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THE SAHEL OF WEST AFRICA

THE GRASSHOPPER AND LOCUST PROBLEM - 1987

An Evaluation of the Problem and Its Needs for Control

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INTEGRATED PEST MANAGEMENT AND ENVIRONMENTAL PROTECTION PROJECT

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CONSORTIUM FOR INTERNATIONAL CROP PROTECTION
THE SAHEL OF WEST AFRICA

Index

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1. ITINERARY - COUNTRIES AND LOCATIONS VISITED

This assignment was initiated with a briefing in OFDA/AID and OEO/Africa Bureau, Washington, D.C. on March 6, 1987. The team departed Washington, D.C. for Dakar, Senegal via Paris, France March 7th. In Paris, the evening of March 7th, the team met with Glen Slocum, AID representative to CILLS. The itinerary within West Africa was as follows:

March 10-11 - Dakar, Senegal

March 12-17 - Banjul, Gambia

March 18-20 - Dakar, Senegal

March 19 - The team met with Wilbur Thomas, Deputy USAID Director, Mali at Dakar, Senegal to review the 1987 USAID, Mali Plan.

March 21 - St. Louis, Senegal

March 22 - Nouakchott, Mauritania

March 23 - Ayoun el Atras, Mauritania

March 24-26 - Nouakchott, Mauritania

March 27-April 3 - Dakar, Senegal

April 4-8 - Washington, D.C.

2. PURPOSE OF TRIP

OFDA/AID contracted with the Consortium for International Crop Protection for a multidisciplinary team to assist West African USAID Missions and National Grasshopper Coordinating Committees to elaborate plans for the 1987 grasshopper control program in West Africa. Specifically, this entomologists assignment was to:

1. Review the 1986 program, particularly the appropriateness of the means used to control the pests, and the institutional capacity of the National Government and National Coordinating Committee to adequately execute the program.

2. Assess the probable extent and severity of the 1987 grasshopper problem.

3. Assess the presently available technical means and resources for the 1987 program.

4. Address other pesticide related concerns except for the evaluation of pesticide formulation plants.

5. Assist in the development of an action plan for future USAID involvement in emergency grasshopper control in 1987.

CONSORTIUM FOR INTERNATIONAL CROP PROTECTION
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3. PARTICIPANTS - WEST AFRICA ASSESSMENT TEAM

REGIONAL TEAM

Bob Thibeault
Team Leader, Disaster Specialist

Bob Herald
Logistics Specialist

George Cavin
Entomologist & Pesticide Specialist

Jack Henderson
Aerial Spray Specialist

THE GAMBIA

Regional Team

Carrol Voss
Entomologist and Aerial Spray Specialist

MALI

Regional Team
(Team met with Wilbur Thomas, Deputy Mission Director of Mali in Dakar)

MAURITANIA

Regional Team

SENEGAL

Regional Team

Karl Seethaler
Logistics Specialist

Ellis Huddleston
Entomologist

4. FINDINGS

A. West Africa - General

Of the 300 or so species of grasshoppers and locusts in Africa only about 30 can be considered to be of economic importance. In West Africa there are probably less than 15 species considered to be of economic importance, including locusts. If year in year out crop damage is used as the basic criteria for determining economic importance then some of the lesser known species will likely dominate as the major perpetrators of crop damage. Each year they take a substantial toll on the highest valued cropland. However, in terms of total numbers, size of area infested and the degree of human suffering evoked during outbreak years, Oedaleus senegalensis must be classified as number one, ahead of even the Desert Locust and African Migratory Locust.

If a line (#1) is drawn across the northern border of Gambia to Segou, Mali, across northern Burkina Faso, dropping slightly southward to Kaduna, Nigeria and eastward towards Biro, Chad; then a second line (#2) is drawn from Dakar, Senegal to Mopti, Mali to Niamey, Niger and N'Gemina, Chad, the area between these two lines can be expected to contain about 75% of all diapausing O. senegalensis eggs laid from about mid-August, 1986 onward. This is the area where primary effort for early season control of O. senegalensis should be concentrated. Since O. senegalensis habitat is primarily grasslands the majority of its eggs will have been deposited in the grasslands sandy loam soil in preference to the cropland.

If a third line (#3) is drawn from St. Louis, Senegal across northern

Senegal and southern Mauritania to Tombouctou, Mali to the northern shore of Lake Chad this will approach the northern most limits of O. senegalensis habitat. The Launois biomodel, while recognizing that variation does occur from year to year, anticipates that some diapausing O. senegalensis eggs will be laid at the northern terminus of the Intertropical Convergence Zone (ITCZ) an area of 250mm to 500mm of rainfall annually and somewhat more in the 500mm to 750mm of annual rainfall. In total this should not exceed more than 25% of the diapausing eggs. (See Attachment Map #1)

Launois states that if there is a prolonged stagnation of the ITCZ in the northerly latitudes, then adult grasshoppers may scatter, prolonging their stay, and force them to lay under adverse conditions. Egg surveys presently underway in Mauritania, Mali and Senegal indicate that perhaps a higher than normal number of eggs were laid in the more northerly area. However, rainfall was apparently sufficient as some areas remained green until well into March 1987. Diapausing eggs populations in these areas was obviously high, more than 20 pods per square meter (m^2).* Predation and parasitization was reported at 40% to 45%.* (Sountera, CPS, Mali reports that in normal years these average about 60%; personal communication). No significant eggs desiccation due to lack of adequate soil moisture has been reported.

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* Egg survey conducted by Ian MacKay in northern Mali and southern Mauritania as reported by Wilbur Thomas.

With normal rainfall in 1987 it appears that the infestation in West Africa could be as large or larger than in 1986. Plans for Senegal, Gambia, Mauritania and western Mali in 1987 anticipate an infested area about equal to that in 1986. For eastern Mali, Niger and Chad most predictions are that the 1987 infestation will be more intense than in 1986 as the infestation shifts further to the east.

B. The Gambia

A large number of grasshopper species exist in Gambia, but only the following five are considered of major economic importance: Kraussaria angulifera, Krausella amabile, Cataloipus fuscocoerulipes, Zacompsa sp. and several species of Hieroglyphus. O. senegalensis exists in Gambia, but is not considered a major pest species. Rainfall in the Gambia generally approaches or exceeds the tolerable level (1000mm) for O. senegalensis reproduction and development. Soil types are also generally not applicable in the reverine flood zones and rainfed swamps.

First generation O. senegalensis that are produced in the Gambia, upon reaching the adult stage, migrate northwards, while adults of the third generation do not return to the Gambia until late fall when most cereal crops have been harvested.

Of the five grasshopper species of major economic importance in Gambia, four are considered major pests of cereals (rice, millet, sorghum and maize) while Zacompsa is principally found in grasslands and bush type vegetation. Of the cropland species Kraussaria and Krausella are generally found to

hatch in close association with cereal crops. Kraussaria is generally found in the upland cereals, while Krausella is found in both lowland and upland cereals. Farmer applied treatments are most effective against these species.

Cataloipus generally breeds in the grasslands and forested areas and migrate from there, rather short distances, into the upland cereal crops.

Hieroglyphus generally lays its eggs in the soil cracks in the rainfed swamps. They hatch shortly following the early rains. As the water rises they move out in advance of the rising waters and invade the upland rice. Hieroglyphus is reportedly a good swimmer. In its early stages of development it is difficult to control due to problems of water contamination with pesticides. Except for ground applications by trained CPS personnel, treatment must be generally withheld until they have moved out of the rainfed swamps and into upland areas particularly the plantings of upland rice.

Thus, it becomes an almost insurmountable task for the individual farmer, who lacks mechanized equipment, to protect his cereal crops from severe damage by Cataloipus and Hieroghyphus in outbreak level populations. These two species are prevalent in the western and lower river divisions, the area where most aerial treatment occurred in 1986.

Hatch is initiated by the onset of the summer rains which may start in the eastern part of the country by mid-May and progress west. If the rains come late the entire country receives rains simultaneously, resulting in a more uniform but more widespread grasshopper hatch.

The economically important grasshoppers of Gambia have single to multiple generations. Except for Cataloipus and Kraussaria which have only one generation up to three generations may occur between May and early December with other species. Early season control against the first generation is the most effective means of eliminating crop damage and preventing recurrence for the following year. Kraussaria can be expected to hatch about 2 to 3 weeks earlier than Cataloipus. Although their habitats are generally dissimilar some overlapping can be expected, and must be considered when scheduling treatment.

The 1984/85 Gambian Agricultural Statistics list the following hectarage cultivated with crops susceptible to grasshopper infestation in the Western, Lower River and North Bank Divisions:

Early Millet	10,940 has.
Late Millet	5,330 has.
Sorghum	1,770 has.
Maize (corn)	3,080 has.
Upland rice	1,999 has

Swamp or deep paddy rice was not included as being threatened from grasshopper attack.

The three Divisions had the highest incidence of grasshoppers in 1986 and the initial 1987 eggs survey shows a mean 2.7 egg pods per square meter in the Western, 2.25 Lower River and 1.075 in North Bank. Numbers per

meter^2 are progressively less moving eastward. Areas of less than 1 pod per meter^2 may have pockets of heavy infestation but overall the population can be expected to be less than economic level.

If we assume that the infested area in 1987 will be comparable to 1986 we can project that 53% of the susceptible cereals will be infested (CPS calculations for September 1986 or 12,253 has.).

The size of the area of infestation outside the cropland could exceed cropland by a multiple of 10.

A three pronged control approach appears sensible against the initial generation.

1. Treatment by farmers to their own infested crops using hand applied dusts, liquid spray and baiting. Multiple applications may be required as the season progresses.
2. Baits applied by CPS power blowers to field boundaries and accessible forest and grassland.

   Additionally CPS liquid sprays applied by motorized units to accessible grasslands and forest lands.
3. Aircraft spraying could be applied to inaccessible areas including grasslands and forest lands.

Liquid insecticide requests are sufficient to treat in excess of 400,000 hectares. Equipment presently available to apply this liquid insecticide has a capacity for treatment of about 40,000 has. throughout a 120 day treatment.

At least two months can be needed to preposition insecticides, particularly farmer applied materials. Distribution should be completed by mid-May in the east and by mid-June in the central and western parts of the nation.

The Gambia Government is expected to arrange for the waiver of all taxes, duties and fees on fuels, pesticides, equipment and materials, etc. which are directly involved with the survey and control of grasshoppers in The Gambia.

It was proposed that a 5% carbaryl-rice husk bait be substituted for much of the insecticide dust included in the action plan. Bait has the advantage that only the insecticide must be imported. Rice husks should be readily available at the rice processing plants in Gambia, and can be provided by the Gambian Government as part of their contribution to the program. Baits can be mixed locally with local labor and no sophisticated equipment is required. Baits are safer when applied by hand by the farmer than dusts as there is no problem from inhalation nor will the bait stick to the farmers skin as in the case of dusts. Baits should also provide a higher degree of control when distributed by hand by the farmer whose only normal equipment for dust application is to shake it out of a burlap bag. Complete coverage of the area to be treated is not necessary with bait as it is attractive to the grasshopper.

At least two spray aircraft may be required for early season application to treat grassland and forested areas inaccessible to ground equipment but from which grasshoppers can migrate into upland corn, millet

and rice crops. Canada, the EEC or other donors was proposed as a source for these aircraft.

C. Mali

The three species of grasshoppers in Mali capable of major outbreak are the African Migratory Locust Locusta migratoria m., the Senegalese grasshopper O. senegalensis and Mali lies within the summer breeding area of the desert locust Shistocerca gregaria f. At the present time only O. senegalensis has reached outbreak proportions. Other more localized grasshoppers such as Aioloplus sp. and Hieroglyphus have reached damaging population levels in restricted areas such as river basin drainage and so must also be considered in the control effort envisioned. Techniques utilized and timing of applications must take into account the varied biology of all economic species to achieve maximum economic impact.

Egg pod surveys are presently being conducted in the principal habitat of O. senegalensis between 13° and 17° north latitude. As many as 20 pods per m^2 have been detected at some locations according to Deputy Mission Director Wilbur Thomas. Although encouraged by the 40% to 45% predation and parasitization of eggs at numerous locations, this is still well below the 90% to 95% of combined egg and anticipated larval mortality necessary to project a reduction in population over the previous year.

If the 1987 rainfall pattern follows the expected norm, rainfall of 20mm or more normally required for hatch will occur by mid-May in a few widely scattered localities. Beginning of hatch will follow in seven to ten

days. Pesticides and application equipment for farmer use should be positioned in the villages and villagers' training completed prior to the beginning of the rains. As the rains mark the initiation of the farmers' busy season, the farmers need adequate time to schedule their actions.

Malathion U2V left over from last year's campaign and other insecticides should be tested prior to use in 1987.

The country plan provides only about one month's time for CPS to distribute 600 tons of dust to the village level. Donor assistance may be required to accomplish this in the limited time available.

Two locations, the Niger River Flood Zone and Moudiah millet production area should be selected for crop loss assessment.

Local aircraft application cost quotation is higher, by at least one third, than similar quotations from other West African countries and an attempt should be made to revise downward.

Lack of a general wind pattern of five to ten miles per hour minimizes the effective use of controlled drift spraying. Spray swaths should be based on non-wind conditions which can reduce hourly output, increasing total application time.

We assume a sizeable carry over of dusts from 1986 as calculations made following Wilbur Thomas' departure from Dakar show 600 tons insufficient to cover 75,000 has. at standard application rate of 10 to 15 kgms per has. It is questionable that 100 back pack sprayers, as proposed by Norway, are sufficient to treat 50,000 has. We calculate 1800 to 2000 has. per day using 100 motorized mist blowers and less than 100 has. per day with

pressurized tank type handpumps. Total needs for first generation control should be based on window of opportunity of 30 to 35 days from hatch until egg laying adults.

If propoxur is unavailable in the quantities proposed in the country plan, it is suggested consideration be given to carbaryl 5% dust or fenitrothion 2.5% dust.

Consideration should be given for inclusion of encapsulated ULV malathion in the OEO pesticide trials, scheduled for either Mali or Senegal.

Imperial Chemical Company (ICI) representatives Jonathan Hall and James Otter met with team in Dakar March 20 to discuss 1987 pesticide testing plans. ICI plans aerial and ground tests in June with Karate near Mourdiah as a repeat of 1986 tests conducted by ICI and FAO consultant George Popov.

Control efforts in Mali in 1987 were late. In early June 1986 severe damage to emerging sorghum and millet crops occurred along the Burkina Faso border southeast of Segou. By the time control efforts were launched, the grasshoppers had begun their migration north. By late June the CPS was reporting more than 250,000 hectares infested in western Mali north of Bamako, but insecticide on hand was sufficient to treat only about 8,000 has. Trained personnel and equipment were far short of that deemed necessary to launch a successful control campaign.

In 1987, Mali is ahead of most other West African nations in its preparation. Donor nations have made their commitments early. At least two aircraft are available for treatment of the larger areas of early season infestation. Although dusts can be formulated in Bamako much cheaper than

importation by air of already formulated material as was necessary in 1986, the cost of dust, including transportation to locations where it can be made available to farmers for application, on a per hectare basis still exceeds the cost of application by aircraft by a factor of at least 2:1 (see attachment) with an efficacy of only about 30% to 40% (Cavin's observations 1986) versus 80% or more with aerial application. Although it is desirable to enable the farmer to actively participate in the program, he only has time or inclination to try to protect his own particular parcel of land. So, for the operation to be effective in preventing population buildup and spread through successive generations maximum use of available aircraft should be made.

