

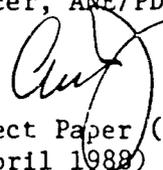
memorandum

DATE: December 28, 1988

REPLY TO
ATTN OF: ^{ERL} Eric R. Loken, Mission Environmental Officer, USAID/Morocco

SUBJECT: Environmental Assessment (EA) Update - Morocco Locust Control Project Paper Supplement (No. 608-0196)

TO: Molly Kux, Bureau Environmental Officer, ANE/PD/ENV

Thru: Charles W. Johnson, Mission Director 

Refs: Morocco Locust Control Project Paper (No. 608-0196), and Environmental Assessment (April 1988)

Attached for your review and approval is the EA Update for the Morocco Locust Control Project Paper Supplement. It has been completed by myself, based largely on the findings and recommendations of the two USAID-financed consultants, Ian Mackay and Albert Fischer. In fact, it includes virtually the entirety of Fisher's important findings and recommendations (edited as required due to the extremely rough draft left with us at the Mission), and all of Mackay's salient findings and recommendations, insofar as they were deemed appropriate and related to the environmental, health and safety aspects of the program. In addition, these findings and recommendations have been largely corroborated and improved through my own subsequent site visits and discussions with knowledgeable consultants (George Cavin) and GOM and USAID staff.

Upon review, I believe you will find these recommendations and conclusions to be comprehensive, appropriate and generally quite satisfactory in addressing the myriad of AID concerns associated with a project of this nature and magnitude. My preliminary discussions with the GOM indicate that they share our concerns in most of these areas and that we will be able to arrive at some mutually acceptable "package" of technical assistance, organizational management, training, research and commodity support to successfully implement these recommendations to the best of our joint abilities. Thus, at this time, I am not recommending any additional covenants, C.P.s or other PROAG clauses beyond those already included in the original PP and PROAG, with the exception of one additional "technical" clause concerning the special monitoring requirements for large fixed-wing aircraft treatment operations. I believe that these original stipulations still adequately cover our primary concerns in this regard. However, I have recommended modifying a few of these clauses to accurately reflect changed project circumstance (i.e., decs addition, additional flexibility in drum disposal procedures per Fischer recommendations, etc.). Based on my limited contacts to date, I believe we stand a better chance of accomplishing our objectives in this difficult matter through a collaborative approach rather than an inflexible posture.

Therefore, pursuant to Section 22 CFR 216 of the Agency's Environmental Procedures, I hereby request your approval of this EA Update so that we may proceed to authorize the Locust Control Project Supplement. Your immediate attention to this matter will be most appreciated.

att: a/s

ANNEX B

ENVIRONMENTAL ASSESSMENT

UPDATE

ANNEX B

ENVIRONMENTAL ASSESSMENT UPDATE

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ENVIRONMENTAL ASSESSMENT UPDATE**1.0** Introduction

An environmental assessment (EA) of the original Locust Control Project was duly completed in April 1988 in accordance with the Agency's 22 CFR 216 environmental procedures (see original PP). This document properly addressed all salient Agency concerns regarding the environmental aspects of this project to the extent feasible given the information and experience available on this subject at that point in time. However, much has happened since the completion of this original EA, and new information and insight has been gained regarding the current status of existing local control program operations and procedures and the most appropriate mechanisms for ensuring that Agency environmental concerns are being properly addressed. This EA Update is provided, therefore, to supplement the original EA findings and recommendations in areas where new information and experience has shown that this is desirable and necessary. It does not replace the original project EA where its conclusions are still valid and appropriate.

2.0 Insecticide Selection

2.1 Original EA Comments: "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 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 1 is subject to change based on the outcome of additional planned field tests and finalization of the L/G Programmatic Environmental Assessment" (L/G PEA). p.5-4.

2.2 Information Update: During last year's Fall 1987 and Spring 1988 Moroccan campaigns, approximately 1.45 million liters of insecticides and 1.9 million liters of toxic organic solvent were sprayed over some 2.8 million hectares of Moroccan territory (see Table 2). U.S. Government donations, consisting of some 43,000 liters of carbaryl and 140,000 liters of malathion, comprised about 9% of the total pesticide use over this period. Similarly, approximately 1 million hectares of land have already been sprayed during the ongoing Fall 1988 campaign, including some 400,000 liters of USG-supplied malathion. In most instances, this coverage has proven to be generally adequate and reasonably effective for most Moroccan locust control objectives, both with regards to the quantities and types of pesticides employed and the area treated. However, in late-October and early-November 1988, weather changes and prevailing locust populations resulted in rapid, extensive northern movements to the southern edge of the Souss-Massa Valley area of southwestern Morocco - a major agricultural region of the country. These swarms were treated by the GOM with karate and delta-methrin (decis), the insecticides of local choice in agricultural areas of the country. The GOM

indicated their intention to continue to use these products in similar such circumstances in the future. They also stated their desire to use USG-supplied aircraft in applying these insecticides where conditions so warrant.

Although not specifically included in the list of L/G PEA-approved insecticides presented in Table 1, both of these products belong to the category of pesticides known as pyrethroids, some of which are approved for USG use under specified conditions (i.e., lambda-cyhalothrin and tralomethrin). In accordance with the above GOM request, USAID applied for a waiver to allow the use of decis in USG-supplied aircraft (see Rabat 10817 in Attachment 1). This waiver was subsequently granted by AID/W on December 11, 1988 (see State 400174 also in Attachment 1). Thus, in addition to the insecticides specified in Table 1, future AID-assisted control operations in Morocco will also provide for the use of decis.

2.3 Recommendations for Future AID-Assisted Operations:

2.3.1 All ongoing AID-assisted locust control operations be restricted to the provision and/or use of the following insecticides: malathion, carbaryl, bendiocarb, dursban (chlorpyrifos), fenitrothion, diazinon, lambda-cyhalothrin, tralomethrin and decis. Eligibility of AID assistance for any of these chemicals is subject to change based on the outcome of additional planned field tests and finalization of the L/G PEA.

3.0 Efficacy of Selected Insecticides for Locust Control

3.1 Original EA Comments: "The efficacy of the eight chemicals selected for AID-funded locust control is treated in the L/G PEA 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." p. 5-6.

"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... 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." p. 5-11.

3.2 Information Update: While all of the above is still generally valid, there appears to be conflicting evidence regarding the performance of the various insecticides currently being employed in Moroccan program operations. The problem appears to relate primarily to local attitudes, practices and conceptions regarding the use of the selected insecticides, rather than to the efficacy of the products themselves. The following examples serve to illustrate the nature of this complex, multi-faceted problem area:

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TABLE 1

LIST OF INSECTICIDES PROVISIONALLY APPROVED
FOR USG USE IN LOCUST/GRASSHOPPER CONTROL ACTIVITIES
(L/G PEA, 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 registered 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

Insecticides utilisés

- DDVP Technique	=	88.702 L
- Fénitrothion 500	=	120.600 L
- Fénitrothion 1000	=	407.290 L
- Malathion 950	=	781.561 L
- Carbaryl 40	=	42.784 L
- Diazinon 900	=	8.200 L
- Karaté 40	=	8.900 L
- Solvant Han	=	1.900.000 L

Soit un total de = 1.458.037 litres de pesticides et 1.900.000 litres de Solvant.

Traitements

Les moyens mis en oeuvre par le Royaume du Maroc et l'aide apportée par la Communauté internationale ont permis de traiter depuis le début des opérations au 20 Juillet 1988 : 2.813.182 hectares répartis par P.C comme suit (superficies en hectares) :

P.C	PAR VOIE AERIENNE	PAR VOIE TERRESTRE	TOTAUX	%
GUELIMIM	759.789	138.050	897.839	31,92
TATA	314.466	120.508	434.974	15,46
LAAYOUNE	35.440	117.041	152.481	5,42
DAKHLA	8.300	108.710	117.010	4,16
OUARZAZATE	354.041	166.388	520.429	18,50
ERRACHIDIA	147.643	157.746	305.389	10,86
BOUARFA	219.813	136.975	356.788	12,68
OUJDA	2.400	25.872	28.272	1,00
TOTAUX	1.841.892	971.290	2.813.182	100
dont : larves	=	1.201.245 ha		
Adultes	=	1.611.937 ha		

- During the Spring 1988 campaign, USAID provided some 43,000 liters of carbaryl to assist Moroccan control program objectives. Following initial applications of this product, there were serious concerns raised regarding its effectiveness in killing locusts, with a variety of possible explanations being suggested for this apparent failure. Subsequent, carefully controlled trials of this product conducted in Morocco, however, provided directly contrary results--that the carbaryl was effective for this purpose, even under rather adverse testing conditions (George Cavin, pers. communication). Further inquiry revealed that the real reason for the Moroccans' erroneous belief in the inefficacy of this product is the longer time span it requires to kill locusts, as it is a stomach rather than a contact poison. Additional local criticisms relate to the increased difficulty in working with this product (i.e., solid (vs. liquid) compound, dilution requirements, etc.). Thus, despite the direct evidence provided above, this insecticide is no longer used in local program operations in favor of easier-to-use, faster-killing, yet much more dangerous, products (e.g., DDVP). It should be noted that this same local criticism has also been levelled at malathion for the same reason specified above, however, to a lesser and continually decreasing degree.

- Other concerns expressed regarding insecticide efficacy result largely from the misapplication of the approved products under local conditions. The USAID-financed Entomologist/Environmental Monitoring Specialist cites several informal, personal observations of malathion being aerielly applied under inappropriate environmental conditions (i.e., low temperatures, high condensation levels), with naturally sub-standard results (i.e., 12.5 percent insect mortality after 32 hours; Mckay, 1988). The reasons for this all-to-frequent occurrence include an insufficient understanding by campaign pilots and ground staff regarding the application requirements and specifications for the various campaign insecticides, lack of equipment to properly monitor and communicate ambient meteorological conditions, and the logistical difficulties of attempting to implement a far-flung campaign operation in a timely and effective manner.

Thus, the problems experienced to date in this area relate fundamentally to a lack of knowledge regarding the conditions of application and the methods of action of the various insecticides, as well as local preference for those products which are relatively easy to use and exhibit dramatic, quick-kill results. While the former issue can be dealt with through staff training and limited commodity support (see Section 4.3 below), the latter attitudinal question requires more thoughtful and imaginative remedial measures.

3.3 Recommendations for Future AID-Assisted Operations:

3.3.1 A series of field trials should be conducted to demonstrate the efficacy of approved locust control insecticides to local campaign staff under Moroccan conditions. The objective here is not to research the efficacy of the various products approved for use, but to educate local participating agency staff of their potential in this regard under local conditions when used in accordance with recommended instructions and procedures. Because of the difficulties inherent in tracking treated swarms to collect mortality

data, it is recommended that control and treated insects be collected from spray blocks and confined in cages for this purpose. For such demonstration work, it is believed the normal "cage-effects" can be ignored. Suitable cylindrical cages can be constructed of mosquito netting or cotton fabric for this purpose. Mortality observations should continue for at least 4-5 days post-treatment to ensure adequate time for the slower-acting toxins. Emphasis should be placed on the demonstration of USG-approved insecticides (see Section 2.3 above) to shift prevailing local preferences away from the other, less desirable products currently being used in campaign operations. For maximum demonstration effect, these trials should be conducted to the greatest extent possible throughout all campaign areas with the active participation of different regional staff. Similarly, all trial results should be given the widest dissemination possible. In this manner, it is hoped that local preferences and procedures can gradually be adapted to the improved, proper application of safer, yet equally effective, compounds.

3.3.2 All insecticides approved for inclusion in AID-assisted operations be used in strict accordance with salient research and product manufacturers' recommendations (e.g., L/G PEA (1988), various manufacturers' instruction/specification materials), with regard to area and type of application, dosages and concentrations, and under proper physical and environmental conditions. (Additional recommendations for proper handling and use of the approved insecticides are provided below).

4.0 Application Methods and Equipment

4.1 Original EA Comments: "The various insecticide application technologies commonly used in locust outbreak control are described in detail in the L/G PEA. 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." p. 5-5.

4.2. Information Update:

4.2.1 Aerial Application Targeting Operations - The Moroccans are using a network of vehicle teams to survey and follow locust swarms. These teams report by radio to regional Command Posts where the results are plotted and the decisions are made as to what action should be taken. All information is passed to the Central Command Post in Rabat. The system is basically very well organized; logistics are good. Ground survey teams are aided by use of helicopters to assist their activities in especially difficult terrain. Based on observations of the system working in Guelmim, Ouarzazate and Errachidia and conversations with the pilots who end up spraying the designated blocks, the existing survey system appears to be working fairly well, but could also benefit from certain minor improvements in targeting accuracy.

Spray block delimitation and flagging appears to be the weakest component of all field spraying operations. The Entomologist/Environmental Monitoring Specialist cites several personal observations of inadequate target delimitation procedures resulting in less than optimum aerial insecticide applications. Most of the problem here appears to be due to one or more of the following causes:

- inexperienced pilots and ground marking crews;
- poor pilot/ground crew coordination;
- inadequate spray block marking procedures; and
- inattention to prevailing meteorological conditions (i.e., wind speed and direction, humidity) within the immediate target area.

4.2.2 Use of Fixed-Wing Aircraft - As a result of the severity and extent of the recent Fall 1988 locust infestation, a decision was made to provide two large USG-supplied fixed-wing aircraft (i.e., DC-7s) to expand the area of coverage commensurate with the size and scope of the identified locust swarms. Although not expressly prohibited from use (see above), such aircraft are not recommended for normal locust control operations due to their reduced targeting specificity and increased potential for non-target environmental impacts (L/G PEA). Although it is too early yet to tell the extent of any such non-target impacts, it is nevertheless considered prudent to establish an appropriate procedure for monitoring the effects of fixed-wing aircraft insecticide application to avoid or minimize any potential negative environmental impacts.

4.2.3 Ground Application Methods - In addition to the above two application areas, there are also concerns regarding campaign ground treatment operations. Specific issues here include proper insecticide application procedures and conditions, and worker safety. As might be expected, ground treatment operations generally experience greater problems in both of these areas than aerial applications. This is due to a variety of factors, such as the difficult terrain and working conditions, the greater number of people in contact with the chemicals, and the lower level of education and training of the average worker (vs. pilots). The Entomologist/Environmental Monitoring Specialist cites several observations of ground treatment mis-application and over-dosing, one of which appears to have resulted in extensive environmental damage on adjacent perennial vegetation (McKay, 1988). Equally important, however, are the greatly increased chances of worker exposure to toxic chemicals in such circumstances through mis-applications, spray blowback, more frequent handling requirements and the almost inevitable lapses in protective clothing use due to the harsh and uncomfortable desert conditions. Preliminary evidence indicates that these worker safety concerns are largely warranted by the number of intoxications and reduced cholinesterase activity levels experienced to date among ground treatment staff (Fischer, 1988).

4.3 Recommendations for Future AID-Assisted Operations:

4.3.1 Aerial Application Targeting Operations -

4.3.1.1 The GOM should consider using small, high-wing profile, spotter aircraft to detect and monitor moving swarms of locusts. These aircraft are

less expensive to operate than helicopters, and would free helicopters for use in more vital program activities.

