SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

PAKISTAN LOCUST CONTROL PROGRAMS

United States Agency for International Development
Mission to Pakistan, Islamabad

August, 1993

UNITED STATES GOVERNMENT

memorandum

DATE: February 28, 1994

REPLY TO ATTN OF: Chaudhary Laiq Ali, Mission Environmental Engineer, USAID/Pakistan

Thru: John B. Swanson, Mission Environmental Officer, USAID/Pakistan

SUBJECT: Supplemental Environmental Assessment - The Pakistan Locust Control Program

TO: **Molly Kux**, Asia Bureau Environmental Coordinator, ASIA/DR/TR, AID/Washington

As desired in interbureau meeting on August 12, 1993 attached is the Supplemental Environmental Assessment (SEA) for Pakistan Locust Control Program. This document is an update of Draft Locust Control Environmental Assessment prepared by Mission Environmental Unit in June 1990.

The comments from Dr. Gary Jahn, ASIA/DR/TR has been incorporated, in addition, this SEA has been prepared after meetings with FAO, GOP's Department of Plant Protection officials and based on our observations/experience, keeping in view the current Locust Emergency in Pakistan.

Your approval is requested.

☐ Approved

☐ Disapproved

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Molly Kux
Asia Bureau Environmental Coordinator

Date:_____

TABLE OF CONTENTS

LIST OF ABBREVIATIONS AND DEFINITIONS

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

MINFAC	-	Ministry of Food, Agriculture and Cooperatives
N	-	north
PEA	-	Programmatic Environmental Assessment
PPS	-	Plant Protection Service
ULV	-	ultra-low volume application of pesticide - less than 2 liters per hectare
U.S.	-	United States of America
USAID	-	AID Mission to Pakistan
USG	-	Government of the United States
W	-	west
waddi	-	intermittent stream bed
WAPDA	-	Pakistan Water and Power Development Authority
WHO	-	World Health Organization

FORWARD

This document is a supplement to USAID's Programmatic Environmental Assessment (PEA) of Locusts/Grasshopper Control in Africa and Asia (TAMS/CICP, 1988).

The Department of Plant Protection (DPP) which operates under administrative control of the Government of Pakistan's (GOP's) Ministry of Food, Agriculture and Cooperatives (MINFAC) is the responsible department for locust control operations in Pakistan. In 1989, USAID/Pakistan provided support to DPP in the form of 40 vehicles, 190,000 liters of Malathion, spare parts for aircraft, communication equipment, and monitoring equipment with Agriculture Commodities and Equipment (ACE) project funds. Also, in 1989, USAID/Pakistan was planning to develop and implement a project to provide programmatic assistance to the Islamic Republic of Pakistan for locust control operations. The proposed assistance would have been in the form of a comprehensive package of commodities and services to meet GOP's demands of the immediate crisis and strengthen its institutional capacity to maintain longer term control of the locust outbreaks.

In 1989-90, USAID/Pakistan's Environmental Unit conducted extensive surveys of locust breeding areas, examined all the capabilities of DPP for combating the locust outbreaks, visited field posts in Balochistan, Sind and Punjab provinces and collected all relevant data for the preparation of an Environmental Assessment. As a result in June 1990 a draft EA was prepared. No further work could be done on this EA due to changed US policy because of Pressler imposed restrictions and it was not finalized.

In the first half of July 1993 desert locust swarms migrated from Yemen, and possibly Saudi Arabia, to infest Oman, Pakistan and India. FAO monitored the situation and coordinated the survey and control actions with regional governments and donor organizations. The Director General of FAO sent a message out to the donor community drawing attention to the serious threat to African food security posed by desert locust infestations in Asia. Historically, locust outbreaks in Afghanistan, Pakistan, and India have developed into major swarms which are carried to Africa on wind currents.

In September 1993, an outbreak of desert locusts assumed alarming proportions on the Pakistan/India border, in the south-eastern deserts. The locusts occurred in their traditional late summer breeding areas, the vast Tharparker and Cholistan deserts. The infestations extended across the border into the Rajistan desert of south-western India. The GOP's DPP launched extensive control operations in the infested areas and established the basic organizational infrastructure required to tackle the locust threat. The DPP reported that a plague could develop in late October 1993. GOP requested donor assistance through FAO for emergency support to meet immediate requirements of vehicles, pesticides, aircraft spares, navigational equipment, exhaust nozzle sprayers, hand sprayers, and field staff for effective locust control operations.

Regarding pesticides, USAID funds can only be used only to support the procurement and use of USAID-approved pesticides. To ensure that USAID-funded equipment and supplies are not employed to procure or use non-USAID-approved pesticides, ground monitoring of operations occurs during campaign implementation. Ground monitoring is the responsibility of the grantee.

USAID cannot take any action unless a Supplemental Environmental Assessment (SEA) is approved for each country that requests aid. Although the Pressler Amendment places strict limitations on aiding Pakistan, locusts are considered a regional threat and do not fall under the purview of Pressler.

The draft prepared in 1990 was updated in 1993 and revised in 1994 to serve as the SEA for Pakistan. The Pakistan SEA has been reviewed by USAID/Pakistan, GOP, and USAID/Washington; and approved by USAID/Washington. It reflects the future options to support GOP's DPP for effective locust management. It contains the best available estimates of environmental impacts and possible mitigating strategies. This document encourages the use of alternatives to pesticides, and the environmentally sound use of chemical pesticides when they are necessary.

1.0 EXECUTIVE SUMMARY

USAID/Pakistan is developing a project to provide programmatic assistance to the Islamic Republic of Pakistan Locust Control Campaign. USAID's assistance will be in the form of a comprehensive package of commodities and services which will aid the Government of Pakistan (GOP) in meeting the demands of a locust crisis **as well as strengthen its institutional capacity** to maintain long term control of locust outbreaks. (Section 4.1).

USAID funds can be used to provide any type of equipment or material necessary for locust control, including pesticides; though the only pesticides that can be purchased with USAID funds are USAID-approved pesticides. To ensure that USAID-funded equipment and supplies are not used in conjuction with non-USAID-approved pesticides, ground monitoring of operations occurs during campaign implementation. Ground monitoring is the responsibility of the grantee.

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

The preferred alternative among the various locust control methods was determined to be chemical (insecticidal) control in the context of a judicious and well-managed application program. (Section 4.3).

Pakistan has a rich and diverse terrestrial flora and fauna and extensive marine and aquatic habitats along the Balochistan and Sind Coasts. There are a number of legally protected nature reserves and ecologically sensitive areas in the locust infestation zone, which must receive special consideration in the decision-making process leading to treatment for locusts. (Section 4.4 and 5.7).

In 1990, the following insecticides were provisionally approved for USAID-funded procurement and/or use in the Pakistan locust control program, subject to the final findings of the Locust/Grasshopper PEA: carbaryl, malathion, fenitrothion, bendiocarb, chlorpyrifos, lambda-cyhalothrin, and tralomethrin. (Section 5.1).

The GOP has in place a strong institutional structure for managing the locust control program, the effectiveness of which could be enhanced by interaction with expert counterparts through the provision of specialized technical assistance. All of the proposed specialists to be provided under the technical assistance component will work very closely with GOP counterparts in the course of carrying out their

responsibilities under the project, thereby imparting knowledge and skills in the form of on-the-job professional development. In addition, each specialist will conduct short-term in-service training activities for field personnel. (Sections 5.9, 5.10, and 8.0).

Required environmental mitigation measures include provisions for specialized technical expertise in the areas of pre- and post-treatment environmental monitoring, pesticide management, health and safety. Health and safety related commodities to be provided include protective clothing & equipment and test kits for monitoring worker exposure to insecticides. All pesticide containers will be labelled in the local language indicating all important information in the form of recommended dose, environmental impact, warnings, handling precautions, storage and disposal guidelines and first aid instructions. This will be coordinated with DPP and will be properly monitored by USAID and FAO. Other critical mitigation measures include special procedures for locust control in ecologically sensitive areas, and disposal of empty insecticide drums. (Sections 7.0 and 8.0, and Appendix C).

2.0 APPLICABLE ENVIRONMENTAL PROCEDURES AND PURPOSE OF ASSESSMENT

In 1990, Pakistan Locust Control provided technical assistance, aerial application services, commodities, equipment and insecticides to assist the GOP in controlling a series of severe desert locust outbreaks. The findings of this SEA were an important element of the project design in 1990. This SEA was prepared on site at USAID/Pakistan as an element of the overall locust control efforts during February 1989. This SEA was updated at USAID Pakistan as an element of the overall locust control efforts in 1993 and revised in 1994. To gather information for the SEA, the USAID/Pakistan's Environmental Unit: conducted extensive interviews with GOP officials in charge of the national locust control effort as well as those responsible for environmental protection and public health; observed control campaign sites and ongoing operations; and inspected the facilities of these and related GOP entities.

2.1 USAID ENVIRONMENTAL PROCEDURES

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

2.2 PROGRAMMATIC ENVIRONMENTAL ASSESSMENT FOR LOCUST CONTROL

In early 1987 USAID initiated a number of activities related to implementation of its commitment to the use of environmentally acceptable pesticides in locust/grasshopper (L/G) control programs in Africa and Asia, including preparation of a Programmatic Environmental Assessment (PEA) per 22 CFR 216.6(d) of L/G control in Africa and Asia; and staging of a field testing program to study the efficacy and environmental impacts of certain pesticides for the control of locusts and grasshoppers in Africa (USAID, 1987). Draft reports resulting from these two activities were available at the time of preparation of 1990 EA, and provided the technical background for many of the findings and recommendations contained herein. In 1990, the PEA was approved. The PEA provided technical background for the 1993 update of this SEA.

One of the purposes of a PEA is to carry out a scoping process to identify and examine the underlying technical concerns and

environmental issues generic to a particular activity on a regional basis, thus allowing an SEA of the same activity in an individual country to focus on the country-specific environmental issues and impacts which were not evaluated in the PEA. In particular, the Programmatic Environmental Assessment for Locust and Grasshopper Control in Africa and Asia (L/G PEA) prepared by TAMS, Inc. and the Consortium for International Crop Protection (TAMS/CICP, 1988), for USAID's Africa and Asia/Near East regional bureaus serves as the basis for this Pakistan-specific SEA. Accordingly, the findings and conclusions of the PEA are incorporated by reference into this SEA, and the PEA will be cited in the text of this document where appropriate in order to avoid unnecessary duplication of material.

2.3 GOVERNMENT OF PAKISTAN ENVIRONMENTAL/PESTICIDE LEGISLATION

The GOP has promulgated laws and other regulatory instruments for the protection of air and water quality; soil conservation; wildlife conservation; solid waste disposal; importation, sale, and use of toxic substances; and urban land use planning. There are no regulations requiring formal environmental review of major actions (either private or public sector) with the potential for impact on the environment. The only voluntary environmental evaluation is a Proforma Guide.

The rules on importation, sale, and use of toxic substances (including pesticides) consist of a complex web of laws, regulations, and administrative decrees, many of which date back to the 1920's and '30's and are therefore clearly outdated and not enforced. The GOP Plant Protection Service (PPS) is responsible for regulating pesticides in Pakistan.

3.0 SCOPING PROCEDURE

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

The process of identifying the technical and policy issues applicable to control of large scale locust outbreaks which require detailed environmental review was performed during preparation of the PEA. The principal Pakistan-specific issues requiring detailed examination are treated in the pesticide use assessment (Section 5.0) of this SEA.

A modified scoping procedure based on an individual consultative approach was adopted. A list of key people contacted in this process is provided in Appendix A.

Meetings to discuss and identify the potential environmental impacts of the proposed project as well as recommended mitigation actions were held with the Ministry of Food, Agriculture and Cooperatives Department of Plant Protection, Ministry of Public Health Environmental Health Service, and UN's Food and Agriculture Organization, Pakistan Country Office.

4.0 DESCRIPTION OF S.E.A.

On 15 August 1989 the emergency waiver of 22 CFR part 216 (USAID's Environmental Procedures governing the provision of pesticides) expired. Since then, all USAID assistance for procurement and use of pesticides must fully comply with the agencies environmental procedures. The Programmatic Environmental Assessment (PEA) and the country-specific Supplemental Environmental Assessments (SEAs) serve as the basis for these regulatory procedures.

A Programmatic Environmental Assessment (PEA) describes the pesticides that USAID can purchase in locust control operations. The purpose of the PEA is threefold: first, it is to describe the environmental impact of current and projected locust and grasshopper control programs, with specific reference to pesticide use; second, it is to evaluate possible alternative control measures and mitigative actions to reduce adverse ecological effects of these measures; and third, it is to provide the US Agency for International Development with comprehensive programmatic recommendations which are to ensure that environmental concerns are fully addressed in future locust and grasshopper programs. A general PEA for locust and grasshopper control in Africa and Asia was approved in March 1989. All USAID locust control programs operate under the restraints and conditions described in the PEA.

A Supplemental Environmental Assessment (SEA) with country specific information must be in place for each country where USAID funds locust control operations. The SEAs contain country-specific environmental information (such as identifying critical habitats) and provide guidance on environmentally sound locust management. This includes an inventory of the pesticides available, and a description of pesticide handling practices in that country.

4.1 BACKGROUND, GOAL, PURPOSE AND OUTPUTS

USAID funds will be used only to support the procurement and use of USAID-approved pesticides. To ensure that USAID funds are not used for non-USAID-approved pesticides, ground monitoring of operations will occur during campaign implementation. Ground monitoring will be the responsibility of the grantee.

4.1.1 Background

Locusts are a serious problem for Pakistan as locust invasions can cause famines and diseases. Pakistan undergoes locust invasions twice a year during an active locust cycle. Pakistan is situated on the east-west route of moving swarms. The locust breeding grounds are located in the desert of Balochistan in the winter and spring. In summer, locusts breed in the Sind and Punjab. The total land area affected is about 332,000 square kilometers.

In 1954 an aerial pesticide spray program was started to control

the wide spread locust breeding in Balochistan, Punjab, Sind and the Northwest Frontier Provinces. This invasion precipitated the development of desert locust control and research programs. The Department of Plant Protection (DPP) is the primary Pakistan Agency responsible for monitoring and control of the desert locust. Due to the Department's efforts since 1960, all locust invasions were controlled and did not reach cultivated agricultural land.

In Sept. 1993, an outbreak of desert locusts assumed alarming proportions on the Pakistan/India border, in the south-eastern deserts. The locusts occurred in their traditional late summer breeding areas, the vast Tharparker and Cholistan deserts. The infestations extended across the border into the Rajistan desert of south-western India. The GOP's DPP launched extensive control operations in the infested areas and organized the basic infrastructure required to tackle the locust threat. The DPP reported that swarm invasions assumed serious proportions and a that a plague could develop in late October 1993. GOP requested donor assistance through FAO for emergency support to meet immediate requirements of vehicles, pesticides, aircraft spares, navigational equipment, exhaust nozzle sprayers, hand sprayers, field staff needs etc. for effective locust control operations.

4.1.1.1 Inventory of Useable Pesticides

According to FAO (Appendix D) GOP's useable pesticide stocks are:
230 tons BHC
25,000 liters Malathion
30,000 liters Fenitrothion

[Note: The word "useable" in this section means that the insecticide has not yet expired, and that the GOP is willing to use these stocks for locust control. Saying that the above pesticides are "useable" is not meant to imply that USAID approves of their use. BHC is not approved by USAID for locust control. See section 5.1 for the complete list of USAID approved pesticides for locust control.]

4.1.2 Locust History

There was a long period of locust inactivity where Pakistan remained free from any gregarious locust invasion from the early sixties until 1978. In June 1978 locust swarms originating from Africa and Saudi Arabia invaded India and then migrated into the Tharparkar (Sind) desert. Over 150,000 square kilometers were infested and locust activity expanded into the desert regions of Cholistan, Umerkot, Chachro, Khipro, Hyderabad and Karachi. Dense egg laying was reported from all infested areas and hatching was observed in July 1978. The hopper bands were controlled by air and ground spraying. BHC dust was used to control 1st and 2nd stage hoppers. Aldrin or BHC baits were used for 3rd, 4th and 5th stage hoppers and young adults. Hoppers were also treated with pesticides through ultra low volume (ULV) spraying via exhaust nozzle sprayers and light aircraft. Other control methods

included aerial spraying with boom and nozzle, vegetation baiting, and treatment of egg beds. Pakistan experienced another locust invasion in August of that year when mature swarms from India started infiltrating Pakistan. This time the locust invasion was more wide spread covering the desert regions near Bahawalpur (Punjab) and Tharparkar (Sind). Another intense aerial and ground spraying program was instigated to control the desert locust.

In 1980, preventative spraying in Balochistan and Turbat areas decreased the concentration of adult locust populations. In 1982 there were hopper bands detected in Lasbela, Tharparkar, Nara and Kharan areas. Preventative spray measures were undertaken to control swarming.

From 1985-1989 Pakistan remained free from gregarious locust activity. In August 1989 some swarming activities were detected in the Lasbela district of Balochistan. Those swarms originated from Saudi Arabia and migrated to Pakistan with prevailing monsoon winds. Swarms were controlled by spraying and baiting with Malathion.

From 1989 to June 1993, Pakistan has remained free from gregarious locust activity. Adult populations with small scale breeding were observed in the coastal areas of Makran and in the Lasbela district of Balochistan in 1990. Those populations were closely monitored by DPP as favorable ecological conditions would develop for locust breeding in the monsoon rainfall season which occurs during the summer months.

In the first half of July 1993 desert locust swarms migrated from Yemen, and possibly Saudi Arabia, to infest Oman, Pakistan and India. FAO monitored the situation and coordinated the survey and control actions with regional governments and donor organizations. The Director General of FAO sent a message out to the donor community drawing attention to the serious threat to food security posed by desert locust infestations. FAO considered the locust outbreaks in Asia to be a serious potential threat to African food security. Historically, locust outbreaks in Afghanistan, Pakistan, and India have developed into major swarms which are carried to Africa on wind currents.

Indications are that the desert locust will continue to remain a threat to Pakistan's agriculture and well being. There is every indication that future spray programs and research are necessary to control the locust problem in Pakistan.

4.1.3 Goal, Purpose, and Output of USAID Assistance

The goal of the GOP locust control campaign is to save agricultural and livestock production from physical destruction in order to avert enormous monetary losses. Through FAO, USAID can provide commodities, equipment, and/or insecticides to assist the GOP in its locust control program.

The outputs of a campaign include:

- The control and destruction of desert locust swarms (the number of hectares treated will be programmed at the time of the infestation and will depend upon the total magnitude of the treatment as well as the assistance being provided by other donors);

- The equipping of GOP planes and helicopters and ground control applications with insecticide application systems and calibration of the systems.

- A Pesticide Environmental Action Plan (PEAP), which describes the proposed action for a specific campaign as well as training, technical assistance, and equipment. See Item 1, Table 1, and Item 4 in PEAP (Appendix F).

4.1.4 USAID/Pakistan's Proposed Assistance for the Current Locust Emergency in Pakistan (1993)

The UN Disaster Management Team and FAO convened an emergency meeting of donors on August 17, 1993 to discuss the Locust Emergency in Pakistan. As a result, a strategy and three lists of requirements to implement it were developed for supporting DPP. FAO monitored the situation. Locust Emergency in Pakistan Updates are attached as Appendix D.

In 1993, DPP is suggested that USAID/Pakistan provide the following assistance:

Sr. No.	Description	Estimated Cost (US$)
1	40,000 Liters of Malathion ULV or suitable substitute	480,000.00
2	500 sets of Chemical Handling Safety Equipment	10,000.00
3	20 UFH Portable Radio Sets	16,000.00
4	6 Portable GPS navigation devices (Magellan)	9,000.00
5	Cash to help with local immediate logistical needs	35,000.00
	Total	550,000.00

4.2 OTHER DONOR ACTIVITIES

A number of other donors, both bilateral and multilateral, assisted the GOP in its locust control program in 1990. The bulk of this assistance was in the form of insecticides and aerial treatment services. Several donors have provided protective clothing and equipment as well as other commodities such as vehicles. Only limited amounts of technical assistance were provided by donors other than USAID. The 1990 project was the first and only donor effort to contribute a comprehensive package of commodities and services to Pakistan's locust control program.

According to FAO, the international assistance for the Locust Emergency in Pakistan in 1993 was as follows:

1. The FAO Emergency Center for Locust Operations (ELCO) allocated US$ 83,000 for immediate expenditure on locust control in Pakistan. This covered approximately 3 MT of chemicals, 4 HF radio, and some spray equipment, plus some local operating costs.

2. The Project Manager from the FAO Locust project in Afghanistan was assigned to provide technical assistance and advice to the UN Disaster Management Team.

3. The FAO in Pakistan loaned two four wheel drive pick-ups to the FAO technical advisor to assist communications and logistics in Sind and the Punjab.

4. The FAO " Locust and Sunn pest project" in Afghanistan supplied three hundred hand held ULV sprayers to the

Government of Sind.

5. Norway committed $100,000 for local procurements for operations support.

6. France committed $100,000 for local procurements and operations support.

7. The UK committed one million british pounds to FAO/Rome for the locust control program in Africa, the Middle East and South Asia.

4.3 ANALYSIS OF ALTERNATIVES

The PEA contains a detailed analysis of five technical alternatives considered by USAID for locust and grasshopper control:

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

For each of the technical alternatives, the PEA analysis considered environmental impact; costs; short, medium, and long-term actions; effectiveness; training requirements; research requirements; and recommended environmental mitigation. The technical alternatives are theoretical rather than actual. There are, at the present time, only two alternatives -- that of taking no action, or of mounting a control effort using chemical control. If control is chosen, then the technical alternatives really come down to different approaches within the chemical control operation: either that of large scale spraying of extensive areas, as was adopted in the African grasshopper campaign of 1986, or more selective spraying of carefully targeted outbreak areas. The latter presents less potentially harmful environmental consequences, as well as being the more cost-effective approach (TAMS/CICP, 1988).

In 1993 selective aerial and ground based treatment in the context of a well-managed and technically sound control program was the preferred alternative of the Pakistan Locust Control Project.

4.4 AFFECTED ENVIRONMENT

Pakistan is an independent nation, bordered on the northwest by Afghanistan, the east by India, and the southwest by the Arabian Sea and Iran. Pakistan is 803,941 $km.^2$ and contains a combination of deserts, alluvial plains, mountains and coastal ranges. The country is divided into four provinces; Balochistan, Punjab, Sind and the Northwest Frontier Province. Pakistan can be divided into three distinct physiographic units, the northern mountains, the western highlands and the Indus plains. The northern mountain ranges include the Karakorums, the Himalayas and the Hindukush.

This area also contains many glaciers that feed the Indus river and its tributaries. The Indus plain is primarily located in the provinces of the Punjab and Sind. These provinces are the most agriculturally enriched, most densely populated, and most economically advanced provinces of Pakistan. The Indus plain is bounded on the west by the western highlands which are lower than the northern mountain ranges in altitude and are also comparatively more arid. This aridity increases in these highlands as one moves from the Northwest Frontier province in the north to the Balochistan province in the south. The Makran coastal range extends along the southern portions of Balochistan and Sind provinces and is abundant in aquatic resources.

4.4.1 Land Utilization and Agricultural Resources

Pakistan has a unique combination of deserts, alluvial plains and some of the highest mountain ranges in the world. Climatic temperatures can ranges as high as 45°C to well below freezing in the Northern areas. Most of the rainfall occurs during monsoon season which is July thru September and shows a wide range varying from 100 mm to more than 1500 mm.

Pakistan has an arid to semi arid climate. Cultivation of agricultural crops is the major land use in Pakistan. Cultivated land amounts to approximately 32 million hectares of which the Punjab accounts for 43%, Sind 26%, Balochistan 22%, and the Northwest Frontier Province 9%. Pakistan has the largest irrigation system in the world consisting of 39,000 miles of canals, that irrigate approximately 33 million acres.

According to the Census of Agriculture in 1990, Pakistan has 5.07 million farms. Climatic conditions aided by irrigation, enable farming to occur throughout the year. The major crops are wheat, cotton, rice, maize, sugarcane, pulses and oil seeds. Fruits are also grown and include citrus, mangoes, apples, peaches, guava, banana, dates, apricots and pears. Cotton, rice, sugarcane and various fruit crops are subject to locust attacks.

Agriculture production and related industries account for half of Pakistan's gross national product and are vital for its economic development. Agriculture provides employment for most of its labor force and export of raw agricultural materials accounts for about two thirds of the total exports for the country.

4.4.2 Forestry & Rangeland Resources

Forests of Pakistan cover about 4.74 million hectares or about 5.4% of Pakistan's total land area. The forests are mostly located in the Northern areas of Pakistan. The Northwest Frontier Province has 30% of the forest area, followed by the Northern areas 20%, Balochistan 15%, Sind 14%, Punjab 13% and Azad Kashmir 8%. The majority of the forests are coniferous or scrub with irrigated plantations and coastal forest comprising the rest. If a locust threat is not contained, those lands are vulnerable.

Hill forests are found in the moist temperate, dry temperate and subtropical zones and cover 1.78 million hectares. The major species naturally growing include Cedrus deodar, Abie Pindrow (fir), Pinus Wallichiani (blue pine), Picea Smithiana (spruce), Pinus gerardiana, Juniperus exclesa, (juniper), Pinus roxburghii (chir pine), Quercus incana (Oak) and Acer Indica (horse chestnut). These forests are the main source of timber, fuel wood, and resin. They also sustain the grazing of millions of cattle, goats, sheep and camels.

There are also forests irrigated by canals. The main species grown are Dal bergia Sissoo (Shisham), Morus alba (mulberry) in the Punjab and Acacia nilotica (babul) and eucalyptus in Sind. These forests are maintained for fuel, timber and for furniture.

Forests occur along the Indus River in the Sind and support species such as babul, jand, shisham, obhan and lai. These forests produce timber for coal mining and furniture industries. Because of their location they act as barriers against floods and are vulnerable to locusts.

In the semi-arid zones the predominant species are Prosopis specigera (jand) Acacia nilotica (babul), Tamarix articulata (farash), Salvadora oleoides, (peelu) and prospois juliflora (mesquite). This vegetation provides feed for livestock and a fuel resource. Pakistan is a wood deficient country with a critical need for conservation measures to increase the forest area and to make most efficient use of available forests.

The other major land use is grazing lands. About 67 percent of the total land area or 59.56 million hectares is dedicated to grazing 90 million livestock heads. These rangelands extend from high elevation alpine pastures in the north to the grazing forests in the plains of the south up to the Arabian Sea. Pakistani lands are overgrazed and are now only managing to meet half their productive capacity. Many ranges are under vegetative stress and are suffering from soil erosion. A number of improvements and changes to rangeland management are needed to prevent further degradation of Pakistan's rangelands. The fragile lands are particularly vulnerable to the present locust outbreak, as they fall directly in the band of prevailing winds.

4.4.3 Parks and Protected Areas

The PEA recommends that no insecticides be applied for locust control in protected areas. The PEA further recommends that no insecticides be applied within 2.5 km of protected areas.

Pakistan has a diverse range of habitats and ecosystems and several unique species of wildlife. To protect this resource, Pakistan designated 5 National Parks, 69 Wildlife Sanctuaries and 74 Game Reserves. National Parks are owned by the GOP and the flora and fauna are protected and preserved in their natural habitat. The Park is protected from construction development, hunting, shooting

and trapping.

A wildlife sanctuary is an area which is set aside specifically as undisturbed breeding ground for the protection of wildlife. Public access is not permitted and no exploitation of the land is allowed. Hunting is not allowed. Game Reserves are areas where hunting and shooting of wild animals is regulated under a special permit. The permit specifies the maximum number of animals that can be killed.

There are also three wetland sites that are of importance. These are the Haleji, Kinjhar and Drigh Lakes. They provide a habitat for a wide variety of water fowl and migratory birds. They are discussed in further detail in Section 5.7.

Parks or protected areas that lie within the desert locust area in Balochistan are listed below.

PARKS/PROTECTED AREAS THAT LIE WITHIN DESERT LOCUST AREA IN BALOCHISTAN

Sr. No.	Name	Area (Hectares)	Wildlife of the Area
1	National Park Hazarganji Chiltan, Balochistan	12,567	Chiltan Markhor, Wild Sheep, Leopard, Chukar and Scesec

Sr. No.	Name	Area (Hectares)	Wildlife of the Area
	Wildlife Sanctuaries		
1.	Band Khush Dil Khan	1,296	Waterfowl and Scesec
2.	Masalakh	46,559	Chinkara, Scesec, Houbara Bustard, Sand Grouse, Urial & Chukor
3.	Surkhab	3,757	Urial, Chukor, and Scesec
4.	Sasnamana	6,607	Chukor, Scesec and Hare
5.	Ziarat	37,247	Urial, Markhor, Scesec & Chukor
6.	Juniper	24,356	Ibex, Urial, Leopard, Chukor and
7.	Koh-e-Geish	21,660	Scesec
8.	Kachau	30,567	Chinkara, Urial, Houbara Bustard
9.	Dhrun	29,555	Chinkara & Urial
10.	Shasham	19,433	Ibex, Urial, Chukor and Scesec
11.	Chorani	178,259	Ibex, Urial, Leopard & Bear
12.	Duriji	18,345	Chinkara, Ibex, Urial, Scesec, Sand Grouse and Houbara Bustard
13.	Khurkhera	125,425	Grey Partridge, Sand Grouse and Houbara Bustard
14.	Raghai Rakshan	33,198	Chinkara, Ibex & Urial
15.	Kolwah Kap	145,101	Chinkara, Urial, Sand Grouse, Houbara Bustard and Grey Partridge
16.	Buzi Makola	1,687,579	Chinkara & Ibex
	Lasbela		Chinkara, Ibex, Sand Grouse and Houbara Bustard

Sr. No.	Name	Area (Hectares)	Wildlife of the Area
	Game Reserves		
1.	Zawarkan	3,887	Markhor, Urial, Chukor & Scesec
2.	Ras Koh	11,660	Ibex, Urial, Chukor & Scesec
3.	Gogi	7,773	Chukor
4.	Wam	10,364	Leopard & Chukor

4.4.4 Rare and Endangered and/or Migratory Species

In Pakistan, at least 31 species of mammals, 20 birds and four reptiles are threatened with extinction. Among these are the Dalmatian pelican, white tailed eagle, peregrine falcon, Asiatic wild ass, markhor, Indian Python, mugger, cheer pheasant, great Indian Bustard, Indus dolphin, snow leopard, wolf, olive ridley green turtles and gavial. The commonest threats to wildlife in Pakistan include: hunting and collection, persecution of predators considered to be pests, competition with domestic animals for limited food and habitat, disease, disturbances in breeding cycles and habitat destruction such as deforestation, drainage of wetlands and erosion of rangelands.

Of particular interest is the Houbara Bustards that migrate to Pakistan's arid zones. The Arab nobility has practiced falconry as a sport and the traditional quarry is the Houbara Bustard. These hunting expeditions have threatened the Bustard with extinction. Approximately 3000 birds are killed each year in Pakistan. The Government of Pakistan and the International Council for Bird Preservation have started augmenting wild populations by releasing captive reared stock to increase breeding of the Houbara bustard. The Houbara bustard resides in various National Parks and Wildlife sanctuaries throughout Balochistan, Sind and Punjab Provinces. Recently enacted measures have greatly reduced the falconry permitted.

The Sind Wildlife Management Board has started a protection and research program for the green turtle located on the coastal areas of Balochistan and Sind. The eggs of the turtle are protected from poachers and feral dogs by transplanting them into protected enclosures along the beach. Over a three year period a total of 57,000 live Green turtle hatchlings have been released into the sea.

The Indus dolphin species is an endangered mammal due to change

in habitat from irrigation practices. The Sind Government declared a stretch of the Indus River between Sukkur and Guddu as a reserve for the dolphins. This conservation effort has doubled the dolphin population. Control efforts will focus on eastern and southern desert areas and will have no measurable effect on the endangered species.

4.4.4.1 Birds

The migratory waterfowl breed in Northern Eurasia and disperse to their winter resorts in the warm south along seven migratory flyways, as given below:

1. Northern Europe - Scandinavian - North Sea
2. European - Black Sea/Mediterranean
3. West Siberian - Caspian/Nile
4. Siberian/Kazakhstan - Pakistan/India
5. East Siberian - Tibet/Ganges
6. Kamchatka - China/Japan
7. Chukotka/Alaska - California

The Flyway No. 4, is internationally recognized as the Indus Flyway. Pakistan has assumed the responsibility of the protection of Indus Flyway, having created a number of wetland sanctuaries recognized as "Wetlands of International Importance".