D. Mauritania

It is not possible to tell precisely the intensity of the grasshopper infestation in Mauritania in 1987. Infestation size and intensity depends to a large extent on the effectiveness of early season control in Senegal, Mali and Burkina Faso.

Desert Locust, Shistocerca gregaria f. - Populations are increasing in the intermediate breeding areas between Aioun el Atrous and Atar in south central Mauritania as a result of favorable rainfall the past two years. According to CPS officials they are still in the solitary phase and as yet show no evidence of gregarious behavior. They do not appear to pose a serious threat in the immediate future but are capable of gregarisation and

localized damage to oasis agriculture, so effort at their control is warranted.

Solitary Grasshoppers - Species such as Hieroglyphus, Kraussaria, Aiolopus, Cataloipus and Cenchrus beflorus which was dominant in the Arroundissment of Aioun Farba in 1986, will likely again be a problem in flood recession and water containment agriculture along and near the Senegal River between Kaedi and Selibaby. Emerging on the July rains they, along with Gryllus sp. of crickets, can be expected to invade irrigated agriculture and nearby rainfed cropland and late flood recession millet and sorghum.

Infestation of the dominant grasshopper species in Mauritania, O. senegalensis is largely dependent on the effectiveness of early season control in nations to the south. Some residual population likely went into diapause in the Touil, Kobenni area as this area has remained green through mid-March. Based on MacKay egg survey (reference Bamako 0421) this residual population should be insufficient to cause major economic damage to rainfed crops and pastureland. However, since first generation population in nations to the south are expected to be sizeable, escapes from control must be expected. Following the northerly progression of the ITCZ these, or their progeny, can be expected to invade southern Mauritania in mid- to late August. Thus control plans must be based on a worst case situation. The Mauritania country plan is based on this assumption. Within the invasion area there are about 8,000 has. of irrigated rice and 250,000 has. of millet and sorghum production in normal rainfall years and several hundred thousand

has. of grassland. Grassland is the primary habitat of most O. senegalensis that will produce a third generation and migrate south following the southerly retreat of the ITCZ.

Pesticides - CPS inventory shows approximately 46,000 liters of 50 percent Fenitrothion on hand, of which 41,000 liters has been distributed to CPS control bases for ground control teams, aerial and farmer application. 35,000 to 40,000 liters of 50 percent Dieldrin is on hand in OCLALAV storage at Aioun el Atrous for locust control but will likely not be used if a source of supply of other pesticides is available.

In 1986 about 230,000 has. were treated by aircraft. CPS estimate of needs for 1987 is about 300,000 has. including dessert locust.

Five thousand liters of 50 percent Fenitrothion is in storage in Nouakchott with an additional 10,000 liters anticipated from France and 30,000 liters of 50 percent Fenitrothion expected from Japan. Thus according to CPS estimates, a shortfall exists for treatment of about 200,000 has. (100,000 liters of insecticide). This estimate includes a built-in safety factor in the event of higher than anticipated escapes from control to the south. But, since control efficiency in Mauritania is the key to the size of probable second phase operations in nations to the south, this safety factor cannot be ignored. However, it may be somewhat on the high side. The minimal shortfall, I would estimate, is about 44,000 liters of ULV equivalent pesticide, sufficient to treat about 100,000 has.

Ground treatments are scheduled to begin in early July and extend through November principally on irrigated and rainfed and flood recession

rice, millet and sorghum along the Senegal River. The country plan lists a need for 876 tons of Propoxur 2 percent dust or equivalent. This appears excessive considering that 1986 usage was 618 tons. Even if provided, the capacity for CPS to distribute this quantity to farmers in advance of need is questionable. Forty to 50 tons of Propoxur 2 percent dust is on hand, and 800 tons are anticipated from Japan with a late June/early July delivery date. This should be more than sufficient. Distribution should begin by May 1st to assure positioning in advance of rains. The 400 tons anticipated from France for early delivery does not appear forthcoming at this time.

1986 Control Program - Hatch initiated in June in Hodh Chargi and Hodh el Gharbi following scattered early season rains. A general emergency of localized grasshopper species and residual O. senegalensis occurred following the onset of general rains in July and August. Migration of O. senegalensis from the south in September appreciably expanded the size and intensity of infestation.

Early season control required use of low concentrate insecticide dust and liquid sprays applied by farmers and CPS. Late season control was almost exclusively by aircraft. Of this 124,987 has. was in the western section using a pawnee and helicopter. 58,544 has. were treated in the eastern section from Mali, and 20,000 has. with DC-7 aircraft operating from Dakar.

Western section control utilized 20,800 liters Diazinon 90 percent, 13,250 liters of Fenitrothion 50 percent, 890 liters of Fenitrothion 96 percent, 24,130 liters of Fenitrothion - Fenvalerate 90 percent, 16,440

liters of Malathion 50 percent and 8,000 liters of Malathion 50 percent. Insecticide usage figures for eastern sector control has not yet been calculated but consisted of Fenitrothion 96 percent and Malathion 50 percent and 90 percent. Control according to CPS ranged from a low of 84 percent at Hassi el Ah-Binena in the eastern sector to 97 percent to 100 percent in most areas. These figures are probably higher than actual accomplishment considering the adverse conditions under which the work must be conducted.

Although two aircraft from Algeria arrived in November for standby in the event of need for desert locust control, no actual treatment was undertaken.

Some reports of bird mortality were received from farmers in areas treated with Diazinon but these reports lack confirmation.

In 1987, Mauritania should again gear their control actions to early season control (July) against mixed species of localized grasshoppers emerging with the advent of the spring rains in and near croplands adjacent to the Senegal River Basin and areas where diapausing eggs of O. senegalensis were found in the Touil and Kobenni area of southeastern Mauritania. Preparation should be made for late August-early September control of migrating O. senegalensis from escapes from early season control in Mali and Burkina Faso. Late season control will probably also be required along the Senegal River to prevent damage to flood recession crops (October-December). Desert locust control may also be required at this time in central Mali if gregarious tendencies are observed.

E. Senegal

The ease in identification of areas that are expected to be infested in 1987, Senegal has been divided into areas as follows (see Attachment):

1. Casamance:

This is the southern most area of Senegal. Although some O. senegalensis will be found in this area in the first generation, the high rainfall, more than 1000mm per year, is not conducive to their development. More localized species such as Kraussaria, Hieroglyphus, Cataloipus, Krausella and Zacompsa, (also dominant in Gambia) are expected to dominate in the Casamance.

2. The southern and central peanut basins:

These two areas have been combined in a single zone for operational purposes. Together, they make up the area where about 75% of the first generation hatch of O. senegalensis is expected to occur. This area must be considered the most critical for early season control of O. senegalensis in Senegal.

3. The northern peanut basin:

Although some eggs of O. senegalensis that went into diapause in 1986 were undoubtedly laid in this area the numbers should be considerably less than those laid in the southern and central peanut basins. Escapes from control in the southern and central peanut basins will breed in this area to initiate a second generation. So in July 1987 we can expect a hatch of 1986 diapausing eggs (first generation) as well as a second generation of O. senegalensis as a result of escapes from

control efforts to the south. Control efforts in this area must take these overlapping generations into account to eliminate repeat applications.

4. The Senegal River Basin (FLEUVE):

   This area of irrigated and flood recession crops is primarily an area of localized grasshopper species similar to those found in the Casamance. One species that is common here, Aiolopus simulatrix has been recorded as being migratory in the Nile River Basin of the Sudan, where it is known as the Sudan Plague Locust. However, in the Senegal River Basin it is generally considered a localized species. Unlike most of the other major species of the Sahel, it overwinters (dry spell) as an adult in cracks in the ground and emerges upon initiation of the summer rains.

5. Between the northern peanut basin and the FLEUVE:

   If early season control is not entirely successful in the peanut basins of Senegal, then a third generation of O. senegalensis will likely occur in this area, the northern terminus of the ITCZ. This third generation, upon reaching adult stage will migrate south, following the southerly retreat of the ITCZ, and attack the millet crop in the peanut basins when the heads are forming and in the milk stage, the time they are most vulnerable to damage.

The Senegal action plan calls for treatment of 1,320,000 hectares of which 800,000 hectares should be with aircraft. The plan follows closely

the recommendations of the strategy working group at the December 1986 Locust and Grasshopper Technical Advisory meeting held at FAO, Rome, Italy. As recommended by the working group, treatment will be aimed at first generation grasshoppers of O. senegalensis in the southern and central peanut basins and against localized species in the Casamance and the Senegal River Basin.

The team recommended to USAID/Senegal that it focus its attention on work against O. senegalensis in the southern and central peanut basins and encourage other donors to take action in the Casamance and Senegal River Basin. USAID activities should include the introduction of bait technology applied by farmers to their fields and field boundaries and by aircraft, and the aerial application of ULV Malathion to 240,000 hectares of cropland and pastureland. The team believes that an effective control effort against the first and possibly second generation should eliminate the need for a massive effort requiring large aircraft against late season populations as was necessary in 1986.

In addition to the Casamance and Senegal River Basin, other donors should be encouraged to undertake any late season cleanup of O. senegalensis at the northern terminus of the ITCZ and following its southerly retreat. The assistance of other donors might also be required against the second generation of O. senegalensis in the central and northern peanut basins if rainfall of 25mm or more occurs generally rather than spottily, which could enable the entire grasshopper population to hatch at one time. This would possibly overwhelm the three aircraft aerial unit proposed for AID support.

5. CONCLUSIONS AND RECOMMENDATIONS

1. The Country Plans of all four nations appeared to be either inflated or else expanded beyond the nations capabilities to perform (i.e., distribution of large quantities of bait to farmers and training them in its application). Many assistance requests were of a long term nature rather than simply a need for the 1987 control operation. Although the long term need is obvious, these needs should be separated from the immediate need to conduct the 1987 campaign, so that donor nations could plan their participation accordingly.
2. In general these four West African nations have developed their action plans to conform to the strategy of early intervention proposed at the December 1986 meeting of the Technical Committee, held in Rome, Italy. The plans for Gambia, Mauritania and Senegal call for early season intervention wherever the grasshoppers may be. In contrast Mali appears to be relying on early season intervention in cropland only. In contrast to the other nations Mali fully anticipates a large late season (Phase II) operation.
3. USAID should encourage the use of baits in preference to dusts wherever practical, and where suitable bait materials are available (flaky rice or millet or wheat bran, rice of millet hulls, etc.). Baits are easily applied by hand and require minimal safety paraphernalia when mixed with pesticides such as carbaryl, fenitrothion and propoxur. Baits are generally less expensive than dusts overall because they do not require complete coverage for adequate control as they are attractive to

grasshoppers. Baits stand up better under adverse weather conditions than do dusts. Baits are not a new technique. They are an old technique that is enjoying a resurgence of popularity.

4. USAID should assure that their technical representatives on the 1987 control program have a broad background in control operations including both aerial and ground operations, aircraft and ground equipment calibration, swath width determination and biology of the target pests. The AID action plans are based on exact calibration and application. No provision has been allowed for error or respray. The AID approach to early season control can assure success only if a well planned and well executed program is in place.

5. It was stated by the working group on control strategies in the December 1986 Rome meeting that Phase II was not a good strategy. A strategy of strategic intervention was proposed using whatever control technique was applicable to a given situation and necessary to interrupt the spiralling population cycle. Control intervention should be made at the most vulnerable biological stages. Both early season control of first generation grasshoppers of third to fifth instar wherever they occur, and utilizing the most feasible means of application, which includes the use of small aircraft, meet the requirements of the intervention strategy.

6. AID technical personnel assigned to the project should be on site by mid to late May and no later than June 1st in Gambia, Mali and Senegal and by mid June to July 1st in Mauritania.

7. A sound detection and delimiting survey is the key to the success of

7. A sound detection and delimiting survey is the key to the success of the control program as proposed. There must be assurance from the affected nation that adequate supplies of fuel (gasoline and diesel) will be available for survey teams in the field. Adequate and timely per diem payments must also be provided. This was one of the major complaints the team received of the 1986 operation.
8. An Operations Center is essential for proper functioning of the program. The Operations Center should be operated by affected nation personnel with technical assistance from donor nations and FAO when required. The Control Center should be the heart of the control operation into which all essential information is funneled and disseminated. Major decisions such as types of treatment, areas of concentration of control effort, assignment of personnel and equipment should be made here in consultation with the control committee. However, flexibility must be exercised to allow for freedom for technical decision making in the field.

Within the Operations Center all program record keeping should be maintained, including up to date mapping of survey and delimiting information, areas within which control has been or is being conducted, and anticipated scheduling of control operations by areas.

In 1986, Operations Centers were normally not set up and information was often scattered between a number of different agencies and organizations making it difficult to keep track of rapidly moving

operations. Thus donors made many of the major decisions on their own.

9. FAO's program role appears to have been pushed somewhat in the background as a result of donors scrambling to get needed supplies and materials quickly prepositioned occasioned by the lateness in completion of most country plans by the host nations. Some fault must also be placed on FAO for their lack of aggressive leadership and action. Most FAO country representatives have backed away from a leadership role in 1987. The FAO Regional Locust and Grasshopper Specialist was conspicuously absent during the time the AID assessment team was in West Africa.

6. LESSONS LEARNED

1. The assessment team went to the field without a clear understanding of the funding level available through OFDA. If knowledge of OFDA/AID thinking in this respect, by nation, had been available in advance the preparation of USAID action plans would have been expedited. Lacking financial parameters within which to work, conflict between USAID's desires and OFDA's willingness and ability to supply was inevitable. This was particularly true in Senegal.
2. Although action started much earlier in 1987 than in 1986 to get plans in place, agreement on strategy, obtain donor commitments, and preposition supplies and materials, some materials will still have to

be air freighted in order to arrive and be distributed within country in time. Country plans have generally been late or have not as yet even been prepared. Thus, USAID and other donor action plans have been delayed awaiting receipt of the country plan. It is obvious that early on, assistance should have been provided by FAO and the donors in the preparation of a viable country plan. Although plans for this year's program called for such assistance, in most cases it appears not to have materialized.

3. Although the use of large aircraft during the 1986 campaign was somewhat controversial at the time, they have come to be recognized as a major new weapon in grasshopper and locust control in Africa. Where crisis pest problems occur now and in the future, they should not be excluded from the arsenal of tools available simply because of their somewhat controversial past. Parameters for their use have been established by FAO which are reasonable. Since contiguous, large area control is generally incompatible with its ecology, judicious use of large aircraft is called for. Decisions on their use should only be made by experienced personnel familiar with their operations and the existing conditions within the worksite.

4. OEO must move quickly to establish their pesticide testing program. Although contract aircraft are available in some parts of Africa, to assure availability, prescribed application equipment and pilots intimately acquainted with test plot spraying, USA aircraft and pilots should be contracted. The OEO plan calls for tests against the Desert

Locust in Sudan or Somalia. In view of the rather dense population of solitary forms present in south-central Mauritania this area should be considered as well. Solitary forms are less likely to migrate from the established treatment area than the more mobile gregarious forms likely to be found in Sudan and Somalia.

