a rolling design based on periodic assessments to refine the assistance package. For the current campaign (through June 1988), priority assistance has been pesticides and spray aircraft now in place. Additional emergency inputs for the current campaign consist of protective clothing, health monitoring kits and ground and logistical support items (radios, grounding marking flares, etc.).

For the campaign beginning in October 1988 and lasting through January 1989, USAID will provide a minimum package of assistance consisting of additional pesticides, continuing services of the two Turbo Thrush aircraft, spray systems to equip Moroccan Bell 205 helicopters, technical assistance and possibly other commodities. This package will be further refined based on assessments made in August and September 1988.

The outputs of the project include: (1) increased GOM capacity to treat desert locust invasions with appropriate aircraft and pesticides; (2) trained Moroccan personnel for proper handling and use of pesticides and the provision of pesticide safety equipment; and (3) improved efficiency of control operations including ground surveillance, ground to air communication, and control strategies.

C. Summary Financial Plan

1. AID Contribution

	5/15/88-6/88	9/88-1/89	Totals
Technical Assistance	37,500	40,000	77,500
Turbo Thrush Air Time	238,650	354,800	593,450
Pesticides	—	1,448,932	1,448,932
Miscellaneous Commodities	177,500	—	177,500
Spray Systems	—	312,500	312,500
Contingency	—	890,118	890,118
TOTAL	453,650	3,046,350	3,500,000

2. GOM Contribution

The GOM anticipates spending approximately 250,000,000 DH or $31.2 million for the current campaign. For the sake of planning, this amount will be assumed for each additional campaign.

3. Other Donor Contribution

It is anticipated that donors will contribute approximately 72,000,000 DH or $9 million for the current campaign. Pledges have not yet been received for future campaigns.

D. Recommendations

The ANPAC cable found in Annex J. of this project paper raised several issues regarding the project, including (1) whether the project could be carried out through OFDA; (2) whether the project could be approved fast enough to complete procurement for October campaign; and (3) whether project sustainability is a concern. These issues have been dealt with in this paper. The project will be carried out through the normal bilateral mechanism rather then OFDA. Of course, if the locust infestation exceeds all predictions, an emergency situation could arise and, in that case, a determination would be made whether to utilize OFDA or not. The project will be approved in early May to allow adequate lead time to employ normal AID procurement regulations and mechanisms. Alternative procurement strategies are also recommended in case commodities must be procured due to "unforeseen urgency." The institutional analysis reconfirmed AID/Washington's determination that sustainability is not an issue.

An in-depth environmental assessment, institutional analysis and technical analysis were completed during the project design. Based on these analyses, the project committee has determined that the proposed activities are environmentally, technically, and administratively feasible. The committee recommends, therefore, that the Morocco Locust Control Project (608-0196) be approved and authorized.

II. BACKGROUND AND RATIONALE

A. The Locust Problem

1. Locusts in History

Locusts and grasshoppers have caused concern since the beginning of recorded history. Their carved images appear on tombs at Saggara, Egypt and in murals and paintings at Ninive and Sharquat, Iraq. They have brought fear and devastating crop losses at one time or another to every continent.

Early man, though principally a hunter, experienced problems from locusts which destroyed grasses upon which man's prey fed. This situation became even more severe when man became a grower of crops. A locust invasion of Libya in 125 B.C. resulted in the death of 800,000 people from starvation and disease.

Depending on the duration and severity of attack, economic loss may vary from isolated farmers losing a portion of a crop to the destruction of the food supply of an entire village or region. Locusts eat their weight in food every day. In 1958, locusts destroyed 167,000 tons of grain in Ethiopia, sufficient to feed one million people for a year. One locust swarm was measured at 400 square miles (ca. 1025 km. sq.) containing at least 40 thousand million locusts weighing 80,000 tons.

The most feared of all the locusts worldwide is the Desert Locust. The total area invaded during Desert Locust plagues extends over some 29 million sq. km. involving more than 60 nations. Unlike the other locusts, the Desert Locust has no clearly identifiable outbreak areas. Between plagues, this locust occupies an area of approximately 14 million sq. km. of desert and sub-desert. Within this recession area are a number of areas that are considered primary breeding and reproduction areas. These include the Red Sea, coastal areas of Sudan and Ethiopia, the northern Somalia coast, Tibesti mountains of Chad, Air of Niger, Adrar des Iforas of Mali, and Ahaggar of Algeria. Since control in these breeding areas is extremely difficult to impossible at the present time, and given favorable moisture conditions, widespread uncontrolled breeding over several generations can occur. Crowding for more than one generation is required to produce the fully gregarious characteristics of plague proportions. This occurs when either a prolonged rainy season allows for the production of several successive generations in the same area, or when a partially gregarized population moves to an alternative seasonal breeding area with conditions continuing to favor gregarization. Otherwise, the population may revert to a partially or wholly solitary type. The Desert Locust is known for its long range pattern of migration as much as several thousand kilometers within a single generation.

The desert locust has a potential natural increase of 100 times or more per generation and as many as 6 generations per year. Consequently for plague prevention and population suppression the minimum standard of mortality must

be aimed at 98% of the entire population. Gregarious locusts that are missed or are considered too dispersed to attack can lead to a building population, generation by generation, and with each succeeding generation the problem becomes increasingly difficult to control.

2. The Regional Problem in Africa

Desert Locust breeding is possible within very broad limits of rainfall, from under 50 mm to over 1,000 mm. It has been determined that the area where swarm breeding usually occurs lies between 80 mm and 199 mm of rain fall. The Sahelo-Saharan zone, with 50 mm - 200 mm of rain falling only during the hot summer period, has the highest frequency of breeding. In summer, the potential breeding area extends across Africa between 14 and 20 degrees north latitude, south into Ethiopia, across the southeastern edge of the Arabian peninsula, and into Pakistan and northwestern India.

In winter, breeding is concentrated in the Somali peninsula and along the Red Sea. Breeding may also occur in Pakistan and northwest India, further south in east Africa, and in scattered areas across the summer breeding area of west Africa. In spring, breeding takes place in northern and northwest Africa, Arabia and the Middle East, Iran and Pakistan.

Much of northwest Africa lies outside of the Desert Locust recession area. This area is affected by Desert Locusts only when gregarization takes place to the south and swarms move northward in the late fall, winter or early spring, often when frontal systems developing in Europe move far enough south to create low pressure areas in northern Africa, bringing into them a southerly flow of air from high pressure areas to the south. During years of adequate rainfall, extensive breeding can occur during the late fall and winter in what is termed the intermediate breeding area of Mauritania and the western Sahara.

Following the end of the Sahel drought, a rise in the density of solitarious Desert Locusts was observed in southeastern and central Mauritania and northwestern Mali. By 1986, some control efforts were mounted in Mauritania by control teams from Algeria. During mid to late summer 1987, swarms from Sudan and northern Chad migrated westward to breeding areas in northern Niger, Mali and southern Algeria. The progeny of these swarms invaded Morocco in the fall. In the meantime, breeding continued in the intermediate breeding area. In the early spring, swarms developing in the western portion of the intermediate breeding area invaded southern Morocco, while those developing in the eastern portion migrated north-eastward across Algeria to Tunisia. These may have been supplemented by swarms developing from breeding in central Algeria.

As a consequence, North Africa currently faces its greatest danger of sustained Desert Locust infestation since the decline of the last major plague over a quarter century ago. Desert Locust plagues, in the absence of widespread concerted control efforts, tend to maintain plague status for 7 to 8 or more years, followed by a prolonged recession period, averaging seven years.

The last major desert locust plague ended in 1962. Since then, there have been 3 major population upsurges: 1967-68, 1974-76, and 1987-88. Effective, early control intervention during the 1967-68 and 1974-76 upsurges, for the first time in recorded history, suppressed the upsurges prior to their reaching plague status. They were virtually brought under control within two years.

Control of the 1967-68 and 1974-76 upsurges occurred much earlier in the development cycle than the control effort of the current 1987 and 1988 upsurges. Because recent control efforts occurred later in the cycle, population levels and dispersal have been greater than the two earlier upsurges. The present upsurge is still confined largely to West and North West Africa. It has not yet reached plague status, but may do so if extensive escapes from control occur from North West Africa. In the spring and early summer of 1988, swarms will enter the summer breeding area from which they can spread westward towards Senegal and/or Eastwards to the Red Sea Coast and Arabian peninsula in huge numbers.

If, however, 1987-88 emergency control efforts in North West Africa are successful in eliminating the bulk of the infestation prior to its return to the summer breeding area, plague can still be prevented. But control at a lower level than during the 1987-88 emergency will still be required for at least two years in order to depress the infestation to recession status.

The extent and intensity of the fall 1988 expected re-invasion of north-Africa largely depends on the success of control efforts presently underway to limit swarm movement back to the summer breeding belt. Drought in eastern Africa all but eliminates the possibility of supplementation of Sahel breeding from outside western Africa. Control efforts that may be undertaken in the Sahel are expected to largely be for the immediate protection of susceptible cropland and have little effect on the locust population as a whole. Thus, the extent to which escapes occur from northern Africa during the early summer of 1988 is the key to the intensity of re-invasion of northwest Africa, and Morocco in particular, during the fall and winter of 1988-89. Considering the size and remoteness of the area within which eggs have been laid in northwestern Africa, escapes must be expected and hence, swarm re-invasion could be substantial.

The Morocco Locust Control Project is based on the assumption that plague prevention can be achieved and extensive crop damage prevented. If plague prevention is unsuccessful, continuous control will be required throughout the desert locust invasion area for many years to come.

3. The Locust Problem in Morocco

a. Ancient Past (1950's)

Major locust invasions of Morocco are cyclical. During this century, major invasions have occurred in 1929-30, 1954-55 and 1987-88. The last major locust invasion began in 1954 and continued into the early 1960s when natural

factors led to the plague's decline. AID's predecessor agency became deeply involved in Northwest Africa control efforts. In Morocco alone, the U.S. funding level reached $5 million per year for several years.

In 1954, the first swarms entered Morocco from the South, moving quickly into the Souss Valley. Dense, towering swarms measuring 200-400 kms sq. were not uncommon. The High Atlas mountain range to the North of the Souss Valley served as a formidable barrier to further northward swarm migration and locusts piled up in the Souss Valley like automobiles at a traffic light, remaining for an extended period of time. Until January-February, 1955 only a few small swarms were able to make their way through the mountain passes to the fertile plains to the North.

From Mid-February through March, 1954, more swarms penetrated the Atlas mountain barrier, reaching as far North as Rabat, Meknes and Fes. Morocco was completely unprepared for this invasion, but quickly mobilized all available resources including extensive military equipment and personnel, but not in time to prevent extensive crop damage. In the Souss Valley, two billion French Francs (Fr) worth of destruction was recorded to olive, fruit and vegetable crops and almost complete loss to the citrus crop. Heavy damage also occurred to date palm groves in southern Morocco and losses to livestock forage was also high. Comparatively less destruction occurred to grain crops, the most serious of which happened near Marrakech along with extensive damage to olives and almonds.

Control costs during the campaign exceeded one billion Francs but was successful in protecting several billion Francs of susceptible agriculture to the North of the Atlas mountains. The use of baits and dusts applied by hand, ground and air was the principal means of attack. More than 2300 tons of HCH 25% and 100 tons of aldrin and dieldrin, insecticides now banned from most nations, were the mainstay of the control effort. Tests were conducted with malathion which led the way as to becoming principal insecticide of use in Morocco in following years.

b. Recent Past (October, 1987 - January, 1988)

The recent fall, 1987 invasion of locusts led to a control effort in Morocco beginning in October, 1987 and ending in January, 1988. This invasion

has been described in greater detail in the Summary and Recommendation Section of this paper. During this time, a total of 1357 Moroccan personnel were mobilized for the campaign, and a total of 179,095 hectares of locusts were treated in the major zones of Ait Melloul, Errachidia, Zagora and Bourfa.

c. Present (March - June, 1988)

Morocco began sighting locusts again in early March, 1988 to the south of the Anti-Atlas Mountains. The initial infested area extended from just north of Guelmin east to near Tata; south to below the Oued Draa and Westward to the Atlantic Ocean. These swarms were bright yellow, very healthy, mature, gregarious desert locust adults. Further to the East near Zagora, Errachidia and Bouarfa additional areas of infestation became apparent by the end of March.

Soil moisture and soil temperature has been ideal for breeding and further reproductions. Breeding groups were common in nearly all Oueds and dunes within the described area, where moist sands exist. During the warmer parts of the day, locust swarms were readily visible. Height of flight extends from near ground level to about 150 meters. An influx of new swarms occurred for several weeks but, due to their meandering flight to locate suitable breeding sites, some swarms have likely been reported and counted several times.

The influx of new swarms was initially beyond the control capabilities of the GOM, but has not been so great as to be overwhelming. To handle the control efforts, the GOM requested additional highly maneuverable aircraft with long range and sufficient power such as the Turbo Thrush to work in rugged terrain.

Yellow, breeding locusts are less voracious than they are in their pink immature adult stage. Without assistance from a strong southerly wind they are less likely to continue a northerly migration toward the Souss Valley and grain fields to the north of the High Atlas Mountains. Their prime motive is to breed and reproduce. Because of the suitable climatic conditions that exist to the south of the Anti-Atlas mountains, the females have laid at least twice and very likely 3 times at 6 to 10 day intervals. Fifty to eighty eggs can be expected with each laying, or about 200 eggs total per female. Dissection of a large number of females failed to reveal any reabsorption of eggs so a full complement of eggs can be expected from those female locusts not controlled in advance of egg laying.

As of the end of March, egg laying was essentially completed and natural mortality due to old age had already begun. Effective control of adult swarms during the early part of March had undoubtedly reduced the potential population of the next generation and thus has limited additional crop damage. Nevertheless, many eggs have been laid and with the ideal soil moisture and soil temperature conditions presently existing a high larval population is expected to emerge during late March through May. Since there has been no significant Desert Locust population in Southern Morocco for many years, the area is practically devoid of principal parasitoids and predators.

So despite present control efforts, and lacking heavy rains to drown newly hatched hoppers, which is doubtful, a major population upsurge can be expected from the generation emerging during March through May.

The GOM estimates that emerging larva will be found within an area encompassing at least 600,000 hectares. Much of this area within which hoppers are expected to emerge is inaccessible to ground spray equipment. Small aircraft lack the power to work in this rugged terrain and lack the ability to range out relatively long distances from established airstrips. Experience has shown that large multi-engine aircraft such as the DC-6, also cannot penetrate the deeper gorges and would have to spray over the top with little likelihood of the insecticide reaching the target. Aircraft with sufficient power and high maneuverability such as the Turbo Thrush and helicopters are thus required and most appropriate.

Because the emerging larva are expected to be found over such an extremely vast region, targeting directly upon the young hoppers is not possible. It is tactically important to spray barriers with a residual insecticide in advance of their line of march must be the strategy. The hoppers will march into the treated area, feed there and die. This is perhaps the most efficient method of locust control and certainly the most environmentally acceptable if properly executed. Carbaryl, (Sevin-4-oil formulation) pesticide is an effective insecticide for this control method. The quantity required is difficult to predict, but will likely be in excess of 200,000 liters.

It is critical that every effort be made to control this forthcoming generation in the hopper stage. If large numbers of escapes occur leading to large swarms of voracious immature gregarious adults in May-June the crop damage potential will be high. Warmer temperatures could allow them to pass over the mountain barriers and into the Souss Valley or grain fields to the North of the High Atlas at about the time of initiation of harvest. However, it is more likely that escaping swarms will move south into the Sahel because of prevailing winds (north to south). Dependent upon the date of initiation of rainfall in the Sahel, this generation can find summer breeding areas, allowing populations to multiply rapidly through successive largely uncontrolled generations, thus leading to the establishment of a new locust plague.

But, no matter how good a job Morocco does in controlling its own locusts, success in plague prevention also depends upon effective control of Desert Locusts this spring by the other North-African nations, namely Algeria, Tunisia and Libya. Most of the Desert Locusts in West Africa are now likely to be in these four nations bordering the Mediterranean sea.

d. Future (October, 1988 - January, 1989 and after)

According to locust experts as well as the FAO forecast for April 1, 1988, substantial escapes from control will occur from North Western Africa (Morocco, Algeria and Tunisia) in late May, 1988 and migrate southwards to Mauritania and the Sahel in late May and June, 1988. Since locusts in the

summer breeding area of the Sahel are generally diffuse and widespread. They often do not provide good targets for control. So, despite any control efforts mounted, if moisture conditions are favorable, a substantial population increase can be expected, since as many as three generations can be produced. At best, to achieve effective control in the summer breeding belt, is extremely difficult and expensive. OCLALAV, the Regional Organization for Desert Locust Control in West Africa, is for all intents and purposes defunct and despite pleas from FAO there appears considerable reluctance on the part of donor nations to pump new blood into the organization. Thus control becomes the responsibility of the weak Sahelian crop protection services.

Despite the effort conducted to date, some swarms or portions of swarms can be expected to escape treatment in Northwest Africa and begin the migration to the summer breeding ares in May and June, 1988. Some of these escapes will almost certainly originate from breeding in Morocco. The largest source, however, is likely to be from Algeria. The extent to which escapes occur, and the weather conditions which prevail in Sahelian breeding areas, will be the determining factors as to the extent of the invasion of northwest Africa in the fall of 1988. Control efforts conducted in the Sahel are not expected to have any appreciable effect on the total locust population. Only adverse weather conditions are expected to provide any measurable benefit.

Despite substantial escapes expected in May-June, 1988, the control effort launched to date has made substantial inroads into the total West Africa Locust population. Only unless exceptional rainfall exists in preferred Sahel breeding sites can it be expected that late 1988 and early 1989 infestation levels in Northwest Africa will reach 1987-88 seasonal levels. However, continual control efforts at near the 1987-88 levels may be necessary for two or possibly three additional years to return populations to recession level status. Any slackening in the control effort can lead to a full fledged plague condition involving some 60 nations within the invasion area stretching from the Atlantic coast to India, south as far as Tanzania and northward to Turkey and Southern USSR. Once a population reaches full plague status throughout the invasion area, there is only a remote possibility that it can be lowered to recession level by other than natural means.

B. Relationship to CDSS and GOM Development Plan

The major objective of USAID/Morocco's agricultural strategy is to improve agricultural productivity. Toward this end, AID is financing agricultural education, agricultural research, improved agricultural planning and economic analysis, and agricultural credit. If the locusts invade Morocco and destroy significant crops, then both USAID's and GOM's agricultural strategies will be in serious danger.

III. DETAILED PROJECT DESCRIPTION

A. Project Goal

The goal of the Morocco Locust Control Project is to save agricultural and livestock production from physical destruction and enormous monetary losses.

B. Project Purpose

The purpose of the project is to assist the GOM control the desert locust.

C. Project Outputs

The outputs of the project include: (1) increased GOM capacity to treat desert locust invasions with appropriate aircraft and pesticides; (2) trained Moroccan personnel for proper handling and use of pesticides and the provision of pesticide safety equipment; and (3) improved efficiency of control operations including ground surveillance, ground to air communication, and control strategies.

D. Project Organization, Activities and Inputs

The Moroccan Government has developed an institutional framework within which to combat the desert locust and the proposed project will work within this framework. The Ministry of Interior is responsible for coordinating the campaign. This Royal Gendarmerie and the Ministry works closely with the Ministry of Agriculture and Agrarian Reform's (MARA) Crop Protection Division which provides technical guidance for the campaign, including advice as to the biological aspects of the locust and the treatment strategy (pesticides, aerial and ground operations, back-pack sprayers, rates of application, capacity required to treat problem, etc.). The Ministry of Interior relies on the military for access to air bases. The Royal Gendarmeries as well as Provincial Agricultural Offices in the affected areas assist with logistics and ground support as well as vehicles. The GOM has set up five Command Posts (PCs) for the region, with a Central Command Post in Rabat (PCC). The PCC is located in the main Gendarmerie station with direct communication links to all other PCs, to other provincial offices, and to the military installations throughout Morocco. The five PCs are located at Ait Melloul near Agadir for the western zone, Zagora for the central zone, Errachidia for the eastern zone, Bouafra for the northern zone, and Oujda for the northeast. At each of the PCs, operations consist of transporting pesticides and loading both back-pack and aircraft with pesticides. The principle area of operation to date for the USAID contribution has been out of the Ait Melloul PC near Agadir, with U.S. planes stationed at Guelmin. It should be noted that the Ait Melloul PC is responsible for all the Western Sahara plus the provinces of Tata and Guelmin. During the 1987 campaign, this PC was the most active (140,000 hectares of the total 180,000 hectares of locusts treated by aircraft occurred at this PC).

The U.S. planes will be stationed in Guelmin but may be moved to other PC's such as Ourzazate, Tata or Errachidia, when the locust infestations in these areas become priority. Decisions as to where U.S. aircraft will be based will be made by the central command post after advising USAID.

The PCC in Rabat maintains a central information system which is equipped with highly sophisticated equipment for locust operations. Extensive telephone, telex, and radio communication networks link key locales throughout Morocco. A 24-hour task force (comprised of Crop Protection and Gendarmerie Royale staff) operates communication lines, receiving information, updating and analyzing operations and sending back new instructions and information to the field. A computer program has been developed which tracks all aspects of the control operations in Morocco on a daily basis (i.e. surface treated or being treated by air or by ground, aircraft disposition, fuel and pesticide stocks, ground equipment, personnel, etc.) Large strategic maps indicating cumulative sightings throughout Morocco are updated daily.

Spraying operations are designed and controlled by monitoring information from a variety of sources. Information from other countries is received directly from other crop protection services or via USAID Missions, FAO, and OFDA. From this information, Morocco can gauge in general terms the potential locust threat. Military surveillance, at five kilometer intervals along the borders, is generally the first to see the actual swarms of locust as they enter Morocco. They convey information to the PCs. Locust surveillance teams are then dispatched to the areas for more accurate diagnosis of the swarm size, direction of movement, and other specifics about the infestation. All this information is collected daily and centralized at PC centers where decisions are made as to regional priorities and for deployment of pesticides and aircraft to regional PC's. The regional PC's have authority for control operations on a daily basis utilizing resources allocated to them by the PCC.

The strategy for treatment is determined by the swarm size. Thus far in Morocco, the area for treatment has ranged from a few hectares up to 5,000. Between one and two hours after sunrise, the locusts begin to move, initially milling around the resting site and then beginning to migrate within two to two and one half hours after sunrise. The most efficacious treatment occurs while the locusts are still on the ground, hence very early in the morning. Swarms occupying less than 100 hectares of locust infestation are treated by ground teams equipped with back-pack sprayers. From 100 to 500 hectares are treated with small aircraft such as those owned by Agricolaire, a private Moroccan spray company. From 500 to 5000 hectares are treated with aircraft similar to the Turbo Thrushes provided in 1987 by OFDA. Aircraft such as the turbine thrush and helicopters have been the most effective as most swarms have ranged in size from 100 to 5000 hectares.

The Morocco Locust Control project will continue to assist the GOM in its battle against locust invasions and/or indemic population build-up when they occur. In this context, the project attempts to define and provide an

appropriate response for each campaign. Each campaign is expected to require a specific level of inputs such as pesticides, aircraft spray services, other commodities and some technical assistance. At this point, the project defines inputs needed for the current campaign March - June 1988 and for the October 1988 - January 1989 campaign. Periodic assessments utilizing the services of key technical advisors, regional information, and GOM reviews of the situation will be made at the beginning of each campaign to determine whether the assistance is appropriate and to make adjustments accordingly.

For the current campaign (March-June) two Turbo Thrush aircraft, 283,000 liters of pesticides, one Field Logistical Coordinator for four months, and one Locust Assessment Expert have already been provided. In addition, the project will finance pesticide/health testing kits, ground to air communication radios, and marking equipment and protective clothing to complete the current campaign.

For the second campaign (October-January), a minimum response capability will provide two Turbo Thrush aircraft, 400,000 liters of malathion, spray systems for 10 Moroccan Bell 205 helicopters, short-term training and technical assistance. One month of technical assistance by a world authority on locusts will assess the problem in early September and assist the GOM and USAID to refine and/or adjust the above inputs.

For this second campaign, a small technical assistance and training package will be provided. A Health Scientist/Technician who is an expert in cholinesterase monitoring test kits will work for approximately one month with Ministry of Health (MOH) officials to train technicians how to administer the cholinesterase monitoring test to field workers who are exposed to pesticides. This advisor will assist the MOH work out a strategy for how, when, and where to test workers and when to pull workers off the job due to over-exposure. A Pesticide Management and Health/Safety Specialist will work for one month with the GOM to advise them on matters involving pesticide management, safety and health within the overall locust control program. He will also work with the Ministry of Health to help them develop programs to minimize health risks to the general public as a result of the control program. He will conduct an in-service training program for GOM Plant Protection employees on the safe handling and management of pesticides. An Entomologist (Locust Expert)/Environmental Monitoring Specialist will work for two months during the campaign to provide long range technical advice to the GOM and to USAID regarding the locust control strategy, management options, and policy. In addition, he will provide information on environmental impact of small spray planes and/or ground application of ULV malathion, fenitrothion, and carbaryl in the control effort. Detailed job descriptions for the above three advisors plus more information on the cholinesterase monitoring test kits and pesticide handling and disposal strategy can be found in Annex D., Environmental Assessment.

One Locust Management Coordinator will be recruited for approximately eight months (June-January) to supervise all USAID assisted operations, and provide liaison between field operations, the GOM, and USAID. The coordinator will also handle Mission reporting requirements and assist with donor coordination.

A Logistics Specialist will work in the field to monitor the airplane contract and to assure that ground operations proceed smoothly. Detailed job descriptions for these two individuals is found in Annex I.

Ten Bell-205 Helicopters will be fitted with spray systems to allow them to participate in the locust control effort and to spray locusts in hard to reach places inaccessible by larger airplanes. A consultant will assist the Moroccans fit their helicopters, calibrate the spray systems, and develop spray expertise among pilots.

As has been the case in 1987, USAID will be working in collaboration with other donors to assist the GOM control the desert locust. The GOM is currently soliciting pledges for airplane flying time from the same donors who assisted in 1987 and 1988. The EEC and the French have already promised assistance and it is likely the other donors will follow suit in the coming months.

IV. FINANCIAL PLAN

A. Financial Plan for Emergency Situation (First Campaign) from May 15 to June 30, 1988

1. Aircraft - Two Turbo Thrush

Rental 34,200/month	x 1.5 months	$ 51,300
Flying Hours at $525/hour	x 150 hour	$ 78,750
Logistical Specialist	x 1.5 months	$ 6,000
		$136,050

2. Insecticide

None

3. Health - Monitoring and Safety Equipment

Cholinesterase Testing Kits (15 kits)	$ 21,000
Technical Assistance for Testing Kits (1 PM)	$ 12,500
Protective Clothing (200 sets)	$ 44,000
	$ 77,500

4. Logistical Commodities

Radios (40)	$ 20,000
Field Marking and Surveillance	$ 20,000
Other	$ 20,000
	$ 60,000

5.* Assessments, Evaluation and Training

Locust Expert/Ecologist (2 PM)	$ 25,000
Pesticide Management/Safety Expert (1 PM)	$ 12,500
	$ 37,500

6.* Aircraft Rental for Three Months

34,200 x 3	$ 102,600

7. Vehicles

(2 Landrovers, 4-Wheel-Drive with Radio)	$ 40,000

SUBTOTAL	$ 453,650

* Expenditures incurred during July - September timeframe.

B.	Second Campaign (October 1988 - January 1989)	
1.	Aircraft - Two Turbo Thrush Aircraft	
	Rental 34,200/month x 4	$ 136,800
	Flying hours at 400/hours x 400	$ 160,000
	Logistical Expert	$ 16,000
	Demobilization	$ 42,000
		$ 354,800
2.	Insecticide	
	Malathion 400,000 liters	$1,328,932
	Sea Freight	$ 120,000
		$1,448,932
3.	Spray Systems for Bell 205 Helicopters	
	10 at 30,000	$ 300,000
	Technical Expert	$ 12,500
		$ 312,500
SUBTOTAL		$2,116,232
C.	Project Coordinator for both Campaigns (June - January)	$ 40,000
GRAND TOTAL OF A., B., and C.		$2,609,882
D.	Contingency	$ 890,118
PROJECT TOTAL		$3,500,000

V. IMPLEMENTATION

A. Implementation Arrangements

The project is designed to fit into the overall locust control strategy being implemented by the Ministry of Interior, the Ministry of Agriculture's Crop Protection Service, and the Ministry of Health. The implementation structure is summarized in Section III. D. of this project paper and analyzed in Section VI. D., Institutional Analysis. USAID will manage its input into the overall strategy with the assistance of a PSC Project Coordinator and a PSC Logistics Specialist whose job descriptions are discussed in Section III. D. The USAID/Morocco Agriculture Division will have overall responsibility for directing the effort. USAID will continue to meet with the donor coordinating committee and will continue to have contacts with the PCC. However, the daily interaction with the PCC as well as with the project field sites will be handled by the Project Coordinator. This individual will also be in charge of reporting the status of the situation via cables to AID/Washington and other interested Missions.

B. Procurement Plan

Since procurement of commodities and technical assistance forms the substance of this project and since the major characteristic of this project is its unpredictability and potential emergency nature, effective procurement planning is critical to success.

For the October to January campaign, critical inputs include air time of the turbo thrushes, malathion, technical assistance, and miscellaneous commodities.

The current contract for the turbo thrushes continues through January, 1989, so aircraft procurement poses no problem for this campaign. The project will assume funding for the contract from the time at which the Project Agreement is signed. USAID/Rabat will submit a PIO/T to amend the contract to include funding from the project to OFDA who will handle the changes. The contract will be reviewed in January 1989 and a decision will be taken as to whether or not to renegotiate it for the following campaign. This determination will depend on the status of the GOM's procurement of its own turbo thrushes as well as a status report regarding the severity of the following infestations. Procurement options at that point are specified in this section under the heading "Air Services Contract."