The ducks & geese of this population assemble in the lake districts of SW Siberia and Kazakhstan and from there the greater part move first along the oral Turgay and then along Syrdarya. However, a significant stream of birds also starts off along the lrtish and after crossing the mountains through Tahunga gateway and Ilaalerus and other river valleys reach the Tarini drainage system. From there, they fly through the mountain passes between the Hindukush and the Karakoram to the upper reaches of the Indus. Thus the Indus valley is a major wintering ground for arctic waterfowl.

Pakistan is therefore, one of the principal wintering grounds of all the migratory waterfowl out of which 75% winter in Pakistan while the rest find their way further southwest. Among the ducks, common teal starts arriving in Pakistan by mid-September followed by Garganey and Shoveller. The return migration starts by end of February and according to geographic position of the regions, continues until early May.

Not all the waterfowl visit Pakistan every year. Some are stragglers or vagrant and others are very rare hence these are seldom seen here, such as Swans, Baikal or Formosa Teal, Falcated or Bronze Capped Teal, Scaup, Longtailed Duck, Golden Eye and Mergansers.

The common winter visitors include the Pintail, Common Teal, Mallard, Wigeon, Shoveller, Common Pochard and Tufted Duck.

Six species of ducks are endemic which are Marbled Teal, Cotton Teal, Lesser Whistling Teal, Large Whistling Teal, Spotbill Duck and Comb Duck.

4.4.4.2 Conservation of Waterfowl in Pakistan

Wetland and waterfowl conservation is a provincial subject in Pakistan and is looked after by the Provincial Forestry and Wildlife Departments. More than 100 important wetlands are well known. The Provincial Governments have declared 6 wetlands in Punjab and 28 wetlands in Sind as Wildlife Sanctuaries, and 4 wetlands in Punjab and 2 in Balochistan as Game Reserves.

Since 1967, the International Waterfowl Research Bureau, Slimbridge, England has organized the International Waterfowl Census in the Western palaearctic carried generally in midwinter. For one day during a two week period generally in mid January, thousands of ornithologists count ducks, swans and coots in the most important wetlands. The data are collected by various agencies and sent to IWRB where these are analyzed for use by organizations and agencies responsible for policy making. In Pakistan, the census is organized and coordinated by the Zoological Survey Department in collaboration with the provincial Governments, National Council for Conservation of Wildlife in Pakistan, Islamabad, and the Pakistan Forest Institute, Peshawar.

The hunting/shooting season of waterfowl in Pakistan is controlled & allowed generally between October - March and a variety of species in restricted number are allowed for hunting on an ordinary shooting permit valid during the season.

The species which are totally protected against hunting/shooting etc., are as follows:

White fronted Goose	(Protected in Sind, Balochistan and N.W.F.P.)
Lesser White Fronted Goose	(Protected in Sind, Balochistan and N.W.F.P.)
Bar-headed Goose	(Protected in Sind, Balochistan and N.W.F.P.)
Grey-lag Goose	(Protected in Sind, Balochistan and N.W.F.P.)
Bewick's Swan	(Protected in Sind, Balochistan, N.W.F.P. & Punjab)
Whooper Swan	(Protected in Sind, Balochistan N.W.F.P. & Punjab.)
Mute Swan	(Protected in Sind, Balochistan, N.W.F.P. & Punjab)

Marbled Teal	(Protected in Sind, Balochistan, N.W.F.P. and Punjab)
Baikal Teal	(Protected in Punjab)
Spot bill Duck	(Protected in Sind, Balochistan N.W.F.P.)
Falcated Teal	(Protected in Punjab)
Ruddy Sheilduck	(Protected in Sind)
Common Sheilduck	(Protected in Punjab)
Smew	(Protected in Punjab)
Goosander	(Protected in Punjab)
Red breasted Marganser	(Protected in Punjab)
Golden Eye	(Protected in Punjab)
Long tailed Duck	(Protected in Punjab)
White headed Duck	(Protected in Sind, Balochistan, N.W.F.P. and Punjab)
Cotton Teal	(Protected in Sind, Balochistan & N.W.F.P.)
Comb Duck	(Protected in Sind, Balochistan, N.W.F.P. & Punjab)

4.4.4.3 Mammals

Pakistan has 188 species of Mammals. A number of these include the snow leopard, common leopard, lynx, caracul, civet, mongoose, hyena, sand cats, jackals and foxes are common in all parks of Pakistan. A mammal species that has declined over the years is a species of wild horse called the Indian Wild Ass. Found in only one area of Sind it is threatened with extinction. Other mammals threatened with extinction include the urial, a type of goat antelope which is represented by different sub-species found in separate populations from Balochistan to the Northern areas. The marco polo sheep is present near the border of Afghanistan in the hills of the Karakorum Mountain Range. The ibex is another mammal found in Pakistan. The Sind Ibex is a form of wild goat occupying the cliffs of the dry and high mountain ranges of Sind and Balochistan. The Himalayan Ibex is found in Swat and Gilgit. Other Mammals include the chinkara, hog, barting and muskdeer. The blackbuck, once threatened with extinction is being reintroduced by a breeding program on a wildlife reserve located near Cholistan Desert south of Bahawalpur in Punjab Province.

Pakistan has a number of laws regarding protection of wildlife, however with the development of the country, many of the

wildlife's natural habitats are disappearing. This loss of habitat is resulting in a decline of various species of wildlife. There is however a growing recognition in Pakistan to preserve and protect endangered wildlife. Various conservation and wildlife protection programs have been established to address the problem.

4.4.5 Plants

Pakistan's climatic and topographical variations encourage of wide range and variety of plant life. Some 6000 species have been identified and include 2000 medicinal plants such as the Ephedra plant found in the locust area of Balochistan. Of the 6000 plant varieties, there are 128 pteridophytes, 23 gymnosperms, 1140 monocots and 4492 dicots. Approximately 500 plants species are on the current list of rare and endangered Pakistan plant species compiled by the International Union for the Conservation of Nature and Natural Resources (I.U.C.N). Many of these plants occur in the area, and are under immediate threat from locusts.

4.4.6 Indus Delta

The Indus River, one of the largest in the world in terms of drainage area, river discharge and sedimentation, drains the arid to semi arid western Himalaya and Karakorum mountain ranges. The Indus River and one of its tributaries, the Sutlej River are trans Himalayan in origin, while the Kabul River tributary drains Afghanistan to the west and the Jhelum, Chenab and Ravi Rivers on the southern side of the Himalayas to the east. The Indus River traverses the Indus Plains for approximately 1000 KM before it reaches the Arabian Sea. The total drainage basin area is 970,000 KM (Quraishee). Although much of the water from the Indus River is diverted for irrigation, it still transports an estimated 50 million mt of sediments to the sea each year. The sediments are mainly silt and clay which form the muddy bottom characteristics of the Karachi/Sind continental shelf area.

At the base of the Indus River lies the Indus Delta, that is located at the head of the Arabian Sea, between Cape Monze and the Runn of Cutch. Geographically, the Indus Delta is situated south of Karachi and north of the international border with India. The Indus Delta is the second largest in area in the Indian subcontinent. The Delta is triangular in shape and covers approximately 1,000 sq. miles. The more productive part of the Indus Delta, located near Keti Bundar has decreased in size to 100 sq. miles due to the development of an extensive irrigation system of canals and barrages over the Indus River resulting in a vast reduction of Indus river discharge in the Delta region.

The Indus Delta is an important natural resource for the country of Pakistan. It has demonstrated its economic value as a viable water resource, a fisheries and wildlife habitat and includes an

extensive mangrove forest ecosystem. The Indus Delta supports the fifth or sixth largest mangrove ecosystem worldwide. The area of mangrove forest has been estimated at 249,486 ha (Khan 1966) within the Indus Delta with some sparsely populated mangrove forests along the Makran coast. There are eight mangrove species in the Indus Delta region and 5 species along the Makran coast with species of the genus Avicennia dominating both areas. The genera and species are:

Bruguiera Conjugata, Ceriops tagal, C. roxburghiana, Rhizophora apiculata, R. mucronata, Aegiceras corniculata, Avicennia marina and Sonneratia caseolaris (Saifullah, 1982).

The Indus Delta mangrove supports local fishery enterprises such as promfrets, anchovies, Hilsa Ilisha and many others. It's also a critical shrimp habitat that provides a feeding and nursery ground for many shrimp and fish as well in the early stages of their life cycles. The marine fisheries off the Karachi/Sind coastline rely on the discharges of organic material from the Indus River and Indus Delta. Pakistan's fisheries production has increased over the years and marine and freshwater scientists have concluded that fish yields can be increased without depleting the country's marine resources. FAO estimates that production could be increased by 235,000 metric tons excluding the mesopelagic species which are important for fishmeal production but not for human consumption. The mangroves also provide a source of fire wood and other forest products and fodder for domestic camels.

Geologists that have studied the Delta believe the region contains good potential for increasing food production, water resources, agriculture, livestock, fisheries and wildlife. The Delta also shows some potential for development of certain minerals such as clays, limestone, coal and possibly oil and gas, although further oil exploration is needed to quantify that potential (Kazmi).

Recent studies indicate that there has been degradation of the Indus Delta. Environmental degradation has occurred due to the large amounts of water from the Indus River that are diverted for irrigation. The result of decreased water and sediment discharges has adversely affected the delta causing a decrease in size, increased salinity in the Delta and surrounding ground water. This rise in salinity has impacted the mangrove ecosystem. Existing forests are showing signs of environmental stress from reduced freshwater availability leading to hypersalinity and nutrient deficiencies. As the demand for freshwater in Pakistan increases for domestic and agricultural uses, the deterioration of the mangrove ecosystem will continue which is likely to have negative economic and ecological impacts. (Snedaker). It is also anticipated that freshwater and marine fisheries resources will be negatively affected.

If pesticide spraying is necessary to control the desert locust

in areas near the Indus Delta appropriate safety measures (Section 7.2) will be followed for pesticide application in ecologically sensitive areas. The Indus Delta is located near the winter/spring breeding zone of the desert locust. The Karachi/Uthal desert locust outpost detected in January, 1989 has residual adult populations in four localities; with the highest populations recorded at Tinkanda (2643.N-6624E).

Environmental studies indicate that the Indus Delta and the coastal area next to Karachi are the most polluted areas in Pakistan. The effluents present in this area include both land based domestic wastes, industrial discharges of heavy metals, salts of heavy metals, significant quantities of oil and grease and waste discharges from sea based ships. Studies conducted (Yates et al 1974) have shown that Pakistan has tripled their use of agricultural pesticides since 1968 to increase agricultural production. Their use of chemical fertilizers has also dramatically increased doubling between 1968 and 1977 (Jackson 1973). While there are beneficial gains from use of pesticides and fertilizers, overuse can result in chemical contamination of surface waters such as lakes, estuaries rivers and canals and ground water. Many of Pakistan's rivers and canals are showing dangerously high levels of chlorinated pesticides which are toxic to aquatic life (Javaid, 1989).

Since the Indus delta and surrounding areas are already showing signs of environmental stress every effort should be made to alleviate residual pesticide effects resulting from agricultural application of pesticides to nearby croplands and pesticide applications for desert locust control.

4.4.5 Human Population

Pakistan is one of the most populous countries in the world. Pakistan's total population is approximately 110 million and has an average annual growth rate of 3.1 percent which is among the highest in the world. This high growth rate means that Pakistan has a very high ratio of children to adults. Almost 45% of the population is below 15 years of age. Most of Pakistan's population (72%) is rural, however there is an increased migration to urban areas in search of employment and a better standard of living. This migration trend has had a negative impact on cities creating polluted and congested urban centers unequipped to absorb the growing demands of the population. Most of the population reside out of the desert locust control areas in the rural and urban areas of the Sind and Punjab Provinces.

5.0 PESTICIDE USE ASSESSMENT

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

5.1 USAID APPROVED INSECTICIDES FOR LOCUST CONTROL PROGRAMS

The following is an alphabetical listing of the pesticides approved in the PEA. The list includes relevant information on toxicity, bio-accumulation, and signal words (to indicate the relative toxicity of each insecticide). All of the chemicals listed below are currently registered either by the U.S. Environmental Protection Agency or its equivalent in other countries for locust and grasshopper control.

TABLE 5-1. INSECTICIDES APPROVED FOR USE IN USAID LOCUST AND GRASSHOPPER CONTROL PROGRAMS.

Sr. No.	NAME	TOXICITY TO						
		FISH	INVER	BIRD	MAMMAL	BIOAC	PERS	SIGNW
1	ACEPAHTE	L	L	L	M	L	L	C
2	BENDIOCARB	M	M	M	M	M	M	W
3	CARBARYL	L	L	L	L	L-M	L	C
4	CHLORPYRIFFOS	M	H	M	M	M	L	C-W
5	DIAZINON	M	H	M-H	L	M	M	C-W
6	FENITROTHION	L	H	H	L	M	L	W
7	LAMDA-CYHALOTHRIN	H	H	L	H	H	M	D
8	MALATHION	L	L	M	L-M	L	L	C
9	TRALOMETHRIN	H	H	L	L	H	M	D

LEGEND:

NON-TARGET ORGANISMS: FISH, INVERTEBRATES (INCLUDING HONEYBEES), BIRDS, MAMMALS

BIOAC = BIO-ACCUMULATION, PERS = PERSISTENCE,

L = LOW, M = MODERATE, H = HIGH (APPLIES TO TOXICITY LEVELS TO NON-TARGET ORGANISMS, BIO-ACCUMULATION AND PERSISTENCE; RELATIVE TOXICITY IS ALSO A FUNCTION OF FORMULATION AND ACTIVE INGREDIENT CONCENTRATION)

SIGNW = SIGNAL WORD: C = CAUTION; W = WARNING; D = DANGER (POISON); (APPLIES TO THE RELATIVE TOXICITY OF PESTICIDES IN ASCENDING ORDER; RELATIVE TOXICITY IS ALSO A FUNCTION OF FORMULATION AND ACTIVE INGREDIENT CONCENTRATION)

Specific doses of pesticides must be worked out by highly experienced personnel familiar with the application equipment, pesticide formulation, etc., to be used. For elaboration on the properties of A.I.D.-approved anti-locust/grasshopper pesticides, consult the PEA and country-specific SEAs.

5.1.1 Recommendations of the L/G Programmatic Environmental Assessment

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

Carbaryl	- Appropriate for both aquatic and terrestrial applications (but not around pollinating insects)
Diazinon	- Use should be conditional on the outcome of a current U.S. EPA review of certain registered uses
Fenitrothion	- Use with caution in aquatic environments; not recommended or 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 aquaticenvironments
Tralomethrin	- Appropriate for terrestrial use; not recommended for aquatic environments
Deltamethrin	- Very suitable for individual bands, band

	infested blocks, settled
(Decis)	swarms and swarms at roost site (settling to land or milling before departure. This pesticide is not suitable for flying swarms

5.1.2 Selection of Insecticides for the Pakistan Locust Control Program

The GOP has in the past used the following insecticides in its locust control program: malathion ULV, fenitrothion ULV, BHC powder, aldrin, DDVP (dichlorvos), and dieldrin.

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

In summary, the insecticides which are eligible for procurement or use in Pakistan with USAID assistance are those listed in Table 5-1.

5.2 INTEGRATED PEST MANAGEMENT AND LOCUST CONTROL IN PAKISTAN

Integrated pest management (IPM) consists of employing a coordinated mixture of control techniques, including chemical, biological, and cultural methods, in a scientifically based program which makes maximum use of monitoring and surveillance in order to control pest populations effectively at the earliest possible stage with the least intrusive interventions. This option is analyzed in detail in the PEA (TAMS/CICP, 1988). In fact, IPM in the case of locust control would consist of some mixture of the suggested control methods which were evaluated in the alternatives analysis component of the PEA. At the present time and for the foreseeable future, Pakistan's locust infestation will be at the outbreak

25

stage, and as stated in Section 4.3, chemical control is the only effective means of dealing with the locust problem at this level. In this context, an IPM approach consists of "the judicious use of chemicals with a willingness to utilize other control methods should they become available. In terms of field operations it amounts to good, careful chemical control." (TAMS/CICP, 1988).

5.3 APPLICATION METHODS AND EQUIPMENT

The various insecticide application technologies commonly used in locust outbreak control are described in detail in the PEA (TAMS/CICP, 1988). The Pakistan locust control program includes a mixture of modern treatment techniques, ranging from individual hand-pump and ULV sprayers to gasoline-powered backpack or vehicle-mounted mist blowers to ultra-low volume (ULV) aerial application from rotary and fixed wing platforms. The method applied in each particular instance depends on an array of site specific factors. The criteria employed for selection of application techniques form an important element of the overall control program strategy. Proposed AID assistance will probably include a package of commodities and equipment.

5.4 ACUTE AND LONG-TERM ENVIRONMENTAL AND TOXICOLOGICAL HAZARDS

A detailed analysis of the acute and chronic risks to humans associated with both public and occupational exposure to the insecticides selected for AID-funded locust control is presented in the PEA (TAMS/CICP, 1988), and is applicable to the present situation in Pakistan. The three insecticides being used against locusts in Pakistan (malathion, carbaryl, and fenitrothion) are moderately toxic to humans. The group at highest risk are the insecticide handlers (mixers, loaders, spray applicators, etc.). Field visits by the USAID staff to locust control pesticide storage and transfer centers and ongoing control operation sites revealed a reasonable level of basic occupational safety precautions to be in place, although there is room for improvement (see Section 5.9). Regarding risk to the general public, control operations for the most part are being conducted in remote, non-crop areas or rangeland, where public exposure will be at a minimum (see Section 5.7).

5.4.1 Overaged Pesticide Situation

One aspect of the Pesticide locust control program which has both safety and AID Policy implications is the disposal of overaged pesticides and empty pesticide drums.

In Pakistan there exists a large stock of overaged pesticides that were imported for use but were never used. These pesticides are being stored in an unsafe manner throughout the provinces of Pakistan. Recent survey results of pesticide stocks indicate that there are over 700 drums of pesticides such as Aldrin, BHC Powder, and Dieldrin located at various locust control posts throughout Balochistan. These drums are in very poor condition showing signs

of corrosion and rusting. Left unattended they pose a hazard to human health and the environment as many are leaking into the soil and contaminating the environment.

There are also large pesticide stocks of granules and powders such as Aldrin, BHC Powder and Dieldrin. Recent inventories indicate there are over 2000 pesticide bags located throughout Balochistan. These bags are also in very poor condition. Appendix C contains a specific inventory of these pesticide stocks.

In locust control operations in Morocco and Africa, AID has determined that, as a matter of Agency Policy, any and all empty containers resulting from provision and use of AID-funded locust control insecticides will be destroyed or otherwise rendered useless, followed by disposal in an appropriate, environmentally sound manner. Compliance with this policy in Pakistan is discussed in Section 7.0.

5.5 EFFICACY OF SELECTED INSECTICIDES FOR LOCUST CONTROL

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

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

An important area of concern is the possible interaction of locust control insecticides with public health (vector control) insecticide application programs. Problems can develop when the application of insecticides against agricultural pests results in increased resistance among disease vectors, thus decreasing the effectiveness of the vector control program. For example, applying fenitrothion to an area in which mosquitos (malaria vector) are being treated with malathion could cause irreversible resistance to malathion, as a result of the cross-resistance effect between fenitrothion and malathion in the mosquito. There haven't been any cases of cross resistance demonstrated in Pakistan.

5.7 CONDITIONS UNDER WHICH INSECTICIDES ARE TO BE USED

A general description of Pakistan's natural and human environment is provided in Section 4.4. The current and projected locust infestations are in the deserts of Cholistan and Tharparker. These areas may generally be categorized as arid to semi-arid climate. The Sind and Punjab are in the Indus alluvial plain area. The Indus Plains are comparatively green and fertile and comprise roughly about a third of the country. The majority of the population resides in these provinces which are rich in agricultural resources.

Assuming that insecticide application for locust control could occur anywhere within the regions described above, it is important to identify any environmentally sensitive areas within the region which would be at greatest risk from application of locust control insecticides, and which should therefore receive special consideration in the process leading to a decision to perform treatment and should treatment be elected, mitigative action given the prevailing arid conditions of the locust infestation region. Environmental sensitive areas are discussed below. Other protected areas are discussed in Section 4.4.3.

5.7.1 SENSITIVE AREAS

5.7.1.1 Captive Breeding Areas

There are a number of captive animal and bird breeding programs in the Provinces that are near desert locust invasions zones. In the Lal Suhanra National Park in Bahawalpur, World Wildlife Fund introduced in 1970 a blackbuck (Antilope Cerricapia) breeding area. This area covers about 728 acres on the border of the Cholistan desert just east of Bahawalpur. The total antelope population is now over 100 and the population is growing. In the Lal Suhanra Park there is also a breeding program for the marbled teal another endangered wildlife species in Pakistan.

Another endangered wildlife species is the Urial (Dvisu/orientalis punjabiensis) located in the Punjab Province predominantly in the Salt and Kala Chitta Ranges. Most of the Urial population is in the Kalabagh World Wildlife Fund Sanctuary, the private reserve of the Maliks of Kalabagh. There are also breeding programs for the Urial at Jallo Park near the city of Lahore and the Bahawalpur Zoo. There are plans to establish a Urial breeding program near the Mangla Reservoir southeast of Islamabad in the Jhelum district of Punjab.

There are quite a few threatened animal species in Pakistan. Although the Government of Pakistan has taken steps to preserve the wildlife, it is recognized that more restrictions and enforcement of existing restrictions are necessary. Consequently, the importance of conserving wildlife in Pakistan needs no emphasis. Some of the nearly extinct species are; the Western Horned Tragopan, Snow leopard, Leopard Palla's Cat, Leopard Cat, Lynx, Black and Brown Bear, Musk Dear, Nilgai, Great Indian Bustard, Balochistan Black Bear, Marcopolo Sheep and many others.

These animal conservation programs, are important areas to be cognizant of and any pesticide spraying occurring near those areas should follow the safety precautionary measures set forth in Section 7.2 Further efforts are required to geographically target and map these sensitive areas discussed in this section of the E.A.

5.7.1.2 Pakistan's Coastal Areas/Marine Fisheries

Pakistan has a coastline of about 1,050 KM that primarily contains two fishing areas, the Karachi/Sind, extending southeast from Karachi to the Indian border and the Makran coast, West of Karachi and along the coast of Balochistan to the Iranian border. These two regions are believed to contain the largest potential resources of marine fish in the world. 400 Species of fish have been recorded in these areas and of these 40 are considered to be of economic importance. Some 240 Species are demersal fish, 50 are small pelagics, 10 are medium-sized pelagics and 18 are large pelagic fish. In addition there are 15 commercial species of shrimp, 12 of squid, 1 cuttle fish, 1 octopus and 5 lobster. The common names of these fish are groupers, snapper, mackerel, herring, cat fish, shark, rays, jew fish, pomfret, Indian salmon, eels, and red snapper. In 1984, production of marine fish was estimated to be 308,050 metric tons and 70,606 metric tons of fresh water fish.

5.7.1.3 Inland Fisheries

The Indus River and its tributaries is the major area of the country's inland fisheries. The Indus River flows from the NWFP through the Punjab province where it is joined by four large rivers, the Jhelum River, the Chenab River, the Ravi River and the Sutlej River.

These rivers flow through the Punjab and converge to form a much larger Indus River before coursing through the Sind Province to the Indus Delta where it meets the Arabian Sea. A dominant feature of the Indus River system is the numerous reservoirs and the extensive canal and irrigation system that forms a network of interconnecting water courses throughout the Punjab and Sind Provinces.

This area is the breeding and feeding area for about 30 varieties of fresh water fish including species such as brown and rainbow trout, perch, cat fish, palla and mullet.

Because of Pakistan's extensive irrigation system a significant reservoir and inland fisheries has developed. The major reservoirs fisheries are managed by WAPDA whose authority extends to all provinces. The provincial Department of Fisheries manage all other fisheries including small reservoirs, lakes, rivers and canals. The major types of fisheries for each province are discussed below;

Sind Province

In the Sind Province catfish, carp and Hilsa Ilisha account for more than 70 percent of the total fish catches. In this province, the major inland capture fisheries is from rivers and canals followed by catches from lakes. Other fish species caught in the Sind include Labro Rohita, Catla Catta, Cirrhinus mrigala, finfish and shrimp. 1985-86 statistics from the Department of Fisheries indicate that the total inland fish catch was 40, 567

mt.

Punjab Province

In 1985/86, total fish production was 21,400 mt. The majority of fish produced is from the capture fisheries located on the rivers, canals and reservoirs connected to the headworks of irrigation barrages. The Mangla, Tarbella and Chashma reservoirs are rather large reservoirs and provide a significant fishing resource. The predominant species are carp (Mahaseer-Tor Putitora), and a variety of carnivorous fish including Khagga (Ritarita), Mullee (Wallago attu), Singharee (mystus aor) and Ophicephalus spp.

Balochistan

In Balochistan province there are limited possibilities for inland fisheries development because of the arid climate and scant water resources. However there have been some limited development of fish culture ponds in Dera Murad along the Sind border near Jacababad.

North West Frontier Province

In the Northwest Frontier Province (NWFP) there are many rivers that are used for sport fishing. In 1985, the NWFP total fish production was 768 metric tons. Fish species include rainbow and brown trout, mallah, carp, Mahasser and Torki. There are five hatcheries throughout the province.

5.7.1.4 Fish Hatcheries and Nurseries

Pakistan also has a number of fish hatcheries in all of the provinces. In the Sind province there are two carp hatcheries located at Chilja, Thatta District and one in Sukkur. The Department of Forestry operates two more carp nurseries, one at Mando Dero near Sukkur and one in Kandhkot. In the Punjab there are six carp hatcheries and 22 nurseries. In 1986 these hatcheries produced 18 million fingerlings. In the NWFP, the Department of Fisheries operates five trout hatcheries and one carp hatchery. In 1986 over 400,000 trout fingerlings and over 1 million carp fingerlings were produced from these facilities and are stocked in rivers, streams and reservoirs.

5.7.1.5 Wetland Sanctuaries

There are also a number of wetland sanctuaries, such as lakes and reservoirs that provide a habitat for several species of wildlife and waterfowl. The names of the lakes located in or near locust areas are Haleji, Hundero, Keenjbar, Lungh and Drigh. Six major reservoirs are located in various parts of the country: Tarbella in the NWFP and Chashma in the Punjab are on the Indus River. Mangla is in the NWFP on the Jhelum River, Khanpur is in the Punjab near Islamabad on the Haro River, Warsak is in the NWFP on

the Kabul River near Afghanistan and Hab is on the Hab River northeast of Karachi on the border between Sind and Balochistan.

Some of these wetlands harbor rare species. In Punjab, the White-head duck winters in small number on Lake Khabbaki and Lake Vcchali. The rare Barheaded Goose (Ansu indicus) winters at the Taunsa and Chashma barrage. In Sind, Haleji Lake harbors in winter a wide variety of waterfowl including the less common species of cotton teal, spotbill duck and Ruddy Shelduck. In Balochistan, Lake Zanginawar in District Chagai attracts a large concentration of ducks. There is evidence of breeding of the Marbled Teal and common pochard in Pishin District Lake Siranda in Lasbela District, a desert locust infestation area, harbors large concentrations of waterfowl and is a recognized wintering ground. There is a wildlife sanctuary in Lasbela. If there is large scale spray program in this area, it must be carefully executed to protect ecologically sensitive areas.

Nine of Pakistan's Wetlands has been designated as Wetlands of International Importance. They are listed below:

Sr. No.	Name of Wetland	District	Province
1	Thanedrawala	Bannu	NWFP
2	Malugal Dhand	Bannu	NWFP
3	Kandar Dam	Kohat	NWFP
4	Tanda Dam	Kohat	NWFP
5	Kheshki	Peshawar	NWFP
6	Khabbaki Lake	Khushab	Punjab
7	Kinjhar Lake	Thatta	Sind
8	Drigh Lake	Larkana	Sind
9	Haleji Lake	Thatta	Sind

5.7.1.6 National Parks Near Desert Locust Areas

Kirthar National Park

This park is situated in the southwest province of Sind and is located near the desert locust infested area in Lasbela. Its exact location is between latitudes 25° 10'N and 26° 05' N and longitude 67° 10' E and 67° 55' E. The park covers 308,733 hectares and provides a refuge for some wildlife that are considered to be endangered with extinction. These species are the Houbara Bustard, Sind Ibex and the Urial. Any large scale spray programs planned for this area should be carefully executed given it's close proximity to Lasbela (See Section 7.2).

Lalsohanra & Hazargangi Chiltan National Parks

The other National Parks that are located near desert locust areas are the Lalsohanra Park in Punjab and the Hazargangi Chiltan Park in Balochistan. The Lalsohanra Park has over 31,000

hectares and provides a habitat for wildlife such as Black buck, Chinkara, Blue bull and waterfowl. The Hazarganji Chiltan Park has over 12,000 hectares and provides a habitat for the Chiltan Markhor, Wild Sheep, Leopard, Chukor and Scesec.

5.7.1.7 Game Reserves

Game reserves are also present near the desert locust area. The Surjan, Sumbak, Eri, Hothiano and Pai are located on the eastern flank of the Kirthar National Park.

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

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

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

Pakistan imports 2000 metric tons (2 million kg) of pesticides (as formulated product) annually. No active ingredients are manufactured in Pakistan, but there are private sector pesticide formulators.

As discussed in Section 2.3, the GOP's pesticide regulatory system is complex and outdated. Responsibility for pesticide registration and regulatory development and enforcement lies in the GOP Plant Protection Service's 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.

In addition to its regulatory development activities, the GOP Plant Protection Services's of Pesticides and Registration conducts scientific reviews, including field testing, to screen all new pesticides proposed for importation into Pakistan 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 PPS 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 PPS has been assigned responsibility for analysis of the effects of insecticide application on non-target

flora and fauna (GOP, 1988).

In recognition of the special requirements of a large and complex operation such as the locust control program, the GOP should establish a Locust Task Force to coordinate the activities of the various GOP ministries concerned with the program, and to provide centralized guidance and operational leadership to the campaign.

The Ministry of Food, Agriculture and Cooperatives (MINFAC) should play a key role in the locust control program. The MINFAC has been assigned responsibility for developing appropriate safety measures for the general public in treated areas to minimize insecticide exposure: for informing provincial medical authorities concerning medical interventions to be applied in the event of intoxification; and for coordinating the Locust Task Force's efforts concerning occupational health among the workers handling insecticides, including prevention, detection, and treatment of poisoning cases (GOP, 1988). The MINFAC is in the process of designing a program for worker exposure monitoring (see Section 7.0), 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 MINFAC 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 the use of pasture land for at least one month following treatment with insecticides.

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

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

re-use.

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

All of this pointed up the need for technical assistance and training, which was one of the key elements of previous program's recommended environmental mitigation (see Sections 5.10 and 7.0).

5.10 PROVISIONS FOR TRAINING LOCUST CONTROL INSECTICIDE USERS

All of the proposed specialists to be provided under the technical assistance component will work very closely with GOP counterparts in the course of carrying out their responsibilities under the project, thereby imparting knowledge and skills in the form of on-the-job professional development. In addition, each specialist will conduct short-term in-service training activities for field personnel.

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

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

6.0 1993 PAKISTAN LOCUST CONTROL ACTION PLAN

6.1 BACKGROUND

USAID cannot provide any funds for locust control operations unless a Supplemental Environmental Assessment (SEA) is approved for each country that requests aid. Although the Pressler Amendment places strict limitations on aiding Pakistan, a locust plague threat is considered a regional threat and does not fall under the purview of Pressler.

The SEA is an overview of the environmental precautions that must be taken in a particular country in order to minimize environmental impact during an effective locust control operation. Once the SEA is approved for a particular country, there is no need to do a new SEA each time that USAID provides assistance to that country for locust control. Rather, an action plan is submitted to AID/W by the grantee. The action plan presented in this chapter will address environmental issues as they pertain to the 1993 locust campaign in Pakistan. For recommended procedures relating to this action plan see section 8.0, part III.

6.2 THE PROCUREMENT AND USE OF ONLY USAID-APPROVED PESTICIDES.

Nov. 1993: DPP suggests that USAID/Pakistan provide the following assistance:

TABLE 1. MATERIALS TO BE PURCHASED WITH A.I.D. FUNDS

Sr. No.	Description	Estimated Cost (US$)
1	40,000 Liters of Malathion ULV or suitable substitute	480,000.00
2	500 sets of Chemical Handling Safety Equipment	10,000.00
3	20 UFH Portable Radio Sets	16,000.00
4	6 Portable GPS navigation devices (Magellan)	9,000.00
5	Cash to help with local immediate logistical needs	35,000.00
	Total	550,000.00

The following is an alphabetical listing of the pesticides approved in the PEA. The list includes relevant information on toxicity, bioaccumulation, and signal words (to indicate the relative toxicity of each insecticide). All of the chemicals listed below are currently registered either by the U.S. Environmental Protection Agency or its equivalent in other countries for locust and grasshopper control.

