OVERVIEW OF THE DESERT LOCUST PLAGUE
FY 1988

The year 1988 marked a turning point in the fight against desert locusts. As inadequately controlled upsurges gave rise to a generalized plague in northwestern Africa, West Africa, portions of East Africa, and the Arabian peninsula, most experts felt that an additional five to seven years of extensive control campaigns might be necessary to stem the plague.

Fortunately, an unprecedented outpouring of human and material resources resulted in a very successful control program. In addition to the timely inputs, weather finally worked in favor of the containment effort. For example, the large-scale movement of locusts into the Atlantic in the fall, the lack of early rains along the Red Sea coast of Sudan, and the absence of winds bringing locusts into the Horn contributed to the success of the campaign.

A major reason for the effectiveness of the control program was the establishment by A.I.D. Administrator Alan Woods of an intra-agency Desert Locust Task Force (DLTF) in June 1988. Chaired by OFDA and staffed with representatives from A.I.D.'s Africa and Asia/Near East bureaus, the DLTF was exclusively dedicated to ending the locust plague. The efforts of the DLTF—operating under OFDA emergency procurement authority to purchase and ship pesticides and radio equipment, rent aircraft, and provide other critical inputs—combined with those of the U.N. Food and Agriculture Organization (FAO) and other donors who provided equally unprecedented levels of human and material assistance, made the critical difference.

MOROCCO

Desert locusts entered Morocco in late 1987 for the first time in 20 years. At the same time, locusts were hatching in northern Mali, southern Algeria, and Mauritania. By October, massive swarms were moving northwest across the Sahara on a broad front, entering western and southeastern Algeria and then moving into eastern Morocco. Soon after the first sightings, additional swarms began arriving from northern Mauritania and Western Sahara.

On Nov. 4, 1987, the Government of Morocco (GOM) requested USAID/Rabat help with the effort to control the locusts migrating into Morocco. A disaster declaration was issued on the same date. OFDA worked with USAID/Rabat to obtain immediate technical assistance, airplanes, and the pesticide malathion. The EC, Portuguese, Spanish, Germans, and French also assisted.

About 200,000 ha. were sprayed during the fall 1987 campaign. USAID-supplied Turbo Thrush aircraft, financed by OFDA, covered 15% of the total area sprayed. A three-person logistical ground-support team and, subsequently, three American entomologists assisted. Ground-to-air communications equipment, radios, strobe lights, motor pumps, and other logistical needs also were provided.

Morocco was hit again by an unexpected locust attack of potential plague proportions in March 1988. The invasion from March through June 1988 was approximately five times more severe than the fall 1987 infestation and affected all Maghrebian countries. USAID/Rabat, working with OFDA, procured 100,000 liters of malathion and 183,200 liters of carbaryl and continued spray operations utilizing the two Turbo Thrush aircraft already in country. The fight against locusts in the fall of 1987 and the spring of 1988 successfully prevented migration north of the Atlas Mountains and into important agricultural regions. During the spring, however, locusts were able to
lay eggs in southern Morocco, and a subsequent generation developed and escaped to return to the Sahel and to Sudan in June where the rainy season was beginning.

Locust swarms migrating northward were again sighted in the extreme southern regions of Morocco in late September and early October 1988. The situation became extremely critical between Oct. 31 and Nov. 4. With the resumption of hot, southerly winds and the continued lack of vegetation between Senegal and Morocco, even larger swarms continued into December. The locust situation soon outstripped the GOM’s spraying capacity of 30,000 to 40,000 ha. per day, and on Nov. 4 the GOM requested two DC-7 aircraft from USAID. The arrival of the two DC-7s on Nov. 10 boosted daily treatment capacity to 80,000 ha., still short of the desired 100,000 ha. per day rate.

Simultaneous with the arrival of the big planes, locust swarms were moving toward the Souss Massa Valley. This was considered a major threat because the Souss Massa Valley is a principal irrigation zone with abundant vegetation and the main producer of high value agricultural exports. If the swarms had managed to settle in the valley, major crop damage would have occurred. Worse yet, temperatures and humidity were favorable for locust development. Breeding and egg-laying in the area would have created a new generation within 45 days. Intensive control efforts prevented this. On Nov. 15, Morocco treated 81,339 ha., which represented the largest single daily treatment.

Given the international dimensions of the potential disaster, His Majesty King Hassan II hosted an international conference on the locust peril in Fes on Oct. 28 to 29, 1988. OFDA Director Julia Taft, USAID Morocco staff, and representatives from 32 countries, the U.N. Development Program (UNDP), and the EC attended. The participants recommended: 1) increased locust control capacity at the national crop protection level, and 2) the creation of an international task force to reduce massive reproduction in recession areas.

**Action Taken by the Government of Morocco (GOM)**

The GOM’s expenditures for the control campaign totaled $26.6 million in FY 1988 and about $50 million in FY 1989.