H. Contacts Made

THE GAMBIA CONTACTS

1.	Herbert Horowitz		U.S. Ambassador
2.	Tom Mahoney		Acting AID Representative (Program Officer)
3.	Ralph Conley	A.I.D.	Supervisory ADO
4.	Tom Hobgood	A.I.D.	Assistant ADO
5.	Kenneth Klemp	A.I.D.	Controller
6.	Amadou Taal	Ministry of Agriculture and Rural Development Chairman Steering Committee	Permanent Secretary
7.	Dodou C.A. Jagne	Crop Protection Services	Director
8.	Bakary B. Trawally		National Coordinator 1987 Grasshopper Control Campaign
9.	Dr. F.M. Reda	Ministry of Agriculture	FAO Representative
10.	Rick Richter	Peace Corps	
11.	Janet Tuthill	Management Services International	Vice President

MALI CONTACTS

1.	Wilbur Thomas	USAID	Deputy Director

CONSORTIUM FOR INTERNATIONAL CROP PROTECTION
THE SAHEL OF WEST AFRICA

MAURITANIA CONTACTS

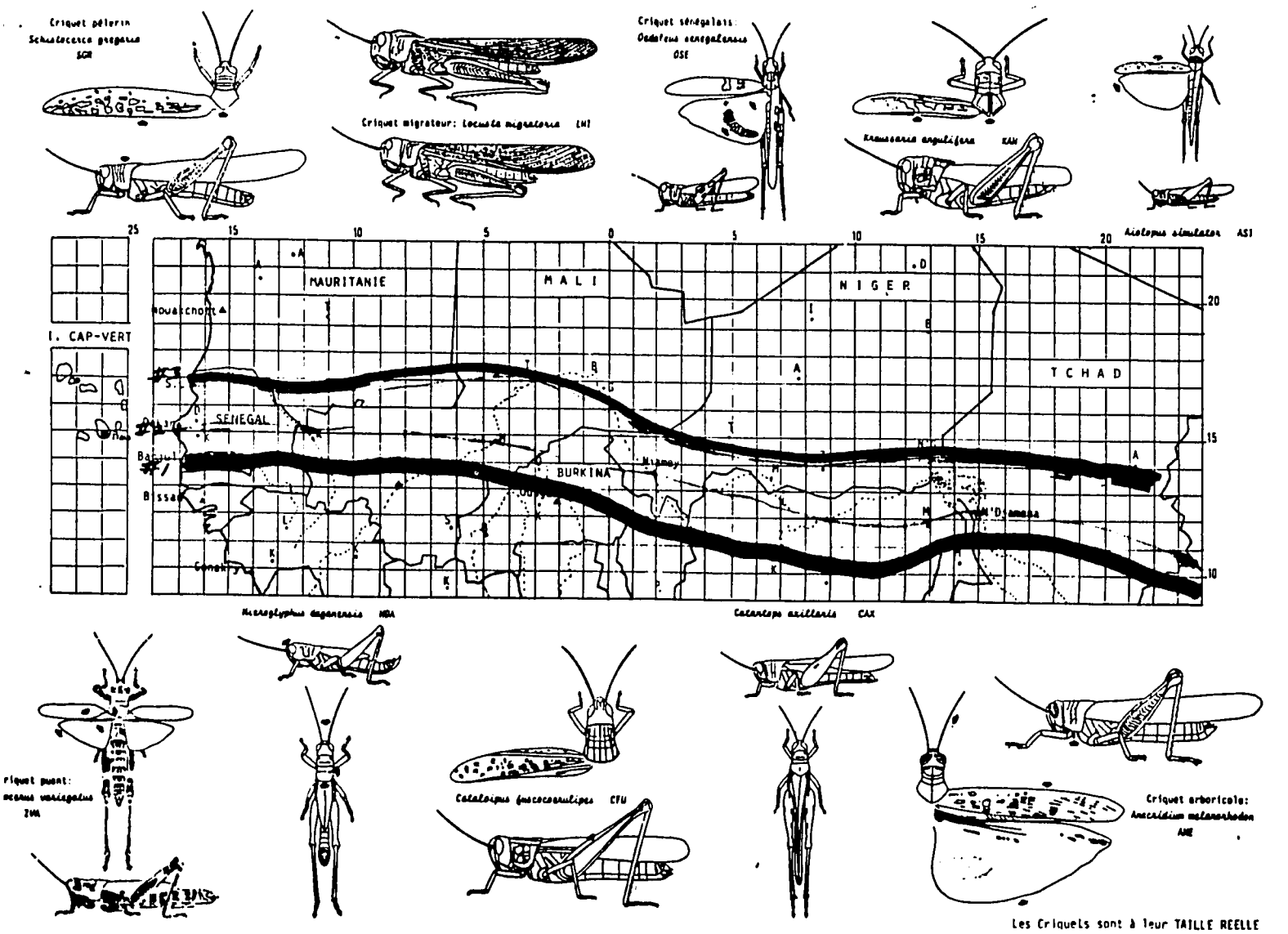
1.	Riddell Jean Louis	France
2.	Ahriz Abdelmunaam	Algeria
3.	Diarra Sadio	CPS/DIRO/AGR
4.	Mark Lynham	Ariz. Agri. Research COP II
5.	Robby Ackerman	Ariz. Agri. Research Admin. II TA
6.	Max Goldensohn	DAI-COP
7.	George T. Eaton	Mission Director AID
8.	Robert L. Pugh	Ambassador
9.	Ralph Winstanley	DCM
10.	Dieudonne Koguiyagda	FAO
11.	Soumare Abdoulaye	Dep Chief CPS
12.	Tahara Galedou	Chief CPS
13.	Sy Adama	Directeur Agriculture
14.	Nancy Hooff	Asst. Program Officer
15.	Jim Bednar	Food for Peace Officer

CONSORTIUM FOR INTERNATIONAL CROP PROTECTION
THE SAHEL OF WEST AFRICA

USAID/SENEGAL CONTACTS

1.	Sarah Jane Littlefield	Director
2.	George Carner	Deputy Director
3.	Wayne Nilsestuen	Chief, Ag. Dev. Office (ADO)
4.	Ronald Harvey	Dep. Ag. Dev. Office (ADO)
5.	Francis Can	Ag. Research/Extension Liaison Office (ADO)
6.	Mawa Diop	Proj. Asst. (ADO)
7.	Steve Wallace	Exec. Officer (EXO)
8.	Alison Webb	Asst. Exec. Officer (EXO)
9.	Carrie Dailey	Supply Mgt. Officer (SMO)
10.	Souham Wehbe	Admin. Assistant (ADO)
11.	Catherine Ndiaye	Special Assistant/Editor
12.	John Franklin	USDA/APHIS - Abidjan, Ivory Coast
13.	Jonathan Hall	Imperial Chemical Company London
14.	James Otter	Imperial Chemical Company London

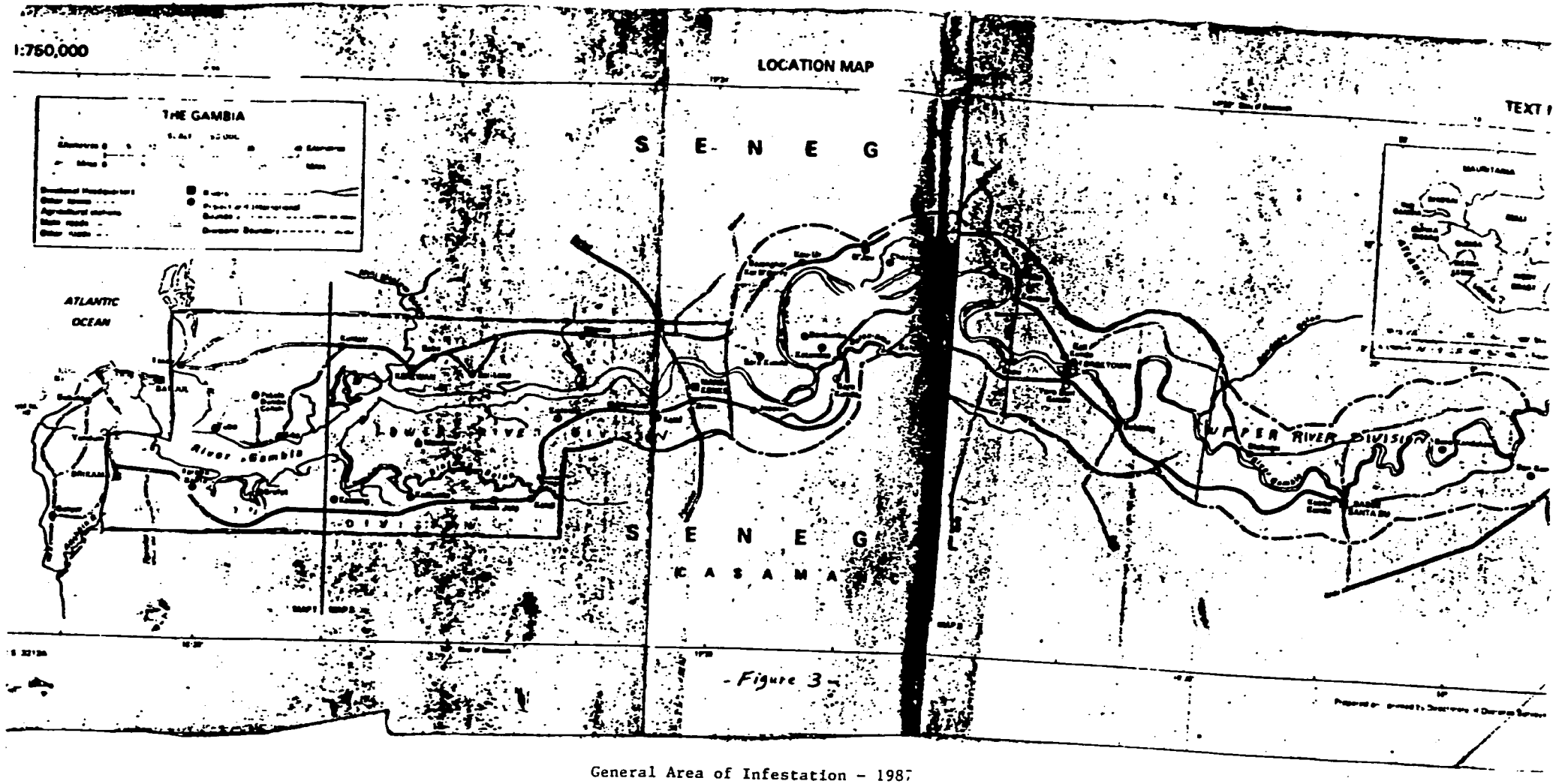
MAP # I



Lines #1 and #2 - Areas Within These Lines Principal Area of O. Senegalensis Egg Deposition

Line #3 - Northern Terminus of O. Senegalensis Migration

MAP # II



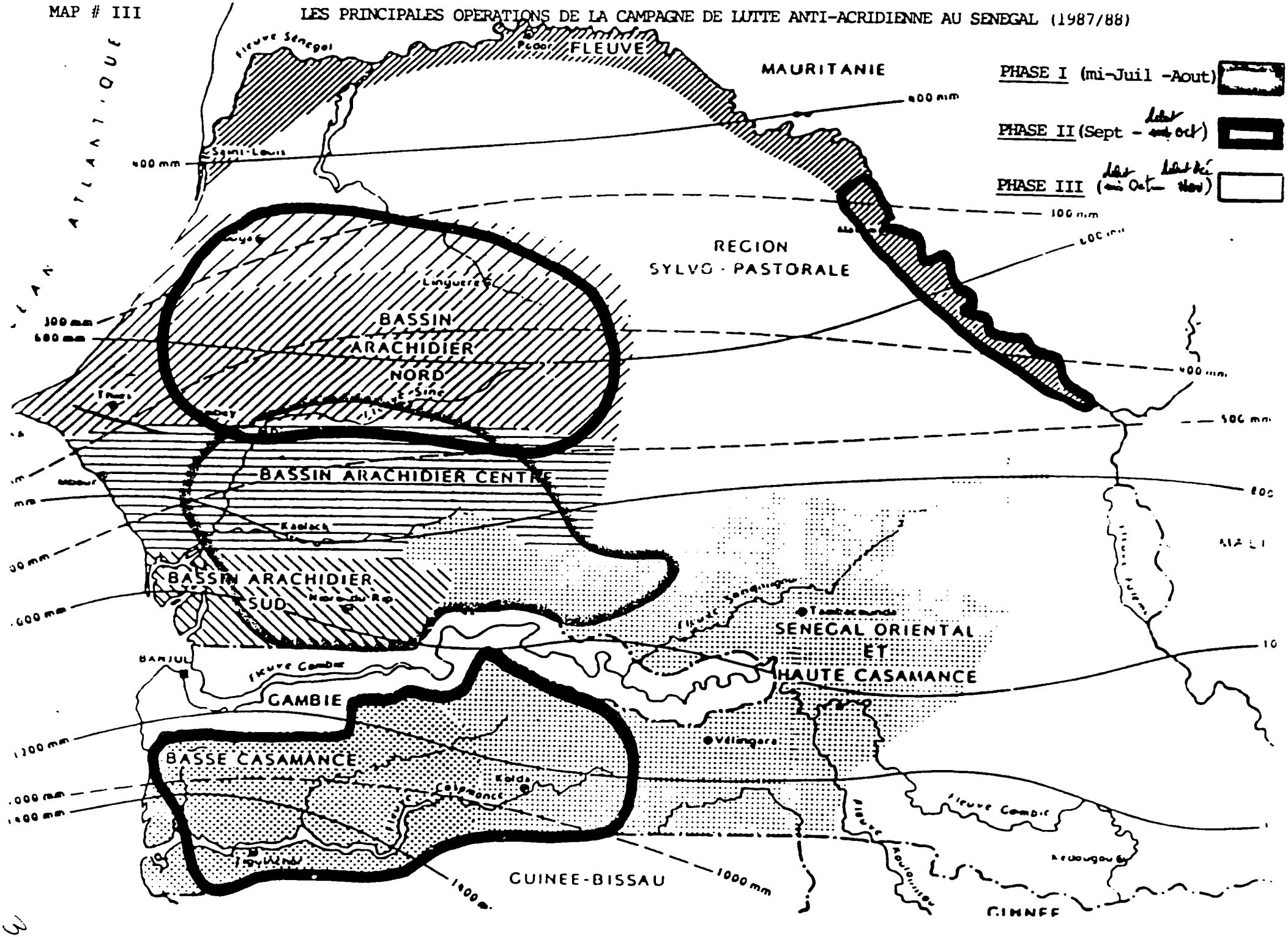
General Area of Infestation - 1987

(Based on 1987 Egg Survey)

32.

MAP # III

LES PRINCIPALES OPERATIONS DE LA CAMPAGNE DE LUTTE ANTI-ACRIDIENNE AU SENEGAL (1987/88)



33

THE REPUBLIC OF THE GAMBIA

Crop Protection Service,
Ministry of Agriculture,
Yundum, W/Division,
The Gambia.

CPS/GONOV.5/VOL.2/(22) 23rd. January, 1987.

SAHEL GRASSHOPPER CAMPAIGN 1987

Your letter Ref: DL1/1(1987) dated 16th. January, 1987 re-Grasshopper Campaign control potential for 1987 refers.