TABLE 2. INSECTICIDES APPROVED FOR USE IN AID LOCUST AND GRASSHOPPER CONTROL PROGRAMS.

Sr. No.	NAME	TOXICITY TO						
		FISH	INVER	BIRD	MAMMAL	BIOAC	PERS	SIGNW
1	ACEPAHTE	L	L	L	M	L	L	C
2	BENDIOCARB	M	M	M	M	M	M	W
3	CARBARYL	L	L	L	L	L-M	L	C
4	CHLORPYRIFOS	M	H	M	M	M	L	C-W
5	DIAZINON	M	H	M-H	L	M	M	C-W
6	FENITROTHION	L	H	H	L	M	L	W
7	LAMDA-CYHALOTHRIN	H	H	L	H	H	M	D
8	MALATHION	L	L	M	L-M	L	L	C
9	TRALOMETHRIN	H	H	L	L	H	M	D

LEGEND:

NON-TARGET ORGANISMS: FISH, INVERTEBRATES (INCLUDING HONEYBEES), BIRDS, MAMMALS

BIOAC = BIO-ACCUMULATION, PERS = PERSISTENCE,

L = LOW, M = MODERATE, H = HIGH (APPLIES TO TOXICITY LEVELS TO NON-TARGET ORGANISMS, BIO-ACCUMULATION AND PERSISTENCE; RELATIVE TOXICITY IS ALSO A FUNCTION OF FORMULATION AND ACTIVE INGREDIENT CONCENTRATION)

SIGNW = SIGNAL WORD: C = CAUTION; W = WARNING; D = DANGER (POISON); (APPLIES TO THE RELATIVE TOXICITY OF PESTICIDES IN ASCENDING ORDER; RELATIVE TOXICITY IS ALSO A FUNCTION OF FORMULATION AND ACTIVE INGREDIENT CONCENTRATION)

6.3 THE SAFE DISTRIBUTION, STORAGE, USE AND DISPOSAL OF PESTICIDES AND CONTAINERS (INCLUDING PESTICIDE LABELLING, AND COLLECTION AND DISPOSAL OF EMPTY CONTAINERS).

SAFE DISTRIBUTION, STORAGE, USE AND DISPOSAL OF PESTICIDES

During the 1993 locust control campaign in Pakistan the following guidelines will be adhered to. FAO and USAID/Pakistan's Environmental Unit will monitor for compliance with:

- Guidelines for the packaging and storage of pesticides, as per Appendix D to AID Locust/Grasshopper Management, Operations Guidebook, January 1989.

- International Code of Conduct on the Distribution and use of pesticides given in Appendix E to AID Locust/Grasshopper Management, Operations Guidebook, January 1989.

- The disposal of waste pesticides and pesticides containers, as per Appendix F to AID Locust/Grasshopper Management, Operations Guidebook, January 1989.

- Control operational requirements - Aerial as given in Appendix G to the AID Locust/Grasshopper Management, Operations Guidebook, January 1989.

In 1989, USAID/Pakistan procured 190,000 liters of Malathion for GOP's DPP to be used in locust control operations. This pesticide had a shelf life of two years and was not used for locust control operations as there was not any major locust threat during that period. To use the pesticide before its expiration date, DPP decided to use it on rice crops in Punjab and NWFP.

Similarly, if at the end of 1993 locust emergency some pesticides render surplus, they will be used to meet other requirements e.g., malaria control programs or spraying on crops (if needed) like sugarcane, rice, cotton etc., or will be given to some needy third world country. DPP in consultation with USAID and FAO will determine the appropriate utilization of any remaining insecticide.

APPROPRIATE PESTICIDE LABELING

All pesticide containers will be appropriately labeled in the local language; indicating all important information in the form of recommended dose, environmental impact, warnings, handling precautions, storage and disposal guidelines and first aid instructions. This will be coordinated with DPP and will be properly monitored by USAID and FAO.

SAFE DISTRIBUTION, COLLECTION, AND DISPOSAL OF PESTICIDE CONTAINERS

USAID and FAO will maintain a regular liaison with DPP for the disposal of empty pesticide containers in accordance with the provisions of the PEA.

The following guidelines are based on observations made in the course of field visits during preparation of the Pakistan SEA, and based on AID policy as described in the PEA for Locust and Grasshopper Control in Africa and Asia.

1) Large numbers of unattended drums (both "empty" and containing material) were observed out in the open on the flight line at a number of airstrips in remote rural areas

in which access by the public is not restricted. This is an obvious safety hazard. All pesticides, and all pesticide containers which have not been both decontaminated and rendered useless, will be under 24 hour guard, even if they are in a "secure" area and/or in an enclosure under lock and key.

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

3) It is USAID policy that any and all empty containers resulting from provision and use of USAID-funded locust control insecticides will be destroyed or otherwise rendered useless, followed by disposal in an appropriate, environmentally sound manner. The following management plan for disposal of USAID-funded insecticide drums represents a reasonable compromise between what would be ultimately desirable from an environmental protection standpoint, and what is achievable in the context of the proposed project. The plan presupposes the retroactive collection and disposal of empty USAID-funded drums already in-country using the methods outlined below. It is important that the plan be instituted immediately and consistently implemented in order to avoid another backlog of drums awaiting disposal.

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

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

   c. The disposal activity itself will be carried out

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

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

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

6.4 QUALITY CONTROL

DPP personnel engaged in spraying are trained in the safe and proper use of spray equipment, calibration techniques, and the use of protective clothing, (e.g., gloves, gas masks, etc.). DPP personnel have been trained to use Micron Sprayers. Outside personnel hired for spraying and dusting are first trained in application and safety measures. See Item 3 in PEAP (Appendix F).

6.5 TRAINING OF SPRAYERS IN SPRAYING TECHNIQUES AND HEALTH AND SAFETY REQUIREMENTS.

The GOP has in place a strong institutional structure for managing the locust control program, the effectiveness of which could be enhanced by interaction with expert counterparts through the provision of specialized technical assistance. All of the proposed specialists to be provided under the technical assistance component will work very closely with GOP counterparts in the course of carrying out their responsibilities under the project, thereby imparting knowledge and skills in the form of on-the-job professional development. In addition, each specialist will conduct short-term in-service training activities for field

personnel.

See Item-4 in PEAP (Appendix F)

6.6 NOTIFICATION OF AFFECTED COMMUNITIES VIS-A-VIS SPRAYING PLANS AND PRECAUTIONS

For a desert, the Thar is highly populated with reportedly over 500,000 people living in small villages and making a living from herding and rainfed crops grown between the dunes. Caution will have to be exercised if aerial spraying is to be widely employed as the herders may be spread throughout the desert to take advantage of the good vegetation cover. The people and their herds could be exposed to pesticides. Regarding risk to the general public, control operations for the most part are being conducted in remote, non-crop areas or rangeland, where public exposure will be at a minimum.

It is recommended that there be no spraying in human settlements.

See Items 5 & 6 in PEAP (Appendix F).

6.7 AVOIDANCE OF SPRAYING HUMAN SETTLEMENTS, ECOLOGICALLY SENSITIVE AREAS, PROTECTED AREAS, AND THE HABITATS OF IMPORTANT SPECIES (ESPECIALLY WETLANDS AND ENDANGERED SPECIES)

It is recommended that there be no spraying in human settlements or environmentally fragile areas.

Proper counseling for pilots and other spraying staff will be conducted on a regular basis to make sure that environmentally fragile areas are protected. Army Helicopters are being used to point out the exact targets of heavy locust infestation for spray.

The parks and protected areas that lie within the desert locust area are in Balochistan. These protected areas are listed below.

PARKS/PROTECTED AREAS THAT LIE WITHIN DESERT LOCUST AREA IN BALOCHISTAN

Sr. No.	Name	Area (Hectares)	Wildlife of the Area
1	National Park Hazarganji Chiltan, Balochistan	12,567	Chiltan Markhor, Wild Sheep, Leopard, Chukar and Scesec

Sr. No.	Name	Area (Hectares)	Wildlife of the Area
	Wildlife Sanctuaries		
1.	Band Khush Dil Khan	1,296	Waterfowl and Scesec
2.	Masalakh	46,559	Chinkara, Scesec, Houbara Bustard, Sand Grouse, Urial & Chukor
3.	Surkhab	3,757	Urial, Chukor, and Scesec
4.	Sasnamana	6,607	Chukor, Scesec and Hare
5.	Ziarat	37,247	Urial, Markhor, Scesec & Chukor
6.	Juniper	24,356	Ibex, Urial, Leopard, Chukor and Scesec
7.	Koh-e-Geish	21,660	
8.	Kachau	30,567	Chinkara, Urial, Houbara Bustard
9.	Dhrun	29,555	Chinkara & Urial
10.	Shasham	19,433	Ibex, Urial, Chukor and Scesec
11.	Chorani	178,259	Ibex, Urial, Leopard & Bear
12.	Duriji	18,345	Chinkara, Ibex, Urial, Scesec, Sand Grouse and Houbara Bustard
13.	Khurkhera	125,425	Grey Partridge, Sand Grouse and Houbara Bustard
14.	Raghai Rakshan	33,198	Chinkara, Ibex & Urial
15.	Kolwah Kap	145,101	Chinkara, Urial, Sand Grouse, Houbara Bustard and Grey Partridge
16.	Buzi Makola	1,687,579	Chinkara & Ibex
	Lasbela		Chinkara, Ibex, Sand Grouse and Houbara Bustard

Sr. No.	Name	Area (Hectares)	Wildlife of the Area
	Game Reserves		
1.	Zawarkan	3,887	Markhor, Urial, Chukor & Scesec
2.	Ras Koh	11,660	Ibex, Urial, Chukor & Scesec
3.	Gogi	7,773	Chukor
4.	Wam	10,364	Leopard & Chukor

Following are specific guidelines for locust operations in ecologically sensitive areas:

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

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

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

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

appropriate officials or specialists.

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

3) Post-application biological and insecticide residue monitoring will be performed at selected sites during this locust campaign to identify any adverse environmental impacts of spray operations. The results of the monitoring should be factored into planning of subsequent operations in the affected areas.

6.8 MONITORING OF PESTICIDE USE, EFFECTIVENESS, AND SAFETY

The GOP 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. Since it may take up to 48 hours for insecticides such as malathion, carbaryl, and fenitrothion to result in significant locust mortality, control workers normally have moved on to other areas before results of treatment are observable. Any assessments of efficacy which are made are approximations only, and are not based on quantitative sampling techniques. The findings of AID's efficacy field trials (Dynamac, 1988) will be applied to the Pakistan program as appropriate.

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

In addition, cholinesterase blood levels will be monitored in workers that deal with these insecticides. If cholinesterase blood levels in a particular person are below normal, that person will not work with organophosphate insecticides until his or her cholinesterase levels are normal again.

Under the 1990 procurement, the MINFAC received 15 field kits and a supply of associated expendable items for routine monitoring of whole-blood cholinesterase levels in workers exposed to pesticides

44

in the course of the GOP locust control program. The kits were designed for use under harsh field conditions by technicians with minimal training. The use of this kit allowed the MINFAC to screen workers for cumulative intoxication with cholinesterase-inhibiting pesticides (organophosphates, including malathion and fenitrothion) and thus prevent potential cases of chronic pesticide poisoning.

In 1990, a consultant was contracted to conduct a training program in the use of the test kit for GOP's MINFAC and technicians assigned to the previous locust control campaign. The Consultant was also responsible for advising the MINFAC on the development and implementation of a national program for the protection of workers at risk due to high body burdens of cholinesterase-inhibiting pesticides based on data collected using the test kit. Finally, the Consultant advised the MINFAC on administrative and management techniques for timely and effective use of worker monitoring results by means of appropriate methods for data management and handling.

6.9 FAO ACTION PLAN

The following FAO action plan is summarized from the information given in Appendix D. For information on radios, training, and how USAID funds will not be used in conjunction with BHC see Appendix F.

1. Aerial surveys are conducted to determine where there are patches of green vegetation in the desert regions. Currently airplanes are being used. A helicopter is required for target search and directing spray aircraft onto the target.

2. Ground teams are sent to these regions to search for locusts. Ground teams:
    1) Record the approximate density of locusts, and the area they cover;
    2) Record the stage of development of the locusts observed;
    3) Record the locust behavior (e.g., laying, hatching, marching, swarming, etc.);
    4) Control hopper bands using BHC 10% dust, dispersed by hand.
3. Swarms are treated with Ultra Low Volume (ULV) malathion, ULV fenitrothion, and dieldrin; applied with exhaust nozzle sprayers and small AMT aerial control. Three spraying aircraft have been deployed in the Thar desert.

[Note: USAID/Pakistan's proposed assistance for the current locust emergency in Pakistan is mentioned in Section 4.1.4. An Action Plan to combat the current locust threat is given in Appendix-D, FAO Reference: Locust.018 of August 22, 1993, i.e., Locust Emergency in Pakistan (Communication No. 4). Resident Coordinator, FAO Office/Islamabad is the focal point for donor assistance to the Government of Pakistan for Locust Control Operations. FAO Letter Ref: Locust.018 of August 22, 1993 addresses Environmental Considerations during locust control

campaign and FAO will be responsible for monitoring.]

7.0 ENVIRONMENTAL IMPACTS AND MITIGATION PLANS

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

1. For a desert, the Thar is highly populated with reportedly over 500,000 people living in small villages and making a living from herding and rain fed crops grown between the dunes. Caution would have to be exercised if aerial spraying was to be widely employed as the herders have spread throughout the desert, taking advantage of the good vegetation cover. The people and their herds could be exposed to pesticides.

MITIGATION PLAN: See Item 5 of PEAP (Appendix F).

2. Aerial and ground application of locust control insecticides will have significant effects on some non-target organisms, including locust predators and parasites; pollinators and other beneficial insects; birds (especially in the case of fenitrothion); and possibly some higher animals.

MITIGATION PLAN:
Biological monitoring of impacts on non-target organisms is a critical component of the proposed project, and the results of these studies must feed back into overall management of the locust control program. Similarly, any relevant findings of AID's insecticide field testing program (Dynamac, 1988) will be taken into consideration during project implementation.

3. Insecticides may be applied near some or all of the protected and/or sensitive ecological areas identified and described in Sections 4.4.3 and 5.7 of this SEA. If swarms are treated from the air, there is a potential for wind-drift of the insecticides into the protected areas.

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

1) Under no circumstances should aerial application of insecticides occur in legally protected areas (see Section 4.4.3). If hopper bands are present in the protected area, treatment should be deferred until the hoppers move out of the area. Control can be achieved in that case by placing an insecticide around the perimeter of the protected area

47

(with at least a 100 m buffer zone). If compelling circumstances make treatment of hopper bands within the protected area an absolute necessity, this should be done by means of selective spraying of hoppers with malathion using ground equipment only. If swarms are present in the protected area, treatment should be deferred until they move out of the area.

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

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

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

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

3) Post-application biological and insecticide residue monitoring should be performed at selected sites during each locust campaign to identify any adverse environmental impacts of spray operations. The results of the monitoring should be factored into planning of subsequent operations in the affected areas.

4. Organophosphate insecticides, such as malathion and fenitrothion, can cause reversible nerve damage in humans by inhibiting the enzyme cholinesterase.

MITIGATION PLAN:
Workers will be provided with protective clothing to reduce

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

In addition, cholinesterase blood levels will be monitored in workers that deal with these insecticides. If cholinesterase blood levels in a particular person are below normal, that person will not work with organophosphate insecticides until his or her cholinesterase levels are normal again.

Under the 1990 procurement, the MINFAC received 15 field kits and a supply of associated expendable items for routine monitoring of whole-blood cholinesterase levels in workers exposed to pesticides in the course of the GOP locust control program. The kits were designed for use under harsh field conditions by technicians with minimal training. The use of this kit allowed the MINFAC to screen workers for cumulative intoxication with cholinesterase-inhibiting pesticides (organophosphates, including malathion and fenitrothion) and thus prevent potential cases of chronic pesticide poisoning.

A consultant was contracted to conduct a training program in the use of the test kit for GOP's MINFAC and technicians assigned to the previous locust control campaign. The Consultant was also responsible for advising the MINFAC on the development and implementation of a national program for the protection of workers at risk due to high body burdens of cholinesterase-inhibiting pesticides based on data collected using the test kit. Finally, the Consultant advised the MINFAC on administrative and management techniques for timely and effective use of worker monitoring results by means of appropriate methods for data management and handling.

5. BHC is being applied by the GOP. When compared to organophosphates (e.g., malathion and fenitrothion) BHC has relatively high residual activity, relatively high bioaccumulation, and relatively high oral toxicity. Under USAID guidelines, USAID funds may not be used to purchase any chlorinated hydrocarbon insecticides (e.g., BHC and DDT); nor can any equipment purchased with USAID funds be used in conjunction with the application of chlorinated hydrocarbons.

MITIGATION PLAN: See Item 1 in PEAP (Appendix F)

6. As discussed in Sections 5.4 and 5.9, improper management of insecticide drums (whether full or empty) can result in severe safety and health hazards and environmental impacts. Due to the scale and complexity of Pakistan's locust control program, large numbers of drums of liquid insecticide are involved. Proper management of these drums throughout the extensive distribution network, from acceptance

through disposal, represents a significant logistical and management challenge.

MITIGATION PLAN:
The following guidelines are based on observations made in the course of field visits during preparation of this SEA, and on AID policy.

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

2) As discussed in Section 5.4, insecticide drums are subject to very rough handling in transit from the point of reception to point of use. Due to the danger of spills and accidents from ruptured drums, and the near impossibility of uniform enforcement of proper drum handling procedures, it is recommended that 30 gallon (as opposed to 55 gallon) drums of the heaviest possible gage steel be specified in all insecticide procurements.

3) As discussed in Section 5.4, it is AID policy that any and all empty containers resulting from provision and use of AID-funded locust control insecticides will be destroyed or otherwise rendered useless, followed by disposal in an appropriate, environmentally sound manner. The following management plan for disposal of AID-funded insecticide drums represents a reasonable compromise between what would be ultimately desirable from an environmental protection standpoint, and what is achievable in the context of the proposed project. The plan presupposes the retroactive collection and disposal of empty AID-funded drums already in-country using the methods outlined below. It is important that the plan be instituted immediately and consistently implemented in order to avoid another backlog of drums awaiting disposal.

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

   b. Basic facilities, equipment, and supplies required at

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

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

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

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

8.0 DESERT LOCUST PROGRAM RECOMMENDATIONS

The following recommendations (which are specific for Pakistan) are consistent with general recommendations in the PEA for Locust and Grasshopper Control in Africa/Asia. The numbers associated with the Pakistan recommendations, do not correspond to the numbers associated with the recommendations in the PEA.

DESERT LOCUST RECOMMENDATIONS

The recommendations are divided into Sections I through VI. The one recommendation in Section I is a pre-condition for all of the others.

Section II contains recommendations whose implementation should commence immediately.

Section III contains recommendations that should be implemented in the current locust and grasshopper control program.

Section IV includes high priority recommendations that should be implemented with some urgency.

All four sections -- I through IV -- contain a set of recommendations that are considered to be essential if AID is to remain involved in locust and grasshopper control.

Sections V and VI contain recommendations that are desirable but of a lower priority. The Sections differ in that V contains recommendations that are related only to locust and grasshopper control while the recommendations in Section VI have a broader sweep and involve items that go outside of the narrow locust and grasshopper control definition.

SECTION I

Recommendation 1

It is recommended that the institutional capacity of GOP to deal with long term locust management be strengthened.

SECTION II

As a pre-condition to many of the recommendations there is an immediate need to take stock of the situation in the field at the present time. To this end we would argue for Recommendations 2, 3, and 4 being addressed as a matter of urgency with implementation being started at the earliest possible opportunity

INVENTORY AND MAPPING

From an environmental standpoint the most urgent need is to identify the areas that are environmentally fragile.

Recommendation 2

It is recommended that an inventory and mapping program be started to determine the extent and boundaries of environmentally fragile

areas.

These would be areas containing wildlife species of particular concern, national parks, forest resources and wetlands. This mapping needs to be done on a country-by-country basis; only when it has been done can recommendation 5, regarding areas that should be protected from spraying, be implemented effectively.

Such an inventory and mapping will, of course, be of use outside of the rather narrow confines of locust and grasshopper control. It will be a resource that can be utilized to address the environmental consequences of a wide range of projects in the countries involved.

Under Section 4.4 of this SEA "Affected Environment", details have been provided on environmentally fragile and sensitive areas. In addition, in Appendix E to this SEA a list of Parks and Protected areas in Pakistan have been attached and a map of Pakistan has also been attached highlighting the Parks and Protected areas and the areas of heavy locust infestation.

An equally urgent need is to address the pesticide disposal issue. There are at present stocks of obsolete pesticides from previous agricultural uses of pesticides in many of the Provinces of Pakistan. These stocks are posing serious environmental problems. Therefore:

Recommendation 3
It is recommended that an inventory of existing chemical stocks be made.

This inventory should look at existing stocks of chemicals, the existing storage facilities, the disposal facilities, the disposal procedures and laws, and chemical accounting procedures.

GOP's DPP has a system for pesticide inventory and storage facilities at all the locust main offices in Punjab, Sind and Balochistan provinces. A list of locust command posts is given in Appendix-B. An overaged pesticides inventory with DPP as of May 1990 is given in Appendix-C.

Stocks of chemicals currently available with DPP are mentioned in FAO Office Memorandum of August 1, 1993 (copy attached in Appendix-D).

During the current locust control campaign in Pakistan these guidelines will be followed. FAO and USAID/Pakistan's Environmental Unit will monitor for compliance with the following:

- Guidelines for the packaging and storage of pesticides, as per Appendix D to AID Locust/Grasshopper Management, Operations Guidebook, January 1989.

- International Code of Conduct on the Distribution and use

of pesticides given in Appendix E to AID Locust/Grasshopper Management, Operations Guidebook, January 1989.

- The disposal of waste pesticides and pesticides containers, as per Appendix F to AID Locust/Grasshopper Management, Operations Guidebook, January 1989.

- Control operational requirements - Aerial as given in Appendix G to the AID Locust/Grasshopper Management, Operations Guidebook, January 1989.

In 1989, USAID/Pakistan procured 190,000 liters of Malathion for GOP's DPP to be used in locust control operations. This pesticide had a shelf life of two years and was not used for locust control operations as there was not any major locust threat during that period. To save this pesticide from becoming an overaged/obsolete, an environmental hazard and an added amount of work for its disposal, it was decided to use it on rice crop in Punjab and NWFP and was properly utilized.

Similarly, if at the end of current locust emergency some pesticides render surplus, they will be used to meet other requirements i.e., malaria control programs or spraying on crops (if needed) like sugarcane, rice, cotton etc., or will be given to some needy third world country. DPP in consultation with USAID and FAO will decide for its appropriate utilization.

It is also necessary, if USAID is to remain in the locust and grasshopper control program, for there to be better information on the equipment, manpower and procedures that are already in place, on a country-by-country basis. Without this information it is difficult to evaluate the requests for assistance when they are received. Thus, Recommendation 4:

Recommendation 4
It is recommended that an inventory of manpower, procedures and equipment be carried out.

This inventory would list the available equipment in terms of planes, spraying equipment, vehicles; the availability of trained manpower including technicians, chemists and environmental scientists; the present environmental and public health monitoring procedures and the state of the existing crop protection service. This information is necessary before recommendations 9, 12 and 13 can be usefully implemented.

Recommendations 2, 3 and 4 can be commenced at the same time by a single team. It is recognized that to try to implement these recommendations across the board, in all countries where AID is involved in locust and grasshopper control, would be an impossible task. Therefore it should be commenced as soon as possible, on a pilot basis, in three or four selected countries.

INFORMATION EXCHANGE

Recommendation 5
It is recommended that USAID facilitate exchange of information on desert locust invasions occurring on the international borders between India and Pakistan, Pakistan and Iran and Pakistan and Afghanistan.

During the environmental assessment it became apparent that technical exchange of information between India and Pakistan and other border countries regarding desert locust invasions were not occurring as frequently as needed nor in enough technical detail resulting in Pakistan aerially spraying banned pesticides, such as Dieldrin for precautionary measures on their border areas. For example, in Cholistan Desert from Bahawalpur to Rahim Yar Khan, Pakistan Plant Protection officials routinely aerially spray because they are not confident that India controls the locust invasions occurring in Rajasthan when prevailing winds are towards Pakistan.

PESTICIDE STOCKS
Recommendation 6
It is recommended that unused Malathion stocks intended for desert locust control be used in U.S. AID's Malaria Control Project.

Outbreaks of desert locust did not occur as frequently nor with the intensity anticipated resulting in a large quantity of malathion drums in storage. It is recommended that the Malaria Control Project use this excess of Malathion in the upcoming year as the shelf life for Malathion is approximately 2 years.

SECTION III

Recommendations in this section should have immediate application in any locust and grasshopper control that AID is involved.

MITIGATION
Recommendation 7 It is recommended that there be no spraying in environmentally fragile areas and human settlements.

Buffer zones of 5 km should be established around water bodies and buffer zones of 15 km established around areas containing endangered species or in critical habitats.

The implementation of this Recommendation in an effective manner is dependent upon Recommendation 2 being implemented.

Environmentally fragile areas have been highlighted in Section 4.4, 4.6, 5.0, 6.0 and 7.0 of this SEA. A map has been provided in Appendix E. USAID and FAO will closely monitor and coordinate with GOP's DPP for protection of these areas.

Quality control: proper counseling for pilots and other spraying staff will be conducted on a regular basis to make sure that environmentally fragile areas are protected. Army Helicopters are

being used to point out the exact targets of heavy locust infestation for spray.

Outside of the fragile areas spraying needs to be carried out with caution, bearing in mind that all pesticides are toxic to species other than the target species. In no case should aerial spraying of pesticides be conducted closer than 500 meters to aquatic resources. Every one of the pesticides examined in this report are toxic to associated invertebrates including non-target competitors, predators and community/complex species. In addition, some of them are toxic to mammals, birds or fish. Therefore:

Recommendation 8
It is recommended that pesticides used should be those with the minimum impact on non-target species. See section 6.9.

FAO/GOP plan to use ULV formulations of Malathion or Fenitrothion. AID approved insecticides for Locust Control Programs is given in Section 5.1 of this SEA. The most suitable insecticide is malathion. Extreme care will be exercised while using Fenitrothion as it is highly toxic to invertebrates and birds. Areas having wet-lands, wildlife sanctuaries and game reserves will not be sprayed, see Section 4.4.4 in this SEA for details. Proper counseling of spraying crew will be conducted by DPP and USAID & FAO will keep regular monitoring/liaison for compliance.

BOX - indicates which pesticides have the most effect on the different ecosystems. Those marked "yes" can be used with caution in the ecosystem indicated. Those marked "caution" should only be used with appropriate mitigative measures and those marked "no" should never be used in the environment indicated,

BOX - PESTICIDE EFFECT IN AQUATIC AND TERRESTRIAL ECOSYSTEMS

Pesticide	Aquatic	Terrestrial
Carbaryl	Yes	Yes (1)
Diazinon	Caution (3)	Caution (3)
Dieldrin	No	No
Fenitrothion	Caution (2)	No (2)
Lindane	No	No
Malathion	Caution	Yes
Propoxur	Yes	Caution
Acephate	Yes	Yes
Bendiocarb	Yes (4)	Caution
Chlorpyrifos	Caution	Caution (4)
Cypermethrin	No	Yes
Lambda-Cyhalothrin	No	Yes
Tralomethrin	No	Yes

(1) not around bees
(2) this insecticide is highly toxic to birds
(3) conditional on the outcome of review presently under way
(4) testing and data very limited

In itself, the careful selection of pesticides and the avoidance of spraying in environmentally sensitive areas is not sufficient. Monitoring the impact of the spraying is also necessary. Therefore:

Recommendation 9
It is recommended that post-treatment monitoring and sampling of selected organisms and water and soils be carried out.

Whenever possible, pre-treatment baseline data for selected organisms or parameters should be established.

APPLICATION
The approach to be adopted in application should be one of limited, well-timed spraying of carefully designated areas. With early intervention in the outbreak cycle utilized in order to minimize the need for applications. In the case of the Desert Locust, spraying should be concentrated on areas where they assemble in gregarious waves prior to moving across mountain barriers. Other species of locust can also be sprayed in breeding and outbreak areas which are geographically limited. In local control programs the use of baits should be encouraged and supported. Therefore:

Recommendation 10
It is recommended that one of the criteria to be utilized in the selection of control techniques should be a

minimization of the area to be sprayed.

The current locust threat is extremely serious in nature so all the options in the form of ground and aerial spray are being used. Army and local district administrations are also helping DPP in control operations. FAO and USAID have regular contact with DPP to sure that accuracy in spraying is maintained and that wherever possible ground treatment will be preferred over aerial treatment.

Accuracy in spraying is essential, and ground treatment should be favored over aerial treatment wherever possible.

Recommendation 11
It is recommended that helicopters should be used when aerial treatment is indicated and accurate spraying is necessary, such as close to environmentally fragile areas.

GOP's DPP has a fleet of small aircraft. About 10 Cessna Airplanes are currently being used for spraying operations. Army helicopters and DPP's navigation staff are helping for spotting the spray targets. DPP has a well-trained staff to properly handle, load and accurately spray the pesticides. Mapping, guidance and communication is partially available through DPP staff and Army. Although access to the desert areas is extremely difficult, the DPP staff is knowledgeable about the area. FAO and USAID will maintain a regular liaison with DPP on this aspect and will continue monitoring.

Recommendation 12
It is recommended that small planes should, whenever possible, be favored over large planes such as four-engine transport type and that experienced contractors be used.

Where aerial spraying is carried out, the following guidelines should be followed:

- Pilots and contractors who have demonstrated past, proven performance should be selected. Contracts should never be based solely on the basis of a low bid.

- Contractors who are able to provide the necessary equipment and trained personnel, both local and expatriate, to properly handle, load and accurately spray the pesticide, should be selected.

- Mapping, guidance and communication must be in place and adequate prior to any spraying.

With regard to the large plane option, it needs to be recognized that this is not an environmentally sound approach to locust and grasshopper control, as small planes

are better for pinpoint spraying. In addition, they are easier to operate in remote areas, less expensive, and more suitable for Pakistani conditions with the small air strips already available in the target areas. There may however, be areas that are only accessible to large planes and if they are to be sprayed this might be the only option. Large planes should always be regarded as the last resort to be used only when no other approach is possible.

In order to adopt a careful, environmentally sensitive approach to chemical control:

Recommendation 13
It is recommended that chemical control efforts should be supported by a strong technical assistance component.

This component should include specialists in survey, aerial and ground control application, logistics, environmental monitoring, communications and training. AID should also assist host countries in setting up an adequate system of management and accounting for chemicals.

SECTION IV

The Recommendations in this Section are of high priority and should be addressed as such. All of them should be implemented if AID is to remain involved in locust and grasshopper control.

DISPOSAL
One of the major environmental hazards growing out of past locust and grasshopper control program, (as well as other pest control programs), is the stock of obsolete and out of date chemicals to be found in many parts of Pakistan. (These include BHC, aldrin, heptachlor and dieldrin). Therefore:

Recommendation 14
It is recommended that AID provide assistance to host governments in disposing of obsolete pesticides.

USAID and FAO will maintain a regular liaison with DPP for disposal of empty pesticide containers in accordance with the provisions provided in the PEA.

PUBLIC HEALTH
An area that has been neglected in the past, but that needs to be addressed is that of public health. Therefore:

Recommendation 15
It is recommended that training courses be designed and developed for health personnel in all areas where

pesticides are used frequently.

The purpose of these courses would be to familiarize health workers with the symptomatology of pesticide poisoning and provide information on appropriate measures for first aid, specific treatment, prevention and referral to a hospital center.

Recommendation 16
It is recommended that each health center and dispensary located in an area where pesticide poisonings are expected to occur should be supplied with a large wall pamphlet in which the diagnosis and treatment of specific poisonings are depicted.

Recommendation 17
It is recommended that presently available tests for monitoring human exposure to pesticides should be evaluated in the field. This includes measurement of cholinesterase levels in small samples of blood as a screening test. The DPP do not have any test kits. The DPP personnel are regularly checked medically by the Civil Aviation Medical Doctor and the Federal Government's Civil Surgeon of the Ministry of Health.
See Item 7 in the PEAP (Appendix F).

Special attention should be given to improving the logistics for specimen collection and preservation. If the presently available methods prove to be inadequate, attempts could be made to develop a cheap semi-quantitative microtest that could be distributed widely. The test for the direct determination of pesticides and of their metabolites in urine and blood should also be evaluated under different field conditions.