**Summary of U.S. Government Assistance**

**FY 1988**

**First Disaster Declaration (11/04/87)**

- Ambassador’s authority used for local support: $25,000
- Technical assistance (entomologists): $19,658
- Procurement and transport of 40,000 liters of malathion: $301,871
- Contract for 2 Turbo Thrush aircraft: $100,157

**Second Disaster Declaration (03/15/88)**

- Technical assistance (entomologists to assist with assessment and pesticide application; experts to inspect planes, analyze pesticides, and conduct a review of program): $33,916
- Procurement and transport of 100,000 liters of malathion: $616,185
- Procurement and transport of 183,270 liters of carbaryl ($504,203 of the original cost was refunded because some of the pesticide was ineffective): $398,926
- Contract for continued use of 2 Turbo Thrush aircraft: $300,000
- Pesticide procurement (USAID/Rabat funds): $1,600,000
- Aircraft rental (USAID/Rabat funds): $1,400,000
- Mission contribution toward technical assistance, equipment, and operating expenses (USAID/Rabat funds): $500,000

**Total OFDA**: $1,349,027
**Total Other U.S. Government**: $3,500,000

**Total FY 1988**: $5,295,713
**FY 1989**

**Disaster Declaration (11/07/88)**

Contract for 2 DC-7s for aerial spraying .......................... $300,000

Aerial operations specialist ........................................ $13,305

Locust Project Paper amendment (USAID/Rabat funds) ............ $10,000,000

Total OFDA .................................................. $313,305

Total Other U.S. Government ...................................... $10,000,000

Total FY 1989 ................................................ $10,313,305

**TOTAL** $15,609,018

**Assistance Provided by the International Community**

**International Organizations**

EC - provided aircraft and pesticide.

FAO - supplied pesticide and technical assistance.

**Governments**

Belgium - supplied 2 Alouette helicopters and 13,400 liters of pesticide.

France - provided 9 aircraft and 4,000 liters of pesticide.

Germany, Fed. Rep. - furnished 2 Bell helicopters, 100,000 liters of fenitrothion, and 200 knapsack sprayers.

Italy - contributed sprayers and technical assistance.

Portugal - supplied 16,000 liters of pesticide and aircraft.

Saudi Arabia - donated 30 Land Rovers and 136,000 liters of pesticides.

Spain - furnished aircraft and 14,800 liters of fenitrothion.

The International Community provided an additional $20,000,000 worth of assistance in FY 1989 (as of 6/20/89)

**TOTAL** $25,019,305

**ALGERIA**

During the fall of 1987, swarms of desert locusts entered Algeria from Mali, Mauritania, Western Sahara, and Morocco. Accurate estimates of the area infested were lacking, however, because of the rapid dispersal of the locust swarms and the difficulty in surveying the vast areas of remote and inaccessible terrain.

An OFDA assessment team traveled to Algeria in December 1987. The entomologists concluded that Algeria faced a serious threat of invasion in the spring of 1988 from the Sahel where large residual populations persisted in Mali, Niger, and Chad, as well as from Mauritania and Western Sahara where locusts could invade across a broad front from the west. Invading swarms not effectively controlled in Algeria could disintegrate into smaller swarms in the Atlas Piedmont and establish a breeding cycle, creating a serious risk to Algeria's northern agricultural regions.

The U.S. Ambassador declared a disaster on Dec. 29, 1987, and OFDA provided radios and aerial spray equipment for the spring campaign. As expected, waves of locusts began to invade Algeria in the spring of 1988. A second disaster declaration was issued by the U.S. Embassy in Algiers on March 27, 1988. An estimated 200,000 to 300,000 ha. were infested over a three-month period.

Assessments by entomologists predicted that Algeria could experience invasions of the same, if not greater, magnitude in the fall of 1988 due to the large potential breeding sites in remote areas of the Sahel near the southern Algerian border. OFDA continued its assistance to Algeria under this expected emergency (disaster declaration Aug. 16, 1988) by providing a technical assistance team to assess the readiness of the crop protection service and to be on-site when the swarms came and by purchasing and shipping 150,000 liters of malathion, protective clothing, and additional radio equipment to improve the sets provided for the spring campaign.

The Government of Algeria (GOA) had prepositioned over 20 aircraft in strategic points around the country. Moreover, the GOA began negotiations for a five-year loan of $58 million with the World Bank to assist in preparations for what was perceived to be a plague of at least five years' duration. The purpose of the loan is to minimize,
if not avert, economic disruption to some 39.7
million ha. of Algeria's productive lands and to
protect the livelihood of some 11.9 million people
potentially at risk in the invaded areas.

**Summary of U.S. Government Assistance**

**FY 1988**

*First Disaster Declaration (12/29/87)*

Pre-disaster assessment .................. $2,724
Radio equipment ........................ $73,942
Spraying equipment for aircraft ....... $64,007

*Second Disaster Declaration (03/27/88)*

Cost of 6 fuel tank kits and transport ... $39,634

*Third Disaster Declaration (08/16/88)*

Procurement and shipment
of 150,000 liters of malathion ........ $685,852
Radio equipment ....................... $109,386
Protective clothing ................... $68,904
Technical assistance from USDA/OICD . $25,583

Total FY 1988 ....................... $1,070,032

**FY 1989**

*Carry-over for FY 1988 disaster declaration*

Technical assistance .................. $7,155
Travel expenses of technical
assistance team ........................ $10,000
Air freight of truck spare parts ....... $803

Total FY 1989 ....................... $17,958

**TOTAL** $1,087,990

**Assistance Provided by the International Community**

*International Organizations*

EC - gave 50,000 liters of fenitrothion and 200
backpack sprayers.