4.3.1.2 To improve target delimitation practices, all ground crews should be trained in proper spray area delimitation, marking and swath flagging procedures. This course should include use of compasses, and map-reading and position reporting. This training should include a round-table discussion with participating campaign pilots to promote proper ground/air coordination of aerial spray operations.

4.3.1.3 Where necessary, control program pilots should receive training in the basic principles and practices of agricultural spraying operations delivered by an experienced spray pilot.

4.3.1.4 All campaign ground crews should be provided with VHF radio communications to facilitate ground/air coordination.

4.3.1.5 To facilitate aerial spotting by pilots, the GOM should consider distinctively marking all ground crew vehicles for ready identification from the air. Consideration should also be given to providing each ground crew with powerful, portable spot or strobe lights to assist pilot identification and orientation. (It is worth remembering that much of this work is carried out in darkness due to the specific local environmental conditions.)

4.3.1.6 Each spray block team should be supplied with instruments to record the wind, relative humidity and air temperature at the beginning and end of treatment. These data should be collected for every treatment to provide, at a minimum, the opportunity for a retrospective analysis of any observed problems. Instruments needed are a handheld windmeter (anemometer), compass (wind direction), and robust psychrometer (this can be used to measure temperature and humidity simultaneously). Care should be taken to supply metric system instruments.

4.3.1.7 All spray block teams should be provided with a continuous supply of "kromocote" cards for measuring spray deposit and droplet size. This information provides important feedback for improving aerial insecticide applications.

4.3.2 Use of Fixed-Wind Aircraft -

4.3.2.1 To the greatest extent possible, fixed-wing aircraft control operations should be undertaken with pre- and post-application environmental monitoring of the general target area. Monitoring information requirements would include: percent of target area coverage, percent of application falling outside of designated target area, method of target area delimitation, existing climatological conditions at the time of application, extent of non-target environmental impacts both within and outside of the designated spray area, and any other observations of interest. Should this recommendation not prove to be entirely feasible, it is suggested that at least a representative sample of such flights be monitored in this fashion over each cycle of operations (i.e., different climatological, topographical,

biological, and regional situations with different insecticides). Post-application monitoring should continue for at least up to four days duration.

4.3.3 Ground Application Methods -

4.3.3.1 All ground treatment personnel should receive appropriate, practical training regarding the nature of the chemicals in use, techniques for their proper handling and application, and the various safety measures which need to be carefully observed in all such operations. These courses should be offered frequently to accommodate new employees and changing products. They should be delivered in the local language.

4.3.3.2 To minimize inefficient applications and worker exposure to chemicals, it is recommended that aerial treatment be used to the greatest extent possible. Where physical and logistical conditions permit such flexibility, aerial application should be considered the treatment method of choice in ongoing campaign operations.

5.0 Ability of the Government of Morocco to Regulate or Control the Distribution, Storage, Use, and Disposal of Pesticides

5.1 Original EA Comments: "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.

"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 Casablanca. 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 this 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...

"The Ministry of Public Health (MOPH) is also 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 intoxication; 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, 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 sound basic knowledge and understanding of safety, health, and environmental considerations. Shortcomings in facilities and equipment exist... 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." pp. 5-8 to 5-10.

The EA called for technical assistance and training to improve these aspects of campaign operations along with commodities support of such items as protective clothing and equipment for insecticide handling and spray personnel, cholinesterase testing kits and insecticide drum disposal equipment.

5.2 Information Update: While much of this original information is still valid and accurate, more recent evidence suggests that this important area of campaign operations is fraught with a variety of shortcomings and liabilities. Virtually every aspect of local insecticide handling and use practice contains serious problems, as evidenced by the alarmingly large numbers of chemical intoxications and reduced cholinesterase activity observed among campaign staff. Those workers at particular threat include the high chemical contact categories involved in aircraft refilling operations, ground treatment applications (see Section 4.3.3 above), and insecticide storage and mixing operations. To illustrate the concerns in this area of campaign operations, the following discussion has been excerpted from the draft report of the USAID-financed Pesticide Management and Health/Safety Expert (Fischer, 1988).

Storage of pesticide drums on bare ground is inadequate as leaks cannot be detected and the soil can thus be directly contaminated. Even if the duration of storage is relatively brief, drums can be exposed to quite high temperatures. Average temperatures can reach 47C on the metal surface of the containers, and maximum temperatures can exceed that value considerably. With such temperatures, the pesticides can break down and become a hazardous waste. Further problems observed at the storage level include the general lack of warning signs, fire fighting equipment, fully adequate washing facilities (showers and eye-cleaning devices) and correct labeling of drums. Storage facilities were, in general, inaccessible to outsiders, but often close to dwellings.

Handling of drums is very rough, and some centers have begun using bulldozers and fork lifts to move them. A drum disposal method is not yet operational and empty drums (punctured or not) pile up at the PCs and sub PCs constituting a hazard. Reused drums are all insufficiently labeled and represent a hazard for those who cannot read or are not familiar with the operations. Except for one case where one-year-old carbaryl drums were found, there were no outdated stocks of pesticide. It appears that, on average, insecticide drums are stored about 1-2 months or less.

Workers at all PCs, Sub PCs and Operational Units wear protective suits and respirators. Protective suits were plastified or had a rainfast coat, most suits also had a hood. Rubber boots were worn mostly with pants covering them. Workers had rubber gloves, unfortunately, in most cases the quality was poor (easily broken) and this may have been a source of the recorded intoxications of people handling

insecticides. The respirators were in good condition but it appears to be quite difficult to get the workers to wear them. Workers complained that protective gear was uncomfortable and hot, they would like to have something more adapted to Moroccan conditions, which is also more appropriate for the hardships of terrestrial treatments. The respirator is uncomfortable, and respiration through it is difficult. Many workers tend not to wear it. The protective gear quickly wears out or gets ruptured and continuous replacement is needed. In several cases, boots were in short supply. The protection equipment offers good protection from pesticide exposures. Intoxications result from negligence in properly using of the protective gear, from wearing equipment that is worn and torn (such as most of the gloves), and from reckless handling of a very toxic product.

The use of a respirator should be maintained and a continuous supply of filtering cartridges should be available. Since the instructions accompanying the masks were in a foreign language, confusion existed with regards to the frequency of filter changes. In general, filters are changed when the mask has strong pesticide smells, when it is difficult to breathe through, or if headaches and dizziness are felt. This is pretty much a decision of the user who needs to be made aware of these facts. It was difficult to identify in most cases how and where protective gear was washed. Many workers washed them at home. It could not be established if workers washed them in the same place clothes are washed. This was suspected in most cases. One worker was washing his protective suit in a bucket using bare hands to remove the pesticide stains. Some PCs sent all of the protective suits to a nearby laundry. The degree of knowledge at the laundry of the kind of material they were washing was not clear. The plastic eye protection was randomly worn, as visibility soon deteriorates while working with them on. However, eyes offer an almost direct route of pesticide penetration. The helmet with a plastic face coverage appears more adequate, and would also solve the problem of many workers not wearing a hat.

Refilling the planes with pesticides is the most hazardous situation, accounting for at least 50% of the intoxications. It occurs in the early morning when it is still dark. The crew of about 8 men works clumsily in the darkness. Pesticide is pumped out of the drums. When one drum has been emptied, the suction hose, with its terminal pipe, is withdrawn and put into the next drum. The suction pipe comes out of the drum soaked in pesticide, which is splashed and falls on the ground. As this hose-pipe assembly is heavy, workers literally hug it and get thoroughly wet with the insecticide (most often DDVP). The rubber hoses deteriorate and sometimes leak or break, splashing pesticide all around. The person holding the filling hose at

the tank opening is usually too close, risking inhalation of the dense insecticide vapours, or being splashed with product. Not wearing the mask or wearing perforated gloves has resulted in intoxications and hospitalizations. The input of the technicians leading the crews is a key factor in the safety of this operation.

Sophistication and additions to the protective gear are not really going to eliminate intoxications if there is little assurance of it being properly worn. To address this situation, a near closed pesticide refilling circuit (for the airplanes) is needed, such that it will require the participation of only 1 or 2 workers. The refilling of the planes results in repeated daily pesticide spillages on the ground. A cement floor (instead of bare ground) to store the drums and contain spillages is needed at each airfield. The refilling areas are not delimited or isolated and, in general, no warning signs are posted. In theory, a nurse is always where pesticide is being handled, but transport to clinics and hospitals is sometimes a problem. Fire protection and washing facilities are in many cases insufficient.

The terrestrial treatment operations are the other important source of contamination with insecticide. Refilling the atomizers with insecticide often is hazardous. The other exposure situation is when one worker walks into somebody else's spray mist, or when changes in wind direction blow back the worker's own spray. Workers going back and forth to refill sprayers usually walk through pesticide mist. Negligence with the protective gear (mainly respirators and eye protection) in such circumstances may lead to intoxication.

Workers treat large extensions, usually on rough terrain or on hilly landscapes. This work is energy demanding and increases the heat inside the protective suits. Wearing a respirator becomes most uncomfortable. All of this results in workers neglecting the proper use of their protection gear. Seeking lighter, better adapted equipment may help. An alternative solution, however, is that terrestrial treatments be minimized, and the involvement of helicopters in such areas be increased. Smoking, eating and drinking is forbidden during terrestrial spraying. Often there is a nurse accompanying the field crews to the treatment sites.

There are problems with the motorized atomizers used for terrestrial treatments. Not only are they very often "en panne", but in certain cases, there are safety problems, such as when rubber and plastic hoses deteriorate and leak pesticide which is spilled onto the worker and the ground. Drivers of trucks with pesticide for refilling the atomizers in the field should wear protective equipment as operating on irregular

terrain is hazardous. Drivers of truck-mounted equipment (Micronair and large mistblower systems) should also wear protective gear. While spraying, the driver should keep the windows shut to avoid any of the spraying mist. With the mistblower cannon, a good deal of the spraying mist can whirl back towards the spraying unit.

The medical assistance for the locust control campaign is well organized, and in most cases works efficiently, reaching the crews in the field. There is a physician at each local hospital working with the PC, with other physicians and nurses distributed in the Sub PCs. Cholinesterase tests for workers are performed periodically, and more kits and replacement parts are beginning to be needed. Physicians and hospitals were all capable of treating intoxications by organophosphate insecticides but did not seem very sure about treating intoxications with lambda-cyhalothrin and deltamethrin, new compounds only recently incorporated into the campaign (see above). In most cases, they need technical data sheets of such new products. In some hospitals, the need existed for equipment to treat hospitalized intoxications. Some hospitals were in short supply of atropine and contraction. In some hospitals, the lack of pajamas to change for the pesticide-contaminated clothes of the arriving patients was a problem. Patients lay in bed with the same contaminated clothes they arrived in. Everybody seemed well aware of the safety problems, and seemed able to deal with intoxications, and to prevent hospitalizations by using the cholinesterase test as an early diagnostic tool. Many physicians complained that there would be less intoxications if the highly toxic DDVP insecticide were substituted by a less toxic, and equally effective, compound.

The workers are generally of poor caliber (many of them nomads, depending on the region), most of whom speak only Arabic and are not fully literate. In only specific cases, the crews remained relatively stable so that all workers could reach a certain level of proficiency. In most cases, when individuals leave, they are replaced by newcomers with no prior campaign experience. The low educational level, and the fluctuating level of expertise in these crews, helps explain the difficulty encountered in convincing and enforcing the use of the protective equipment.

The regulatory aspects of pesticide use need to be updated. Although new regulations are supposed to be in progress, no documents have been made available for review to date. Such is also the case of the proposed new regulations for pesticide registration.

The Laboratory of the Plant Protection Division at Casablanca appears to be the sole local institution physically and technically capable of monitoring pesticide residues in the environment at present.

5.3 Recommendations for Future AID-Assisted Operations:

5.3.1. Fire fighting equipment should be placed in all insecticide mixing plants, storage areas, transport vehicles, and in all areas refueling and refilling planes with pesticides. The fire fighting equipment should include fire extinguishers, fire blankets, hose reels and a fire alarm. Sufficient water must always be available. It must be borne in mind that after a fire, contaminated fire-fighting water may flood into drains and waterways posing serious risks. Advice on fire-fighting equipment and facilities can be obtained from local fire authorities. Fire equipment locations should all be clearly identified with appropriate signs. There should be a crew trained to control a fire provided with the necessary equipment. Emergency drills should be conducted from time to time. Fuel or solvents and pesticides should be separated by distance or by a solid fire barrier. These barriers should be used at the mixing installations in Ait Melloul. Fire equipment must be regularly checked and maintained in good condition. Maintenance records should be kept.

5.3.2. Signs indicating smoking or eating restrictions, access restrictions, location of emergency equipment, need to wear protective gear for access, telephones and all escape routes must be clearly displayed. Symbols should be easily understood and should be in the local language. There should be symbols on pesticide drums indicating the toxicity of the different chemicals.

5.3.3. Considerable improvements are needed at the drum storage sites. The first requirement is a firm, impermeable base to avoid soil contaminations, and to contain and mop up spillages. This floor should be surrounded by a containment wall capable of containing a spillage of at least the total volume of liquid held by the largest of the drums, and any contaminated water from fire fighting operations. At the base of the containment wall, there should be a drainage gully sloping to a sump. The sump should be periodically emptied and disposed of in a biodegradation pit (see below), or be highly diluted (1/10) and sprayed over a deserted area. Larger biodegradation units should also be constructed at the airfields to contain the contaminated rinsing water from the plane's pesticide tank; alternatively, this water could also be sprayed over deserted areas. A simple way of flooring a storage site is by using several layers of heavy plastic covered by a 2-6 in layer of soil or clay or other absorbants. The storage site must be well ventilated and preferably roofed to prevent the deterioration of the insecticide, or its formulation, with the high desert temperatures. Asphalt is not recommended as flooring material because it softens with heat and with certain solvents.

All 200 litre drums should be stored on pallets, where leaks can be spotted and corrosion at the bottom of the tanks can be prevented. Two hundred liter drums may thus be stacked in two layers separated by pallets. All drums must

be stored in such a way that there is sufficient space (aisles) for inspection and fire-fighting access. Mechanized handling of drums (fork lifts, bulldozers) should be available, and drums need to be arranged to permit the operation of such units. This would substantially reduce damage caused by dropping drums. Aisles should be marked with paint on the floor. Fuel should be stored separately from insecticide, or at least separated by a fire wall.

Storage requires careful inventory control and the rule of "first in, first out" should be applied. Regular inspections should be conducted. Drums should be identified with their arrival date. Storage facilities should be properly locked or surrounded by a fence. Storage should be in areas not subject to flooding and away from dwellings, offices, water sources, food and animals. Storage should be away from inhabited areas. If current facilities are close to dwellings or offices, cholinesterase tests should regularly be applied to the neighbouring individuals.

Storage areas must be provided with a good water supply for emergencies. Dry absorbent materials such as absorptive clay, charcoal, sand, sawdust, vermiculite, dry rags or paper should be at hand for cleaning (mopping up) leaks or spills on cement or plastic floors. After cleaning, these contaminated materials should be properly disposed of as hazardous wastes. Organophosphates are easily hydrolyzed with lime or sodium hypochlorite. This also applies to lambda-cyhalothrin. It is advisable to have such substances on hand to quickly decontaminate any spillages.