CHEMICAL FORMULATION AND MANAGEMENT
There are, at present, problems regarding the suitability of some formulation, labelling and packing of chemicals for use in the countries where they are required for locust and grasshopper control. Therefore:

Recommendation 18
It is recommended that specifications should be developed and adopted for all AID purchased locust insecticides.

These specifications should state that these insecticides be specifically formulated for storage and use under tropical conditions. Specifications presently under development by FAO might be suitable for AID use.

Recommendation 19
It is recommended that pesticide container specifications be developed.

Containers need to be sufficiently durable for transportation and storage under tropical conditions. Also the size should be appropriate size for the end user, not just the most economical size.

Recommendation 20
It is recommended that all containers be appropriately labeled. All pesticide containers will be labelled in local language indicating all important information in the form of recommended dose, environmental impact, warnings, handling precautions, storage and disposal guidelines and first aid instructions. This will be coordinated with DPP and will be properly monitored by USAID and FAO.

BIOLOGICAL CONTROL
If locust and grasshopper control is to move beyond solely chemical control there is a need to test pathogens in the field. At present the only one that shows promise is Nosema. There is, at present, no evidence that Nosema can control African or Asian locust and grasshopper populations. Therefore:

Recommendation 21
It is recommended that Nosema be field tested under Pakistan conditions.

The research and testing should determine the following for each target pest species:

- Optimal application testing
- Efficacy demonstrated in terms of population suppression
- Best application techniques

TRAINING
AID is already active in the area of training and this should continue. There are some areas in which training programs need to be instituted. Therefore:

Recommendation 22
It is recommended that a training program for scheduled USAID Mission personnel who have responsibility for control operations be developed.

Emphasis in this program should be on sound IPM approaches and environmental concerns, including public health and safety.

Recommendation 23
It is recommended that local programs of training be instituted for Pesticide store management, environmental monitoring and public health (see Recommendation 15).

Under the current Pressler imposed policy constraints,

USAID is only providing support for immediate requirements; keeping in mind that locust control is a regional problem. USAID is not supporting any training for the locust program. However, FAO is providing counseling services to DPP for safe pesticide handling, storage, spraying and disposal of empty container techniques. See Item 4 in the PEAP (Appendix F).

DPP conducts regular workshops on safe and efficient use of pesticides to train its personnel as well as those of the provincial agriculture departments. Three workshops have been conducted: one in May 1990 under WHO/FAO on pesticide toxicology and safe use, and two workshops in 1992 (one at Multan and the other at Karachi) under FAO-TCP/PAK/0051. The overall responsibility for health and safety measures lies with the Head of the DPP.

ECONOMICS

A constant problem in trying to evaluate locust and grasshopper control in economic terms is the lack of data. If control measures are to be evaluated there is a need for this data. Therefore:

Recommendation 24

It is recommended that field research be carried out to generate economic data.

Areas that will need to be addressed include:

- What are crop outputs in a "normal" year and what is the impact on the outputs from the normal locust population?
- What is the effect on output of an uncontrolled locust swarm?
- What amount of output is saved by the various locust control measures?
- What is the total cost -- both local and donor -- of various locust control measures?

The economic threshold for intervention needs to be refined. AID has already contracted, with Oregon State University, for work to be done in this area. For the present:

Recommendation 25

It is recommended that no pesticide should be applied unless the provisional threshold is exceeded by pest numbers.

SECTION V

The implementation of Recommendations in this Section is considered desirable but are not of the same urgency as the

recommendations in the Sections above.

STORAGE
Storage for pesticides in many countries involved in locust and grasshopper control programs is frequently insufficient and inadequate. Therefore:

Recommendation 26
It is recommended that more pesticide storage facilities be built.

FORECASTING
Any locust and grasshopper control program can be more effective if good forecasting methods are developed. The most promising methods of forecasting at present under development, rely upon remote sensing. AID can opt for continuing to develop the remote sensing methods for locust and grasshopper early warning and environmental monitoring that it has been sponsoring under its own aegis, or it can propose that locust and grasshopper control teams use the services of the FAO's locust early warning program and its upcoming part in the ARTEMIS system. The first option gives AID more control over its data and procedures, but at the expense of overseeing and funding the effort. In the second case it would lose a certain amount of control over the information, but gain access to a remote sensing and pest early warning program that is already semi-operational and apparently well advanced in program planning. Therefore:

Recommendation 27
It is recommended that AID make a decision as to whether to continue funding forecasting and remote sensing or utilize the FAO's early warning program.

If the decision selects the FAO option, then good liaison needs to be set up to ensure that FAO provides good, on time information to locust and grasshopper control programs.

PUBLIC HEALTH
There is a need to develop more information on the public health impact of pesticides in the countries where the locust and grasshopper spraying is being carried out. Health and nutrition in many of these countries is markedly different from that of the industrialized world and the impact on the human population could be very different. Therefore:

Recommendation 28
It is recommended that a series of epidemiologic case-control studies, within the countries involved in locust and grasshopper control, should be implemented in areas of heavy human exposure to pesticides.

Cases with and without specified conditions should be studied for differences in the degree of pesticide exposure and ability of effective detoxification. Health conditions to be considered may include symptomatic schistosomiasis, chronic hepatitis, HB antigenemia, pregnancy and birth defects, symptomatic vs. asymptomatic vitamin A deficiency, etc. Likewise, a retrospective comparative study between cases with symptomatic pesticide poisoning and asymptomatic control subjects heavily exposed to the same pesticides should be made to identify possible risk factors. Hypothetically, the following health conditions could be considered as pre-disposing factors that decrease pesticide tolerance: skin lesions, malnutrition, vitamin A deficiency, pica (earth eating), and chronic liver diseases.

RESEARCH

There is a need for applied research in locust and grasshopper control, especially in the area of efficacy of various chemicals. Therefore:

Recommendation 29

It is recommended that applied research be carried out into the efficacy of various pesticides and their application.

Specific areas to be addressed include:

- bendiocarb as bait
- chlorpyrifos as barrier spray
- carbaryl as barrier spray
- carbaryl as bait
- acephate on dry vegetation
- propoxur as liquid spray

There is also a need to determine how effect antifeedants can be as part of an IPM approach to locust and grasshopper control. At present the only antifeedant that shows some promise is Neem. Therefore:

Recommendation 30

It is recommended that applied research be carried out on the use of Neem as an antifeedant.

One area in which we require more information is that of the impact of organophosphates in relation to their use with other chemicals. Therefore:

Recommendation 31

It is recommended that research be carried out to determine the best techniques for assessing the impacts of organophosphates used for locust and grasshopper control in relation to the use of these and other chemicals for other pest control programs.

9.0 LIST OF PREPARERS

This environmental assessment was prepared and modeled after the Morocco Locust Control Project (608-0196), May 11, 1988; the SEA of the Eritrean Locust Control Program; the Sea of the Ethiopian Locust Control Program; and the Programmatic Environmental Assessment for Locust and Grasshopper Control in Africa/Asia (March 1989) by Tams Consultants, Inc. New York, NY/Washington, D.C. and Consortium for International Crop Protection, College Park, M.D.

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APPENDIX A

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APPENDIX B: Part I

PAKISTAN LOCUST CONTROL COMMAND POSTS

PAKISTAN LOCUST CONTROL COMMAND POSTS

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DEPARTMENT OF PLANT PROTECTION
MINISTRY OF FOOD, AGRICULTURE AND COOPERATIVES
GOVERNMENT OF PAKISTAN
MALIR HALT, SHARAH-E-FAISAL, KARACHI

MAIN OFFICES

PUNJAB	SIND	BALOCHISTAN
1. Bahawalpur 2. Rahim yar Khan	1. Mirpur Khas 2. Sukkar	1. Urthal 2. Pasni 3. Turbat 4. Panjgur 5. Kharan 6. Khuzdar 7. Nushki 8. Quetta

APPENDIX B: Part II

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

STATEMENT OF WORK AND ILLUSTRATIVE COSTS

ENTOMOLOGIST/ENVIRONMENTAL MONITORING SPECIALIST

I. OBJECTIVE

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

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

II. QUALIFICATIONS AND EXPERIENCE

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

III. STATEMENT OF WORK

A. General

The Contractor's effort during each TDY shall be organized around two principal scopes which will run simultaneously and in parallel. Scope A will consist of

activities associated with technical direction of the large scale control effort, while Scope B will entail environmental and biological monitoring of the pesticide application program. Activities will be field oriented, under harsh environmental conditions.

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

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

B. Specific

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

SCOPE A AND B:

1. Perform a two-day official TDY in AID/Washington immediately before and after each Pakistan TDY to receive/deliver briefings on the current locust situation and to confer on other project matters with Pakistan Locust Control Project backstop personnel.

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

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

SCOPE A:

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

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

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

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

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

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

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

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

SCOPE B:

1. In consultation with Mission and GOP technical personnel, select an appropriate number of candidate test plots of manageable size and in reasonably accessible locations, taking into account the ongoing pesticide application program, representative ecological considerations, and logistical factors. Monitoring shall

be undertaken in areas harboring larval forms undergoing ultra-low volume (ULV) aerial or ground treatment. Test plot size shall range from 0.5 to one hectare, and shall be replicated at least once with adequate numbers of untreated control plots. All areas selected for plot establishment should be typical of those in which desert locust control is normally undertaken in Pakistan.

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

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

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

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

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

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

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

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

IV. LEVEL OF EFFORT

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

V. ILLUSTRATIVE COSTS*

ITEM	
Salary - 70 days @ $260/day	
Domestic U.S. travel - two RT's	
International travel - one RT U.S./Pakistan	
In-country travel	
Air	
Vehicle rental	
Per diem	
U.S. - 10 days @ $120	
Pakistan - 60 days @ $78/day	
Miscellaneous	
FICA @ 7.5 percent salary	
DBA @ $2.57/100 salary	

Supplies and Equipment
Subtotal
Contingency
TOTAL

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

STATEMENT OF WORK AND ILLUSTRATIVE COSTS

PESTICIDE MANAGEMENT AND HEALTH/SAFETY SPECIALIST

I. OBJECTIVE

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

II. QUALIFICATIONS AND EXPERIENCE

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

III. STATEMENT OF WORK

A. General

The Contractor shall have primary responsibility for advising the GOP Plant Protection Service on matters involving pesticide management, safety, and health within the overall locust control program. The Contractor shall also advise the GOP Ministry of Food and Agriculture concerning development and implementation of programs to minimize health risks to the general public as a result of the locust control effort. An important function of the Contractor shall be to conduct an in-service training program for GOP Plant Protection employees on the safe handling and management of pesticides in the locust control effort. In carrying out these activities, the Contractor will be required to travel to remote field sites under harsh environmental conditions.

B. Specific

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

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

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

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

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

5. Analyze the effectiveness of the Crop Protection Service's locust control pesticide management system by means of extensive site visits to observe the entire pesticide handling network, including receiving (port/airport); temporary storage; transport; warehousing; re-formulation; distribution; use in active locust control areas; and temporary storage/ultimate disposal of wastes and empty containers. Recommend improved procedures as necessary. Attention should be given to appropriateness

and adequacy of temporary storage facilities located at remote field sites for use by farmers and/or in ground-application operations, and training needs of personnel responsible for managing such stores.

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

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

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

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

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

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

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

13. Summarize all data, observations, findings, conclusions and recommendations resulting from the health and safety analyses in a report to be prepared and finalized prior to departure from Pakistan. The report

shall include a separate section which fully describes all recommended health and safety mitigation actions associated with the Pakistan Locust Control effort, including implementation procedures, duration, training requirements, estimated capital and recurrent costs, and agencies responsible for execution. This section shall focus on recommended programmatic interventions on the part of USAID, especially those with management implications, i.e., requiring significant changes in project direction or scope. All recommendations shall, however, be cost effective and implementable under Pakistani conditions.

IV. LEVEL OF EFFORT

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

V. ILLUSTRATIVE COSTS*

ITEM
Salary - 30 days @ $260/day
Domestic U.S. travel - one RT Washington
International travel - one RT U.S./Pakistan
In-country travel
Air
Vehicle rental
Per diem
Washington - 2 days @ $117/day
Pakistan - 33 days @ $78/day
Miscellaneous
FICA @ 7.5 percent salary
DBA @ $2.57/100 salary
Supplies and Equipment
Subtotal

C o n t i n g e n c y	
T O T A L	

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

STATEMENT OF WORK AND ILLUSTRATIVE COSTS

CHOLINESTERASE MONITORING TEST KIT TRAINING CONSULTANT

I. OBJECTIVE

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

II. QUALIFICATIONS AND EXPERIENCE

The Contractor shall be a qualified health scientist/technician well versed in pesticide residue monitoring in biological fluids. The Contractor shall have specific, extensive experience in the use of the "Lovibond" brand colorimetric tintometric whole blood cholinesterase activity measurement kit, or technical equivalent. The Contractor shall also have experience in training technicians in the use of this kit under field conditions in one or more developing countries, and be knowledgeable of the institutional and administrative requirements for implementing a successful and effective national pesticide worker screening program based on use of the Lovibond test kit.

III. STATEMENT OF WORK

A. General

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

appropriate methods for data management and handling.

B. Specific

The Contractor shall:

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

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

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

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

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

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

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

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

IV. LEVEL OF EFFORT

The estimated level of effort for the Contractor is one day in AID/Washington and 17 work days in Pakistan (six day work week).

V. ILLUSTRATIVE COSTS

ITEM	
Salary - 18 days @ $260/day	
Domestic U.S. travel - one RT Washington	
International travel - one RT U.S./Pakistan	
In-country travel	
Air	
Vehicle rental	
Per diem	
Washington - 2 days @ $117/day	
Pakistan - 21 days @ $78/day	
Miscellaneous	
FICA @ 7.5 percent salary	
DBA @ $2.57/100 salary	
Subtotal	
Contingency	
TOTAL	

STATEMENT OF COMMODITY REQUIREMENTS, SPECIFICATIONS AND COSTS OF CLOTHING AND PERSONAL PROTECTIVE EQUIPMENT FOR LOCUST CONTROL FIELD WORKERS HANDLING PESTICIDES

I. OBJECTIVE

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

II. SPECIFICATIONS

A. Head/Eye Protection

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

B. Respiratory Protection

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

C. Clothing

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

III. QUANTITIES AND ILLUSTRATIVE COSTS

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

ITEM

Head/Eye Protection - 200 units @ $50

Respiratory Protection - 200 units @ $50	
Replacement cartridges - 1,000 units @ $2	
Clothing - 200 complete sets @ $150	
Shipping and handling - 10,000 lbs @ $1.00/lb	
T O T A L	

STATEMENT OF COMMODITY REQUIREMENTS, SPECIFICATIONS, AND COSTS: CHOLINESTERASE MONITORING TEST KITS

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

Manufacturer: See attached literature.

Supplier: See attached literature.

Specifications: See attached literature.

Items and Quantities to be Procured, with Illustrative Costs:

ITEM						
Test Kits						
	1	5	@	$	6	7 5
Reagents						
	Bromothymol blue ampules		-	2000	@	$9/500
Other Expendables						
	Blood lancets		-	30,000	@	$25/1000
	Test tubes		-	150	@	$ 8
	Test tube brushes		-	30	@	$ 2
	Stirring rods		-	15	@	$ 3
	Fused glass cells		-	15	@	$18
	Vol. pipettes (0.01 ml)		-	5000	@	$80/1000
Shipping and Handling (air freight)						
	250 lbs @ $3.50/lb					
TOTAL						

APPENDIX C

OVERAGED PESTICIDES INVENTORY WITH GOP's DPP, MAY 1990

PESTICIDE STOCK POSITION
WITH
GOVERNMENT OF PAKISTAN'S DEPARTMENT OF PLANT PROTECTION AS OF
MAY 1990

Sr. No.	Locust Control Post	Aciodel	Aldrin		BHC Powder (%)									Dieldrin			Ensodil	Unidentified Chemicals	Remarks
		15%	40%	60%	0.1	0.2	0.3	1.0	2.5	10	12	12.5	12-14	10%	20%	50%	10%		
1	Mirpur Khas	6-Drums + 39-Drums (Leaked/empty)	EC 8-Drums + 20-Drums (Damaged) + 5-Power Drums + 2-Drums (Empty)							2-Drums	22-Drums	330-Drums		69-Drums	21-Drums	15-Drums	12-Drums		Very old, Hard to move

2	Uthal											150 - Drums			20- Drums			8- Drums	Very old, hard to move
3	Turbat							658 Bags			228 - Bags + 36- Paper Drums			40- Drums		2- Drums			Very old, hard to move
4	Pasni											60- Drums		5- Drums				3- Drums	Very old, hard to move
5	Panjgur		1- Drum (non-soluble) + 5- Drums (EC)	11 Buckets	58 Bags	172 Bags	220 Bags		19- Bags + 16- Paper Drums			396 - Bags	183 - Bags		1- Drum + 5- Drums (EC)	15- Bags + 2- Drums			Purchased in 1962-63

APPENDIX D

LOCUST EMERGENCY IN PAKISTAN, 1993
FAO UP-DATES

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

ادارۂ خوراک و زراعت اقوام متحدہ
پاکستان

P.O. BOX 1476, ISLAMABAD, PAKISTAN

OFFICE MEMORANDUM

FROM: R. Breitbart, Representative a.i.

TO: Mr. Hans C. von Sponeck, UNDP Resident Representative

August 1, 1993

URGENT

INVASION OF DESERT LOCUST IN PAKISTAN

The FAO office has received a request from the Ministry of Food and Agriculture to assist in control operations of an upsurge of Desert Locust in Pakistan. The request, amounting to US$ 4.2 million including a fleet of 60 Toyota Landcruisers, 5 Trucks, Pesticides and Sprayers, is far beyond the scope of FAO. However, the Plant Protection Service at FAO Headquarters confirm that a major emergency is imminent during the month of August if not immediate control measures are undertaken. Pakistan's request will be included in the Director General's Appeal for Desert Locust which will be issued shortly.

The Department of Plant Protection of the Ministry of Food and Agriculture reports that between 11th and 24th July about 21 maturing swarms have entered Pakistan who have migrated out of large scale breedings in Jemen and Saudi Arabia. (Similar reports have been received from India.) These swarms have split into smaller groups who have spread over vast areas of Tharparkar and Cholistan where they have started breeding. (Refer to PTV news broadcasts.) These areas recently have had widespread rains which is very conducive for hatching so that a very serious situation may develop by the end of August.

FAO Headquarters recommend the following:

- Institution of a Desert Locust Steering Committee comprising of Donors, Government and FAO to provide donors with regular updates on the situation and as a forum for Government requests to donors for multilateral (including through FAO) and bilateral funding.
- The Plant Protection Department of the Ministry of Food and Agriculture provide detailed information on dates swarms and bands which have been seen, areas affected and where breeding has been observed.
- Information should also be provided about available stocks of chemicals and equipment and whether such would be available for purchase within the country.
- In a subsequent phone call, AGPP proposed to immediatly despatch Mr. Rob Nugent, Locust expert, who is currently under the Afghanistan program at Mazar-i-Sharif. He could assess the situation, recommend a strategy and act as coordinator. Concurrance would be necessary from UNDP Afghanistan and UNOCHA who is funding his current mission.

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

ادارۂ خوراک وزراعت اقوام متحدہ
پاکستان

P.O. BOX 1476, ISLAMABAD / PAKISTAN

The Department of Plant Production, MINFA, states that the resources available (vehicles, manpower, logistics, equipment, chemicals) will not be sufficient for the necessary large scale operations. Additional resources from the government as well as the donors' community are required most urgently. Stocks currently available with them are:

- 230 tons BHC
- 25,000 liters Malathion
- 30,000 liters Fenitrothion
- 16 Exhaust Nozzle Sprayers mounted on vehicles (and currently in operation)
- 10-12 Exhaust Nozzle Sprayers for which no vehicles are available

Oil-based chemicals used with 'Exhaust Nozzle' and aerial sprayers are not available locally. They would have to be imported. Emulsion-based pesticides could probably be purchased in-country. The main bottle-neck from the point-of-view of the Department are vehicles and drivers as well as the chemicals which are not available in-country.

I would like to recommend the following initial steps for your consideration:

- The UN Disaster Management Team convene a donors' meeting to which Dr. Shafi, Director Plant Protection Department, should be invited to present the case.
- The UNDP Office (and/or UNOCHA) is approached to despatch Mr. Nugent for expert advise on situation and strategy.

Based on this I would approach FAO Headquarters for consideration of technical assistance through TCP funding, possibly in the form of a technical advisor/ coordinator.

I have discussed above proceedings by telephone with Dr. Shafi who is in agreement.

I am looking foreward to hearing from you as soon as possible.

With kind regards,

Yours sincerely

Reinhard Breitbart
Representative a.i.

cc.: Mr. A.W. Kazi, Additional Secretary, MINFA, Islamabad
Dr. M. Shafi, Director Plant Protection Department MINFA, Karachi
Mr. Hans Page, Chief DDFT, FAO Rome
Mr. van der Graff, Chief AGPP, FAO Rome

UNITED NATIONS NATIONS UNIES

P.O. Box 1051
Islamabad, Pakistan

Telex: 5886 UN - IBA PK
Telephone: 822618
Telefax: 823783, 822796

RESIDENT CO-ORDINATOR

Reference: Locust.003
August 3, 1993

Dear Mr. Farooki,

Locust Emergency in Pakistan

On behalf of the United Nations System, I would like to convey to you that we fully share the concern of your Ministry about the upsurge of Desert Locust in vast areas of Sindh and the Punjab and would like to assure you that we are standing ready to assist your Government wherever possible.

Mr. Breitbart, FAO Representative a.i., has been in contact with Mr. A.W. Kazi, Additional Secretary of your Ministry, proposing the fielding of Mr. Robert Nugent, an experienced Entomologist, who has been working since 1990 as Chief Technical Adviser on Locust and Sunnpest control in Afghanistan. He has recently helped in northern Afghanistan to control a severe attack of locust. We propose that Mr. Nugent, on an urgent basis, undertake a fact finding mission to locust affected areas of Pakistan to assist Government in developing a control strategy. On this basis Government and FAO could then proceed in soliciting international support. Mr. Nugent, we believe, would facilitate the process of mobilization and coordination of donor assistance in Pakistan.

Based on recommendations and findings emerging from this joint effort, the UN Disaster Management Team would then convene a local donor meeting. The report would also be forwarded to the Office of the Director General of FAO for a possible international appeal.

Please find attached a copy of the bio-data of Mr. Nugent. Given the urgency of the situation, we would appreciate receiving clearance for his visit as soon as possible.

106

UNITED NATIONS NATIONS UNIES

Let me take this opportunity to express my very best wishes to you for your new assignment.

With kind regards,

Yours Sincerely

H.C. von Sponeck
Resident Coordinator

Mr. Salman Farooqi
Secretary General
Ministry of Food and Agriculture
Islamabad

cc.: Mr. A.R Akhund, Secretary General, Economic Affairs Division

COMPUTER PROFORMA

LOCATION [ ] SERIAL NO. [| | | | |]

1. MINISTRY(Dealing with the case) _____ [|]
2. DEPARTMENT(-do-) _____ [| |]
3. SUBJECT OF THE CASE _____ [| |]
4. FULL NAME ROBERT NUGENT
5. DATE OF BIRTH 21 / 07 / 58 (DD MM YY) 6. SEX (Male/Female) MALE [ ]
7. FATHER'S/~~HUSBANDS~~ NAME PERC NUGENT
8. PROFESSION/DESIGNATION CHIEF TECHNICAL ADVISER [|]
9. PASSPORT NO. SA 43512 10. NATIONALITY AUSTRALIAN [|]
11. PRESENT ADDRESS IN PAKISTAN (IF ANY) CTA - LOCUST AND SUNNPEST PROJECT, MAZAR-I-SHARIF, AFGHANISTAN. [| |]
12. PERMANENT ADDRESS 233, MOUNT STREET, ALTRNUY, AUSTRALIA. _____ [| |]
13. VISIT SPONSORED BY _____
14. PURPOSE OF VISIT/EXTENSION IN STAY _____

****

FOR THE USE OF CLEARING AGENCY

CLEARED/NOT CLEARED [ ] C/N CLEARING CRITERIA(R/G) [ ]

REFERENCE NO._____ DATED [| / | | | |]

****

NOTE

INSTRUCTIONS FOR FILLING THE PROFORMA

a) The form should be filled in CAPITAL letters.
b) All the boxes ([ ]) should be left blank.
c) Maximum information should be provided in the items from 1 to 14.
d) In case of foreigner his contact address in Pakistan be mentioned in item No.(11) and his address abroad be mentioned in item No.(12) above.

103

OFFICIAL FILE

UNITED NATIONS NATIONS UNIES

P.O. Box 1051
Islamabad, Pakistan

RESIDENT CO-ORDINATOR

Telex: 5886 UN - IBA PK
Telephone: 822618
Telefax: 823783, 822796

ACTION
Date 8/22.
NAN/
8/16/93
Initial BA

Reference: Locust.007
August 10, 1993

Dear Mr. Blackton,

Locust Emergency in Pakistan

This is to inform you that the UN System, in particular FAO, has been monitoring since end July the appearance of locust swarms in Pakistan. The Ministry of Food and Agriculture has reported the presence of Desert Locust in vast areas of Sindh (Tharparkar) and Punjab (Cholistan).

In order to get a clearer picture about the extent of the threat, FAO has fielded an experienced Entomologist, Mr. Robert Nugent, to undertake a fact finding mission to locust affected areas of Pakistan to assist the Government in developing a control strategy. Mr. Nugent has been working since 1990 as Chief Technical Adviser on Locust and Sunnpest control in Afghanistan. He has established contact with the Plant Protection Department and is currently visiting the infested areas. He is supplying us with regular situation reports.

The attached update prepared by FAO-Islamabad summarizes the facts as known todate. As soon as more conclusive evidence of the locust invasion is known, we will decide whether or not to call a meeting with the international community to review what measures we could jointly take to assist the Pakistani authorities to combat what seems to/be a serious threat to the cotton, sugarcane, rice, vegetable and fodder (maize) crops currently standing in these and the adjacent areas.

With kind regards,

Yours Sincerely

H.C. von Sponeck
Resident Coordinator

Mr. John Blackton
Director
USAID Office
Islamabad

LOG # 1476

OFFICE	ACTION	INFO	OFFICIAL FILE
DIR		✓	
DD			
PRO		✓	
AFGHANISTAN FO			
PRO			
RLA		✓	
CC/CMO			
POM		✓	✓
PEN			
ARD	✓	05	
ENG			
HPN			
HRD			
RM			
EXO			
PER/TRV			
FSD			
ADP			
GSO			
PROC			

RECEIVED AUG 17 1993

OF THE UNITED NATIONS

P O. BOX 1476, ISLAMABAD / PAKISTAN

پاکستان

INVASION OF DESERT LOCUST IN PAKISTAN
SITUATION UPDATE

August 9, 1993

The ***Department of Plant Protection of the Ministry of Food and Agriculture*** reports that between 11th and 24th July about 21 maturing swarms of Desert Locust have entered Pakistan which have migrated out of large scale breeding in Yemen and Saudi Arabia. These swarms have split into smaller groups and have spread over vast areas of **Tharparkar** and **Cholistan** where they have started breeding. These areas recently have had widespread rains which is very conducive for hatching.

The ***FAO Emergency Center for Locust Operations (ECLO)*** informed on 2 August that further swarms of Desert Locust crossed into Oman from Yemen in late July. The swarms are reported to be moving along the coast of Oman toward North-West, particularly the area around Sur. The current wind pattern the region is favorable for migration of these swarms into Pakistan and possibly India.

A FAO Locust Specialist has been despatched to Karachi on 7 August to undertake a fact finding mission to locust affected areas of Pakistan and to assist the Government in developing a control strategy. The situation as of 9 August has been described as follows:

- Several hundred Hopper Bands in various stages of maturity have been observed in a number of locations in Tharparkar, Sindh (Chhore, Danodandal, Diplo, Chachro, Mithi) and Cholistan, Punjab (Gunianwala, Rukunpur). Hoppers are still continuing to emerge.
- Mature, pairing/ laying swarms and swarmlets have been observed in Nara (Tajjal/ Garh), Tharparkar (Diplo, Chachro, Danodandal, Mithi) and Cholistan (R.Y. Khan Base, Gunianwala).
- On 7 August, Pakistan Government officials have met with their Indian counterparts at Munabao (70° 15'E, 25° 45'N). The Indian authorities confirmed similar large scale problems.
- It appears as if laying and hatching is occurring concurrently in the India/ Pakistan border areas requiring urgent improvement of cross-border liaison.
- Ground control of bands started using BHC (Benzine-hydro-chlorite). Swarms are being treated with 'Exhaust Nozzle Sprayers' and small AMT aerial control. Three spraying aircraft have been deployed in the Thar desert.

Currently there are no figures available on the rate of chemical use. Therefore it is not possible to make forecasts on how long the available chemicals will last.

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Block No. 2, Ramna – 5, Islamabad/Pakistan
Cable Address: FOODAGRI ISLAMABAD

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822070 -- 79
Telex 5548 FAOIB -- PK.

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

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پاکستان

P.O. BOX 1476, ISLAMABAD / PAKISTAN

Stocks estimated by the Director of the Plant Protection Department are (as of 2 August):

- 230 tons BHC
- 25,000 liters Malathion
- 30,000 liters Fenitrothion
- 16 Exhaust Nozzle Sprayers mounted on vehicles (and currently in operation)
- 10-12 Exhaust Nozzle Sprayers for which no vehicles are available

Officials of the Plant Protection Department have expressed serious concern and have made a subjective comparison to plagues developed 30-40 years ago. Swarm formation could commence by the end of August/ early September with a high probability of causing widespread damages to crops. It appears as if the situation is not contained and the resources available with the Department of Plant Protection will not be sufficient. Most urgent requirements at this stage are:

- Vehicles to install the remaining 'Exhaust Nozzle Sprayers': Such vehicles could not be temporarily rented from somewhere since due to their function they will be contaminated and smelling.
- Hand-sprayers for farmers: There is an urgent need to increase the speed on the ground control operations through participation of villages in the affected areas. (At the moment no sprayer airplanes are flying because the winds are too strong.)
- Portable UHF equipment: Radio for ground to air communication is essential to direct airplanes into target areas.
- Wind monitoring equipment: Helium balloons and Theodolite balloons for monitoring upper level winds.