World Bank - provided a loan in 1989.

*Governments*

France - contributed 10,000 liters of carbaryl and
100 backpack sprayers.

Germany, Fed. Rep. - sent 32,900 liters of
fenitrothion.

Italy - provided 60,000 liters of carbaryl and
helicopters.

Saudi Arabia - furnished trucks, sprayers, and
pesticide.

Soviet Union - supplied 2 Antonov aircraft,
vehicles, and pesticide.

*Note: No figure for international assistance for
Algeria is available.*

**TUNISIA**

Like Morocco and Algeria, Tunisia experienced
large invasions of desert locusts in the spring of
1988. On March 15, 1988, the Crop Protection
Service reported that desert locusts had crossed
the Algerian border near Netta and moved east
on the Gafsa-Sfax axis to Maknassy. The
Government of Tunisia (GOT) immediately
mobilized a National Locust Control Committee
under the leadership of the Prime Minister and
appealed for international assistance. The fear
was that the change of winds from northeasterly
to southeasterly in April could blow the locusts
into the rich agricultural lands in the Cap region
of the north.

A disaster declaration was issued by the U.S.
Ambassador on March 19, 1988. OFDA sent
George Cavin, a senior American entomologist, to
Tunisia on March 20, 1988, to make an
assessment of the situation. Waves of locusts
continued to arrive from Algeria during the
following weeks, and the GOT increased the
number of aircraft in service to 17 and ground
units to 58. Between March 2 and 24, over 52,687
ha. were treated. By the end of May the area
treated had reached 306,000 ha.
OFDA provided important assistance during the spring 1988 campaign: air shipments of 50,000 liters of malathion ULV; a technical assistance team comprising a logistician, an aerial control expert, a radio communications expert, and entomologists; radio equipment; and strobe lights for night treatment of settled swarms.

By the end of May, the worst was over, and Tunisia began to make early plans for an expected resurgence from Algeria or Libya in the fall. A control effort of at least 300,000 ha. was anticipated, with a maximum of one million ha. as a contingency. Under a disaster declaration issued on July 23, 1988, USAID/Tunis requested OFDA/DLTF assistance to organize for the invasion. In preparation, greenness maps were provided, a technical assistance team reassessed the readiness capability of the GOT and was on-site to consult in case of locust invasions, 150,000 liters of malathion were shipped by sea, and spare parts for spray planes were shipped in by air. In addition, USAID/Tunis concluded a Commodity Import Program (CIP) arrangement with the GOT for the purchase of three spray planes.

Addendum: Control efforts in Senegal, Mauritania, and Morocco were timely and well executed (see separate reports). As a result, Tunisia received few swarms of any significance in the last campaign.

Action Taken by the Government of Tunisia (GOT)
Under the CIP arrangement, the GOT spent $10 million on aircraft for the insect control program.

Summary of U.S. Government Assistance

FY 1988

First Disaster Declaration (03/19/88)
Purchase and air shipment of 10,000 liters of malathion ......................... $515,934
Technical assistance (entomologist, experts in spraying operations, communications, logistics) ......................... $33,185
Radio and communications equipment ................ $44,253
Spare parts for spray aircraft ................ $36,453

Second Disaster Declaration (07/23/88)
Purchase and air shipment of 150,000 liters of malathion .......................... $685,852
Technical assistance (USDA/OICD) ........................ $17,770
Unspecified purchase (USAID/Tunis funds) ....................... $28,000
Total OFDA ........................................ $730,622
Total Other U.S. Government ................................ $28,000
Total FY 1988 ........................................ $1,361,447

FY 1989

Carry-over for FY 1988 declaration
Technical assistance (entomologists, environmental specialist) ..................... $36,252
Purchase of 3 air tractors .................. $1,300,000
Total OFDA ........................................ $36,252
Total Other U.S. Government ................ $1,300,000
Total FY 1989 ................................. $1,336,252
TOTAL ........................................ $2,697,699

Assistance Provided by the International Community

International Organizations
EC - donated pesticide and $111,000 for fuel.

Governments
Belgium - provided 10,000 liters of fenitrothion, 80 vehicle sprayers, and 4,000 exhaust nozzles.
France - furnished 4 Piper aircraft and 10,000 liters of fenitrothion.
Greece - contributed 15,900 liters of pesticide, 100 sets of protective gear, and 30 backpack sprayers.
Italy - provided 2 Hughes helicopters.
Saudi Arabia - contributed 10,000 liters of fenitrothion, 30 Toyota vehicles, and 10 exhaust sprayers.

Spain - gave 6,000 liters of fenitrothion.