400,000 liters of malathion will be procured for the October to January campaign. This quantity will be procured via AID/W procurement route. Hence, a waiver will not be required. If an AID/W procurement officer works to assure that this procurement is moved through the system expeditiously, there should be adequate lead time so that the pesticide arrives prior to the locust problem. There is not enough lead time to simply allow the procurement to traverse the normal GSA route.

In case a situation arises in this campaign which surpasses the GOM's ability and which requires AID's support at a higher than anticipated level, there are two strategies which the Mission can employ in order to procure

items in an expeditious manner, not requiring OFDA emergency assistance mode. First, the AA/ANE has the authority, under AIDAR 706.302.-70 (B) (3) to waive competition so that the Bureau can procure items like OFDA currently does. Second, the Mission Director, under FAR 6.302-2, which argues "unusual and compelling urgency," or under FAR 6.302-1, which argues "only one responsible source or not other supplies or services will satisfy agency requirements," can waive competition. This waiver would allow the Mission to contract with the air company without competition or procure pesticides without competition and bring them to Morocco by air rather than sea. However, both of these options would still require that an AID/Washington procurement specialist be available to invest the time and energy to procure the items speedily and arrange for requisite transportation. USAID will engage in a dialogue with the ANE Bureau to assure that such a procurement capability exists, given the fact that several ANE Bureau Missions will be affected by the locust invasion and will, no doubt, depend upon AID/Washington's assistance in situations of great urgency.

Following is an analysis and proposed schedule for the major project procurement items. Annex F., Procurement Analysis contains a more indepth analysis of the procurement requirements by item.

Test Kits, Radios

These items are needed immediately, prior to the completion of the current campaign. The test kits are made by only one company, which is located in England. Hence, direct procurement is possible. The Mission will cable AID/W on May 15 to procure these items immediately.

Pesticide

Malathion should be purchased directly from Cyanamid International Sales Cooperation, 1 Cyanamid Plaza, Wayne, New Jersey.
Carbaryl should be purchased from Rhône-Poulenc agro-chemical P.O. Box 125, Black Horse Lane, Monmouth Junction, NJ 08852, (Tel: 201-297-0100)

AID/W receives PIO/C	May 15
Solicitation and award	4 weeks June 15
Malathion production and lab testing	4 weeks July 15
Shipment from US	2 weeks July 30
Port	Ocean transit and
ETA Morocco	5 to 6 weeks
Distribution in country	Mid-september

Equipment (Safety Clothing, Ground Marking)

AID/W receives PIO/C	May 15
Solicitation and award	4 weeks June 15
Production/Supply time	6 to 8 weeks August 22
AIR Freight Morocco	August 30
Distribution in country	End August

Contingent on manufacturing/supply leadtime. Must have item description to determine. Maybe some of the equipment can be procured off-shelf.

Spray Systems

It appears there are two companies Simplex Helicopter Spray Systems located in Portland Oregon and Aircraft Airspray Systems, Washington, Minnesota who can provide these systems. Procurement will be initiated for these items on May 15 and they should arrive in September.

Air Services Contract

Presently OFDA has contracted with Altair, Lake Osborne Dr, Lakeworth, FLA for flying services from March through January 1989. Depending upon quality of these air services it is possible to re-negotiate a continuation of these services with a minimum of flying hours and options for additional aircraft if available.

The mobilization costs will be covered under the present OFDA contract for flying services.

The Mission Director has authority to approve a non-competitive procurement based upon FAR 6.302-2 (Unusual and Compelling urgency).

Technical Services

- The Project Coordinator and Logistics Specialist will be hired by the Mission under Personal Service Contracts.

- The Health/Test Kit Specialist will be hired under the Test Kit Contract because he will most likely be an employee of the company which produces the kits.

  The Spray Systems Specialist will be hired under the Spray System Contract because he will probably work for the company.

- The Pesticide Handling/Health Specialist and Locust Entomologist/Environmental Specialist will either be hired from USDA or from an IQC. The Mission will make this determination soon after the project is authorized. Although Gray Amendment entities cannot be currently identified for direct contracting for these positions, such entities will be included in the search for suitable contractors.

Method of Implementation and Financing:

AID will disburse by direct payment for commodities and equipment ($1,938,932), Turbo Thrush air time ($593,450), and Technical Assistance ($77,500). It is expected that $890,000 set forth under contingency will be used to meet the requirements set forth above and thus will also be disbursed by direct payment.

C. Implementation and Procurement Schedule

The following is an illustrative implementation schedule, based on the information currently available and the predictions of the project design Entomologist and AID/Washington Procurement Specialist

DATE	ACTIVITY
May 6, 1988	Project Paper Authorized
May 12, 1988	Project Agreement Signed
May 12, 1988	Mission cables AID/W to begin procurement of pesticides, test kits, spray systems, radios, safety equipment
June, 1988	Test kits and specialist will arrive and train MOH technicians how to administer test.
August - September, 1988	Entomologist will arrive to assist Mission assess locust situation and refine October strategy.
September, 1988	Spray Systems and expert arrives and helps Moroccans install spray systems.
September, 1988	Malathion, protective clothing, ground marking equipment arrives.
October, 1988 - January, 1989	Locust Control Campaign
February, 1989	Internal Evaluation
March, 1989	Possible Amendment of Project
March-June, 1989	Possible Campaign
September, 1989 - January, 1990	Possible Campaign
March - June, 1990	Possible Campaign
September 1990	PACD

D. Monitoring and Evaluation Plan

Since, as has been stated several times in this paper, not even the most erudite and experienced locust entomologist can accurately predict the behavior of desert locusts, this project is being planned as a rolling, flexible design which will be reviewed and redrafted periodically as information about future invasions becomes available. Hence, monitoring and evaluation become critical functions. The first critical review will take place in September, 1988, when information about the locusts behavior in other African countries should be available so that predictions regarding the magnitude of the October, 1988 - January, 1989 invasions can be clarified. At that point, USAID, together with the GOM can determine with more accuracy whether the campaign package proposed in this project is adequate. Following the campaign, an internal evaluation will be conducted to determine the efficacy of the campaign in staving off the locust disaster and to determine what the nature of future USAID assistance should be. There is a large possibility that additional funding may be neededat that time. Based on decisions made at that time, future campaign strategies will be worked out as well as future monitoring and evaluation critical points identified. The PSC Project Coordinator will be responsible for briefing the Mission on progress being made in campaigns and for writing monthly progress reports.

VI. ANALYSES

A. Abbreviated Economic Analysis

The economic impact of a Desert Locust invasion is potentially dramatic and disastrous, but there has been no work in Morocco and few efforts elsewhere to quantify the effects of past locust invasions. Well-documented measures of loss in past invasions include 7 million grape vines in Libya in 1944, six thousand tons of oranges in Guinea in 1957, and 167,000 tons of grain in Ethiopia in 1958. In addition, unmeasured but significant amounts of forage have been lost to locusts. The scale of losses is unpredictable because the size of invading swarms cannot be predicted far in advance.

The potential damage which can be done is a function of the size of the locust swarm. The potential is incredibly large because of the reproductive power of the locust. A female lays approximately 200 eggs in her last month of life. If breeding conditions are good as they have been this year in North Africa, all the eggs may survive to the hopper stage. While there are few studies on hopper mortality, it appears that even in good conditions mortality is a significant percentage of the total population. One study in Mali found 90% mortality in spite of good conditions for survival. Even so, the population in this study increased by 16 times over the parents' population!

Currently, Morocco is attempting to control 60,000 hectares of Desert Locust swarms and an estimated 600,000 hectares of hopper bands. The density of the swarms has been estimated at 100 per square meter. Thus the population of locusts is about 60 billion individuals. They have not succeeded in reaching the major agricultural areas including the Souss Valley which is the most vulnerable to an invasion. However, the potential for an enormous population increase of the next generation and subsequent invasion is great. For example, in the past an observer in Somalia measured a 1,000-fold increase in population over the course of several generations of Desert Locusts. The control measures underway now are intended to keep such a population surge from occurring.

The 600,000 hectares of hopper bands could contain up to a theoretical maximum of 6,000 billion individuals. It is likely that about 90% of them will die before reaching the adult stage whether or not they are sprayed. However, as we have seen above, natural mortality is insufficient to keep the population from expanding by a factor of 16 when conditions are good.

Much larger swarms than are currently observed in North Africa have occurred in the past. Swarms of up to 300 billion individuals have occurred in India for example. An adult locust lives from 2 and a half to 5 months and consumes its weight (1 and 1/2 to 3 grams) in vegetable matter daily. Thus, a swarm of 300 billion locusts could consume up to 90 million tons of vegetable matter over its lifetime. The current population of hoppers will mature and migrate to the Sahelian countries this summer. It will breed again there and return to Morocco in October and November. If conditions are right, the current locust population in Morocco of about 60 billion could easily become many times larger, perhaps exceeding the swarms observed in the past in India and elsewhere.

If swarms larger than those which threatened Morocco this year were to return and reach the grain farming areas north of the Atlas mountains as they did in the fifties and as they have done on numerous occasions since 1939, the damage could be considerable. For example, the annual grain crop varies in size from 6 to 8 million tons. Added to this is the citrus crop and other major tree crops which would be damaged by locusts. There is also forage material which will be devoured by a large swarm, thus impairing livestock, milk and other meat production. The total Value Added in the agricultural sector is about 3.5 billion dollars annually. It is potentially all at risk if breeding conditions for the Desert Locust remain highly favorable and if the control campaign proves to be less than fully effective over the coming six months.

The potential economic loss is large compared to the cost of control campaigns. It is estimated that spraying on an emergency basis costs about $30 per hectare. Thus, the costs of spraying 1,500,000 hectares this year in Morocco should amount to about 45 million dollars. The effectiveness of this spraying is estimated to be about an 80% kill rate for each swarm sprayed. Depending upon when the spraying takes place, a control campaign of this level of effectiveness can increase mortality sufficiently to reduce the chances of a population upsurge. Particularly since control efforts are likely to be less effective in the Sahelian countries, the success of the current effort is critical to reducing the potential population of locusts returning in the Fall.

Given the expense of a control campaign and the certain knowledge that all locust plagues have eventually ended and gone into recession populations, is it worth the gamble to do nothing and allow nature to run its course? Experts report numerous cycles of locust plagues of seven to eight year average duration. While locust populations eventually decline, the potential damage which they can do while they run their course can greatly affect the well-being of human populations. No nation can sit idly by and count on nature alone to keep the threat of locust plague at bay.

The experts advise us that prevention of a locust population upsurge requires eliminating 98% of the population. Since they regenerate every five months, each new generation must be reduced in size to no more than that of its parents' generation. Clearly, the favorable breeding conditions of the present and the observed increases of 16-fold in one generation in uncontrolled conditions both should be convincing factors that means other than natural control must be employed to keep the population from increasing rapidly. Descriptions of the cost-effective methods of control being employed in this campaign lead us to conclude that the spraying of swarms on the ground and the control of hopper bands should permit us to achieve the control target of 98% mortality among the locust population.

We conclude by citing the draft Programmatic Environmental Assessment of Locust and Grasshopper Control in Africa/Asia by TAMS Consultants, Inc. and Consortium for International Crop Protection. After reviewing data availability worldwide regarding the costs and benefits of locust and grasshopper control, they conclude, "Without more complete information, the usual economic tools cannot be used to make judgments regarding the costs and benefits of locust and grasshopper control programs. If they are to be continued, more data on costs and pest damage need to be generated."

We agree that there is not enough data to conduct a standard benefit-cost analysis. However, there is sufficiently high probability of population upsurge and attendant economic losses as great or greater than damage documented elsewhere in the past to justify attempts at controlling the locust population. What we cannot comment upon intelligently in this analysis is how many resources should be devoted to a control campaign. To do so would require much more information about the survival function of the Desert Locust, a probability distribution for the quality of breeding conditions, and better information about the damage done to specific crops and pasture. Short of this information, we must rely upon the technician's best estimates of what is required to achieve the target level of control and attempt to achieve that target level in the most economical manner.

B. Environmental Assessment Summary

A full environmental assessment (EA) as required by AID's Environmental Procedures at 22 CFR Part 216 has been prepared for the proposed project and is attached as Annex D. to this project paper. In view of the fact that the proposed project would include the provision of large quantities of insecticides as well as application services and equipment, the special pesticide procedures at 22 CFR 216.3(b) also apply. The environmental assessment factors these criteria into the identification, evaluation, analysis, and recommended mitigation of probable environmental impacts of the proposed project.

Key environmental mitigation measures which would be required under the project include provision of specialized technical expertise in the areas of pre- and post-treatment environmental monitoring, pesticide management and health/safety. Health and safety related commodities to be provided include protective clothing and equipment and test kits for monitoring worker exposure to insecticides. Other critical mitigation measures include special procedures for locust control in ecologically sensitive areas, and disposal of empty insecticide drums. These measures are described fully in the Annex D.

C. Technical Analysis Summary

A complete technical analysis has been conducted on the locust control strategy advocated in this project paper, based upon the biology of the locust, past control efforts, and the capability of the GOM to carry out a locust campaign. This analysis appears in Annex E. of this project paper. Also included in Annex E. is a technical analysis of the air planes which are generally used in locust control as well as an analysis of the spray systems which will be fitted onto ten GOM Bell 205 helicopters.

D. Institutional Analysis

As stated in Section III. D. of this project paper, the Royal Gendarmerie has overall responsibility for the implementation of the locust control strategy. The Royal Gendarmerie which has the responsibility for assuring that control efforts are effectively implemented. The Gendarmerie works with the Ministry of Interior and the Ministry of Agriculture's Crop Protection Service for technical guidance. The Crop Protection Service is now housed in the Central Command Post of the Gendarmerie in Rabat in order to assure close collaboration. In addition, the Ministry of Health provides guidance to assure the health and safety of workers who are exposed to pesticides during the campaign. The Regional Medical Officer in each command area makes arrangements for proper medical care in case of emergency. The overall organizational structure is shown on Chart IV. D.-1.

The Ministry of Interior relies on the military for access to air bases. The Royal Gendarmeries as well as Provincial Agricultural Offices in the affected areas assist with logistics and ground support as well as vehicles. The GOM has set up five Command Posts (PCs) for the region, with a Central Command Post in Rabat (PCC). The PCC is located in the main Gendarmerie station with direct communication links to all other PCs, to other provincial offices, and to the military installations throughout Morocco. The five PCs are located at Ait Melloul near Agadir for the western zone, Zagora for the central zone, Errachidia for the eastern zone, Bouafra for the northern zone, and Oujda for the northeast (see attached map). At each of the PCs, operations consist of transporting pesticides and loading both back-pack and aircraft with pesticides. The principle area of operation to date for the USAID contribution has been out of the Ait Melloul PC near Agadir, with U.S. planes stationed at Guelmin. It should be noted that the Ait Melloul PC is responsible for all the Western Sahara plus the provinces of Tata and Guelmin. During the 1987 campaign, this PC was the most active (140,000 hectares of the total 180,000 hectares of locusts treated by aircraft occurred at this PC). The U.S. planes may be moved from Guelmin to other PC's such as Ourzazate, Tata or Errachidia, when the locust infestations in these areas become priority. Decisions as to where U.S. aircraft will be based will be made by the central command post after advising USAID. The organizational structure of the PC at Guelmin is shown on Chart IV. D.-2.

The PCC in Rabat maintains a central information system which is equipped with highly sophisticated equipment for locust operations. Extensive telephone, telex, and radio communication networks link key locales throughout Morocco. A 24-hour task force (comprised of Crop Protection and Gendarmerie Royale staff) operates communication lines, receiving information, updating and analyzing operations and sending back new instructions and information to the field. A computer program has been developed which tracks all aspects of the control operations in Morocco on a daily basis (i.e. surface treated or being treated by air or by ground, aircraft disposition, fuel and pesticide stocks, ground equipment, personnel, etc.) Large strategic maps indicating cumulative sightings throughout Morocco are updated daily. The organizational structure of the PCC Rabat is shown on Chart IV. D.-3.

Spraying operations are designed and controlled by monitoring information from a variety of sources. Information from other countries is received directly from other crop protection services or via USAID Missions, FAO, and OFDA. From this information, Morocco can gauge in general terms the potential locust threat. Military surveillance, at five kilometer intervals along the borders, is generally the first to see the actual swarms of locust as they enter Morocco. They convey information to the PCs. Locust surveillance teams are then dispatched to the areas for more accurate diagnosis of the swarm size, direction of movement, and other specifics about the infestation. All this information is collected daily and centralized at PC centers where decisions are made as to regional priorities and for deployment of pesticides and aircraft to regional PC's. The regional PC's have authority for control operations on a daily basis utilizing resources allocated to them by the PCC.

The PCC in Rabat has been incredibly well-organized during the previous and current campaign, maintaining close contact with the field operations and publishing, on a daily basis, the status of the locust infestation and the spray operations. Representatives from the Plan Protection Service, now working in the PCC, have been in daily contact with all donors and all field operations and have immediately gone to the General in Charge of the Gendarmerie for critical decisions, such as to send a plane to Senegal to pick up the carbaryl.

Field PC's, though not equipped with the sophisticated computer systems and graphics as the PCC in Rabat, have been extremely overworked but stalwart in their persistence to solve the locust problem. Plant Protection staff have worked side by side with Gendarmerie officers. The major problem with field operations has been the lack of equipment and the lack of personnel. Since the locust invasion hit virtually without warning, there were not enough people to undertake all the pesticide handling, prospection, and spraying operations. Hence, individuals were hired in large groups and trained on the job. Not all of them have been able to understand the operation adequately to perform at a consistently high level. However, with experience and donor assistance, they have been improving their performance.

The adequacy of the control operations have been analyzed from a highly experienced entomologists point of view. This individual's point of view is found in Annex E., Technical Analysis, Section 2.c.

CHART IV, D.-1.

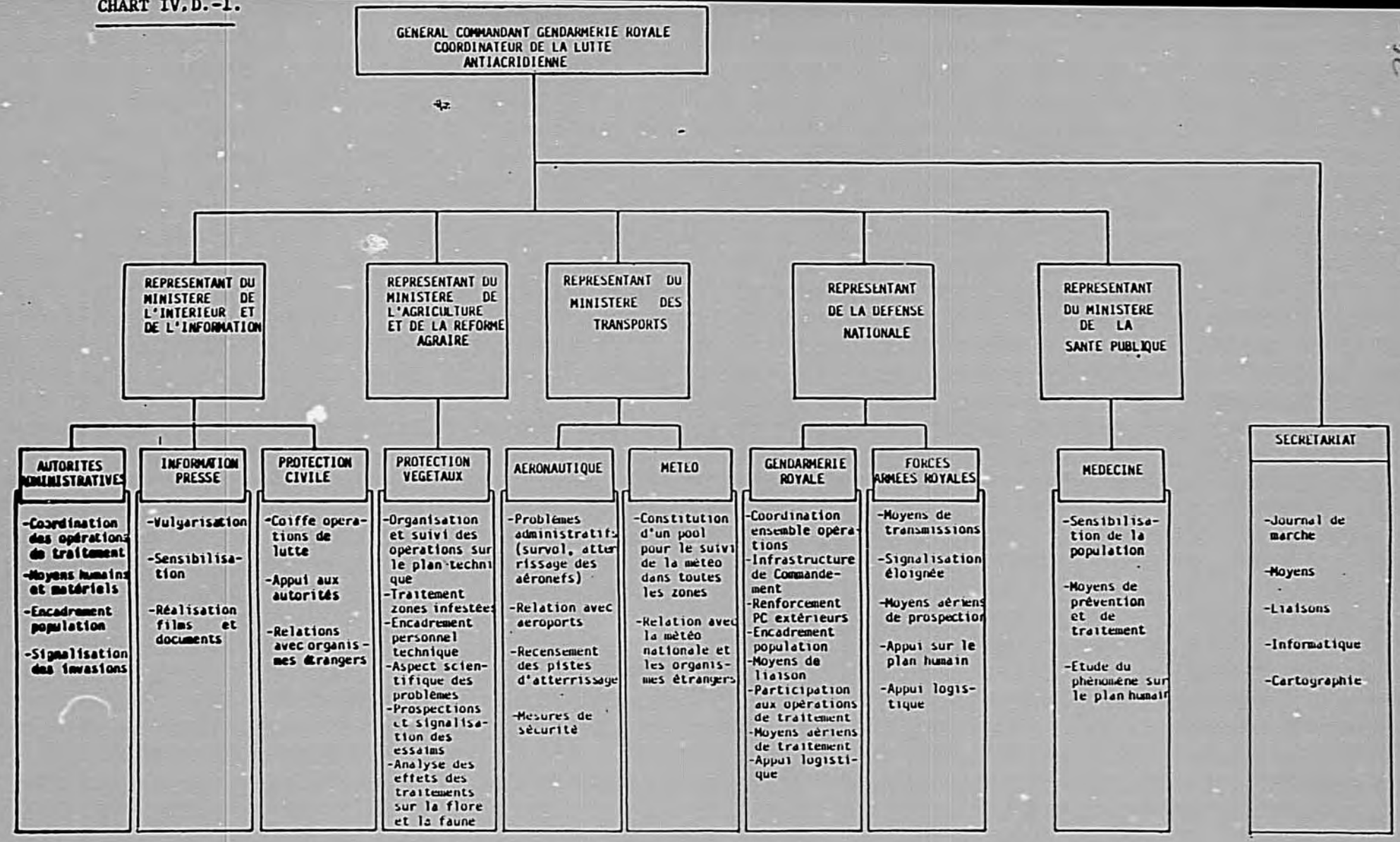
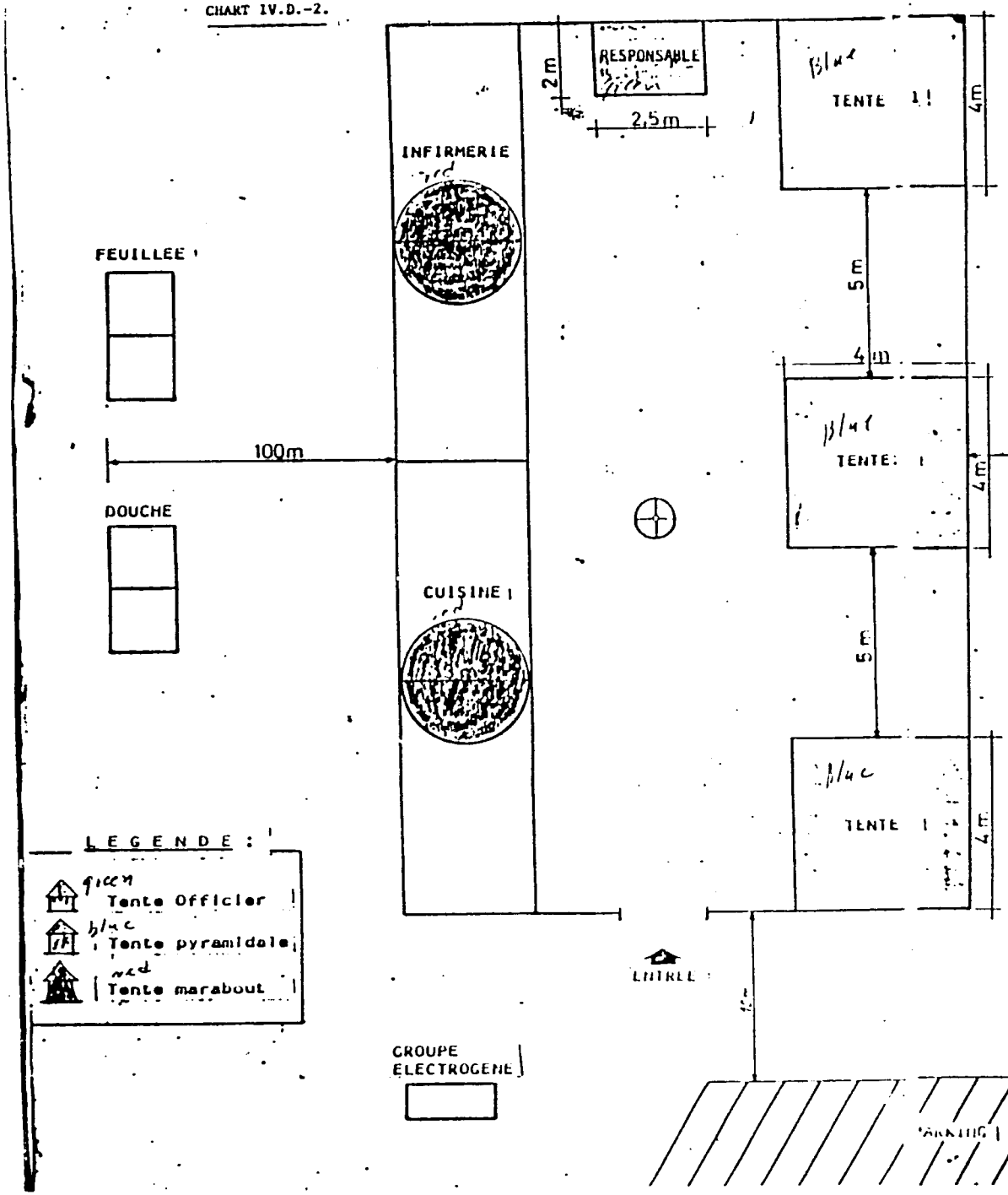
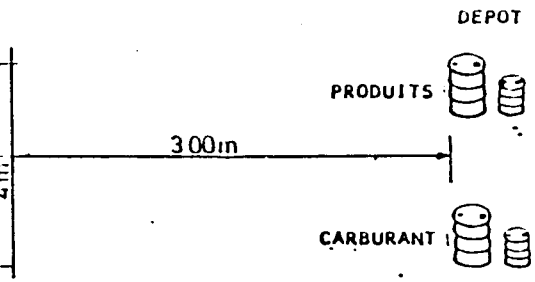

GENERAL COMMANDANT GENDARMERIE ROYALE
COORDINATEUR DE LA LUTTE ANTIACRIDIENNE
REPRESENTANT DU MINISTERE DE L'INTERIEUR ET DE L'INFORMATION
REPRESENTANT DU MINISTERE DE L'AGRICULTURE ET DE LA REFORME AGRAIRE
REPRESENTANT DU MINISTERE DES TRANSPORTS
REPRESENTANT DE LA DEFENSE NATIONALE
REPRESENTANT DU MINISTERE DE LA SANTE PUBLIQUE
AUTORITES ADMINISTRATIVES
-Coordination des opérations de traitement
-Moyens humains et matériels
-Encadrement population
-Signalisation des invasions
INFORMATION PRESSE
-Vulgarisation
-Sensibilisation
-Réalisation films et documents
PROTECTION CIVILE
-Coiffe operations de lutte
-Appui aux autorités
-Relations avec organismes étrangers
PROTECTION VEGETAUX
-Organisation et suivi des operations sur le plan technique
-Traitement zones infestées
-Encadrement personnel technique
-Aspect scientifique des problèmes
-Prospections et signalisation des essaims
-Analyse des effets des traitements sur la flore et la faune
AERONAUTIQUE
-Problèmes administratifs (survol, atterrissage des aéronefs)
-Relation avec aeroports
-Recensement des pistes d'atterrissage
-Mesures de sécurité
METEO
-Constitution d'un pool pour le suivi de la météo dans toutes les zones
-Relation avec la météo nationale et les organismes étrangers
GENDARMERIE ROYALE
-Coordination ensemble operations
-Infrastructure de Commandement
-Renforcement PC extérieurs
-Encadrement population
-Moyens de liaison
-Participation aux opérations de traitement
-Moyens aériens de traitement
-Appui logistique
FORCES ARMEES ROYALES
-Moyens de transmissions
-Signalisation éloignée
-Moyens aériens de prospection
-Appui sur le plan humain
-Appui logistique
MEDECINE
-Sensibilisation de la population
-Moyens de prévention et de traitement
-Etude du phénomène sur le plan humain
SECRETARIAT
-Journal de marche
-Moyens
-Liaisons
-Informatique
-Cartographie

CHART IV.D.-2.