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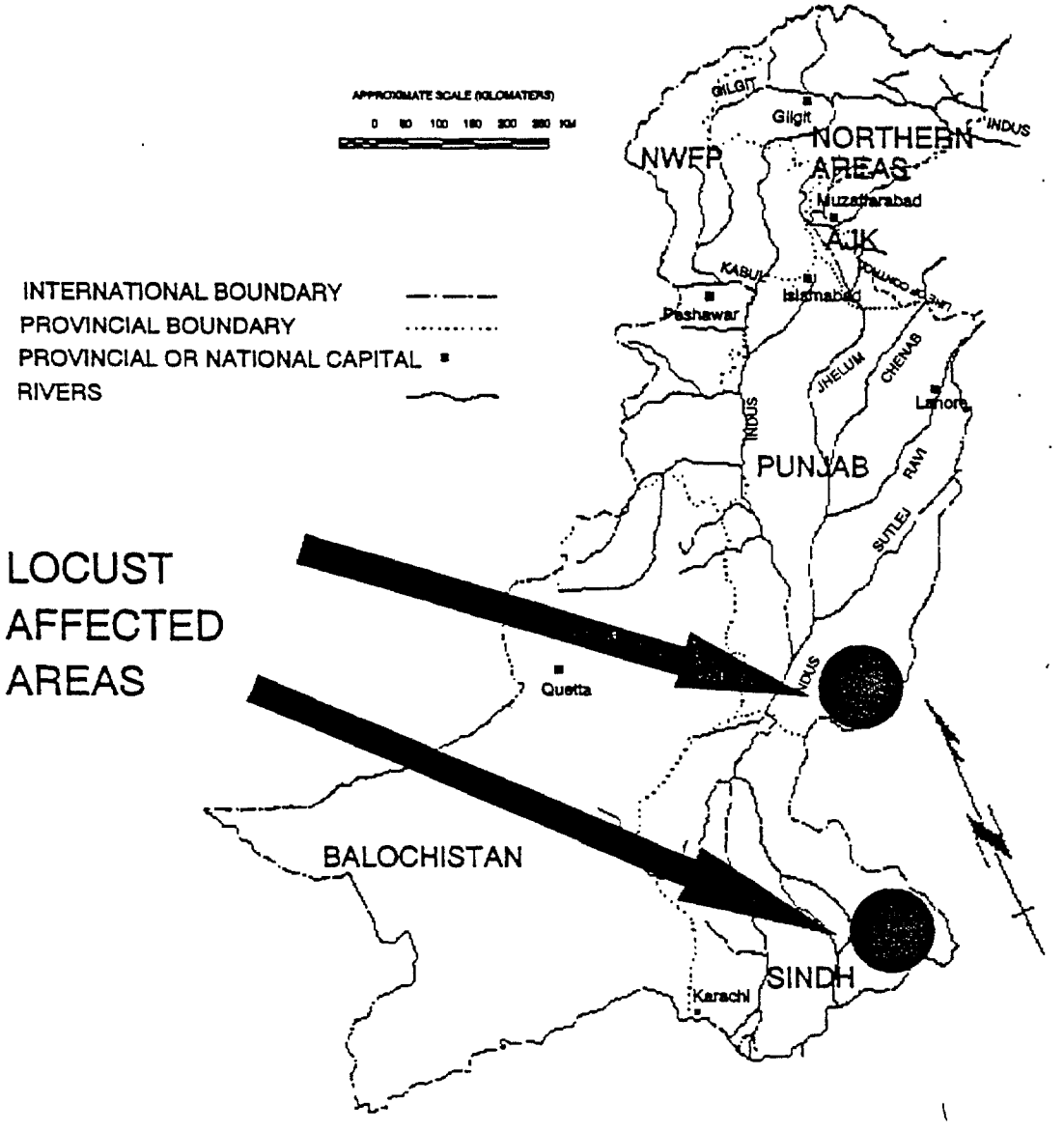
APPROXIMATE SCALE (KILOMETERS)
0 50 100 150 200 250 KM
INTERNATIONAL BOUNDARY
PROVINCIAL BOUNDARY
PROVINCIAL OR NATIONAL CAPITAL
RIVERS
LOCUST AFFECTED AREAS
GILGIT
Gilgit
INDUS
NWFP
NORTHERN AREAS
Muzaffarabad
AJK
KABUL
Peshawar
Islamabad
JHELUM
CHENAB
Lahore
INDUS
PUNJAB
RAVI
SUTLEJ
Quetta
BALOCHISTAN
SINDH
Karachi

OFFICIAL FILE

UNITED NATIONS NATIONS UNIES

2/15/93

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Islamabad, Pakistan

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Telephone: 822618
Telefax: 213959, 822796

RESIDENT CO-ORDINATOR

ACTION 8/24 NAN 8/16/93 BA Initials

Reference: Locust.012
August 14, 1993

Dear Mr. Blackton,

Locust Emergency in Pakistan (Communication No. 2)

Further to our letter of 9 August, I would like to inform you that we have received additional reports from the Pakistani authorities and the FAO entomologist who is currently visiting the main locust infested areas. The reports indicate that the situation is indeed serious and could develop into an emergency within the next two to three weeks when the hopper bands reach maturity and start swarming into the adjacent agricultural areas. It has been agreed with the Ministry of Food and Agriculture that a donor meeting be convened as soon as possible since the resources available to the Government will not be sufficient to contain the situation.

We propose to hold such a meeting on Tuesday 17 August at 10:00 am. The venue will be the Conference room in the UN-Annex Building. At this meeting Government officials and FAO will present a comprehensive overview of the extent of the locust infestation, activities undertaken to date, a strategy proposed for immediate action and additional resources required.

We would be grateful if you or your representative could attend the meeting since concerted action is required to gain control over a situation which otherwise could develop into a major plague possibly lasting several years and extending over vast areas of South-West Asia with obvious consequences for food and cash crops. For your information, I am attaching the transcript of the appeal from the Director General of the Food and Agriculture Organization of the United Nations to the International Donor Community and some data on the situation on the Indian side of the border.

With kind regards,

Yours Sincerely

H.C. von Sponeck
Resident Coordinator

Mr. John Blackton
Director
USAID Office
Islamabad

DOC # 1493

OFFICE	ACTION	INFO	OFFICIAL FILE
DR		✓	
DO			
PRO		✓	
AFGHANISTAN RO			
PRO			
RLA		✓	
CC/CMO			
PDM		✓	✓
PEN			
ARD	✓	✓	
ENG			
HPN			
HRD			
IRA			
EXO			
PER/TRV			
FSD			
ADP			
GSO			
PROC			
BMS			
HALD			
MA&T			
CRS		✓	

RECEIVED AUG 15 1993

LOCUST EMERGENCY IN PAKISTAN

PROPOSED AGENDA FOR THE DONOR MEETING
TUESDAY 17 AUGUST 1993 10:00 am

CONFERENCE ROOM OF UN-ANNEX BUILDING

I. INTRODUCTION OF THE SUBJECT

II. PRESENTATION OF THE SITUATION by the GOP and the FAO
- A. Areas infested
- B. Extent of infestation (Number and density of swarms, bands, etc.)
- C. Projection of further development
- D. Activities to date
- E. Outlook for crops in adjacent areas

III. PROPOSED STRATEGY FOR ACTION
- A. Plan of Operation
- B. Requirements

IV. DISCUSSION

V. CLOSURE

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

ادارۂ خوراک وزراعت اقوام متحدہ
پاکستان

P.O. BOX 1476, ISLAMABAD / PAKISTAN

APPEAL FROM FAO'S DIRECTOR-GENERAL FOR DESERT LOCUST

The Director General of the Food and Agriculture Organization of the United Nations draws the attention of the International Donor Community to the serious threat to food security posed by Desert locust Infestations and the need to implement urgently additional measures to contain the current situation.

The Desert locust situation has deteriorated dramatically since May 1993. Desert locust swarms have now been reported throughout East Africa and the Sahel including Sudan, Eritrea Ethiopia, Somalia, Chad, Mali, Niger and Mauritania with one recent report from Morocco. The current locust distribution pattern results from a general migration from the traditional winter-spring breeding areas of the Red Sea which commenced in early June 1993.

Hence, the Desert locust situation must be considered as extremely dangerous with significant Desert locust populations now reported from all the traditional summer breeding areas. Some of these areas have already received sufficient rainfall to enable successful breeding to occur and the probability of rain falling shortly in other must be regarded as high. If uncontrolled breeding occurs over the next few months in these regions there will be a very high risk of a major plague developing and extending into the Maghreb Countries of North-West Africa, to more countries in West Africa and re-infestations of the Middle East and East Africa on a substantial scale are also likely. Such developments would present a major threat to food crops and food security.

Since early 1993 the International Donor Community has responded generously to the emerging Desert locust situation. However, the recent deterioration in the situation urgently requires additional efforts and assistance to contain the Desert locust and to prevent the Risk of a major plague, which could last several years, developing and extending over vast areas of Africa, the Near East and South-West Asia.

The FAO emergency center for Locust operations (ECLO), which was re-established in Late 1992 in recognition of the developing situation, is continuing to monitor the emerging situation and to coordinate appropriate survey and control action in cooperation with national governments, regional organizations and donors. Due to the limited time available for concerted action to survey the large areas involved quickly and effectively FAO considers the most urgent requirements at this stage are (i) Assistance for the costs of aerial survey operations to establish rapidly the full extent and scale of infestations and to implement aerial control operations as necessary (ii) assistance to national and regional plant protection organizations with the operational costs for ground survey and control teams to complement aerial survey/control and (iii) the re-establishment of the pesticide bank mechanism which operated in the Desert locust emergency of 1987-1990 to ensure rapid delivery of appropriate quantities of pesticides to affected countries thereby minimizing the risk of unnecessary stockpiling and associated storage problems. In addition to the above, donor assistance for communications and technical assistance to national plant protection services is also foreseen. A document detailing assistance requested in under preparation by FAO/ECLO and will be circulated to donors in the immediate future for consideration.

The Director General wishes to acknowledge the assistance provided by donors to date and to appeal to donors to review their current assistance programmes and to consider allocating additional aid resources for Desert locust survey and control operations. The Director-General looks also to the effective participation of donor representatives in the national locust steering committees which have been re-activated in the affected countries.

Edouard Saouma (Director General Food and Agriculture Organization of the United Nations)

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Government of India
Ministry of Agriculture
Department of Agriculture & Cooperation
Directorate of Plant Protection, Quarantine & Storage
NH.IV , Faridabad
PIN - 121 001 (Haryana)
.....

Tel. Nos.

Off: 8-213985
Res: 8-213295

LOCUST SITUATION BULLETIN

Vol. 45 No. 14 Period 16-31 July, 1993

SUMMARY & FORECAST : Movements of several exotic swarms were reported in 640 localities of Jaisalmer, Jodhpur, Jalore, Barmer districts of Rajasthan and Banaskantha and Kutch Bhuj districts of Gujarat. Besides Hoppers emergence was reported in 336 localites in Jaisalmer, Jodhpur, Jalore, Barmer districts of Rajasthan and Banaskantha district of Gujarat.

Control operations were undertaken against swarms/swarmlets and hoppers over an area of 12747 ha. consuming 83675 Kg BHC 10% dust, 930 lt Dieldrin 18% Sol, 1250 lt. Fenitrothion ULV, 1140 lt. Malathion ULV both by ground and aerial.

Incursion of exotic swarms from West is likely to occur in view of presence of several swarms in Pakistan. Since the swarms are mature, the egg laying is likely to take place and hopper emergence is likely to occur on larger scale.

WEATHER SUMMARY :

Rajasthan : Southwest monsoon has been vigorous in south Rajasthan on 17th, in west Rajasthan on 18th, in southwest Rajasthan on 19th and in north Rajasthan on 21st July. It was active in east Rajasthan on 16th, in northeast Rajasthan on 17th and 21st, in northwest Rajasthan on 19th and in west Rajasthan on 20th.

Rainfall has occurred at many places in east Rajasthan from 15 to 17th and in west Rajasthan from 19 to 21st, in Ajmer division on 21st and 22nd, in Jodhpur division on 17th, at a few places in Ajmer division on 19th and 20th, in Kota division and Udaipur division on 18th, 19th and 21st, in Bikaner division on 17th, 18th and 22nd, in Jodhpur division on 16th, 18th and at one or two places in Ajmer division on 26th and 28th, in Kota division on 20th, 27th to 29th, in Udaipur division on 20th, 24th, 28th and 29th, in Bikaner division on 16th, 23rd and 24th. Weather remained mainly dry in the rest state during the remaining days of the fortnight.

North Gujarat : Monsoon was vigorous on 17th and 18th. Rainfall occurred at almost all places on 19th, at many places on 20th, at a few places on 16th and at one or two places on 21st to 24th. Weather remained dry during the remaining days of the fortnight.

.....2/-

Saurashtra : Rain has occurred at almost all the places in Saurashtra region on 18th, at many places on 17th, at a few places on 20th and at one or two places on 15th and 16th. Weather remained dry during the remaining days of the fortnight.

Kutch: Rain has occurred at almost all the places on 18th, and at one or two places on 17th. Weather was dry during the remaining days of the fortnight.

METEOROLOGICAL OBSERVATIONS:

S.No.	Station	Temperature (°C) Max	Min	Humidity (%) Max	Min	Rainfall (mm)
1.	Barmer	39	24	100	35	228.0
2.	Jaisalmer	40	25	95	18	185.2
3.	Jodhpur	38	24	95	37	167.4
4.	Ganganagar	41	23	90	30	62.7
5.	Sikar	39	21	90	43	50.0
6.	Bikaner	41	25	100	25	23.7
7.	Bhuj	37	24	95	65	26.4
8.	Deesa	36	25	100	75	211.5

LOCUST SITUATION

Desert Locust (Schistocerca gregaria, F.)

(a) Swarm movements : Several movements of exotic swarms were reported in Jaisalmer, Jodhpur, Jalore, Barmer districts of Rajasthan and Banaskantha, Bhuj districts of Gujarat as per details given below

State	District	No. of Localities reporting swarm movement
Rajasthan	Jaisalmer	149
	Jodhpur	25
	Jalore	138
	Barmer	290
Gujarat	Banaskantha	32
	Kutch Bhuj	6

(b) Gregarious breeding : Hoppers emergence were reported in several localites in Thar Desert of India as per detail given below :

.....3/-

3424/P3

117

State	District	No. of Localites reporting Hoppers emergence
Rajasthan	Jaisalmer	139
	Jodhpur	9
	Jalore	18
	Barmer	150
Gujarat	Banaskantha	20

(c) Control Operation : Both aerial and ground operations were undertaken against swarm/swarmlets and hoppers as per detail given below :

GROUND

State	District	Swarms: Area treated (ha)	Swarms: Pesticides consumed	Hoppers: Area treated (ha)	Hoppers: Pesticides consumed
Rajasthan	Jaisalmer	645	16125 Kg BHC 10% dust	606	7575 Kg BHC 10% dust
	Barmer	450	10000 Kg BHC 10% dust 10 lt. dieldrin 18% Sol.	1622	20025 Kg BHC 10% dust+201t. Dieldrin 18% Sol.
	Jodhpur	556	13900 Kg. BHC 10% dust	104	1300 Kg BHC 10% dust
	Jalore	230	5750 Kg BHC 10 % dust	68	850 Kg. BHC 10% dust
Gujarat	Banaskantha	158	3950 Kg. BHC 10% dust	-	-
	Kutch Bhuj	168	4200 Kg. BHC 10% dust	-	-

AERIAL

District	Swarms: Area (ha.)	Swarms: Pesticides Malathion ULV(lt)	Swarms: Pesticides Fenitrothion ULV (lt)	Hoppers: Area (ha.)	Hoppers: Pesticides Dieldrin 18% Sol(lt)	Hoppers: Pesticides Fenitrothion ULV (lt)
Jaisalmer	1140	1140	-	4500	900	-
Barmer	2000	-	1000	500	-	250

The control operations both by ground and air are in progress.

3424/Pq

.....4/-

INTERNATIONAL LOCUST SITUATION

SOUTH WEST ASIA

PAKISTAN : (Report for 1-15 July, 1993)

Two mature pairing swarms of about 2 Sq. Km. in size were reported at Hayat tar and Bombay tar on 11th and 12th July in Tharparkar desert. Another two swarms size ranging from 1 to 3 Sq. Km. were reported at Samrotar and Khetlari on 14th July. Two swarms were also detected at Methi and Somo Road area on 15th July.

In Cholistan desert mature swarms of 1-2 Sq.Km. in size were detected near Islamgarh, Karim Kanda and Ramo on 13th July. Another 4 swarms were reported at Nonjewala, Lakhuwala, Gunianwala and Suddowala Dhar on 15th July. All these swarms were immediately controlled by exhaust spraying.

Further influx of swarms from West was observed around Khuzdar on 15-7-1993 over an area of 40 Sq. Km. Another swarm of medium density was also observed - over an area of 50 Sq.Km. in Baghbara area on 15th July. Control operations were carrie carried out by exhaust nozzle sprayer.

IRAN: Report awaited.

AFGHANISTAN: Report awaited.

NEAR EAST

Report awaited.

EAST AFRICA

Report awaited.

WEST AFRICA

Report awaited.

NORTH WEST AFRICA

Report awaited.

Tel Nos.

Shastri Bhawan : 384182
New Delhi 385026

(BRAJENDRA SINGH)
ENTOMOLOGIST (I)
for Plant Protection Adviser
to the Government of India
Tel. No. 8-212125

3424/PS

BRIEF ON DESERT LOCUST OUTBREAK IN PAKISTAN

BY
R. NUGENGT, FAO, ISLAMABAD

AUGUST 17, 1993

1. Introduction
2. Background
3. Current situation
   - 3.1 Locusts - Pakistan - India
   - 3.2 Control activities
   - 3.3 Forecast
   - 3.4 Capacity to deal with the problem
     - 3.4.1 Chemical
   - 3.5 Coordination with India
4. Major constraints
5. Proposed immediate strategy
6. Technical recommendations
7. Follow up.

Brief on Desert Locust outbreak in Pakistan

R.Nugent FAO Islamabad, 17 August 1993.

1. Introduction

An outbreak of Desert locusts is assuming alarming proportions on the Pakistan / Indian border, in the south eastern deserts.

This brief has been prepared after a necessarily hasty visit (7-15 August) to the main infestation areas to assess the situation and meet with Pakistan Agricultural officials who are combating the locusts.

2. Background

In early July, 1993 a number of swarms of Desert locust, borne by seasonal monsoonal winds, migrated across the Arabian Sea from Yemen and northern Somalia to traditional breeding areas in southern Pakistan and south western India.

The Pakistan government's Plant Protection department, which has the mandate to control locusts in Pakistan, commenced control operation against swarms in the Thar and Cholistan Deserts in mid-July. At that time the Plant Protection service raised the initial alarm, reporting the swarm invasions had assumed serious proportions and a plague could develop if successful breeding occurred.

3. Current situation

3.1 Locusts - Pakistan and India

The locusts are occurring in their traditional late summer breeding areas, the vast Thar and Cholistan deserts. The majority of the population is in the immature "hopper" phase (I-IV instar). Hatching is likely to continue for another two weeks. Some small patches of low density adults are continuing to lay eggs.

Locust hoppers occur in small bands of generally less than 50 meters in diameter.

The exact extent of the populations has not been determined because of the inaccessibility of the area.

The infestations extend across the border into the Rajistan desert of south western India and the population will be at a similar stage of development.

3.2 Control operations

The Plant Protection department of the Pakistan Ministry for Agriculture is coordinating extensive control operations in all the infested areas so far located and has put in place the basic organisational infrastructure required to tackle the campaign.

To date it has not been possible to estimate the percentage of the population that has been controlled. The situation is not contained with new areas of bands being located daily.

Control posts have been established in Thar and Cholistan deserts, the two main operational areas. (see map).

Provincial authorities are providing staff and vehicles.
(The government are requested to provide a list of the resources that are currently deployed including those provided by the provincial authorities).

Control operations are being made difficult by the patchy distribution of the hopper bands.

To date the majority of the control has been carried out by dispersing BHC by hand. Ground based vehicle mounted sprayers have also been employed to spray the ULV (Ultra Low Volume) liquid chemicals. Ground control is by the "search and destroy" method.

Additional staff and vehicles have been provided by the provincial authorities. Experienced locust officers have even been recalled from retirement and many others seconded from other departments within the Ministry of Agriculture.

14 spray aircraft have been deployed in bases within the areas, however aerial operations have yet to be fully brought into play.

3.3. Forecast

The infestations observed constitute an immediate and very serious threat to all agricultural crop production in the region.

Cotton production in Sind and southern Punjab is vulnerable because of its proximity to the outbreak area. As well all horticultural and orchard crops will be effected. The lower Indus valley is Pakistan's primary food production and export region.
As irrigation continues up to the edge of the deserts, crops in these areas are likely to be especially hard hit.

Bands are already causing some damage to the rain fed crops grown by the small desert communities.

Unless control measures are effective, swarm formation could commence within two weeks in the two main regions.
Given the vast areas involved it would appear inevitable that swarms will develop.

The potential for invasion of swarms from across the border in India remains high.

There is the possibility of further rains that will provide a environmental conditions that are conducive for further breeding in the desert areas.

The locusts have the potential to invade southern Afghanistan, eastern Iran and Saudi Arabia within the next two to three months.

3.4 Capacity to deal with the current and forthcoming situation.

Experience with similar sized outbreaks in other countries has shown that ground control operations alone will not prevent the development of swarms.

In this particular case control operations are restricted by the large extent of the infestations and the difficult terrain of the desert. Poor access will physically limit the amount of ground based control that can be carried out on the area required, in the time available.

Only when swarms develop will it become apparent how effective the ground control operation has been.

There are sufficient aircraft deployed to tackle targets located by ground and air if they are efficiently employed.

3.4.1 Chemical

The strategic resource in locust campaign is liquid ultra low volume (ULV) chemical. No estimate can be made at this stage as to how long the currently available chemical supplies will last.

Currently ULV chemical is largely being used through vehicle mounted ground sprayers. They have not been widely used to this time.

Chemical consumption will increase sharply once aircraft become more widely used.

As a first order estimate, based on 10 aircraft spray sorties per day at 200 litres per sortie * the chemical will last about 30 days based on 70 metric tonnes ** of chemical being available and taking into consideration that some will be used through vehicle sprayers. This level of usage could be

expected to start in two weeks.

In this case currently available reserves would be exhausted by early October if swarms continue to form.

* Approximately 100 liters is required to spray one square kilometer.
** The Government of Pakistan are requested to confirm accurately the availability of chemical in Pakistan at this moment.

3.4.2 Sprayers

The tactical resource in a locust control campaign is the spray equipment and trained staff. At the availability of aircraft will not be a limiting factor on the operations but the ability to fully utilise them will slow the operation down.

3.5 Coordination and cooperation with officials from India

Close cooperation with the Indian authorities is required. FAO has an officer from the emergency locust operations group in the area at this time and an independent report from the region is expected soon. More frequent cross border liaison is required.

4. Major constraints

4.1 Time. There is no deadline to work to. Every passing day mean a progression of the plague. Unless the speed of control operations is increased then there will simply not be enough time to carry out the work required.

4.2 The Indian border.

4.3 Physical conditions are making the ground control operation very slow. The deserts cover over 13,000 square kilometers and many areas are inaccessible due to high sand dunes.

4.4 Non systematic target search and the employment of BHC. This is a function of the magnitude of the task facing the field workers, the lack of alternatives to BHC and a shortage of trained staff.

Not withstanding that the chemical is considered environmentally hazardous, BHC is tediously slow to apply and vehicles are committed to carrying this highly bulky chemical around, thus tieing up limited transportation resources.

The worrying aspect of the infestations so far encountered is that while their total aerial extent may not be known, new bands are consistently being found within as well as outside the known infestation areas.

4.5 The lack of ground to air communications restrict ground teams

communicating targeting directions to the aircraft.

4.5 The high population of the Thar desert. For a desert the Thar is highly populated with reportedly over 500,000 people living in small villages and making a living from herding and rain fed crops grown between the dunes. Caution would have to be exercised if aerial spraying was to be widely employed as the herders have spread throughout the desert, taking advantage of the good vegetation cover. Their herds and themselves could be exposed to the spray.

5. Proposed strategy for future action

The overall aim of any immediate assistance should be to increase the speed and efficiency of the control operation.
Given the constraints on the operation, helicopter air support is required for target searches. This has to be backed up by better ground to air communications and appropriate navigation equipment.

See attached table for inputs required on an immediate basis. Because of the time constraints inputs purchased locally should be given priority.

Time frame: Commencing immediately

5.1 Organisation strategy

5.1.1 A helicopter is required for target search and directing spray aircraft onto the target.

5.1.2 Air/Ground communication established between aircraft and ground based teams.

5.1.3 Geographical Positioning Systems (GPS or satellite based portable navigation equipment) should be used by ground teams and the helicopter to accurately locate targets and guide the planes in. Recent advances in technology have made it possible to economically employ such equipment.

5.2 Spraying strategy

5.2.1 Priority to get remaining exhaust nozzle sprayers into action. Action: Government.

5.2.2 Rely on ULV spraying for hopper bands.

5.2.3 Priority should be on aerial control with helicopters finding targets

6. Technical recommendations aimed to increase speed, efficiency and systematic use of resources.

6.1 Target search procedures need to be covered by a clear set of operating procedures on what constitutes a spray target and how to identify the target area.

6.2 Control bases should have an accurate "Campaign map" on which targets are accurately plotted daily. At least 1:250,000 scale required.

6.3 Reporting of control activities should include data per the attached FAO reporting form.

6.4 Consideration needs to be given to reducing the track spacing for targets to allow smaller, more defined areas to be sprayed. This should be tested in the field.

6.5 Ground crews split into two vehicle teams to be accompanied by a GPS trainer if required.

7. Follow up:

This situation provides an opportunity to review operating procedures, test new ones and make changes where problems are occurring. Locust experience is hard won and easily lost. The most should be made to introduce staff to the new techniques and modified approaches.

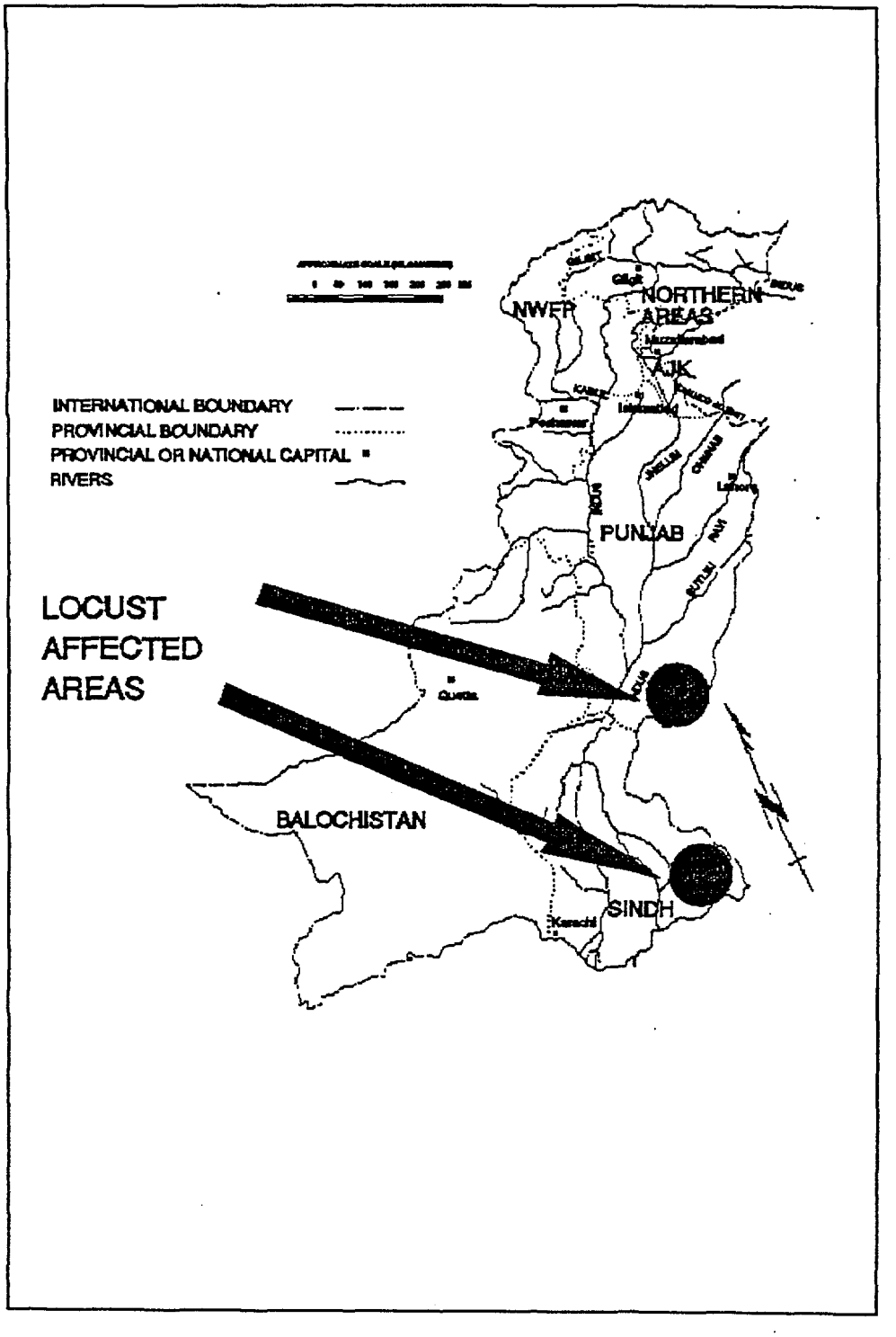
As well a review period should be allocated immediately at the end of the campaign to debrief field staff and consolidate information.

Table 1

LOCUST EMERGENCY
REQUIRED EQUIPMENT, MATERIALS, CHEMICALS

I. Immediate Requirements (within 1 week)	Approximate cost
A. Available In-country	
1. Suzuki Jeeps 4x4 -> 10	100,000
2. Trucks 4x4 -> 3	50,000
3. Sand tyres for vehicles and trucks -> 100	5,000
4. Fuel drums ->	1,000
5. Staff basic equipment	
a. Tents	2,000
b. Bedding	400
c. Water supply/ containers	400
d. Cool boxes	500
e. Gas cylinders, lights and stoves	2,000
6. Detailed Maps	500
7. Compasses	200
8. ULV Chemicals ???	
9. Civil helicopter for rent (50 hours)	25,000
10. Smoke flares ?	
11. Chemical handling and safety gear ?	
B. Imported from abroad	
12. UHF communication equipment	30,000
Potential countries: Japan, USA, UK, Germany	
13. Solar battery chargers	2,000
14. Dipole aerials	2,000
15. GPS navigation equipment + trainer(s)	12,000
Potential countries: Japan, USA, Australia, Germany	
16. Hand sprayers	10,000
Potential countries: UK, France	
17. ULV Chemicals @ 12 USD per litre.	
TOTAL	* 243,000

* Excluding chemical purchases


INTERNATIONAL BOUNDARY
PROVINCIAL BOUNDARY
PROVINCIAL OR NATIONAL CAPITAL
RIVERS
LOCUST AFFECTED AREAS
NWFP
NORTHERN AREAS
AJK
PUNJAB
BALOCHISTAN
SINDH

CV ROBERT NUGENT

AGE: 35, Australian

Acedemic qualifications: Bachelor of resource management, Australia.

Current position: Project Manager for the emergency FAO "Locust and sunn pest project" in Afghanistan. - 3 years.

Previous experience: Australian Plague Locust Commission
OIC western and central areas.

Tanzania, Red locust survey

Somalia, resouce survey, World Bank project.

LOCUST EMERGENCY
REQUIRED EQUIPMENT, MATERIALS, CHEMICALS

I. Immediate requirements (within 1 week)

A. Available in-country

a. Suzuki Jeeps 4x4	40 Nos.
b. Trucks 4x4	6 Nos.
c. Sand Tyres for vehicles and trucks	400 Nos.
d. Staff basic equipment (Tents, Bedding, Water containers, Cool boxes, Gas Cylinders and stoves)	60 sets.
e. Compasses	100 Nos.

B. Imported from abroad

a. ULV Chemicals	150 tonnes
b. UHF communication equipment	40 Nos.
c. Solar battery chargers	50 Nos.
d. Hand Sprayers	5000 Nos.

II. Follow-up requirements

a. Pick-ups/Trucks 4x4	25+5 Nos.
b. ULV Chemicals	200 tonnes
c. Exhaust Nozzles Sprayers	30 Nos.
d. Dipol aerials	20 Nos.
e. GSP navigation equipment + Trainers	6 sets.
f. Spare parts for aircraft	

UNITED NATIONS NATIONS UNIES

P. O. Box 1051
Islamabad, Pakistan

Telex: 5886 UN - IBA PK
Telephone: 822618
Telefax: 213959, 822796

RESIDENT CO-ORDINATOR

Reference: Locust.015
August 18, 1993

Dear colleague,

Locust Emergency in Pakistan (Communication No. 3)

On behalf of the United Nations System in Pakistan, I wish to sincerely thank all the representatives who attended the emergency meeting convened by the UN Disaster Management Team and FAO. The objective of the meeting was to inform the international community of the grave emergency that is confronting Pakistan in the form of a serious plague of Desert Locusts. Each passing day, as we have learnt, leads to a worsening of the situation and the likelihood that the locusts will not be contained.

Please find attached tables that give details of the minimum level of assistance required immediately by the people of Pakistan to allow them to prevent the plague from causing serious damage to their agricultural lands and spreading beyond its borders. I would like to request you to review the tabulated inputs urgently and sympathetically.

The requirements have been divided into three critical phases that take into consideration firstly, the need to provide assistance that will increase the speed and efficiency of the control activities currently being carried out by the Pakistan government (zero lead time!). Secondly, the provision of assistance in the short term for the timely replenishment of essential inputs (four weeks lead time) and thirdly, the provision of assistance that provides an appropriate contingency for longer term replenishment and assistance in light of the results of the previous control activities. Inputs have been divided between those that can be procured locally with the provision of financial assistance and those inputs that need to be procured outside Pakistan either as an in-kind emergency contribution or as a cash donation. All inputs procured outside Pakistan would have to be sent by air freight. Both cash and in-kind donations are welcome. If donors so wish cash payments can be received into a special locally held UN account in Islamabad. This would facilitate local procurement.

In-kind contributions should be sent by urgent airfreight to the Director of the Plant Protection service in Karachi, Dr Shafi. If in-kind contributions are sent, donors are kindly requested to notify UNDP either in Islamabad (P.O. Box 1051, Tel.: 822071 - 822079, Fax: 213959, 822796, 5886 UN IBA PK) or the sub-office in Karachi (G.P.O. Box 403, Tel.:437698, 447142, Telex: UNESC PK) to ensure that arrangements are made for their rapid clearance. To ensure that all equipment is quickly deployed to the field, the department of Plant Protection has an aircraft on standby in Karachi to fly all light equipment directly to the control bases. Heavier equipment and chemical will be trucked from Karachi to the two main operational areas in Sind and Punjab provinces.