As requested, hereunder are details of the up-to-date information asked for in your letter:-

1. VEHICLES

	Nos.	Year of purchase	Condition
Chevrolet Pick-ups	6	1980	Fair
Chevrolet Blazers	2	1980	Fair
Chevrolet Truck	1	1980	Fair
Unimogs L.W.B.	3	1977	Unserviceable
Unimogs S.W.B.	2	1981	Needs repairs
Landrover Pick-ups	1	1981	Needs repairs
Landrover Station Waggons	1	1981	Excellent
Total	16	-	-

2

2. PESTICIDES

Type/Formulation	Quantity	Location	Storage condition
Diazinon 60 E.C.	2000 lts.	Yundum/Sapu/Jenoi	Very good
Fenitrothion 3 dust	56,000 kgs	" " "	" "
Fenitrothion 50 E.C.	100 lts.	" " "	" "
Fenitrothion 98 U.L.V	2700 lts.	Jenoi, Yundum	" "
Malathion 2 dust	4,000 kgs	Yundum, Jenoi	
Propoxur 2 dust	35,000 kg	Yundum, Jenoi	

(Note: To be redistributed to the 8 Bases and 10 serveillance posts by April, 15 latest)

Malathion ULV 91 - Not listed - 42 x 200L = 8400 litres

3d

3. APPLICATION EQUIPMENT

Types	Make	Nos.	Condition
Vehicle mounted Mist blower		2	
Vehicle mounted Dusters	Gastang	6	Fair
Motorised Knapsack sprayers	Gloria	143	Good
Manual knapsack sprayers	Gloria	403	"
Motorised ULV sprayers	Hudson	-	None
Maunal nkapsack dusters	Capri	300	Good
Sack dusters	-	-	-
Bellows	Capri	300	Good
Exhaust Nozzle sprayers	-	-	-
Knapsack Atomiser	Turbomaxi	40	Good

(Note: vehiclesmounted equipment need spares for repair of one stroke engine).

4. RADIOS

1. Radio telephone equipment complete available but not yet installed. It is for 6 C.P.S. Bases (Sibanor, Jenoi, Kerewan, Sapu, Kuntaur and Basse). Extra equipment such as mobile radio telephone sets needed for vehicles and handsets for scouts with motorcycles.

5. REFUELLING EQUIPMENT

There are no refuelling equipment for vehicles and aircrafts with the C.P.S. Department or the Ministry of Agriculture. Assistance will be required in this area.

6. CAMPING EQUIPMENT - None available with the C.P.S.

7. AIRCRAFTS - The Gambia has no aircrafts either for commercial or agricultural use.

8. AIR SPRAY GEAR: None available. It was the OCLALAV that provided these important equipment in the 1986 Grasshopper Campaign.

9. There are two landing strips in the Gambia located at Bwiam and Tendaba. These are in very bad state and needed major repairs. It is proposed that four new landing strips be constructed at Njau Upper Saloum, Mamudfana, Niamina East, Jakunda, Yuli and Basse Fulladu East. Assistance will be required in repairing the existing two strips and the construction of the four.

Hope these informations will give you the data you so urgently required.

Dodou C.A. Jagne
Director.

Dr. F.M. Reda,
FAO Representative,
Office of FAO Representative,
Central Bank Building,
Banjul.

cc: Mr. Amadou S.O. Taal
P.S.M.A./Banjul.

" Mr. G. Gorre-NDiaye
Co-ordinator
Task Force on Grasshopper
Ministry of Agriculture
Banjul.

" File

" Running File.

-136

F.A.O. REGA
O. Representative
Gambia.

1987 SAHEL GRASSHOPPER CAMPAIGN - CONTROL POTENTIAL
THE GAMBIA

IES	SUBJECTS (DESCRIPTIONS)	NATIONAL REQUIREMENTS	PURCHASED BY GAMBIA GOVT	LEFT OVER 1986 CAMPAIGN PROJECT	TOTAL AVAILABLE	ASSISTANCE REQUIRED
LES	Chevrolet Pick-ups	-	6	—	6	—8
	Chevrolet Blazers(St.Waggon)	-	2	--	2	—2
	Chevrolet Truck	-	1	--	1	8
	Unimogs	-	5	--	5	2
	Landrover Pick-ups	-	1	—	1	8
	Toyota Pick-ups 4WD	-	--	--	--	8
	Landrover Station waggons	-	1	--	1	8
CIDES	Diazinon 60 E.C.	30,000 litres	2,000 litres	--	2,000 litres	28,000 litres
	Diazinon 90 ULV	15,000 "	—	--	—	15,000 "
	Fenitrothion 3 Dust	120,000 kgs	56,000 kgs	56,000 kgs	56,000 kgs	64,000 kgs.
	Fenitrothion 50 E.C.	16,000 litres	2,000 litres	—	2,000 litres	14,000 litres
	Fenitrothion 98 ULV	150,000 "	—	2,700 litres	2,700 "	147,300 "
	Malathion 2 Dust	80,000 kgs	4,000 Kgs	—	4,000 Kgs	76,000 Kgs.
	Malathion 50 E.C.	16,000 litres	2,000 litres	—	2,000 litres	14,000 litres
	Malathion 91 ULV —	90,000 "	—	6,400 litres	6,400 "	83,600 "
	Propuxur 2 Dust	80,000 Kgs.	5,000 kgs	30,000 kgs	35,000 kgs	45,000 kgs.

8,400 ?

ORIES	SUBJECT (DESCRIPTIONS)	NATIONAL REQUIREMENTS	PURCHASES BY GAMBIA GOVT	LEFT OVER 1986 C.M PROJE
LICATION IPMENT	Vehicle Mounted Mist Blowers	16	—	2
	Vehicle Mounted Dusters	24	—	6
	Motorised Knapsack sprayers	800	—	143
	Manual knapsack sprayers	800	—	403
	Manual Knapsack dusters	800	—	300
	Motorised ULV Knapsack sprayers	500	—	—
	Exhaust Nozzle sprayers	16	—	—
	Dust Bellows	1,600	—	300
	Sack Dusters	32,000	—	—
IOS				
ELLING PMENT	- Vehicles refuelers	8 sets full equip,	—	—
	-Winged aircraft refuelers	8 " " "	—	—
	-Helicopter refuelers	8 " " "	—	—
ING MENT	- Tents	40	—	—
	- Campbeds	240	—	—
	- Sheets	480	—	—
	- Blankets	240	—	—

ORIES	SUBJECTS (DESCRIPTIONS)	NATIONAL REQUIREMENTS	PURCHASES BY GAMBIA GOVT.	LEFT OVERS 1986 CAMPAIGN 1987 PROJECTS	TOTAL AVAILABLE	ASSISTANCE REQUIRED
	- Gas Heaters & Refills	40	—	—	—	40
	- Mess chests	40	—	—	—	40
	- Filters (large models)	40	—	—	—	40
	- Metal Buckets	80	—	—	—	80
	- Plastic Jerry Cans(Water)	120	—	—	—	120
	- Bowls	40	—	—	—	40
	- Shower Buckets	80	—	—	—	80
	- Jerry Cans (Oil storage)	200	—	—	—	200
	- Ice boxes	40	—	—	—	40
	- Gas or Gasoline lanterns	40	—	—	—	40
	- Mosquito Nets for Dining and meeting tables.	40	—	—	—	40
	- Folding armchairs	240	—	—	—	240
	- Folding dining chairs	240	—	—	—	240
	- Folding Tables	80	—	—	—	80

ORIES	SUBJECTS (DESCRIPTIONS)	NATIONAL REQUIREMENTS	PURCHASES BY GAMBIA GOVT'.	LEFT OVERS 1986 CAMPAIGN PROJECT	TOTAL AVAILABLE	ASSISTANCE REQUIRED
	- Medical Kits	80	—	—	—	80
	- Fire Extinguishers	40	—	—	—	40
rcrafts	Small winged aircrafts					
	Helicopters	—	—	—	—	—
ND	Yundum	1	1	—	1	1
RIPS	Bwiam	1	1	—	1	1
	Tendaba	1	1	—	1	1
	NJau	1	—	—	—	1
	Mansudfana	1	—	—	—	1
	Basse	1	—	—	—	1
	Ja Kunda	1	—	—	—	1
OTECTIVE	Jumpsuits	5,000	500	—	500	4,500
OTHING	Plastic Jackets	3,000	—	50	50	2,950
UIP. AND DICINES	Plastic aprons	3,000	—	—	—	3,000

RIES	SUBJECTS (DESCRIPTIONS)	NATIONAL REQUIREMENTS	PURCHASES BY GAMBIA GOVT	LEFT OVERS 1986 CAMPAIGN/ PROJECT	TOTAL AVAILABLE	ASSISTAN REQUIREM
	Raincoats	3,200	—	—	—	3,000
	Rubber boots	1,200	20	—	20	1,180
	Hoses for use with boots	1,200	110	—	110	1,010
	Respirators (Gas masks)	5,000	—	—	—	5,000
	Goggles or Face shields	5,000	—	—	—	5,000
	Atropine Injection Ampoules	2,000	—	96	96	1,904
	Kerodex 7 Barrier cream tubes	2,000	—	100	100	1,900
	Contrathion Injection Sets.	360	—	180	180	180

ANNEXE

PLANIFICATION DE LA CAMPAGNE

ACRIDIENNE EN 1 9 8 7

CALENDRIER DE TRAVAIL

1°) Prospections Cothèques

Janvier - Février

2°) Mise en place produits, personnel et matériels

Février - Mars A Mai

3°) Lutte terrestre (Prospection et traitement)

Juin Juillet Août

4°) Interventions aériennes .

(Prospections et traitements)

Septembre à janvier

La protection des cultures intesesse aussi bien les cultures pluviales que les cultures de décrue et irriguées. Et pour une meilleure couverture de cet ensemble, il est nécessaire que les produits le matériel et les équipes de traitement soient le plus près possible des zones de cultures. A cet effet, il faut créer des bases principales au niveau des chefs lieu de région et des bases secondaires au niveau des chefs de lieu de Département ou d'Arrondissement et enfin des centres de stockage.

A cet effet prévoir l'équipement de ces bases en matériel et produits de traitement.

- Formel/paysans qui doivent de plus en plus être impliqués dans la protection des récoltes.

- Matériel par base principale

véhicules de transport
véhicules de traitement
véhicule de liaison équipes de E/R

- Immeuble

1 batiment pour logement et bureau
1 hangar de stockage de produit et matériel

Organisation des prospections en fin 1986 pour détecter les zones des dernières pontes.

La découverte de ces pontes indique/les lieux appropriés pour recevoir les produits à stocker, et les points autour desquels intensifier les missions de reconnaissance et cela avec le concours d'Aghrymet et les Agents du Projet lutte Integrée dont les stations sont placées au niveau de différents biotopes.

L'organisation de la lutte à cet effet doit être précédée de la mise en place, et s'effectuer en deux phases.

- lutte terrestre
- intervention aérienne

Si la lutte terrestre est effectuée avec efficacité grace aux actions combinées paysans Agents P.V ; cela reduira sensiblement le niveau de la population pour les interventions aériennes.

1. Traitement terrestre

- Organisation et moyens requis

La zone agropastorale a été partagée en quatre régions. Chacune d'elle, placée sous la responsabilité d'un coordinateur régional comprend 2 à 3 inspections agricoles.

L'inspecteur ou un agent désigné à cette fin coordonne toutes les activités acridiennes de l'inspection concernée.

Les traitements anti acridiens et la moyenne partie de prospections sont assurés par les unités de traitements-prospections réparties dans les Inspections.

Au niveau national l'information recueillie est centralisée par le Coordinateur national organisé et dirige la campagne. Il est aidé par un coordinateur adjoint et un chargé d'approvisionnements.

Schéma d'organisation des zones à traiter en 1987

RÉGIONS	INSPECTIONS	Unités de prospections de traitements
1ère région base à Timbédra	Hodh chargui: (base Néma)	Bassikounou
		Adel Bagrou
		Bousteila
		Djigueni
	Hodh El Gharbi: (base Aïoun)	Koboni
		AIOUN
		Touil
2ème région base a Kiffa	Assaba (Kankossa base)	Kankossa
		Hamoud
		Barkéol
	Tagant	Achram
	Guidimaka (Sélibaby) base	Ould yengé
		Sélibaby
		Mélgue
		Harr
		Tachott
3ème Région	Gorgol (Kaédi base)	Maghama
		M'bout
		Kaédi
	Brakna	Bababé MBagne
		Boghé
4ème Région	Trarza	Rosso Keur Bacéne
		RKiz Tékane
	Inchiri	Akjouj
	Adrar	Atar

Coordinateur National : TAHARA GUEDOU

Coordinateur Adjoint : SOUMARE ALDOULAYE

Approvisionnement : Diakité H.Kaba

1ère Région : les 2 Hodhs

Responsables FALL MOLOUD

- Hodh Chargui : Ba Hamady
- Hodh Gharbi : Mohamed Val

2ème Région : Assaba, Guidimaka , Tagant

Responsables: Mohamed Abdallahi

- Assaba : : Inspecteur
- Tagant : Inspecteur
- Guidimaka : Ba Salif

3ème Région : Gorgol , Brakna

Responsables : Moussa PERE N'DIAYE

- Gorgol : Ba Saïdou
- Brakna : Diagana (Boghé Med Yedal, Bababé, Bady)

4ème Région : Trarza, Adrar, Inchiri

Responsables : DIARRA SADIO

- Trarza : Tandia
- Inchiri : Inspecteur
- Adrar : Inspecteur

N°	LOCALITES	NOMS DES RESPONSABLES	QUALITES
1	Bassikounou	Sidi Camara	C.E.R
2	Aoel Bagrou	Tahmane	Observateur
3	Bousteila	Oumar Moussa	M.E.R
4	Djigueni	Taleb Ould Taleb Jiddou	C.E.R
5	Koboni	Mame Banda Aïdara	C.E.R
6	Touil	Diop Moussa	C.E.R
7	Aïoun	Mohamed Val	ITAER
	Kankossa	El Hassan Ould Mohamed	M.E.R
	Hamoud	Mohamed Ould Isselmou	M.E.R
	Ould Yengé	El-Hambelly	C.E.R
1	Melgué	Yahya Ould M'Bareck	C.E.R
2	Sélibaby	Ba Salif	C.E.R
13	Harr	Dieng Momar Talla	Observateur
14	Tachott	Samb	M.E.R
15	Maghama	Seck	C.E.R
16	M'Bout	Sidi Hamedy Camara	C.E.R
17	Barkéol	Gaye Abdourahmane	C.E.R
18	Kaédi	Ba Saïdou	C.E.R
19	Bababé-M'Bagne	Hady Ould Oubeïd	C.E.R
20	R'Kiz - Tékane	Ba Oumar	C.E.R
21	Rosso - Keur macène	Tandia	C.E.R
22	Achram	Sidina Ould Mohamdi	C.E.R
23	Atar	Mohamed Salem O/ Bouna	C.E.R