**TOTAL** $3,550,000

**CHAD**

Responding to the assessment of locust experts after the 1987 campaign and as a result of donor committee meetings, USAID/Ndjamena submitted a proposal for an emergency locust control plan to AID/Washington. The proposal was approved on July 7, 1988, when the U.S. Ambassador officially declared a disaster. OFDA paid for pesticide, technical assistance, and greenness maps. Delivery of 30,000 liters of pesticide was made on Aug. 3, 1988. OFDA also provided aircraft and funds for local operations.

OFDA-funded aircraft were requested as locust swarms poured into Chad from North Africa. However, the aircraft were never used effectively because of the difficulty in getting them to Chad and the lack of major targets. Village brigades and traditional control measures may have had more of an impact on reducing the larval bands. Approximately 100,000 ha. were sprayed by ground teams and aircraft. Fortunately, many of the locusts disappeared mysteriously and never appreciably damaged food crops in 1988.

**Summary of U.S. Government Assistance**

Amendment to aerial spraying program contract ............... $235,957

Local support (fuel, food, equipment) for field bases for aerial spraying program .......... $64,392

Local procurement in support of aerial services ............. $650,000

Technical aid for spraying program ............... $17,200

Transport of equipment from Morocco .......... $1,437

Airlift of 4 tents from OFDA stockpile .......... $2,500

Airlift of pumps and hoses ............... $1,144

Procurement of pesticide and greenness maps (USAID/Ndjamena funds) ............... $332,600

**Total OFDA** ....... $972,630

**Total Other U.S. Government** ...... $332,600

**TOTAL** $1,305,230

**Assistance Provided by the International Community**

**International Organizations**

African Development Bank - contributed $39,000 for the Fada field office.

EC - supplied 30,000 liters of fenitrothion.

FAO - assisted with regional air support and operating costs and provided 40,000 liters of fenitrothion, 10,000 liters of ULV, 4 Unimogs, and 63,000 liters of dursban.

Organization of African Unity - donated $300,000.

OCALAV - provided 2 pickups, 3 sprayers, and 2 Unimogs.

**Governments**

France - provided a fixed-wing airplane, a helicopter, 40,000 liters of lindane, 60,000 liters of fenitrothion, 15,000 liters of gammophage, a truck, and 500 backpack sprayers.

Germany, Fed. Rep. - furnished 6,000 liters of fenitrothion and assisted with operating costs.

Japan - gave 20,000 liters of fenitrothion.

Netherlands - contributed $280,000 for pesticides.

Switzerland - provided $67,000, 10 nozzle sprayers, and a helicopter.

United Kingdom - furnished operating costs, a base radio, 10 2-way radios, 13 tents, 2 pick-ups, 10,000 liters of fenitrothion, 8 nozzle sprayers, 8 exhaust sprayers, and 100 ULV sprayers.

**TOTAL** $1,951,598

**NIGER**

The first locust swarms sighted in Niger in April
1988 were small, traversing the country from west to east in the Air Mountains. In the valleys of these mountains, a large population of immature, transient adults was able to thrive during the winter of 1987/1988 due to abundant perennial vegetation. The U.S. Ambassador to Niger issued a disaster declaration on July 8 in anticipation of a worsening locust situation leading to food shortages. By August, Niger was experiencing severe locust infestations. Approximately 1.9 million ha. reportedly were infested with locust hoppers in a belt extending east to west across the southern portion of the country.

On Aug. 17, the Government of Niger (GON) convoked the diplomatic community to announce that the locust situation in the country had reached crisis proportions and that additional assistance was required. USAID/Niamey believed that action on improving communications, specifically the acquisition and installation of additional HF radios, was the key to increasing the Niger Crop Protection Service's operational capacity. An HF radio specialist and equipment, therefore, were requested from and supplied by OFDA. OFDA also contributed 60,000 liters of malathion and lent a non-directional beacon (NDB) which worked flawlessly and improved operational efficiency of aircraft and the safety of flights.

Since the beginning of the locust control operation in 1988, the GON estimated that 862,000 ha. have been treated by ground and aircraft. As a result of the control program and the excellent rains and harvest, food crops sustained minimal damage in 1988.

**Summary of U.S. Government Assistance**

**FY 1988**

- Ambassador's authority for local support \( \$25,000 \)
- Radio and electronic equipment \( \$49,686 \)
- Local support for control operations (USAID/Niamey allotment) \( \$155,000 \)
- Purchase and airlift of 60,000 liters of malathion \( \$321,268 \)
- Technical assistance to develop radio network \( \$10,293 \)

**Operations and crop protection service**

(USAID/Niamey funds) \( \$400,000 \)

**Pesticide and greenness maps**

(AID/Africa Bureau funds) \( \$238,400 \)

**Total OFDA** \( \$561,247 \)

**Total Other U.S. Government** \( \$638,400 \)

**Total FY 1988** \( \$1,199,647 \)

**FY 1989**

- Carry-over for FY 1988 disaster declaration\n  - Rental cost for 2 spray planes \( \$166,000 \)

- Mission buy-in to AELGA (African Emergency Locust/Grasshopper Assistance project) (USAID/Niamey funds) \( \$151,000 \)

**Total OFDA** \( \$166,000 \)

**Total Other U.S. Government** \( \$151,000 \)

**Total FY 1989** \( \$317,000 \)

**TOTAL** \( \$1,516,647 \)

**Assistance Provided by the International Community**

**International Organizations**

- EC - contributed 90,000 liters of pesticide and a helicopter.