UNITED NATIONS NATIONS UNIES

Coordination arrangements are taking place through the UNDP/UNDRO office in Islamabad with technical support from the FAO. A daily dialogue with the government has been arranged and UNDRO will issue regular detailed progress reports to donors on the situation as it develops.

The critical path is narrow. For example if the chemical supplies run out the consequences could be devastating crop losses. With the timely and proper support of the donor communities and the United Nations, the people of Pakistan will be able to prevent the continuation of the plague.

Locusts need no passports and they are no one country's problem, nor should one country have to stand alone against them. The locusts now breeding in Pakistan will eventually move on, after causing damage, unless the plague is stopped here.

Key names of Government officials to be contacted:

Mr. Salman Farooqi
Secretary General
Ministry of Food and Agriculture
Islamabad
Telephone: 210351
FAX: 820216

Mr. A.W. Kazi
Additional Secretary
Ministry for Food and Agriculture
Islamabad
Telephone: 211298
FAX: 820216

Dr Muhammad Shafi
Director
Department of Plant Protection
Jinah Avenue, Malir Halt,
Karachi-27.
Telex: 24057-DPPKR. PK
Telefax: 92-21-480115
Telephone: Karachi 482347

With kind regards,

Yours Sincerely

H.C. von Sponeck
Resident Coordinator

Distribution as per attached list

133

TABLE 1.

LOCUST EMERGENCY IN PAKISTAN AUGUST - OCTOBER 1993
IMMEDIATE REQUIREMENTS / NO LEAD TIME ALLOWABLE[1]

Category / *Item / Function*	Unit/ Type	Total cost US$	Cost per unit US$	Local units	Int. units	Possible Source / Supplier	Reason for International assistance
I. CHEMICALS							
1. Fenitrothion ULV and/or Malathion	liters	480,000	12		40,000	Sumitomo/ Japan Cynamid/USA	Not available locally
II. OPERATIONS							
1. Hand held ULV sprayers	1	60,000	30		2,000	France, UK	Not available locally
2. Vehicle mounted ULV sprayers	1	25,000	2,500		10	UK	Not available locally
3. Helicopter / *target search*	hour	48,000	800	60		Private contract[2]	Militarily sensitive area
4. Suzuki jeep / *target search*	1	127,500	8,500	15		Suzuki-Pakistan	Speed-up control ops.
5. Tractors/trailors / *spraying logistics*	1	50,000	10,000	5		Local suppliers	Speed-up control ops.
6. Truck hire / *logistics*	km	20,000	2	~10,000		Hire firm	Speed-up control ops.
7. Sand tryes / *target search*	1	10,000	100	100		Local suppliers	Speed-up control ops.
8. Camping equipment / *control base*	Base	10,000	1,000	10		Local suppliers	Speed-up control ops.
9. Survey material / *target search (Compass,binoculars,dissection kits,first aid,nets)*	Team	10,000	1,000	10		Local suppliers	Speed-up control ops.
10. Detailed maps/ *target search/ control base*	Set	2,000	100	20		Survey of Pakistan	Speed-up control ops.
11. Smoke flares/ *target search*	1	6,000	3	2,000		Army supplies	Speed-up control ops.
12. Chemical handling safety equipment	Set	20,000	20		1,000	Chemical companies	Not available locally
13. Vehicle maintenance/ *spares/ tools*	Set	8,000	200	40		Local suppliers	Speed-up control ops.
SUB-TOTAL		**876,500**					

[1] Any delay in placing inputs would mean that the current emergency could not be contained

[2] The Ministry of Food and Agriculture is exploring the possibile use of PAF Helicopters

TABLE 1 cont.

LOCUST EMERGENCY IN PAKISTAN AUGUST - OCTOBER 1993

IMMEDIATE REQUIREMENTS / NO LEAD TIME ALLOWABLE

Category / *Item / Function*	Unit/ Type	Total cost	Cost per unit	Local units	Int. units	Possible Source / Supplier	Reason for Int. assistance
III. COMMUNICATION AND NAVIGATION EQUIPMENT							
1. UHF Radio / *target search*	1	32,000	800		40	Japan, UK, USA, Germany	Not available locally
2. HF Radio / *target search*	1	37,500	2,500		15	Australia, UK	Not available locally
3. Solar battery chargers	1	18,000	300		20	Japan, UK, Australia	Not available locally
4. Portable GPS navigation equipment / *target search / ground-air coordination*	1		3,000		6	USA, UK (Magellan)	Not available locally
		87,500					
SUB-TOTAL							
		964,500					
GRAND TOTAL							

TABLE 2. LOCUST EMERGENCY IN PAKISTAN AUGUST - OCTOBER 1993

SHORT-TERM REQUIREMENTS / TO REPLENISH SUPPLIES DURING CONTROL CAMPAIGN[3]

Category / *Item / Function*	Unit/ Type	Total cost US$	Cost per unit	Local units	Int. units	Possible Source / Supplier	Reason for Int. assistance
I. CHEMICALS							
1. Fenitrothion ULV and/or Malathion	liters	360,000	12		30,000	Sumitomo, Japan Cynamid/USA	Not available locally
II. SPRAYERS	1	60,000	30		2,000	France, UK	
1. Hand held ULV Sprayers / *target spraying*							
III. OPERATIONS	1	60,000	5,000[4]		12	Cessna (USA), De Haviland (Canada), Fletcher (New Zealand)	Not available locally
1. Aircraft spare parts / *target spraying*							
GRAND TOTAL		**480,000**					

[3] Contincency to cope with changing circumstances if the situation is not contained during immediate operations. Four weeks lead time is required to place necessary orders.

[4] per Aircraft. Mainenanace of aircraft to ensure servicability.

TABLE 3.

LOCUST EMERGENCY IN PAKISTAN AUGUST - OCTOBER 1993
LONG-TERM REQUIREMENTS / TO BE PREPARED FOR FUTURE CONTROL CAMPAIGNS

Category / *Item / Function*	Unit/ Type	Total cost US$	Cost per unit	Local units	Int. units	Possible Source / Supplier	Reason for Int. assistance
I. CHEMICALS							
1. Fenitrothion ULV and/or Malathion	liters	240,000	12		20,000	Sumitomo, Japan Cynamid/USA	Not available locally
II. OPERATIONS	1	297,500	8,500	35		Suzuki-Pakistan	Speed-up control ops.
1. Suzuki Jeeps	1	500,000	100,000		5	Japan, Germany	Not available locally
2. Trucks							
		1,037,500					
GRAND TOTAL							

LOCUST EMERGENCY IN PAKISTAN
PARTICIPANTS IN DONOR MEETING
17 August 1993 10:00

Chaired by Mr. Hans C. von Sponeck, UN Resident Coordinator

Country/ Organization	Name/ Designation
Pakistan	Mr. A.W. Kazi, Additional Secretary, Ministry of Food and Agriculture
Pakistan	Dr. Zafar Altaf, Chairman Pakistan Agricultural Research Council
Pakistan	Mr. Bahauddin Sirhindi, Secretary Agriculture, Government of Sindh
Pakistan	Mr. Ghulam Abbas Jalvi, Director General , Agriculture Extension, Government of Punjab
Pakistan	Mr. Liaquat Ali Arain, Additional Secretary, Agriculture Deptt., Government of Punjab
Pakistan	Dr. M. Shafi, Director and Advisor, Department of Plant Protection
Pakistan	Mr. Pervez Ijaz, Joint Secretary, Ministry of Food & Agriculture
Pakistan	Mr. Sulaiman Shah, Deputy Secretary, Ministry of Foreign Affairs
Pakistan	Mr. Tahir Shah, Deputy Secretary, Ministry of Foreign Affairs
Pakistan	Deputy Commissioner, Bahwahalpur
Australia	Mr. John Townsend, First Secretary (Dev), Australian High Commission
Canada	Mr. Pervez Nooruddin, Programme Officer (Dev), Canadian High Commission
CEC	Mr. Andrew Standley, First Secretary, Commission of the European Communities
CEC	Mr. Imran Ashraf, Agronomist, Commission of the European Communities
France	Mr. Bertrand Taillard, Agricultural Attache, The Embassy of French Republic

France	Mr. Michel Djokovic, First Secretary, Embassy of the French Republic
Germany	Mr. Gerd Benke, Counsellor, Embassy of the Federal Republic of Germany
India	Mr. Francis Vaz, Counsellor, High Commission of India
Italy	Mr. Riccardo Battisti, First Secretary, Italian Embassy
Japan	Mr. Masahiko Tanoi, First Secretary, Embassy of
Saudi Arabia	Mr. Nasser Al-Joid, First Secretary, The Royal Embassy of Saudi Arabia
Sweden	Mr. Klas Gierow, Counsellor, Embassy of Sweden
Switzerland	Mr. Hansjurg Ambuhl, Counsellor (Devt), Embassy of
U.K.	Mr. Asghar Ali, Projects Officer, British High Commission
USA	Mr. Asif M. Farrukh, Agricultural Specialist/USDA, Embassy of the United States of American
USA	Mr. Frank Coolidge, Agricultural Attache, Embassy of the United States of America
USA	Mr. John B. Swanson, Chief (A) Agri. & Rural Devp., USAID
USA	Ch. Laiq Ali, Mission Environmental Engineer, USAID
ADB	Mr. Ahsan Tayyab, Project Implementation Officer
FAO	Mr. R. Breitbart, Representative a.i.
FAO	Mr. R. Nugent, CTA
ILO	Mr. Richard E. Thresher, Representative
UNDP	Mr. Shahrokh Mohammadi, Assistant Resident Representative
UNDP	Mr. Wojciech Jasinski, Member UNDP Governing Council Mission to Uzbekistan
UNDP	Mr. Klaus Haagensen, Programme Officer
UNICEF	Mr. Jim Mayrides, Representative
WFP	Mr. Robert Hauser, Acting Director Operations
World Bank	Mr. Rashed-ul Qayyum, Projects Adviser (Agriculture)

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P.O. Box 1051
Islamabad, Pakistan

Telex: 5886 UN - IBA PK
Telephone: 822618
Telefax: 823783, 822796

RESIDENT CO-ORDINATOR

Reference: Locust.018
August 22, 1993

Dear colleague,

Locust Emergency in Pakistan (Communication No. 4)

In continuation of our efforts to keep you informed as closely as possible, please find attached a status update following the donor meeting on 17 August and a proposed action plan prepared by the local FAO office. In the meantime, Government control efforts continue with a concurrent draw down on supplies which will have to be replenished on an urgent basis. In Annex II we provide a listing of the actual level of activities and the resources currently available with the Government. The figures, however, are subject to change.

I would like to emphasize that only registered chemicals acceptable under international conventions can be accepted as donations for use in the campaign. For more details please refer to Annex I, chapter 4 and the attached list of FAO Guidelines on recommeded chemicals for locust control.

With kind regards,

Yours Sincerely

H.C. von Sponeck
Resident Coordinator

Distribution as per attached list

140

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

ادارۂ خوراک وزراعت اقوام متحدہ
پاکستان

P.O. BOX 1476, ISLAMABAD / PAKISTAN

Update on Locust emergency in Pakistan

21 August 1993

Issued by the FAO Office/ Islamabad

Organisation

In its most simple form a locust control campaign is the meeting of locusts, and several trained people who have with them equipment and chemicals to kill the locusts. This usually takes place in a far away and inhospitable desert. Unfortunately locusts are not tame and they have evolved a complex behavioral pattern that makes such meetings awkward to arrange. If they are left to chance then the locusts will prevail. Organisation is the key to properly coping with this potentially chaotic situation.

While the government has put in place the basic organisational infrastructure to tackle the operation, key resources such as trained staff and logistical support, are being stretched to breaking point. There is a real need for the international community to support the government operations which are in danger of being overwhelmed by the immensity of the task. In this context the Desert locusts have precipitated an infrastructure emergency. This is most evident at the field level where resources are being pooled from the MINFA and Provincial governments. For more details on the governments control operations and what inputs they currently have at their disposal please refer to the attached annex.

As an initial step, to provide donors with some picture of the organizational structure of the control campaign, a chart has been provided as an annex to this update. A relatively complex array of functions and activities is required in staging a locust campaign. Donors are reminded that the bulk of the organisation is already in place and control activities are being attempted regardless of international assistance. It therefore remains a question of how the international community will provide support to these ongoing activities.

Donors considering becoming involved in contributing to the control activities should spend some time looking at the action plan. It sets out procedures for making a contribution to the control campaign and is provided as an attachment to this brief. It also gives details on how inputs will be deployed and a system for reporting on the work. This may require modification as the operation progresses.

Donors are invited to contact, on technical issues the office of the FAO Representative (Mr. R. Breitbart) or the technical adviser (Mr. R. Nugent) on telephones: Islamabad: 820329, 820238 & 822104 - Telex 5548 FAOIB PK - Fax: 824371, and on general issues the UN Resident Coordinator's office (Mr. Sharukh Mohammadi or Mr. Mateen ud Din) on telephones: Islamabad: 822071-822079 - Telex 5886 UN IBA PK - Fax 213959, 822796, at any time if there are any questions or comments. Suggestions for changes that will improve the efficiency of the emergency aid operation are most welcome.

Operations

The Plant Protection Department is carrying out spray operations in Sindh and Punjab. Aircraft are increasingly being used. However operations are severely constrained by a lack of communication equipment and adequate logistic support. It is anticipated that swarms will begin to develop in about 10 days. An FAO assessment mission will be made at that time.

The most immediate problem facing the control operation is how to increase the speed with which locusts are found and sprayed. Contributions from donors will be channeled, as a priority, to support spray operations in the deep desert areas.

Such assistance will immediately support the government field staff working under extremely difficult and trying circumstances. Some of these staff have been in the desert for over four weeks conducting ground spraying. The Plant Protection Department now is attempting to use aircraft as efficiently as their meager resources allow.

There is an urgent need to properly equip several dedicated ground target search teams to operate in the deep desert to locate targets and guide the spray aircraft to them.

Any ground sprayers received shall be deployed as a priority to the Mithi, Diplo and Virawah areas, in Sindh, which is assessed as the area in most need of ground equipment because of the high number of hopper bands in the area and the relatively high population density of the Thar desert.

Status of international assistance

1. The FAO Emergency Centre for Locust Operations (ECLO) has allocated US$ 83,000 immediate expenditure on locust control in Pakistan. This covers approximately 3 MT of chemicals, 4 HF radios, and some spray equipment, plus some local operating costs.
2. The Project Manager from the FAO Locust project in Afghanistan has been assigned to provide technical assistance and advice to the DMT.
3. The FAOR in Pakistan has loaned two four wheel drive pick-ups to be used by the FAO technical adviser to assist communications and logistics in Sindh and the Punjab.
4. The FAO "Locust and Sunn pest project" in Afghanistan will supply three hundred hand held ULV sprayers immediately to Sindh.
5. Several verbal offers of assistance have been received by donors, responses are awaited.
6. Given that the situation requires immediate action, and to assist in the coordination of the appeal, donors are kindly requested to please also revert back to the UN Resident Coordinator if they are **not** in a position to offer immediate assistance.

—

ANNEX I: **Desert Locust Emergency Pakistan**
Action Plan
Period Covered : 21 August - 31 August 1993

This action plan designates priority activities to be coordinated by the United Nations in cooperation with the Pakistan Ministry of Food and Agriculture. It also establishes procedures for the receipt and timely delivery of inputs. Donors are requested to contact FAO if they have any questions, comments, special requirements and especially if they need advice on technical aspects of the work.

Priority Actions.

1. Key contact points are designated.

2. Structure of emergency operations is defined and System for receiving donations and deploying inputs is to be established.

4. Establishing a flow of information and a reporting system.

5. Environmental considerations

1. Key contact points are designated.

United Nations:

1.1 Mr Hans von Sponeck UN Resident Coordinator / Islamabad
Contact: PO Box 1051
Tel.:822 071 - 822 079, Fax.:213 95, 822 796, Telex: 5886 UN IBA PK

1.2 Mr Reinhard Breitbart FAO Representative a.i.
Contact:PO Box 1476
Tel.:820 238, Fax.:92-51-824 371, Email.:FAO-PAK@CGNET.COM

1.3 Mr Robert Nugent CTA FAO
Technical adviser to emergency programme/Field operations and Islamabad
Contact: c/o- FAOR/Islambad (see above)

1.4 Mr Papasolomontos Director AGP FAO Rome
Director Emergency Locust Operations/Rome
Contact: FAO/Rome 39-6-5797 4689. Fax: 39-6- 5797 25271

Ministry of Food and Agriculture (MINFA), Pakistan Government

1.5 Mr A.W.Kazi
Additional Secretary
Ministry for Food and Agriculture
Islamabad
Telephone: 211 298
FAX: 820216

143

1.6 Dr Muhammad Shafi
Director
Department of Plant Protection
Jinah Av. Malir Halt,
Karachi-27
Telephone: 482347, 480111
Telex:24057-DPPKR.PK

2. System for receiving and deploying inputs.

2.1 All donors considering contributing to the emergency, whether in-kind or with cash, are kindly requested to notify the UN Resident Coordinator and/or the FAO Representative to register their intentions.

Donors considering in-kind contributions are requested to please contact the FAO to ensure that inputs are technically cleared and compatible with the on-going control operations.

Designated responsible party:

UNDHA	-	**Register of Donor intentions**
	-	**Technical advice to Donors**
	-	**Regular update reports to donors and MINFA on status of overall pledge.**
MINFA	-	**To keep accurate account of donations and notify FAO if problems are faced in utilising donations.**

2.2 Cash donations

If donors so wish, direct cash contributions can be made to a UNDHA administered account in Islamabad. For further information please contact the local UNDP office.

The Ministry of Food and Agriculture shall act as procurement agent unless otherwise specified by UNDP or the donor.

UNDP shall issue regular financial accounts to donors covering expenditure from this emergency fund.

2.3 In-kind contributions

In-kind contributions should be sent by urgent airfreight to the Director of Plant Protection service in Karachi, Dr Shafi. Please notify UNDP either in Islamabad (PO Box 1051, Tel.:822071-822079, Fax: 213959, 822796, 5886 UN IBA PK) or the sub-office in Karachi (GPO Box 403, Tel.:437698, 447142, Telex: 25044 UNESC PK) so that arrangements can be made for their rapid clearance through customs. All lighter inputs, such as sprayers, shall be flown directly to control bases in the operational area. The Plant Protection department has light cargo aircraft and the Pakistan Air Force (PAF) could possibly assist with heavier materials. Trucks can also be hired for the purpose of delivering inputs. MINFA to arrange.

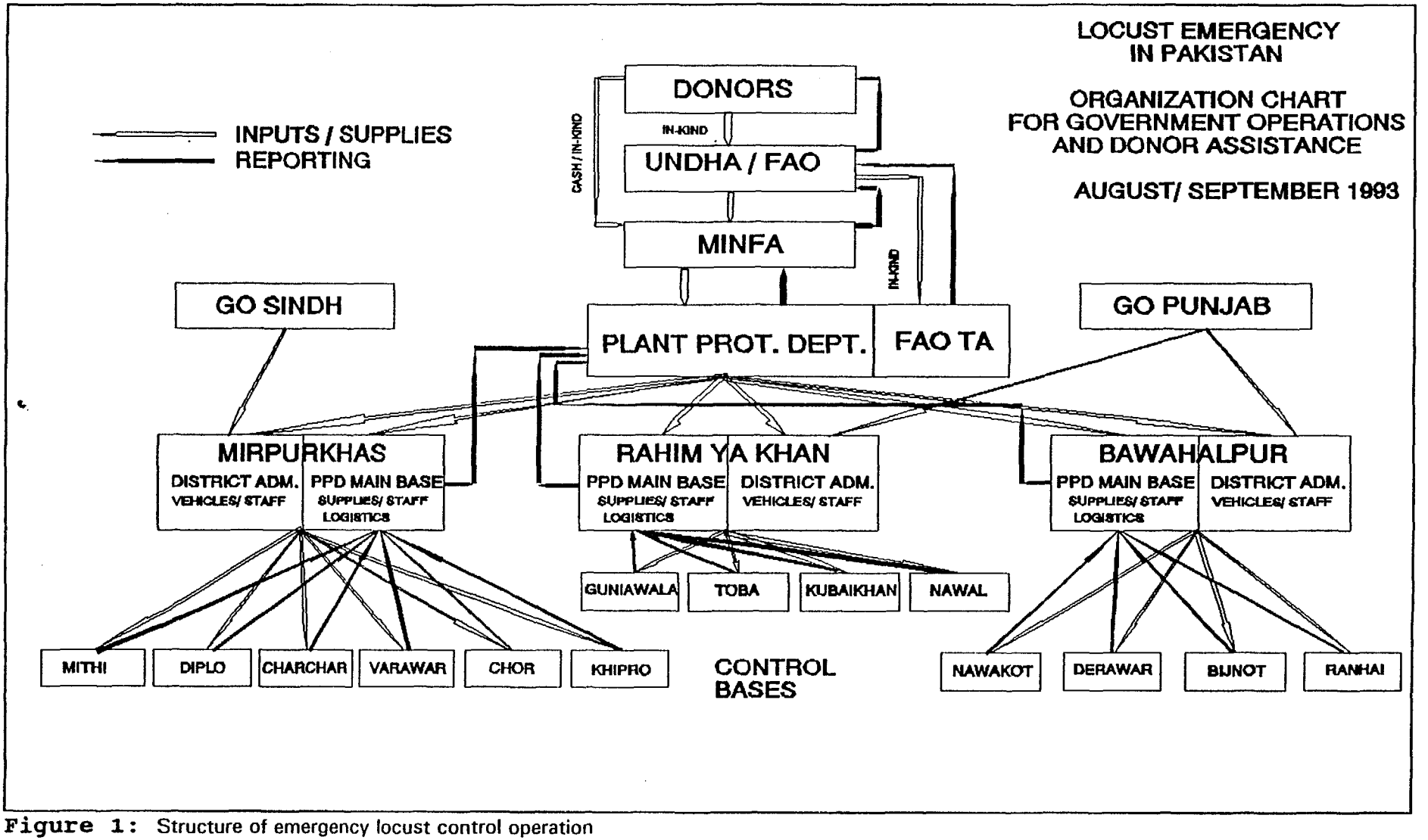

Figure 1: Structure of emergency locust control operation

2.4 Deployment

Inputs received or procured by the United Nations shall be dispersed to the field in consultation with the MINFA. The FAO shall monitor the utilisation of inputs and MINFA is requested to report to the DMT when inputs have been placed in the field and are being actively employed in the control operation. MINFA is also requested to report to the UN if delays are experienced in placing inputs.

Inputs received directly by the MINFA shall be distributed in line with their operational requirements. MINFA shall keep an accurate record and account of all inputs received, their deployment and how they have been employed in the campaign. This shall be reported to FAO on a regular basis so that donors can be informed of the progress of the work.

3. Establishing flow of information and reporting system.

The FAO shall operate a briefing room in the FAOR in Islamabad office. The MINFA shall provide the FAO with regular technical reports on the situation.

Control bases shall make daily reports to the regional supply and coordination centres in Sind and Punjab according to FAO guidelines for reporting locust control activities (see the attached sample of a target control data sheet that has been distributed to MINFA by the FAO).

Information collected in the regional bases from the field of operations shall be sent to the Plant Protection Departments central control room where targets shall be accurately mapped. As well as target information daily records need to be maintained on the deployment of chemical supplies and stocks.

A close watch has to be maintained on all strategic inputs at the central control base in Karachi to ensure that strategic supplies (especially chemicals) are not running short in the control bases.

A warning of possible shortages should be issued well in advance and action taken to resupply the control bases. The critical data required to make this estimate are:

a) Chemicals used, in litres, per target.
b) Chemicals stock remaining, in litres, at each aerial and ground control base.
c) Time required to replenishment a particular base.
d) Location of alternative supplies.

Items a) and b) have to be recorded daily at each control base and transmitted to the regional coordination base. Items c) and d) are the responsibility of the central control base in Karachi and the regional supply bases.

4. Environmental considerations

4.1 The chemicals recommended for use on this control campaign are organophosphates or pyrethroids. Please see attached sheet giving chemicals recommenced for locust control by the FAO. They are registered chemicals and

acceptable under international conventions. They decay rapidly in the environment. While being of relatively low toxicity to mammals they are harmful to most insects. To minimize the harmful affects of chemicals on insect populations wide scale spraying of the chemicals is not recommended. The chemicals should be applied on to specifically identified targets in the desert areas. The target should be a discrete and defined area. In this way unsprayed areas will be left between targets to increase the speed with which insects recolonize a sprayed area. The dose rates of chemicals should be strictly adhered to. Over dosing is unnecessary and will adversely effect other non target organisms.

Water supplies, irrigation canals, streams and rivers should not be sprayed.

4.2 Some of the infested areas are relatively heavily populated. Caution will have to be used when spraying chemical from the aircraft. In these areas targets should not be sprayed without either a ground team being present in the area or the helicopter, to warn the local population. For most of the chemicals being used there is a withholding period of 14 days for livestock grazing.

ANNEX II Government Inputs

The following provides information on the resources currently in use by the government.

At present there is no information on the level of support being provided by provincial authorities.

The figures are subject to change.

Control Work

1. Sindh Province

- 18 vehicle mounted exhaust nozzsle sprayers (no radios)

  Unspecified number of MINFA, vehicles and additional vehicles provided by Provincial Government authorities (no radios).

- 6 Control Posts with radios

2. Punjab

- 6 vehicle mounted exhaust nozzle sprayers (no radio)
- 8 Support and Communication vehicles (MINFA) (no radio)
- 5 Control posts with HF Radio

Unspecified number of vehicles provided by Provincial and District Government Authorities. Many of these vehicles are not desert worthy.

3. Aerial Support

- 14 Spray Aircraft (80% serviceability which is adequate)
- 10 Aircraft deployed in field bases and operational
- No air - ground communications

4. Chemicals

- 70,000 litres of ULV chemical (fenitrothion and malithion)

Attachments

1. FAO SPRAY RECORDING FORM
2. FAO GUIDELINES ON RECOMMENDED CHEMICALS FOR LOCUST CONTROL

Distribution list for:

'Locust Emergency in Pakistan (Communication 4)' dated 21 August 1993

Mr. A.W. Kazi
Additional Secretary
Ministry of Food and Agriculture

Dr. Zafar Altaf
Chairman
Pakistan Agricultural Research Council

Mr. Pervez Ijaz
Joint Secretary
Ministry of Food & Agriculture

Mr. Tahir Shah
Deputy Secretary
Ministry of Food and Agriculture

Dr. M. Shafi
Director and Advisor
Department of Plant Protection

Mr. Bahauddin Sirhindi
Secretary Agriculture
Government of Sindh

Mr. Liaquat Ali Arain
Additional Secretary
Agriculture Deptt., Government of Punjab

Mr. Ghulam Abbas Jalvi
Director General
Agriculture Extension, Government of Punjab

Mr. Sulaiman Shah
Deputy Secretary
Ministry of Foreign Affairs

Mr. John Townsend
First Secretary (Dev)
Australian High Commission

Mr. Pervez Nooruddin
Programme Officer (Dev)
Canadian High Commission

Mr. Andrew Standley
First Secretary
Commission of the European Communities

Mr. Imran Ashraf
Agronomist
Commission of the European Communities

Mr. Bertrand Taillard
Agricultural Attache
The Embassy of French Republic

Mr. Michel Djokovic
First Secretary
Embassy of the French Republic

Mr. Gerd Benke
Counsellor
Embassy of the Federal Republic of Germany

Mr. Francis Vaz
Counsellor
High Commission of India

Mr. Sayed Ali Tahaoghi
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Embassy of the Islamic Republic of Iran
Islamabad

Mr. Riccardo Battisti
First Secretary
Italian Embassy

Mr. Masahiko Tanoi
First Secretary
Embassy of Japan

Mr. H. van der Goes van Naters
Counsellor
Royal Netherlands Embassy
2nd Floor, New PIA Building
Blue Area
Islamabad

Mr Ragnvald Dahl
Resident Representative
Development Co-Operation (NORAD)
Street 84, House No. 9
Ramna 6/4
Islamabad

H.E. Ali Bin Abdullah Al-Musafer
Ambassador
Embassy of Sultanate of Oman
Islamabad

Mr. Nasser Al-Joid
First Secretary
The Royal Embassy of Saudi Arabia

Mr. Klas Gierow
Counsellor
Embassy of Sweden

Mr. Hansjurg Ambuhl
Counsellor (Devt)
Embassy of Switzerland

H.E. Atiq Al-Qamzi
Ambassador
Embassy of the United Arab Emirates
Islamabad

Mr. Asghar Ali
Projects Officer
British High Commission

Mr. Frank Coolidge
Agricultural Attache
Embassy of the United States of America

Mr. John B. Swanson
Chief (A) Agri. & Rural Devp.
USAID

H.E. Abdul Malik Mohammad Al-Tayyeb
Ambassador
Embassy of the Republic of Yemen
Islamabad

Mr. Ahsan Tayyab
Project Implementation Officer
Asian Development Bank

Mr. R. Breitbart
Representative a.i.
FAO

Mr. Richard E. Thresher
Representative
ILO

Mr. Shahrokh Mohammadi
Assistant Resident Representative
UNDP

Mr. Jim Mayrides
Representative
UNICEF

Mr. Rashed-ul Qayyum
Projects Adviser (Agriculture)
World Bank

Mr. Robert Hauser
Director of Operations a.i.
WFP

Desert Locust control record

NO:

This form should be completed for each target area treated. If more than one sortie, complete a form for each.

LOCATION OF OPERATING BASE

COUNTRY: DATE:
LANDING STRIP LATITUDE: LONGITUDE:
DISTANCE & DIRECTION FROM TARGET:

LOCATION OF SPRAY SITE

SPRAY SITE LATITUDE: LONGITUDE:
DISTANCE & DIRECTION FROM NEAREST TOWN:
ORGANIZATION EXECUTING TREATMENT:
NAME OF OFFICER-IN-CHARGE:

HABITAT/VEGETATION DESCRIPTION

DOMININANT SPECIES:
OTHER IMPORTANT SPECIES:
PROPORTION OF BARE GROUND: MEAN HEIGHT GRASS OR CROP:

LOCUST POPULATION

SPECIES:
HOPPER - INSTAR(S): BAND yes/no MARCHING yes/no
ADULT - FLEDGLING/IMMATURE/MATURE SWARM yes/no ROOSTING yes/no
FLYING yes/no MAX. HEIGHT (m):

PESTICIDE

COMMON NAME (A.I.): TRADE NAME:
MANUFACTURER:
FORMULATION TYPE: CONCENTRATION A.I./LITRE:
DILUENT **: RATIO DILUENT:PESTICIDE FORMULATION:
(** if applicable)

APPLICATION

	TIME	TEMPERATURE	REL. HUMIDITY	WIND DIRECTION & SPEED (highest & lowest in 2 min)
TAKE-OFF START SPRAYING FINISH SPRAYING LAND				

METHOD OF APPLICATION: air / vehicle / foot
SPRAY EQUIPMENT - TYPE:
NUMBER OF ATOMIZERS (if applicable): MODEL:
EQUIPMENT SETTING (e.g. Micronair blade angle; no. Micro-Ulva cells; nozzle type, no. & angle)

AERIAL SPRAYING: TYPE OF AIRCRAFT:
HEIGHT OF SPRAYING:

* Complete as many of the relevant sections as possible. Enter N/A where not applicable

continued • •

APPLICATION (continued)

EMISSION FLOW RATE:	HOW DETERMINED:
TRACK SPACING:	HOW DETERMINED:
SPEED OF SPRAYER:	HOW DETERMINED:
VOLUME APPLIED:	HOW DETERMINED:
AREA TREATED:	HOW DETERMINED:
NUMBER OF SPRAY RUNS:	HOW DETERMINED:

EFFICACY CHECK (FIELD)

TIME AFTER SPRAYING:
SUBJECTIVE ESTIMATE OF % KILL:
--- or---
NUMBER ALIVE / DEAD IN AT LEAST 15 SAMPLES (approx. 1 sq. metre each):

EFFICACY CHECK (CAGES)

TIME AFTER COLLECTION (hrs) Cage Number:		6 alive/dead	24 alive/dead	48 alive/dead	..... alive/dead
CONTROL	1				
CONTROL	2				
SPRAYED LOCUST + SPRAYED GRASS	1				
	2				
	3				
SPRAYED LOCUST + UNSPRAYED GRASS	1				
	2				
	3				

COMMENTS

APPENDIX 6. Pesticide suitability

This Appendix indicates the suitability of those pesticides in common use for Desert Locust control against different locust targets.