* Personnel à recruter : fond de Contrepartie

Coordinateur: Moyens requis

Région		Véhicules Tout terrain		Radio (à fixer sur pôhi	
		Disponibles	à rechercher	Disponibles	à reche
National	Coordinateur national	*N		*	
1ère région	Coordinateur régional	*N			*
	Coordinateur H.Chargui	*N			*
	Coordinateur H. El Gharbi	*N			*
2ème région	Coordinateur régional	*N		*	
	Coordinateur Aoseta	*N			*
	Coordinateur Tagant	*N			*
	Coordinateur Guidimaka	*N			*
3ème région	Coordinateur régional	*K			*
	Coordinateur Gorgol	*(attendu)			*
	Coordinateur Brakna	*A			*
4ème région	Coordinateur région	*N			*
	Coordinateur Trarza	*(attendu)			*
	Coordinateur Inchiri		*		*
	Coordinateur Adrar	*(attendu)			*
TOTAL		14	1	2	13

* N : Disponible à Nouakchott
* N : disponible à Kaédi
* A : " à Aleg

69

N° de Zones		Surfaces pâturages cultures (Ha)	Traitements terrestres			Traitements Aériens	
			Superficies (Ha) cultures	poudre quantité de produit (T)		Superficie (Ha)	Litres produits 50 %
1	Bassikounou	100.000	5.000	40		5.000	2.500
2	Adel Bagrou	100.000	4.000	32		4.000	2.000
3	Bousteïla	100.000	3.000	24		3.000	1.500
4	Djiguenni	120.000	4.000	32		8.000	4.000
5	Kobeni	150.000	5.000	40		10.000	5.000
6	Touil	160.000	4.000	32		4.000	2.000
7	Aouin	120.000	3.000	24		9.000	4.500
8	Kankossa	60.000	6.000	48		12;000	6.000
9	Hamoud	80.000	4.000	32		8.000	4.000
10	Ould Yengé	50.000	3.000	24		6.000	3.000
11	Melgué	40.000	3.000	24		6.000	3.000
12	Sélibaby	200.000	4.000	32		8.000	4.000
13	Harr	50.000	5.000	40		10.000	5.000
14	Tachott	50.000	3.000	24		3.000	1.500
15	Maghama	2000.000	6.000	48		18.000	9.000
16	M'bout	150.000	5.000	40		10.000	5.000
17	Barkéol	120.000	7.000	56		14.000	7.000
18	Kaédi	200.000	7.500	60		20.000	10.000
19	Bababe M'Bagne	120.000	10.000	80		20.000	10.000
20	R'Kiz-Tékane	200.000	6.000	48		12.000	6.000
21	Rosso - Keur macène	50.000	5.000	40		10.000	5.000
22	Achram	30.000	5.000	40		5.000	2.500
23	Atar	201.000	2.000	16		2.000	1.000

Produits, Infrastructures et équipement nécessaires dans les de prospections.

N° Zone	LOCALITES	Produits		Moyen de déplacement				Magasins		Radio recepteur émetteurs		Pluviomé	
		Tonnes de Produits poudre	Litres produits ULVSO 0,5 L/Ha	Moto		Véhicules de liaison traitement							
				disponible	A rechercher	disponible	A rechercher	disponible	A rechercher	disponible	A rechercher	Disponible	r c
1	Bassikounou	40	2.500			*			*	*3		*	
2	Adel Bagrou	32	2.000	*1					*	*3		*	
3	Boustéila	24	1.500			*			*	*3		*	
4	Djigueni	32	4.000			*		*		*		*	
5	Koboni	40	5.000			*		*		*3		*	
6	Touil	32	2.000			*		*		*3		*	
7	Aioun	24	4.500			*		*		*		*	
8	Kankossa	40	5.000			*			*	*		*	
9	Hamoud	32	4.000	*1					*	*			
10	Ould Yengé	24	3.000			*		*		*		*	
11	Melgué	24	3.000			*			*	*3			

Légende:

*3=disponible mais à installer
*1=disponible mais attendu dans le cadre de l'aide 67
*2=disponible dans le cadre de la FLM (fédération Luth mondiale.

Produits Infrastructure et équipement nécessaire dans les zones de prospections (Suite

N°	LOCALITES	PRODUITS		Moyen de déplacement:			Magasins		Radios		Pluviomét	
		Tonnes de Produits poudre	Litres produits ULV50 0,5L/Ha	Moto disponible	A rechercher	Véhicules de liaison traitement: Disponible	recherche	disponible	A construire	Disponible	A rechercher	Disponible	re ch
12	Sélibaby	32	4.000			*1		*		*		*	
13	Harr	40	5 000	*1					*	*3			
14	Tachott	24	1.500	*		1			*	*3		*	
15	Maghama	48	9.000			*1	*	*		83	*	*	
16	M'Bout	40	5.000			*1		*		*3		*	
17	Barkéol	56	7.000			*2		*		*		*	
18	Kaédi	60	10.000			*1			*	*		*	
19	Bababé Mbagne	80	10.000			*1		*		*3		*	
20	RéKiz Tékane	48	6000				*		*	*3			
21	Rosso Keur Mécène	40	5 000				*	*		*		*	
22	ACHRAM	40	2 500		-		*		*	*3	-	*	
23	ATAR	16	1 000				*	*		*3		*	

- Carburant (12 mois de campagne)

(1) Nouakchott

-2 Véhicules de coordination nationale

1000 km/mois et par véhicule

consommation: $2 \times 1000 \times \frac{20}{100} \times 7 =$ 2 800 l (Diesel)

-2 voitures légères (500 km/mois/voiture) pendant 12 mois

Consommation: $2 \times 500 \times \frac{15}{100} \times 12 =$ 1.800l (essence)

(2) Unités de Prospections et traitements

-19 Véhicules 1000 km/mois/véhicule (12 mois)

Consommation : $19 \times 1000 \times \frac{20}{100} \times 12 =$ 45.600 l(Diesel)

-8 motos (300 km/mois)

Consommation: $8 \times 300 \times \frac{6}{100} \times 12 =$ 1 728 l (essence)

(3) Coordination régions et zones (8 mois)

15 véhicules: 1000 km/mois:véhicule

Consommation: $15 \times 1\,000 \times \frac{20}{100} \times 8 =$ 24 000l (Diesel)

(4) Autres véhicules de traitement (Unimog)

5 Unimog 500 km /mois/véhicule

Consommation: $5 \times 500 \times \frac{35}{100} \times 7 =$ 6.125l (Diesel

(5) Camion de transport produits

-3 camions:1000 km/mois/7mois

Consommation: $3 \times 1000 \times \frac{50}{100} \times 7 =$ 10 500 l (Diesel

Total carburant et coût

Gasoil: 89.025l x 35 UM/l = 3.115.875

Essence: 3.528l x 54 UM/l = 190.512

Soit: 3.306.387 UM

-Indmnités Personnels

-Coordinateurs:	1 x 10 000UM/j x 10 x 7 (mois)	= 70.000 UM
-Coordinateur adj.	1 x 6000UM /j x 10j x 7	= 42.000 UM
-Responsable des régions	4H x 500 UM/j x 10j x 7	= 168.000 UM
-Responsables de zones	23 H x 3 000 UM/mois x 12	= 823.000 UM
-Chauffeurs	2.1 2 x 450UM/ x 10 x 12	=1.143.000 UM
-Manoeuvres	30 x 350UM/j x10 x 12	=1.260.000 UM
Total		=3.852.000 UM

7-Pesticides

•Quantité utilisé aux premiers traitements terrestres= 820T disponibles (Japon)

•Stock de sécurité 400T x 78.000UM= 31.200.000UM

2)TRAITEMENTS AERIENS

Carburant et lubrifiant auto =	2.400.000 UM
" " " Avion	2.640.000 UM
•Location avion (750 heures)	78.000.000 UM
•Achat stands pompage	150.000 UM
•Imprévu	5.000.000 UM
•Pesticides	32.400.000 UM
Total	117.590.000 UM

3)Prospections outhéque (financement trouvé USAID)

-Déplacements : .	272.000 UM
-Carburant lubrifiant et pièces détachées	290.000 UM
-Equipement	142.000 UM
	704.000 UM

Zones couvertes par les traitements aériens

stands de pompage

localisation

-Kaédi: couvrira : Gorgol et Est Brakna

Kankossa Couvrira: Sud Assaba et Guidimaka

Koboni Couvrira :Hodh Gharbi

Timbédra (Boustella Djiqueni) H. Charghi

Loghé: Couvrira Ouest Brakna et Trarza

2) Matériel de Stand

•1 pompe n°2 pour es ence avion + néces aire (raccord aspiration refoulement tamis)

•1 pompe n°5 produits avec nécessaire

(3) Personnel

5 manoeuvres/stand = 25 manoeuvres

(4) Produits d'entretien

Savon + bicarbonade (neutralisation des résidus)

de Na

(5) Pharmacie

Par stand prévoir. 1 pharmacie contenant des antidotes et médicamnts d'usage courant.

FINANCEMENT

TRAITEMENTS TERRESTRES

	UM
(1)- 12 magasins	6.000.000
(2)- Véhicules...	
Prospections	4.800.000
Coordination	1.200.000
Traitements	25.000.000
(3)-Postes Radios (13) à monter sur véhicules de liaison	2.500.000
(4)-Pluviomètres (50 unités)	100.000
(5)-Carburant	3.306.387
(6)-Frais déplacements	3.867.000
(7)-Divers	1.000.000
(8)-Pesticide	31.200.000
(9)-3 pulvérisateurs (ENS)	600.000
(10)Matériel de Camping	500.000
TOTAL	80.193.387

TRAITEMENTS AERIENS

•Carburant et lubrifiant auto	2.400.000 UM
•Carburant et lubrifiant avion	2.640.000
•location avion (750 heures)	75.000.000
•Achat de 5 stands de pompage	.150.000
•Pesticides ULV (54 0001)	32.400.000
•Imprévu	5.000.000
TOTAL	117.590.000

TOTAL Financement recquis

Traitements terrestres:	80.193.367
Traitements aérien :	117.590.000
TOTAL	197.783.367 UM

Personnel à recruter pour les équipes

	Qualité	Nombre		Financement	
		disponible	à recruter	disponible	à recruter
1	Observateurs	8		*	
2	Chauffeurs	21	13		*
3	Manoeuvres (saisonniers)		63 (7 mois)		*

Coût:

Chauffeurs. 10.000 UM x 13 x 8 mois = 1.040.000 UM

Manoeuvres 6.000 UM x 63 x 7 (mois) 2.646.000 UM

VII- Criquet Pelerin

3.1. Pluie et Végétation

La pluviométrie qui a favorisé le développement des insectes s'est surtout manifestée en 2 périodes

La première période a surtout interessé le Sud du 19è parallèle Nord. C'est ainsi que le brakna, le Tagant et le Nord du Trarza ont été arrosés en Juin Juillet début Août.

Ce fut ensuite une période sèche qui a duré de 15 à 25 jours

La deuxième période pluvieuse a été surtout importante en Septembre et cela jusqu'en début Octobre.

Ces pluies ont donné naissance à un tapis herbacé qui s'est développé jusqu'en fin d'année surtout au dessus du 18è parallèle avec des espèces très appetées par Schisto dans l'Inchiri, Est - Adrar Est Zemmour (Khatt maghteir) et Hank jusqu'aux frontières d'Algérie et du Mali.

7.2. Criquet

La situation de ce ravageur a surtout présenté des inquiétudes le mois de Septembre.

Les plus importantes manifestations ont été signalées en Octobre A cet effet 3 missions de protection (OCLALAV et/ou PV) se sont rendues dans plusieurs secteurs soit pour vérifier une signalisation soit pour prospecter. Des pullulations de toutes les formes phasaires ont été observées.

- Solitaires (larves et ailes)
- gregaricolores (larves et ailes)

Les plus fortes concentrations ont été repérées au Trarza, Nord Brakna, Tagant en Adrar et en Inchiri avec des densités variant de 40 à plusieurs milliers/Ha. Des traitements ont été entrepris dans les zones à forte densité.

.../...

Khatt El Moïnane (Gaula) 38.550 Ha ont été traités dont 18 100 par avion avec 19 100 L de produit liquide et 3 T de produit poudre du 17 /11 au 2/12/ 86.

Aouker (Atoueïgate) 2.260 Ha traités par voie terrestre avec 1.255 L de produit liquide du 2 au 5/12

Adrar L'inspection d'Adrar assurera le traitement à(EIRICH guibli) 200 Ha et Grarat El vras (70 Ha)

Tagant (Takhça) 4500 Ha ont été également traités

Les traitements n'ont pas couvert toutes les zones infestées en raison

- des difficultés d'accès par voie terrestre
- de la despersion des zones infestées
- les dimensions des zones infestées situées dans des dépressions interdunes ou interbarkanes avec des superficies très réduites pour justifier l'utilisation d'un aéronef.

D'une manière générale on n'a pas observé un départ de vol organisé. Cependant il faut noter qu'il subsiste une population résiduelle très importante qui bénéficie d'une grande aire de végétation verte qui pourrait se maintenir jusqu'en Avril. Et cette végétation est signalée en Adrar, au Tiris Zemmour, au Tagant.

Programme 1 9 8 7

En raison de l'importance de la population résiduelle de ce ravageur, il est nécessaire de poursuivre des prospections jusqu'au mois de Mars pour se rendre compte du devenir de cette population.

- Prospection de Juillet à Décembre
- Opération de traitement

6.3. Incidence Financière

63.1. Prospection Mars

Carburant Lubrifiant.....	150.000
Déplacement.....	120.000
TOTAL 63.1.....	270.000

63.2. Prospection Juillet à Décembre

Carburant lubrifiant auto	1.000.000
Déplacement.....	700.000
TOTAL 63.2.....	1.700.000

.../...