- FAO - established a regional operations center (\$57,000), provided regional technical assistance (\$250,000) and a survey, and donated pesticide, a helicopter, and other equipment.

- Islamic Development Bank - gave 6 Toyota pickups.

- U.N. Development Program - supported the OCA 9AV base and donated pesticide (at least 25,000 liters of fenitrothion).

**Governments**

- Algeria - gave 39,000 liters of malathion.

- Canada - provided $224,138 for operations, aircraft, maintenance, fuel, and technical assistance.
France - provided 20 MT of lindane, 100,000 liters of gammophene, battery motor sprayers, a helicopter, spray trucks, and operational costs.

Germany, Fed. Rep. - contributed pesticide (98,400 liters of fenitrothion and 50,000 liters of lambda-cyclothrin) worth $579,039, as well as 3,000 battery-powered sprayers.

Korea, Rep. - provided 2 spray planes.

Libya - furnished a Cessna aircraft, 27,000 liters of dursban, 50 units of protective equipment, and operational costs for the Agadez control program.

Netherlands - gave $250,000 for the purchase of fenitrothion, and provided 4 planes, 30,000 liters of fuel, 2 helicopters, and other operational support.

Nigeria - contributed 30,000 liters of fuel and pesticide.

Switzerland - donated 10,000 liters of fenitrothion.

TOTAL $7,200,000

Mali
The infestations which started in April 1988 spurred intensive control activities by the Mali Crop Protection Service, largely in crop areas. The infestations were particularly serious in the regions of the Adrar and Tamesna. USAID/Bamako estimated that the locust/grasshopper infestation affected a total of 871,000 ha. Overall crop loss was about 2%, but localized damage was often severe. In response to the U.S. Ambassador’s disaster declaration on Aug. 26, 1988, OFDA procured and shipped 100,000 liters of malathion to Mali and provided field support. The AID/Africa Bureau also purchased pesticide and supported control activities.

Summary of U.S. Government Assistance
Purchase and airlift of 100,000 liters of malathion .......... $529,110
Mission allotment for in-country transport and field equipment .......... $25,000

Mission buy-in for operations support and flying hours (USAID/Bamako funds) ......... $500,000
Nosema pesticide trials (AID/Africa Bureau funds) ........ $135,000
Procurement of 50,000 liters of malathion (AID/Africa Bureau funds) $471,000
Greenness maps and FAO entomologist (AID/Africa Bureau funds) ........ $115,000

Total OFDA ............ $554,110
Total Other U.S. Government .......... $1,221,000

TOTAL $1,775,110

Assistance Provided by the International Community

International Organizations
EC - furnished 32,000 liters of fenitrothion.
FAO - provided 25,000 liters of fenitrothion, 10 vehicles, technical assistance, and operational support.
U.N. Development Program - provided technical assistance.

Governments
Canada - furnished fixed-wing aircraft, a helicopter, and 10,000 liters of fenitrothion and assisted with ground support and operational costs.
France - donated 20,000 liters of lindane and 10,000 liters of gammophene, as well as 5,000 liters of gas and oil and 5,000 liters of avgas. France also supported an unspecified number of flight hours.
Japan - supplied 25,000 liters of fenitrothion.
Morocco - provided 10,000 liters of malathion, 100 hours of fixed-wing aircraft operations, 2 jeeps, and technical assistance.
Netherlands - gave 25,000 liters of fenitrothion and provided operational support.
Norway - furnished 4 helicopters.
Switzerland - contributed 15,600 liters of fenitrothion.
United Kingdom - donated 8,000 liters of fecarn and 10 sprayers.

TOTAL $3,500,000

SENEGAL AND GAMBIA

The first locusts to be reported in Senegal entered from Mauritania on April 5, 1988, and did not cause much damage. The U.S. Ambassador declared a disaster on May 11, 1988, in anticipation of a destructive infestation and released his disaster assistance authority to purchase mobile radios for the Crop Protection Service (CPS).

The next invasion in September, however, did surprise international and local experts. A combination of unusual movement of the intertropical convergence zone and uncontrolled locust breeding elsewhere led to the sudden, massive invasion of egg-laying locusts from southwestern Mauritania. In response to disaster declarations from the Gambia on Oct. 14 and from Senegal on Oct. 24, 1988, the U.S. government initially supported spraying operations of two small aircraft. It became obvious in early November, however, that these operations, and indeed all other attempts to control the locusts, would not be enough.

The use of blanket aerial treatment by a large plane operation, therefore, was recommended.

One C-130 and two DC-7s began flying only five days after the formal request was made to AID/Washington, demonstrating the rapid response capability of OFDA and the two aviation contractors which supplied the aircraft and crews. In support of the big plane operation, commercial and military aircraft flew additional quantities (253,200 liters) of malathion.