Pesticide	Individual band	Band infested block	Settled swarm	Swarm at roost site (1)	Flying swarm
bendiocarb (Ficam)	✓✓	✓	✓✓	✓✓	✓✓
chloropyrifos (Dursban)	✓✓	✓	✓✓	✓✓	✓✓
deltamethrin (Decis)	✓✓	✓✓	✓✓	✓✓	✗
diazinon (Basudin, Diazinon)	✗	✗	✓✓	✓✓	✓✓
fenitrothion (Sumithion)	✓	✓✓	✓✓	✓✓	✓✓
fenitrothion + esfenvalerate (Sumicombi- α)	✓✓	✓✓	✓✓	✓✓	✗
lambdacyhalothrin (Karate)	✓✓	✓✓	✓✓	✓✓	✗
malathion (Malathion, Fyfanon)	✓	✓	✓	✓	✓
phoxim + propoxur (Volaton-Unden)	✓	✓	✓	✓	✓

(1) Settling to land or milling before departure.

✓✓ very suitable ✓ suitable ✗ unsuitable

Note: 'Suitability' relates essentially to mode of action. Price and safety must also be considered in the choice of a pesticide.

FAO wishes to know if these judgements conflict with field experience.

FROM: FAOR-PAK (General Mailbox)

TO: Reinhard Breitbart (Prg Off) DATE: 08-18-93
TIME: 12:15

CC:
SUBJECT: DESERT LOCUSTS, PAKISTAN
PRIORITY:
ATTACHMENTS:

FORWARDED FROM: FAOR-PAK (General Mailbox)
Return-Path: <FAO-IND@CGNET.COM>
Date: Wed, 18 Aug 1993 11:20:00 -0700 (PDT)
From: FAOR Delhi <FAO-IND@CGNET.COM>
Subject: DESERT LOCUSTS, PAKISTAN
To: FAO-PAK@CGNET.COM
X-Mailer: Microsoft Mail V3.0
Encoding: 261 TEXT
TO : MR. ROBERT NUGENT, FAO, ISLAMABAD
FM : LAURY MCCULLOCH, FAO, ROME
DATE : 18 AUGUST 1993
EM NO: 551

CONSULTANCY REPORT

Laurence McCulloch
FAO/ECLO

Report on Desert Locust in India

August 1993

Plant Protection and Production Division

Food and Agriculture Organization of the United Nations

156

1. Background

- a detailed background on the emerging Desert Locust situation internationally is attached as Annex 1 for information. This Annex was issued as part of the FAO Director-General's appeal on 2 August 1993 following a donor review meeting held in Rome on 23 July 1993.

- Essentially the Desert Locust situation poses a serious threat of developing into a major plague with Desert Locust populations present in all traditional summer breeding areas in West Africa, parts of East Africa and India/Pakistan.

- It is believed that the most significant Desert Locust populations are present in India and Pakistan. If these are not controlled successfully over the next 2 months there is a serious risk that migration will occur in October with swarms re-infesting the Middle East and possibly Eastern Africa thereby initiating a plague.

- the last plague occurred in 1987-89 and was estimated to have required approximately US$200 million in external assistance. This plague was however relatively short lived due to a combination of natural mortality due to migration into the Atlantic Ocean, drought and control by insecticides.

2. Situation in India

-India (and Pakistan) was invaded by swarms which crossed the Arabian peninsula and Arabian Sea from Yemen and Oman in early to late July 1993.

- the invasion of both countries was on a sunbstantial scale and breeding occurred quickly due to the highly favourable ecological conditions. It is suspected that locusts have laid eggs several times as evidenced by the wide range of hopper instars reported and as recently as 16 August swarms with fully mature eggs, indicating imminent laying, were observed in the Barmer area of Rajahstan.

- in Rajahstan the Indian authorities quickly mobilised control resources against invadin swarms and resultant hopper bands which emerged. It is my view that this control has been highly successful in the southern parts of Rajahstan (Jodhpur-Jalore-Sanchore). However, in the Jaisalmer area a number of late instar hpper bands were observed on 16 August and it is strongly suspected that other areas of hopper bands are present in this area. The control gigures would, in my view, support this view since out of a total control effort of approximately 80,000 ha some 67,000 ha has been controlled in the Jaisalmer area and a more detailed look at the figures indicates that a large percentage of this control has been conducted by aerial operations over the past 10 days.

- It is therefore my view that immature swarms will start to form in the Jaisalmer area within the next 10 days. The scale of this is difficult to predict but my best estimate would be that the

scale will be moderate scale with perhaps 100-300km2 of swarms forming.

- However, of more concern is the situation in Pakistan. An FAO locust officer has recently conducted a survey in Pakistan and descibes the sitaution as alarming. (see Annex 2 for details).

- In my view it is virtually certain that swarms will form on a large scale on the Pakistan side of the border again within the next 10 days. Furthermore it is again virtually certain that due to the prevailing south-westerly monsoon wind pattern that many of these swarms, if not controlled in Pakistan, will invade India.

- It is my view that such an invasion is likely to occur from late August onwards on a substantial scale. Again it is difficult to define or estimate substantial but as an INDICATION this could result in between 1000-2000km2 of swarms.

- due to the persisting favourable ecological conditions in Rajahstan it is also my view that incoming and locally produced swarms will mature quickly and reproduce with hopper bands forming in late September.

- the scale of the problem poses a high risk to cropping areas of Rajahstan and particularly to irrigated crops. In addition there is a risk of swarms migrating further north to threaten crops in the Punjab.

- on the international level ther is also a risk that if not controlled further swarm migration will lead to a plague developing.

- In my view India is the best place to try to stop the development of the plague. The Indian locust authorities and personnel are experienced, an effective reporting and control structure exists and logistical problems are not insurmountable. However, there is, in my view, an urgent need to further supplement and strengthen the Indian efforts through additional immediate assistance.

3. Action required.

- the immediate threat is a large scale swarm migration. Swarms are relatively easy to detect by aerial surveys and to control. The initial startegy must be to control as many incoming swarms as possible to limit and contain further potential breeding.

- to achieve effective control swarms must be attacked by aerial ulv control using organophosphate or synthetic pyrethroids pesticides. There will also be a need for aerial survey commencing almost immediately to detect swrams. This is particularly the case in the Jaisalmer area where local reporting by villagers is less effective.

- ground control measures using ulv control need also to be strengthened.

- effective control is also highly dependent on an effective communications network.

- it is unlikely that all incoming swarms will be controlled prior to breeding and even at this stage it must be assumed that band control will be required probably commencing in late September.

4. Requirements

- an outline of requirements to strengthen the Indian response is attached as Annex 3.

- It is critical that the communications network be improved through the availability of High Frequency radios for reporting and operational co-ordination. Similarly VHF radios are required to allow direction of spray aircraft.

- One difficulty may be the availability of suitable spray aircraft and it may be necessary to examine the possibility of contracting overseas companies. I would stongly advocate assistance be considered for the hire of survey or spray aircraft although hiring from overseas will be more expensive than local hire.

- there is an acute shortage of both hand held (suitable for band control) and vehicle (suitable for swarm control) ulv sprayers. In addition it is strongly advocated that training in ulv spraying, both ground and aerial, be given to staff.

- It is believed that the Indian authorities have recently purchased 50,000 litres of malathion. This is a reasonable security stock but I would recommend strong consideration be given to the supply of an additional 50,000 litres of suitable locust ulv pesticide together with appropriate quantities of protective clothing.

- Technical assistance particularly for training and monitoring of ulv pesticide application must also be considered a pricrity area.

- There is also an acute shortage of survey vehicles for locust operations. In my view the acquisition of approximately 15-20 locally produced vehicles would also signifcantly strengthen control efforts. However, it should be first ascertained that these vehicles would (i) be immediately available and (ii) capable of carrying a vehicle mounted ulv sprayer.

- It is stressed that due to the urgency of the situation any assistance provided should be air-freighted to India.

Outline Assistance Budget ($US)

1. Communications

- 10 HF Base sets (Unit cost - $3500)
- 15 HF Mobile sets(Unit Cost ($3500)
- 30 VHF sets (Unit cost $ 800)

$95,000

2. Sprayers

- 15 ulv vehicle sprayers (Unit Cost $6000)

- 200 hand held sprayers+ spare parts

$140,000

3. Protective clothing

- masks
- rubber gloves
- coveralls $ 20,000

4. Pesticide

50,000 litres $ 500,000

5. Aircraft hire

200 hours aircraft flying $ 200,000

6. Vehicles

15 local produced vehicles
(Unit cost $7000) $ 100,000

7. Technical assistance

- ulv spray training (1m/m)
- Locust coordination (2m/m) $ 36,000

TOTAL

Notes

1. all costs estimated

2. Aircraft hire and pesticide could be pledged in stages. e.g.

- initially 100 hrs aircraft hire with option to extend contract

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INTERNATIONAL
THE NEWS
AUGUST 24, 1993
BUSINESS

Locust time bomb explosion feared in Pakistan: UN

ISLAMABAD: The United Nations said on Monday a locust invasion of vast desert lands in Pakistan and neighbouring India was a time bomb that it was trying to prevent from exploding across the region.

Unless it was stopped, the locust outbreak could start a cycle of plagues lasting several years, a U.N. statement said.

Locusts on both sides of the India-Pakistan border "constitute a serious threat to all agricultural production in the region", a U.N. Food and Agriculture Organisation report was quoted as saying.

"International donors have been requested to provide equipment and chemicals for use by the Plant Protection Department of Pakistan," said the statement, issued by the U.N. information office in Islamabad.

It added that similar assistance was being provided in India. "The aim is to try and prevent this time bomb in the desert from exploding across the region.

"A major outbreak of desert locusts is occurring in the deserts of Sindh and Punjab in Pakistan and cross-border in India," it said. "After invading the area in the middle of July by flying across the Arabian Sea from Yemen and Oman, the insects now extend throughout vast areas of desert."

Pakistani authorities said earlier this month the locust threat was serious though they had destroyed nearly 100 swarms and about 4,000 hopper bands in the Thar desert of Sind and the Cholistan desert in Punjab.

Officials say the locust attack is Pakistan's worst in nearly three decades and could threaten the vital cotton crop later this month. The U.N. statement said the swarms could start invading crops in Sind and Punjab in the next two to three weeks if Pakistani and Indian operations failed to control the outbreak.

"If the locusts breed successfully they could migrate back across the Arabian Sea to Yemen and Saudi Arabia, starting a cycle of plagues that could last two to three years if it is not stopped in Pakistan and India," it said.

Officials say the swarms had hit hundreds of thousands of acres (hectares) of desert land after entering overland from India as well as across the sea since early July. The Food and Agricultural Ministry says its plant protection teams are fighting the swarms with insecticides from 14 ground and nine air stations. The U.N. statement said the locally represented U.N. system was coordinating international assistance to Pakistan. "A U.N. disaster management team...is in place and maintaining daily contacts with Pakistani authorities to ensure linkage between local control efforts and international support in the fight against the menace which could threaten vital cash and food crops such as cotton and wheat." Plant protection officials estimate that between 250,000 and 300,000 acres (100,000 and 120,000 hectares) of land have been affected in the Thar area and a similar area in the Cholistan desert.

The officials say the insects now pose a threat mainly to sugarcane, paddy crops and orchards in Sind, but could threaten the cotton crop in the main growing areas of Punjab later this month when they could move north after breeding.

Meanwhile, the meeting of inter-provincial committee on food and agriculture held under the chairmanship of M.Salman Farooqui, secretary general, federal ministry of food and agriculture and cooperative to evaluate the progress achieved to eliminate the locust swarms in Thar, Nara deserts in Sindh and Cholistan in Punjab informed that the anti-locust operations by the federal department of plant protection carried out in Thar, Nara deserts in Sindh and Cholistan in Punjab proved very successful and one could cautiously hope that the potential serious threat to the irrigated areas in Sindh and Punjab would be avoided. The ministry of food and agriculture has requested the ministry of defence to provide at least two helicopters for the surveillance of the locust -affected areas. Helicopter is the only quick medium to find out from the air the hopper bands on the ground.

The other ways to locate the hopper bands are the services of ground teams functioning for the purpose.

In Sindh, Thar desert is worst affected. Two sector headquarters have been set up at Mirpurkhas and Sukkur and further divided into six and one sub-sectors, repectively.

Thirty teams are operating in Thar desert and another 3 have been assigned to Nara.

In the Punjab, Cholistan area has been divided into two sectors,i.e. Rahimyar khan and Bahawalpur, each having 6 sub-sectors, respectively .In the case of Cholistan, 9 field teams have been set up in Rahimyar Khan sector and another 12 in Bahawalpur.

The field operations are backed up by aerial support for which 5 temporary air strips have been set up in Thar and one in Nara deserts.In the case of Cholistan, there are 2 air strips in Rahimyar khan sector and one in Bahawalpur sector.

The provincial governments of Punjab, Sindh and Balochistan have been actively involved in these operation who have also been provided 45 vehicles (20 each by Punjab and Sindh and 5 by Balochistan) and also some field staff,to supplement the existing resources of the department of plant protection.—Agencies

Agriculture secretary to inspect operation

By our correspondent

KARACHI: Sindh Secretary for Agriculture and Wildlife, Bahauddin Sirhindi, would visit Mithi, Tharparkar district, on August 26, to inspect the campaign launched by his department to eliminate the locust swarms breeding in the deserts.

According to a statement released on Monday by the Central Agriculture Publicity Cell, the secretary would also take a closer look at the performance of the field assistants deputed by the Agriculture Extension Department to carry out the anti-locust campaign.

The secretary would also inquire into the problems being faced by the field assistants and look into the demands their office bearers had earlier placed before him.

The field assistants had requested the secretary agriculture to raise their grade from the present BPS-5 to BPS-11 in addition to various allowances and facilities they require in view of the hardships they are facing during the campaign.

Apart from the secretary agriculture, the administrative secretary has also assured the field assistants that their genuine demands would be looked into and if their efforts make the anti-locust campaign a success he would fight for their cause.

FAX MEMORANDUM FROM
USAID MISSION TO PAKISTAN
FAX NUMBER: 92-51-824086

Date: September 2, 1993

From: **Chaudhary Laiq Ali**
Mission Environmental Engineer
USAID/Islamabad

(Signature) Laiq Ali

To: **Molly Kux**
Asia Bureau Environmental Coordinator
ASIA/DR/TR, AID/Washington

Fax Number: (202) 647-1805

Approved: **John B. Swanson**, Chief, ARD and
Mission Environmental Officer

for Laiq Ali

Signature

Number of pages including the cover page = 60

Subject: Supplementary Environmental Assessment (SEA) for Pakistan Locust Control Program - Appendix D (FAO Updates)

Attached is Appendix D to SEA for Pakistan Locust Control Program. SEA was sent to you earlier as an e-mail attachment.

Regards

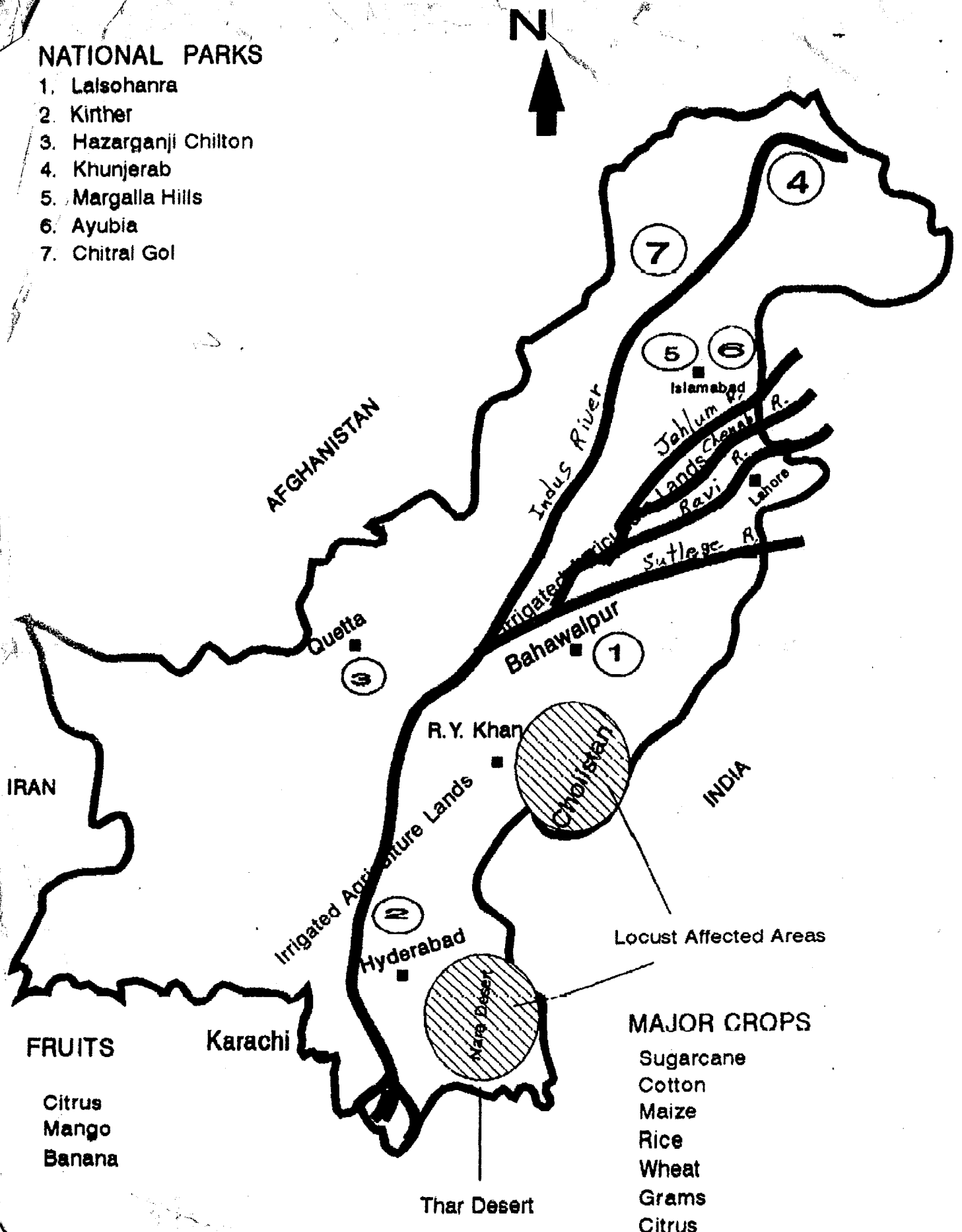
TO BE COMPLETED BY C&R

Date Transmitted: Time Logged:
Charges (Rs)

C&R Supervisor

ARD:CLAli:September 1, 1993
C:\91F1

162


NATIONAL PARKS
1. Lalsohanra
2. Kirther
3. Hazarganji Chilton
4. Khunjerab
5. Margalla Hills
6. Ayubia
7. Chitral Gol
N
AFGHANISTAN
IRAN
INDIA
Indus River
Jehlum R.
Chenab R.
Ravi R.
Sutlej R.
Islamabad
Lahore
Quetta
Bahawalpur
R.Y. Khan
Cholistan
Irrigated Agriculture Lands
Hyderabad
Karachi
Thar Desert
Nara Desert
Locust Affected Areas
FRUITS
Citrus
Mango
Banana
MAJOR CROPS
Sugarcane
Cotton
Maize
Rice
Wheat
Grams
Citrus

APPENDIX-E

LIST OF NATIONAL PARKS, WILDLIFE SANCTUARIES AND GAME RESERVES

LIST OF ENDANGERED WILDLIFE SPECIES (PAKISTAN)

A. Reported by Wildlife Enquiry Committee

I. **MAMMALS**

The following three species appear to be **Already Extinct:**

1) Cheetah (Acinonyx jubatus)
2) Wild Dog (Cuon alpinus)
3) Chowsingha (Tetracerus quadricornis)

The following species are **Endangered:**

1) Rhesus Monkey (Macaca mulatta)
2) Common Langur (Presbytis entellus)
3) Pangolin (Manis crassicaudata)
4) Baluchistan Black Bear (Selenarctos thibetanus gedrosianus)
5) Brown Bear (Ursus arctos)
6) Yellow-throated Marten (Martes flavigula)
7) Marbled polecat (Vormela Pergusna)
8) Smooth Indian Otter (Lutra perspicillata)
9) Common Otter (Lutra)
10) Himalayan Palm Civet (Paguma larvata)
11) Pallas's Cat (Felis viverrina)
12) Fishing Cat (Felis margacita)
13) Caracal (Felis caracal)
14) Leopard Cat (Felis margacita)
15) Sand Cat (Felis bengalensis)
16) Lynx (Felis lynx)
17) Snow Leopard (Panthera uncia)
18) Leopard (Panthera pardus)
19) Wild Ass (Equus hemionus)
20) Musk deer (Moschus moschiferus)
21) Barking deer or Muntjac (Muntiacus muntjak)
22) Hog Deer (Axis procinus)
23) Kashmir Stag or Hangal (Cerves Elaphus)
24) Black Buck (Antilope cervicapra)
25) Chinkara Gazelle (Gazelle subguttrosa)
26) Goitred Gazelle (Gazella subguttrosa)
27) Nilgai (Boselphas magouallrelus)
28) Thar (Hemitragus jemalicus)
29) Punjab Urial (Ovis orientalis punjabiensis)
30) Marco Polo's Sheep (Ovis ammon polii)
31) Suleman Markhor (Capra falconeri jerdoni)

II. **BIRDS**

1) Marbled Teal (Anas angustirostris)
2) Spotbill Duck (Anas poeolarhyncha)
3) White-headed Duck (Oxyhia oncocephala)
4) Cotton Teal (Nettapus commandelicus)
5) Western Tragopan (Tragopan melanocephalus)
6) Himalayan Monal Pheasant (Lophophorus impejanus)
7) Kaleej Pheasant (Lophura leucomelana)
8) Koklas Pheasant (Pucrasia macrolopha)
9) Cheer Pheasant (Catreus wallichii)
10) Red Junglefowl (Gallus)
11) Peafowl (Pavo cristatus)
12) Common Crane (Grus)
13) Siberian Crane (Grus leucogeralus)
14) Sarus Crane (Grus antigone)
15) Demoiselle Crane (Anthropoides virgo)
16) Great Indian Bustard (Choriotis undulata)
17) Houbara Bustard (Chlamydotis undulata)
18) Lesser Florican (Sypheotides Indica)
19) Large Pintailed Sandgrouse (Pierocles alchata)
20) Woodcock (Scolopax rusticola)

III. **REPTILES**

1) Marsh Crocodile (Crocodilus palustris)
2) Gharial (Gavialis gangeticus)
3) Monitor Lizards (Varanus spp.)
4) Rock Python (Python molurus)
5) Sea Turtles (Turtles of the genera Chelone, Dermochylys, caretta and Erotomochelys)

B. Animals which are threatened with extinction as reported by the International Union for the Conservation of Nature and Natural Resources (IUCN)

1) Leopard (Panthera pardus)
2) Asiatic Cheetah (Acinonyx jubatus)
3) Indian Wild Ass (Equus hemionus)
4) Wolf (Canis Lupus)
5) Asiatic Wild Dog (Cuon alpinus)
6) Baluchistan Bear (Selenarctos thibetanus gedrosianus)
7) Chiltan Markhor (Capra falconeri chiltanensis)
8) Straight Horned Markhor (Capra falconeri jerdoni)
9) Great Indian Bustard (Choriotis nigriceps)
10) Indus Dolphin (Platanista indi)

LIST OF NATIONAL PARKS, WILDLIFE SANCTUARIES AND GAME RESERVES

I. NATIONAL PARKS

"National Parks" means comparatively large areas of outstanding scenic merit and natural interest with the primary object of protection and preservation of scenery, flora and fauna in the natural state with limited forestry activities to which access for public recreation, education and research may be allowed. Uptil now the following national parks have been notified:

Sr. No.	Name of National Park	Province	Wildlife of the Area
1.	Lalsohanra	Punjab	Black buck, Chinkara, Blue Bell and Waterfowl.
2.	Kirther	Sind	Sind Ibex, Urial, Deer, Leopard, Grey Partridges and Houbara Bustard.
3.	Hazarganji Chiltan	Baluchistan	Chiltan Markhor, Wild Sheep, Leopard, Chukor and Seesee.
4.	Khunjerab	Northern Areas	Marcopolo Sheep, Blue Sheep, Himalayan Ibex, Snow Leopard, Wolf, Brown Beer, Tibetan Wild Ass, Ram Chakor and Chukor.
5.	Margalla Hills	Federal Capital Territory	Leopard, Goral, Rhesus moneky, Grey & Black Partridge, Kalij Pheasants, Cheer Pheasant and Waterfowl.
6.	Ayubia	Northern Areas	
7.	Chitral Gol	NWFP	Markhor, Urial, Leopard, Black Bear, Monal Pheasant, Snow Cock.

II. WILDLIFE SANCTUARIES

"Wildlife Sanctuary" means an area closed to hunting, shooting or trapping of wildlife animals, declared as such by a Government as undisturbed breeding ground primarily for the protection of wildlife inclusive of all natural resources such as vegetation, soil and water. The following areas have been declared as game sanctuaries:

Sr. No.	Name of Wildlife Sanctuary	Province	Area in Hectares	Wildlife of the Area
1.	Rasool Barrage	Punjab	1,138	Waterfowl
2.	Tehra (Jallo) Plantation	"	339	Partridge
3.	Khabbe-ke-Lake	"	283	Waterfowl
4.	Taunsa Barrage	"	6,569	Hog-Deer, Otter, Hare, Black and Grey Partridges.
5.	Kharar Lake	"	235	Waterfowl
6.	Chumbi Surla	"	55,968	Green Pigeon and Partridges.
7.	Nemal Lake	"	486	Waterfowl
8.	Chashma Lake	"	33,097	Waterfowl
9.	Takkar	Sind	45,513	Deer, Grey Partridges and Houbara Bustard.
10.	Kinjhar (Kalri) Lake	"	13,468	Waterfowl
11.	Hudero Lake	"	1,321	Waterfowl
12.	Haleji Lake	"	1,704	Waterfowl
13.	Lung Lake	"	19	Waterfowl
14.	Drigh Lake	"	164	Waterfowl

Sr. No.	Name of Wildlife Sanctuary	Province	Area in Hectares	Wildlife of the Area
15.	Mahal Kohistan	Sind	70,577	Deer, Grey Partridge, Sand Grouse and Houbara Bustard.
16.	Hub Dam	"	27,219	Deer, Grey Partridge, Sand Grouse, Houbara Bustard and Waterfowl.
17.	Ghondak Dhoro	"	31	Waterfowl
18.	Miani Dhand	"	57	Waterfowl
19.	Samno Dhand	"	23	Waterfowl
20.	Gulsher Dhand	"	24	Waterfowl
21.	Dhoung Block	"	2,098	Waterfowl
22.	Lakhat	"	101	Waterfowl
23.	Kot Dinghano	"	30	Waterfowl
24.	Mohabat Dero	"	16	Waterfowl
25.	Bijoro Chach	"	121	Waterfowl
26.	Norung	"	243	Waterfowl
27.	Cut Munarki Chack	"	405	Waterfowl
28.	Sadnani	"	84	Waterfowl
29.	Shah Lanko	"	61	Waterfowl
30.	Hilaya	"	324	Waterfowl
31.	Majiran	"	24	Waterfowl
32.	Gullel Kohri	"	40	Waterfowl

Sr. No.	Name of Wildlife Sanctuary	Province	Area in Hectares	Wildlife of the Area
33.	Marho Kotri	Sind	162	Waterfowl
34.	Munarki	"	12	Waterfowl
35.	Khadi	"	81	Waterfowl
36.	Keti Bunder North	"	8,948	Waterfowl
37.	Keti Bunder South	"	23,056	Waterfowl
38.	Khat Dhoro	"	11	Waterfowl
39.	Runn of Kutch	"	2,150	Houbara Bustard, Deer, Wild Ass.
40.	Nara Desert	"	3,650	Houbara Bustard, Deer.
41.	Sheikh Buddin	NWFP	15,540	Suleman Markhor, Urial, Chukor.
42.	Bilyamin	"	4,050	Black and Grey Partridges, Hare
43.	Giddar Baik	"	4,450	Ibex, Leopard, Black Bear, Monal Pheasant, Snow Cat.
44.	Manglot	"	715	Grey Partridge, Chukor
45.	Borraka	"	2,025	Urial, Leopard, Chukor, Black Partridge.
46.	Manshi	"	2,321	Leopard, Black Bear, Monkeys, Monal Pheasant, Koklas, Snow Cock, Musk Deer.
47.	Masalakh	Baluchistan	46,559	Chinkara, Seesee, Houbara Bustard, Sand Grouse, Urial and Chukor.

Sr. No.	Name of Wildlife Sanctuary	Province	Area in Hectares	Wildlife of the Area
48.	Sutkhab	Balochistan	3,757	Urial, Chukor and Seesee.
49.	Sasnamana	"	6,607	Chukor, Seesee and Hare.
50.	Ziarat Juniper	"	37,247	Urial, Markhor, Seesee, Chukor.
51.	Koh-e-Geish	"	24,356	Ibex, Urial, Leopard, Chukor, Seesee.
52.	Kachau	"	21,660	Chinkara, Urial, Houbara Bustard.
53.	Dhrun	"	30,567	Chinkara and Urial.
54.	Shashan	"	29,555	Ibex, Urial, Chukor, Seesee.
55.	Chorani	"	19,433	Ibex, Urial, Leopard, Bear.
56.	Dureji	"	178,259	Chinkara, Ibex, Urial, Seesee, Sand Grouse, Houbara Bustard.
57.	Khurkhera	"	18,345	Grey Partridge, Sand Gouse, Houbara ustard.
58.	Raghai Rakshan	"	125,425	Chinkara, Ibex, Urial.
59.	Kolwah Kap	"	33,198	Chinkara, Urial, Sand Grouse, Houbara Bustard, Grey Partridge.
60.	Buzi Makola	"	145,101	Chinkara, Ibex
61.	Lasbela	"	1,687,579	Chinkara, Ibex, Sand Grouse, Houbara Bustard.
62.	Kachhi, Sibbi, Naseerabad	"	2,336,648	Chinkara, Houbara Bustard.

Sr. No.	Name of Wildlife Sanctuary	Province	Area in Hectares	Wildlife of the Area
63.	Guf	Balochistan	165,992	
64.	Salkhala	Azad Kashmir	810	Pheasant.
65.	Naltar	Northern Aereas	27,206	Markhor, Ibex, Snow Leopard, Musk Deer, Fox, Ram Chukor, Chukor.
66.	Kargah	"	44,108	Ibex, Markhor, Musk Deer, Snow Leopard.
67.	Astore	"	41,457	Astore Markhor, Himalayan Ibex, Musk Deer, Snow Leopard, Brown Bear, Black Bear, Black Bear, Wolf, Lynx, Fox, Flying Squirrels, Monal Pheasants, Ram Chukor, Chukor, Hawks, Eagles, Vultures, Kites, Falcons.
68.	Baltistan	"	41,457	Ibex, Markhor, Urial, Musk Deer, Snow Leopard, Brown Bear, Fox, Chukor, Ram Chukor and Birds of Prey.
69.	Banni Gala Hill	Federal Capital Territory	3,521	Partridges, Fancy Birds.
	TOTAL =		**5,239,074**	

III. GAME RESERVES

"Game Reserve" means an area declared by a Government as such for the protection of wildlife and increase in the population of important species of the area where in capturing and hunting of the wildlife animals shall be unlawful except with permits. Uptil now the following areas have been notified as game reserves:

Sr. No.	Name of Game Reserve	Province	Area in Hectares	Wildlife of the Area
1.	Sodhi	Punjab	5,820	Chuko, Seesee, Partridge, Urial, Chinkara.
2.	Khari Murat	"	5,620	Urial, Deer, Grey Partridge, Seesee, Chinkara.
3.	Kamalia	"	4,500	Grey and Black Partridges, Hare.
4.	Gat Wala	"	5,885	Grey and Black Partridges, Hare.
5.	Kathar	"	1,141	Cheer and Kalij Pheasant, Barking Deer, Leopard.
6.	Chaupalia	"	9,861	Chinkara, Partridge.
7.	Rahri Banglow	"	5,466	Chinkara, Houbara Bustard, Sand Grouse.
8.	Bheni	"	2,069	Chinkara, Grey Partridge.
9.	Bhon Fazil	"	1,063	Waterfowl, Black Partridge.
10.	Head Qadirabad	"	2,850	Blue Bull, Hog Deer, Black Partridge, Waterfowl.
11.	Hajwal	"	5,466	Blue Bull, Chukor, Partridge.