63.3. Opération de traitement

Produit	50.400.000
Carburant lubrifiant.....	2.000.000
Personnel saisonnier	400.000
TOTAL 63.3.....	52,800.000

63.4. Imprévus 5.500.000

RECAPITULATIF :

Prospection Mars;;;.....	270.000
Prospection Juillet à Décem...	1.700.000
Opérations traitement.....	52.800.000
Imprévus.....	5.500.000
TOTAL 6.3...	60.270.000

.../.-

...AN GRASSHOPPER CAMPAIGN 1987
...IMATED NEEDS (REVISED 14 JANUARY, 1987)

		MAURITANIA	SENEGAL	GAMBIA	GUINEA BISSAU	MALI
Area to be treated ('000 ha)						
Phase I	Farmers	30	60	35	10	25
	Ground	70	50	75	20	incl. above
	Air		100		100	100
	Sub-Total	100	210	110	30	125
Phase II	Farmers		50			
	Ground		50	20	20	50
	Air	200	250	150	10	350
	Sub-Total	200	350	170	30	400
	TOTAL I ('000 ha)	300	560	280	60	525
I. INPUTS						
Farmer use						
2% Produsur dust at ('000 kg)		300	1,100	350	100	750
1% kg/ha (US$7.5/ha) ('000 US$)		225	875	262	75	562
or equivalent						
Other ground/air treatment						
Fenitrothion 50% ULV at 0.5 ('000 lit)		135	225	112	25	250
Cost (US$ 3.5/ha) ('000 US$)		945	1,575	857	175	1,750
or equivalent						
(Can be provided to farmers instead of dust if they are supplied with ULVA sprayers)						
TOTAL II		1,170	2,450	1,119	250	2,312
II. FLYING HOURS						
Helicopters						
70% Survey, 30% Control						
at US$ 1,200/hour ('000 US$)		150	200	75	50	200
		180	240	90	60	240
Fixed wing (small)						
Hours (at 700 ha/hour)		300	500	200	15	650
at US$ 800/hour ('000 US$)		240	400	160	12	520
TOTAL III		420	640	250	72	760
IV. OPERATIONAL COSTS ('000 US$)						
Local expenses, vehicle hire, personnel emoluments		250	500	100	50	500
TOTAL II + III + IV		1,840	3,590	1,469	372	3,572
V. TECHNICAL ASSISTANCE						
Grasshopper adviser	m/m (US$ 8000/m/m)	8	8	3	2	8
Logistic al specialist	m/m (US$ 8000/m/m)	8	8	3		8
Asst. Admin. Officer	m/m (US$ 2000/m/m)	6	6			6
Pesticide trials	m/m (US$ 8000/m/m)					
Crop loss assessment	m/m (US$ 8000/m/m)					
Environmental impact assessment ('000 US$)						
Training in application equipment use ('000 US$)		10	10			10
TOTAL V		150	150	48	16	150
VI. EQUIPMENT AND SUPPLIES						
Vehicles						
Approx.unit price US$						
4x4 1/2 tonne	18,500	2 36,000	6 108,000	3 54,000	2 36,000	10 180,000
4x4 1-2 tonne	50,000	3 150,000	3 150,000	1 50,000	1 50,000	5 250,000
Load carries	35,000					1 35,000
Bicyclettes	150					100 15,000
Radios						
HF SSB	4,000	5 20,000	10 40,000			
VHF	600					
Information equipment						
Dusting sacks	3					
Hand bellows dusters	5	1,000 5,000	2,500 12,500	1,000 5,000	5,000 15,000	10,000 30,000
Micron ULVA sprayers	50		1,000 50,000	200 10,000	500 2,500	5,000 25,000
Torch Batteries '000	500		32 16,000	6 3,000	200 10,000	1,000 50,000
Exhaust Nozzle Sprayers	1,500	3 4,500	10 15,000		6 3,000	32 16,000
Motorised Knapsack ULV sprayers	500	50 25,000	100 50,000	20 10,000		5 7,500
Aircraft sprayers	2,000				15 7,500	100 50,000
Refuelling equipment					2 4,000	
Aircraft refuelling stands (sets)	8,000	1 8,000	1 8,000	1 8,000	1 8,000	2 16,000
Pesticide hand pumps	100	100 10,000	200 20,000	100 10,000	50 5,000	200 20,000
Protective clothing						
Masks	10	300 3,000		150 1,500	300 3,000	1,000 10,000
Overalls	50	300 15,000		250 12,500		1,000 50,000
Boots, pairs	30	300 9,000		300 9,000	100 3,000	1,000 30,000
Gloves, pairs	10	300 3,000		300 3,000	200 2,000	1,000 10,000
Goggles, pairs	5	300 1,500		250 1,250	200 1,000	1,000 5,000
Other						
Sets of Camping Equipment	2,000	10 20,000	20 40,000	10 20,000	10 20,000	50 100,000
First Aid Kits	50	10 500	20 1,000	10 500	10 500	50 2,500
Generators	1,500	10 15,000	20 30,000	10 15,000	10 15,000	50 75,000
Maps (sets)	50	5 250	10 500	5 250	5 250	25 1,250
Collecting equipment	100	10 1,000	20 2,000	10 1,000	10 1,000	50 5,000
200 Lit. drum water	50	10 500	20 1,000	10 500	10 500	50 2,500
" " petrol	50	10 500	20 1,000	10 500	10 500	50 2,500
20 Lit. jerrycan water	40	10 400	20 800	10 400	20 800	50 2,000
" " petrol	40	10 400	20 800	10 400	20 800	50 2,000
TOTAL VI		328,550	546,600	215,880	189,350	992,250
GRAND TOTAL (II + III + IV + V + VI)		2,168,550	4,286,600	1,732,800	577,350	4,714,250

ANNEX

PLANNING OF THE LOCUST CONTROL IN 1987

PROGRAM OF WORK

1. Egg Pod Survey

   January- February

2. Installing products, staff and equipment

   February- March to May

3. Control in the field (Prospecting and treatment)

   June, July, August

4. Control from air

   (Survey and treatment)

   September to January

VI. STRATEGY AND PROGRAM FOR 1987

Protection of crops involves rainfed crops as well as flood recession and irrigated crops. For a better protection of all these crops, it is necessary that products, equipment and treatment teams be as close as possible to the crop areas. In view of that, main bases should be developed in the main towns of the regions and secondary bases in the Department or Arrondissement main areas, and lastly storage centers.

The bases should be supplied with equipment and treatment

chemicals.

- to train farmers who should also be more and more involved in crop protection activities

- equipment for each main base

transportation vehicles, treatment vehicles, liaison vehicles for the E.R.teams,

- Construction

1 construction for housing and office

1 chemicals and equipment storage hangar

Organization of surveys end of 1986, to find the most recent egg-laying areas.

Such areas will determine the appropriate places to receive the chemicals to be stored and the areas around which the reconnaissance missions are to be intensified, all this with the participation of Aghrymet and the workers of the Integrated Control Project that have their stations at the various biotopes. The installation should be done prior to the organizing of the locust control which should be done in two phases.

- control in the field

- control from the air

If the control in the field is carried out efficiently through the joint action of the farmers and workers of Crop Protection, this would reduce appreciably the level of the insect population to be controlled from the air.

1. Treatment in the field

Organization and means required

The agropastoral area was divided into four regions. Each region is under the responsibility of a regional coordinator and

includes 2 to 3 agricultural inspectorates.

The Inspector or a worker designated to act as an Inspector coordinates all the locust control activities of the inspectorate concerned.

The locust control treatments and the middle part of the survey are performed by units of treatment/prospecting distributed within the inspectorates.

At the national level the information collected is centralized by the national coordinator who organizes and directs the activities. He is assisted by an assistant coordinator and a person in charge of supplies.

VII - Migratory Locusts

3.1. Rain and Vegetation

The rainfall which favorized the development of insects appeared mostly in two periods.

The first period concerned mostly the area south of the North 19th parallel. The regions of Brakna, Tagant and the north of the Trarza region received rainfalls in June, July and early August.

Then there was a dry period that lasted between 15 and 20 days.

The second rainy period was mostly in September and lasted until early October.

The rains resulted in a herbaceous cover that lasted until the end of the year, mostly above the 18th parallel with species appreciated by schisto in the Inchiri, East of Adrar, East of Zemmour (Khatt maghteir) and Hank up to the borders with Algeria and Mali.

7.2. Grasshoppers

The status of this pest was of general concern during September. The most important manifestations were noted in October. Six missions of crop protection (OCLALAV and/or PV) went to several areas either to check an information or to make surveys. Quantities in any phase of development were noted.

- solitary (larvae and wings)
- groups (larvae and wings)

The densest concentrations were noted in the Trarza, North Brakna, Tagant, Adrar and Inchiri with densities ranging from 40 to several thousands/Ha. Treatments were undertaken in strong density areas.

Khatt El Moinane (Gayla) 38,500 Ha were treated, including 18,100 by air with 19,100 liters of liquid chemical and 3 T of powdered chemical between Nov. 17 and Dec. 12, 86.

Aouker (Atoueigate) 2,260 Ha treated in the field with 1,255 L of liquid chemical between 2 and 5 December.

Adrar The Adrar Inspectorate will ensure the treatment in Eirichguibli) 200 Ha and Grarat El vras (70 Ha).

Tagant (Takhça) 4500 Ha were also treated.

The treatments did not cover all the infested zones for the following reasons:

- difficult access over land
- dispersion of the infested areas
- size of the infested areas located in interdune or "interbarkane" depressions, with areas too limited to justify the use of an airplane.

Generally speaking a departure of insects in an organized flight was not observed. However it should be noted that there is still a very important residual insect population feeding on a vast green area which might last until April. Such vegetation is noted in Adrar, Tiris Zemmour and Tagant.

1987 Program

Because of the importance of the residual population of this pest, it is necessary to continue the surveys until March to learn what is going to happen to that population.

- Surveys from July to December
- Treatment activities

6.3. Financial impact

63.1 March prospecting

Fuel, lubricant	150,000
Travel	120,000
Total 63.1	270,000

63.2 July through December survey

Fuel, lubricant for cars	1,000,000
Travel	700,000
Total 63.2	1,700,000

63.3. Treatment operation

Chemical	50,400,000
Fuel, lubricant	2,000,000
Temporary personnel	400,000
Total 63.3	52,800,000

63.4 Contingencies	5,500,000

RECAPITULATION

March survey	270,000
July-Dec. survey	1,700,000
Treatment activities	52,800,000
Contingencies	5,500,000
Total 6.3.	60,270,000

ACTION PLAN FOR THE 1987 LOCUST CAMPAIGN IN SENEGAL

Dakar, March 1987

INTRODUCTION

I. OPERATIONAL STRUCTURE

- 1.1 Coordinating Committee
- 1.2 Technical Committee
- 1.3 Command Center
- 1.4 Communication NetWork

II. TRAINING PROGRAM

- 2.1 Training Session
  - a) Seminar
  - b) Long Term Training
- 2.2 Short Term Training
- 2.3 Collaboration with Development Agencies
- 2.4 Rural Education Radio Program
- 2.5 School Agricultural Program

III. SURVEY AND SIGNALS NETWORK

- 3.1 Survey
- 3.2 Establishment of Consistent Signalling Network
  - a) Grassroot informants
  - b) Warning Bases and observation posts
  - c) Regional Monitoring Committee

IV. GRASSHOPPER CONTROL INTERVENTION PLAN

- 4.1 Ground Intervention
  - a) Nymph Control
  - b) Adult Control

2. REQUIREMENTS FOR THE CONDUCT OF THE GRASSHOPPER CONTROL CAMPAIGN, ACCORDING TO THE PROPOSED PLAN OF ACTION

5.1 Areas to be treated and amount of pesticides required
   a) South-Center Peanut Basin and South of Senegal
   b) Diourbel-MBacké-Touba-Dahra areas.

5.2 Vehicles

5.3 Aircraft Intervention and Survey

5.4 Supply requirements

5.5 Fuel for Ground Survey and Intervention

5.6 Fuel and Lubricants for Equipment and Pesticide Transportation

5.7 Equipement and Pesticide Delivery Cost.

5.8 Temporary Workers

5.9 Per Diem for Technicians.

VI. EVALUATION OF PESTICIDE IMPACT ON THE ENVIRONMENT.

VII. ANNEXES:

I. Planning

II. Campaign Costs.
   Total budget

INTRODUCTION

During the 1986/87 season, the Senegalese farmers have gone through great hardships in their agricultural production due to late rains followed by rather long rain stoppages in July and August and also to the locust infestations which had ravaged most rainfed food crops (millet, sorghum, corn...). Despite the numerous land and air interventions by the GOS Crop Protection Service (DPV) to limit the damages to an economic level, surviving grasshopper populations and third generation pullulations towards the end of the rainy season have thus become a major threat to the next season's crops.

Information sources from PRIFAS (November 1986) and from FAO (December 1986) indicate that the quantity of eggs ready to be hatched following the 1987 early rains in Senegal, Mauritania, Mali and Burkina Faso will be almost equal to last year's. This has been confirmed by the survey results carried out in those countries since December.

In view of the seriousness of the locust situation, the Government of Senegal is conscious that they have not enough and adequate means to stop the disaster.

Therefore, the Government of Senegal has called upon the International Community to provide them further technical and financial assistance.

The CPS will be able to cope efficiently with this locust disaster thanks to this global effort (National and International).

Considering the experience of the last locust campaign, the aim of this present document is:

1. to define a campaign strategy based on scientific and technical sources;
2. to determine the means to be set up;
3. to evaluate the total campaign cost by enphasizing the contribution expected from the International Community.

The locust campaign will go from April to November 1987, with a preliminary period, an intensive locust control, expecially during the rainy season, and an evaluation period

It will take place in Senegal, on an area of 1,320,000 ha with 800 000 ha of aerial control.

After an exhaustive inventory of the existing means, the total cost to be financed is estimated at 3,376,160,000 CFA F (THREE BILLIONS, THREE HUNDRED SEVENTY SIX MILLIONS, ONE HUNDRED AND SIXTY THOUNSAND FRANCS CFA)

Besides their important means available (human resources, pesticides, equipment, running) and despite their economic situation, the Government of Senegal has made a particular effort by giving 644,000,000 CFA F (SIX HUNDRED FORTY FOUR MILLIONS CFA FRANCS).

In a spirit of solidarity, the Government of Senegal wishes that the International Community could provide the rest of the funds, that is to say 732 160 000 CFA F (TWO BILLIONS SEVEN HUNDRED,THIRTY TWO MILLIONS, ONE HUNDRED AND SIXTY THOUNSAND FRANCS CFA)

NOTA: In the evaluation of the internatonal contribution, the survey costs are not taken into account.

THE DIFFERENT POINTS OF THE ACTION PLAN

To carry out the campaign efficiently with the cheapest costs and to reduce any risk at the lowest level (or even to do it without risk), the following key actions have been selected:

-Operational Structure

To meet the needs of conception, setting up of means, planning, control and survey of actions, various committees and a command center have been created.

-Training Program

The correct implementation of the action plan requests the training for a high number of Extension Agents (CPS-RDA-NGO) and farmers.

-Survey and Signals NetWork:

For an efficient action a quick information should be given. A well organized prospection and concise signal must be considered.

-Grasshopper Control Intervention Plan

After the signals network and the survey which are significant criterias for grasshopper problem, the following strategies have been considered.

Farmers:	170.000 ha.
Ground Control (CPS)	350.000 ha.
Aerial Treatment	800.000 ha.

-Logistics

Actions to be taken require important means as soon as possible.

-Evaluation of Pesticide Impact on the Fauna and the Environment

Considering the large surface often covered by the pesticides, a reasonable use of these products is necessary for a better eco-system conservation.

- Balance and Annual Report

A detailed balance, and an annual report will be set up at the end of the campaign.

I. OPERATIONAL STRUCTURE

The locust campaign being multidisciplinary, it is recommended that the Senegal Grasshopper Control effort should be organized in the following fashion:

1.1. Coordinating Committee

The coordinating Committee directed by the Ministry of Rural Development is made up of GOS and donors'Representatives. Their function would be to review the Country plan, determine needs, set broad policy guidelines and solicit funds and assistance for their respective capitals.

The proposals of this Committee are submitted to the Minister for Approval.

1.2 Technical Committee

The Technical Committee may be composed of the following:

-Director of CPS (Chairman)
-Technical Adviser of the Minister of Rural Development
-FAO Representative

-Donor Technical Assistants (U.S., France, Italy, Canada, F.R.G, Belgium, Japan, Netherlands - EEC, FAO, UNDP, etc..)
-OCLALAV Representative
-Two Representatives from the Inter NGO Coordinating Committee.

The Minister of Rural Development will appoint new members as needed. This Technical Committee will implement the plan of action, and will seek guidance from the Coordinating Committee. The Technical Committee will handle the day to day operation of the grasshopper survey and control.

1.3 Command Center

A Grasshopper Control Command Center should be established at the C.P.S in Dakar. The center would be the focal point of all grasshopper survey and control operations. And then, it is necessary to collaborate directly with OCLALAV, National Geographic Center, AGRHYMET Project, FAO, Donor Technical Assistances etc.... All information regarding the control effort would come to the Command Center for distribution and immediate action.