In total, the large plane operation applied approximately 460,000 liters of insecticide to 746,000 ha. in Senegal and 41,000 liters to 69,000 ha. in the Gambia. The small plane operation treated approximately 142,000 ha.

Locust control operations in Senegal successfully prevented the formation of an immense swarm of mature locusts that could have destroyed much of Senegal's agriculture and created future havoc in neighboring countries. The successful outcome was marred, however, by the unprovoked missile attack on the two DC-7s over the Western Sahara and the tragic deaths of five Americans working for T&G Aviation on the Senegal desert locust control program.

Action Taken by the Government of Senegal (GOS)
The GOS paid purchase and shipment costs of $2.5 million for 110,000 liters of malathion in FY 1989.

Summary of U.S. Government Assistance

SENEGAL

FY 1988
First Disaster Declaration (05/11/88)
Ambassador's authority used for procurement of mobile radios for the CPS ............ $25,000
Technical assistance (USDA/OICD) ... $120,829
Unspecified purchase (USAID/Dakar funds) ........... $100,000
Total OFDA .................. $145,000
Total Other U.S. Government .............. $100,000
Total FY 1988 .................. $245,829

FY 1989
Second Disaster Declaration (10/24/88)
Contract for 2 DC-7 aircraft for spray program ........ $545,000
Contract for a C-130 aircraft ............. $589,080
Purchase of fuel oil .................. $6,840
Airlift of 253,200 liters of malathion ... $870,915
DOD airlift of crash victims' bodies .... $51,020
Contract for 3 air tractors ............. $190,000
Cost of flying Turbo Thrush aircraft from Morocco (USAID/Dakar funds) ... $31,400

Purchase and transport of 67,000 gallons of malathion (USAID/Dakar funds) ... $1,803,840

Extension of C-130 and operating expenses (USAID/Dakar funds) ............. $196,160

Total OFDA .................. $2,252,855
Total Other U.S. Government ...... $2,031,400

Total FY 1989 ............... $4,284,255
TOTAL $4,530,084

GAMBIA

FY 1989

First Disaster Declaration (10/14/88)
Ambassador's authority used for purchase of pesticide, fuel, and equipment ........ $25,000

TOTAL $25,000

Assistance Provided by the International Community

International Organizations
Common Fund - allocated $633,000 for insecticide and shovels.

EC - contributed $1,200,000 for an entomologist, a logistician, and 130,000 liters of fenitrothion.

FAO - furnished $153,000 for early warning and regional coordination, as well as camping materials, radios, 4 planes, a helicopter, and fuel.

Islamic Development Bank - gave $250,000 for materials and a vehicle.

Organization of African Unity - contributed $97,000.

OCALAV - provided $787,000 for operations.

U.N. Development Program - donated $47,000 for equipment.

Governments
Canada - dispatched a regional locust coordinator and 2 small planes.

France - provided $333,000 for a helicopter, a plane, pesticide, radios, and other equipment.

Japan - furnished $3,700,000 for pesticide and equipment.

Netherlands - gave $4,000,000 via FAO for the West Africa control program.

Spain - donated $33,000 for fenitrothion.

United Kingdom - provided $40,000 for pesticide and an equipment handbook.

TOTAL $11,273,000

MAURITANIA

Heavy rainfall in the summer and fall of 1987 gave rise to environmental conditions that were favorable for locust breeding and survival.

Although the 1988 season began and ended with locusts in the northern regions, the main impact of the locust plague was felt in southern pastoral and agricultural areas. Rain continued in the northern regions in early March 1988 and control programs continued on an austere level with questionable impact. Reportedly, swarms of adult locusts moved in and around Mauritania in June.

In August, all observed that treatment efforts were inadequate because of the vastness of the infested regions and the rapidly increasing numbers of locusts. The U.S. Ambassador declared a disaster on Aug. 30, 1988, and OFDA airlifted pesticide to Mauritania to support an upscaled campaign. By early September, rainfall in the south and southeast had exceeded the heavy levels of the previous year, and the area was ecologically suited for locust proliferation.

By mid-October, the FAO and Canada had each increased operations to two spray planes, and the French also had mounted a small, two-plane operation.

In response to a new disaster declaration on Oct. 27, 1988, OFDA began providing technical
assistance and deployed four Turbo Thrush aircraft. The USG-funded operations were conducted from early November to mid-December with a total of 156,150 ha. treated. The combined control operations treated nearly 900,000 ha. during the 1988 season with the assistance of the Mauritanian military and the involvement of Peace Corps volunteers.