Biodegradation pits can be built to contain moderate amounts of toxic materials from cleanup of storage spillages. Pits 2 m in diameter and 2 m in depth, are dug in the ground. They should be lined with 10 cm clay and 2 cm lime, cement or plastic. Layers, 5 to 15 cms thick, of charcoal (at the bottom), lime and a source of organic matter, such as manure or plant residues containing biodegrading microorganisms, should be added to the pits. The pits should be kept moist. Anaerobiosis should be avoided. Added wastes (10-15cm thick) should be covered with a layer of soil. More layers of charcoal, lime, and organic matter, should be added as the pit becomes filled.

Pesticides should be stored in adequately labeled containers, including conventional toxicity warning symbols. All such labelling should be in the local language, since workers and technicians also need to know what kind of product they are handling. Paint should be used instead of stick-on paper labels which are easily lost. Old out-dated labels should be removed or covered with paint.

Employees should be trained on how to handle spillages and on emergency treatment of exposures, as well as to recognize the symptoms of over-exposure. Spillages on the ground (earth, gravel, etc.) should be shovelled off and put into closed containers for safe disposal. The use of water to clean up spillages on cement floors should be avoided since water disperses the pesticide, enlarging the contaminated area.

Food, feed or other articles intended for consumption by humans or animals should not be allowed in storage areas. First aid kits should be available in

all storage areas. Workers must spend the least time possible in the storage areas. Medical authorities should be given full details of all pesticides being stored and used in the area. These recommendations apply to all insecticide and aircraft fuel storage areas, including Casablanca port areas.

5.3.4. Enforcement of the proper use of protective equipment could be improved up to a point. There seems to be a limited opportunity for improvement beyond which further improvements will prove very difficult. Additions to the current protective gear may increase the uncomfot presently felt and not necessarily improve protection, since wearing the equipment will perhaps always face some degree of inconsistency. In any case, lighter and more comfortable protective suits should be better accepted by field personnel.

5.3.5 To obtain a significant improvement in safety, the refilling operation needs to be simplified, the number of persons in contact with the product needs to be drastically reduced, and/or their contact made more sporadic (such as by limiting the frequency of terrestrial treatments (see Section 4.3.3 above) and/or alternating crews). At airport level, the use of cistern trucks with built-in pumps would offer a practically hermetic circuit from the cistern to the plane which could be operated by 1-2 workers (8-10 are currently involved). The more hermetic the refilling sequence is, the less will be the number of workers in contact with the product. A cheaper, and perhaps better alternative, is to place a cistern (or a cistern truck) on an elevated ramp, higher than the plane to be filled. The plane could then be gravity fed with a hose. There would be no pump (lower cost, no risk of fire and spillages), and the system can be handled by one worker. Efficient ball shut-off valves should be placed at either end of the hose. Such systems should be imposed at every plane-operating center, if the number of intoxications (or low cholinesterase %) are to be drastically reduced and if work with DDVP continues. By working with cisterns, an important additional objective is also achieved: elimination of drum accumulations at airfields and storage areas.

There is an alternative system that could also help avoid the handling of the heavy pipe and rubber hose set presently used to transfer the product. Pipes (reaching the bottom of the drums) can be inserted into each drum, with the suction hose hand-clamped to the upper end of the pipe. When the drum is empty, the hose is unclamped and re-clamped to a similar pipe in the next full drum. This is a much easier and cleaner maneuver than transferring the entire hose and pipe assembly to each drum, resulting in substantive regular product spills and contaminations.

5.3.6. Pumps used for loading or mixing pesticides should have an antisplash shield covering them, and a receptacle at the base to contain leakages (see Attachment 2).

5.3.7 Many liquid insecticide formulations are based on flammable organic solvents (such as HAN, which is being used at Ait Melloul). Thus, in formulating and mixing plants using such solvents, there is always the risk of fire with the emitted vapours. For this reason, all electrical equipment and vehicles in the vicinity must not produce sparks.

5.3.8. Considering the general background of the field workers, the recommended training approach is to train the trainers. Train the permanent staff that works daily with the crew in the field. Such training courses should be 1-2 weeks long, staged at key regional locations. The course (or stage) should involve the participation of Moroccan scientists in the lecturing. All training should be conducted when campaign operations are in recess. An outline of such a course is included in Attachment 3. The courses should have a practical approach.

5.3.9 Empty drums should be thoroughly drained, either by removing the top or by opening convenient holes at the edge of the lid near the front spout. The effluent should be collected and added to another container with the same product. A triple rinse should follow (fill 1/4 of the volume of the container with water, shake vigorously, drain, and repeat this operation 3 times). If the formulation is an emulsifiable concentrate, then an organic solvent such as kerosene or gas oil (diesel) should be used for the triple rinse, which is expected to remove 95% of the pesticide. The drum now can be punctured or crushed and sent for disposal. A more rigorous treatment would be to first triple-rinse, then treat with a suspension of lye (NaOH), sodium carbonate, or quick lime to hydrolyze the product (organophosphate). Then, empty the drum and rinse, fill it with water, add a couple of handfuls of powdered or activated charcoal and some detergent. Shake it and let it sit for several hours. The problems with this system is that it: a) assumes an abundance of water, which does not occur in many regions of Morocco; and b) requires additional disposal facilities to discard the rinsing water.

Thus, a different technique has been suggested to overcome the above limitations. Drums should be completely drained (the product drained should be collected for later use). Several hours may be needed for optimum drainage, however, for practical reasons, 30 min may suffice. The top and sides of the drum should be repeatedly punctured. Then a few litres of kerosene or gas oil should be added, and the residual pesticide flamed off. Prevailing winds should not carry contaminated smoke to inhabited places. This operation should be conducted in the open and away from flammable solvents or pesticides. Workers should wear full protective gear and have the wind in their backs. The flamed drums can then be crushed and taken to a disposal site.

The ideal disposal of drums would be to recycle them as scrap in a steel smelting plant (such plants exist in Morocco). This seems the most adequate and environmentally safe alternative to pursue for large-scale drum disposal operations. Drums should always be drained and triple-rinsed or flamed before being sent to smelting plants or other disposal facilities.

Crushing drums is also a very effective way of rendering them unusable and ready for burial. Moderate amounts of crushed empty drums can be buried in landfills. These installations must be on high ground, in low rainfall areas, with a very deep water table (deeper in sandy than in heavier soils) and not subject to flooding. Soil should be as impermeable as possible (clay and silts near the surface). The disposal area should not be in use by people or

grazing animals. The wind direction should be consistently away from any sensitive areas. The area should be fenced and lockable. It should be adequately posted with warning signs. The material should be buried deep enough so that erosion will not expose it; this depends on soil texture. The site should be excavated, and the ground covered by a double synthetic liner (ideal situation, for relatively small areas). The liner should be covered with 3 feet of compacted clay, a layer of charcoal and a layer of lime. However, in many instances, large areas may be required to meet the disposal requirements. In such cases, the plastic liner may not be feasible. The insurance against infiltration will then be the impervious compacted clay layer, the absorptive charcoal band and the lime which should hydrolyze the organophosphates. Each layer of crushed drums should be covered by a layer of soil (also a layer of lime can be added) that should be well compacted by a tractor or bulldozer. The soil acts as an absorbant and a source of degrading microflora. Periodic soil samples should be taken around the area to detect any toxic seepage from the landfill. Periodic light irrigation will help keep the soil microflora active.

Selecting a disposal site will require some informed judgement for assessing the depth and thickness of the clay horizon, evaluating the erodibility of the soils, and judging the depth of percolation and that of the water table, and a good knowledge of local meteorology and flooding history (very important, even if flooding is rare).

5.3.10 Printed safety guidelines should be distributed in the local language to all campaign personnel and local extension agents. They should be based mainly on pictures. A similar type of publication should be devised for the general public.

5.3.11 Hospitals, particularly the small ones, should be provided with pajamas for patients to change pesticide-contaminated clothes. Periodic checks should be made to ensure that all participating hospitals have sufficient medical supplies to treat chemical intoxications and burns. In addition, all concerned medical staff should receive up-to-date information and training regarding effective treatments for all chemicals currently in use in campaign operations.

5.3.12 Periods for reentry into a crop or other area treated by insecticides, by bees, animals and men should be known and publicized to prevent premature exposures. If unknown, wait 24-48 hours for reentry.

5.3.13 Protective gear is a consumable item. A sufficient stock of such equipment should always be available at each locust control center.

5.3.14 The use of DDVP in the locust control campaign is the main reason for the intoxications or low cholinesterase values observed. Research should be conducted to identify equally effective chemicals with lower acute toxicities (see Recommendation 3.3.1 above).

5.3.15 The use of ramps and/or cushion tires is not presently working in avoiding the bashing of drums. Ramps have to be at least as wide as the length of the drum; otherwise, drums tend to fall off the ramp. Two men with gloves need to insure a slow and controlled drum descent to the cushioning tire.

5.3.16 There should be control over the quality of drums reused at Ait Melloul. Recycled drums are very bashed and ostensibly corroded. Ideally, only new drums should be re-used. Older drums should be professionally reconditioned prior to re-use (if specialized facilities for reconditioning exist in Morocco), or not re-used at all.

5.3.17 Protective clothes should be washed far from food, dwellings or potable water sources. A specific tub should be used for this purpose only. Long gloves must be worn for washing. After washing, clothes should be well exposed to sunlight to break down any remaining traces of pesticide. Contaminated rinsing water could be disposed of in a biodegradation pit or other environmentally safe disposal system. Protective clothes should only be worn when strictly necessary. They should never be taken home.

In washing the respirator, the filter cartridges should be removed. Water or soap must never wet the activated charcoal of the filter. Protective gear should be stored in a closed cabinet away from the insecticide storage site.

5.3.18 The GOM should organize a mobile team of knowledgeable officials to periodically check all operations units to ensure that all recommended safety practices are being followed and to provide advice on shortcomings and improvements. This type of compliance monitoring is particularly important during periods of campaign operations, when resources are stretched and oversights are inevitable. This team should be responsible for all areas of toxic chemical and fuel handling and use (e.g., storage, mixing, transfer, filling, disposal; fire and health safety; warning signs, brochures, protective equipment and other commodities; etc.). This team should also be tasked with "spot" testing the workers and neighboring inhabitants for reduced cholinesterase activity or other signs of intoxication. Key populations would include those people living near storage areas, disposal sites and areas being sprayed. (Additional recommendations for more general environmental monitoring requirements are presented in Section 6.3 below.)

5.3.19 The Interministerial Pesticide Commission needs to accelerate its effort to produce a document with all the regulations and guidelines regarding the rational and safe use of (at least) the insecticides involved in the present locust control campaign. This material should be distributed to all ranks at PC and Sub PC level. This material will provide the basic information for the compliance monitoring, publicity and training programs discussed above.

The section in charge of the registration of pesticides would benefit from an IBM-compatible (XT or AT) micro-computer to rationalize their records and allow efficient retrieval of information. This unit could also keep lab

records as well as field data from insecticide efficacy experiments. With this facility and the information from the registration files, a phyto-sanitary guide could be compiled, consisting of a data sheet for each agrochemical in use.

5.3.20 Extension personnel need to develop adequate extension material on pesticide safety. There appear to be no such publications available at present. Extension agents need training in the rational and safe use of pesticides. These personnel should participate in regional training courses designed for this purpose.

5.3.21 With respect to the registration of pesticides, more emphasis should be placed on the study of pesticide effects on the environment in determining whether a product can be used or not. Contamination of water is an important issue that also needs to be included in the registration data. It is recommended that the following material be made available to the Interministerial Pesticide Commission and to the Bureau of Pesticides and Registration of the Plant Protection Service:

- Regulating Pesticides. Nat. Academy of Sciences, 1980
- International Code of Conduct on the Distribution and Use of Pesticides. Rome, FAO. 1986
- Guidelines on Environmental Criteria for the Registration of Pesticides. Rome, FAO. 1985
- Guidelines for the Registration and Control of Pesticides (including a model scheme for the establishment of national organizations) Rome, FAO. 1985
- Pesticide Regulation Handbook. McKennay, Conner & Cuneo. Executive Enterprises Publ. Co., Inc.

An examination of the labeling requirements included in the current local pesticide registration procedures, suggests the necessity for some improvements. A description of the formulation and its components is required. Considerations for the protection of the environment (flora, fauna, water, soil) should also be included on the label. In addition, first aid measures must be included in the event of intoxications. The conditions for storage and suggested methods for disposal must also appear on the label. Other important items are the prescription of periods to wait before returning to a treated area, and the minimum period allowed between the last pesticide application to the crop and the harvest. For completing and updating label information, the following publication may prove useful:

Guidelines on Good Labeling Practice
for Pesticides. Rome, FAO. 1985.

Short-term visits or short courses at EPA or universities in the US, may assist in improving pesticide regulation work in Morocco. Very capable personnel, with knowledge of English, can be found in the offices of the Plant Protection Division.

6.0 Effect of Selected Insecticides on Non-Target Organisms and the Natural Environment

6.1 Original EA Comments: "The L/G PEA 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 ..., 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 ... in order to document any adverse impacts and allow for necessary mitigative action." p. 5-6.

6.2 Information Update: Although little reliable information is available on this subject, informal field research and observations indicate that program operations to date have resulted in various adverse impacts both on non-target organisms and the natural environment. The Entomologist/Environmental Specialist cites several personal and other source observations which would indicate, at least superficially, that substantive vegetative and non-target organism kills and/or degradation have occurred in program operations areas. In addition, the discussion presented in Section 5.2 above cites many examples of potential untoward environmental impacts resulting from insecticide spillages, mis-application and other potentially hazardous handling and use procedures. Of particular concern in this regard are the current conditions within the vicinity of the campaign's Ait Meloul regional base, where toxic chemical spills and contaminations over the many years of use of this facility have reached such an extent that they now threaten the economic prosperity and health of the local inhabitants of the area. This situation is even more alarming considering Ait Meloul's leadership role within the local field organization where proper examples and procedures should be set. While it is hoped that many of these impacts will prove insignificant or capable of amelioration through the various recommendations listed above, this must be properly examined and verified to assure that all such adverse impacts are kept to the absolute minimum. This goal can only be achieved through the establishment of a regular, systematic environmental research and monitoring program in campaign areas which can generate and feedback information on a continual, organized basis regarding the environmental aspects of ongoing campaign operations.

6.3 Recommendations for Future AID-Assisted Operations:

6.3.1 As a first step, the GOM must undertake without delay a thorough, yet rapid, assessment of the extent of environmental damage in and around the Ait Meloul base from toxic chemical accumulations, and its

potential economic and/or health impact(s) on the neighboring local inhabitants of the area. This assessment should provide for analysis of a representative set of soil, water, and biological (floral/faunal) samples from the Ait Melloul/Agadir vicinity for indications of any toxic chemical accumulations. Particular attention should be devoted to all local water supply sources (both surface and groundwater), and agricultural crops and livestock. This assessment should also include cholinesterase testing of a random sample of the neighboring local population. The GOM must also implement without delay any appropriate remedial and preventive measures called for through the assessment results. In addition, it is recommended that the GOM seriously consider moving the Ait Meloul facility at the earliest opportunity to a suitable, less populated location.