PERSONNEL
- 1 Technicien
- 13 Ouvriers
- 2 Cuisiniers
- 1 Infirmier
- 1 Gendarme
- 2 Conducteurs

VEHICULES
- 1 jeep radio BLU
- 1 jeep Land-Rover
- 1 citerne 1000 litres
- 1 groupe électrogène

DIVERS
- 1 tente officier
- 3 tentes pyramidales
- 2 tentes marabout
- 1 douche
- 1 feuillée

COUCHAGE
- 22 lits de camp équipé

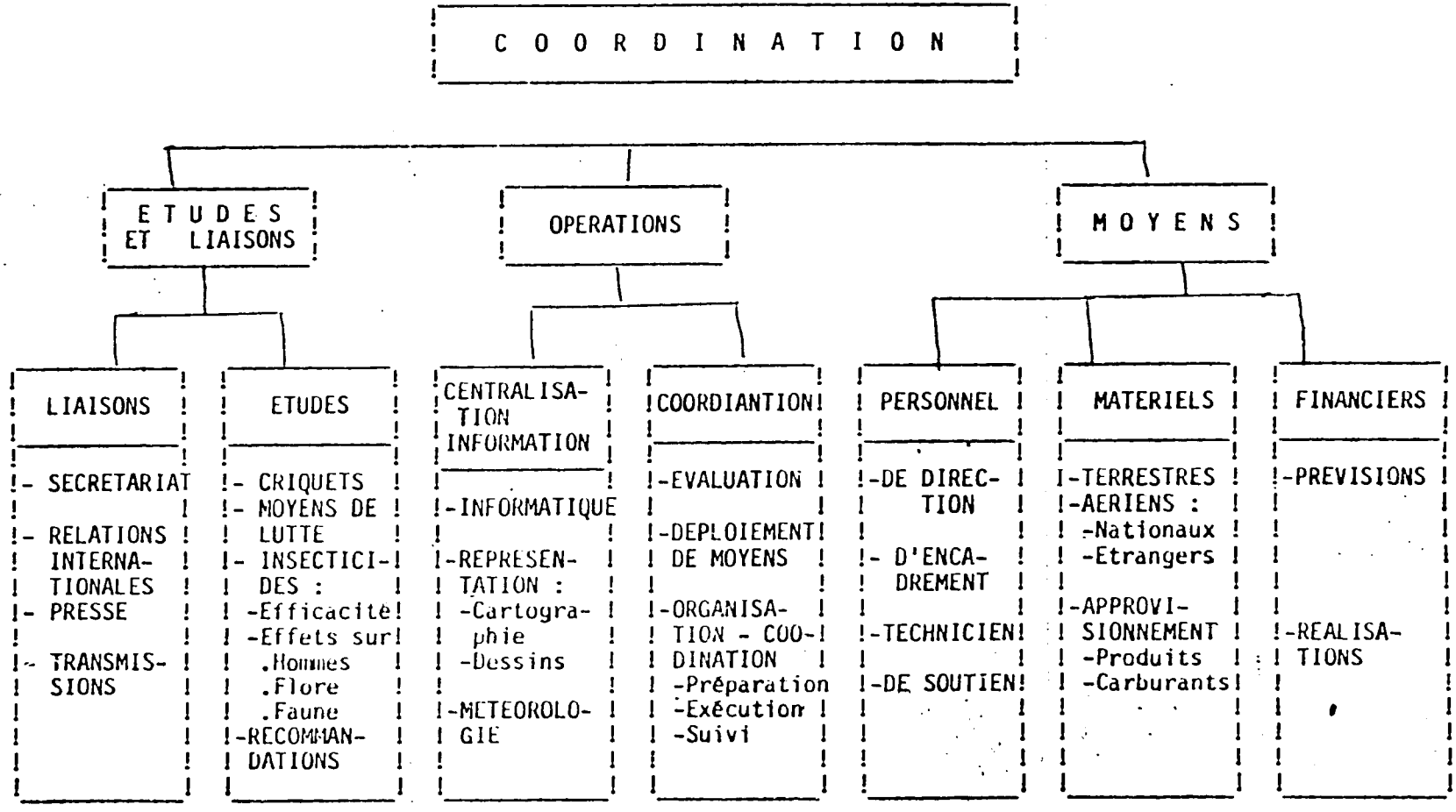
AMEUBLEMENT
- 4 tables pliantes
- 22 chaises pliantes
- 1 fourneau de camp
- 2 caisses popote
- 1 glacière
- 2 lampes à butane

SANTE ET HYGIENE
- 1 trousse de première urgence
- des produits d'entretien

CHART IV.D.-3.

-oOo- ORGANIGRAMME FONCTIONEL -oOo-

DU P.C. CENTRAL



VII. CONDITIONS PRECEDENT AND COVENANTS

The Project Agreement will contain the standard condition precedent as follows:

- Prior to the first disbursement under the Grant, or to the issuance by AID of documentation pursuant to which disbursement will be made, the Grantee will, except as the Parties may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

  A statement of the function and the name of the person holding or acting in the office of the Grantee and of any additional representatives, together with a specimen signature of each person specified in such statement.

The Project Agreement will contain special covenants as follows:

(a) The GOM agrees to utilize only U.S. registered and approved insecticides in U.S. financed aircraft and equipment and to follow recommended procedure for each insecticides, in spray operations.

(b) The GOM agrees to follow AID policy regarding the disposal of empty drums and containers of insecticides that are AID financed.

ANNEXES TO THE PROJECT PAPER

ANNEX A.

LOGICAL FRAMEWORK

ANNEX A.

Date: 04/28/88
Wang File No.: 1695M
Drafter: RStryker:dz

LOGICAL FRAMEWORK

PROJECT TITLE AND NUMBER: The Morocco Locust Control Project Paper (608-0196)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: To save agricultural and livestock production from physical destruction and enormous monetary losses.	Measures of Goal Achievement Major agricultural and livestock production areas are protected from locust invasions.	1. GOM information surveys and USAID monitoring of crop and livestock production in major regions such as Souss Valley and cereals regions. 2. Timely and accurate reporting of information from other countries	1. Regional maghrebien control efforts are effective. 2. Regional sahelian control efforts are effective. 3. Individual country control efforts are effective. 4. Climatic conditions in Sahel do not remain favorable for population build-up over long term.
Project Purpose To assist the GOM to control the desert locust.	End of Project Status Locust populations in Morocco are reduced or maintained at non-threating levels (reduced from gregarious to solitary life cycle).	1. GOM and USAID field assessment of locust populations in Morocco 2. USAID monitoring using GOM computerized information network.	1. Locust invasions from neighbouring countries do not become overwhelming 2. GOM provides timely and accurate assessments of locust populations 3. GOM is able to provide inputs (fuel, coordinations and logistical support) for control operations.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs	Magnitude of Outputs:		
1) Increased GOM capacity to treat locust invasions with appropriate aircraft and appropriate pesticides	Capability to treat an additional 400,000 hectares with two turbo thrush, 10 helicopters and 400,000 liters of pesticides through Jan. 1989.	Field monitoring by GOM and USAID	Assumptions apply to each output: 1. Effective GOM organizational structure and leadership maintained.
2) Trained Moroccan personnel for proper handling and use of pesticides.	Five to ten surveillance and marking crews (5 individuals each) trained	Field monitoring by GOM and USAID	2. AID procurement is timely and responsive to needs.
3) Improved efficiency of control operations including ground surveillance, ground to air communication, and control strategies.	Five to ten ground crews (10-20 people each) trained.	Field monitoring by GOM and USAID	3. Sufficient ground crews are able to be trained in timely manner.

Project Inputs:

Implementation Target:

Summary Financial Plan for AID Contribution

	To 6/88	9/88-1/89	Future
Technical Assistance	37,500	40,000	--
Turbo Thrush Air Time	276,000	396,000	--
Pesticides	--	1,448,932	--
Miscellaneous Commodities	137,500	--	--
Spray Systems	--	312,500	851,568
Contingency For Future Campaigns	--	--	--
TOTAL	$451,000	$2,197,432	$851,568

Contingency line item will be programmed after January, 1989, depending on status of infestation at that time and predictions for the future.

ANNEX B.

REQUEST FOR ASSISTANCE FROM GOM

ROYAUME DU MAROC

MINISTERE DE L'AGRICULTURE
ET DE LA REFORME AGRAIRE

LE MINISTRE

246 CAB

- 2 NOV. 1987

RABAT, LE

Monsieur le Directeur Général,

Le Maroc connait depuis le 19 Octobre 1987 une invasion de plus en plus massive de criquets pélérins, à ce jour les essaims couvrant une superficie totale de plus de 100 000 ha ont été signalés dans différentes régions du Sud du Maroc (Bouarfa, Errachidia, Zagora, Zag ... etc).

Ces essaims en provenance de pays limitrophes et des différents pays de l'Organisation Commune de lutte Antiacridienne et de lutte Antiaviaire (Mauritanie, Niger, Mali , Tchad...) résultent de la reproduction Estivale qui a eu lieu dans ces pays où les actions de lutte ont été très modestes et n'ont pu nullement circonscrire la situation. Les informations en provenance de ces pays indiquent en outre que de très fortes populations larvaires existent et devraient donner naissance à des essaims de grandes dimensions qui atteindront sans aucun doute le Maroc dans les semaines qui suivent.

Aussi,compte tenu de la gravité de la situation, je vous serai gré du soutien urgent que vous voudrez bien apporter aux actions de lutte qui ont déjà debuté au Maroc et qui risquent d'être dépassées par l'ampleur de l'invasion.

Il serait vivement souhaitable que notre pays puisse disposer de moyens de traitement aérien de grande envergure de type DC 3, DC 4 ou DC 6 .

Comptant sur votre collaboration, je vous prie de croire,Monsieur le Directeur Général,en l'assurance de ma haute considération.

MONSIEUR LE DIRECTEUR GENERAL
DE L'USAID

- RABAT -

Le Ministre de l'Agriculture et de la Réforme Agraire

Signé : [illegible]

39

ROYAUME DU MAROC — INFO COPY

MINISTERE DE L'INTERIEUR
SECRETARIAT GENERAL
DIRECTION DES COLLECTIVITES LOCALES

Rabat le 17 DEC. 1987

AGR
SOC

Le Ministre de l'Intérieur

à MONSIEUR LE DIRECTEUR DE L'USAID

- RABAT -

N° 172 /DCL.

NOTA: Les réponses doivent porter le numéro d'ordre rappeler l'objet sur lequel elles portent

ACTION : AGR

DUE DATE: 12121

INFO: DIR - DIDIR PROG - AGSOUNS - CHRON - RF

Le Maroc connait depuis le 26 Octobre 1987 des incursions d'importants essaims de criquets pèlerins envahissant toutes les provinces du Sud et Sud-Est du pays. D'importants moyens sont actuellement déployés dans toutes les zones infestées pour faire face à la situation. Les superficies traitées ont atteint actuellement plus de 65.000 ha et les essaims continuent d'affluer à une cadence régulière. Les informations qui parviennent des prospecteurs opérant dans ces zones font état de l'avancée de fortes populations de criquets couvrant de très grandes surfaces et laissant présager une invasion encore plus importante qui risque de menacer les zones agricoles du Maroc et de la région environnante.

Compte tenu des expériences passées et de la situation prévalant dans le Sahel et les pays situés au Sud du Sahara, il est à craindre que ce fléau persiste plusieurs années si une lutte permanente et efficace n'est pas entreprise dans les zones infestées de manière à réaliser un cordon de sécurité contre cette calamité naturelle.

C'est pourquoi, je vous saurai gré des interventions que vous voudriez bien faire afin d'obtenir un soutien urgent de l'USAID aux actions de lutte antiacridiennes que mène le Maroc sans relâche depuis plusieurs semaines dans l'intérêt de toute la région.

Ce soutien contribuerait à faire face à la situation inquiétante actuelle et à renforcer le dispositif de lutte contre les invasions futures.

USAID/RABAT C & R 18 DEC. 1987

.../...

ROYAUME DU MAROC

MINISTERE DE L'INTERIEUR

CABINET

Le Ministre de l'Intérieur

N° 319 / CAB

à MONSIEUR THOMAS NASSIF
AMBASSADEUR DES ETATS-UNIS
D'AMERIQUE.

- RABAT -

Me référant aux termes de ma lettre N° 163/DCL du 17 courant, j'ai l'honneur de vous demander, vu l'urgence, et en attendant l'élaboration d'un programme d'assistance plus étendu, d'intervenir dans un premier stade auprès de l'USAID pour :

1- Le maintien des 2 avions mis à la disposition du Royaume du Maroc, au minimum jusqu'à la mi-janvier 1988. En effet, le Royaume du Maroc s'attend dans les prochains jours à venir à de nouvelles invasions de criquets pélerins dont la ponte a eu lieu dans les Provinces Sahariennes et aux frontières mauritaniennes.

2- Autoriser pour une meilleure efficacité et si c'est nécessaire les avions à traiter, à partir de Laayoune comme base de départ les superficies infestées dans les Provinces limitrophes.

Le Ministre de l'Intérieur

Signé : DRISS BASRI

L'effort à fournir devrait porter sur les moyens en aéronefs, pulvérisateurs, atomiseurs, matériel de protection, matériel de transmission, véhicules de prospection et produits de traitement.

Comptant sur votre collaboration, je vous prie, Monsieur le Directeur, de croire en l'assurance de ma haute considération./.

Le Ministre de l'Intérieur

Signé : Driss BASRI

ROYAUME DU MAROC

MINISTERE DE LA SANTE PUBLIQUE

N° 531 /DT/214

26 FEV. 1988

08329

ACTION : AGR (WILKINS)

DUE DATE: 03/15

INFO : DIR - DEPDIR

CHR (WILKES) - PROG - COLT -

MGT - GREEN - RF

ANNEX B.

المملكة المغربية

وزارة الصحة العمومية

608 - 019
« HLS

20 FEV. 1988

LE MINISTRE DE LA SANTE PUBLIQUE

//-))

MONSIEUR LE DIRECTEUR DE L'U.S.A.I.D.

- RABAT -

OBJET : Requête pour l'assistance de l'USAID pour la surveillance sanitaire du personnel exposé aux insecticides utilisés dans la campagne antiacridienn

5969-4949 (202)

Dans le cadre des préparations prévisionnelles po la campagne de lutte antiacridienne pour l'année 1988, j'ai l'honneur de vous formuler une requête pour une assistance d votre Agence pour permettre à mon Département d'entreprendre un programme de surveillance sanitaire du personnel suscepti d'être impliqué dans les opérations de traitement chimique. Cette surveillance, en plus des mesures et recommandations prodiguées pour l'utilisation sécuritaire des pesticides, a pour objectif de prévenir à temps les intoxications dûes à exposition critique.

Vous trouverez, ci-joint, une proposition des be soins en kits de terrain et réactifs pour mener cette actio lesquels besoins ont été estimés sur la base de la stratégi déployée lors de la campagne de lutte au cours de 1987.

Veuillez agréer, Monsieur le Directeur, l'expres de mes respects distingués.

USAID/RABAT C & R 02 MARS 1988 RECEIVED

Le Ministre de la Santé

Ministère de la Santé Publique

Signé : Taïeb BENCHEIKH

Ci-joint : proposition des besoins pour la la surveillance sanitaire du personnel de la lutte antiacridienne

PROPOSITION POUR LA SURVEILLANCE DU PERSONNEL EXPOSE AU RISQUE D'INTOXICATION LORS DE LA CAMPAGNE ANTIACRIDIENNE 1988 .

I.- CONSIDERATIONS GENERALES :

La campagne de lutte antiacridienne entamée dans le 4ème trimestre de l'année 1987 était une opération importante ayant mobilisé des moyens humains, équipement et produits. Le personnel impliqué dans la manipulation la préparation et l'épandage des insecticides était constamment exposé au risque d'intoxication. Des mesures de prévention, d'hygiène ont certes été prodiguées pour éviter les surexpositions critiques pour la santé de ces travailleu mais le besoin s'est fait sentir pour une surveillance régulière de cette exposition pour pouvoir prévenir à temps le début d'intoxications.

Pour celà, en prévision de la campagne de lutte antiacridienne projetée pour l'année 1988, il est nécessaire de programmer cette surveillance à temps. Comme la plupart des insecticides seront des organophosphorés inhibiteurs de la cholinestérase il est possibl d'axer cette surveillance sur l'estimation de degré d'inhibition de la cholinestérase dans le sang des individus exposés. Les mesures seront effectées à l'aide de kits de terrains basés sur la méthode colorimétrique de dosage. Le choix a été porté sur ce type de kit malgré quoiqu l'on parle dans la littérature de la disponibilité de papiers teste de cholinestérase mais qui sont moins sensibles que les kits.

II.- PROPOSITION D'UN PLAN D'ACTION DE SURVEILLANCE POUR 1988 :

2.1. Objectif : Prévenir les intoxications dûes aux exposition du personnel impliqué dans la lutte antiacridienne.

2.2. Stratégie : Contrôler l'inhibition de la cholinestérase chez le personnel exposé (préparateurs, pilot d'avion, traiteurs) deux fois par semaine.

.../...

2.3. Estimations des besoins :

- les estimations seront basées sur l'effectif déploy en 1987.
- la durée de surveillance s'étalera sur la période de opérations qu'on évalue à 4 mois (Octobre-Janvier).

a) Personnel à surveiller :

	Provinces	Préparateurs	Pilotes	Traiteurs	Total
AGADIR	Aït Melloul	14	2		16
	Guelmim		12	52	64
	Tan-Tan		2	8	10
	Tata		6	35	41
	Tiznit		-	6	6
	Smara		4	6	10
	S/TOTAL 1	14	26	107	147
OUARZAZATE	Ouarzazate	27	6	54	87
	Foum Zguid	1		8	9
	S/TOTAL 2	28	6	62	96
ERRA-CHI-DIA	S/ TOTAL 3	-	16	132	148
FIGUIG	Bouarfa	4	6	158	168
	Beni Tadjt	4		4	8
	Talsint	7		28	35
	S/TOTAL 4	15	6	[illegible]	211
TOTAL		57	54	491	607

→ 1200

Le personnel à surveiller est estimé à 600.

b) Nombre d'examen à effectuer :

- durée : 120 jours
- fréquence d'examens : 2 fois par semaine
- effectifs : 602
- Nombre d'examens : 21.100 + 15% (imprévu) : 25.000

c) Equipement nécessaire :

- kit de terrain pour dosage de cholinestérasse (Tint méthode) ; on prévoit un kit par P.C. pour éviter le déplacements à effectuer par l'agent chargé de la s veillance, lesquels déplacements nécessiteront des moyens de transport, frais de carburants et indemni pour le personnel.
- Ainsi les besoins sont de 12 kits.

d) Formation des agents chargés de la surveillance :

- effectifs : 2 par P.C. : total 24 agents
- durée de stage : 1 semaine
- lieu : Rabat
- encadrement : toxicologues marocains de l'Institut National d'Hygiène.

2.4. Estimation des coûts :

- kits : 12 x 600 $ = 7.200 $
- réactifs pour 25.000 tests = 2.500 $

9.700 $

- Support pour formation : = 2.000 $

TOTAL = 11.700 $

L'estimation globale est de 11.700 $.

ANNEX C.

STATUTORY CHECKLIST

5C(2) PROJECT CHECKLIST

Listed below are statutory criteria applicable to projects. This section is divided into two parts. Part A. includes criteria applicable to all projects. Part B. applies to projects funded from specific sources only: B.1. applies to all projects funded with Development Assistance loans, and B.3. applies to projects funded from ESF.

CROSS REFERENCES:	IS COUNTRY CHECKLIST UP TO DATE? HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?	(a) Prepared by AID/W yearly (b) Yes

A. GENERAL CRITERIA FOR PROJECT

1. FY 1986 Continuing Resolution Sec. 524; FAA Sec. 634A.

   Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project.

   Congressional notification submitted March 30, 1988.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of $500,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

   (a) Yes

   (b) Yes

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

   N/A

4. FAA Sec. 611(b); FY 1986 Continuing Resolution Sec. 501. If for water or water-related land resource construction, has project met the principles, standards, and

   N/A

	procedures established pursuant to the Water Resources Planning Act (42 U.S.C. 1962, et seq.)? (See AID Handbook 3 for new guidelines.)	
5.	FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?	N/A Project does not involve construction financed by U.S.
6.	FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	No
7.	FAA Sec. 601(a). Information and conclusions whether projects will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	(a) No (b) No (c) No (d) No (e) No (f) No
8.	FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	N/A

9.	FAA Sec. 612(b), 636(h); FY 1986 Continuing Resolution Sec. 507. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.	GOM is contributing the vast majority of financing for the locust control effort, since it is an ongoing program.
10.	FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?	U.S. does not own excess foreign currency of Morocco
11.	FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes
12.	FY 1986 Continuing Resolution Sec. 522. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?	N/A
13.	FAA 118(c) and (d). Does the project comply with the environmental procedures set forth in AID Regulation 16. Does the project or program take into consideration the problem of the destruction of tropical forests?	Yes
14.	FAA 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (dollars or local currency generated therefrom)?	N/A

15. FY 1986 Continuing Resolution Sec. 533. Is disbursement of the assistance conditioned solely on the basis of the policies of any multilateral institution?

16. ISDCA of 1985 Sec. 310. For development assistance projects, how much of the funds will be available only for activities of economically and socially disadvantaged enterprises, historically black colleges and universities, and private and voluntary organizations which are controlled by individuals who are black Americans, Hispanic Americans, or Native Americans, or who are economically or socially disadvantaged (including women)? N/A - ESF funded

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(a), 111, 113, 281(a). Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward N/A - ESF funded

	better life, and otherwise encourage democratic private and local governmental institutions. (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status, (e) utilize and encourage regional cooperation by developing countries?	
b.	FAA Sec. 103, 103A, 104, 105, 106. Does the project fit the criteria for the type of funds (functional account) being used?	Yes
c.	FAA Sec. 107. Is emphasis on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)?	Yes
d.	FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed country)?	Yes
e.	FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?	Yes

f.	FAA Sec. 128(b). If the activity attemps to increase the institutional capabilities of private organizations or the government of the country, or if it attempts to stimulate scientific and technological research, has it been designed and will it be monitored to ensure that the ultimate beneficiaries are the poor majority?	Yes
g.	FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.	N/A - ESF funded

2. Development Assistance Project Criteria (Loans Only)

a.	FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, at a reasonable rate of interest.	N/A
b.	FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?	N/A

3. Economic Support Fund Project Criteria

a.	FAA Sec. 531(a). Will this assistance promote economic and political stability? To the maximum extent feasible, is this assistance consistent with the policy directions, purposes, and programs of part I of the FAA?	Yes Yes
b.	FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities?	No
c.	ISDCA of 1985 Sec. 207. Will ESF funds be used to finance the construction of, or the operation or maintenance of, or the supplying of fuel for, a nuclear facility? If so, has the President certified that such country is a party to the Treaty on the Non-Proliferation of Nuclear Weapons or the Treaty for the Prohibition of Nuclear Weapons in Latin America (the "Treaty of Tlatelolco"), cooperates fully with the IAEA, and pursues nonproliferation policies consistent with those of the United States?	No
d.	FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?	N/A

ANNEX D.

ENVIRONMENTAL ASSESSMENT

ACTION AID3 INFO: DCM ECON/5

VZCZCRA0297EBV078
OO RUEBRA
DE RUEBC #9885 1320122
ZNR UUUUU ZZE
O 1102282 MAY 88
FM SECSTATE WASHDC
TO AMEMBASSY RABAT IMMEDIATE 4815
BT
UNCLAS STATE 149885

LOC: 156 778
11 MAY 88 0757
CN: 02285
CHRG: AID
DIST: AID

AIDAC

E.O. 12356: N/A
TAGS:
SUBJECT: MOROCCO LOCUST CONTROL PROJECT (628-0196) - ENVIRONMENTAL CLEARANCE

REFERENCE: ENVIRONMENTAL ASSESSMENT (EA) OF THE MOROCCO LOCUST CONTROL PROJECT - REPORT DATED APRIL 1988.

1. SUMMARY: REFERENCED REPORT HAS UNDERGONE TECHNICAL REVIEW IN AID/WASHINGTON RESULTING IN MINOR MODIFICATIONS WHICH ARE SUMMARIZED BELOW. THE PRINCIPAL CONCLUSIONS AND RECOMMENDATIONS OF THE EA ARE UNCHANGED. THE SUBJECT PROJECT IS APPROVED FOR ENVIRONMENTAL SOUNDNESS. END SUMMARY.

2. FOLLOWING TECHNICAL REVIEW IN AID/WASHINGTON, A REVISED AND FINAL VERSION OF THE EA HAS BEEN PREPARED AND IS BEING POUCHED TO THE MISSION. MINOR CONTENT AND EDITORIAL CHANGES HAVE BEEN MADE IN SECTIONS 4.0, 5.0, AND 7.0. IN APPENDIX F OF THE EA, THE SCOPE OF WORK FOR THE ENTOMOLOGIST/ENVIRONMENTAL MONITORING SPECIALIST HAS BEEN REVISED AS FOLLOWS:

A. IN SECTION III.F., QUOTE SPECIFIC UNQUOTE, ADD THE FOLLOWING ITEM UNDER QUOTE SCOPE A AND B UNQUOTE:

QUOTE: PRIOR TO DEPARTURE TO MOROCCO, DEVELOP TECHNICAL PROTOCOLS FOR PRE- AND POST-TREATMENT ENVIRONMENTAL MONITORING OF LOCUST CONTROL AREAS. CONSULTATIONS WITH APPROPRIATE USG AND ACADEMIC SPECIALISTS IN TERRESTRIAL AND AQUATIC ECOLOGY, AND PESTICIDE APPLICATION IMPACT ASSESSMENT SHALL BE UNDERTAKEN IN THE COURSE OF CARRYING OUT THIS TASK. UNQUOTE.

B. IN THE SAME SECTION, UNDER QUOTE SCOPE A UNQUOTE, REVISE ITEM 1 TO READ QUOTE: OVERSEE THE FIELD APPLICATION OF PESTICIDES AND ADVISE ON THE TYPES OF PESTICIDES AND FORMULATIONS MOST SUITABLE FOR USE; SELECTION OF APPLICATION EQUIPMENT; AND SPECIFICATION OF MAINTENANCE AND REPAIR SERVICES. UNQUOTE.

C. REVISE SECTION IV, QUOTE LEVEL OF EFFORT UNQUOTE TO READ QUOTE: THE ESTIMATED LEVEL OF EFFORT FOR THE CONTRACTOR FOR EACH LOCUST CONTROL CAMPAIGN (ASSUMING

ONE TDY TO MOROCCO PER CAMPAIGN), INCLUSIVE OF TRAVEL TIME, IS SIX DAYS OF CONSULTATIONS IN THE U.S. WITH ECOLOGICAL SPECIALISTS, FOUR DAYS IN AID/WASHINGTON, AND 62 WORK DAYS IN MOROCCO (SIX DAY WORK WEEK). UNQUOTE. THE BUDGET IN SECTION V HAS ALSO BEEN REVISED TO TAKE INTO ACCOUNT THESE CHANGES IN THE LEVEL OF EFFORT.

3. SUBJECT TO MISSION COMPLIANCE WITH THE RECOMMENDED ENVIRONMENTAL IMPACT MITIGATION PROVISIONS OF THE REFERENCED ENVIRONMENTAL ASSESSMENT, AS REVISED, ANE/PD/ENV HEREBY CLEARS THE SUBJECT PROJECT FOR ENVIRONMENTAL SOUNDNESS. SHULTZ
ET
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ANNEX E.

TECHNICAL ANALYSIS

ANNEX E.

TECHNICAL ANALYSIS

1. Biology of the Desert Locust

Locusts belong to the order Orthoptera and the super-family Acridoidea. The life cycle comprises three stages: Egg; Hopper (nymph or larvae(Fr.)); and adult. The time spent in each stage, the number of instars of the hoppers and the time required for the adult to become sexually mature show considerable variation depending upon the weather.

True locusts differ from grasshoppers by their ability to change behavior, physiology, color and shape in response to a change in their population density. Individuals of the grasshopper-like form are said to be in the SOLITARIOUS PHASE, whereas those in the swarming, locust-like form are said to be in the GREGARIOUS PHASE. Intermediate forms are said to be in the TRANSIENS PHASE.

Locusts deposit their eggs in moist sandy soil in pods a few mm below the soil surface. The number of eggs in a pod and the number of pods laid depend upon the food availability and the length of the laying season. Eggs are generally laid in groups. Eggs do not go through a period of diapause. Egg survivability is dependent upon adequate soil moisture and temperature. The maximum period of viability is only about 2.5 to 3 months. The rate of egg development is related to soil moisture and temperature. At 32 C - 34 C (air temperature) egg development proceeds at the minimum rate and hatching takes place in 11 days. At 20 C hatching takes place in about 24 days.

Female Desert Locusts can lay eggs up to 3 times during their lifetime. The number of eggs in a pod can vary from about 20 to over 100. The average number of eggs in the first pod laid are about 95 for solitarious phase locusts and 70 - 80 for the gregarious phase. The average number of eggs in the second laying are somewhat less and if a third laying occurs the number of eggs will average less than 50.

The young hoppers pass through five instars. Each instar extends from about 5 days for the initial instar to 12 days for the fifth and final instar. The total hopper period averages 38 days but can vary from a low of about 20 days at air temperatures of 38 C. to 66 days at 24 C. Solitarious populations may take 5 to 10 additional days to develop at the same temperatures.

The final moult is from the fifth instar to adult. This change is called fledging and the young adult is called a fledgling.

Hoppers hatching from scattered pods normally move into the nearest vegetation and remain largely quiescent, while hoppers hatching in areas of sparse vegetation, even though the pods may be somewhat scattered will form marching bands, even at population levels as low as 10 - 20 hoppers per sq. meter.

Crowding for more than one generation is required to produce fully gregarious characteristics. This happens either when a prolonged rainy season allows the production of several successive generations in the same area, or when a partially gregarized population moves to an alternative seasonal breeding area with conditions continuing to favor gregarization. Otherwise, the population may revert to a partially or wholly solitarious type.

When hoppers occur in large number they gather together in bands which move about as distinct units. The have a more or less regular pattern of behavior. At night and in the early morning, hoppers are found off the ground roosting (resting) on plants, bushes and stones. Roosting also occurs during the middle of the day when the temperature exceeds about 36 C.

Hoppers usually spend the greater part of the day marching. Under sunny conditions bands of first instar hoppers may march about 100 meters per day while large bands of fifth instar hoppers may march as much as 1 -2 km. per day. Direction of march is generally downwind. However, in rough or hilly terrain their direction of march may be channeled by the direction of watercourses and other impediments to a straight line movement.

The main feeding period for hoppers begins with their roosting on plants in the evening, but they also feed briefly while marching. Just before moulting they feed very little or not at all. For the first three instars this non-feeding period lasts about one day, but for the latter two instars it may last 2 -4 days.

The length of life of an adult Desert Locust under favorable conditions varies between 2.5 and 5 months. It reaches sexual maturity about 45 days after fledging. Mature adults live about 30 days. In unfavorable conditions maturation may take as long as 6 months. In gregarious locusts the mature adults have a bright pink coloration which turns to brick red as they grow older. Mature adults are yellow. In the solitarious form the adults are usually grey or dull brown.

Desert Locusts begin flying soon after becoming adults. Solitarious forms fly at night and require a temperature of about 23 C or more for takeoff. Some fly frequently, while others hardly at all. Low density solitarious forms are found throughout the Saharan and Sahelian areas of Africa and in the arid areas of the Near East to Central India. Gregarious Desert Locusts fly during the daylight hours. They can fly continuously for 17 hours or more. The energy needed is derived from fat stored within its body. The longest flights are made by immature locusts, which do the most feeding and store the most fat. In sunshine, long continuous flight is possible when air temperatures are above 14 C., but flight decreases when the air becomes hotter than 40 C.