**Summary of USG Assistance**

**FY 1988**

*First Disaster Declaration (08/30/88)*
- Purchase and airlift of 100,000 liters of malathion ........ $522,877
- Leasing of aircraft and transport support ............. $35,000
- Technical assistance (USDA/OICD) ............. $71,087
- Aircraft rental and technical assistance from FAO (AID/Africa Bureau funds) .... $300,000
- Greenness maps (AID/Africa Bureau funds) ............... $50,000
- Technical assistance and ground support (AID/Africa Bureau funds) .......... $468,000

**Total OFDA** ............... $628,964
**Total Other USG** ............... $818,000

**Total FY 1988** ............... $1,446,964

**FY 1989**

*Second Disaster Declaration (10/27/88)*
- Purchase and air freight of radios ........ $26,633
- Contract for 4 Turbo Thrush aircraft (Mauritania's share) ........ $700,000
- Technical assistance (radio technicians) ........ $24,623

**Total FY 1989** ............... $751,256

**TOTAL** ............... $2,198,220

**Assistance Provided by the International Community**

**International Organizations**
- EC - furnished 200 hours of helicopter time, vehicles, and 100,000 liters of pesticide.
- FAO - provided a Cessna plane, $246,000 for OCALAV, pesticide, sprayers, vehicles, and radios.
- OCALAV - provided a fixed-wing spray plane.
- U.N. Development Program - gave $166,000.

**Governments**
- Algeria - supplied 15,000 liters of fenitrothion, 5 vehicles, and 9 technicians.
- Canada - contributed 2 fixed-wing spray planes and $1,800,000 in regional assistance.
- China, People’s Rep. - donated 1.5 MT of malathion.
- France - furnished a helicopter, a spray plane, fuel, 15,000 liters of lindane, and 3,000 liters of liquid pesticide.
- Germany, Fed. Rep. - gave 32,000 liters of fenitrothion and $1,158,078.
- Japan - contributed 40 MT of liquid pesticide, 8 vehicles, and 2,000 liters of ULV.
- Morocco - sent 20,000 liters of fenitrothion.
- Saudi Arabia - donated 15 vehicles and 100 MT of pesticide.
- Soviet Union - gave 30 MT of malathion.
- Spain - supplied 5,250 liters of fenitrothion.
- Sweden - donated 12 vehicles.
- Tunisia - furnished 10,000 liters of fenitrothion.

**TOTAL** ............... $3,370,078
CAPE VERDE

Four waves of desert locusts infested Cape Verde, with swarms first arriving in March 1988 after early rains. Damage was mainly to fruit and irrigated crops. OFDA and the AID/Africa Bureau responded by supplying sprayers and vehicle spare parts after the U.S. Ambassador issued a disaster declaration on Oct. 27, 1988.

Summary of USG Assistance

FY 1988
Purchase of vehicle spare parts
(AID/Africa Bureau funds) ........... $75,000
Total Other U.S. Government ....... $75,000
Total FY 1988 ..................... $75,000

FY 1989
Ambassador’s authority used to purchase
100 backpack ULV sprayers .......... $25,000
Total FY 1989 .......................... $25,000
TOTAL ................................. $100,000

Assistance Provided by the International Community

International Organizations
EC - supported rental/purchase of vehicles and furnished a helicopter and insecticide.
FAO - provided 200 sprayers, technical assistance, and operational expenses.
Organization of African Unity/African Development Bank - furnished a pickup truck and contributed toward operating expenses.

Governments
France - sent an environmentalist and provided 150 MT of poison bait and other pesticide.
Netherlands - assisted with operational expenses and donated sprayers, all worth $64,000.

Portugal - supplied a helicopter.

TOTAL $950,000

SUDAN

On May 20, 1988, mature swarms were first reported entering Northern Darfur province from Chad. By the end of July, 350,000 ha. were infested and 2,500 ha. were treated. After a disaster declaration by the U.S. Ambassador on July 29, OFDA provided funds and radios to support an aerial spray operation run by the Sudanese Plant Protection Department. Egg laying, hatching, and hopper maturation occurred in August.

By the end of the month 180,000 ha. were infested with hoppers and control teams had treated nearly 46,000 ha. Over 550,000 ha. were reported infested by September and nearly 170,000 ha. were treated during that month. Despite heavy infestations of locusts during the summer campaign, only minor damage to grain and vegetables occurred, with severe localized damage in some areas. The loss of cereal production to locusts was estimated at 2%.

In November, second-generation hoppers matured and fledged, forming immature swarms by the end of the month. Most of these swarms joined earlier swarms in a general east and northeast migration to the winter breeding areas along the Red Sea coast. Nearly 770,000 ha. were reported infested and 207,000 ha. were treated during November. The treated area included 26,000 ha. along the Red Sea coast.

The U.S. Ambassador issued a new disaster declaration on Dec. 30, 1988, and OFDA responded by sending a DLTF program officer and a logistically to help plan control activities. From May 22 to Dec. 31, 1988, over 3.7 million ha. were infested with desert locusts in the summer breeding areas of Sudan, and over 880,000 ha. were treated by ground and aerial teams.

However, dry vegetative conditions forced many swarms from the winter breeding grounds along the Red Sea coast. The locusts continued east to the Arabian peninsula. Some breeding, nevertheless, occurred in favorable areas of the
Tokar Delta and Wadi Oko/Diib but were controlled without emergency measures.

Action Taken by the Government of Sudan (GOS)
Control activities by the GOS amounted to almost $1.8 million in FY 1988.