6.3.2 To examine the effects of spray operations on non-target organisms, a series of research trials should be initiated in campaign areas. The Errachidia region seems the most promising location for this work to start. These trials should be small, split-block replicates to look at the effects of the various campaign insecticides on the local non-target flora and fauna. Insecticides which should be tested first are malathion, DDVP (Dichlorvos) and possibly, decis or deltamethrin. Attachment 4 provides detailed recommendations for an initial set of trials. There are two design possibilities: using 30 hectares blocks sprayed by aircraft, with 1 hectare plots; or, if aerial spraying is not feasible, using 0.25 hectare plots sprayed with a handheld, battery-powered ULV sprayer (Ulvamicron or equivalent). These trials should also include a residue sampling component. The results of these experiments should provide a baseline of data on the non-target effects of correctly applied pesticide. With such initial results in hand, it should then be possible to superpose more complex questions: what are the effects of overdosing? what is the effect of large numbers of locust carcasses? what are the long-term consequences, if any?

A parallel project would be to look at the abundance and diversity of pollinators, parasitoids and other small flying insects in the Tafilalet oasis. If sticky traps were used, it would not be very time-consuming during the height of activities, as the traps can be labelled, stored flat and examined at leisure, later in the year.

6.3.3 In addition, the PCC should organize all field personnel to systematically look for cases of possible intoxication or death in insectivorous and carnivorous vertebrates. Any specimens should be gutted; if locusts are found, they should be sun-dried and sent to Casablanca for laboratory examination (along with the head, wings, etc... of the victim to permit identification, with details of the locality, circumstances, insecticide, etc...). Particular attention should be paid to raptors (hawks and falcons), white stork (Ciconia ciconia), and the Houbara Bustard (Chlamydotis undulata). Birds are particularly important in this respect since they are noticeable, have high metabolic rates and often restricted diets, are sensitive to environmental toxins and have relatively specific habitat requirements. Such a national alert would greatly improve the chances of noticing problems, since the probability of finding anything during limited small-block trials is very low. The results of this monitoring should be compiled and reported on a regular periodic (per campaign) basis.

6.3.4 In Ouarzazate province, beehives were severely affected during last year's operations; approximately 2,500 hives were seriously damaged, out of a total estimated at 12,000. Samples of bees, honey and wax were sent to Casablanca for analysis; organophosphorus residues were found in the bees, but not in the honey or wax. Apparently, foraging bees picked up insecticide and contaminated other bees when they returned to the hive. Apiculture is extensive in this region; most families have 1-5 hives usually located in the walls of the house. A few producers have up to 80 hives. Honey from this region is highly appreciated, the bees foraging mainly on wild flowers. In addition to their local economic value, the bees of this region are a distinct race which is of great interest to the international beekeeping community because it is a highly productive species, the bees have a large foraging radius and long mouthparts. Experiments in crossing these bees with Canadian bees are already under way, for example. Thus, these bees are a valuable resource. USAID should support further research by Moroccan scientists to determine explicitly the impact locust insecticides are having on the Saharan race of bees and what can be done to mitigate any identified problems.

6.3.5 Finally, there is an urgent need for a longer term, national environmental monitoring program to be undertaken for the duration of ongoing locust control campaign activities. Critical monitoring needs would include insecticide residue accumulations in the ambient soil, water and flora and fauna of treatment areas and in and around PC storage and handling areas. It is recommended, therefore, that each PC establish forthwith a representative set of sampling stations within each of their respective areas and proceed to collect suitable surface and groundwater, soil and floral and faunal samples on a regular, periodic basis. These samples should then be forwarded to the Casablanca Plant Protection laboratory for analysis. The results of this environmental monitoring program should be compiled into a summary, seasonal (per campaign) report for the identification of potential problem areas and appropriate mitigative measures.

7.0 Summary and Conclusions

An environmental assessment of the original Locust Control Project was duly completed in April 1988 in accordance with the Agency's 22 CFR 216 environmental procedures. This document properly addressed all salient Agency concerns regarding the environmental aspects of this project to the extent feasible given the information and experience available on this subject at that point in time. However, much has happened since the completion of this original EA, and new information and insight has been gained regarding the current status of existing local control program operations and procedures and the most appropriate mechanisms for ensuring that Agency environmental concerns are being properly addressed.

Based upon this additional information, the Update examines the status of project activities within five general categories of locust control campaign operations. These include:

- Insecticide Selection

- Efficacy of Selected Insecticides for Locust Control
- Application Methods and Equipment
- Ability of the Government of Morocco to Regulate or Control the Distribution, Storage, Use and Disposal of Insecticides
- Effect of Selected Insecticides on Non-Target Organisms and the Natural Environment

Each of these five topics is addressed in relation to the original EA findings and recommendations, new information or experience which has been gained since the original EA completion, and a list of specific recommendations to be followed for all future AID-assisted control program operations. The bulk of the new information and resultant recommendations were obtained through the work of the two AID-financed, short-term consultants (Entomologist/Environmental Monitoring Specialist and Pesticide Management and Health/Safety Specialist) recommended in the original EA. Whereas the Update generally confirms the original EA results, it also provides a greater specificity and definition to ongoing program environmental requirements as a result of the additional Morocco-specific information now available on this subject.

The overall thrust of the Update recommendations is that control program environmental, health and safety considerations need to be organized into a suitable local institutional framework so that they can be dealt with systematically and effectively on a long-term basis. Past experience clearly shows that the myriad of such important considerations cannot be successfully dealt with on a short-term, "ad-hoc" basis, especially during actual campaign operations. Thus, the recommendations fundamentally call for the formation of an Environmental/Health Safety Unit within the Moroccan campaign institutional framework to oversee the successful design and implementation of all ongoing program environmental/health safety considerations. This Unit would be assisted by USAID-financed Environmental/Health Safety advisor(s) for the duration of USG assistance to the program, and short-term consultants in specific technical areas on an as-needed basis. The Unit would have primary responsibility for all aspects of program environmental/health safety considerations, including: the design and scheduling of appropriate technical assistance, training, research and monitoring activities; specification of the types and amounts of program environmental/health safety commodities requirements; completion of all required insecticide health/safety and regulatory information, brochures and procedures; monitoring the status of implementation of program environmental/health safety recommendations; and preparation of periodic, comprehensive campaign reports covering all environmental/health safety aspects of ongoing campaign operations.

Certain other Update recommendations relate to program operational areas, such as pilot and ground crew training for improved aerial spraying effectiveness and insecticide efficacy demonstrations to promote the most cost-effective, safe and appropriate application techniques for Moroccan conditions. It is believed that most of these latter recommendations can be dealt with

adequately through the provision of short-term training assistance and a relatively modest purchase of commodities for improved target area survey, delimitation and ground/air communications.

In conclusion, the Update largely reconfirms the original EA findings for continued USAID involvement in Moroccan locust control operations. Moroccan campaign personnel generally seem to have a good appreciation of the potential environmental hazards associated with this type of activity. Serious problems do exist, however, in certain program areas, most notably in aerial application targeting and efficacy and the myriad of procedures being employed in insecticide handling and use. Update recommendations provide for addressing these problems through a comprehensive and systematic program of research, technical assistance, training and commodity support, as well as establishment of a campaign-wide environmental monitoring program. If these recommendations are properly carried out, it is believed that the program can be implemented in an environmentally acceptable manner commensurate with all salient Agency regulations.

8.0 Bibliography

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9.0 Attachments

UNCLASSIFIED
AID 11/04/88
DIR: CWJOHNSON
AGR: RHELLYER: NF
1. DADO: RSTRYKER, 2. ADO: REHRICH, 3. A/DDIR: KSCHOFIELD
AID-5 CHARGE

CWJ
RH RBS
RS RBS
RE RBS
KS

AMEMBASSY RABAT
SECSTATE WASHDC, IMMEDIATE.
INFO AMEMBASSY KHARTOUM
AMEMBASSY ALGIERS
AMEMBASSY TUNIS
AMEMBASSY NOUAKCHOTT
AMEMBASSY DAKAR
AMEMBASSY BAMAKO
AMEMBASSY NIAMEY
AMEMBASSY ADDIS ABABA
AMEMBASSY NDJAMENA
AMEMBASSY ROME
AMEMBASSY NAIROBI
AMEMBASSY ABIDJAN
AMEMBASSY BRUSSELS
AMEMBASSY OUAGADOUGOU
AMEMBASSY PARIS

Rabat 1-817

AIDAC/LOCUST

AID/W FOR OFDA/DLTF AND ANE/TR/ARD; KHARTOUM FOR
CAVIN/FARNSWORTH; ABIDJAN/NAIROBI FOR REDSO; BRUSSELS
FOR USEC; PARIS FOR OECD/CLUB; ROME FOR FODAG

E.O. 12356: N/A
SUBJECT: MOROCCO LOCUST CONTROL PROJECT (608-0196):
SITREP 8

1. SUMMARY: SITREPS 6 AND 7 WERE TRANSMITTED ONLY TO
AID/W. THIS SITREP (NO. 8) PROVIDES LOCUST COLLECTIVE
WITH A RECAP OF THE SITREPS 6 AND 7 AS WELL AS UPDATE
ON CURRENT LOCUST SITUATION IN MOROCCO. MESSAGE ALSO
REQUESTS ACTION FROM AID/W TO EXECUTE A WAIVER FOR USE
OF DECIS ON CROP LANDS. END SUMMARY.

2. AS OF OCTOBER 30, 1988, GOM REPORTED TREATING A
TOTAL OF 300,000 HECTARES. DAILY TREATMENT HAS JUMPED

DRAMATICALLY FROM 5000-10,000 HA PER DAY IN MID-OCTOBER TO 20,000-35,000 HA PER DAY IN LATE OCTOBER. 14 PERCENT HAS BEEN GROUND TREATMENT AND 86 PERCENT HAS BEEN TREATED BY AIR. MISSION ESTIMATES GOM PRESENTLY HAS CAPACITY (GROUND AND AIR) TO TREAT 40,000 HA PER DAY UNDER IDEAL CONDITIONS. CURRENT BREAKDOWN OF PERSONNEL AIRCRAFT, GROUND TREATMENT AND LOGISTICAL SUPPORT MATERIAL IS AS FOLLOWS:

SPECIALISTS	-	250
NON-SPECIALISTS	-	1644
TREATMENT AIRCRAFT	-	18
OBSERVATION HELICOPTERS	-	5
TREATMENT HELICOPTERS	-	8
JEEPS W/RADIOS	-	47
JEEPS W/O RADIOS	-	273
SMALL CARS	-	54
LIGHT ALL-TERRAIN TRUCKS	-	140
LIGHT ALL-TERRAIN TRUCKS	-	
- FOR TREATMENT	-	96
SMALL TRUCKS	-	7
LARGE TRUCKS	-	33
LARGE TANK TRUCKS	-	14
TANK TRAILERS	-	30
MOTOR BACK-PACK SPRAYERS	-	1630
MANUAL BACK-PACK SPRAYERS	-	196
EXHAUST NOZZELS SPRAYER	-	61

3. CLIMATIC CONDITIONS: A LARGE WEATHER FRONT MOVED SOUTHWARD THROUGH THE SOUSS-MASSA VALLEY DURING THE LATE EVENING OCTOBER 31, BRINGING COOLER TEMPERATURES AND RAIN. WINDS PUSHED LOCUST SWARMS IN THE SOUSS-MASSA VALLEY (ESTIMATED AT 20,000-30,000 HECTARES) BACK TO THE GUELMIM - BOUZAKARNE AREA (I.E. BACKSIDE OF THE ATLAS MOUNTAINS). THIS FRONTAL SYSTEM TEMPORARILY REVERSED A VERY DANGEROUS SITUATION WHICH OCCURRED DURING THE PREVIOUS FOUR DAY PERIOD OF OCTOBER 28 TO 31 WHERE WEATHER SITUATION HAD CREATED WINDS FROM SOUTHEAST AND VERY HIGH TEMPERATURES (THE DESERT WINDS). THE STRONG HOT SOUTHEASTERLY WINDS ALLOWED MAJOR SWARMS TO MOVE OVER 250 KM IN 48 HOURS

INTO THE SOUSS-MASSA VALLEY. COOLER TEMPERATURES LASTED FOR ONLY TWO DAYS (NOVEMBER 1 AND 2). ON NOVEMBER 3, THE WEATHER AGAIN CHANGED FAVORING RAPID LOCUST MIGRATION IN NORTHERLY DIRECTION. USAID AND THE GOM BELIEVE THAT A SERIOUS THREAT WILL EXIST FOR THE NEXT THIRTY TO FORTY FIVE DAYS AS LARGE SWARMS CONTINUE TO MOVE NORTH FROM MAURITANIA, AND SAHEL-WEST AFRICA. GIVEN THE LACK OF DESERT VEGETATION AND THE EVER PRESENT THREAT OF HIGH TEMPERATURES AND SOUTHEASTERLY WINDS, SWARMS (IF NOT CONTROLLED), WILL PROCEED TO THE SOUSS-MASSA VALLEY AS WELL AS TO OTHER AREAS WITH ABUNDANT VEGETATION INCLUDING MAJOR IRRIGATION ZONES.

4. THE FOLLOWING IS A RECAP OF NOVEMBER 2-4 SITUATION

- A. NOVEMBER 2: THE STORM SYSTEM CONCENTRATED LOCUSTS IN VARIOUS REGIONS. TOTAL ESTIMATED INFESTATION WAS APPROX. 13,000 HECTARES WITH MAJOR CONCENTRATION OF 7000 HECTARES IN LAAYOUNE AREA. THE GOM C-130 MADE ONE SPRAY TREATMENT OF 5000 HECTARES ON THE MORNING OF NOVEMBER 2 IN THE LAAYOUNE AREA. THE C-130 IS WORKING WITH 205 BELL HELICOPTER (WITH SPRAY SYSTEM). THE USAID TURBO THRUSH AIRCRAFT TREATED A VERY DENSE SWARM ESTIMATED AT 4000 HECTARES 60 KILOMETERS NE OF BOUZAKARNE ON NOVEMBER 1. LOCUSTS STAYED ON THE GROUND UNTIL 11:00 ALLCWING GOOD KILL RATES. OTHER AREAS, TOTTALLING ABOUT 6000 HECTARES WERE BEING TREATED BY GROUND CREWS IN OUJDA, ERRACHIDIA, AND QUARZAZATE. A SECOND BELL 205 EQUIPPED WITH SPRAY SYSTEM WAS OUT OF COMMISSION WITH MECHANICAL PROBLEMS.