Most feeding occurs in the evening soon after settling has occurred. During swarming some feeding also occurs. Individual locusts leave the swarm for short periods to feed on any green vegetation that the swarm happens to pass over, then they rejoin the swarm. Contrary to some belief, locusts do

The insecticides to be used will depend upon the situation prevailing at the time. Low to moderate toxicity insecticides with short residual activity will generally be considered for use in the control of swarms. Insecticides such as malathion and fenitrothion are included in this category. Major emphasis will be placed on late fall to early winter control of swarms of immature adult locusts invading southern Morocco in order to restrict breeding and reproduction on Moroccan soil. Recognizing that this effort may not be completely effective, efforts will also be directed towards the control of emerging hoppers and hopper bands, the result of breeding by invading swarms. The longer residual moderately toxic insecticide Carbaryl-Sevin-4-oil formulation has been selected for hopper band control. In the early instars prior to banding and migration either short or longer residual insecticides can be applied directly on concentrations of young hoppers using both aircraft and ground equipment (back pack mist blowers etc.)

Although AID plans to limit its pesticide purchases to ULV malathion and Carbaryl Sevin-4-oil other pesticides may be provided by other donor nations or the Moroccan Government. Pesticides considered suitable for locust control as included in the Locust/Grasshopper Programmatic Environmental Assessment (PEA) will be acceptable for application by U.S.A.I.D provided equipment within the limits or restrictions imposed.

not seek out and fly to areas of green vegetation. Locusts are carried downwind to areas of low level wind convergence which often happens to be where rainfall has occurred and green vegetation is therefore present.

The beginning of adult maturity can be recognized by the disappearance of the pink color of the hind tibia. Male locusts mature and then give off a pheromone (scent) which causes maturation to start in the female

2. Technical Response to Locust

a. Control Strategies

Locust control on other than an individual farmer or national basis had its beginning in 1929 when the United Kingdom recognized that control methods by individuals practiced until that time, only when invasions occurred, were of little value and in the long term, wasteful. Effective control required an approach to the problem as a whole regardless of political boundaries. The prerequisites for such an approach were scientific knowledge of the species, its incidence and biology. By the outbreak of the Second World War, sufficient progress had been made to provide a basis for planning large scale locust control efforts in Africa and the Middle East, then in the grip of a locust plague which threatened the economy of the region.

The end of World War two and the termination of plague conditions brought with then a reduction in U.K. Government funding for locust research until 1945 when the Anti-Locust Research Center, came into existence. By 1952, the region was again in the grip of a major locust plague. The FAO accepted a coordinating role and has continued in that role until now. A predecessor agency to AID established a regional project to assist in the control effort. Much of that effort was focused on Morocco, a nation in which effective control is a key to success.

The goal of all locust/grasshopper control efforts is to attack the problem at the earliest possible stage of development of an upsurge so as to minimize to the extent possible the control costs, area requiring treatment and the potential for crop and grassland damage. For locusts, the criteria employed in determining when control efforts are justified is dependent on phase transformation as detected through surveys. The types of surveys are listed on Chart 1.

In late summer and early fall at the end of the summer rains, gregarious Desert Locusts migrate from the summer breeding area of sub-Saharan Africa and the Southern Arabian peninsula and concentrate in northwestern Africa, the Red Sea coastal plains of Sudan, Ethiopia and Saudi-Arabia, the northern and eastern coast of Somalia and the Great Indian Desert. Enroute they become trapped by terrain features which restrict their movement, thus making them ideal targets for control. These entrapment areas include the Atlas Mountains of northwest Africa, the northern Ethiopian (Eritrean) highlands and the mountains of Yemen where cool weather limits their flight. At the eastern end of the invasion area the heavy rainfall of central and eastern India force Desert Locusts to concentrate in the Deserts of Pakistan and India.

Chart 1

SURVEYS

a. Solitarious phase – Adult Survey

Adult surveys are conducted in major breeding areas on solitarious populations to check on population numbers, aggregating tendencies and phase transformation. They serve as a guide as to the need for control measures against future generations. Aerial surveys are not suitable for observing these non-swarming populations.

b. Gregarious phase – Hopper Surveys

Since control efforts are desirable against all gregarious locust forms, these surveys are designed to delimit areas in which hopper bands are present. These are normally ground surveys as hopper bands are difficult to detect from the air, particularly in areas of abundant vegetation.

c. Gregarious phase - Flying Swarm Surveys

Both ground and aerial surveys are utilized to detect flying swarms. Ground surveys usually rely on reports of sightings from the local populace as a guide. Once sighted swarm movement is tracked to provide guidance to control teams. Survey teams have the responsibility to mark the boundaries of the location at which the swarm settles for the night.

d. Gregarious phase – Settled Swarm Surveys

These surveys are most useful in areas where terrain features inhibit swarm movement. Since bright colorations are typical of many immature and mature adult locust species aerial survey for settled swarms is often a suitable technique.

Survey is the responsibility of the Crop Protection Service, Morocco. Aircraft provided by the USAID are not to be used for survey.

1. Hoppers

Although natural mortality in hoppers is highest in initial instars, in the case of mountainous regions, treatments will be made quickly after emergence before the young hoppers have a chance to band and disperse beyond the confines of the oued bottoms. Spraying can be conducted either by aircraft or ground equipment. Short residual insecticides (Malathion ULV and Fenitrothion ULV) can be applied directly to the hopper concentrations using ground equipment. USAID chartered aircraft will utilize carbaryl to take advantage of the residue on nearby plants in addition to direct contact.

In large open areas with adequate vegetative cover where marching hopper bands have been detected, barrier strips employing Carbaryl Sevin-4-oil will

be the application method of choice. Barrier spraying utilizes one-half or less insecticide than blanket coverage. Alternate treated and untreated strips reduces the hazard to non-target organisms and is the most economical and effective method of locust hopper band control (see Strategy Paper for use of carbaryl sevin-4-oil, Annex.)

Aircraft application for direct contact on concentrations of young hoppers will generally be limited to the treatment of sandy bottom oueds that are remote and inaccessible to ground equipment. Latter instars in marching bands will normally be treated utilizing barrier applications applied either by ground or aerial application. For large open areas with adequate vegetative cover barrier strips 200 to 300 meters wide will be treated well in front of the marching bands and back through the entire infested area. Untreated strips of 200 to 500 meters, dependant on speed of migration, will be left between treated barriers. Modifications of treatment widths of barriers and untreated areas between barriers will be made on the basis of results obtained (see annex - strategy for desert locust hopper control using carbaryl).

2. Swarms

Swarm control involves two strategies:

- Flying swarm control utilizing a quick acting, contact insecticide. Although research has shown flying swarm control to be highly efficient under actual field conditions it does not always live up to research findings due to rapid fluctuations in swarm size and density. Flying swarm control is also dangerous. It requires aerial application. Flying locusts impinging on the aircraft windshield impair the pilots vision. Locusts pack up in the airscoops of the aircraft and between the engine and nacelle sending engine temperatures soaring. USAID aircraft will not be used to treat flying swarms.

- Settled Swarm Control is safer and generally more effective than flying swarm control. Settled swarms are usually highly concentrated The area they occupy is normally 3 to 10 times less than flying swarms. During warm weather locusts begin flying from early morning until late evening, so the application time is short. Treatments must start shortly after daylight and cease when swarms begin to fly usually by 10 AM. Late afternoon and evening spraying is to be avoided.

- Settled swarm control will utilize Malathion 96% ULV at 75 liters per hectare or fenitrothion ULV at 5 liters per hectare. Carbaryl Sevin-4-oil diluted 4:1 with diesel fuel and applied at 2 liters per hectare is an acceptable settled swarm treatment if the other two insecticides are not available.

b. Appropriateness and Soundness of Strategy

The control and survey strategy as designed is appropriate for the present and anticipated problem, which is based on the best available forecast information. Forecasting is derived from data provided by the FAO Desert

Locust Information Service, Rome, Italy, determinations by independent locust experts in the field and the Crop Protection Services of Morocco and its neighbors. Forecasting involves the use of historical data of previous Desert Locust outbreaks, including a detailed literature search, long range weather forecasting and greenness maps of vegetation development in known breeding areas as provided by the U.S. Geological Survey from NOAA satellite imagery.

The control strategy has been jointly developed and agreed upon by the Government of Morocco, other donor nations and USAID. It is based on proven grasshopper/locust control strategies in similar previous programs within the Near East and Africa, and for grasshopper and other locust control world wide. Also taken into account are the special terrain features of Morocco which makes it distinct from most other nations of the Desert Locust invasion area. Morocco is bounded on two sides by large water bodies (Atlantic Ocean and Mediterranean Sea) which affect low level winds systems, the guiding force to Desert locust migration. The Anti-Atlas and Atlas mountains of southern Morocco act as a barrier to the fall and winter northward migrations and concentrate the locust swarms along their southern slopes. In the spring and early summer, with the return of warmer weather, the locusts can penetrate this mountain barrier through the lower mountain passages and continue northward migration to the fertile plains of central Morocco and Mediterranean coast. Mediterranean coastal and offshore winds normally prevent continued migration to the European continent.

The strategy is designed to prevent spring migrations to north of the Atlas mountains while at the same time prevention of infestations in the fertile Souss Valley and minimizing crop damage to oases to the south. The strategy recognizes that all crop damage cannot be avoided, but attempts to limit damage to the less productive areas. Attempts to eliminate all crop damage would entail movement of the control zone even further south into remote desert areas, losing the advantage of the mountain barrier and increasing logistics problems and cost.

The strategy is also designed to prevent or at least minimize the escape of swarms back to the summer breeding areas of the Sahel which then becomes a source of continued infestation in the fall of 1988 and future years. So, not only providing protection to the fertile agriculture of Morocco, the strategy also provides a large measure of protection to the nomadic Saharan tribesmen and the small Sahelian farmer who could be subject to destruction of grazing lands and crops. Locusts in the summer breeding areas are likely to spread out over vast areas at lower but still economic population levels appreciably increasing the problems and costs associates with their control, and more widespread pesticide application and its associated environmental concerns.

The strategy recognizes that due to the rugged remote and lightly inhabited area to the south of the mountains there is no impediment to complete elimination of the problem in any one given year. The object is to protect the fertile agricultural areas of Morocco while whittling away at the residual population returning to the summer breeding belt, which in turn reduces the population returning to Morocco the following fall and winter. This strategy of plague prevention suggests that continuing intensive control

efforts on an ever decreasing population can within two or three years eliminate the present problem. It recognizes that failure of accomplishment can result in the rapid population buildup to full plague status throughout the 60 plus nation invasion area within a relatively short period and a projected 7 to 8 years or more of continuous infestation at that level.

The strategy recognizes that for now or the foreseeable future there is no permanent solution to the problem but, that presently, plague prevention is the most feasible means of approach.

c. Capabilities of Actors to Implement Strategy

Although Morocco has one of the most efficient, best trained and equipped Crop Protection Services of the developing nations it is small in comparison to the problem. In their effort the CPS has been supplemented in large measure through the use of military forces and personnel from other governmental agencies. However, the problem developed so rapidly that there was little time to train these supplemental forces in the intricacies of large scale locust control. Even within the CPS, due the length of time since the last major Desert Locust outbreak, there were only very few personnel available who could adequately relate to the problem and be called upon to guide operational planning. Thus it has become both a learning as well as an operational experience for most Moroccan participants.

The rapid response of the donor community, though instrumental in providing the equipment and material necessary to prevent major crop losses, has to some extent provided further consternation among the Moroccans due a lack of technical assistance in its operation or use. However, without this assistance, in spite of the large numbers of personnel and support equipment recruited from other Moroccan government sources it is likely that the intensity of the problem would have overwhelmed the Moroccan capacity to effectively respond.

As with any large scale pest control effort utilizing significant numbers of inexperienced personnel there becomes a tendency for overkill through overapplication or the use of pesticides that are more toxic than is necessary. Until now such unfortunate practices have frequently occurred, given rise to increased environmental hazards as well as increasing overall control costs.

On the positive side, with the experience they have gained, many of the Moroccan technicians have now adopted a more rational approach to control, recognizing the environmental consequences that could ensue, and that the problem will not evaporate quickly. Except in military circles the necessity for killing each and every locust appears to be a thing of the past. There is becoming a recognition that to achieve the project objective of returning the population to solitarious status through an adhered to plan of action is superior to the reactive approach initially subscribed. Acknowledging that the cost of control is high, many personnel are now searching for ways to get "more bang for the buck".

Still, in some sectors a tactical military approach to control is still very much in evidence. This includes treatments at inopportune times of the day or under conditions in which efficacy of operations is either minimal or non-existent. The proposal to mount a military type ground operation of several thousand people armed with back-pack sprayers marching through the countryside spraying hoppers which they run across appears to be a throwback to control efforts of earlier times. Such efforts in the past have never proved successful in plague prevention. Also, most pesticides used today are inappropriate for this type operation. If undertaken at the level proposed, it can be expected to further dilute the numbers of experienced personnel available for more productive endeavors involving proven efficacious control techniques.

Thus, a declining rate of return on personnel inputs must be expected until it is recognized that the presently practiced state of the art techniques provide the greatest opportunity for success.

On the positive side, with respect to military involvement, the use of helicopters has greatly enhanced the efficiency of survey. Early detection utilizing military and CPS observers in military helicopters has been a major factor in the success in swarm destruction prior to reaching the fertile Souss Valley. To reach an equivalent level of efficiency would have required scores more of technically trained personnel. Sprayer equipped military aircraft have also been successful in controlling swarms in areas inaccessible to conventional fixed wing aircraft.

Although in the beginning many of the Moroccan personnel on the program were forced to gain experience through trial and error, this experience should begin to pay more and more dividends in the future as they grow towards self reliance. For the near future, however, technical assistance remains a necessity and a desired donor contribution.

3. Technical Analysis of Airplanes:

Large Category Aircraft

Large Aircraft are selected for remote areas requiring long range distances. The average large aircraft will carry between 7570 to 11, 355 liters (2000 to 3000 gallons) of pesticide. Application swath runs should be 30 to 45 kilometers long (17 to 24 nautical miles) and ferry distance capability up to 1706 kilometers (922 nautical miles) round trip non-stop flight and deliver a full pesticide load.

a. Electronic Guidance

Large category aircraft must be equipped with Loran "C" where acceptable coverage and signal strength is available on the Omega Navigation System modified with the 211 agriculture grid software to improve accuracy from 1 1/2 miles to one-half (1/2) mile accuracy.

Long spray runs cannot be ground marked over long distances consistently without multiple distraction to the flight crew.

Some Items to be Considered when Selecting Aircraft Types

- Speed of Aircraft
- Effective Swath Width
- Useful Pay Load
- Fuel Capacity and Ferry Distance Capability
- Maneuverability at Average Loaded Wights
- Performance at Above 1524 Meters (5000 FT) Elevation
- Type of Fuel Available
  Size of Area(s) to be Treated.
- Performance Over Rugged Terrain at all Altitudes
- Overall Production Capability to Finish the Job During the Window of Opportunity
  Runway Length and Width Requirements of the Type of Aircraft Including Taxiway and Ramp Strength.

Minimum Size treatment area guidelines are listed at 50,000 hectares. One unit block does not require the immediate contracting of a large four-engine aircraft to disperse approximately 29,228 liters (7722 gallons) insecticide. One model will treat the area with 2.6 loads. The situation would probably not be an emergency unless multiple sized 50,000 hectare areas could be clocked in for efficient use of high speed aircraft.

The following is an example of poor judgment in the use of large aircraft.

- Treatment area 5 kilometers (3.1 statute miles) long. Aircraft speed 187 knots (215 MPh). The total hectare area infested or liters carried are unknown.

- One swath run takes 52 seconds treating, and 2 minute turns at each end turn-around or by circling back to the original starting point to spray the area in one direction.

- Properly calibrated the aircraft will use more liters of fuel than liters of pesticide. Fuel consumption is about 1609 liters/h. (425 gallons) per hour. Only about 2923 liters (772 gallons) of pesticide will be needed to treat the area.

- Seasonal program plans can be projected on potential insect activity. Disastrous threat usually allows some lead time for acquiring large aircraft if necessary. Many times in the example above four medium aircraft will control 5000 hectares (12,355 acres) of locusts and be flexible to split into pairs to work separate smaller areas.

Cost Justification

Large aircraft contracting costs are expected to be high. The unexpected costs are the added "Operational Assurance Factor" that if it taxes 2 aircraft under ideal weather, high production and no breakdowns. It takes three aircraft to be assured of always having two fully operational aircraft in the United States.

- Overseas operations takes 4 large aircraft to operate two aircraft to be assured of meeting the biological timing of the insect;

- Large aircraft on site in Africa contracts can cost approximately one million dollars mobilization on site emergency on site costs.

- Important decisions must come from professional program planners and an entomologist to be certain the size aircraft selected are compatible with the terrain. Infestation and field support before a "quick fix" solution is suggested.

Medium Size Aircraft

- Medium sized aircraft should probably be classed on the familiar ayres turbo thrush, grumman turbine powered AG-CAT, and the snow air tractor.

- The above aircraft are high performance single engine spray aircraft capable of working in higher and more rugged terrain than small low powered aircraft. The turbine maneuverability in narrow confines of small mountain wadis are more successful at controlling the locust in Morocco than large aircraft can expect to accomplish.

Justification

- Turbine powered aircraft are considered more reliable than piston powered with much better high altitude performance.

- Jet "A" fuel is available throughout Africa, in addition, the logistics of 60 weight oil is not necessary as with piston engines.

- Fuel consumption is 151.4 liters/hour (40 gallons/h) Jet "A".

- All contract thrush turbine aircraft must be equipped with long range internal wing tanks of 117.5 to 863 liters (190 to 228 gallons) fuel capacity. Original standard fuel capacity of only 401 liters (106 gallons) in the early models is not acceptable on African aerial contracts.

  For all locust control aircraft long range fuel must be required for medium aircraft, and should be required for small aircraft if their power and design permits the modifications.

- Turbine powered aircraft have much more:

  load carrying capability than piston powered models;

  capable of carrying above average pesticide and fuel loads; and

  40 km/hour (22 knots/hour - 25 MPh) higher operating speed.

Turbine powered aircraft available from factory by order:

- Ayres Thrush
- Air Tractor (Snow)
- Schweizer AG-CAT (Grumman)

Small Size Aircraft

Small aircraft most familiar are the Cessna 188B models and Piper Pawnee PA-36 series.

- Small fuel supply limits ferry distance aircraft work from the base of operations.
- Hectares treated per hour are less than more powerful aircraft.
- Used over flat to slightly rolling terrain at lower levels above sea level.
- Capable of operating off un-improved airstrips with agile maneuverability at lower elevations above sea level.

Helicopter Use

- Helicopters can be used for aerial observation and survey.
- Aerial communications air to air, air to ground and relay between ground units in the field and to the airstrip base.
- Monitoring weather conditions and affect on the spray coverage.
- Distribution of spray dye cards before area treatment.
- Recover dye cards after area treated to check coverage and make hopper/locust kill checks to determine spraying results.
- During monitoring of aerial operation, observe spray fixed wing or rotor wing during turns for leaking spray systems.
- Make excellent small area search and spot sprayer, as they require only small opening "heliports" selected near the worksite.
- Weather decisions when to start and when to stop.

Communications

- Hand held programmable radios for communication from the ground field observer team leader to the treatment aircraft on VHF aircraft frequencies.
- Monitoring treatment area weather conditions and report information to the aircraft base. Using long range such as H.F. frequency.

- Monitoring spray coverage and by radio communication to the pilot such a drift, loss of pesticide, high temperatures or wind.

- Assist pilots in locating locust boundary changes.

- Monitor aerial operation - report system leaks, symptoms of calibration problems to the pilot and airport base if possible.

Request for C-130 Retrofit Large Aircraft Category

The Morocco Air Force owns two hercules C-130 aircraft. The U.S. Government Agency for International Assistance was requested to furnish spray equipment retrofit for the C-130 for large scale spray operations against the african locust. USAID equipment specialists responded with an evaluation of the model and series C-130 and feasibility of installing specific dispersal configurations.

- Recommendations for equipment installation are:

  Engineering specifications approved to mount spray lines and end booms on wings, and

  Install onboard 3885 liter (1000 gallon) tank or up to four tanks connected together cross-flow operated from central control unit position with power to spray pumps.

Priority for this assistance has not been made since the need for large aircraft has not been established.

Helicopters Bell 205 A Model Retrofit

Morocco airforce request spray systems to be installed in 10 (ten) Bell 205 A helicopters.

The most common approved spray systems are available on order from Simplex Company. The standard 378 liter (100 gallon per minute) standard configuration can be ordered with a suggested positive geared displacement 60 liter (16 gallon) maximum per minute pump powered by a high torque low RPM (Revolutions Per Minute) electric motor for ULV (Ultra Low Volume) locust spray operations.

The model No. 7000 onboard spray tank considered is mounted in the main cargo area behind the pilot cockpit section.

- The unit was recommended for maintaining the open clearance between the landing skids and higher mounting of the spray booms avoiding damage from rough surface, rocks and low desert vegetation.

Dispersal Electric, Wind and Hydraulic Devices

Requests by most african locust areas are for the spinning electric or wind driven dispersing devices producing actual or theoretical desired droplet sizes.

Speed of the aircraft shearing effect, humidity and temperature, wind and pesticide formula characteristics combine to influence the final result.

The U.S. Department of Agriculture use the flexibility of the tee-jet flat fan. Canada, England, Europe use spinning devices with flat fan and cone orifice diaphram nozzles. The majority USA private AG-aviation sector use combinations of all the above.

Exception

- Carbaryl Sevin- oil formulations do not maintain calibration when dispersed through caged spinning screens or mesh sleeves etc. Over agitation of the material causes thickening and plugging.

- Flat fan nozzles larger than used for ULV malathion with slotted screens in each nozzle must replace the 50 mesh size standard screen.

- Helicopter spray systems estimated costs:

Mode No. 7000 =	$20,600
Electric Beecomist-Spinning at $1100.00 each - 6 units/aircraft =	6,600
Electric Micronaire-Spinning at $1190.00 each - 6 units/aircraft =	7,140
Estimated crating each unit for shipping	75
Estimated $300,000.00 for 10 units including shipping	$34,415

Sevin 4-Oil Mixing Tanks

The Rhone-Poulenc Agrochemie, Lyon, France representatives agree the product must be circulated thoroughly before loaded into the spray aircraft tank.

Self contained two wheel trailers carry permanent mounted tanks. Engine and pump with 2 inch quick no drip disconnect hose is used at each aircraft loading site.

- Critical Items:

Barrels must be rolled 90 meter to mix sediment from storage.

Formula must be mixed at recommended rate for specific project.

Formulation must be circulated for complete mixing, and only then.

Load the aircraft.

Equip aircraft and calibrate with stainless steel flat fan tee-jet series recommended for speed of aircraft.

ANNEX F.

PROCUREMENT ANALYSIS

To: R. Thompson, PDO

From: P. Howley, ACO

Attached is the procurement schedule for the Locust Control Project.

Attachment # 1	Procurement Plan Pesticides
Attachment # 2	Issuance of PIO/C's
Attachment # 3	Flying Services 2 pages)
Attachment # 4	Waivers (2 pages)
Attachment # 5	Sample Justification (2 pages)
Attachment # 6	Assistant Adm. Auth.
Attachment # 7	Competitive Proc
Attachment # 8	Notes of telecon with OFDA

Aitachment 1.

April 11, 1988

MEMORANDUM

TO: RThompson, PDO

FROM: PHowley, Contracting Officer

SUBJECT: Procurement Plan Pesticides

For project procurement, with sufficient leadtime, GSA can procure the pesticides needed under its agreement with AID and under its delegation of authority for directed procurement.

The pesticides should be procured as soon as possible so that we can gain the tremendous savings of shipping by boat versus by air. It costs about 8 or 9 times more to ship by air. These savings could be then used for other procurement. If not the Mission Director has authority to approve non-competitive procurement based upon FAR 6.302-2 (Unusual and Compelling Urgency or 6.302-1 (Only one responsible source or not other supplies or services will satisfy agency requirements.) for any future procurements.)

Attachment 2.

April 13, 1986

MEMORANDUM

To: RThompson, PDO

From: PHowley

Subject:)/C's for
pesticides and equipment.

The issuance of the PIO/C's for malathion and ıe made by
SER/OP/COMS. All they need to issue a PIO/C the facesheet plus
any conditions or instructions that the Missi include regarding
these items of the locust program.

We possibly need to add specifications.

You must be aware that PIO/C's will not be issued without the funding obligation and approval of the PP.

Attachment 3.

April 11, 1988

MEMORANDUM

TO: RThompson, PDO

From: PHowley

Subject: Future flying services

The original flying service contract was negoti[illegible]y to meet an immediate need. Under these circumstances the [illegible] has most of the advantages because of the extreme urgency and m[illegible] procurement rules', for sound cost or price analysis cannot be secu[illegible]

Since the present contract was negotiated for 10 months it gives AID an opportunity for an audit to be done before future negotiations take place.

It is my recommendation that an audit be requested as soon as possible in order to determine the reasonableness of the flying hour costs.

Experience with the initial disaster contract will make it possible to more accurately forecast the minimum and maximum hours of flying services needed to be negotiated for the contract from January 1989 through January 1990.

At this time one cannot accurately forecast the number of flying hours or the number of aircraft needed, however, AID should ascertain from the Contractor whether or not he has additional aircraft, the whereabouts of these aircraft and the time it will take to have the aircraft delivered to Morocco should the need arise.

The preliminary estimate based upon observations by entomologist, G. Cavan, is that present needs call for flying hours of 12 per week on the average of 1 flight per day when the locust are " swarming" and 2 flights a day when they are "hopper bands".

Attachment 3.

April 9, 1988

MEMORANDUM

TO: RThompson, PDO

FROM: PHowley, Contracting Officer

SUBJECT: Flying Services

The flying services contract that is now being ...ed in Washington will be for a limited period of time. Normally the... ...cts are negotiated with a mobilization cost. This cost covers all the... ...tors costs and profits associated with mobilization. The contract usu... ...s a guaranteed number of flight hours per week, month etc... and will be ... certain number of dollars per hour. (For example the Altair Contra... ...e should be from $900-$1500 per hour). The contract can contain a c... ...e for a fixed hourly rate for flight hours above the guaranteed flying hours.

The contract should contain costs for demobilization and usually consists of personnel, supplies and equipment. AID may, at its discretion, exercise an option to extend the period of the contract.

The pilots supplied by the contractor should be certified and have a minimum of flying hours. The contractor should provide ground personnel to ma ntain and service the turbo/thrush if the Moroccan government is not about to.

The contract should contain a liquidated damages clause to protect AID if the plane is unable to operate for an extended period of time. The contractor shall have a certain time in which to replace the plane and if he does not replace the plane the contractor will be considered to be in default, and the contract may be terminated pursuant to the "Default" clause of the contract.

At this time there appears to be two periods when the two thrush planes will be in service. The first period starts March 1988 through July 1988. The second period is expected from October 1988 through January 1989. Because there should be a hiatus between those two periods the question arises what should be done with the planes on the down-time. Hopefully the contract can be negotiated so that the contractor can receive a minimum flying hours per week to maintain the planes in Morocco so the Contractor does not lose money. It appears the Contractor may need at least 1 hour per day with a maximum of 5 hours per week. An alternative is to give other Missions an opportunity to use those planes but only re only when it is certain that they are needed in Morocco or that they can be returned to Morocco immediately if on loan when a disaster occurs.

Attachment 4.

April 11, 1988

MEMORANDUM

TO: RThompson

FROM: PHowley Contracting Officer

SUBJECT: Waivers

AIP SERVICES CONTRACT

The original contract has been procured non-competitively using the waiver Authority of OFDA. The follow-up contract will have to be waived using the Mission Directors' authority under FAR 6.302-2, (Unusual and compelling urgency.) A justification will have to be prepared that will allow non-competitive procurement. It appears that approval can be made quite easily due to the nature of this project.

PESTICIDES

In the case of malathion and carbaryl waivers of competition can be prepared based upon FAR 6.302.1 - only one responsible source and other supplies or services will satisfy agency requirements. GSA will procure for USAID with sufficient lead time.

EQUIPMENT

The major equipment can be procured under the OFDA procurement umbrella: A schedule for the procurement of other equipment can be made and purchased through the GSA because of adequate leadtime.

TECHNICAL ASSISTANCE

The Mission can procure the technical services it needs through a PASA, IQC contract a Personal Services Contract or a "buyin" contract. It appears to me that a PASA contract with the Department of Agriculture Forest Service would be the most practical since the Department of Agriculture would have access to all the different skills needed. It is also easier to guarantee the same individuals would be available to return to Morocco. (The Mission will have to prepare a waiver of OMB Circular 76)

An IQC contract can be used to procure individuals quickly. A waiver of competition is not needed because the IQC contract orders are the result of competition.

An IQC contractor can also have an institutional memory and in some cases can make available the same people.

It appears now that the Mission might want to consider long-term personal services especially for the project coordinator.

In the personal services contract the Mission Director can approve non-competitive waivers under AIDAR 706-3. Other than full and open competition.

The "buy-in" contracts are similar to the IQC's in that they have been competed and work orders are issued to different institutions.

Attachment 5.

SAMPLE FORMAT NON-COMPETITIVE JUSTIFICATION

TO: Director

From: Project Officer

Subject: Justification for other than full and open competition

CONTENT

(a) Each justification shall contain information to justify the use of a specific authority cited. As a minimum, each justification shall include the following information.

(1) nature and description of project

(2) a description of the services the agency needs

(3) citation of the authority permitting negotiated procurement

(4) demonstrate the unique qualifications or the nature of the acquisition, requires the use of the authority cited.

(5) show exemption to Commerce Business daily as required by sub-part 5.2 of the Federal Acquisition Regulations and, if not, which exception under 5.202 applies.