1.4 Communication Network

The CPS should have a sophisticated communication network sufficient to maintain constant 24-hour communication with all out bases and all mobile units, together with adequate maintenance and back up transceiver units. Aircraft operation companies should be required by contract to equip their aircraft with radio equipments which are compatible with those used by the CPS communication network.

II. TRAINING PROGRAM

2.1 Training Sessions

a) Seminars

Through FAO, USAID funding, training programs for technicians, pesticide applicators and farmer groups, will be organized at the Training Center and in the different regions:

-Training of trainers (15 - 30 April)
-60 Technicians: (45 CPS
15 NGO and RDA) 1st - 21May
-60 pesticide applicators at the Training Center (end of May - Mid June).
-16 farmers'groups in Kolda, Kaffrine, Linguère, Matam (4 UFG/region) in June-September.

b) Long Term Training

A long term training program (signals network, surveys, identification, densities evaluation, pesticide application, etc..) will be set up and applied by the Pest Control Training Center. The aim of this training is to allow the different participants to get used to the technics of the grasshopper control.

2.2 Short Term Training

Under the retraining of the National Crop Protection Service Agents, the CPS Director is seeking funding sources from the "Fonds d'Aide et de Coopération" (FAC) for the training of five agents. This training on Grasshopper Control will take place at CIRAD (Montpellier) from 4th to 15th May. Considering the importance of the subject, it would be better to increase the number of participants to ten.

17

2.3 Collaboration with the Regional Development Agencies

CPS will retrain the Extension Agents of the NGOs and RDAs (SAED-SODEFITEX, SODEVA, SODAGRI, SOMIVAC) because of their presence among the farmers, and their availability for the pest control. These extension agents will subsequently organize training sessions for farmers in their intervention areas.

2.4 Rural Education Radio Program

In Dakar, The CPS will be able to collaborate with the national information sources (Radio, TV, Newspapers) to broadcast on-farm crop protection messages. At the Regional level, the CPS Chiefs could broadcast the extension package of the locust control campaign through the Rural Education Radio program.

2.5 The School Agricultural Program

In rural areas, children are used to helping their parents with field work (sowing, weeding, guarding) during the rainy season. Therefore, it would be better that the MDR contact the Minister of National Education to sensitize and encourage all regional and departmental primary school inspectors, and headmasters to urge the schoolchildren to participate in such important activities of the locust control campaign.

III. SURVEY AND SIGNALS NETWORK

In general, the success of a locust campaign depends on signals network and the results of surveys. Therefore, this important part of C.P.S. activities must draw our attention. As the grasshopper campaign would take place in the best located areas and at an appropriate time, an improved survey and a better organized reporting would reduce the operations costs as well as the crop loss during the agricultural campaign and after harvest. Besides, this would lead a better planning on the extent of infestation for the next campaign.

During this survey phase, all the ground operations will be coordinated by the CPS Command Center.

3.1 Survey Periods

The nymph survey should start with the early rains and continue until the end of rainy season, which will not only permit to make preventive control more effective against larvae as soon as they are hatched, but also to save the insecticides which will be used for the control of other pests. At the same time a particular attention would be given to adults and egg mass survey.

This last operation will be repeated at the end of the campaign (October-November) in the whole area.

3.2 Establishment of a Consistent Signalling Network

a) Grassroots informants

Shepherds report on the situation in the ranges, fallows and forests. Farmers, students and Peace Corps Volunteers report on the grasshopper situation in the fields.

Pilot farmers gather these data to forward them to the head of the CERP (ATA - RDA - Agricultural Sector) who go to the field to check and assess the magnitude of infestation in order to make appropriate intervention recommendations.

b) Warning Bases and Observation Posts

The CPS has 11 functional transmitter/receiver sets (8 ICOM IC 735 and 3 SBA 302). It is necessary to install them at the Warning Bases of CPS (5), and at the observation posts (3), as well as on the survey and treatment vehicles. Twenty seven additional sets are needed to strengthen the staff and to make CPS reporting and intervention networks more responsive.

c) Regional Monitoring Committee

This committee led by the Regional Governor gathers all the persons in charge of the regional services in rural area, with the Regional Inspector of Agriculture as Chairman. The aim of this committee is to advise on the appropriate intervention measures:

-In the case of specific attacks on their crops, farmers will be advised to perform preventive treatment as soon as the first signs appear.

-In the case of overall infestation, the pest control supervisors should be warned so that a field verification and a appropriate control measure can be jointly organized (ground control, aerial control)

IV. GRASSHOPPER CONTROL INTERVENTION PLAN

Due to concern for a large-scale grashopper infestation during this Campaign, the National Crop Protection Service together with donors' experts, plan various appropriate intervention methods (ground and aerial treatmnent) on the grasshopper population dynamics related to the rainfall conditions and the shift of the intertropical front (FIT).

4.1 Ground Intervention

a) Nymph Control

With regard to ground intervention, the strategy considered aims à priori at a preventive control early in the season against nymph concentrations. The hatchings will take place 10 to 15 days after the first rains (25 mm). the recommended products for this kind of intervention are the Propoxur 1% and the Fenitrothion 2,5%. Farmers will assure themselves these treatments, around and within the fields with dusting bags and bellows. The fallows and the forests will be treated by C.P.S.

b) Adult Control

Then, adult grasshopper Control should be performed through spraying with liquid formulations (ULV and EC):

-ULV formulation for fallows and forests (preference);
-EC formulation for close protection of crops.

4.2 Aerial Treatment

Aerial treatment (Annex II) takes place only when there is a widespread grasshopper infestation which exceeds the available means for ground treatment. It aims at combating heavy insect densities in the reproduction area.

Aerial treatment will always be preceded by an intensive survey of the region suspected of heavy infestation, it should also be made through the lead of reconnaissance aircraft and reporting ground teams. In the Kolda and Ziguinchor regions higher rate of insecticide for the treatment is necessary. As Oedaleus senegalensis is almost ubiquitous in all Senegal, areas for aerial treatment are estimated to 800.000 ha. The schedule of this operation is described in the annexes II.

As the aerial treatments require important means (People, Equipment, Finance), it would be better to have the approval of the Technical Committee before taking any appropriate action.

Besides the magnitude and intensity of the infestation of Oedaleus senegalensis (early June - November), it is necessary to note the destructive activities of others species whose infestation periods vary according to the environmental areas.

In Kolda and Ziguinchor regions, the early rains and their long duration further the hatching and development of the Oedaleus senegalensis and other sedentary locusts. The latter group is active (Cataloïpus, Kraussaria angulifera, Hieroglyphus daganesis, Krausella amabile, Zacompsa festa, Zonocerus variegatus) between August and November and causes heavy damages to cereals. Thus, it is necessary for farmers to take appropriate control measures by mid-June.

Ailopus simulator poses a threat to recession crops in the Senegal River Valley (Late Oct-Nov). The best control strategy is baiting which ensures timely protection of the seedings. With powder (Propoxur 1%) and Cereal bran, farmers will make baits (2,5 Kg of Propoxur 1% for 97,5 Kg of bran); after moistening the product, they will arrange baits in 2 x 2 m packs in his field.

V. REQUIREMENTS FOR THE CONDUCT OF THE GREASSHOPPERS CONTROL ACCORDING TO THE PROPOSED PLAN OF ACTION

Pesticide, equipment, vehicles, flight hours, training costs and technical assistance requirements etc., are estimated on the basis of the strategy proposed for coming grasshopper control campaign, and the current and future availabilities of the National Crop Protection Service. These requirements are as follows:

5.1 Areas to be treated and amount of products required for 1987-88 agricultural season based on the strategy adopted.

* 1st Phase: mid-June - mid-August

a) South Center Area and South: 1st generation hatchings.

-farmers level: around 25% of acreage 100,000 ha (baits plus dust) - close protection of crops (sowings)

-NCPs intervention: crop protection and treatment of fallows (not very large areas which do not need aerial interventions) - 55,000 ha (15000 ha through dusting and 4,000 ha through ULV spraying)

-aerial treatment: fallows and classified forests 100,000 ha to 200,000 ha.

b) (Diourbel-Mbacke-Touba-Dahra) area: as of late July, 1st generation hatchings plus emergence of imagos towards the North.

- farmers level: almost 25% of cereal cultivated lands - 60,000 ha (baits plus powder) - close protection of crops (sowings)
- National Crop Protection Service Intervention: Crop protection and fallows treatment - 55,000 ha (15,000 ha through dusting and 40,000 ha through ULV spraying)

In the overall, the areas treated are:

- *farmers level: 160,000 ha, which involves 1,600 tons of propoxur 1% (on young larvae preferably) or Fenitrothion 2.5% for dusting as well as 80 tons of Propoxur 1% and 900 tons of cereal bran for baits (farmers will be requested to contribute most baits by the provision of millet or sorghum bran).

- *National Crop Protection Service level: 110,000 ha for which 30.000 for dusting, 80,000 ha ULV spraying which requires 450T of Propoxur powder 1% or Fenitrothion 2.5% and 40,0001 of Fenitrothion 500 ULV. The figure of treated areas corresponds more or less to the capacities.

- *Aerial interventions: 200,000 ha which require 100,0001 of Fenitrothion 500 ULV or its equivalent.

*2nd Phase: Mid August-Early October

During this period, action will be taken here and there, and there will be larger coverage conducted at a greater speed. To ensure safety, the National Crop Protection Service will be reinforced with treatment vehicles and equipment for its ground intervention.

Oedalus Control from Diourbel to the North, Southern Zone and departments of Matam/Bakel

* National Crop Protection Service interventions: 140,000 ha of which 100,000 ha ULV sprayed and 40,000 ha dusted, which required 50,000 liters of Fenitrothion 500 ULV and 600 tons of Propoxur 1% dust or Fenitrothion 2.5% - close protection of crops and small pockets - nearly 30% of acreage cultivated with cereals.

* Aerial treatment: Nearly 60% of areas which were treated last year. As a more effective and earlier control will be made in phase 1 and that more specific areas to be treated will be delineated (smaller aircrafts and further surveys):

Diourbel-Dahra-Louga-Mbacke-Gossas Area:	270,000 ha
Matam-Bakel Region:	60,000 ha
Kolda and Ziguinchor Regions	170,000 ha

In the overall, the areas treated are:

- National Crop Protection Service Level: 140,000 ha. which require 50,000 liters of Fenitrothion 500 ULV (or its equivalent) and 600 tons of Propoxur powder 1% or Fenitrothion 2.5%)

- Aerial interventions: 500,000 ha. which require 290,000 liters of Fenitrothion 500 ULV (or its equivalent).

*3rd Phase: October-November

a) Elimination of residual populations (nearly 50% of areas treated in phases 1 and 2) and 3rd generation in the South-Centre area and South:

*National Crop Protection Service Intervention: 70,000 ha. sprayed with ULV.

*Aerial interventions: 100,000 ha.

b. Control of Aiolopus among recession crops (Senegal River Valley).

*National Crop Protection Service intervention: 30,000 ha. sprayed with ULV.

*Farmers level: 10,000 ha. through dusting and baits (cf phase 1).

In the overall, the areas treated in phase 3 are:

*farmer level: 10,000 ha. which require 100 tons of Propoxur 1% or Fenitrothion 2.5%, 10 tons of Propoxur 1% and 100 tons of bran.

*National Crop Protection Service: 100,000 ha. which require 50,000 liters of fenitrothion 500 ULV (or equivalent).

*aerial intervention: 100,000 ha which require 50,000 liters of Fenitrothion 500 ULV (or equivalent).

Finally, the amount of pesticide required given the control strategy proposed can be summed up in the following annexes.

5.2 Vehicles

The purpose is to be equipped at the beginning of phase 2 with:

-30 UNIMOG (3/Region)
-10 vehicles in order to establish an equivalent of signalling and surveying teams (4 based at the central level and 6 in the regions). At least 8 out of these vehicles should be equipped with a transmitter
receiver set, 45 pickups diesel 4 x 4 for the interventions (1 per department, 5 at the CSPV level and 10 for a reinforcement team at central level)
- Two trucks of 30 tons each
- Two trailers which can be fixed to the Unimogs.

For CPS this would ensure greater flexibility for the distribution , delivery of equipment and supply, and security in case of lack of conveyors. Once these vehicles are available, CPS will secure rotative transport of about 100 tons of products and equipment. This cannot cover the CPS needs in term of distribution, and delivery. The needs are detailed in the annexes.

5.3 Aircraft Intervention and Survey

a) Planes

Phase I : 2 planes of treatment (200.000 ha).
Phase II et III: 6 planes of treatment (600.000 ha).

Estimated total hours of treatment is approximative 800 heures at the rate of 1000 ha/hour.

b) Helicopter: It is necessary to conduct grasshopper control surveys in the areas which are difficult of access (Senegal River Valley and Ziguinchor Regim). Requirements should not exceed, given last year's experience of, 60 flight hours. A French Air Force Helicopter can possibly be rented.

5.4 Supply Requirements

a) Diesel Engine Motor Dusters (Stella Berthoud duster for instance with Lambardini engine) and duster fixed to a plug, (for example Stella Berthoud or Jacto)

To reinforce intervention capacities in case of severe and widespreac attacks than expected and to allow in such a case to apply swiftly the insecticide dust currently stored, especially during phase 1 and 2, it would be necessary to have 50m range diesel engine motordusters and dusters available which could, if necessary, be mounted on vehicles available at departmental level agricultural divisions. The interest of the use of these dusters is that they do not need a high technology.

b) Canon type ULV sprayers mounted on plugs on diesel driven engine (see general requirements table).

c) Radio Network: (rf III 2-6)

d) Further Requirement : Camping equipment, protection equipment, spraying control equipment, catching equipment etc...

NOTA: The number of heavy duty dusters or ULV sprayers in the table recapitulating the requirements are relevant to the vehicles on tractors equipment available at the National Crop Protection Service and those requested as supplement so that they can perform dusting or ULV spraying activity according to the needs.

5.5. Fuel for Ground Survey and Intervention:

a) Working of Vehicles

*Phase 1: Based on the number of vehicles available at the National Crop Protection Service and the treatment schedule, fuel needs for interventions during this phase can be estimated at 83,000 liters of diesel oil for 110,000 ha. Lubricants needs are estimated to 2.500 liters.

*Phase 2: By extrapolation, requirements can be estimated at 105,000 liters of diesel oil for the intervention. Lubricants needs are estimated to 3,000 liters.

*Phase 3: 75,000 liters of diesel oil for 100,000 ha and 2.000 liters of Lubricants.

b) Fuel to Mix with ULV Products

On the basis of one liter of Diesel oil for 1 liter of insecticide (Fenitrothion 500 ULV compatible with Diesel oil), we can estimate 140.000 liters Diesel oil for the mixture.

In the overall, fuel requirements for surveys and intervention can be estimated at 460.000 L of Diesel oil, and 8.200 L of lubricants.

5.6 Fuel and Lubricants for Equipment and Pesticide Delivery by CPS

To transport 1000 T of products and equipments, the needs can be estimated at 18.000 L of Diesel oil and 200 L of Lubricants.

5.7 Equipment and Pesticide Delivery Costs

Besides the equipments and the insecticides that the CPS can deliver by its own means, we can estimate at 3.000 T the remaining weight to be delivered by conveyors.