12.	Bhawalpur Forest	"	514	Grey Partridge.
13.	Daphar	"	31,093	Black and Grey Partridges.

Sr. No.	Name of Game Reserve	Province	Area in Hectares	Wildlife of the Area
14.	Perowal Kikarwala	Punjab	506	Black and Grey Partridges.
15.	Cheechawatni	"	891	Black and Grey Partridges.
16.	Kot Sabzal	"	10,121	Houbara Bustard, Sand Grouse, Grey Partridge.
17.	Head Islam	"	3,132	Waterfowl.
18.	Chaubara-Mankeera		"	321,166 Chinkara, Grey Partridge.
19.	Kala Chitta	"	132,664	Urial, Chinkara, Leopard, Grey Partridge, Chukor, seesee.
20.	Diljabba-Domeli	"	118,154	Urial, Chukor, Black and Grey Partridges.
21.	Cholistan	"	2,694,478	Chinkara, Black Buck, Blue Bull, Caracal cat, Desert Cat, Houbara Bustard, Imperial Sand Grouse and Grey Partridges.
22.	Abbasia	"	10,070	Hare, Black and Grey Partridges, Houbara Butard and Sand Grouse.
23.	Dauluana	"	2,429	Hare, Black and Grey Partridge, Quails.
24.	Border Belt (Indo-Pak)	"	-	Hog Deer, Blue bull, Sand Grouse, Waterfowl, Grey and Black Partridges.

25.	Hala	Sind	953	Grey and Black Partridges.
26.	Sahib Same	"	349	Black and Grey Partridges.
27.	Deh Khalifa	"	429	Black and Grey Partridges.

Sr. No.	Name of Game Reserve	Province	Area in Hectares	Wildlife of the Area
28.	Deh Jangisar	Sind	314	Black and Grey Partridges.
29.	Mirpur Sakro	"	777	Black and Grey Partridges.
30.	Nara	"	109,966	Black and Grey Partridges, Hog-Deer.
31.	Sumbak, Surjan Eriand	"	40,632	Sind Ibex, Grey Partridges, Deer.
32.	Mando Dero	"	1,234	Black and Grey Partridges, Hog Deer.
33.	Dosu Forest	"	2,312	Black and Grey Partridges, Hog Deer.
34.	Khipro Forest	"	3,885	Black and Grey Partridges, Hog Deer.
35.	Tando Mitha Khan	"	5,343	Black and Grey Partridges, Hog Deer.
36.	Pai Forest	"	1,969	Black and Grey Partridges, Hog Deer.
37.	Indus River (From Guddu Barrage to Sukkur Barrage)	"	-	Indus Dolphin
38.	Yakh Darra	NWFP	1,040	Monal Pheasant, Koklas.
39.	Agram Basti	"	2,560	Ibex, Snow Leopard, Snow cock.
40.	Darosh Gol	"	1,680	Markhor, Leopard.

41.	Gahriat Gol	"	3,000	Markhor.
42.	Parit Gol/Chinar Gol		"	5,460 Markhor, Snow cock.
43.	Daggar	"	100	Black and Grey Partridges, Chukor.

Sr. No.	Name of Game Reserve	Province	Area in Hectares	Wildlife of the Area
44.	Totali	NWFP	16,190	Black and Grey Partridge, Chukor.
45.	Swagali	"	1,620	Grey Partridge, Chukor.
46.	Shinawari	"	400	Grey and Black Partridge.
47.	Resi	"	5,050	Grey Partridge, Seesee.
48.	Thanadarwala	"	4,050	Grey and Black Partridges.
49.	Nizampur	"	780	Hare, Grey Partridge, Seesee.
50.	Makhnial	"	4,248	Kalij Pheasant and Chukor.
51.	Zawarkan	Baluchistan	3,887	Markhor, Urial, Chukor, Seesee.
52.	Ras Koh	"	11,660	Ibex, Urial, Chukor, Seesee.
53.	Gogi	"	7,773	Chukor.
54.	Wain	"	10,364	Leopard, Chukor.
55.	Machayara	Azad Kashmir	13,537	Musk Deer, Ibex, Black Bear, Goral, Snow Leopard, Langoor, Rhesus Monkey, Pheasants, Chukor, Ram Chukor.

56.	Moji	"	3,861	Goral, Black Bear, Pheasants.
57.	Kazinag	"	4,832	Markhor, Snow Leopard, Ibex, Black Bear, Rhesus Monkey, Langoor, Pheasants, Chukor.

Sr. No.	Name of Game Reserve	Province	Area in Hectares	Wildlife of the Area
58.	Hillan	Azad Kashmir	423	Markhor, Goral, Snow Leopard, Pheasant.
59.	Mori Said Ali	"	243	Markhor, Goral, Black Bear, Snow Leopard, Pheasant.
60.	Phala/Kuthnar	"	324	Markhor, Musk Deer, Ibex, Black Bear, Goral, Rhesus, Monkey, Langoor, Pheasants, Chukor, Ram Chukor.
61.	Vatala	"	450	Markhor, Blue Bull, Grey and Black Partridge.
62.	Ghamot	"	27,283	Ibex, Gorak, Musk Deer, Monal and Western Horned Tragopan.
63.	Danyor Nallah	Northern Area	44,308	Ibex, Markhor, Urial, Snow Leopard, Chukor, Ram Chukor.
64.	Sherqillah	"	16,842	Ibex, Markhor, Brown Bear, Lynx, Chukor, Ram Chukor.
65.	Kilika Minteka	"	65,036	Marcopolo Sheep, Ibex, Snow Leopard, Wolf, Fox, Brown, Bear, Chukor,

				Ram Chukor.
66.	Pakura Nallah	"	7,515	Ibex, Snow Leopard, Fox, Wolf, Chukor, Ram Chukor.
67.	Nazber Nallah	"	33,425	Ibex, Snow Leopard, Lynx, Chukor, Ram Chukor.

Sr. No.	Name of Game Reserve	Province	Area in Hectares	Wildlife of the Area
68.	Chassi/Bowshdar	Northern Area	37,053	Ibex, Snow Leopard, Brown Beer.
69.	Tangir	"	14,251	Markhor, Black Bear, Lynx, Wolf, Snow Leopard, Fox, Monal Pheasant, Chukor, Ram Chukor and Birds of Prey.
70.	Askor Nallah	"	12,955	Markhor, Ibex, Snow Leopard, Chukor, Ram Chukor, and Birds of Prey.
71.	Satpara	"	31,093	Urial, Ibex, Musk Deer, Chukor, Ram Chukor.
72.	Nar Nallah	"	7,253	Ibex, Musk Deer.
73.	Islamabad	Federal Capital Territory	7,878	Grey and Black Partridge, Waterfowl.
		TOTAL =	**3,999,284**	

WILDLIFE SANCTUARIES & GAME RESERVES IN SIND PROVINCE

Sr. No.	Wildlife Sanctuaries/ Game Reserves	Area of Constituency	Disrtict	Area in Hectares
		WILDLIFE SANCTUARIES		
1.	Takkar	Sohra	Khairpur	45,513.344
2.	Keenjihar (Kalri) lake	Thatta	Thatta	13,468.416
3.	Hudero Lake	"	"	1,320.940
4.	Haleji Lake	"	"	1,704.273
5.	Lung Lake	Kamber	Larkana	19.179
6.	Drigh Lake	"	"	164.268
7.	Mahal Kohistan	Mahal Kohistan	Dadu	70,577.090
8.	Hab Dam	Karachi	Karachi	27,219.151
9.	Ghondak Dhoro	Kashmore	Jacobabad	30.920
10.	Miani Dhand	Hyderabad	Hyderabad	56.660
11.	Samno Dhand	Hala	Hyderabad	22.660
12.	Gulsher Dhand	Hala	Hyderabad	24.282
13.	Dhoung Block	Khanpur	Shikarpur	2,097.965
14.	Lakhat	Sakrand	Nawabshah	101.175
15.	Kot Dinghano	Sakrand	Nawabshah	30.252
16.	Mohabat Dero	Kandiaro	Nawabshah	16.188
17.	Bijoro Chach	Thatta	Thatta	121.410
18.	Nourung	Thatta	Thatta	242.820
19.	Cut Munarki Chach	Thatta	Thatta	404.700
20.	Sadnani	Thatta	Thatta	83.772
21.	Shah Lanko	Thatta	Thatta	60.705
22.	Hilaya	Thatta	Thatta	323.760
23.	Majiran	Thatta	Thatta	24.282
24.	Gullel Kohri	Ghorabari	Thatta	40.470
25.	Marho Kotri	Ghorabari	Thatta	161.880
26.	Munarki	Jati	Thatta	12.141
27.	Khadi	Mirpur Bathoro	Thatta	80.940
28.	Keti Bunder North	Keti Bunder	Thatta	8,948.322

29.	Keti Bunder South	Keti Bunder	Thatta	23,056.046
30.	Khati Dhoro	Dokri	Larkana	10.522
31.	Runn of Kutch	Nagparparkar, Mithi, Diplo, Badin & Tando Bago	Badin and Tharparkar	2,150.000
32.	Nara Desert	Pano Aqil, Rohri Nara, Khipro and Sanghar	Sukkur, and Khairpur and Sanghar	3,650.000

Sr. No.	Wildlife Sanctuaries/ Game Reserves	Area of Constituency	Disrtict	Area in Hectares
		GAME RESERVES		
1.	Hala	Hala	Hyderabad	953.473
2.	Sahib Samo	"	"	348.851
3.	Deh Khalifa	Ghorabari	Thatta	428.982
4.	Deh Jangisar	Mahal Keti Bunder	Thatta	313.642
5.	Mirpur Sakro	Mirpur Sakro	Thatta	777.024
6.	Nara	Sohra	Khairpur	109,966.39
7.	Sumbak, Surjan, Eri and	Mahal Kohistan	Dadu	40,631.88
8.	Mando Dero	Rohri	Sukkur	1,234.335
9.	Dous Forest	Ratodero	Larkana	2,312.212
10.	Khipro Forest	Khipro	Sanghar	3,885.254
11.	Tando Mitha Khan	Khipro	Sanghar	5,343.294
12.	Pai Forest	Sakrand	Nawabshah	1,969.270
13.	Indus River (From Guddu Barrage to Sukkur Barrage	Ubaro, Kashmore, Mirpur Mathelo, Kandhkot, Ghotki, Shikarpur, Pano Akil, Sukkur	Jacobabad Shikarpur, Sukkur	

3

APPENDIX F

1993 PAKISTAN PESTICIDE ENVIRONMENTAL ACTION PLAN (PEAP)

Oct. 28, 1993

PESTICIDE ENVIRONMENTAL ACTION PLAN

1993 PAKISTAN LOCUST CONTROL ACTION PLAN

Background

In early July 1993, a number of desert locust swarms borne by seasonal monsoonal winds, migrated across the Arabian Sea from Yemen, Northern Somalia and possibly Saudi Arabia to traditional breeding areas in South-Eastern Pakistan and South-Western India. The desert locust outbreaks posed a serious potential threat to food security in the region including Asian and African countries. Historically, locust outbreaks in Afghanistan, Pakistan, and India have developed into major swarms which were carried to Africa on wind currents. Presently, FAO is monitoring the locust situation in the region and also coordinating the survey and control operations with regional governments and donor organizations.

As of September-October 1993, desert locust infestations were assuming alarming proportions on the Pakistan-India border, in the south-eastern deserts. In Pakistan, the locusts were occurring in their traditional late summer breeding areas i.e., the vast Nara, Tharparker and Cholistan deserts. The infestations extended across the border into the Rajasthan desert of South-Western India. In August 1993, the Government of Pakistan (GOP) launched extensive control operations in all known infested areas. While a large percentage of the locusts were killed by the vigorous control activities of the area teams supported by the Pakistan Department of Plant Protection (DPP), an unknown number escaped into the vastness of the deserts along and across the Pakistan-India border. These locusts still remain a threat because they have the potential to breed again and migrate to other areas within the region. Some parts of the remote deserts have not yet been reached and there remains the possibility that those areas could harbour significant populations of locusts, therefore extra vigilance is required. Presently, the situation in both India and Pakistan is reportedly calm, with only a few swarms being detected and sprayed daily. The lesson learnt from previous plagues is that now is the time to regroup as well as conduct extensive monitoring surveys to ensure that accurate forecasts can be made about what the locusts will do next. What will become of the remaining locusts will depend largely on the weather. The winds in the south Asian region may bring the bulk of the remaining locusts back into Pakistan and on into the over-wintering areas on the shores of the Persian Gulf, the Arabian Sea and possibly Afghanistan. The GOP has the basic organizational infrastructure required to tackle the locust threat and has requested donor assistance through FAO for vehicles, pesticides, aircraft spares, navigational equipment, exhaust nozzle sprayers, hand sprayers, field staff needs, etc..

The purpose of this Pesticide Environmental Action Plan (PEAP) is to insure that the Agency for International Development (USAID) has acted in an environmentally responsible way in the granting of funds for the procurement and use of pesticides in the current locust campaign. Although USAID normally ensures this through preparation of an Environmental Assessment (EA), under emergency situations where USAID is a minor donor to a multidonor project it is the policy of USAID's Asia Bureau that a PEAP can be used in lieu of an approved EA.

Although requiring approval by USAID prior to disbursement of granted funds, the PEAP is an FAO document. It describes basic, internationally accepted standards and safeguards that will be in place to ensure that significant adverse environmental and human health impacts do not result from pesticide application funded under the USAID grant. These provisions fall into seven categories: 1. The procurement and use only of USAID approved pesticides; 2. The safe distribution, storage, use and disposal of pesticide containers; 3. Contractor quality control; 4. Training of sprayers (both air and ground) in spraying techniques and health and safety requirements; 5. Notification of affected communities vis-a-vis spraying plans and precautions; 6. Avoidance of spraying human settlements, ecologically sensitive areas, protected areas and the habitats of important species; and 7. monitoring of pesticide use and effectiveness.

These seven categories of environmental provisions are described below in the greatest detail practical. In describing them, the PEAP: 1. Documents how the campaign will be conducted; 2. describes how USAID funding will be used in the campaign, including an estimate of how USAID monies will be used for specific categories of actions; and 3. Documents FAO environmental commitments and how FAO proposes to implement and monitor the PEAP provisions during the campaign.

This Pesticide Environmental Action Plan addresses environmental issues related to the 1993-94 locust and grasshopper control campaign in Pakistan.

(1) **THE PROCUREMENT AND USE OF ONLY A.I.D.-APPROVED PESTICIDES.**

It is suggested that USAID grant funds to FAO be used to provide the following assistance. Due to the changing locust situation ECLO/FAO in Rome may require that the funds be apportioned differently between the three countries within the south Asia Region (India, Pakistan, Afghanistan), taking into consideration that the total USAID contribution is 750,000 USD:

TABLE 1. MATERIALS TO BE PURCHASED WITH A.I.D. FUNDS

Sr. No.	Description	Estimated Cost (US$)

1	20,000 Liters of Malathion ULV or suitable substitute	240,000.00
2	500 sets of Chemical Handling Safety Equipment including First Aid Boxes, Gas Masks, Filters and Refills	13,000.00
3	5-Portable GPS navigation devices (Magellan) for ground use Cash to help with local immediate logistical needs	10,000.00
4	Aircraft spare parts and MICRON-AIR sprayers (for ULV)	35,000.00
5	Hand sprayers	125,000.00
6	<u>Technical Assistance</u> FAO will arrange consultants	57,000.00
7	<u>4-Weeks Consultancy</u> Training of Trainers from DPP and Agriculture Extension in Selection and Handling of Pesticides	15,000.00
	<u>4-Weeks Consultancy</u> Training of Pilots	15,000.00

	10-Weeks Consultancy 1-2 Weeks Training Courses by a Local Consultant at different locations. Training to DPP field Staff, Agriculture Extension workers, NGO's, District Administration workers and village workers/brigades in safe pesticides handling, application, storage, disposal of empty containers, environmental & health and safety impacts and emergency treatment in case of toxic exposures. 4-Week Consultancy Training of DPP staff and medical personnel for Cholinesterase Testing and Purchase of 20 Kits	15,000.00 25,000.00
	Total	550,000.00

In Table 2. is an alphabetical listing of the pesticides approved in the PEA. The list includes relevant information on toxicity, bioaccumulation, and signal words (to indicate the relative toxicity of each insecticide). All of the chemicals listed in Table 2. are currently registered either by the U.S. Environmental Protection Agency or its equivalent in other countries for locust and grasshopper control. The four chemicals highlighted with an * are also on the approved list for FAO, as well as being approved by the Pakistan DPP and would represent the only pesticides that could be purchased by FAO with USAID funds for locust control.

All purchases of pesticides are contracted at FAO in Rome. Offers for sale are tendered internationally and local suppliers are not excluded. Purchases are accepted considering the needs in an emergency program (price of chemical and application, availability and needs of the host nation.) In an emergency locust program, air freight is expected for any chemicals purchased outside of the host country. Any large purchase of pesticide FAO requires chemical testing of the pesticide. This is handled by the FAO Rome.

AID funds will be used only to support the procurement and use of AID-approved pesticides, which overlap with those approved by FAO. To ensure that AID-funded equipment and supplies are not employed to procure or use non AID-approved pesticides, ground monitoring of operations will occur during campaign implementation. Ground monitoring will be the responsibility of the grantee.

TABLE 2. INSECTICIDES APPROVED FOR USE IN AID LOCUST AND GRASSHOPPER CONTROL PROGRAMS.

Sr. No.	NAME	TOXICITY TO						
		FISH	INVER	BIRD	MAMMAL	BIOAC	PERS	SIGNW
1	ACEPAHTE	L	L	L	M	L	L	C
2	BENDIOCARB*	M	M	M	M	M	M	W
3	CARBARYL	L	L	L	L	L-M	L	C
4	CHLORPYRIFOS	M	H	M	M	M	L	C-W
5	DIAZINON*	M	H	M-H	L	M	M	C-W
6	FENITROTHION *	L	H	H	L	M	L	W
7	LAMDA-CYHALOTHRIN	H	H	L	H	H	M	D
8	MALATHION*	L	L	M	L-M	L	L	C
9	TRALOMETHRIN	H	H	L	L	H	M	D

LEGEND:

NON-TARGET ORGANISMS: FISH, INVERTEBRATES (INCLUDING HONEYBEES), BIRDS, MAMMALS

BIOAC = BIO-ACCUMULATION, PERS = PERSISTENCE,

L = LOW, M = MODERATE, H = HIGH (APPLIES TO TOXICITY LEVELS TO NON-TARGET ORGANISMS, BIO-ACCUMULATION AND PERSISTENCE; RELATIVE TOXICITY IS ALSO A FUNCTION OF FORMULATION AND ACTIVE INGREDIENT CONCENTRATION)

SIGNW = SIGNAL WORD: C = CAUTION; W = WARNING; D = DANGER (POISON); (APPLIES TO THE RELATIVE TOXICITY OF PESTICIDES IN ASCENDING ORDER; RELATIVE TOXICITY IS ALSO A FUNCTION OF FORMULATION AND ACTIVE INGREDIENT CONCENTRATION)

(2) THE SAFE DISTRIBUTION, STORAGE, USE AND DISPOSAL OF PESTICIDES AND CONTAINERS (INCLUDING PESTICIDE LABELLING, AND COLLECTION AND DISPOSAL OF EMPTY CONTAINERS).

SAFE DISTRIBUTION, STORAGE, USE AND DISPOSAL OF PESTICIDES

During the current locust control campaign in Pakistan the following guidelines will be adhered to. FAO will monitor for compliance.

- Guidelines for the packaging and storage of pesticides, as per Appendix D to AID Locust/Grasshopper Management, Operations Guidebook, January 1989.

- International Code of Conduct on the Distribution and use of pesticides given in Appendix E to AID Locust/Grasshopper Management, Operations Guidebook, January 1989.

- The disposal of waste pesticides and pesticides containers, as per Appendix F to AID Locust/Grasshopper Management, Operations Guidebook, January 1989.

- Control operational requirements - Aerial as given in Appendix G to the AID Locust/Grasshopper Management, Operations Guidebook, January 1989.

Up to 20,000 liters of Malathion ULV or a suitable substitute may be purchased under the current procurement (See Table-1). All procurement related documentation including a pesticides need assessment will be kept ready by FAO to ensure proper utilization of the funds provided. The amount of pesticide to be procured will be based on the actual needs. This way, storage time prior to use, and the possibility of the pesticides becoming surplus and overaged/obsolete will be minimized.

If at the end of current locust emergency some pesticides remain as a surplus, FAO will make all possible efforts to return same to the pesticide supplier and have a refund to the FAO account for South Asia. FAO will inform AID accordingly and will use these funds for the same purpose in the same country in the future. A second alternative is that leftover pesticides will be put in an FAO pesticide bank. FAO will give AID a "chit" for the same amount of the same pesticides to be used when needed for the same purposes in the same country in the future.

If Malathion becomes surplus, in view of its unique storage/shelf-life problems, FAO may decide to use it for locust control operations in some other country with an approved PEAP, the cost will be estimated accordingly and will

be charged from the needy country by FAO and will be credited for future similar use in Pakistan, or it may be sold through open auction and the funds received be retained in an FAO account for a future similar use in Pakistan. AID will be kept informed of all the actions.

APPROPRIATE PESTICIDE LABELING

All pesticide containers will be appropriately labeled in the local language; indicating all important information in the form of recommended dose, environmental impact, warnings, handling precautions, storage and disposal guidelines and first aid instructions. This will be coordinated with DPP and will be properly monitored by USAID and FAO.

SAFE DISTRIBUTION, COLLECTION, AND DISPOSAL OF PESTICIDE CONTAINERS

FAO will maintain a regular liaison with DPP for the disposal of empty pesticide containers in accordance with the provisions of the PEAP.

The following guidelines are based on observations made in the course of field visits during preparation of the Pakistan SEA, and on AID policy as described in the PEA for Locust and Grasshopper Control in Africa and Asia.

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

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

3) It is AID policy that any and all empty containers resulting from provision and use of AID-funded locust control insecticides will be destroyed or otherwise rendered useless, followed by disposal in an appropriate, environmentally sound manner. They cannot be refilled with other chemicals. The following management plan for disposal

of AID-funded insecticide drums represents a reasonable compromise between what would be ultimately desirable from an environmental protection standpoint, and what is achievable in the context of the proposed project. The plan presupposes the retroactive collection and disposal of empty AID-funded drums already in-country using the methods outlined below. It is important that the plan be instituted immediately and consistently implemented in order to avoid another backlog of drums awaiting disposal.

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

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

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

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

on the surface to weather.

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

(3) CONTRACTOR QUALITY CONTROL.

The importation and use of chemicals in Pakistan should be controlled by the national regulations, covering registration of the chemical and its use through the responsible government body. The Pakistan Department of Plant Protection is the organization chartered with carrying out the Desert locust control in this country and is the body responsible for insuring that the legislation covering chemical use on Desert locusts is followed.

The DPP has a compliment of trained staff and spray equipment although not enough for the current campaign. They also have an aerial spray section comprised of 14 aircraft flown by DPP pilots, and equipped with ULV spray gear. As such all ULV spraying is carried out under the control of the DPP by trained DPP staff. No outside contractors are used for the aerial spraying and the fleet of aircraft is maintained specifically for the purpose of emergency locust control under the direction of the Senior DPP Officer.

If additional aircraft need to be contracted, the local FAO Rep can hire an aircraft locally for excursions but cannot hire aircraft for application of pesticides or survey of locust populations. Contracting for aerial application aircraft (airplanes/helicopters) and aircraft for locust survey is handled at the FAO in Rome. Bids are requested internationally. Specifications are defined in Rome according to the needs of the host country. Contracts define the region where pesticides are to be used, time frame of probably activity and what pesticides may be applied with a particular aircraft. (See question 1 for list of approved pesticides.) Contracts are let according to the "FAO Manual." These procedures will be followed during the current campaign.

(4) TRAINING OF SPRAYERS IN SPRAYING TECHNIQUES AND HEALTH AND

SAFETY REQUIREMENTS.

The GOP has in place a strong institutional structure for managing the locust control program, the effectiveness of which could be enhanced by interaction with expert counterparts through the provision of specialized technical assistance. All of the proposed specialists to be provided under the technical assistance component will work very closely with GOP counterparts in the course of carrying out their responsibilities under the project, thereby imparting knowledge and skills in the form of on-the-job professional development. In addition, each specialist will conduct short-term in-service training activities for field personnel.

A FAO and/or local consultant will be needed to coordinate a series of training courses in the short term. These training courses will aim to improve the skills of DPP officers who actually have to go out and conduct the spraying. The immediate term objective will be to rapidly train the lower and mid level staff in the techniques outlined in the FAO Desert Locust Guidelines as well as explicitly concentrate on the environmental and public health implications.

LOWER LEVEL SHORT TERM Training Needs.

The training will be aimed at the Field Operations Staff of the DPP, DPP Pilots, NGO Trainers, DPP Trainers, District Officers and Army Staff. Both protective clothing and training, however will also be provided to all appropriate applicators of AID-procured pesticides including as appropriate any village workers or brigades involved in pesticide use.

Training will be conducted at field locations as needed by DPP Training Officers with a FAO Consultant.

Training will consist of 2-3 day courses repeated as necessary in the field bases and regional centers. Training will include: Target identification; Ground marking for aircraft; Coordinating ground control operation with aerial operations; Radio use; Track marking; Principles of ULV chemical application; Monitoring treatment efficacy; Keeping field operation and applications records; Chemical safety and handling; Basic first aid and obtaining advanced medical care; Field use of the ULVA-Mast and Micron ULVA; Environmental effects and protection of the non-target environment. Trainees will also receive instruction in monitoring and survey techniques.

MIDDLE LEVEL SHORT TERM Training needs.

Training will be conducted for Senior DPP Field Staff,

Technical Directors, Operations Managers and DPP Trainers. Training will be conducted at Provincial centers or at DPP Headquarters by an FAO Consultant. Each training course will consist of 3-4 days of training targeted on campaign organization and advanced control techniques in order to prepare them to act as trainers/managers of lower level staff and community spray operators (lower level staff and community spray operators will also receive training prior to engaging in spraying operations). As well as going over all topics to be offered to lower level staff, the following areas will be covered as needed in short training courses: Campaign organization, reporting and forecasting; Organizing community participation in ground control activities; Conducting field trails of pesticide efficacy; Training techniques for hand held ULV applicators; Chemical safety and advanced first aid, handling emergencies; Notifying the public about spray operations; Vehicle mounted ULV equipment operations; Aerial application techniques for locust control; GPS use; and Environmental effects of pesticides and protection of the non-target environment. Trainees will also receive instruction in monitoring and survey techniques.

The training needs of the NGO's are similar to the training offered to the lower level DPP officers. As such NGO representatives will be invited to attend these courses in the field stations. To allow well qualified NGO Trainers access to the more advanced training selected NGO staff will be invited to attend the middle level training courses.

An FAO Consultant working with the DPP Headquarter Staff will assess the need for other long term training needs. Fellowship programs should be considered for outstanding officers.

At the end of this campaign debriefing sessions will be conducted with all field staff who participated in the campaign as practical to analyze experiences, collect information, highlight short coming in the operations and discuss how improvements might be made in coming desert locust campaigns.

(5) NOTIFICATION OF AFFECTED COMMUNITIES VIS-A-VIS SPRAYING PLANS AND PRECAUTIONS.

For a desert, the Thar, as well as other desert areas in Pakistan, is highly populated with reportedly over 500,000 people living in small villages and making a living from herding and rainfed crops grown between the dunes. Caution will have to be exercised if aerial spraying is to be widely employed as the herders may be spread throughout the desert to take advantage of the good vegetation cover. The people and their herds could be exposed to pesticides. Regarding risk to the general public, control operations for the most part are

being conducted in remote, non-crop areas or rangeland, where public exposure will be at a minimum.

No spraying will occur in human settlements.

As a primary method of preventing accidents, a ground team from GOP's DPP will be to the extent practical be present to supervise the operations while aerial spraying is being carried out. However this is not always possible.

The training of trainers will incorporate recommended methods for keeping the public informed. Maximum use is to be made of existing extension services and ideally all agricultural extension programs in the affected area will routinely incorporate information on pesticide safety and withholding periods for livestock after spraying (~14 days).

Radio announcements will be made of upcoming aerial spraying operations 24 hours in advance to notify where spraying will occur. Since many of the poorer farmers do not own radios or have regular access to radios, however, a full range of other methods will also be employed to inform the affected public of upcoming spray operations. Methods will include, but not be limited to: 1. Distributing diagrammatic pamphlets in the local language; 2. Extension workers visiting the areas to inform community and tribal leaders; 3. Leaflets dropped by airplane; 4. Contact centers set up in each district; and/or 5. Information broadcasts from the Mosques.

(6) AVOIDANCE OF SPRAYING HUMAN SETTLEMENTS, ECOLOGICALLY SENSITIVE AREAS, PROTECTED AREAS, AND THE HABITATS OF IMPORTANT SPECIES (ESPECIALLY WETLANDS AND ENDANGERED SPECIES)

There will be no spraying in human settlements or environmentally fragile areas.

Proper counseling for pilots and other spraying staff will be conducted on a regular basis to make sure that environmentally fragile areas are protected. Army helicopters are being used to point out the exact targets of heavy locust infestation for spraying.

Many parks and protected areas that lie within the desert locust area are in Balochistan, Sind and Punjab. A complete listing of these protected areas is available with USAID and will be provided to FAO and GOP.

Following are specific guidelines for locust operations in these and other ecologically sensitive areas:

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

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

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

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

   c. Under no circumstances will fenitrothion be used where birds are present. If aerial spraying is performed, great care will be used in order to accurately pinpoint the target and to minimize overspraying and drifting.

3) Post-application biological and insecticide residue monitoring is best considered for the next locust campaign, to identify any adverse environmental impacts of spray operations. The results of the monitoring will be factored into planning of subsequent operations in the affected areas. A FAO consultant will be needed to preform the task or to train local personal to collected the samples.

(7) MONITORING OF PESTICIDE USE, [illegible], AND SAFETY.

The GOP Department of Plant [illegible] will keep detailed records of the quantities and types of chemicals applied, the

extent (in ha.) and locations of the areas treated, and the amount of chemical sprayed per target. Since it may take up to 48 hours for insecticides such as malathion, carbaryl, and fenitrothion to result in significant locust mortality, control workers normally have moved on to other areas before results of treatment are observable. Any assessments of efficacy which are made are approximations only, and are not based on quantitative sampling techniques. The findings of AID's efficacy field trials (Dynamac, 1988) will be applied to the Pakistan program as appropriate.

Workers will be provided with protective clothing to reduce exposure to these insecticides. Under this procurement the GOP's Department of Plant Protection will be provided with a supply of appropriate protective clothing and equipment for use by workers including village workers and brigades exposed to pesticides in the course of [illegible] control effort. This equipment is intended for workers at risk due to high and/or long-term exposures, i.e., [illegible] aircraft loading and service crews, mist blower operators, etc., and will include industrial grade head and [illegible]tion; organic vapor respirators; and chemical resistant coveralls, boots, and gloves.

In addition, a program will be developed to monitor cholinesterase blood levels in workers that deal with these insecticides. Base line information on a worker's cholinesterase level needs to be developed and if cholinesterase blood levels in a particular person are below normal, that person will [illegible] with organophosphate insecticides until their cholinesterase levels are normal again.

Under the 1990 procurement, the Ministry of Food, Agriculture and Cooperatives (MINFAC) received 15 field kits and a supply of associated expendable items for routine monitoring of whole-blood cholinesterase levels in workers exposed to pesticides in the course of the GOP locust control program. The kits were designed for use under harsh field conditions by technicians with minimal training. Use of this kit allowed the MINFAC to screen workers for preventive intoxication with cholinesterase-inhibiting [illegible] (organophosphate, including malathion and [illegible]) and thus prevent potential cases of chronic pesticide poisoning.

In 1990, a consultant was [illegible] to conduct a training program in the use of the [illegible] for GOP's MINFAC and technicians assigned to the [illegible] locust control campaign. The Consultant was also responsible for advising the MINFAC on the development and implementation of a national program for the protection of workers at risk for high body burdens of

cholinesterase inhibiting pesticides based on data collected using the test kit. Finally, the Consultant advised the MINFAC on administrative and management techniques for timely and effective use of worker monitoring results by means of appropriate methods for data [illegible] and handling. A follow up on these cholinesterase [illegible] conducted to determine if they are still usable and if qualified person are available to use them.