(6) a realistic cost estimate should be drafted

(7) show how the technical package is not suitable for competition

(8) each justification shall have a contracting officer certification that the justification is accurate and complete to the best of the contracting officer's knowledge and belief.

NOTE: Each justification shall be prepared by the project officer and will include supporting data and the rationale for other than fall and open competition which will form the basis for the justification.

Attachment 5.

SAMPLE OF JUSTIFICATION

TO: Director Charles Johnson

From: RStryker/ADO

Subject: PIO/T
Project 608-0196
Locust Control, OMB CIRCULAR A-76 Exemption

Problem. Your approval of an exemption to OMB Circular A-76 is required to permit USAID/Morocco to obtain the services of the Department of Agriculture Forestry Service to assist the Government of Morocco to conduct the Locust Control Project.

Background

1. What is problem
2. Key components
3. Why activities appropriately implemented in the public sector

Discussion and Justification.

1. Show how public sector has repository of talent
2. Show timeliness of talent needed
3. Necessity for multiple trips to meet semi-annual program
4. Short notice and availability

Altachment 6.

April 11, 1968

MEMORANDUM

TO: RThompson, PDO

FROM: PHowley, Contracting Officer

SUBJECT: Assistant Administrator's Authority

There has been some discussion that AA Julia (:h will waive competition using her authority under AIDAR 70((B)(3) which states the Assistant Administrator responsible for project :- makes a formal written determination, with supporting fundings .iance with full and open competition procedures would impair foreig: e objectives, and would be inconsistent with the fulfillment of the assistance programs.

I'm not sure the bureau will do this or whether it :: :ssary. Most of the procurement to date can be done under OFDA and there : ars to be time to procure the other materials and services. If not, then the Mission can use exceptions from the FAR PART 6 Sub-part 6.302-1 and 6.302-2 and AIDAR PART 706.302-70(b) (2).

84

Attachment 7.

April 11, 1988

MEMORANDUM

TO: RThompson, A/DIR

FROM: PHowley, Contracting Officer

SUBJECT: Competitive Procurement Locust Project

Normal competitive procurement averages from 8 to 12 months from the issuance of the PIO/T until the contract is executed and contractor personnel are in country. The Locust Project cannot be considered normal procurement due to the uncertainty of the locust infestation. The urgency of the air services and pesticides make it impossible to plan on a long-term basis.

What was thought to be a yearly occurrence now appears to be semi-annually. It makes procurement planning difficult if not impossible if normal procedures were undertaken.

The immediacy of the problem lends itself to quick and responsive actior This can only be taken if the Mission has the latitude to procure materials and services quickly. The exception in the FAR Regulation Part 6 (unusual and compelling urgency) can be invoked by the Mission Director in his/her capacity as the head of the procuring activity. For purchases under # 100,000 the AIDAR exception can be used.

Attachment 8.

SUBJECT: Notes of telecon

1/8/88

Per telecon with C. Siegel OFDA has negotiated a ten month contract with Altair for flying services from March 24 through January 1989. The contract has a hiatus of 2 month. There will be an average of 50 hours per month during the peak with a minimum of 275 flying hours in the contract. The contract can be amended if need be.

I am not sure at this time what part of the contract will be picked up by OFDA and what portion is going to be picked up USAID when the project paper is approved.

Spray Equipment

As stated earlier this equipment is contingent upon Simplex not receiving contract from the Forestry Department. If they are not successful, we should then request OFDA procure this equipment non-competitively under their delegated authority.

It should be noted that some training will be necessary to install this equipment. It is therefore suggested that a personal services contract be negotiated for an individual to come to Morocco for about three (3) weeks to instruct in the installation and calibration of these systems.

Technical Services

It now appears that instead of using a Participating Agency Service Agreement (PASA), the services of the project coordinator, logistics specialist, entomologist, health and public safety specialist and spray/calibration specialist may be procured under personal services contracts. This way candidates can be located that can fit into the schedule with requisite skills.

UNITED STATES G ‘E ENT

memorand. m

DATE: 3 May 1988

REPLY TO ATTN OF: MAJ Wilson, MUSLO/AR

SUBJECT: Pyrotechnics for Signalling Aircraft during Locust Spraying Operations

THRU: LTC Crodin
COL Collins Wilson "om word" 52

TO: Ms. Janet Ballantyne, USAID

1. There are two types of devices which would be useful in signalling aircraft during locust-spraying operations: hand held/fired flares to notify the pilot of the general location of the infested area and smoke grenades/pots to delineate the parameters of the infested area.

2. All of these devices are stocked by the U.S. Army and are available through military procurement channels. Some of these devices or similar ones should be available commercially. The specific data for requesting this material through military channels and approximate costs are provided for your information at enclosure.

3. As with any type of pyrotechnic, those mentioned above can be dangerous and must be handled with care. There are certain methods and safety requirements that should be taught prior to their use. If you order these items, request any publications pertinent to each one.

4. Recommend you use a flare to gain the attention of the pilot (as long as he has been informed to fly a certain area and look for this signal) and a smoke grenade for back-up. Visual signals must be predetermined between pilot and ground control. A second flare or smoke grenade of a different color could be used to alert the markers to initiate the smoke to designate the parameters for spraying (which exact signal will depend on the size of the area and type of area, e.g., does the marker have visual contact with the ground controller?). Recommend smoke pots for delineating the area for spraying, however, accessibility to the area is important since the M5 smoke pot weighs approximately 30 lbs. For areas which require extensive walking to place markers, several smoke grenades could easily be carried (each grenade weighs about two lbs.).

1 Encl:
as

OPTIONAL FORM NO. 10
(REV. 1-80)
GSA FPMR (41 CFR) 101-11.6
5010-114

☆ GPO : 1984 O - 421-526 (223)

TYPE	NSN[1]	DODIC[2]	COST	REMARKS
M126A1-SIGNAL, ILLUMINATION GROUND, RED STAR PARACHUTE	1370-00-629-2336	1370-L311	$28.46[3]	Best for initial signalling of pilot (last 10-15 seconds)
M127A1-SIGNAL, ILLUMINATION GROUND, WHITE STAR PARACHUTE	1370-00-753-1859	1370-L312	$26.51[3]	Could be used to signal those marking the area, once pilot has confirmed he is prepared to spray
M8 HC SMOKE GRENADE	1330-00-219-8511	1330-G930	$12.18[4]	1 1/2 to 2 1/2 minutes of smoke
M18 SMOKE GRENADE GREEN	1330-00-289-8851	1330-G940	$13.92[4]	1 to 1 1/2 minutes of smoke
RED	1330-00-289-6852	1330-G950	$14.25[4]	" "
VIOLET	1330-00-289-6853	1330-G955	$14.05[4]	" "
YELLOW	1330-00-289-6854	1330-G945	$13.75[4]	" "
M5 - SMOKE POT, GROUND W/HC SMOKE MIXTURE & IGNITING DEVICE	1365-00-598-5207	1365-K866	$138.00	Best to delineate area; lasts 10 to 20 mins.[5]

1. National Stock Number
2. Department of Defense Document Identification Code
3. Ordered by case - 36 per case
4. Ordered by case - 16 per case
5. For smoke pots which last longer than 20 minutes, a fuel mixture is usually required. It is also possible to buy fuel thickening compounds and make your own smoke pots.

Enclosure 1

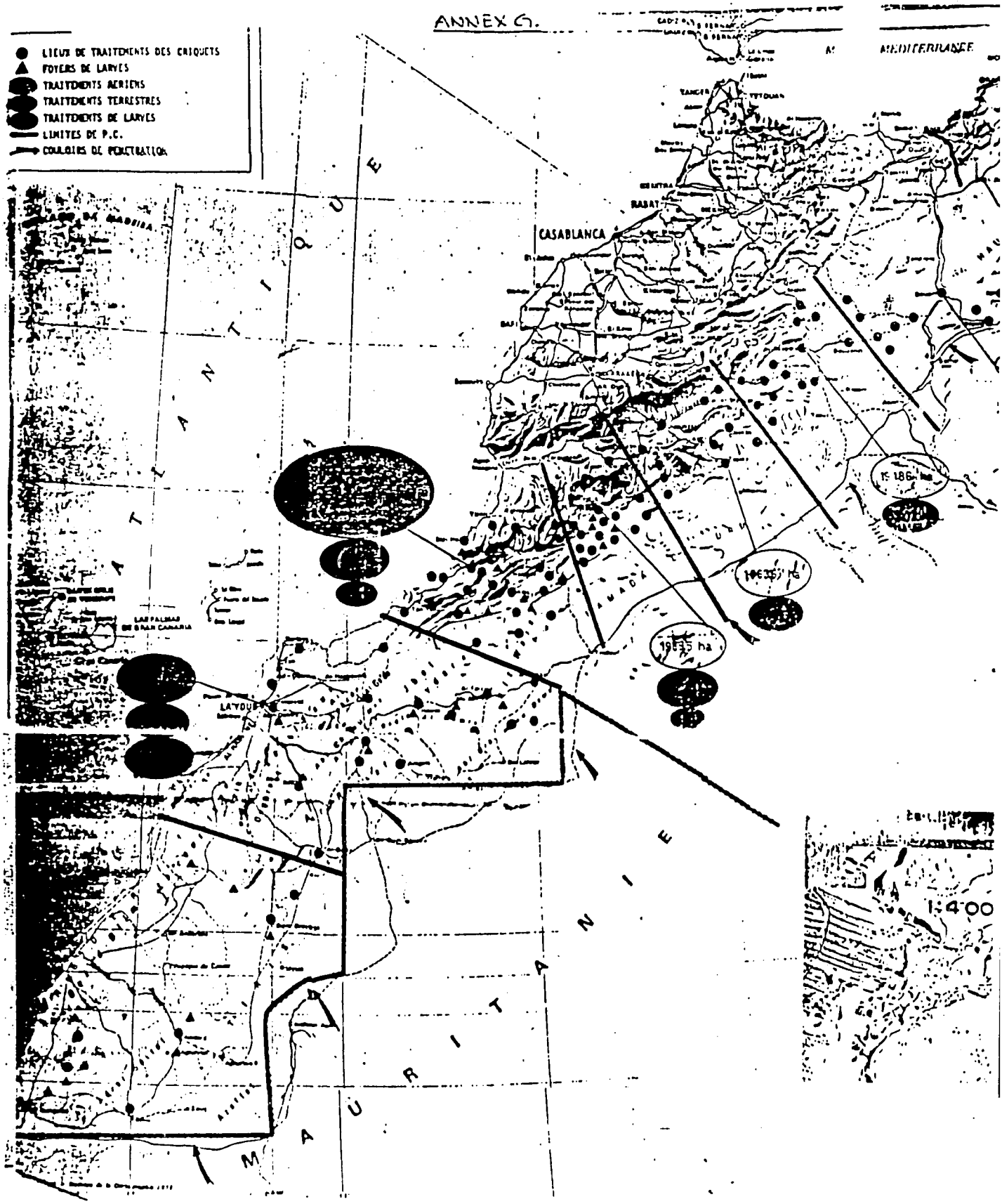
ANNEX G.

MAP OF AFFECTED AREAS

ANNEX H.

MAP OF CONTROL STRATEGY

ANNEX G.


LIEUX DE TRAITEMENTS DES CRIQUETS
FOYERS DE LARVES
TRAITEMENTS AERIENS
TRAITEMENTS TERRESTRES
TRAITEMENTS DE LARVES
LIMITES DE P.C.
COULOIRS DE PENETRATION
MEDITERRANEE
CASABLANCA
RABAT
OCEAN ATLANTIQUE
MAURITANIE
LAYOUNE
LAS PALMAS DE GRAN CANARIA
1:400

ANNEX I.

STATEMENTS OF WORK FOR TECHNICAL ASSISTANCE

LOGISTICS SUPPORT SPECIALIST

Statement of Work:

1. General: The logistical specialist supports the U.S. aircraft spray operations (two Turbo Thrush) by identifying and communicating daily aircraf operational needs to the GOM ground support crews. The specialist also monitors the aircraft contract on behalf of USAID and ensures that obligations of the contract are fulfilled. In this context the specialist will work within the context of a GOM command post specially organized for locust control operations and will be assigned to an oper tional base in the field such as Guelmin in the southern Morocco. The spec ialist will be required to communicate with both civilian and military person l where aircraft are based.

2. Specific:

- Establish a daily schedule in concert with pi GOM authorities, and GOM ground support crews that identifies and p for timely operational requirements to aircraft, principal refueling, pesticide delivery and loading, and maintenance r raft.

- Develop working relationship with GOM authoritie nat insures appropriate logistical support in coordin. nor aircraft requirements.

- Assist pilots and GOM mechanics to service aircraft as needed.

- Maintain contact with spare parts suppliers in U.S. or elsewhere (spare parts for both aircraft and spray systems) and order parts as necessary.

- Participate in daily briefings for pilots provided by GOM in order to determine safe conditions for treatment as well as fuel and pesticide requirements.

- Monitor obligations of aircraft contract with AID, and report on performance and constraints to USAID/Rabat at least twice/week.

- Monitor consumption of pesticide for Turbo Thrush aircraft and disposal of empty pesticide containers.

- Other similar duties as assigned by USAID/Rabat.

- Assist as needed with field spray operations and monitor spraying effectiveness.

- Six day work week is required.

3. Qualifications: Field operations experience and knowledge of a similar nature desired. Field experience in Morocco is highly preferred. Specialist must have French and/or Arabic language capability.

Budget in support of funding

	U.S. Dollars
1. Salary 18 days at $100/day	1800
2. Per Diem ($39/day=lodging and meals)	819
3. Travel and transportation round trip Casa-Agadir	200
plus local transportation	135
4. FICA (7.5% salary)	
5. Miscellaneous	446
	$3400

COORDINATOR/MANAGER

Statement of Work:

1. General: The Locust Project Coordinator is responsible for the day to day operations and activities of the U.S.G. supported Locust Control Project (608-0196). The coordinator will work within the USAID/Morocco's Food and Agriculture Office in Rabat and will report directly to the USAID Project Officer. The Coordinator will provide daily liaison between USAID/Morocco, the GOM Central Command Post (PCC) in Rabat and the field operations in Guelmin.

2. Specific:

- Establish a working relationship with GOM authorities, Logistic Support Specialist in Guelmin and USAID/Morocco in order to obtain and communicate timely information regarding the various aspects at locust control activity.

- Maintain contact with other international agencies and donors who are supporting the locust control activity.

Budget in support of funding

	U.S. Dollars
1. Salary June 1, 1988 to June 30, 1989	22,000
2. Per Diem Field Trips 15 days at $39/day	585
3. Travel and Transportation International Internal (4 trips Casa-Agadir)	2000 500
4. FICA (7.50% Salary)	165
5. Miscellaneous	1750
6. Housing Allowance	6000
	32,700

ANNEX J.

ANPAC ISSUES CABLE

ANNEX 1

UNCLASSIFIED STATE 050892/01

PID-3 INFO: AMB DCM ECON AGR/9

INFO COPY

LOC: 055 603
19 FEB 88 0859
ON: 48214
CHRG: AID
DIST: AIDA

ff 608-0196

VZCZCRA0431EEV766
PP RUFRRA
DE RUEEC #0892/01 0500643
ZNR UUUUU ZZH
P 190042Z FEB 88
FM SECSTATE WASHDC
TO AMEMBASSY RABAT PRIORITY 3453
BT
UNCLAS SECTION 01 OF 02 STATE 050892

ACTION : AGR

DUE DATE: 02/23

INFO : DIR - DDIR - PROG - ACCOUNTS - RLA MGT - CONT - CHRON - RP

AIDAC

E.O. 12356: N/A
TAGS: N/A
SUBJECT: MOROCCO LOCUST CONTROL (608-2196) PID REVIEW

1. SUBJECT PROJECT PID WAS REVIEWED BY ANPAC ON FEBRUARY 9, CHAIRED BY DAA/ANE A. FULLER WITE REPRESENTATIVES FROM OFDA, PD, TR, MENA, DP AND GC IN ATTENDANCE. PID IS APPROVED AND MISSION MAY PROCEED TO DESIGN PP. APPROVAL OF THE IP IS HEREBY DELEGATED TO THE MISSION DIRECTOR.

Bravo Fanbal!

2. REVIEW WAS SIMPLIFIED BY WELL ORGANIZED, STRAIGHT-FORWARD PID THAT WAS CLEAR AND SUCCINCT. DURING REVIEW, A NUMBER OF ISSUES AND CONCERNS WERE IDENTIFIED WHICH WILL BE DEALT WITH IN THE PP. THESE ARE LISTED BELOW.

3. LOCUST CONTROL PROJECT PROPOSES A BILATERAL EFFORT WITH THE GOM. THE URGENT NEED TO DESIGN AND IMPLEMENT THE PROJECT NOW PRECLUDES WAITING FOR A BROADER REGIONAL DISASTER PREPAREDNESS STRATEGY. MISSION WILL BE KEPT INFORMED OF BUREAU STRATEGY AND THE SUB-SAHARA REGIONAL LOCUST CONTROL PROJECT (BOTH NOW IN DRAFT) TO ENSURE CONGRUENCE BETWEEN THE PROJECT AND THE STRATEGY.

4. ISSUE WAS RAISED AS TO WHETHER PROJECT COULD BE CARRIED OUT THROUGH THE OFFICE OF U.S. FOREIGN DISASTER ASSISTANCE (OFDA). OFDA DIRECTOR HAS ISSUED A MEMO INDICATING AN UNDERSTANDING WITH AFRICA BUREAU THAT FOR FUTURE AFRICA LOCUST CONTROL PROGRAMS QUOTE...ALL AID/W RESPONSIBILITY, INCLUDING FUNDING AND PROCUREMENT, WOULD BE TRANSFERRED TO THE AFRICA BUREAU. UNQUOTE OFDA HAS INDICATED THAT SAME APPROACH WILL BE USED WITH ANE BUREAU. IN THE MEMO (BEING POUCHED TO MISSION), OFDA DOES PROPOSE TO PROVIDE SUPPORT TO MISSION WITH FOLLOWING:
--- A. SHORT-TERM TA TO ASSIST WITH USAID/RABAT PP,
--- B. IDENTIFICATION OF PERSONNEL TO ASSIST MISSION WITH LONG-TERM CONTROL EFFORTS, AND
--- C. PROVISION OF EMERGENCY ASSISTANCE IN EVENT HOST COUNTRY IS UNSUCCESSFUL IN KEEPING OUTBREAKS IN CHECK AND THAT AN UNFORESEEABLE EMERGENCY SITUATION EXISTS.
ANPAC ACKNOWLEDGED RECEIPT OF MEMO, BUT NOTED EXTREMELY TIGHT DEADLINES AND POSSIBILITY THAT REGULAR CONTRACTING

USAID/RABAT C & R 19 FEV. 1988 RECEIVED V06

UNCLASSIFIED STATE 050892/01

PROCEDURES MIGHT NOT PRODUCE EQUIPMENT AND COMMODITIES ON TIME. IF IT APPEARS THAT DELAYS ARE LIKELY, DAA NOTED THAT AMB WOULD TURN TO OFDA FOR ASSISTANCE WITH PROCUREMENT OF EQUIPMENT, COMMODITIES, TECHNICAL ASSISTANCE, AND AERIAL SPRAYING SERVICES. HOWEVER, AT PRESENT MISSION SHOULD PROCEED ON BASIS THAT PROJECT WILL BE FUNDED AND PROCUREMENTS MADE WITHOUT OFDA. THERE MAY BE A DIFFERENCE OF OPINION BETWEEN AMB AND OFDA ON THE CONDITIONS UNDER WHICH OFDA WOULD PROVIDE PROCUREMENT ASSISTANCE. OF COURSE, OFDA WOULD PROVIDE DISASTER ASSISTANCE FOLLOWING A DISASTER DECLARATION PER AID HANDBOOK 6 CRITERIA.

5. MAJOR ISSUE AND CONSTRAINT TO IMPLEMENTATION IS POSSIBLE TIMING DIFFICULTY IN PROCUREMENT OF EQUIPMENT, COMMODITIES, TECHNICAL ASSISTANCE AND AERIAL SPRAYING SERVICES. WITH AN OCTOBER DEADLINE FOR ON-SITE LOCATION OF ALL GOODS AND PERSONNEL, IT IS ESSENTIAL THAT ALL CONTRACTS AND PURCHASES BE EXECUTED BY SUMMER OF 1988. AID/W IS DRAFTING A PROCUREMENT PLAN FOR MISSION CONSIDERATION. THIS PLAN SHOULD HELP AMB DETERMINE WHETHER OFDA ASSISTANCE WILL BE NEEDED WITH PROCUREMENTS. THIS PLAN WILL BE SENT IN SEPTEL.

6. ISSUE WAS RAISED ON PROJECT SUSTAINABILITY AFTER AID ASSISTANCE TERMINATES. AS NATURE OF PROJECT IS TO SUPPORT MOROCCO WITH SUPPLEMENTAL ASSISTANCE ADDRESSING AN EPISODIC, TIME-LIMITED PROBLEM, AND AS THE MOROCCAN CROP PROTECTION CONTROL DIVISION IS VERY WELL OPERATED IN NORMAL CIRCUMSTANCES, SUSTAINABILITY IS NOT

CONSIDERED AN ISSUE. PP TECHNICAL/INSTITUTIONAL ANALYSIS SHOULD VERIFY THIS OBSERVATION.

7. THE FOLLOWING CONCERNS AND GUIDANCE INDICATE TOPIC AREAS THAT SHOULD BE ADDRESSED IN PP.

--- A. PP NEEDS TO INCLUDE A FULL ENVIRONMENTAL ASSESSMENT AND A FULL INSTITUTIONAL AND TECHNICAL ANALYSIS. THE PP DOES NOT NEED TO INCLUDE A FULL ECONOMIC/FINANCIAL ANALYSIS OR A SOCIAL SOUNDNESS ANALYSIS. HOWEVER, THE MAGNITUDE OF RISK FROM LOCUSTS AND POTENTIAL SAVINGS SHOULD BE SHOWN ILLUSTRATIVELY. SOCIAL GROUPS AFFECTED BY PROJECT SHOULD BE POINTED OUT AS TARGETED BENEFICIARIES OF ACTIVITIES.
--- B. PP SHOULD INCLUDE A BRIEF DESCRIPTION OF THE OFDA LOCUST EMERGENCY PROJECT OF 1987 AND SHOW HOW THE PROPOSED LOCUST CONTROL PROJECT WILL UTILIZE THE EXPERIENCE GAINED AND LESSONS LEARNED FROM THAT EXPERIENCE.
--- C. PP SHOULD DESCRIBE THE SYSTEM BY WHICH PROJECT

EFFORTS WILL BE COORDINATED WITH TECSI OF OTHER DONORS, INCLUDING THE DUTCH, GERMANS, AND EEC.
—— D. BUDGETING APPROACH IN PID CONSIDERED APPROPRIATE IN THESE CIRCUMSTANCES. PP SHOULD DESCRIBE IN SOME DETAIL THE SPECIFICATIONS FOR EQUIPMENT, COMMODITIES, AERIAL SPRAYING AND TECHNICAL ASSISTANCE. FOR TIMELY EXECUTION, PP SHOULD CONTAIN INFO NEEDED FOR ALL PIO/C'S, PIO/T'S, AND ANY WAIVERS.
—— E. MISSION SHOULD IMMEDIATELY PREPARE A CN, WITH NOTE AN ADVICE OF PROGRAM CHANGE AND AN ACTIVITY DATA SHEET.

6. PROJECT PAPER DESIGN TEAM: ANPAC IDENTIFIED NEED TO EXPAND PP DESIGN TEAM TO INCLUDE FOLLOWING EXPERTS - ENTOMOLOGIST, ENVIRONMENTALIST, AERIAL SPRAYING EQUIPMENT SPECIALIST, CONTRACTS/PROCUREMENT EXPERT, SOCIAL SCIENTIST FOR INSTITUTIONAL ANALYSIS, AID ENVIRONMENTALIST, AND DESIGN COORDINATOR/TEAM LEADER. FIRST TWO AREAS OF EXPERTISE MAY BE COVERED BY ONE PERSON. THROUGH A BUY-IN TO THE INTEGRATED PEST MANAGEMENT AND ENVIRONMENTAL PROTECTION PROJECT (936-4142) UNDER CONTRACT WITH THE CONSORTIUM FOR INTERNATIONAL CROP PROTECTION (CICP) USING PD AND S FUNDS, MISSION COULD PROCURE SERVICES OF ENTOMOLOGIST/ENVIRONMENTALIST, AERIAL SPRAYING EQUIPMENT SPECIALIST, AND CONTRACTS/PROCUREMENT EXPERT. S&T/AGR CAN PROVIDE CERTIFICATION TO AID/W CONTRACTS OFFICE THAT ASSISTANCE WITH PP DESIGN FITS INTO SCOPE OF CICP PROJECT AND THEREFORE WILL NOT HAVE TO BE COMPETED.

AID/W WILL PROVIDE AID ENVIRONMENTALIST. MISSION COULD PROVIDE TEAM LEADER AND SOCIAL SCIENTIST. MISSION SHOULD QUICKLY PREPARE PIO/TS FOR CICP ASSISTANCE AND SUBMIT REQUEST FOR PD AND S FUNDS.

8. BECAUSE OF THE URGENT NATURE OF PROJECT AND SHORT LEAD TIME BEFORE PROJECT MUST COMMENCE, DESIGN EFFORT SHOULD BE TOP PRIORITY. AID/W WILL MAKE CONCERTED PUSH TO EXECUTE CONTRACTS AND WAIVERS WHEN SUPPLIED NECESSARY DOCUMENTS, TO BE CONTAINED IN PP. SHULTZ
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ANNEX K.

NEWSPAPER ARTICLES

Swarms of Locusts Threatening North Africa

By Paul Delaney
New York Times Service

TUNIS — Treating it as an invading army, Tunisia, Algeria and Morocco have mobilized to fight the most serious infestation of locusts in over 30 years.

Billions of the insects have already caused extensive damage to crops and are threatening to inflict great harm to the delicate economies of North Africa. Millions of dollars have been spent in the effort, and much more — $150 million, one official estimated — will be required from meager treasuries.

The invasion is drawing increasing worry from southern European countries, too. They fear the highly unpredictable and mobile insects will be carried across the Mediterranean Sea if not stopped in North Africa.

The European Parliament has urged members to help, and the European Community has contributed $2.5 million. Aid is being provided by at least a dozen institutions and countries, including the United States, Canada and the United Nations.

The locusts are an immediate threat to this city. Millions are within a few miles; a few have been spotted on lawns and swarming about. But the biggest concentrations in Tunisia are southwest of here, breeding and swarming, waiting to travel wherever air currents push them.

Millions more are concentrated in the Atlas Mountain in Morocco where high peaks have acted as a barrier to their advance toward the country's breadbasket and the cities of Casablanca, Rabat, Fez and Marrakech. "We are in a state of general alert, said Edouard Saouma, director general of the United Nations Food and Agriculture Organization. "Swift and decisive action is needed to avoid a major regional food crisis."

There are also high concentrations of the locusts in the desert of Algeria. Experts say the normal pattern would be for the locusts to turn east and head back this way, threatening this country more as well as others. Some of the insects have also been spotted in Italy and Malta in recent weeks.

The threat has forced some neighboring countries who have not enjoyed the best of relations into closer cooperation, though not as close as some officials believe is necessary. Algeria and Morocco have momentarily put aside their differences over the Polisario war in the Western Sahara to join in the effort to stem the spread.

A Moroccan official said the nations of the region were discussing establishing a permanent agency specially trained in the latest techniques and utilizing the most modern equipment to battle the locusts.

Representatives of the three countries, along with those from Libya and Mauritania, have held meetings, although some backbiting has been evident. For example, officials of each have questioned if the others are making enough of an effort.

In Tunis, the government has set up a central coordinating committee and what is in effect a war room, or command center. The committee of officials from such offices as the Agriculture and Interior ministries, meets twice daily, while the command center room is staffed round the clock by meteorologists, army and air force personnel, communications operators and other civilians.

"The situation changes daily, depending on the weather, the temperature, wind velocity and direction," remarked an army captain. "They move during the day, not at night. We attack them with insecticide on the ground at night and in the air during the day. We have enough equipment and insecticide at present to stop them, if there are no new concentrations, but there are a lot of them in Algeria ready to head this way."

One expert said he believed that 90 percent of all the locusts in the world were now in North Africa. An official of the Agency for International Development explained that the locusts were part of a normal, continuing cycle that originated in India and Pakistan and headed west over Africa and then back east, breeding and devouring crops.