- B. NOVEMBER 3: GOM REPORTED THE LOW PRESSURE SYSTEM OFF COAST OF PORTUGAL IS PROVIDING IDEAL SITUATION (I.E. TEMPERATURES AND WINDS) FOR NORTHERLY MOVEMENT OF LOCUSTS. GOM STATED TOTAL INFESTATION LEVEL AT 42,500 HA OF WHICH 37,651 HA WERE TREATED. LOCATIONS WERE AS FOLLOWS:

- - 22,000 HA OUARZAZATE
- - 6,220 HA AIT MELLOUL (IN THE SOUSS-MASSA VALLEY,
- 10 KMS FROM AGADIR)
- - 6,635 HA TATA

- - 3,060 HA ERRACHIDIA
- - 2,700 HA BOUARFA
- - 1,155 HA OUJDA
- - 800 HA GUELMIM
- - SWARMS IN THE SOUSS-MASSA VALLEY WERE TREATED WITH AIRCRAFT AND GROUND TREATMENTS USING KARATE AND DECIS. THE GOM PREFERS TO USE THESE PESTICIDES IN AGRICULTURAL REGIONS. THE GOM PREPOSITIONED TWO P.A. 25 AIRCRAFT IN MARRAKECH. ONE P.A. 25 CRASHED (PILOT UNHARMED) ON NOVEMBER 3 DUE TO HIGH WINDS IN MOUNTAIN AREA.

- C. NOVEMBER 4: AT 9:00, GOM REPORTED A TOTAL 75,487 HA INFESTATION WITH 50,765 HA IN THE GUELMIM AREA, 17,681 IN TATA AREA, 6,420 HA IN THE OUARZAZATE AREA AND 621 HA IN THE OUJDA AREA. AT 11:00, APPROXIMATELY 100,000 HA OF ADDITIONAL SWARMS WERE CONFIRMED MOVING THROUGH THE SAHARA. THIS REPRESENTS MAJOR NEW SWARM MOVEMENT INTO THE REGION FROM MAURITANIA. USAID TURBO THRUSH PILOTS, WHO HAD BEEN SCHEDULED FOR A DAY OFF IN AGADIR, WERE IMMEDIATELY SENT BY HELICOPTER BACK TO GUELMIM IN THE EARLY MORNING AND HAVE BEGUN TREATMENT OF A 6000 HA BLOCK.

5. WAIVER REQUEST FOR DELTA-METHRINE (DECIS): ON OCTOBER 28, 1988, GOM BEGAN TREATMENT OF SWARMS NEAR CHICHAOUA 50 KM WEST OF MARRAKECH AND NORTH OF THE ATLAS MOUNTAINS. THESE SWARMS WERE TREATED WITH DELTA-METHRINE (DECIS) USING EXHAUST NOZZELS MOUNTED ON LAND ROVERS. THE CROP PROTECTION PERSONNEL REPORTED THAT DECIS IS GOM INSECTICIDE OF CHOICE FOR USE ON AGRICULTURAL CROPLANDS. PRESENTLY THEY HAVE 10,000 LITERS ON HAND AND 100,000 LITERS ON ORDER. MISSION ANTICIPATES THAT USAID FINANCED AIRCRAFT MAY BE CALLED UPON TO APPLY DECIS. MISSION REQUEST AID/W PREPARE AND EXECUTE WAIVER TO ALLOW FOR USE OF DECIS IN USAID AICRAFT. HAWES**

ACTION AID2 INFO: DCM ECON, AGR

OFFICIAL FILE

VZCZCRA0009EHU410
PP RUFHRA
DE RUEHC #0174 3460014
ZNR UUUUU ZZH
P R 110012Z DEC 88
FM SECSTATE WASHDC

LOC: 413 879
11 DEC 88 1022
CN: 41802
CHRG: AID
DIST: AID

TO RUFHRA/AMEMBASSY RABAT PRIORITY 8235
INFO RUEHAS/AMEMBASSY ALGIERS 2613
RUEHTU/AMEMBASSY TUNIS 2788
RUEHAB/AMEMBASSY AHARTOUM 0193
RUEHDK/AMEMBASSY DAKAR 3865
RUTANA/AMEMBASSY NOUAKCHOTT 6349
BT
UNCLAS STATE 400174

608-0196

AIDAC LOCUST RABAT FOR HELLYER/KITTS

E.O. 12356: N/A

TAGS:

SUBJECT: LOCUSTS - APPROVAL OF DECIS WAIVER

ACTION: AGR

DUE DATE: 12/14

INFO: Dir Dir2 Prog

AGCONS - OFF CHRO1 - RF

1. ON DECEMBER 8, 1988, THE ADMINISTRATOR SIGNED A DOCUMENT WAIVING REGULATION 16 PESTICIDE PROCEDURES FOR THE USE OF DECIS (A SYNTHETIC PYRETHROID) IN THE LOCUST CONTROL PROGRAM IN THE KINGDOM OF MOROCCO.

2. THE WAIVER MAKES REFERENCE TO THE PROGRAMMATIC ENVIRONMENTAL ASSESSMENT (PEA) WHICH DISCUSSED SYNTHETIC PYRETHROIDS GENERALLY, WHILE ADDRESSING THE USE OF TWO SPECIFIC SYNTHETIC PYRETHROIDS FOR LOCUST CONTROL, LAMBDA-CYHALOTHRIN AND TRALOMETHRIN. IN PROVIDING GUIDANCE ON SYNTHETIC PYRETHROIDS, THE PEA CAUTIONED THAT THESE CHEMICALS ARE HIGHLY TOXIC TO AQUATIC ORGANISMS. THE WAIVER CITES THE PEA CAUTION, AS WELL AS THE SPECIFIC GUIDANCE THAT A BUFFER ZONE OF 500 METERS BE OBSERVED WHEN APPLYING PESTICIDES BY AIR NEAR AQUATIC ZONES.

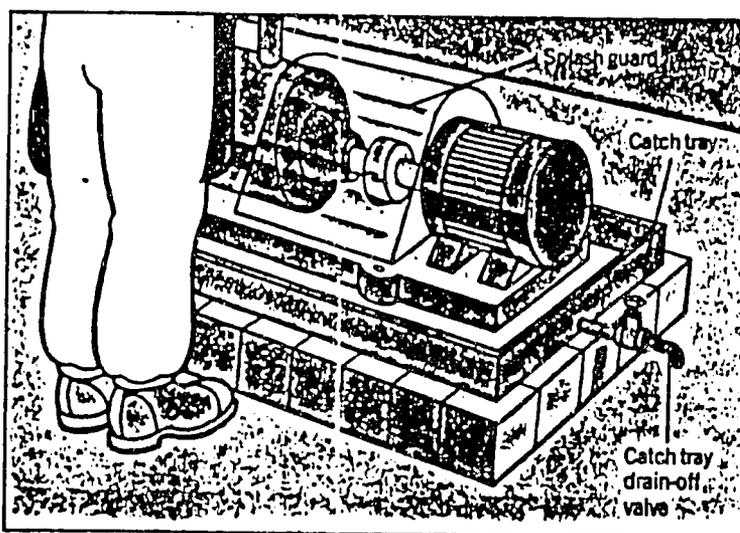
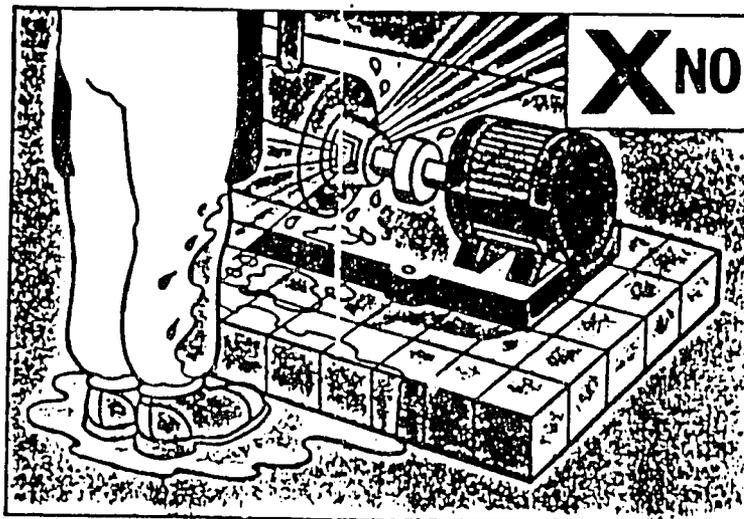
3. FULL TEXT OF WAIVER BEING POUCHED TO MISSION.

S HULTZ

BT

0174

NNNN



Pumps handling toxic materials *must* be fitted with a splash guard and catch tray.

(N.B.: This attachment also serves as an excellent example of the type of visual training aids which should be used extensively throughout all recommended staff training activities.)

Pesticide Management Training Technical Topics

1. FAO Code of Conduct
Introduction to the FAO International Code of Conduct on the Distribution and Use of Pesticides
2. Introduction to Pest and Pesticide Management
Overview defining the term pest, a general description of pest categories and the types of damage each causes.
Explanation of "pesticide management" as including all aspects from manufacture/formulation through distribution, retail, application and residue disposal.
3. Pest Control Methods
Explanation and description of various general control categories (e.g. prevention, cultural, physical/mechanical, biological, chemical).
4. IPM
Definition of Integrated Pest Management including application across and within various pest management disciplines.
Suggestion of need for economic and environmentally sound approach to pest management.
5. Pesticides
Focus on types of pesticides, and categorization based on chemistry and target pests. Discussion of characteristics of each group and practical implications for their use. Also discussion of formulation, packaging, label information, etc.
6. Safety
Focus on precautions to take when handling pesticides in transport, storage, mixing, application, and residue and container disposal. Recognition of poisoning symptoms and first aid procedures.
7. Application Equipment
Description and demonstration of various pesticide application equipment including proper use and maintenance.
8. Equipment Calibration
Description and exercises in determining total volume of spray solution applied to any area to be sprayed.
9. Dose Calculation
Description and exercises in determining the amount of formulated product needed in the spray solution.

10. Extension Resources and Methods

Discussion of regional, national and international public and private organizations that may serve as informational resources. Discussion and demonstration of various methods for communicating pesticide management information to farmers.

11. Pesticide Legislation/Regulation

Discussion of government control schemes for pesticide use at national and regional levels.

Includes suggestion for compliance with FAO guidelines and International Code of Conduct for the Distribution and Use of Pesticides.

topics.doc 08/15/88

ANNEX. Outline and protocol for a pilot experiment to assess the effects of locust spraying on the non-target arthropod fauna in Morocco

Definitions

Study Sites: Sites should be in the general areas undergoing spraying, should be ecologically representative and preferably not infested with desert locusts. One site should be located in the Oued Draa seasonal flood zone and another in the arid steppe zone west of Errachidia. The exact sites for the experiments should be chosen by the principal investigator in January, from the range of possible sites visited.

Experimental unit: Split block

Replication: 1 malathion sub-block, 1 DDVP sub-block, 1 control sub-block, matched as closely as possible for physical and biological characteristics.

Experimental design: Split block, three replicates (9 sample plots). See below for details.

Sampling methods: Ground arthropods will be sampled using pitfall traps: buckets inserted flush with the ground surface that will be emptied daily. The traps will have square, white painted covers (30 x 30 cm). Small flying insects will be monitored using TRECE sticky traps mounted on 1 meter poles. Residues will be sampled on soil, water and vegetation (annual and perennial). Other sampling methods can be added if time is available.

Outline

Survey: Identify suitable homogenous sites of approximately 100 hectares. Map area and inform local authorities of site locations.

Delimit areas: Define blocks, sample plots and mark with flags on stakes.

For aerial spraying spraying delimit two 30 hectare blocks for treatment and a 30 hectare control block which should be upwind of treated areas. There should be at least 500 meter wide buffer zones between treated areas.

For spraying with a handheld, battery-powered ULV sprayer (ULVA micron or equivalent), delimit 1 hectare plots.

Description of sites: A detailed description of physical characteristics, soil, vegetation, animal and/or human use etc... Begin daily recording of temperature (maximum/minimum), humidity, rainfall, condition of sky.

Prespray activities: Take samples of vegetation, soil and water for residue analysis (follow whatever protocol is requested by Plant Protection Casablanca laboratory or researchers at I.A.V. Hassan II, Rabat). Flag blocks for spraying with 1x2 meter white flags on 3 meter high poles. Install pitfall traps, stakes for sticky traps. 10 pitfall traps should be installed at 15 meter intervals along the vertexes of a triangle i.e. 3 radial 45 meter transects. 9 sticky trap sites should be assigned randomly. Unambiguously mark any other other sampling sites (anthills, bushes, etc.). Check aircraft or other equipment calibration on a separate check plot. Begin separate test to establish best interval for changing sticky traps (1 day, 2 days etc.).

When all this has been done, decide on date of spraying and then begin prespray data collection (5 days before, 1 day before).

Aerial Spraying: Spray units of 30 hectares (1000 x 300 meters) with each chemical (malathion and DDVP) at rates currently used. Malathion 96% ULV: 0.75 liters/ha. (885 grams active ingredient/ha). DDVP (Dichlorvos) 20%: 1 liter/ha (200 g a.i. /ha). Control pilot should be upwind of spray plots. Staggered plots with 500 meter buffer zones. A line of spray cards perpendicular to the swath to monitor deposit (150 meter line at 5 meter intervals, horizontal and vertical cards at height of 20 cm. Vertical cards should be less than 6 mm wide. Minimise drift, VMD 80-120 um. Aircraft height should be 3-4 meters, no wind.

Ground spraying: Spray 1 hectare plots with Ulvamicon (fresh batteries). Monitor deposit with cards. The same cautions apply, as with aerial application.

Immediate Postspray: Qualitative assessment of any mortality; collect cadavers for reference at 1, 12 and 24 hours. Install sticky traps and check pitfall covers.

Sampling: Three replicates. 9 one hectare plots, each with 10 pitfall traps and 9 sticky traps located in the central part of sprayed areas to minimise any edge effects.

Sampling frequency. Sample intervals of -5, -1, 0, 1, 5, 10, 15 days post-spray. Pitfall traps emptied daily (early morning).

Data analysis. Population counts, enumerated by taxa (taxonomic level to be decided). Data will be interpreted using appropriate linear models (ANOVA, comparison of means).

Supplementary activities: Qualitative observations on other taxa, including vertebrates. Taxonomic inventory of study area. General insect collecting in adjacent matched sites, including light trapping, beating, malaise trap, for baseline faunal information. Investigate other possible methods of monitoring e.g. blacklight transects for scorpions, constant time counts of bees visiting bushes, robber fly transects, etc...

Discussion: These activities will probably require the full time participation of at least two people per site. Time required to collect the data is the constraint. I estimate at least a week to delimit areas, install traps, stakes, etc. Approximately two weeks for sampling and a week for analysis and write-up (longer if taxonomic work is needed). It should be possible to spray both chemicals in one morning (30 ha each).

The ground fauna will be sampled with the pitfall traps whilst the sticky traps will catch small flying insects. Larger flying insects are not being sampled. Neither sweep-netting nor light trapping are valid quantitative techniques and are not recommended for a study of this sort. It might be possible to identify indicator species to use as monitors: they should ideally be easily located, identifiable, regularly distributed and numerous enough to provide a valid sample. I predict that whatever sampling is done, the results will prove to be highly variable in space and time. This problem can only be solved by much more intensive sampling.