Summary of USG Assistance
FY 1988

First Disaster Declaration (07/29/88)
Charter of helicopter and spray aircraft . $555,000
Radio equipment and transport ........ $21,925
Protective clothing and transport .......... $9,108
Technical assistance of radio engineer .... $7,245
Technical assistance (USDA/OICD) .... $39,137
Unspecified Mission purchase
(USAID/Khartoum funds) ............. $30,000
Total OFDA ..................... $632,415
Total Other U.S. Government ........ $30,000
Total FY 1988 ................. $662,415

FY 1989

Carry-over for FY 1988 disaster declaration
Aircraft for DLTF assessment team .... $25,000
Greenness maps ..................... $49,531

Second Disaster Declaration (12/30/88)
Procurement of radio equipment ...... $6,853
Technical assistance (logistics/operations expert, locust control coordination officer, assistant to USAID/Khartoum to start up aerial control program) .... $50,599
Total FY 1989 ..................... $131,983
TOTAL $794,398

Assistance Provided by the International Community
Information on specific contributions is unavailable.

TOTAL $3,428,333

ETHIOPIA

Ethiopia fell victim to pest infestations for the third year in a row. First reports of locust activity in June noted the presence of mature swarms in the Asmara region of northern Eritrea. These locally bred adult locusts were joined by swarms migrating from heavily infested Northern Darfur province in Sudan. Wet soil from unusually heavy July and August rains provided good breeding grounds for the insects along the Red Sea coast, around Asmara, and in the western lowlands. According to the Eritrean Relief Association (ERA), the relief arm of the Eritrean People's Liberation Front (EPLF), 500,000 ha. in the region were affected.

In mid-October, locusts from Saudi Arabia invaded eastern Tigray. The Relief Society of Tigray (REST) of the Tigray People's Liberation Front (TPLF) estimated that 3,000 ha. of Tigrayan cropland sustained damage. By the end of December, low- to medium-density immature swarms were reported in Tigray and in Seraic, Hamassein, and Key Bahir areas of Eritrea. Newly fledged young swarms were prevalent in the winter breeding grounds of the Red Sea coast. However, control operations from both the rebel relief groups and the Ethiopian government helped prevent major crop damage and mass migrations of the insects into neighboring countries.

As the threat became evident in July, the Ministry of Agriculture (MOA), working with the multinational Desert Locust Control Organization for East Africa (DLCO/EA), mobilized its resources for the control campaign. An FAO consultant carried out a computerized inventory of government pesticide stocks and the MOA readied mobilization teams to organize farmers for ground operations. An official appeal for international assistance was issued, and MOA and DLCO/EA base staff arranged for strategic stocking of pesticides in northern Ethiopia. The MOA Crop Protection Service supervised the ground campaign which began in August. With
USG and FAO assistance, DLCO/Ea undertook aerial operations in early fall using a DLCO/Ea spray plane, an FAO-funded helicopter, and two chartered aircraft. Surveys and spraying occurred in Eritrea, Tigray, and parts of Wollo. DLCO/Ea also conducted an aerial survey of Hararghe which revealed no presence of locusts. Political and physical inaccessibility of the most affected areas considerably constrained GPORE and DLCO/Ea efforts.

Rebel groups also conducted locust control. In June, the ERA initiated its campaign in EPLF-occupied territory of Eritrea, treating up to 18,000 ha. of infested land by Sept. 25. In TPLF-held land in Tigray, the REST campaign started in October and included a combination of fighter aircraft spraying and farmers using traditional methods.

U.S. Charge James R. Cheek declared the insect infestation to be a disaster on Sept. 2, 1988. In conjunction with the declaration and an earlier DLCO/Ea request, OFDA funded three months’ worth of operational support for air and ground control teams, aviation and vehicle fuel, and repair of an aircraft engine for the locust campaign in East Africa. A portion of this assistance was used for Ethiopia. OFDA purchased 44 hours of helicopter survey time in October. An FAO-funded entomologist used the survey time to conduct an aerial assessment of Tigray and Hararghe. Additionally, OFDA arranged for the procurement and transport of 40,000 liters of malathion from Cheminova Co. in Denmark. The pesticide was airlifted to Djibouti from Europe where it arrived on Sept. 21 and was stored under DLCO/Ea auspices for use in Ethiopia.

Summary of USG Assistance

FY 1988
Purchase of 40,000 liters of malathion $140,220
Transport of malathion $74,600
Grant to DLCO/Ea for locust control program $193,000
Total FY 1988 $407,820

FY 1989
Carry-over for FY 1988 Disaster Declaration
Helicopter survey time $15,405
Total FY 1989 $15,405
TOTAL $423,225

Assistance Provided by U.S. Voluntary Agencies
World Vision Relief and Development - donated 500 knapsack sprayers.

Assistance Provided by the International Community
FAO - provided $90,000 for one month’s flying time for one helicopter.
Italy - furnished $500,000 in technical assistance, air support, and 30 MT of pesticide.
Oxfam/UK - sponsored an assessment of usable pesticide stocks.
United Kingdom - contributed $370,370 to DLCO/Ea for use in Ethiopia.
TOTAL $960,370