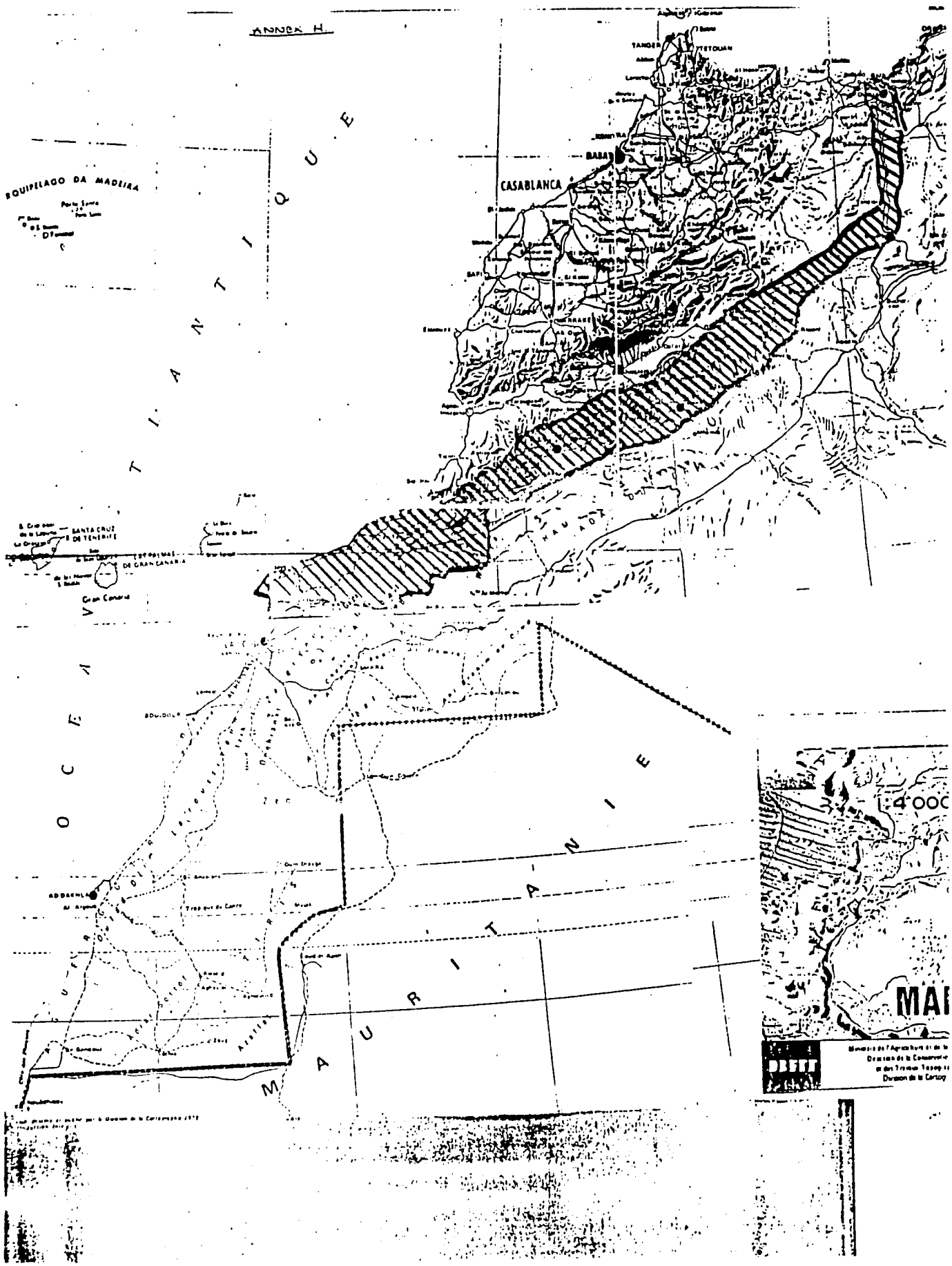
Millions, sometimes billions of locusts take to the air, usually in the morning, forming what resemble storm clouds that can blacken the sky.

Two years ago, they were a major threat to East Africa, although the number was far lower than this year's outbreak. Civil strife in several of the countries, Sudan and Ethiopia, for example, hampered efforts to control the insects.

"Small numbers are no threat," the AID official said in Rabat. "But given the right climatic condition, they breed like heck, become gregarious, multiply and migrate. Every 10 to 15 years a combination of weather factors favors breeding.

"There's been tremendous rainfall this year in areas that only get a few drops normally. They were a serious problem last year between October and January. given the numbers this year, things are really bad." Officials fear that after the locusts feed on plentiful vegetation this year, they will continue to be unusually abundant for years to come.

ANNEX H


OCEAN ATLANTIQUE
ARCHIPELAGO DA MADEIRA
CASABLANCA
TANGER
TETOUAN
SANTA CRUZ DE TENERIFE
LAS PALMAS DE GRAN CANARIA
Gran Canaria
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ENVIRONMENTAL ASSESSMENT OF THE MOROCCO LOCUST CONTROL PROJECT

608-0196

United States Agency for International Development
Mission to Morocco
Rabat, Morocco

May 1988

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LIST OF ABBREVIATIONS AND DEFINITIONS

AID	-	U.S. Agency for International Development (Washington)
ALIC	-	Arid Lands Information Center, University of Arizona
CICP	-	Consortium for International Crop Protection
CFR	-	U.S. Code of Federal Regulations
deg	-	degree
EA	-	environmental assessment
EPA	-	U.S. Environmental Protection Agency
FAO	-	Food and Agriculture Organization
ft	-	foot
gal	-	gallon (US)
GOM	-	Government of Morocco
ha	-	hectare
IPM	-	integrated pest management
IUCN	-	International Union for the Conservation of Nature and Natural Resources
kg	-	kilogram
km	-	kilometer
l	-	liters
L/G	-	locust/grasshopper
L/G PEA	-	Programmatic Environmental Assessment for Locust and Grasshopper Control in Africa and Asia (TAMS/CICP, 1988)
m	-	meter
min	-	minute
ml	-	milliliter
mm	-	millimeter

MOPH	-	Ministry of Public Health
N	-	north
PEA	-	Programmatic Environmental Assessment
PPS	-	Plant Protection Service
ULV	-	ultra-low volume application of pesticide - less than 2 liters per hectare
U.S.	-	United States of America
USAID	-	AID Mission to Morocco
USG	-	Government of the United States
W	-	west
waddi	-	intermittent stream bed
WHO	-	World Health Organization

1.0 EXECUTIVE SUMMARY

USAID/Morocco intends to develop and implement a project to provide programmatic assistance on an urgent basis to the Kingdom of Morocco's Desert Locust Control Campaign. USAID's assistance will be in the form of a comprehensive package of commodities and services which will aid the Government of Morocco (GOM) in meeting the demands of the immediate crisis as well as strengthen its institutional capacity to maintain longer term control of the locust outbreak. (Section 4.1).

This environmental assessment (EA) was prepared as a critical element of the project design, in compliance with AID's environmental procedures at 22 CFR 216. The EA identifies and analyzes the environmental and health/safety issues specific to the proposed project. The Programmatic Environmental Assessment (PEA) of Locust and Grasshopper Control in Africa and Asia (TAMS/CICP, 1988) forms the technical basis for the findings and recommendations of this EA, including a determination of the scope of the technical and policy issues to be examined in assessing the environmental impacts of large-scale use of insecticides for control of locusts in Morocco. (Sections 2.0 and 3.0).

The preferred alternative among the candidate technical approaches was determined to be chemical (insecticide) control in the context of a judicious and well-managed application program. (Section 4.3).

Morocco has a rich and diverse flora and fauna. There are a number of legally protected nature reserves and/or ecologically sensitive areas in the locust infestation zone, which must receive special consideration in the decision-making process leading to treatment for locusts. (Section 4.4).

The following insecticides are provisionally approved for AID-funded procurement and/or use in the Morocco locust control program, subject to the final findings of the Locust/Grasshopper PEA: carbaryl, malathion, fenitrothion (use only), bendiocarb, chlorpyrifos, lambda-cyhalothrin, and tralomethrin. (Section 5.1).

The GOM has in place a strong institutional structure for managing the locust control program, the effectiveness of which could be enhanced by interaction with expert counterparts through the provision of specialized technical assistance. (Section 5.9).

Required environmental mitigation measures under the project include provision of specialized technical expertise in the areas of pre- and post-treatment environmental monitoring, pesticide management and health/safety. Health and safety related commodities to be provided include protective clothing and equipment and test kits for monitoring worker exposure to insecticides. Other critical mitigation measures include special procedures for locust control in ecologically sensitive areas, and disposal of empty insecticide drums. (Section 7.0 and Appendix B).

2.0 APPLICABLE ENVIRONMENTAL PROCEDURES AND PURPOSE OF ASSESSMENT

The Morocco Locust Control Project will provide technical assistance, aerial application services, commodities, equipment and insecticides to assist the GOM in controlling the current series of severe desert locust outbreaks and in preventing or minimizing attendant crop damage due to locust infestations. Given that a significant amount of the technical assistance and commodities to be provided under the project are related to the mitigation of potential adverse environmental impacts of both this project and in GOM's overall locust control program, the findings of this environmental assessment are an important element of the project design. This environmental assessment was prepared on site at USAID/Morocco as an element of the overall locust control project design during March-April 1988. Due to the unexpected major locust outbreak in Morocco during this time, the project design and authorization process was accelerated in order to allow timely response to the crisis. To gather information for the environmental assessment, the Locust Control project design team conducted extensive interviews of GOM officials in charge of the national locust control effort as well as those responsible for environmental protection and public health; observed control campaign sites and ongoing operations; and inspected the facilities of these and related GOM entities.

2.1 AID ENVIRONMENTAL PROCEDURES

It is AID policy to ensure that the environmental consequences of AID-financed activities are identified and considered by AID and the host country prior to a final decision to proceed and that appropriate environmental safeguards are adopted (AID, 1980). This policy is embodied in the legal requirements set forth at Title 22 of the Code of Federal Regulations, Part 216, "A.I.D. Environmental Procedures" (22 CFR 216). The environmental assessment (EA) for the Morocco Locust Control Project is based on the requirements of 22 CFR 216. In view of the fact that the proposed project will provide chemical insecticides for locust control, the EA for this project also includes (Section 5.0) the analyses required under AID's pesticide procedures at 22 CFR 216.3(b). The environmental assessment factors these criteria into the identification, evaluation, analysis, and recommended mitigation of probable environmental impacts of the proposed project.

2.2 PROGRAMMATIC ENVIRONMENTAL ASSESSMENT FOR LOCUST CONTROL

In early 1987 AID initiated a number of activities related to implementation of its commitment to the use of environmentally acceptable pesticides in locust/grasshopper (L/G) control programs in Africa and Asia, including preparation of a programmatic environmental assessment (PEA) per 22 CFR 216.6(d) of L/G control in Africa and Asia; and staging of a field testing program to study the efficacy and environmental impacts of certain pesticides for the control of locusts and grasshoppers in Africa (AID, 1987). Draft reports resulting from these two activities were available at the time of preparation of this EA, and provided the technical background for many of the findings and recommendations contained herein.

One of the purposes of a programmatic environmental assessment is to carry out a scoping process to identify and examine the underlying technical concerns and environmental issues generic to a particular activity on a regional basis, thus allowing an environmental assessment of the same activity in an individual country to focus on the country-specific environmental issues and impacts which were not evaluated in the PEA. In particular, the Programmatic Environmental Assessment for Locust and Grasshopper Control in Africa and Asia (L/G PEA) prepared by TAMS, Inc. and the Consortium for International Crop Protection (TAMS/CICP, 1988), for AID's Africa and Asia/Near East regional bureaus serves as the basis for this Morocco-specific EA. Accordingly, the findings and conclusions of the L/G PEA are incorporated by reference into this EA, and the PEA will be cited in the text of this document where appropriate in order to avoid unnecessary duplication of material. It should be noted that the L/G PEA was in draft final form and under AID review at the time of preparation of the Morocco Locust Control EA. Given that the conclusions and recommendations of the PEA are subject to revision as a result of the review process, any changes in the PEA affecting the conclusions of the Morocco EA will need to be addressed following finalization of the PEA. It is not anticipated at this time that any of the principal findings of the Morocco EA will be substantively affected by the outcome of the L/G PEA review.

The purpose of environmental assessments, whether programmatic or country-specific, is to provide AID and host country decision makers with a full discussion of the significant environmental effects of a proposed action so that the expected benefits of development objectives can be weighed against any adverse impacts on the human environment. In view of this important function of environmental assessments, both the L/G PEA and the Morocco Locust Control EA will be translated into French in order to insure that all GOM agencies concerned with the locust control effort will have ready access to the findings, conclusions, and recommendations of these studies.

2.3 GOVERNMENT OF MOROCCO ENVIRONMENTAL/PESTICIDE LEGISLATION

The GOM has promulgated laws and other regulatory instruments for the protection of air and water quality (including seawater pollution); soil conservation; wildlife conservation; solid waste disposal; importation, sale, and use of toxic substances; and urban land use planning (ALIC, 1980). There are apparently no regulations requiring formal environmental review of major actions, either private or public sector, with the potential for impact on the environment.

The rules on importation, sale, and use of toxic substances (including pesticides) consist of a complex web of laws, regulations, and administrative decrees, many of which date back to the 1920's and '30's and are therefore clearly outdated from a technical standpoint. Regarding pesticides in particular, the GOM Plant Protection Service (PPS) (which is responsible for regulating pesticides in Morocco) is currently engaged in a regulatory development effort to streamline, revise, and update the regulations governing pesticides (see Section 5.9).

3.0 SCOPING PROCEDURE

A.I.D. Environmental Procedures at 22 CFR 216.3(a)(4) describe the scoping process to be employed in identifying the significant issues related to a proposed project and determining the scope of the issues to be addressed in the environmental assessment. Critical elements of the scoping process include: a determination of the scope and significance of the issues to be analysed in the EA, and identification of and elimination from detailed study those issues that are not significant or have been covered by earlier environmental review.

The process of identifying the technical and policy issues applicable to control of large scale locust outbreaks which require detailed environmental review was performed during preparation of the L/G PEA (TAMS/CICP, 1988), and will not be repeated here. The principal Morocco-specific issues requiring detailed examination are treated in the pesticide use assessment (Section 5.0). Since preparation of this EA occurred during an ongoing emergency operation, it was not feasible to stage a "scoping session" of the type normally held for projects with the potential for significant environmental impacts, due to the fact that most of the GOM personnel responsible for Morocco's locust control program were traveling heavily or on temporary assignment to field posts to manage the operation. Therefore, a modified scoping procedure based on an individual consultative approach was adopted. A list of key people contacted in this process is provided in Appendix A.

Meetings to discuss and identify the potential environmental impacts of the proposed project as well as recommended mitigation actions were held with the Ministry of Agriculture Crop Protection Service, Ministry of Public Health Environmental Health Service, and Food and Agriculture Organization Morocco Country Office.

4.0 PROJECT DESCRIPTION

4.1 BACKGROUND, GOAL, PURPOSE AND OUTPUTS

4.1.1 Background

For the first time in twenty years, in 1987, desert locusts (Schistocerca gregoria) entered Morocco, threatening disaster and significant agricultural losses. Swarms of desert locusts, which had migrated from Chad, invaded Niger in early summer, 1987. Breeding occurred and a large new generation was produced. At the same time, locust hatching was apparently taking place in Northern Mali, Mauritania, and Southern Algeria. In October, massive swarms of locusts moved northwest across the Sahara on a vast front. Swarms moved into eastern Morocco where they were first sighted in late October.

As a consequence of the severity of the influx of locusts and their threat to agriculture, on November 4, 1987 the Government of Morocco (GOM) requested that USAID provide emergency assistance. On November 9, 1987, two American aircraft were moved from Dakar, Senegal to Guelmim, Morocco. A shipment of 40,000 liters of malathion insecticide was air-lifted from the United States to Agadir shortly thereafter. Technical assistance was provided to support the operation and assist the GOM to assess the biological aspects of the locust infestation and advise on spray operations. The USAID aircraft operation was assisted by AID-funded ground to air communication radios and strobe lights. Protective clothing and motor pumps (used to transfer malathion from barrels to planes) were also provided by USAID. The total amount of AID support was $650,000. Due to the prediction by entomologists that the locust threat would repeat itself during October, 1988 and possibly October, 1989, and due to the GOM's expressed need for further support, a decision was made to design a longer term bilateral project to assist the GOM with a locust control strategy. Subsequent to this, Morocco again suffered an unexpected locust attack of plague proportions. The Mission turned to AID/Washington for assistance. The emergency is expected to last until the end of June, 1988. During this period, OFDA will procure for Morocco 100,000 liters of malathion, 183,000 litres of carbaryl, test kits for pesticide contamination, radios, field marking devices, and 2 turbo thrush aircraft which began operating March 27 and will continue until the end of the current emergency.

Indiciations are that the desert locust will return to Morocco in potentially plague proportions in October 1988 and create problems until January 1989. Depending on the success of control procedures, the locust could again return in March to June 1989, and again in October 1989 and March 1990. There is a possibility that the locust problem could continue over the next seven to eight years. The proposed project would address the medium term outlook, beginning for the October 1988 invasion and allowing flexibility for future U.S. support for the GOM control efforts over the period until the project's PACD of September 30, 1990.

4.1.2 Project Goal, Purpose, and Output

The goal of the proposed Morocco Locust Control Project is to save agricultural and livestock production from physical destruction in order to avert enormous monetary losses. The specific purpose of the project is to assist the GOM in controlling the desert locust. The project will provide technical assistance, aerial application flight hours, commodities, equipment, and insecticides to assist the GOM in its locust control program. Based on the projected strategy, the project will fund the following technical assistance: a project management coordinator, a logistical operations specialist, an entomologist/ecologist, a pesticide management and health/safety specialist, and a spray calibration specialist.

The outputs of the project include: (1) the control and destruction of desert locust swarms (the number of hectares treated will be programmed at the time of the infestation and will depend upon the total magnitude of the infestation as well as the assistance being provided by other donors); (2) the equipping of GOM heliocopters with insecticide application systems and calibration of the systems; (3) the training of GOM personnel in the proper management, handling, and use of locust control insecticides and the provisio· of pesticide safety equipment; and (4) the provision of specialized technical assistance to enhance he GOM's capability to assess the extent of the locust infestation and to develop and implement an appropriate response.

4.2 OTHER DONOR ACTIVITIES

A number of other donors, both bilateral and multilateral, are assisting the GOM in its locust control program. The bulk of this assistance is in the form of insecticides and aerial treatment services. Several donors have provided protective clothing and equipment as well as other commodities such as vehicles. Only limited amounts of technical assistance have been provided by donors other than USAID. The proposed project would be the first and only donor effort to contribute a comprehensive package of commodities and services to Morocco's locust control program.

4.3 ANALYSIS OF ALTERNATIVES

The L/G PEA (TAMS/CICP, 1988) contains a detailed analysis of five technical alternatives considered by AID for locust and grasshopper control:

- No action
- Non-chemical control (i.e., mechanical destruction or changes in cultural practices)
- Biological control
- Chemical control
- Integrated pest management (IPM)

For each of the technical alternatives, the L/G PEA analysis considered environmental impact; costs; short, medium, and long-term actions; effectiveness; training requirements; research requirements; and recommended environmental mitigations. The alternatives analysis concluded that:

> The technical alternatives are theoretical rather than actual. There are, at the present time, only two alternatives -- that of taking no action, or of mounting a control effort using chemical control. If control is chosen, then the technical alternatives really come down to different approaches within the chemical control operation: either that of large scale spraying of extensive areas, as was adopted in [the African grasshopper campaign of] 1986, or more selective spraying of carefully targeted outbreak areas. The latter presents less potentially harmful environmental consequences, as well as being the more cost-effective approach (TAMS/CICP, 1988).

The situation in Morocco warrants a similar conclusion (Section 4.1). Selective aerial treatment in the context of a well-managed and technically sound control program is the preferred alternative of the Morocco Locust Control Project, and will be the focus of this EA.

4.4 AFFECTED ENVIRONMENT

The Kingdom of Morocco lies at the northwest corner of the African continent, bordered on the north and west by the Mediterranean Sea and the Atlantic Ocean, respectively, and on the east and south by Algeria and Mauritania, respectively. Morocco covers an area of approximately 500,000 square kilometers (193,000 square miles), including the territory of the former Spanish Sahara, which is claimed and controlled by Morocco. Morocco is divided into two distinct topographic regions, the coastal plains in the northwest, and the mountains and arid plateaus in the east and south. The fertile coastal plains are separated from the economically poorer arid plateaus by a series of mountain ranges, including the High Atlas, Middle Atlas, and Rif Massif systems. The agriculturally rich coastal plains are the most densely populated and most economically advanced. South and southeast of the mountain systems, the arid plateaus gradually converge with the Sahara desert (ALIC, 1980).

4.4.1 Land Utilization and Agricultural Resources (USAID/Morocco, 1986)

Morocco has an essentially arid or semi-arid climate, with moderate winters and dry summers. Most of the precipitation occurs between October and April, with very little rainfall between June and September. Only 8.3 million hectares (12 percent) of Morocco's 69 million hectares (ha) of land (excluding the Sahara) have adequate soils and sufficient rainfall for crop production. Another 41.6 percent of Morocco's land (28.7 million ha) consists of semi-arid and forest regions, suitable only for grazing. Between 40 and 50 percent of the cultivable land receives an erratic rainfall averaging less than 400 mm. The distribution of rains during the agricultural cycle varies such that

aggregate production levels fluctuate significantly - at least 35-40 percent around the long term average.

Nearly 2 million households (40 percent of the labor force) are dependent on agriculture, making this sector critical to Morocco. Approximately 51 percent of the agricultural households rely on rainfed agriculture (often associated with animal husbandry); 18 percent depends solely on livestock production; 26 percent depends on irrigated agriculture; and 5 percent depends on forestry and other miscellaneous activities. Crop production in Morocco is narrowly focused. In recent years cereals have been planted on approximately half of the cultivated land (including irrigated land), other crops on 20 percent of the land, with the remainder lying fallow. Fruits, vegetables, forage crops, and industrial crops are grown in irrigated regions. Livestock production represents 36 percent of gross agricultural production.

4.4.2 Forestry Resources (USAID/Morocco, 1986; ALIC, 1980)

Forests cover about 5.2 million hectares, 360,000 ha of which is in plantations and the rest in natural growth. Another 2.6 million ha is covered with alfa grass (Stipa tenacissima). It is estimated that 2.4 million ha of forests (31 percent of the total) and 1 million ha of alfa grass (13 percent of the total) have some productive potential. The primary value of the remaining forest and grass land is in soil and watershed protection. The main forest producing areas in Morocco are east of the Rabat-Mohammedia region, the Middle Atlas and Rif mountains, and the Gharb Mamora forest near Kenitra. Alfa grass, which is used primarily for the production of paper and for forage, grows primarily in the northeastern part of the country.

4.4.3 Parks and Protected Areas (ALIC, 1980; Drucker, 1987; Duvall, 1988)

Morocco has two established national parks and 13 other nature and/or wildlife preserves. All protected areas are administered by the Ministry of Agriculture. Day-to-day management is the responsibility of the Direction des Eaux et Forets. None of the existing parks or protected areas currently meet international standards, but projects with various international organizations are assisting in the development of national park management plans and information centers, which should eventually result in some improvement in the overall situation. Design of any new parks will take international criteria into account. There are also a number of unprotected wetlands of biological importance, most of which are on the Atlantic and Mediterranean coasts. An important exception is the series of mountain lakes in the Middle Atlas, only one of which (Lac Affenourir) is protected. These lakes are permanent, and are of great importance for migratory and wintering waterfowl. Parks and/or protected areas that lie within regular desert locust breeding sites and migration corridors in Morocco are: Khnifiss reserve biologique, Bouarfa reserve de faune, and Iriki reserve de faune.

4.4.3.1 Khnifiss Reserve Biologique. This 6,5?C ha reserve is situated on the southern portion of Morocco's Atlantic coast, 70 km north of Tarfaya and 120 km south of Tan Tan, in the province of Tarfaya

(28 deg 00 min N, 12 deg 25 min W). The site, which is an important shore bird habitat, consists of a large brackish lagoon with mudflats, sandy islets, and saline marshy areas. Military considerations restrict access by aircraft, and locust control measures in the vicinity of this reserve would be most likely consist of ground strip spraying for hopper band control.

4.4.3.2 Bouarfa Reserve de Faune. This large reserve (ca 220,000 ha) is located in eastern Morocco near the Algerian frontier, south of the town of Bouarfa (32 deg 25 min N, 02 deg 00 min W). This area, which is rich in saharan wildlife such as the dorcas gazelle and the houbara bustard, is situated on the Haut Plateau and has varied relief. Locust control in the vicinity of this reserve will be principally by means of aerial ULV spraying of insecticides.

4.4.3.3 Iriki Reserve de Faune. Iriki is in southern Morocco near the Algerian border (29 deg 50 min N, 05 deg 35 min W), and is comprised of temporary marshes in the oued Draa valley which are filled by the flood waters of the oued Draa after heavy rains. The climate is classified as arid Saharan, with less than 60 mm rain per year. The marshes can be completely dry for years when there is no rain. In wet years the area harbors large numbers of wintering waterfowl and breeding birds. The area to the west of the Iriki reserve is a major breeding area for locusts, and will undergo aerial treatment.

4.4.4 Rare and Endangered and/or Migratory Species (ALIC, 1980; Duvall, 1988)

Definitive information on the current status of the flora and fauna of Morocco is not available. Very little is known about the distribution of endangered species within Morocco. The information provided below is based on best professional judgement. Habitat loss from overgrazing, depletion of forests, and other non-sustainable resource use leading to severe ecosystem degradation is known to be resulting in serious detrimental impacts on indigenous species, although the exact extent of these changes is undocumented. Morocco's coastal wetlands along the Mediterranean and the length of the Atlantic coast are a sensitive and extremely important habitat and/or flyway for migrating and wintering waterfowl from Europe, as well as several indigenous species.

4.4.4.1 Birds. Approximately 131 species of passerine birds are known to occur in Morocco, comprised of resident breeders, migrant breeders, occasional breeders, winter visitors, and accidental visitors. The species of birds which occur in the breeding or migrating areas for desert locusts, and which are considered to be rare or endangered are as follows: Tawny or Steppe Eagle (Aquila rapax); Golden Eagle (A. chrysaetos); Griffon Vulture (Gyps fulvus); White Stork (Ciconia ciconia); Red Kite (Milvus milvus); Bearded Vulture or Lammergier (Gypaetus barbatus); Peregrine Falcon (Falco peregrinus); Houbara Bustard (Chlamydotis undulata); Red-necked Nightjar (Caprimulgus ruficollis); Dark Chanting Goshawk (Melierax metabates); and Bald Ibis (Geronticus eremita).

4.4.4.2 Mammals. Morocco has 108 species of indigenous mammals, but the status of most of species is unknown. A number of these which may occur in the breeding and migrating areas of the desert locust are considered to be rare or endangered, including: Insectivores, four species; Rodentia, four species; carnivora, four species - Ruppel's Sand Fox (Vulpes ruppelli), Striped Hyaena (Hyaena hyaena), Caracal (Felis caracal), and Cheeta (Acinonyx jubatus); and Artiodactyla, four species - Dorcas Gazelle (Gazella dorcas), Cuvier's Gazelle (Gazella cuvieri), Dama Gazelle (Gazella dama), and Barbary Sheep (Ammotragus lervia).

4.4.4.3 Plants. The identified species of Morocco's flora, which, with subspecies, number 4,200 (including 800 endemics) are both rich and diverse. Factors related to cultivation of marginal lands and severe overgrazing of almost all available land make it extremely difficlult to determine the current state of indigenous flora. Some 34 of these species known at some time to occur in the areas likely to be treated for locusts are on the current list of rare and endangered Moroccan plant species compiled by the International Union for the Conservation of Nature and Natural Resources (IUCN).

4.4.5 Human Population (ALIC, 1980; USDS, 1986)

The estimated 1984 population was 22.8 million, with an annual growth rate of 2.6 percent. Ethnically, the population is 99.1 percent Arab-Berber, and the urban sector constitutes over 40 percent. Most of the people live west of the High Atlas Mountains. All but one of the primary urban centers with a population of more than 100,000 are west of the Atlas, and most of these are coastal. All of the locust control operations will take place east of the Atlas mountains.

5.0 PESTICIDE USE ASSESSMENT

The format and content of this assessment is based on the requirements of 22 CFR 216.3(b)(1)(i) (AID, 1980). Much of the technical background for this assessment is available in the L/G PEA (TAMS/CICP, 1988) and in the report on AID's L/G control pesticide field testing program in Mali (Dynamac, 1988), and will not be repeated here. Citations to these documents will be made where appropriate, and the reader is referred to them for more detail.

5.1 BASIS FOR SELECTION OF INSECTICIDES FOR LOCUST CONTROL AND U.S. ENVIRONMENTAL PROTECTION AGENCY REGISTRATION STATUS OF THE SELECTED INSECTICIDES

5.1.1 Field Testing Programs

AID is currently conducting a scientific program to study the efficacy and environmental impacts of certain pesticides for the control of locusts and grasshoppers in Africa (Dynamac, 1988). Rigorous efficacy and environmental impact field trials of eight insecticides have been conducted in Mali, against the Senegalese grasshopper, Oedaleus senegalensis. It is currently planned under this program to evaluate the same eight pesticides in two additional countries, against other grasshopper/locust species. The preliminary phase of the testing program consisted of a technical selection process to narrow the field of pesticides with potential for use in AID-funded L/G control projects to a list of candidate chemicals for which detailed field testing is considered appropriate. The classes of pesticides from which selections were made were organophosphorus compounds, carbamates, and pyrethroids. The primary criterion for selection was AID's policy that any AID-financed pesticide for locust/grasshopper control be registered with U.S. EPA and have a tolerance established for at least one food use (40 CFR 80), or meet the established acceptable daily intake level and maximum residue level recommended by the Joint Meeting on Pesticide Residues to the FAO/WHO Codex Committee on Pesticide Residues. Table 5-1 lists the insecticides selected for field testing on the basis of this policy requirement, and taking into consideration potential environmental impacts and efficacy as determined by literature reviews, balance among the three classes of pesticides to be evaluated, and product availability.

Table 5-1. Insecticides Selected for AID Field Testing Program.

Organophosphates	Carbamates	Pyrethroids
Malathion	Carbaryl	Lambda-cyhalothrin
Fenitrothion	Bendiocarb	Tralomethrin
Chlorpyrifos		
Diazinon		

The preliminary conclusions of the testing program based on the results of the Mali field trials showed all eight chemicals to be efficacious against the Senegalese grasshopper at the rates applied. The findings were inconclusive regarding effects on beneficial and non-target insects due to shortfalls and variabilty of test data. No impacts on birds, reptiles, and mammals were observed, but incomplete residue analysis precluded a full evaluation of the potential environmental impact of the insecticides. The lack of acute effects and preliminary evidence of rapid decomposition of the applied insecticides suggested that single applications in grassland or agricultural areas can be done safely (Dynamac, 1988).