Materials List For Small-Block Trials

Maps, large blank sheets for mapping site
Marking stakes, 60 cm long, and paint
Flag poles (3m) and 1 by 2 meter white flags (20)
Compass or 90 degree prisun
Measuring tape or rope (30 meters)
Notebooks, pens, pencils
Recording forms and clipboards
Field tags, marking pens
Spray cards (3 packets)
Spray card holders, 30 cm wire (45)
Pliers and roll of wire
Stinky traps (300)
Stakes, 1 meter painted (100)
Pitfalls: 100 plastic buckets (20 cm by 18 cm 0)
 100 covers, painted plywood 30 x 30 cm
 nails for feet
Picks and shovels
Plastic bags (500)
Alcohol, ethanol 95% (2 liters)
Measuring cylinder 500 ml
Rubber gloves
Bucket
Collecting light
Insect nets
Killing bottles
Insect pins and boxes
Flashlights, batteries
Maximum-minimum thermometer
Psychrometer
Rainganges
Handheld windmeter

2 hand click counters
240 gallon ice-chests (transporting residue samples)
200 20 x 30 on plastic bags (samples)

2 20 liter water bidons
2 Ulvamicron sprayers
4 sets batteries for sprayer

First Amendment dated _____
to the Project Grant Agreement, dated May
16, 1988 ("The Agreement")

Between

the Kingdom of Morocco, acting through the
Ministry of Interior ("Morocco or Grantee"),

And

The United States of America, acting
through the Agency for International
Development ("A.I.D."),

Together referred to as the "Parties."

WHEREAS, the Parties entered into a Project
Grant Agreement dated May 16, 1988 for the
Morocco Locust Control Project ("Project"),
and

WHEREAS, the Parties entered into an
Agreement for Economic, Technical and
Related Assistance dated April 2, 1957, and
amended May 19, 1958, pursuant to which the
Project Agreement was entered into; and

WHEREAS, the Parties confirm their mutual
commitments to the Project and have
mutually agreed to substantially expand the
scope of activities under the Project and
extend the length of the Project; and

WHEREAS, the Parties have mutually agreed
that additional resources are necessary to
accomplish the expanded scope of the
Project.

NOW THEREFORE, A.I.D. hereby adds Dollars
ten million (\$10,000,000) to the Project
and the parties hereto agree that the Annex
A to the Agreement (Project Description)
and Annex B (Standard Provisions) will be
deleted and the Agreement shall be amended
to read as follows:

Premier Avenant en date du _____
à l'Accord de Don pour le Projet daté du
16 mai 1988 ("l'Accord")

Entre

Le Royaume du Maroc, agissant par
l'intermédiaire du Ministère de
l'Intérieur ("Maroc" ou "Bénéficiaire")

Et

Les Etats-Unis d'Amérique, agissant par
l'intermédiaire de l'Agence Américaine
pour le Développement International
("A.I.D."),

désignés ensemble sous le nom de
"Parties".

ATTENDU QUE les parties ont conclu le 16
mai, 1988 un Accord de Don en faveur du
Projet de Lutte Anti-Acridienne
("Projet"), et

ATTENDU QUE les Parties ont conclu le 2
avril 1957 un Accord portant sur une
assistance économique, technique et
connexe, modifié le 19 mai 1958, et en
vertu duquel intervient le présent
Accord passé entre le Maroc et l'A.I.D.;
et

ATTENDU QUE les Parties confirment leur
engagement mutuel à l'égard du Projet et
qu'elles ont mutuellement convenu
d'élargir substantiellement la portée et
les activités du projet et d'en
prolonger la durée; et

ATTENDU QUE les Parties ont mutuellement
convenu que des ressources
supplémentaires sont nécessaires pour
accomplir le projet.

L'A.I.D. ajoute dix millions de dollars
(10.000.000 \$) au projet et les Parties
conviennent par les présentes que
l'Annexe A à l'Accord (Description du
Projet) et l'Annexe B (Dispositions
Standard) sont supprimées et que
l'Accord est modifié comme suit:

ARTICLE 1. - THE AGREEMENT

The purpose of this Agreement is to set out the understandings of the Parties named above with respect to the undertaking by the Grantee of the Project described below, and with respect to the financing of the Project by the Parties.

ARTICLE 2. - THE PROJECT

Section 2.1. Definition of Project

The Project, which is further described in Annex 1, will consist of assistance to the Government of Morocco in its battle against the desert locust plague. The Project will provide technical assistance, aerial spraying, pesticides, training, and commodities and equipment in support of this purpose. Annex 1, attached, amplifies the above definition of the Project. Within the limits of the above definition of the Project, elements of the amplified description stated in Annex 1 may be changed by written agreement of the authorized representatives of the Parties named in Section 8.2., without formal amendment of this Agreement.

Section 2.2. Incremental Nature of Project

(a) A.I.D.'s contribution to the Project will be provided in increments, the initial one being made available in accordance with Section 3.1 of this Agreement. Subsequent increments will be subject to availability of funds to A.I.D. for this purpose, and to the mutual agreement of the Parties, at the time of a subsequent increment, to proceed.

(b) Within the overall Project Assistance Completion Date stated in this Agreement, A.I.D., based upon consultation with the Grantee, may specify in Project Implementation Letters appropriate time periods for the utilization of funds granted by A.I.D. under an individual increment of assistance.

ARTICLE 1. - L'ACCORD

L'objet du présent Accord est de fixer les conditions que doivent remplir les parties susmentionnées ("Parties") quant à l'exécution par le Bénéficiaire du Projet décrit ci-dessous, et quant au financement du Projet par les Parties.

ARTICLE 2. - LE PROJET

Section 2.1. Définition du Projet

Le Projet, dont une description plus détaillée figure à l'Annexe 1, consistera à contribuer à la campagne anti-acridienne menée par le Royaume du Maroc. Le projet fournira des services d'assistance technique, d'épandage aérien, des pesticides, une formation, ainsi que des produits et du matériel pour soutenir cet objectif. L'Annexe 1 ci-jointe élargit cette définition du Projet. Dans les limites de la définition ci-dessus, des éléments de la description élargie donnée à l'Annexe 1 peuvent être changés par accord écrit des représentants agréés des Parties, nommés à la Section 8.2., sans avenant officiel au présent Accord.

Section 2.2 Financement par Tranches Successives

(a) La contribution de l'A.I.D. au Projet se fera par tranches cumulatives, la première étant mise à disposition conformément à la Section 3.1 du présent Accord. Des tranches ultérieures seront sujettes à la disponibilité des fonds de l'A.I.D. à cette fin, ainsi qu'à l'accord mutuel des Parties de poursuivre le projet, au moment de chaque nouvelle tranche.

(b) Dans la période allant jusqu'à la date d'achèvement d'assistance au Projet énoncée dans le présent Accord (cf. Section 3.3 a) l'A.I.D., après consultation avec le Bénéficiaire, peut préciser dans les lettres d'exécution du Projet, les périodes appropriées pour l'utilisation des fonds accordés par l'A.I.D. au titre de chaque tranche d'assistance.

ARTICLE 3. - FINANCING

Section 3.1. The Grant

To assist the Grantee to meet the costs of carrying out the Project, A.I.D., pursuant to the Foreign Assistance Act of 1961, as amended, agrees to grant the Grantee under the terms of this Agreement not to exceed thirteen million five hundred thousand United States (U.S.) dollars (\$13,500,000) ("Grant").

The Grant may be used to finance foreign exchange costs, as defined in Section 6.1., and local currency costs, as defined in Section 6.2., of goods and services required for the Project.

Section 3.2. Grantee Resources for the Project

(a) The Grantee agrees to provide or cause to be provided for the Project all funds, in addition to the Grant, and all other resources required to carry out the Project effectively and in a timely manner.

(b) The resources provided by the Grantee for the Project will be not less than the equivalent of one hundred and seventy six million six hundred thousand United States (U.S.) dollars (\$176,600,000), including costs borne on an in-kind basis.

Section 3.3. Project Assistance Completion Date

(a) The "Project Assistance Completion Date" (PACD) is June 30, 1991, or such other date as the Parties may agree to in writing. This is the date by which the Parties estimate that all services financed under the Grant will have been performed and all goods financed under the Grant will have been furnished for the Project as contemplated in this Agreement.

ARTICLE 3. - FINANCEMENT

Section 3.1. Le Don

Pour aider le Bénéficiaire à financer les coûts de l'exécution du Projet, l'A.I.D., conformément à la loi de 1961 sur l'aide étrangère, telle qu'elle a été amendée, convient d'accorder au Bénéficiaire, aux termes du présent Accord, un don d'un montant qui ne dépassera pas Treize Millions Cinq Cent Mille Dollars (13.500.000 \$ U.S.) ("le Don")

Le Don peut être utilisé pour financer les coûts en devises, comme définis à la Section 6.1., et en monnaie locale (DH), comme définis à la Section 6.2., des biens et des services nécessaires à l'exécution du Projet.

Section 3.2. Ressources du Bénéficiaire pour l'Exécution du Projet

(a) Le Bénéficiaire convient de fournir, ou de faire fournir, pour l'exécution du Projet tous les fonds, outre le Don, et toutes les autres ressources requises pour exécuter efficacement et en temps voulu le projet.

(b) Les ressources fournies par le Bénéficiaire pour le Projet ne seront pas inférieures à l'équivalent de Cent Soixante Seize Million Six Cent Mille Dollars des Etats-Unis (176.600.000\$ US), y compris les coûts en nature.

Section 3.3. Date d'Achèvement d'Assistance au Projet

(a) La "Date d'Achèvement de l'Assistance au Projet" (DAAP), à savoir le 30 Juin 1991, ou toute autre date dont les Parties peuvent convenir par écrit, est la date à laquelle les Parties estiment que tous les services financés au titre du Don auront été exécutés et que tous les biens financés au titre du Don auront été fournis pour l'exécution du Projet comme le prévoit le présent Accord.

(b) Except as A.I.D. may otherwise agree in writing, A.I.D. will not issue or approve documentation which would authorize disbursement of the Grant for services performed subsequent to the PACD or for goods furnished for the Project, as contemplated in this Agreement, subsequent to the PACD.

(c) Requests for disbursement, accompanied by necessary supporting documentation prescribed in Project Implementation Letters, are to be received by A.I.D. or any bank described in Section 7.1. no later than nine (9) months following the PACD, or such other period as A.I.D. agrees to in writing. After such period, A.I.D., giving notice in writing to the Grantee, may at any time or times reduce the amount of the Grant by all or any part thereof for which requests for disbursement, accompanied by necessary supporting documentation prescribed in Project Implementation Letters, were not received before the expiration of said period.

ARTICLE 4. - CONDITIONS PRECEDENT TO DISBURSEMENT

Section 4.1. First Disbursement

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

(a) A statement of the name of the person holding or acting in the office of the Grantee specified in Section 8.2., and of any additional representatives, together with a specimen signature of each person specified in such statement.

Section 4.2. Notification

(b) A moins que l'A.I.D. n'en convienne autrement par écrit, elle n'émettra, ni n'approuvera les documents autorisant le déboursement du Don pour la prestation de services exécutés après la DAAP ou pour des biens fournis aux fins du Projet comme le prévoit le présent Accord, après la DAAP.

(c) Les demandes de déboursement, accompagnées des pièces justificatives nécessaires comme indiqué dans les Lettres d'Exécution du Projet, doivent parvenir à l'A.I.D., ou aux banques figurant à la section 7.1., au plus tard neuf (9) mois après la DAAP ou tout autre délai dont l'A.I.D. convient par écrit. Après cette période, l'A.I.D., après notification écrite au Bénéficiaire, peut, à tout moment, réduire le montant du Don en tout ou en partie du montant pour lequel les demandes de déboursement accompagnées des pièces justificatives nécessaires indiquées dans les Lettres d'Exécution du Projet, n'ont pas été reçues avant l'expiration de ladite période.

ARTICLE 4. - CONDITIONS PREALABLES AU DEBOURSEMENT

Section 4.1. Premier Déboursement

Avant le premier déboursement effectué au titre du Don ou avant l'émission par l'A.I.D. des documents en vertu desquels le déboursement sera fait, le Bénéficiaire, à moins que les Parties n'en décident autrement par écrit, fournira à l'A.I.D. sous une forme et dans un fond établis à la satisfaction de cette dernière:

(a) Une communication citant le nom de la personne occupant le poste du Bénéficiaire, ou agissant en tant que tel, comme spécifié à la Section 8.2., et le nom de tous représentants additionnels, avec la signature spécimen de ou des personnes dont le nom figure dans ladite communication.

Section 4.2. Notification

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When A.I.D. has determined that the conditions precedent specified in Section 4.1. have been met, it will promptly notify the Grantee.

Section 4.3. Terminal Dates for Conditions Precedent

If all of the conditions specified in Section 4.1. have not been met within 90 days from the date of this Agreement, or such later date as A.I.D. may agree to in writing, A.I.D., at its option, may terminate this Agreement by written notice to the Grantee.

ARTICLE 5. - SPECIAL COVENANTS

Section 5.1. Pesticides

The Grantee agrees to utilize only U.S. registered and approved pesticides in U.S.-financed aircraft and equipment and to follow recommended procedures in spray operations for each pesticide.

Section 5.2. Pesticide Drum Disposal

The Grantee agrees to destroy, or otherwise render useless, empty containers of A.I.D.-financed pesticides.

Section 5.3. Geographical Limits of Aerial Spraying Operations

The Grantee will ensure that all U.S.-financed aircraft treat only within geographic areas deemed secure, as defined jointly by Grantee and USAID.

Section 5.4 Navigational Maps and Briefings

The Grantee will provide adequate navigational maps to all AID-financed pilots and brief pilots, at least once per

Lorsque l'A.I.D. aura établi que les conditions préalables mentionnées à la Section 4.1. ont été remplies, elle le notifiera rapidement au Bénéficiaire.

Section 4.3. Date Limite d'Accomplissement des Conditions Préalables

Si toutes les conditions préalables mentionnées à la Section 4.1. n'ont pas été remplies dans les 90 jours qui suivent la date de signature du présent Accord ou à une date ultérieure dont l'A.I.D. peut convenir par écrit, l'A.I.D. aura la faculté de mettre fin au présent Accord par un avis écrit envoyé au Bénéficiaire.

ARTICLE 5. - CLAUSES SPECIALES

Section 5.1. Pesticides

Le Bénéficiaire convient de n'employer, avec les avions et l'équipement financés par les Etats-Unis, que des pesticides homologués et autorisés aux Etats-Unis, et de suivre les procédures recommandées dans les opérations d'épandage pour chaque pesticide.

Section 5.2 Destruction des Bidons de Pesticide

Le Bénéficiaire convient de détruire, ou de rendre inutilisables, les récipients vides ayant contenu des pesticides financés par l'AID.

Section 5.3 Limites Géographiques des Opérations d'Épandage

Le Bénéficiaire veillera à ce que tous les appareils financés par les Etats-Unis ne traitent que des régions jugées sûres, suivant la définition conjointe du Bénéficiaire et de l'USAID.

Section 5.4 Cartes de Navigation et Briefings

Le Bénéficiaire fournira des cartes de navigation appropriées à tous les pilotes financés par l'USAID et les

week, on the security of flying conditions in areas proposed for treatment.