In a separate study funded by FAO, Pinto, et al. (1988) performed an environmental assessment of fenitrothion use in the Sudan L/G control program, including efficacy/environmental impact field trials and residue studies of aerial ULV application. The results of this study indicated that fenitrothion, when applied at approved dosages according to standard protocols, was effective against the desert locust (Schistocerca gregaria). Significant effects on some nontarget organisms were observed. The assessment concluded that more study of such adverse effects is needed, and that use of fenitrothion in locust/grasshopper control programs must occur in the context of well-managed operations in order to minimize unavoidable impacts.

5.1.2 Recommendations of the L/G Programmatic Environmental Assessment

The L/G PEA (TAMS/CICP, 1988) evaluated the eight insecticides listed above (among others) for efficacy and environmental soundness in L/G control based on available information (which, for the draft PEA, did not include the findings of the Mali or Sudan field tests). The preliminary conclusions of the L/G PEA regarding use of these eight chemicals in L/G programs are as follows (TAMS/CICP, 1988):

Carbaryl	-	Appropriate for both aquatic and terrestrial applications (but not around pollinating insects)
Diazinon	-	Use should be conditional on the outcome of a current U.S. EPA review of certain regisered uses
Fenitrothion	-	Use with caution in aquatic environments; not recommended for terrestrial use (due to toxicity to birds)
Malathion	-	Use with caution in aquatic environments; appropriate for terrestrial application
Bendiocarb	-	Appropriate for aquatic environments; use with caution in terrestrial application
Chlorpyrifos	-	Use with caution in both aquatic and terrestrial application
lambda-cyhalothrin	-	Appropriate for terrestrial use; not recommended for aquatic environments
Tralomethrin	-	Appropriate for terrestrial use; not recommended for aquatic environments

5.1.3 Selection of Insecticides for the Morocco Locust Control Program

To date, the GOM has used the following insecticides in its locust control program, beginning with the 1987 campaign: malathion ULV, carbaryl 20 percent ULV, fenitrothion ULV, and DDVP (dichlorvos). Of the total amount of malathion and carbaryl used or to be used by Morocco during both the 1987 and present campaigns, AID has provided 140,000 l of malathion ULV and 183,000 l of carbaryl 20 percent ULV to the GOM under AID emergency procurement procedures. The fenitrothion and DDVP used by the GOM are obtained from other sources.

Fenitrothion has not and will not be provided to Morocco by AID, in part due to the fact that it is manufactured outside of the U.S., thus not meeting standard source and origin requirements for AID project assistance. Given that fenitrothion makes up a significant portion of the insecticide routinely being used by the GOM for locust control, it is likely that use of fenitrothion by the GOM will be "co-mingled" with other AID-funded services and commodities under the proposed project, e.g., aerial spray services, two-way radios, protective clothing and equipment, etc. As noted above, the preliminary conclusions of the L/G PEA (TAMS/CICP, 1988) recommend against terrestrial applications of fenitrothion due to problems with bird toxicity. This is an issue which will receive close technical scrutiny during review of the draft PEA, due in part to the findings of the Mali and Sudan field trials, which did not indicate significantly higher environmental risks associated with judicious use of fenitrothion in locust control applications. In view of these management and technical considerations, this EA provisionally approves AID assistance to the GOM in the aerial application of fenitrothion, subject to resolution of the technical issues associated with fenitrothion's environmental impact. Mitigative actions to be employed in this regard are described in Section 7.0.

DDVP is an organophosphate fumigant, which, while effective against locusts as a contact poison, has limited overall utility and is not cost-effective for large scale locust control efforts due to its extreme volatility, which means that application leaves virtually no residue. Due to this limitation, and in consideration of the occupational risks to pesticide handlers associated with reformulation of technical DDVP (which is acutely toxic) to the 4 percent (by weight) solution used for aerial treatment, use of this material is not recommended for locust control. In addition, on February 29, 1988 U.S. EPA published an "Initiation of Special Review" action for DDVP based on EPA's determination that exposure to DDVP from its registered uses (in the U.S.) may pose an adverse oncogenic risk and inadequate margins of safety for cholinesterase inhibition and liver effects to exposed individuals. The GOM has indicated that it has exhausted its stocks of DDVP and plans no further procurement of this material for use in locust control operations. In any event, none of the AID-funded aerial spray equipment to be provided under the proposed project will be employed in application of DDVP. In addition to human health concerns, there is a technical restriction to the use of AID-funded equipment in applying DDVP, since these spray systems will be designed for ULV application of carbaryl and malathion, and are thus not

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calibrated for application of DDVP at the higher volumetric rate required for the 4 percent spray formulation.

The L/G PEA (TAMS/CICP, 1988) also analyzed the use of insecticides from the chlorinated hydrocarbon group, dieldrin and lindane in particular, and recommended against their use under any circumstances. Due the high persistence of these chemicals in the environment and the risks associated with their demonstrated bio-accumulation in the adipose tissues of many animals, including humans, most uses of the chlorinated hydrocarbon pesticides have been cancelled in most industrial countries. In the current L/G campaign in Africa and the Near East AID has stipulated as a matter of policy that it will not participate in, or otherwise provide assistance to, any locust control program in which chlorinated hydrocarbons such as dieldrin, aldrin, benzene hexachloride (BHC) or lindane (gamma isomer of BHC) are being used, whatever their source. Although it received an unsolicited donation of dieldrin in 1987, the Government of Morocco has stated and repeatedly confirmed (including at several international locust control fora) its policy of non-use of dieldrin for locust control under any circumstances.

In summary, the insecticides which are eligible for procurement or use in Morocco (in the case of fenitrothion, use only) with AID assistance are those listed in Table 5-1, with the exception of diazinon, pending its registration review in the U.S. Based on cost, availability, past practice, and efficacy, however, the Morocco locust campaign will employ three materials more or less exclusively: malathion, carbaryl, and fenitrothion. Eligibility of AID assistance for any of the chemicals in Table 5-1 is subject to change based on the outcome of additional planned field tests and finalization of the L/G programmatic environmental assessment.

5.2 INTEGRATED PEST MANAGEMENT AND LOCUST CONTROL IN MOROCCO

Integrated pest management (IPM) consists of employing a coordinated mixture of control techniques, including chemical, biological, and cultural methods, in a scientifically based program which makes maximum use of monitoring and surveillance in order to control pest populations effectively at the earliest possible stage with the least intrusive interventions. This option is analyzed in detail in the L/G PEA (TAMS/CICP, 1988). In fact, IPM in the case of locust control would consist of some mixture of the candidate control methods which were evaluated in the alternatives analysis component of the PEA. At the present time and for the forseeable future, Morocco's locust infestation will be at the outbreak stage, and as stated in Section 4.3, chemical control is the only effective means of dealing with the locust problem at this level. In this context, an IPM approach consists of "the judicious use of chemicals with a willingness to utilize other control methods should they become available. In terms of field operations it amounts to good, careful chemical control." (TAMS/CICP, 1988).

5.3 APPLICATION METHODS AND EQUIPMENT

The various insecticide application technologies commonly used in locust outbreak control are described in detail in the L/G PEA (TAMS/CICP, 1988). The Morocco locust control program includes a mixture of modern treatment techniques, ranging from individual hand-pump sprayers to gasoline-powered backpack or vehicle-mounted mist blowers to ultra-low volume aerial application from rotary and fixed wing platforms. The method applied in each particular instance depends on an array of site specific factors. The criteria employed for selection of application techniques form an important element of the overall control program strategy. Proposed AID assistance would include a package of commodities, equipment and technical assistance, including retrofitting of ten GOM helicopters with aerial ULV spray systems and provision of the services of an aerial spray/pesticide application specialist. In addition to assisting the GOM in technical interactions with the helicopter spray equipment vendor, the specialist would advise on maintenance, repair, and calibration of the rest of the GOM's inventory of aerial and ground application equipment. Guidance concerning specific application methods and strategies would also be supplied by the entomologist/environmental monitoring specialist (see Appendix B).

5.4 ACUTE AND LONG-TERM ENVIRONMENTAL AND TOXICOLOGICAL HAZARDS

A detailed analysis of the acute and chronic risks to humans associated with both public and occupational exposure to the insecticides selected for AID-funded locust control is presented in the L/G PEA (TAMS/CICP, 1988), and is applicable to the situation in Morocco. The three insecticides being used against locusts in Morocco (malathion, carbaryl, and fenitrothion) are moderately toxic to humans. The group at highest risk are the insecticide handlers (mixers, loaders, spraymen, etc.). All insecticides except for carbaryl provided with AID assistance in Morocco will be supplied and used in ready-to-use ULV formulations requiring no dilution before application. Field visits by the AID project design team to locust control pesticide storage and transfer centers and ongoing control operation sites revealed a reasonable level of basic occupational safety precautions to be in place, although there is room for improvement (see Section 5.9). Regarding risk to the general public, control operations for the most part are being conducted in remote, non-crop areas or rangeland, where public exposure will be at a minimum (see Section 5.7).

One aspect of the Moroccan locust control program which has both safety and AID policy implications is the disposal of empty insecticide drums. To date AID-funded insecticides provided to the Morocco locust control effort have alone resulted in the importation into Morocco of 1,179 (55 gal) drums containing either malathion (791 drums) or carbaryl (388 drums) and 880 (30 gal) drums containing carbaryl. As detailed in the L/G PEA (TAMS/CICP, 1988) empty pesticide drums, if improperly managed and disposed of, represent a significant environmental and safety hazard due to the presence of left over material (approximately 300 ml for a 55 gal drum) remaining in the "empty" container. All countries which receive donations of locust control pesticides consider the drums valuable commodities due to their potential for re-use,

both within and outside of the control effort. In theory, safe and environmentally sound re-use is possible if the drums are decontaminated, reconditioned, and re-labled according to strict protocols, a fairly complex process requiring specialized facilities which are not available in most developing countries. Moreover, even if adequate facilities for reconditioning are available, collection and transportation of empty drums to a central location for decontamination and reconditioning is a serious logistical obstacle in the context of an ongoing emergency control operation. In view of these facts, AID has determined that, as a matter of Agency policy, any and all empty containers resulting from provision and use of AID-funded locust control insecticides will be destroyed or otherwise rendered useless, followed by disposal in an appropriate, environmentally sound manner. Compliance with this policy in Morocco is discussed in Section 7.3.

5.5 EFFICACY OF SELECTED INSECTICIDES FOR LOCUST CONTROL

The efficacy of the eight chemicals selected for AID-funded locust control is treated in the L/G PEA (TAMS/CICP, 1988) and is the subject of the ongoing AID locust control insecticide field testing project (Dynamac, 1988). The efficacy of malathion and carbaryl against locusts and grasshoppers has been demonstrated in the U.S. and elsewhere.

5.6 EFFECT OF SELECTED INSECTICIDES ON NON-TARGET ORGANISMS AND THE NATURAL ENVIRONMENT

The L/G PEA (TAMS/CICP, 1988) provides an in-depth review of existing information on the environmental impacts of the chemicals selected for locust control in Morocco. And, as has been stated previously (Section 5.1.1), one of the principal objectives of AID's ongoing field testing program (Dynamac, 1988) is to gather data on the environmental impacts of the selected L/G control insecticides under prevailing environmental conditions in Africa. This Morocco EA recommends the incorporation of routine pre- and post-treatment biological monitoring in Morocco as a component of each locust control campaign (Section 7.1.1) in order to document any adverse impacts and allow for necessary mitigative action.

An important area of concern is the possible interaction of locust control insecticides with public health (vector control) insecticide application programs. Problems can develop when the application of insecticides against agricultural pests results in increased resistance among disease vectors, thus decreasing the effectiveness of the vector control program. For example, applying fenitrothion to an area in which mosquitos (malaria vector) are being treated with malathion could cause irreversible resistance to malathion, as a result of the cross-resistance effect between fenitrothion and malathion in the mosquito. Consultations with the Ministry of Public Health indicated that this should not be a concern in the locust control program, since no insecticide-based vector control programs are being carried out in the arid regions subject to locust infestation. The relatively limited amount of insecticide application for malaria control carried out by the GOM occurs in the eastern coastal plains, out of the locust areas, and employs non-organophosphate insecticides.

5.7 CONDITIONS UNDER WHICH INSECTICIDES ARE TO BE USED

A general description of Morocco's natural and human environment was provided in Section 4.4. The current and projected locust infestions in Morocco are principally in a band which begins on the far south Atlantic coast between Dakhla and Sidi-Ifni, extending north and east following the Oued Draa along the southern foot of the Anti-Atlas Mountains through the area between Ouarzazate and Zagora, and continuing in a northeasterly arc along the southeastern foot of the High Atlas Mountains through Bouarfa to Oujda on the Mediterranean Coast. This area may be generally categorized as arid to semi-arid steppe with annual vegetation occuring for approximately six weeks during the winter rains. Livestock grazing (principally sheep, goats, and camels) occurs during those times when forage is available. Production of cereals and fruit trees center around a number of irrigated perimeters located in the region as well as fertile valleys in the central portion of the Anti-Atlas mountains.

Assuming that insecticide application for locust control could occur anywhere within the region described above, it is important to identify any environmentally sensitive areas within the region which would be at greatest risk from application of locust control insecticides, and which should therefore receive special consideration in the process leading to a decision to perform treatment, and, should treatment be elected, mitigative action. Given the prevailing arid conditions of the locust infestation region, environmentally sensitive areas within that region are centered around surface water features. These are discussed below, moving from south to north. Nature reserves and other protected areas withing the locust control areas are described in Section 4.4.3.

The only area along the Atlantic coast likely to undergo aerial treatment with donor (including AID) assistance is the Plage Blanche, which lies between Sidi-Ifni and Tan-Tan. Plage Blanche consists of a beach backed by bare sand dunes 200 - 300 m wide. There are no salt water lagoons or marshland, but rainwater and moisture collects in a 400 - 500 m wide depression behind the dune system, resulting in annual vegetation. Behind the vegetated strip is a 200 - 300 m high rock escarpment, which is the edge of a dry coastal plain devoid of vegetation. Locust breeding has occured in the green area behind the dunes. Aerial reconnaisance of Plage Blanche in late March 1988 revealed swarms of locusts in the vegetated area, and heavy concentrations of shore birds on the beach.

The Oued Draa is an intermittant stream system which extends from its source in the High Atlas mountains north of Ouarzazate southeast to Zagora, and then to the southwest along the southern boundary of the Anti-Atlas mountains to Cap Dra on the Atlantic coast. There is a large irrigation impoundment at Ouarzazate, and the stretch between Ouarzazate and Zagora has a number of smaller impoundments and oases. Locust breeding has occured in a number of vegetated areas within this region, as well as in waddis extending north from the Oued Draa into the Anti-Atlas mountains. Along its southwesterly course from Zagora to the Atlantic, the Oued Draa exhibits a number of perennial

surface water features in the form of oases and small impoundments. Locust breeding has occured in many of these areas as well.

There is a large irrigation impoundment north of Er-rachidia, and locust control operations are being mounted to the south in the grasslands and cultivated areas which surround the irrigated perimeter. Although locusts have been reported as far north as Oujda on the Mediterranean coast, this area is not well-suited for locust breeding due to the relatively high salinity of the soils. It is therefore unlikely that large scale locust control will be undertaken in the northern coastal area.

5.8 AVAILABILITY AND EFFECTIVENESS OF OTHER INSECTICIDES AND/OR NON-CHEMICAL CONTROL MEASURES

As discussed in Sections 4.3, 5.1, and 5.2, chemical control by means of the specified insecticides is presently the only viable alternative for addressing Morocco's locust problem. AID will stay abreast of new developments in the field of biological and other non-chemical control methods, and seek to incorporate them into its project assistance, in Morocco and elsewhere, as feasible.

5.9 ABILITY OF THE GOVERNMENT OF MOROCCO TO REGULATE OR CONTROL THE DISTRIBUTION, STORAGE, USE, AND DISPOSAL OF PESTICIDES

Morocco imports 5,000 metric tons (5 million kg) of pesticides (as formulated product) annually. The breakdown of this material, which is composed primarily of crop protection chemicals, is as follows:

Insecticides	-	52 percent
Fungicides	-	25 percent
Herbicides	-	10 percent
Others	-	12 percent

No active ingredients are manufactured in Morocco, but there are four private sector pesticide formulators.

As discussed in Section 2.3, the GOM's pesticide regulatory system is complex and outdated. Responsibility for pesticide registration and regulatory development and enforcement lies in the GOM Plant Protection Service's Bureau of Pesticides and Registration. This office, which is staffed by qualified agricultural chemists, is in the process of developing streamlined and updated regulations for pesticide registration, labeling, sale, distribution, storage, use, and disposal, as well as residue tolerances for food crops. Technical effort on this regulatory development process has been underway for three years, and it is expected that at least two more years will be required to promulgate the new rulemaking package. In some respects, the objective of this effort to modernize Morocco's pesticide regulations is to bring the rules

into conformance with actual current practice. For example, because of its significant exports of fruits and vegetables to European countries, Morocco must routinely comply with the pesticide residue limits imposed by the regulations of its trading partners for agriculture products.

In addition to its regulatory development activities, the Bureau of Pesticides and Registration conducts scientific reviews, including field testing, to screen all new pesticides proposed for importation into Morocco for efficacy and toxicological risk. Each new product which passes initial screening receives a three year provisional registration during which time it undergoes follow-up field testing prior to full registration. The field testing is supervised by regional inspectors which report to the Registration Bureau in Rabat. The Bureau also issues technical directives and guidelines to the field concerning storage, handling, and disposal of pesticides, pesticide wastes, and empty containers. In the ongoing locust control program, the Bureau of Pesticides has been assigned responsibility for analysis of the effects of insecticide application on non-target flora and fauna (GOM, 1988).

Routine quality assurance checks on imported agricultural chemicals as well as pesticide residue analyses are performed at the Laboratoire Officiel d'Analyses et de Recherches Chimiques in Casa Blanca. This laboratory is well-equipped with standard pesticide analytical apparatus and instrumentation, including gas-liquid chromatographs and high performance liquid chromatographs. Quality assurance tests of pesticides imported for locust control are regularly carried out at the Official Laboratory. The Pesticide Bureau, in conjunction with the Laboratory, is currently in the process of starting up a program to monitor for pesticide residues in environmental media as a result of the locust control effort.

In recognition of the special requirements of a large and complex operation such as the locust control program, the GOM has established a Locust Task Force to coordinate the activities of the various GOM ministries concerned with the program, and to provide centralized guidance and operational leadership to the campaign. The task force is headed by the General Commandant of the Gendarmerie Royale and includes representatives of the Ministries of Interior, Agriculture, Transport, National Defense, and Public Health. The task force operates out of a central command post in Rabat and a number of field operation posts which have been established and staffed to manage the campaign. Communication between the central and field posts is carried out by means of an efficient system of telephone, telex, radio, and computer links.

The Ministry of Public Health (MOPH) is playing a key role in the locust control program. The MOPH has been assigned responsibility for developing appropriate safety measures for the general public in treated areas to minimize insecticide exposure; for informing provincial medical authorities concerning medical interventions to be applied in the event of intoxification; and for coordinating the Locust Task Force's efforts concerning occupational health among the workers handling insecticides, including prevention, detection, and treatment of poisoning cases (GOM, 1988). The MOPH is in the

process of designing a program for worker exposure monitoring (see Section 7.1.3), and has already established a network of well-equipped field emergency medical units in the locust control operational area. The Plant Protection Service is providing protective clothing and equipment for workers involved in the locust control operation who are in high pesticide exposure job categories.

The Ministry of Interior is responsible for mounting a public information campaign in the areas under treatment for locusts concerning necessary safety precautions to be taken by affected inhabitants, and for enforcing prohibitions on consumption of treated locusts. Interior is also charged with overseeing compliance with guidelines adopted by the locust task force which prohibit use of pastureland for at least one month following treatment with insecticides.

In general, GOM use of insecticides in the locust control program reflects a sound basic knowledge and understanding of safety, health, and environmental considerations. Shortcomings in facilities and equipment exist, however. For example, none of the pesticide staging areas visited had adequate change room, shower, and laundry facilities for workers handling pesticides. Command and control of aerial spray operations is hampered by lack of ground to air radios and field marking equipment. More important, however, is the challenge to translate knowledge into action, especially in the context of an operation which is being mounted on an emergency basis. Many illustrations of this problem could be cited, among them:

(1) Although Plant Protection Service guidelines prohibit re-use of empty pesticide drums, it is being done routinely in the field. During one site visit, workers were observed loading re-formulated fenitrothion (for transport to the field to be used in back pack sprayers) into empty malathion ULV drums which were bearing the original product label and had no doubt been neither decontaminated nor reconditioned (and certainly not re-labeled) prior to this re-use.

(2) The condition of insecticide drums once they reach field operation posts indicates that they receive very rough treatment in transit. In one instance, a drum that had ruptured completely along one seam was observed, apparently the result of rolling the drum off the back of a truck directly onto the tarmac without using either a ramp or cushioning material. A fork lift was available at that particular location.

All of this points up the need for technical assistance and training, which is one of the key elements of the recommended environmental mitigations (see Sections 5.10 and 7.1).

5.10 PROVISIONS FOR TRAINING LOCUST CONTROL INSECTICIDE USERS

Training under the proposed project will be accomplished at several levels and in various contexts. All of the proposed specialists to be provided under the technical assistance component will work very closely with

GOM counterparts in the course of carrying out their responsibilities under the project, thus imparting knowledge and skills in the form of on-the-job professional development. In addition, each specialist will be expected to stage an appropriate number of short-term in-service training activities for field personnel. The specialists proposed under the project are as follows (see Section 7.1 and Appendix B for detailed scopes of work):

- Entomologist/Environmental Monitoring Specialist
- Pesticide Management and Health/Safety Specialist
- Cholinesterase Monitoring Test Kit Training Consultant
- Aerial Spray Equipment Specialist (not included in Appendix B)

5.11 PROVISIONS FOR MONITORING THE USE AND EFFICACY OF THE SELECTED INSECTICIDES

The GOM Plant Protection Service keeps detailed records of the quantities and types of chemicals applied and the extent (in ha) and locations of the areas treated. The PPS does not, however, have an institutionalized procedure for monitoring the efficacy of locust control insecticides used in the emergency program. Since it may take up to 48 hours for insecticides such as malathion, carbaryl, and fenitrothion to result in significant mortality, control workers normally have moved on to other areas before results of treatment are observable. Any assessments of efficacy which are made are approximations only, and are not based on quantitative sampling techniques. Efficacy studies are a key component of AID's field testing program (Dynamac, 1988), the findings of which will be applied to the Moroccan program as appropriate.

6.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

A detailed technical analysis of the full range of potential environmental impacts of insecticide-based locust control is presented in the L/G PEA (TAMS/CICP, 1988) and will not be repeated here. The following sections highlight impacts in the context of the situation in Morocco.

6.1 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Aerial and ground application of locust control insecticides will have significant effects on some non-target organisms, including locust predators and parasites; pollinators and other beneficial insects; birds (especially in the case of fenitrothion); and possibly some higher animals. It is likely that insecticides will be applied near some or all of the protected and/or sensitive ecological areas identified and described in Sections 4.4.3 and 5.7 of this EA. In such cases, judicious, and carefully planned and executed application is a must (see section 7.2). Biological monitoring of impacts on non-target organisms is a critical component of the proposed project, and the results of these studies must feed back into overall management of the locust control program. Similarly, any relevant findings of AID's ongoing insecticide field testing program (Dynamac, 1988) should be taken into consideration during project implementation.

6.2 THE RELATIONSHIP BETWEEN SHORT-TERM IMPACTS AND LONG-TERM PRODUCTIVITY

The L/G PEA (TAMS/CICP, 1988) analyzes the risks and benefits, both short and long-term, associated with locust control programs. Major benefits would acrue as a result of the program if a locust plague is averted. However, since plague prevention is dependent on regional actions as opposed to, for example, Morroco's program alone, it is difficult to consider Morocco's program in isolation from a risk-benefit standpoint. The equation is also complicated by the costs and short-term effects of unpredictable events such as accidents (chemical spills, fires, spray plane crashes, etc.). The ultimate conclusion depends of the analyst's degree of confidence in the supposition that emergency locust control operations are an element in the effective prevention or containment of lon-term locust plagues.

6.3 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

The proposed project would result in the irretrievable consumption of petro-chemicals in the form of internal combustion engine fuel (by aircraft and ground vehicles) and insecticides. Relatively small amounts of other non-renewable resources would also be expended by the project. In the unlikely event that insecticide application were to permanently alter some aspect of the affected ecosystem, this would represent an irreversible change. Given the low persistence of all of the selected locust control insecticides in the natural environment, this is not expected to occur.

7.0 MITIGATION OF ENVIRONMENTAL IMPACTS

There is a vast literature on the prevention and mitigation of environmental impacts of the handling and use of pesticides in general and locust control insecticides in particular, much of which has been reviewed and analyzed in the context of locust control in Africa as presented in the L/G PEA (TAMS/CICP, 1988). In addition, AID's current L/G insecticide field testing program (Dynamac, 1988) is yielding directly relevant information on impacts of specific insecticides and how to minimize them. This section provides guidance on specific environmental and safety mitigative actions which are considered necessary for the proposed Moroco locust control project in particular.

7.1 ENVIRONMENTAL/HEALTH/SAFETY TECHNICAL ASSISTANCE, COMMODITIES, AND EQUIPMENT

The design of the technical assistance component of the proposed project allows for identification and implementation of required mitigative actions based on the results of observations and data gathering made in the course of carrying out the prescribed technical assistance. In that sense, the technical assistance itself is both the starting point and vehicle for most of the mitigations which will occur under the proposed project. In addition, the provision of certain specialized equipment items is recommended as a part of the proposed project's environmental mitigation package. Recommended technical assistance and commodities are described below (refer to Appendix B for complete scopes of work and equipment specifications).

7.1.1 Entomologist/Environmental Monitoring Specialist

This individual, who would be contracted to serve in Morocco for a period of two months during each locust campaign for the duration of the project, would provide broad-ranging scientific guidance to USAID/Morocco and the Government of Morocco (GOM) in conducting the national locust control program. The Entomologist/Ecologist would be responsible for providing long-range technical advice to the Mission and the GOM regarding locust control strategy, management options, and policy, and for collecting and analyzing data on the environmental impact of small spray plane and/or ground application of ULV malathion, fenitrothion, and carbaryl in the Morocco Locust control effort. An important function of the Entomologist/Ecologist will be to provide on-site field training to GOM counterparts in locust biology; identification; aircraft calibration and ground guidance procedures; techniques for field evaluation of insecticide application patterns; and assessment of biological impacts of insecticide application for locust control.

The Entomologist/Ecologist would serve as the principal scientific advisor to USAID's locust control project and would have direct responsibility for technical management of the project, including, among other things, pesticide usage strategy, locust outbreak forecasting, counterpart training, and

situation assessment. The Entomologist/Ecologist would also be responsible for designing and implementing a program to conduct appropriate pre- and post-pesticide application environmental monitoring of selected areas, chosen in consultation with Mission and GOM technical personnel. Biological effects of the locust control insecticides on the environment would be assessed by monitoring changes in populations of species selected on the basis of economic importance (beneficial insects - locust predators or parasites, pollinators); known sensitivity to the chemicals being used, and/or known vulnerability due to position in the particular ecosystem being studied. Biological monitoring would also include assessment of changes in species diversity in treated areas and study of physiological and behavioral parameters. A critical responsibility of the Entomologist/Ecologist would be coordination with GOM counterparts to identify those areas within the locust control region which are critical habitats for endangered wildlife species, and implementation of an appropriate strategy for minimizing impacts on these species as a result of the locust control effort.

The Entomologist/Ecologist will be required to prepare a detailed report which will summarize all data, findings, conclusions and recommendations stemming from the field effort, including a separate section which fully describes all recommended environmental mitigation actions associated with the Morocco Locust Control effort, including implementation procedures, duration, training requirements, estimated capital and recurrent costs, and agencies responsible for execution. This section would focus on recommended programmatic interventions on the part of USAID, especially those with management implications, i.e., requiring significant changes in project direction or scope. All recommendations would be required to be cost effective and implementable under Moroccan conditions.

7.1.2 Pesticide Management and Health/Safety Specialist

This services of this individual, who would be contracted to serve in Morocco for a period of one month during each locust campaign for the duration of the project, would assist the GOM in safeguarding the health and safety of workers involved in the chemical control aspects of the locust effort as well as the general public; lessen the possibility of accidents involving insecticides; and enhance the GOM Plant Protection Service's emergency response capability. The specialist would have primary responsibility for advising the GOM Plant Protection Service on matters involving pesticide management, safety, and health within the overall locust control program, and would advise the GOM Ministry of Public Health concerning development and implementation of programs to minimize health risks to the general public as a result of the locust control effort. A critical responsibility of the Health and Safety Specialist would be to conduct an in-service training program for GOM Plant Protection employees on the safe handling and management of pesticides in the locust control effort. Another key responsibility of this specialist would include an analysis of the Crop Protection Service's locust control pesticide management system by means of extensive site visits to observe the entire pesticide handling network, including receiving (port/airport); temporary storage; transport; warehousing; re-formulation;

distribution; use in active locust control areas; and temporary storage/ultimate disposal of wastes and empty containers, and recommendation of improved procedures as necessary.

7.1.3 Cholinesterase Monitoring Test Kits

Under this procurement, the Ministry of Public Health (MOPH) would be provided with 15 field kits and a supply of associated expendable items for routine monitoring of whole-blood cholinesterase levels in workers exposed to pesticides in the course of the GOM locust control program. The kits are designed for use under harsh field conditions by technicians with minimal training. The use of this kit will allow the MOPH to screen workers for cumulative intoxication with cholinesterase-inhibiting pesticides (organo-phosphates and carbamates, including malathion, fenitrothion, and carbaryl) and thus prevent potential cases of chronic pesticide poisoning.

A consultant would be contracted to conduct a training program in the use of the test kit for Government of Morocco Ministry of Public Health management and technicians assigned to the current locust control campaign. The Consultant would also be responsible for advising the MOPH on the development and implementation of a national program for the protection of workers at risk due to high body burdens of cholinesterase-innibiting pesticides based on data collected using the test kit. Finally, the Consultant would advise the MOPH on administrative and management techniques for timely and effective use of worker monitoring results by means of appropriate methods for data management and handling.

7.1.4 Clothing and Personal Protective Equipment

Under this procurement the Government of Morocco Plant Protection Service would be provided with a supply of appropriate protective clothing and equipment for use by workers exposed to pesticides in the course of the locust control effort. This equipment is intended for workers at risk due to high and/or long-term exposures, i.e., formulators, aircraft loading and service crews, mist blower operators, etc., and would include industrial grade head and eye protection; organic vapor respirators; and chemical resistent coveralls, boots, and gloves.

7.2 INSECTICIDE APPLICATION IN ECOLOGICALLY SENSITIVE AREAS

In general, control of locusts at the hopper band stage by means of carbaryl barrier application is preferred over blanket spraying of settled or flying swarms, since barrier spraying requires smaller treated areas, and thus lower quantities of insecticide application. Also, alternating untreated strips with the treated barriers allows for more rapid regeneration of non-target organisms in the treated areas. Following are specific guidelines for locust operations in ecologically sensitive areas:

1. Under no circumstances should aerial application of insecticides occur in legally protected areas (see Section 4.4.3). If hopper bands are present in the protected area, treatment should be deferred until the hoppers move out of the area. Control can be achieved in that case by placing barrier strips of carbaryl around the perimeter of the protected area (with at least a 100 m buffer zone). If compelling circumstances make treatment of hopper bands within the protected area an absolute necessity, this should be done by means of selective spraying of hoppers with malathion using ground equipment only. If swarms are present in the protected area, treatment should be deferred until they move out of the area.

2. Other ecologically sensitive areas not under legal protection (see Section 5.7) should, as much as possible, be accorded the same treatment as the protected areas. Otherwise, minimum guidelines for non-protected sensitive areas are as follows:

a. During field surveys for locusts in sensitive areas (which, in the arid regions of Morocco, translates into areas near surface water features), survey personnel should note the presence of any sensitive receptors such as active water supplies; settlements; cultivated fields and/or orchards; livestock herds; and non-target organisms, including birds, pollinating insects, and other wildlife. All such information should be gathered and considered in deciding whether or not to treat, and, if treatment is elected, the timing and mode of treatment.

b. If any endangered species are suspected to be present, treatment should be deferred pending consultation with appropriate officials or specialists.

c. After full consideration of all of the above factors, if treatment in a sensitive area is elected, carbaryl should be used exclusively, due to its lower impact (compared to malathion and fenitrothion) on both terrestrial and aquatic non-target organisms. Under no circumstances should fenitrothion be used where birds are present. If aerial spraying is performed, heliocopters should be used in order to accurately pinpoint the target and minimize overspray and drift.

3. Post-application biological and insecticide residue monitoring should be performed at selected sites during each locust campaign to identify any adverse environmental impacts of spray operations. The results of the monitoring should be factored into planning of subsequent operations in the affected areas. See proposed scope of work for the "Entomologist/ Environmental Monitoring Specialist" (Section 7.7.1 and Appendix B).

7.3 MANAGEMENT OF LOCUST CONTROL INSECTICIDE DRUMS

As discussed in Sections 5.4 and 5.9, improper management of insecticide drums (whether full or empty) can result in severe safety and health hazards and environmental impacts. Due to the scale and complexity of

Morocco's locust control program, large numbers of drums of liquid insecticide are involved. Proper management of these drums throughout the extensive distribution network, from acceptance through disposal, represents a significant logistical and management challenge. The following guidelines are based on random observations made in the course of field visits during preparation of this EA, and on AID policy. Additional and more comprehensive guidance will be generated by the Pesticide Management and Health/Safety Specialist to be provided under the proposed project (Section 7.1.2).

1. Large numbers of unattended drums (both "empty" and containing material) were observed out in the open on the flight line at a number of airstrips in remote rural areas in which access by the public is not restricted. This is an obvious safety hazard. All pesticides, and all pesticide containers which have not been both decontaminated and rendered useless, should be under 24 hour guard, even if they are in a "secure" area and/or in an enclosure under lock and key.

2. As discussed in Section 5.9, insecticide drums are subject to very rough handling in transit from the point of reception to point of use. Due to the danger of spills and accidents from ruptured drums, and the near impossibility of uniform enforcement of proper drum handling procedures, it is recommended that 30 gallon (as opposed to 55 gallon) drums of the heaviest possible gage steel be specified in all insecticide procurements.

3. As discussed in Section 5.4, it is AID policy that any and all empty containers resulting from provision and use of AID-funded locust control insecticides will be destroyed or otherwise rendered useless, followed by disposal in an appropriate, environmentally sound manner. Of the 2,059 drums of insecticide contributed by AID to Morocco's locust control program since November 1987, it appears likely (based on field observations and interviews of knowledgeable individuals) that none have been properly disposed of as yet. This is due in part to the utility of the empty drums for such purposes as transporting reformulated insecticides for use in ground spray operations, and also due to the difficulty, in the midst of an emergency operation, of applying resources (human and fiscal) to what is perceived to be a low priority activity. The following management plan for disposal of AID-funded insecticide drums represents a reasonable compromise between what would be ultimately desirable from an environmental protection standpoint, and what is achievable in the context of the proposed project. The plan presupposes the retroactive collection and disposal of empty AID-funded drums already in-country using the methods outlined below. It is important that the plan be instituted immediately and consistently implemented in order to avoid another backlog of drums awaiting disposal.

a. This plan is decentralized, on the assumption that disposal of empty drums at a different site from the one in which they were opened and used adds a layer of logistical complexity and requires an extra degree of management oversight. If consolidation of drums from two or more sites for disposal is desirable and appears to be technically feasible in particular instances, it should be considered on a case-by-case basis.

b. Basic facilities, equipment, and supplies required at each site in which disposal is to take place are: a fenced or other appropriate secure enclosure near the area in which planes are loaded with insecticide and under 24 hour guard, reserved exclusively to serve as a holding area for empty USG-supplied drums awaiting disposal; a simple rack located near the enclosure for draining empty drums and collecting the drained material (by means of a trough or other appropriate device) for recycling; tools for cutting the tops out of the drums and puncturing the sides and bottom; and fuel for flaming out the drums.

c. The disposal activity itself will be carried out during the "down time" between active locust campaigns. During ongoing locust control operations, drums will simply be transferred to the holding enclosure immediately upon being emptied, and will be temporarily stored there until a lull in operations allows attention to the disposal process.

d. For each drum, the recommended disposal procedure is: (1) Remove the drum from the holding enclosure and cut the top out; (2) Invert the drum on the draining rack, and allow it to drain for at least 12 hours; (3) Transport the drum to the disposal site, which should be well removed from human habitation and preferably in an area of clay soils and/or a low water table; (4) Douse the drum with fuel and flame off residual chemical; and (4) Puncture the sides and bottom of the drum with enough holes to make it completely unusable. At this point, if a bulldozer or other suitable equipment is available at the disposal site, the drum should be crushed and buried in a shallow trench. Otherwise, it should be left on the surface to weather.

e. A system should be established whereby the COM would generate reports on a monthly basis (say), detailing the status of the USG drums under its control by individual location, indicating at a minimum: number of drums received since last report and total number of USG drums on hand; number of full drums awaiting use; number of empty drums being held for disposal; number of drums disposed of since last report and means of disposal; and a description of problems encountered and remedial measures taken.

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APPENDIX A

PERSONS CONTACTED

APPENDIX A

PERSONS CONTACTED

Government of Morocco

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   Ministry of Agriculture

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APPENDIX B

RECOMMENDED TECHNICAL ASSISTANCE AND COMMODITIES FOR MITIGATION OF ENVIRONMENTAL AND HEALTH/SAFETY IMPACTS

STATEMENT OF WORK AND ILLUSTRATIVE COSTS

ENTOMOLOGIST/ENVIRONMENTAL MONITORING SPECIALIST

I. OBJECTIVE

The objective of this procurement is to contract a specialist to provide broad-ranging scientific guidance to USAID/Morocco and the Government of Morocco (GOM) in conducting the national locust control program. In addition to performing the specific tasks set forth below, the Contractor shall be responsible for providing long-range technical advice to the Mission and the GOM regarding locust control strategy, management options, and policy.

The objective of the environmental monitoring portion of the Contractor's scope of work is to provide information on environmental impact of small spray plane and/or ground application of ULV malathion, fenitrothion, and carbaryl in the Morocco Locust control effort. The biological effects of pesticides on the environment can be assessed by monitoring changes in populations of species selected on the basis of economic importance (beneficial insects - locust predators or parasites); known sensitivity to a pesticide, or known vulnerability due to position in the particular ecosystem. Biological monitoring can also be done by assessing changes in species diversity in ecosystems or by studying physiological and behavioral parameters.

II. QUALIFICATIONS AND EXPERIENCE

The Contractor shall be a qualified agricultural and/or integrated pest management entomologist, preferably with African locust or grasshopper control program experience, and with direct experience in conducting pre- and post-treatment environmental surveys for determinination of the environmental impact of aerial insecticide applications for crop and rangeland protection. The Contractor shall have knowledge of, and be experienced in standard assessment procedures for biological monitoring associated with pest control efforts, and shall be capable of interpreting data and making programmatic recomendations based on such assessments. Developing country experience is highly desirable. French language capability at or above the FSI 3-3 level is required.

III. STATEMENT OF WORK

A. General

The Contractor's effort during each TDY shall be organized around two principal scopes which will run simultaneously and in parallel. Scope A will consist of activities associated with technical direction of the large scale control effort, while Scope B will entail environmental and biological monitoring of the pesticide application program. Activities will be field oriented, under harsh environmental conditions.

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Under Scope A, the Contractor shall serve as the principal scientific advisor to USAID's locust control project and shall have direct responsibility for providing broad-ranging technical advice and direction to the project, including, among other things, pesticide usage strategy, locust outbreak forecasting, counterpart training, and situation assessment.

Under Scope B, the Contractor shall be responsible for planning and conducting appropriate pre- and post-pesticide application environmental monitoring of selected areas, chosen in consultation with Mission and GOM technical personnel. Pre- and post-monitoring of beneficial species, including parasites and predators as well as other species, shall be executed. The Contractor's duties shall include interpretion of all data collected during the surveys and development of appropriate programmatic recommendations.

B. Specific

For each locust control campaign during the life of the project in which such services are deemed necessary, the Contractor shall:

SCOPE A AND B:

1. Prior to departure to Morocco, develop technical protocols for pre- and post-treatment environmental monitoring of locust control areas. Consultations with appropriate USG and academic specialists in terrestrial and aquatic ecology, and pesticide application impact assessment shall be undertaken in the course of carrying out this task.

2. Perform a two-day official TDY in AID/Washington immediately before and after each Morocco TDY to receive/deliver briefings on the current locust situation and to confer on other project matters with Morocco Locust Control Project backstop personnel, including review of proposed environmental monitoring protocols.

3. Upon arrival in-country, prepare a detailed work plan and schedule for Mission review, setting forth the principal tasks under the scope of work, and how they will be implemented, including indentification of all Mission and GOM support and/or coordination which will be required.

SCOPE A:

1. Oversee the field application of pesticides and advise on the types of pesticides and formulations most suitable for use; selection of application equipment; and specification of maintenance and repair services.

2. Maintain liaison with the GOM Crop Protection Service to advise on control strategies based on locust development, both within Morocco and throughout the global locust breeding areas.

3. Forecast possible locust invasions and invasion routes, and timing of needed control interventions.

4. Advise the Mission on additional support requirements that may be necessary to protect against significant crop damage and evaluate the extent of any crop damage that may occur.

5. Provide on-site field training to GOM locust control personnel as to locust biology; identification; aircraft calibration and ground guidance procedures; and techniques for field evaluation of insecticide application patterns.

6. Assist GOM locust control personnel in delineating protected nature reserves as well as non-protected but nonetheless ecologically sensitive areas within the locust treatment region; identify areas with the potential for harboring endangered species; and advise on appropriate, environmentally sound locust control strategies within these areas.

7. Prepare situation reports on a weekly basis for submission to USAID.

8. Summarize all data, findings, conclusions and recommendations resulting from the field effort in a report to be prepared and finalized prior to departure from Morocco. The report shall include a full description of the status of Morocco's locust problem; a forecast of trends in the locust situation; and recommended programmatic interventions on the part of USAID, especially those with project management implications, i.e., requiring significant changes in project direction or focus.

SCOPE B:

1. In consultation with Mission and GOM technical personnel, select an appropriate number of candidate test plots of manageable size and in reasonably accessible locations, taking into account the ongoing pesticide application program, representative ecological considerations, and logistical factors. Monitoring shall be undertaken in areas harboring larval forms undergoing ultra-low volume (ULV) aerial or ground treatment. Test plot size shall range from 0.5 to one hectare, and shall be replicated at least once with adequate numbers of untreated control plots. All areas selected for plot establishment should be typical of those in which desert locust control is normally undertaken in Morocco.

2. For each test plot, perform a detailed baseline pre-treatment count of animals beneficial to the agricultural ecosystem, i.e., locust predators/parasites and other arthropods affecting crop production, as well as other taxa including birds, small mammals, reptiles and amphibians (if applicable) using appropriate techniques, such as sweep netting, pitfall traps, visual transect counts, and ant surveys. Perform a similar assessment of each control plot.

3. Specify and record the formulation and application rate of the particular pesticide applied to each test plot.

4. For each test plot, perform a detailed post-treatment count of animals beneficial to the agricultural ecosystem, i.e., locust predators/parasites and other arthropods affecting crop production, as well as other taxa including birds, small mammals, reptiles and amphibians (if applicable) using appropriate assessment techniques, including carcass counts. Post-treatment counts should be repeated at suitable time intervals (e.g., one, seven, and 14 days following treatment) for each test plot.

5. Employing standard analytical methods, interpret the data collected in order to obtain accurate measures of the adverse effects of each pesticide used on animals beneficial to the agricultural ecosystem, i.e., locust predators/parasites and other arthropods affecting crop production.

6. Similarly, quantify direct mortality or other acute effects on the full range of fauna and flora in the test plot ecosystems.

7. Advise the GOM Plant Protection Service concerning insecticide residue monitoring in environmental media. Attempt to coordinate the GOM residue monitoring program with the post-spray environmental monitoring effort under this scope of work, in order to correlate residue data with observed non-target organism morbidity or mortality.

8. Advise Mission and GOM concerning any recommended actions stemming from the findings of the ecological studies.

9. Summarize all data, findings, conclusions and recommendations resulting from the environmental monitoring analyses in a report to be prepared and finalized prior to departure from Morocco. The report shall include a separate section which fully describes all recommended environmental mitigation actions associated with the Morocco Locust Control effort, including implementation procedures, duration, training requirements, estimated capital and recurrent costs, and agencies responsible for execution. This section shall focus on recommended programmatic interventions on the part of USAID, especially those with management implications, i.e., requiring significant changes in project direction or scope. All recommendations shall, however, be cost effective and implementable under Moroccan conditions.

IV. LEVEL OF EFFORT

The estimated level of effort for the Contractor for each locust control campaign (assuming one TDY to Morocco per campaign), inclusive of travel time, is six days of consultations in the U.S. with ecological specialists, four days in AID/Washington and 60 work days in Morocco (six day work week).

V. ILLUSTRATIVE COSTS*

ITEM	AMOUNT
Salary - 70 days @ $260/day	18,200
Domestic U.S. travel - two RT's	1,500
International travel - one RT U.S./Morocco	2,500
In-country travel	
Air	1,500
Vehicle rental	5,000
Per diem	
U.S. - 10 days @ $120	1,200
Morocco - 60 days @ $78/day	4,680
Miscellaneous	
FICA @ 7.5 percent salary	1,365
DBA @ $2.57/100 salary	468
Supplies and Equipment	1,000
Subtotal	37,413
Contingency	1,587
TOTAL	39,000

*This budget is for services during a single campaign. Line items should be adjusted accordingly for estimating the total life of project cost of entomological/environmental monitoring services for multiple campaigns.

STATEMENT OF WORK AND ILLUSTRATIVE COSTS

PESTICIDE MANAGEMENT AND HEALTH/SAFETY SPECIALIST

I. OBJECTIVE

The objective of this procurement is to contract a specialist to provide expert technical assistance to the Government of Morocco (GOM) in the safe management of pesticides being used in its desert locust control program. The ongoing locust control effort involves the use of large quantities of chemical insecticides within a complex distribution and useage network. The scale of the effort, and the fact that it is an emergency operation being conducted on a temporary basis means that a larger than usual number of workers are involved and that comprehensive training in safety and health guidelines for all employees responsible for the management and handling of pesticides is not always feasible. The technical services provided by the Contractor will assist the GOM in safeguarding the health and safety of workers involved in the chemical control aspects of the locust effort as well as the general public; lessen the possibility of accidents involving insecticides; and enhance the GOM Plant Protection Service's emergency response capability.

II. QUALIFICATIONS AND EXPERIENCE

The Contractor shall be a qualified public and occupational health and safety specialist with direct experience in the identification, analysis, and mitigation of public and occupational hazards and health risks associated with use of agricultural insecticides in large scale aerial and ground treatment crop protection programs. The Contractor shall have knowledge of, and experience in safe pesticide management practices for the full life cycle of pesticides used in crop protection programs, including acceptance, transport, storage, aircraft and ground spray operations, and disposal of wastes and empty containers. The Contractor shall be capable of advising the GOM on emergency preparedness and response strategies and procedures. The Contractor shall also have experience in both container and bulk systems for transport, storage, and load-out of pesticides. Developing country experience is highly desirable. French language capability at or above the FSI 3-3 level is required.

III. STATEMENT OF WORK

A. General

The Contractor shall have primary responsibility for advising the GOM Plant Protection Service on matters involving pesticide management, safety,

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and health witnin the overall locust control program. The Contractor shall also advise the GOM Ministry of Public Health concerning development and implementation of programs to minimize health risks to the general public as a result of the locust control effort. An important function of the Contractor shall be to conduct an in-service training program for GOM Plant Protection employees on the safe handling and management of pesticides in the locust control effort. In carrying out these activities, the Contractor will be required to travel to remote field sites under harsh environmental conditions.

B. Specific

For each locust control campaign during the life of the project in which such services are deemed necessary, the Contractor shall:

1. Perform a two-day official pre-departure TDY in AID/Washington to receive briefings on the current locust situation and to confer on other project matters with AID/Washington technical and Locust Control Project backstop personnel.

2. Upon arrival in-country, prepare a detailed work plan and schedule for Mission review, setting forth the principal tasks under the scope of work, and how they will be implemented, including identification of all Mission and GOM support and/or coordination which will be required.

3. Analyze the GOM's official guidelines on pesticide safety for crop protection workers in terms of technical adequacy, compliance monitoring, and internal enforcement procedures within the locust control program, and recommend needed changes.

4. Assess the GOM's regulations governing public health protection from exposure to pesticides, especially impacts of crop protection programs employing chemical pest control, and recommend needed changes in regulatory content or provisions for compliance monitoring.

5. Analyze the effectiveness of the Crop Protection Service's locust control pesticide management system by means of extensive site visits to observe the entire pesticide handling network, including receiving (port/airport); temporary storage; transport; warehousing; re-formulation; distribution; use in active locust control areas; and temporary storage/ultimate disposal of wastes and empty containers. Recommend improved procedures as necessary. Attention should be given to appropriateness and adequacy of temporary storage facilities located at remote field sites for use by farmers and/or in ground-application operations, and training needs of personnel responsible for managing such stores.

6. Attempt to inventory the Plant Protection Service's stocks of outdated (or otherwise unusable) pesticides and/or pesticide wastes, including empty containers, and make recommendations for safe and practical disposal of these materials.

7. Analyse the GOM's capability to monitor public health impacts of broadcast insecticide applications in the locust control effort, identify needed improvements, and recommend appropriate actions in response to identified needs.

8. Develop a one or two day in-service training workshop for locust control workers in high pesticide exposure job categories, and stage the workshop at appropriate regional centers in the locust control area. Provide more in-depth "train the trainers" training for a selected number of Peace Corps volunteers, in order to prepare them to provide follow-up training to locust workers serving at remote field sites in the fundamentals of safe pesticide handling and management.

9. Assess the Crop Protection Service's physical infrastructure for worker protection, including shower/change room and laundry facilities; protective clothing and equipment; and firefighting, medical and other emergency response equipment and supplies. Make recommendations for appropriate and practical improvements, as necessary.

10. Review the GOM program for routine whole-blood cholinesterase testing of locust control workers for pesticide exposure, and recommend modifications as necessary.

11. Analyse the Crop Protection Service's plans and preparedness for emergency response to incidents such as chemical spills, fires, and acute pesticide poisoning cases. Identify technical areas or physical locations requiring enhancement and recommend mitigating actions.

12. Verify GOM procedures for destruction of drums originating from USG-provided locust control insecticides, and assess progress in the disposal program.

13. Summarize all data, observations, findings, conclusions and recommendations resulting from the health and safety analyses in a report to be prepared and finalized prior to departure from Morocco. The report shall include a separate section which fully describes all recommended health and safety mitigation actions associated with the Morocco Locust Control effort, including implementation procedures, duration, training requirements, estimated capital and recurrent costs, and agencies responsible for execution. This section shall focus on recommended programmatic interventions on the part of USAID, especially those with management implications, i.e., requiring significant changes in project direction or scope. All recommendations shall, however, be cost effective and implementable under Moroccan conditions.

IV. LEVEL OF EFFORT

The estimated level of effort for the Contractor for each locust control campaign (assuming one TDY to Morocco per campaign) is two days in AID/Washington and 28 work days in Morocco (six day work week).

V. ILLUSTRATIVE COSTS*

ITEM	AMOUNT
Salary - 30 days @ $260/day	7,800
Domestic U.S. travel - one RT Washington	750
International travel - one RT U.S./Morocco	2,500
In-country travel	
Air	1,000
Vehicle rental	3,000
Per diem	
Washington - 2 days @ $117/day	234
Morocco - 33 days @ $78/day	2,574
Miscellaneous	
FICA @ 7.5 percent salary	585
DBA @ $2.57/100 salary	200
Supplies and Equipment	1,000
Subtotal	19,643
Contingency	1,357
TOTAL	21,000

*This budget is for services during a single campaign. Line items should be adjusted accordingly for estimating the total life of project cost of health and safety services for multiple campaigns.

STATEMENT OF WORK AND ILLUSTRATIVE COSTS

CHOLINESTERASE MONITORING TEST KIT TRAINING CONSULTANT

I. OBJECTIVE

The objective of this procurement is to obtain technical services for training of Government of Morocco (GOM) Ministry of Public Health (MOPH) technicians in the use of an instrument for the measurement of whole-blood cholinesterase levels in workers exposed to pesticides in the course of the GOM locust control program. The instrument to be employed is available in self-contained kit form for use under field conditions by technicians with minimal training. The use of this kit will allow the MOPH to screen workers for cumulative intoxication with cholinesterase-inhibiting pesticides (organo-phosphates and carbamates) and thus prevent potential cases of chronic pesticide poisoning.

II. QUALIFICATIONS AND EXPERIENCE

The Contractor shall be a qualified health scientist/technician well versed in pesticide residue monitoring in biological fluids. The Contractor shall have specific, extensive experience in the use of the "Lovibond" brand colorimetric tintometric whole blood cholinesterase activity measurement kit, or technical equivalent. The Contractor shall also have experience in training tecnicians in the use of this kit under field conditions in one or more developing countries, and be knowledgable of the institutional and administrative requirements for implementing a successful and effective national pesticide worker screening program based on use of the Lovibond test kit. Due to the requirement to perform field work in remote locations in Morocco, French language capability at or above the FSI 3-3 level is required.

III. STATEMENT OF WORK

A. General

The Contractor shall be responsible for conducting a training program in the use of the Lovibond test kit for Government of Morocco Ministry of Public Health technicians assigned to the current locust control campaign, and shall advise the MOPH on the development and implementation of a national program for the protection of workers at risk due to high body burdens of cholinesterase-inhibiting pesticides based on data collected using the Lovibond kit. The Contractor shall also advise the MOPH on administrative and management techniques for timely and effective use of worker monitoring results by means of appropriate methods for data management and handling.

B. Specific

The Contractor shall:

1. Perform a one-day pre-departure TDY in AID/Washington to receive briefings from concerned technical and Morocco Locust Control Project backstop personnel.

2. Upon arrival in-country, prepare a brief work plan and schedule for Mission review, setting forth the principal tasks under the scope of work, and how they will be accomplished, including indentification of any Mission and GOM support and/or coordination which will be required.

3. Inspect the consignment of test kits and related commodities procured under the Morocco Locust Control Project in order to verify their condition and suitability for immediate use in the project.

4. Perform an initial training session in Rabat for a core group of senior MOPH technical personnel, covering use of the kit as well as recommendations for collection, management, and use of the data resulting from the national monitoring program. This training session should emphasize fundamentals of Lovibond kit use in order to enable the MOPH core group to assume the training function in subsequent locust control campaigns in Morocco.

5. Travel to up to four regional sites to train field personnel in the use of the Lovibond kit, including methods for interpretation and processing of test results. The training should clearly specify criteria for determining which workers should be tested on a regular basis, and the frequency at which testing should occur.

6. Brief Mission and MOPH personnel upon conclusion of the field training program, to identify any constraints to implementation of the monitoring program and to make recommendations for prevention of potential problems.

7. Advise MOPH management on appropriate approaches for utilizing data collected in the pesticide worker monitoring program. Specific guidance shall be provided on criteria for using test results to identify workers at risk due to excessive pesticide exposure, and management alternatives for effectively removing such persons from chemical exposure for an adequate amount time to allow de-toxification.

8. Prior to departure from Morocco, prepare a letter report to the USAID Project Officer, summarizing relevant findings, conclusions, and recommendations, including a proposed procurement plan and schedule for replacement reagents and test kit expendables.

IV. LEVEL OF EFFORT

The estimated level of effort for the Contractor is one day in AID/Washington and 17 [illegible] in Morocco (six [illegible] work each).

V. ILLUSTRATIVE COSTS

ITEM	AMOUNT
Salary - 18 days @ $222.22/day	4,000
Domestic U.S. travel - one RT Washington	700
International travel - one RT U.S./Morocco	1,000
In-country travel	
Air	[illegible]
Vehicle rental	[illegible]
Per diem	
Washington - 5 days @ $ [illegible]/day	[illegible]
Morocco - 17 days @ $75.00	1,[illegible]
Miscellaneous	
FICA @ 7.1 percent salary	[illegible]
DBA @ $1.87/$100 salary	[illegible]
Subtotal	13,[illegible]
Contingency	1,[illegible]
TOTAL	15,[illegible]

STATEMENT OF COMMODITY REQUIREMENTS, SPECIFICATIONS AND COSTS

CLOTHING AND PERSONAL PROTECTIVE EQUIPMENT FOR

LOCUST CONTROL FIELD WORKERS HANDLING PESTICIDES

I. OBJECTIVE

The objective of this procurement is to provide the Government of Morocco Plant Protection Service with appropriate protective clothing and equipment for use by workers exposed to pesticides in the course of the locust control effort. This equipment is intended for use by workers at risk due to high and/or long-term exposures, i.e., formulators, aircraft loading and service crews, mist blower operators, etc.

II. SPECIFICATIONS

A. Head/Eye Protection

- Hard hat of a general industrial occupational standard, adjustable size, international orange or other high-visibility color;
- Swing-down full face visor attached to hard hat, clear, chemical resistant plastic, for splash hazard protection.

B. Respiratory Protection

- U.S. Mining Safety Administration "Comfo Flo 11" respirator or equivalent, with organic vapor cartridges;
- Replacement cartridges for above.

C. Clothing

- Long sleeved heavy-duty serviceable coverall, tightly woven chemical and fire resistant fabric, international orange or other highly visible color, size medium;
- Elbow-length gauntlet-type work gloves, chemical-resistant (neoprene or natural) rubber, unlined, size medium;
- Knee-high work boots, chemical-resistant (neoprene or natural) rubber, steel toe, unlined, size medium.

III. QUANTITIES AND ILLUSTRATIVE COSTS

The quantities presented below are preliminary recommendations based on an estimate of the GOM's actual needs, taking into account contributions to-date from other donors.

ITEM	AMOUNT
Head/Eye Protection - 200 units @ $50	1,000
Respiratory Protection - 200 units @ $50	1,000
Replacement cartridges - 1,000 units @ $2	2,000
Clothing - 200 complete sets @ $150	30,000
Shipping and handling - 10,000 lbs @ $1.00/lb	10,000
TOTAL	44,000

STATEMENT OF COMMODITY REQUIREMENTS, SPECIFICATIONS, AND COSTS

CHOLINESTERASE MONITORING TEST KITS

Objective: The objective of this procurement is to provide the Government of Morocco (GOM) Ministry of Public Health (MOPH) with an instrument for the measurement of whole-blood cholinesterase levels in workers exposed to pesticides in the course of the GOM locust control program. The instrument to be employed is available in self-contained kit form for use under field conditions by technicians with minimal training. The use of this kit will allow the MOPH to screen workers for cumulative intoxication with cholinesterase-inhibiting pesticides (organo-phosphates and carbamates) and thus prevent potential cases of chronic pesticide poisoning.

Manufacturer: See attached literature.

Supplier: See attached literature.

Specifications: See attached literature.

Items and Quantities to be Procured, with Illustrative Costs:

ITEM	AMOUNT
Test Kits	
15 @ $675	10,125
Reagents	
Bromothymol blue ampules - 2000 @ $9/500	36
Other Expendables	
Blood lancets - 30,000 @ $25/1000	750
Test tubes - 150 @ $8	1,200
Test tube brushes - 30 @ $2	60
Stirring rods - 15 @ $3	45
Fused glass cells - 15 @ $18	270
Vol. pipettes (0.01 ml) - 5000 @ $80/1000	400
Shipping and Handling (air freight)	
250 lbs @ $3.50/lb	875
TOTAL	13,761

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