Section 5.5 Redeployment of Aircraft

The Grantee will obtain the agreement of the USAID/Morocco Director, in writing, prior to redeploying AID-financed aircraft from Agadir (in the case of the DC-7 aircraft) or Guelmim (in the case of the Turbo-Thrush aircraft)

Section 5.6. Project Evaluation

The Parties agree to establish an evaluation program as part of the Project. Except as the Parties otherwise agree in writing, the program will include, during the implementation of the Project and at one or more points thereafter:

(a) Evaluation of progress toward attainment of the objectives of the Project;

(b) Identification and evaluation of problem areas of constraints which may inhibit such attainment;

(c) Assessment of how such information may be used to help overcome such problems; and

(d) Evaluation, to the degree feasible, of the overall development impact of the Project.

ARTICLE 6. - PROCUREMENT SOURCE

Section 6.1. Foreign Exchange Costs

Disbursements pursuant to Section 7.1. will be used exclusively to finance the costs of goods and services required for the Project having, with respect to goods, their source and origin, and with respect to services their nationality in the United States (Code 000 of the AID Geographic Code Book as in effect at the time orders are placed or contracts entered into for such

mettra au courant au moins une fois par semaine des conditions de sécurité de vol dans les zones qu'il est prévu de traiter.

Section 5.5 Redéploiement des Appareils

Le Bénéficiaire obtiendra du Directeur de l'USAID/Maroc son accord écrit pour le redéploiement des appareils financés par l'AID à partir d'Agadir (dans le cas du DC-7) ou de Guelmim (dans le cas du Turbo-Thrush).

Section 5.6 Evaluation du projet

Les Parties conviennent d'établir un programme d'évaluation dans le cadre du Projet. Sauf si les Parties en décident autrement par écrit, ce programme comprendra pendant l'exécution du projet et à un ou plusieurs stades par la suite:

(a) Une évaluation pour déterminer dans quelle mesure les objectifs du projet auront été atteints;

(b) L'identification et l'évaluation des problèmes ou des contraintes qui peuvent entraver la réalisation des objectifs fixés;

(c) L'évaluation de la manière dont ces observations peuvent être utilisées pour contribuer à surmonter ces problèmes; et

(d) L'évaluation, dans la mesure du possible, de l'incidence globale du Projet sur le développement.

ARTICLE 6. - SOURCE D'ACHAT

Section 6.1. Coûts en Devises

Les déboursements effectués au titre de la Section 7.1. seront uniquement utilisés pour financer les coûts des biens et services requis pour l'exécution du Projet et ayant, en ce qui concerne les biens, leur source et origine, et en ce qui concerne les services, leur nationalité, aux États-Unis (Code 000 du Code

goods or services)("Foreign Exchange Costs"), except as A.I.D. may otherwise agree in writing, and except as provided in the Project Grant Standard Provisions Annex, Section C. 1 (b) with respect to marine insurance. Ocean transportation costs will be financed under the Grant only on vessels under flag registry of the United States, except as A.I.D. may otherwise agree in writing.

Section 6.2. Local Currency Costs

Disbursements pursuant to Section 7.2. will be used exclusively to finance the costs of goods and services required for the Project having their source and, except as A.I.D. may otherwise agree in writing, their origin or nationality in Morocco ("Local Currency Costs"). To the extent provided for under this Agreement, "Local Currency Costs" may also include the provision of local currency resources required for the Project.

ARTICLE 7. - DISBURSEMENT

Section 7.1. Disbursements for Foreign Exchange Costs:

(a) After satisfaction of Conditions Precedent, the Grantee may obtain disbursements of funds under the Grant for the Foreign Exchange Costs of goods or services required for the Project in accordance with the terms of this Agreement by such of the following methods as may be mutually agreed upon:

(1) by submitting to A.I.D. with necessary supporting documentation as prescribed in Project Implementation Letters, (A) requests for reimbursement for such goods or services, or (B) requests for A.I.D. to procure commodities or services

Géographique de l'A.I.D. tel qu'il est en vigueur à l'époque où les commandes sont placées et les marchés passés pour ces biens et services.) ("Coûts en Devises"), à moins que l'A.I.D. n'en convienne autrement par écrit et en ce qui concerne l'assurance maritime sous réserve des dispositions prévues à la Section C.1 (b) de l'Annexe II sur les Dispositions Standard de l'Accord. Les coûts du transport maritime ne seront financés dans le cadre du Don que sur des navires battant pavillon des Etats-Unis sauf accord écrit de l'A.I.D.

Section 6.2. Coûts en Monnaie Locale

Les déboursements effectués aux termes de la Section 7.2. seront uniquement utilisés pour financer les coûts des biens et services nécessaires à l'exécution du Projet et ayant leur source et, à moins que l'A.I.D. n'en convienne autrement par écrit, leur origine et nationalité au Maroc ("Coûts en Monnaie Locale"). Dans la mesure où le prévoit le présent Accord, les "Coûts en Monnaie Locale" pourront aussi inclure la fourniture des ressources en monnaie locale nécessaires pour le Projet.

ARTICLE 7. - DEBOURSEMENTS

Section 7.1. Déboursements Destinés au Financement des Coûts en Devises:

(a) Une fois que les conditions préalables auront été remplies, le Bénéficiaire pourra obtenir des déboursements de fonds au titre du Don pour le financement des coûts en devises des biens et services nécessaires à l'exécution du Projet et ce, conformément aux termes du présent Accord, en appliquant, après accord mutuel, l'une des méthodes suivantes:

(1) en soumettant à l'A.I.D. accompagnées des pièces justificatives nécessaires comme le stipulent les Lettres d'Exécution du Projet (a) les demandes de remboursement de ces biens et services ou (b) les demandes pour que

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on the Grantee's behalf for the Project; or

(2) by requesting A.I.D. to issue Letters of Commitment for specified amounts (A) to one or more U.S. banks, satisfactory to A.I.D., committing A.I.D. to reimburse such bank or banks for payments made by them to contractors or suppliers, under Letter of Credit or otherwise, for such goods or services, or (B) directly to one or more contractors or suppliers, committing A.I.D. to pay such contractors or suppliers for such goods or services.

(b) Banking charges incurred by the Grantee in connection with Letters of Commitment and Letters of Credit will be financed under the Grant unless the Grantee instructs A.I.D. to the contrary. Such other charges as the Parties may agree to may also be financed under the Grant.

Section 7.2. Disbursement for Local Currency Costs:

(a) After satisfaction of Conditions Precedent, the Grantee may obtain disbursements of funds under the Grant for Local Currency Costs required for the Project in accordance with the terms of this Agreement, by submitting to A.I.D., with necessary supporting documentation as prescribed in Project Implementation Letters, requests to finance such costs.

(b) The local currency needed for such disbursements may be obtained by acquisition by A.I.D. with U.S. Dollars by purchase (or from local currency already owned by the U.S. Government). The U.S. dollar equivalent of the local currency made available hereunder will be the amount of U.S. dollars required by A.I.D. to obtain the local currency.

l'A.I.D. achète au nom du Bénéficiaire les biens ou les services destinés au Projet; ou

(2) en demandant à l'A.I.D. d'émettre des Lettres d'Engagement pour des montants définis (a) en faveur d'une ou de plusieurs banques américaines, agréées par l'A.I.D., engageant cette dernière à rembourser ladite ou lesdites banques des paiements qu'elles auront effectués aux contractants et aux fournisseurs, au titre de lettres de crédit ou autrement pour lesdits biens ou services, ou (b) directement à un ou plusieurs contractants ou fournisseurs engageant l'A.I.D. à payer aux dits contractants et fournisseurs lesdits biens ou services.

(b) Les frais bancaires encourus par le Bénéficiaire quant aux Lettres d'Engagement et de Crédit, seront financés au titre du Don à moins que le Bénéficiaire n'avise l'A.I.D. du contraire. Les autres frais dont les Parties peuvent convenir peuvent également être financés dans le cadre du Don.

Section 7.2. Déboursement pour le Financement des Coûts en Monnaie Locale:

(a) Une fois que les conditions préalables auront été remplies, le Bénéficiaire pourra obtenir les déboursements de crédits au titre du Don pour le financement en monnaie locale des coûts nécessaires à l'exécution du projet, conformément aux termes du présent Accord, en soumettant à l'A.I.D. accompagnées des pièces justificatives requises, comme le stipulent les Lettres d'Exécution du Projet, les demandes de financement de ces coûts.

(b) Les sommes requises en monnaie locale pour ces déboursements pourront être obtenues par acquisition par l'A.I.D. qui se les procurera avec des dollars E.U. (ou de la monnaie locale que possède déjà le Gouvernement des Etats-Unis). L'équivalent en dollars de la monnaie locale rendue disponible au titre du Don sera le montant en dollars

requis par l'A.I.D. pour obtenir la monnaie locale.

Section 7.3. Other Forms of Disbursement

Disbursements of the Grant may also be made through such other means as the Parties may agree to in writing.

Section 7.4. Rate of Exchange

Except as may be more specifically provided under Section 7.2, if funds provided under the Grant are introduced into the Kingdom of Morocco by A.I.D. or any public or private agency for purposes of carrying out obligations of A.I.D. hereunder, the Grantee will make such arrangements as may be necessary so that such funds may be converted into currency of Kingdom of Morocco at the highest rate of exchange which, at the time the conversion is made, is not unlawful in Kingdom of Morocco.

ARTICLE 8. - MISCELLANEOUS

Section 8.1. Communications

Any notice, request, document, or other communication submitted by either Party to the other under this Agreement will be in writing or by telegram or cable, and will be deemed duly given or sent when delivered to such party at the following address:

To the Grantee:

Ministry of Interior
Rabat, Morocco

Alternate address for cables:

31065

To A.I.D.:

Director
Agency for International
Development
137, Av. Allal Ben Abdellah
B.P. 120 - Rabat

Section 7.3. Autres Formes de Déboursement

Les déboursement peuvent également s'effectuer par d'autres moyens dont les Parties peuvent convenir par écrit.

Section 7.4. Taux de Change

Sauf indication spécifique prévue à la Section 7.2., si les fonds fournis dans le cadre du Don sont introduits au Maroc par l'A.I.D. ou par un organisme public ou privé pour satisfaire aux obligations de l'A.I.D. au titre du présent Accord, le Bénéficiaire prendra les mesures nécessaires pour s'assurer que ces fonds peuvent être convertis en devises marocaines au taux de change le plus élevé qui, à l'époque de la conversion, ne soit pas illégal au Maroc.

ARTICLE 8. - DIVERS

Section 8.1. Communications

Tous avis, demandes, documents ou autres communications envoyés par l'une des Parties à l'autre au titre du présent Accord, seront présentés par écrit, télégramme ou cable et seront considérés comme remis ou envoyés lorsqu'ils parviendront à la Partie intéressée aux adresses ci-après:

Au Bénéficiaire:

Ministère de l'Intérieur
Rabat

Adresse télégraphique:

31065

A l'AID

Directeur
Agence Américaine pour le
Développement International
137, Avenue Allal Ben Abdallah
B.P. 120 - Rabat

Alternate address for cables:

AMEMBASSY RABAT - 31005M

All such communications will be in English or French. Other addresses may be substituted for the above upon the giving of notice.

Section 8.2. Representatives

For all purposes relevant to the Agreement, the Grantee will be represented by the individual holding or acting in the office of the Minister of Interior and A.I.D. will be represented by the individual holding or acting in the office of Director, USAID Morocco, each of whom, by written notice, may designate additional representatives for all purposes other than exercising the power under Section 2.1. to revise elements of the amplified description in Annex 1.

The names of the representatives of the Grantee, with specimen signatures, will be provided to A.I.D., which may accept as duly authorized any instrument signed by such representatives in implementation of this Agreement, until receipt of written notice of revocation of their authority.

Section 8.3. Standard Provisions Annex

A "Project Grant Standard Provisions Annex" (Annex 2) is attached to and forms part of this Agreement.

Section 8.4. Language of Agreement

This Agreement is prepared in both English and French. In the event of ambiguity or conflict between the two versions, the English language version will control.

IN WITNESS WHEREOF, The Kingdom of Morocco and the United States of America, each acting through its duly authorized

Adresse télégraphique:

AMEMBASSY RABAT - 31005M

Toute communication sera en anglais ou en français. D'autres adresses pourront remplacer celles indiquées ci-dessus sur avis de l'intéressé.

Section 8.2. Représentants

Aux fins du présent Accord, le Bénéficiaire sera représenté par la personne occupant le poste de Ministre de l'Intérieur, ou agissant en tant que tel, et l'A.I.D. sera représentée par la personne occupant le poste de Directeur de la Mission U.S.A.I.D. au Maroc, ou agissant en tant que tel. Par écrit, chaque partie peut désigner d'autres représentants à toutes fins autres que celles d'exercer le pouvoir au titre de la Section 2.1. pour réviser les éléments de la description élargie à l'Annexe 1.

Les noms des représentants du Bénéficiaire, accompagnés de leurs signatures spécimens, seront communiqués à l'A.I.D. qui acceptera comme dûment agréé, tout document signé par ces représentants, à moins qu'un avis écrit de révocation de leur autorité ne lui soit parvenu.

Section 8.3. Annexe Relative aux Dispositions Standard

Une annexe relative aux "Dispositions Standard du Projet" (Annexe 2) figure ci-joint au présent Accord et en fait partie.

Section 8.4. Langue de l'Accord

Le présent Accord est préparé en anglais et en français. En cas d'ambiguïté ou de conflit entre les deux versions, la version anglaise seule fera foi.

EN FOI DE QUOI, le Royaume du Maroc et les Etats-Unis d'Amérique, chacun agissant par l'intermédiaire de son

representative, have caused this Agreement to be signed in their names and delivered as of the day and year first above written.

représentant dûment agréé, ont fait signer le présent Accord en leur nom et l'ont fait remettre à la date sus-mentionnée.

UNITED STATES OF AMERICA

LE ROYAUME DU MAROC

By: John H. Hawes

Par: _____

Title: Chargé d'Affaires a.i.
Embassy of the United
States of America

Titre: _____

By: Charles W. Johnson

Par: _____

Title: Director, U.S. Agency for
International Development
in Morocco

Titre: _____

ANNEX A: Amplified PROJECT DESCRIPTION
Morocco Locust Control
(608-0196)

ARTICLE I: General Project Description

A. Project Summary

The goal of the project is to protect Moroccan crops and livestock from the locust plague. The purpose is to assist the Government of Morocco, in coordination with other donors, to control desert locusts. The Project began providing assistance in May 1988 and will continue until June 1991.

The Project will assist the Government of Morocco in its battle against locust invasions and endemic population build-ups as they occur. It is extremely difficult to predict the magnitude of locust invasions more than a few months in advance. Therefore, the project will utilize a flexible design based on periodic assessments of the locust problem to specify assistance requirements for each control campaign. The assessments will be conducted jointly by USAID and GOM and will serve to refine the assistance package to fit emerging needs.

Campaign periods are defined as successive October - June periods. Assessments will be conducted during the summer months between control campaigns, June through September, and during the lull in campaign activities which usually occurs between late December and early March. The summer operational down-time will also be used to provide technical assistance and training in areas which can be addressed outside the conduct of actual control operations.

The project will:

1. Enhance Grantee capacity to control desert locusts through aerial spraying of insecticides
2. Improve strategic planning and tactics of control operations, including preparation for appropriate responses north of the Atlas mountains if necessary;
3. Improve efficiency of control operations including ground surveillance, ground to air communication, and treatment strategies; and
4. Improve GOM capacity for the management and monitoring of environmental safety and health aspects of control operations.

B. Institutional Framework

USAID will work within the institutional framework developed by the GOM to implement locust control operations. The framework is as follows: The Ministry of Interior (MOI) is responsible for coordinating the campaign. The MOI works closely with the Royal Gendarmerie, which provides logistics and communications support. It also works 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. The MOI relies on National Defense's military branches (Royal Air Force and Army) for access to air bases and use of observation posts. The Grantee has set up command posts (PCs) for the region, with a central command post in Rabat (PCC).

Currently operating are the nine PCs of Ait Melloul, Zagora, Errachidia, Bouafra, Oujda, Guelmin, Tata, Laayoune and Dakhla. These PCs are backed up by PCs in Missour, Khenifra and Marrakech, Safi and Essaouira. The PCC in Rabat maintains the central information system for locust operations.

C. Project Activities

1. It is anticipated that the project will provide aerial spraying services and insecticides to augment GOM treatment capacity for each campaign. USAID-leased aircraft, pesticide stocks and related activities will continue to be concentrated in Guelmim (single engine aircraft) and Agadir (four engine aircraft). The aircraft and other materials can be moved quickly to other PC's such as Ouarzazate, Tata or Errachidia, or to critical crop zones north of the Atlas mountains if the intensity of locust infestation in these areas should so warrant. Decisions as to where USAID-financed aircraft will be based and deployed will be made by the Central Command Post, Rabat, with the written approval of USAID.

2. For each campaign the project will provide technical assistance and selected commodities at the regional PC level to improve the strategic and tactical planning of treatment operations. Technical assistance will include evaluation of the effectiveness of aerial treatment and insecticide. "Greenness" satellite imagery maps will be provided and jointly evaluated by USAID and the GOM in order to more accurately predict the magnitude of infestations in northwestern Mauritania and the Western and Southern Sahara and to refine the aerial spray strategy. Pilot and mechanic training for Turbo-Thrush aircraft will also be provided.

3. The project will provide technical assistance, training and selected commodities to improve pesticide handling, communication capacity, and prospection and survey methods. Selected studies for determining the efficacy of alternative pesticides, and calibration of aircraft spray systems will be undertaken.

4. The project will assist the GOM to organize environmental, health and safety considerations into an effective institutional framework so that they can be dealt with systematically and successfully on a long-term basis. This will be accomplished by the formation of an Environmental and Health Safety Unit within the Moroccan campaign organization to oversee the design and implementation of all ongoing program environmental, health and safety activities. This Unit will be assisted by a USAID-financed Environmental and Health and Safety advisor(s) and consultants in specific technical areas. The project will also assist this unit through the provision of research, training and commodity support required to ensure that these critical aspects of campaign operations are properly addressed and successfully carried out.

5. Specific Nature of Activities for Completing the Current Campaign through June 1989

- a. Project activities for the FY 1989 campaign through June 1989 have been identified as follows: As quickly as possible after the execution of this amendment, two Turbo Thrush aircraft will be provided from January through June 1989, two large aircraft (DC-7s) will be leased for March through June 1989. They will be based in

Agadir (large aircraft) and in Guelmim (small aircraft). As swarms are expected to increase dramatically in March-June 1989, following egg laying and hatching in northwestern Mauritania, and in other regions outside Morocco, there may be a need to lease two additional large aircraft and/or two turbo thrushes from March 15, 1989 through June 30, 1989. 400,000 liters of pesticide will also be procured for prepositioning by March 1989.

- b. Critical support commodities such as radios, greenness maps, pesticide transfer equipment and any other logistical items will be procured as quickly as possible in order to augment overall operational efficiency prior to March 1989.
- c. The improved environmental program will be organized by March 1989. Associated environmental, health and safety commodities such as cholinesterase kits, protective clothing and fire equipment will be procured as quickly as possible.
- d. Selected short term technical assistance and training for pesticide handling, pesticide efficacy testing, calibration testing, survey team training and other planned activities will be scheduled between February and September 1989.

6. Projected Activities for Subsequent Campaigns (October 1989 - June 1990 and October 1990 - June 1991)

- a. Specific activities to be funded by AID for the 1990 and 1991 campaigns have not been fully determined. Prior to each campaign, an assessment will be undertaken by the GOM and USAID to determine the specific nature and level of assistance needed.

- b. Activities will generally be of the same type as described in section 5 above.

D. Technical Guidelines

Given the technical nature of this project and the safety and environmental concerns associated with locust control, it is important that the following procedures and guidelines be followed.

1. Operational Guidelines for U.S. Aircraft

The Grantee will apply the following procedures for use of USAID supplied aircraft.

- a. Aircraft and pilots will be given leave one day per week for purposes of maintenance of aircraft and pilot recuperation.
- b. Standard safety precautions for flying according to U.S. regulations will be adhered to. Pilots make the final decision regarding whether or not safe conditions exist.
- c. Aircraft will treat adult swarms while they are resting on the ground surface (normally between the hours of 0600 and 1000).
- d. Aircraft will treat hopper bands by either direct contact spraying or by barrier spraying as long as low temperatures and light winds permit and safety conditions are maintained.
- e. Briefings as to the exact location for treatment will be given to pilots and the logistical specialist each morning before sorties take place.

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- f. The Grantee will provide ground crews to load fuel and pesticides into aircraft prior to 0600 of each operational day.
- g. Pilots will be provided aerial maps (1:50,000) of areas to be treated.
- h. Ground marking teams will identify target areas for pilots with easily identifiable signals and will maintain contact with pilots by VHF radios.

2. Security Guidelines for US Aircraft

- a. Unless the parties agree otherwise in writing, operation of US-financed aircraft will take place only within the following geographic limits:
 - 1) Saharan Provinces -- as far south as the 16th parallel, and no more than 100 miles east of the atlantic coast.
 - 2) The province of Tan Tan.
 - 3) Then starting from 27 Degree draw a line northeasterly to 27 degrees 55' n 9 degrees 59' w; then to 28 degrees 30' n 9 degrees 27' w; then to 29 degrees 15' n 8 degrees 09' w; then to 29 degrees 55 n 7 degrees 19 w; then to 30 degrees 04' n 6 degrees 51' w, then to 30 degrees n 5 degrees 31' w. The coordinates mark the southern limit for the USAID-financed aircraft.
 - 4) The eastern limit of USAID-financed aircraft operation will be mutually agreed upon prior March 1, 1989.
- b. The Grantee will provide pilots with detailed tactical aircraft charts of a 1:500,000 scale including the security limits agreed to by both parties.

- c. The Grantee will provide to pilots involved in USAID funded operations a weekly briefing concerning physical security in regions proposed for treatment.

3. Use of Large Fixed-Wing Aircraft

To the greatest extent possible, DC-7 aircraft control operations should be undertaken with pre- and post-application environmental monitoring of the general target area. A representative sample of such flights will be monitored in this fashion over each cycle of operations (i.e., different climatic, topographical, biological, and regional situations with different insecticides).

4. Approved Pesticides

The Grantee will utilize only ~~U.S.~~ *pesticides approved in the PEA* registered and EPA (Environmental Protection Agency) ~~approved pesticides~~ for USAID-financed aircraft and the spray systems of the Moroccan Bell 205 helicopters. Approved pesticides by group are:

Organophosphates

Malathion
Fenitrothion
Chlorpyrifos
Diazinon

Carbamates

Carbaryl
Bendiocarb

Pyrethroids

Lambda-cyhalothrin
Tralomethrin
Decis

Agency

pesticides approved in the PEA

5. Pesticide Application in Ecologically Sensitive Areas

The Grantee will apply the following guidelines for locust control operations in ecologically sensitive areas (as indicated in the May 1988 Project Paper Environmental Assessment):

- a. Aerial application of pesticides will not occur in legally protected areas. If adults or hopper bands are present in the protected area, treatment will be deferred until they move out of the area. If compelling circumstances make treatment of hopper bands or adults within the protected area an absolute necessity, this should be done by means of selective spraying with malathion and using ground equipment only.
- b. Other ecologically sensitive areas not under legal protection will be accorded the same treatment as the protected areas to the extent possible.

B. Her 2014 S

6. Disposal of Pesticide Drums

AID policy requires that all empty pesticide drums and containers resulting from provision and use of AID-funded locust control pesticide be destroyed or otherwise rendered useless, followed by disposal in an appropriate environmentally sound manner. Pesticide drums funded by USAID will not be recycled for storage of other pesticides.

The Grantee will report to USAID on a monthly basis, detailing the status of the USG drums under its control by individual location, indicating at a minimum: 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.

7. Environmental Monitoring

Environmental monitoring and review findings, undertaken by the project, will be fully discussed between the parties. Additional procedures to protect the environment may result from these findings and be mutually agreed upon.

ARTICLE II: Contributions of the parties

In order to achieve the purpose and objectives of the Project, as described in Articles I. and II., the parties will provide inputs to the Project as described below:

A. A.I.D (\$23,500,000)

To date \$3,500,000 have been expended under the project. This section describes broadly USAID's anticipated inputs and financing to the Project through June 1991. The project will be funded incrementally based on periodic assessments of needs as described in Article I, the availability of funds to AID, and the willingness of the parties to proceed.

As of the time of Project Agreement Amendment Number One, AID has made available \$13,500,000 to the Project. Funding in excess of this amount is not to be assumed. In the event that conditions of the locust plague change so as to make future AID funding for project activities unnecessary (i.e. the plague is broken during the 1989 or 1990 campaign) no further funding will be made available for the Project.

Estimated funding for each broad category of inputs is provided in Article V, Illustrative Financial Plan. Inputs include:

- 1) Rental of Aircraft
- 2) Insecticides
- 3) Support Commodities
- 4) Training and Technical Assistance
- 5) Anticipated Future Funding Requirements

B. Grantee

The Grantee's estimated contribution to the current campaign through December 1988 is \$ 26.6 million. The GOM contribution from January through December 1989 is projected to be \$50.0 million.

It is anticipated that the GOM will contribute approximately the same level of funding for 1990 and 1991 assuming the locust plague is of a similar nature.

Grantee financial inputs to the Morocco Locust Control Project:

- 1. Fuel and motor oil for use in the USAID provided aircraft;
- 2. Tarmac parking, including compressed air, electricity, and water as available for the aircraft;
- 3. All legal authorizations, permits (including import and export and crew work permits), licences, local taxes, and customs duties, fees and clearances for the aircraft as required by the Grantee where spray applications are to take place or where overflight is required during aircraft relocation;
- 4. Dilutants and pesticides otherwise not provided by the project;

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5. Vehicles, equipment and ground support personnel for transporting, loading, and unloading all pesticides, fuel, equipment, and cargo in support of the spray operations;

6. Payment of any fees, taxes, or labor charges associated with loading or unloading of pesticides and other commodities at the port of entry; and

7. Security for USAID-financed equipment.

8. Staff support and locally available commodities and equipment to properly implement environmental, health and safety program requirements.

ARTICLE III: Implementation

A. Implementation Plan

Three locust control campaigns are assumed through June 1991: the current campaign through June 1989; the second from October 1989 through June 1990; and the third from October 1990 through June 1991.

For the current campaign the following inputs are planned: The short-term rental of two Turbo Thrush aircraft and two DC-7 aircraft; 400,000 liters of insecticides; health and safety support commodities; environment and logistic support commodities; and training and technical assistance.

The nature of technical assistance will be defined jointly by USAID and GOM. USAID will prepare Scopes of Work for the appropriate technical advisors no later than February 1989.

For the second and third campaigns the project will provide essentially the same inputs. However, the exact nature of inputs for the second and third campaigns will be determined in consultation with the GOM following periodic campaign assessments described in Article I, above.

B. Procurement

AID will procure aircraft services; insecticides; health and safety and environmental and logistics support commodities; and technical assistance and training funded by AID.

C. Donor Coordination

The GOM will endeavor to hold weekly meetings at the P.C.C. in Rabat, during active campaign periods, to review the previous seven day treatment area, modifications to treatment strategy, and estimation of area to be treated for the next seven days. Donors exchange information regarding currently financed Locust control efforts as well as pledges for continued support.

ARTICLE IV: Monitoring and Evaluation

A. Monitoring

It is impossible to predict accurately the behavior of desert locusts. Thus, this project has been designed in a way that allows for modifications as information about future invasions becomes available. Hence, monitoring and assessment become essential functions. The first critical review took place in September 1988. The second is scheduled for late summer 1989, when information about the locust population build-up in other African countries should be available. At that point, USAID together with the GOM can determine with more accuracy whether the campaign package proposed is appropriate. The effectiveness of treatment operations will also be jointly reviewed based on accumulated information provided by the AID-financed technical advisor and GOM data. USAID, with technical assistance, will prepare a campaign assessment report stating key conclusions and, if necessary, making recommendations for adjustment of future campaign activities.

Similar campaign assessments will be conducted during the same time of the year before each of the subsequent campaigns. More informal reviews of campaign activities will occur during the lull in campaign activities between late December and early March.

Monitoring of project activities will be conducted on a weekly basis by the USAID Project Officer. The PSC Project Coordinator will be responsible for briefing the Mission on progress being made in campaigns and for writing monthly progress reports.

B. Evaluation

Following the last campaign financed under this Grant, an end of project evaluation will be conducted to determine the impact of project activities in preventing a locust disaster and to derive lessons learned that can be useful to AID and the GOM in the design of future locust control efforts.

ARTICLE V: Illustrative Financial Plan

An Illustrative Financial Plan sets forth the planned contributions of the Parties. Changes may be made to the Plan by written agreement of the representatives of the Ministry of Interior and A.I.D. identified in Section 8.2 without formal amendment of the Agreement, provided that such changes do not cause A.I.D.'s Grant contribution to exceed the amount set forth under Section 3. or the GOMs contribution to be less than the amount set forth under Section 3.2 of the Agreement. The Ministry of Finance will be informed of changes.

PROJECT FINANCIAL PLAN
 USAID/MOROCCO
 LOCUST CONTROL PROGRAM (608-0196)

SOURCE & APPLICATION OF FUNDING

PROJECT INPUTS	AMOUNT PREVIOUS FISCAL YEAR	AMOUNT THIS AMENDMENT	CUMULATIVE OBLIGATIONS (AS OF 1/1/89)	ANTICIPATED OBLIGATIONS	TOTAL LOP
			AID	AID	AID
1 AIRCRAFT	593,450	6,520,000	7,113,450	0	7,113,450
2 INSECTICIDE	1,448,932	2,033,000	3,481,932	3,067,000	6,548,932
3 MISCELLANEOUS COMMODITIES	177,500	797,000	974,500	400,000	1,374,500
4 CONTINGENCY	890,118	0	890,118	0	890,118
5 SPRAY SYSTEMS	312,500	0	312,500	0	312,500
6 TRAINING & TECHNICAL ASSISTANCE	77,500	650,000	727,500	750,000	1,477,500
7 AUDIT	0	0	0	100,000	100,000
8 FUTURE FUNDING REQUIREMENTS	0	0	0	5,583,000	5,583,000
TOTAL	3,500,000	10,000,000	13,500,000	10,000,000	23,500,000