Based on 27 CFA Francs/Km/ton for transport and an average transport distance of 500 Km, Costs can be estimated at 40.5 million CFA Francs.

5.8 Temporary Workers

Costs based on the living of 300 day laborers at the average costs of 1.500 FCFA/day for 5 months, that is to say 67.5 million Francs CFA.

5.9 Per Diem for Technicians

It would be better to provide 10.000 CFA per day for technicians on trip.

If we estimate at 40 the technicians working during 5 months (at the average of 15 days/Agent/Month) in the survey and control operations, the necessary total amount would be estimated at 30 million Francs CFA.

VI. EVALUATION OF PESTICIDE IMPACT AND ENVIRONMENT

Should donor entomologists be involved as technical experts in the grasshopper control activity, it is desirable in cooperation with their Senegalese Counterparts (CPS), that they diversify their research program in the following areas:

1. Evaluation of the impact of insecticides on pests and environment as ground and aerial treatments are implemented.

2. Evaluation of the harmfullness of insecticides on the applicators and the population during the treatments.

3. Evaluation of damages on affected crops.

4. Efficiency test and evaluation of various formulations of some insecticides used against grasshoppers.

5. Quality Control of the insecticide formulations.

ANNEXES

ANNEXE I : PROGRAM PLANNING

ANNEXE II: CAMPAIGN COSTS

A N N E X E I.

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ACTION PLAN OF GRASSHOPPER CONTROL CAMPAIGN IN SENEGAL

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Table N° 1

ACTIVITIES	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1. Elaboration of a 1987-1988 Action Plan												
2. Creation of a operational Structure												
3. Assignment of CPS Agents in the Regions												
4. Periodic Meetings with Donors												
5. Training Program												
a) Training of trainers												
b) Technicians												
c) Pesticide Applicators												
d) Farmers												
e) Long term Training												
f) Rural Radio Broadcasting Program												
6. Signals Network												
7. Surveys Program												
a) Grashoppers Nymph and adult												
b) Egg-Mass												
8. Logistic Operation												
a) Stock inventories (Pesticides, vehicles, etc)												
b) Pesticide & Equipment purchase												
c) Vehicles & Equipment repair												
d) Logistics												

Table N° 2

ACTIVITIES	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
9. Crop Protection Intervention:												
a) Phase I (Mid June, Mid August)												
South Center Peanut Basin:												
Basin, Northern Zones												
(Linguère, Matam, Dagana):												
Southern Zones of the												
North Peanut Basin												
(Diourbel, Mbacké, Touba,												
Déali...)												
* Ground and Air control												
b) Phase II (Mi Aug-October):												
Northern Peanut Basin,												
Matam, Bakel, River												
Valley, South Area												
* Ground and Air control												
c) Phase III (October -												
November): Clearing of												
treated areas in Phases												
I & II - River Valley,												
Recession crop												
* Ground & air Control												
10. Evaluation of results												
11. Campaign Evaluation												
Annual Report												

* Clearing

TABLE No.3
AND EQUIPMENTS

TABLE OF THE DATE OF PAYMENT OF PRODUCTS

DESIGNATIONS	15 MAY	1st JUNE	1st JULY	1ST AUG	1st SEPT
Fenitrothion 500 ULV	320,000 l				
" 1000 ULV			100,000 l		
Pesticide dust		1,500 T.			
Fenitrothion 50 EC			3,000 l		
Cereal Bran	500T	500 T			
Diesel Engine Canon Type Motordusters		25			
Plugged Canon Type Moto-dusters		20			
Motorized sprayers		115			
Unimogs	17				
Pick up 4 x 4 double cabine with radio		3			
Pick up 4 x 4 Diesel	19				
Trucks (30T)	2				
Radios	27				
Protection Sheets	2400m2				
Camping Equipment		100			
Light traps	10 + 100				
Spare Parts and tyres	34,000,000 CFA F				
Pumping Station for refiling aircrafts	x				
Helicopters				x	
Planes				x	
Fuel and Lubricants	217.5 M				

PROGRAM OF ONE WEEK TRAINING

TABLE No. 4

- Monday

- Introduction to Grasshopper Study
  - . Classification
  - . Morphology
  - . Biology
  - . Ecology

- Tuesday

  .Identification of the most commun grasshoppers in Senegal
  .Practice on the grasshopper identification
  .Survey
  .Signals NetWork
  .Scouting

- Wednesday

- Pesticide used in Senegal
  .Toxicity
  .Classification
  .Formulation
  .Absorption ways
  .Modes of Action
- Protection Equipment
  .Description
  .Use

- Thursday

- Different steps in the pesticide application
- Different methods of grasshoppers control
- Precaution measures during the pstic:de application
- First aid procedures in case of intoxication.

Friday

- Spray equipments used in Senegal
  .Description
  .Assembling
  .Dismantling
  .Working
  .Measuring and dosage
  .Usual breakdown
  .Maintenance

-Saturday
  - Practice on the use of different spray equipments.

A N N E X E II

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TABLE 5. ESTIMATION OF AREAS INFESTED BY GRASSHOPPERS IN SENEGAL (1987/88)

PHASE	Period	Intervention Area	Ground Treatment (Ha)	Aerial Treatment (Ha)
I	Mid June - Mid August	Groundnut Basin Center -South	155 000 ha	100,000-200,000 ha
		North Area (Linguere, Matam, Dagana)		
		Southern zone of the North Groundnut Basin (Diourbel, Mbacké, Touba, Deali...)	115,000 ha	
I & II	Mid June - October	SOUTHERN AREA	140,000 ha	170,000 ha
II	Mid August - October	MATAM/BAKEL		60,000 ha
		North Groundnut Basin Sen. River Valley		270,000 ha
III	October - Late November	Clearing of treated Areas in Phases I & II	70,000 ha	100,000 (?)
		Senegal River Valley (Recession Crops)	40,000 ha	
TOTAL			520,000 ha	700,000-800,000 ha

TABLE No. 6

Treatment	Insecticide	Phase I Mid June Mid-August	Phase II Mid-August October	Phase III October November	Total
Ground	* Baiting				
	- cereal bran	900 T	-	100 T	1,000 T
	- Propoxur 1%	80 T		10 T	90 T
	* Propoxur 1% or	2,050 T	600 T	100 T	2,750 T
	Fenitrothion 2.5%				
Aerial	* Fenitrothion 500 ULV equivalent (Carbaryl, Malathion, Diazinon)	140,000 l	340,000 l	100,000 l	580,000 l

Plan 100,000 liters of Fenitrothion ULV 1000 (96% ULV) for the aerial control in the phase II at the rate of 0.25 liter of Fenitrothion 1000 ULV/Ha.

TABLE NO 7

ESTIMATION OF OPERATION COST OF AERIAL TREATMENT

DESIGNATION	Available	Needs	To be purchased	New Estimation In Millions CFA Francs
- PRODUCTS				
Fenitrothion 500 U1V	-	200,001	200,0001	541
" 1000 ULV	380 l.	100,380 l	100,0001	415
" 1250 ULV	3,800 l.	-	-	-
TOTAL PRODUCTS				956
- EQUIPMENTS				
Pumping Station				
. Tank	-	4	4	?
. Japi Pump	-	4	4	?
. Rellumix Spraygun	-	4	4	?
. Boutillon Spraygun	-	4	4	?
. Boutillon Filter	-	4	4	?
. Adapter	-	4	4	-
. Sifter - washleather	-	4	4	-
TOTAL EQUIPMENT*				?
- AERIAL OPERATION COST:				
- Helicopter		60 h	60 h	22
- Plane		800 h	800 h	180
Aerial and ground support				10.5
- Kerosene	-			?
TOTAL AERIAL CONTROL*				212.5
GRAND TOTAL				1,168.5

N.B.: * Incomplete Total (due to some non estimated costs)

TABLE no. 8

ESTIMATION OF GROUND CONTROL COSTS

DESIGNATION	Available	Needs	To be purchased	New Estimation In Millions CFA Francs
1/ Pesticides				
Fenitrothion 500 ULV	64,900 l	184,900 l	120,000l	325
Propoxur 1% PP	342T	1,342T	1,000T	350
Fenitrothion 2,5% PP	1,450T	1,450T	-	-
Fenitrothion 3% PP	16T	516T	500T	150
Cereals bran	-	1,000T	1,000T	20
Sumicombi 30.E.C	33,201 l	33,201 l		
Deltamethrine 25g/lEC	3,160 l	17,000 l	13,840l	97
Fenitrothion 50 E.C	12,000 l	15,000 l	3,000l	9.15
TOTAL PRODUCTS				951.15
2/ Equipment				
Dusting bags	290,416	290,416	-	-
Bellows	1,100	1,100	-	-
Dorsal dusters	310	610	300	8
Diesel engine canon type motordusters	6	31	25	25
Plugged dusters	12	32	20	8
Manual sprayers	974	974	-	-
Pesticide manual pump	-	100	100	3

TABLE no. 9 ESTIMATION OF THE GROUND CONTROL COSTS

DESIGNATION	Available	Needs	To be purchased	New Estimation In Millions CFA Francs
Dorsal motorized sprayers	185	300	115	16
ULV Canon Type Motor-dusters (400 C.A)	15	38	23	41
Sprayers ULV fixed to a plug (401 L H)	12	18	6	4.5
Exhaust Sprayer	9	9	-	-
TOTAL TREATMENT EQUIP MENTS				105.5
3/Intervention Vehicles				
Unimog	13	30	17	291
Pick-up 4 x 4 Double cabine with radio	1	4	3	19
Pick-up 4 x 4 Diesel	26	45	19	85
TOTAL INTERVENTION VEHICLES				395
4/ Vehicles/Transportation and Delivery				
10 T Trucks	2	2	-	-
30 T Trucks	0	2	2	60
Trailers (8T) Fixable to Unimogs	2	4	2	9
TOTAL VEHICLES/TRANSPORTATION & DELIVERY				69

TABLE no. 10

GROUND CONTROL COSTS

DESIGNATION	Available	Needs	To be purchased	New Estimation In Millions CFA Francs
5/ Fuel, Lubricants				
- Surveys, control, pesticides mixture	-	-	-	137
- Delivery of 3,000 T Equipments & Pesticides				40.5
TOTAL FUEL/LUBRICANT				177.5
6/Radio Network				
VHF sets	8	8	-	-
Radio Type ICOM IC 735	8	35	27	?
Radio Type SBA 302	3	3	-	-
Thompson CSFTRC no. 95 Model including:				
+ BLV mobile set mounted on survey vehicles (5 break) including: Helicopter antenna, atomizers with 12 V feed: 1 micro, 1 quartz	-	5	5	-
+ Fixed BLV set (installed at CSPV bases) including antenna, large band: with masts, microfeed with pedal, 4 quartz	-	5	5	-
+ Solar panel (GS 160 with: Leroy-Sommer) including battery, regulator	-	4	4	-
+ Sets of spare parts for maintenance + installation costs				25
7/ Miscellaneous				
Porta Pack or Holder SP 75	-	100	100	15

TABLE no. 11 ESTIMATION OF THE GROUND CONTROL COSTS

DESIGNATION	Available	Needs	To be purchased	New Estimation In Millions CFA Francs
Protection sheets for pesticides		2,400 m^2	2,400 m^2	4.5 M
Protection equipment (uniforms, glasses, mask with recharge canisters, gloves, boots etc...)	314	414	100	8 M
Mask with forced ventilations and pesticide filter with refillable feed on 12 HP cell	-	10	10	2.5
Set of camping equipment for 6 people, including 1 detachable shelter, 1"popote" box, 1 ice box, 1 gas stove	-	10	10	5 M
Camp beds + mattress	-	100	100	2 M
Topothread with reloading reel		10	10	1 M
Surveyor compass	-	10	10	0.5 M
Generator	-	10	10	4.5 M
Miscellaneous (insect net, reporting sheets, first aid aid kits, jerrycans, drums, flashlights)				6.5 M
Light traps (Type IPM Project/Bambey)	-	100	100	15 M
TOTAL MISCELLANEOUS				64,5 M

Table 12. GROUND CONTROL COSTS

DESIGNATION	AVAILABLE	NEEDS	To be purchased	NEW ESTIMATIONS In CFA FRANCS
8/Spare Parts & tyres				34 M
9/Expenses/Temporary Labor and Per Diem				
- Temporary Labor (Handling costs and Treatments)				67.5 M
- Per Diem for locust campaign Technicians				30 M
TOTAL LABOR AND PER DIEM				97.5 M
GRAND TOTAL GROUND CONTROL				1 959.15 M

Table 13.

SUPPLY ESTIMATIONS FOR THE COMMAND CENTER - GRASSHOPPER CAMPAIGN 1987/1988

DESIGNATION	AVAILABLE	NEEDS	TO BE PURCHASED	NEW ESTIMATION CFA FRANCS
Computers and accessories	1	3	2	9
Supplies (Photocopies/ and Tapes)				6.5
Maps	-	360	360	1
Supplies (Misc.)				0.3
Slides projectors	2	3	1	0.12
Temporary Secretary	-	1	1	0.64
Typewriter	-	1	1	0.75
Magnetic Tapes	-	100	100	0.55
Tape recorder	-	1	1	0.55
Printing and Misc.	-			1.94
TOTAL				21.35

Table 14.

SUMMARY OF NEEDS OF TRAINING FOR THE GRASSHOPPER CONTROL

DESIGNATION	NUMBER OF TRAINING SESSIONS	NUMBER OF DAYS PER SESSION	NUMBER OF PARTICIPANTS PER SESSION	RATE FCFA/DAY	TOTAL COST (IN MILLION CFA FRANCS)
1/Lodging & Food	6	7	20	6,000	5.04
2/Pocket Money	6	7	20	4,000	3.36
Total Seminars					8.40

Training of CERP and Agricultural Extension Agents at the CPS.

Number of CERP = 120

Number of Sessions/Department: 1

Number of Days/Session: 7

Rate per participant: 3500

Training Cost: 120 x 1 x 3.500 x 7 =	2.94
Supplies (Note book, Tables, Chairs, Pens, Pencils)	0.50

Training Trip and Practice

15 days/month during 5 months at 10,000 francs/day for 4 instructors	3.00
Color films and development	0.30

Fuel

8.000 L Diesel oil at 210 F/L	1.68
Oil for generating group	0.10
Temporary workers	0.50
Total Training:	17.42
Miscellaneous = 10% of total training	1.74
GRAND TOTAL TRAINING:	19.16 M FCA

Table No. 15.

EVALUATION OF PESTICIDE IMPACT ON NON-TARGET PESTS

DESIGNATION	NEEDS	ESTIMATED PRICE F CFA
1/ Evaluation of treatments efficiency		
- Physico-chemical control equipment		
- Biological control equipments		
- Total:		53,000,000
2/ Evaluation of the Impact of Treatment on Applicators and the Environment		
- Total:		15,000,000
GRAND TOTAL:		68,000,000

TABLE 16. TECHNICAL ASSISTANCE NEEDS FOR THE GRASSHOPPER CAMPAIGN 1987/88

SPECIALITIES	NUMBER	PERIODS OF ACTION	ACTIVITIES
Entomologist (Generalist)	2	1st Sept-25 Oct.	Operations Center, conception, training, evaluation of treatments
Acridologist	1	15 Jul-30 Sept.	Operations Center, Conception, collection of field data
Logistician	1	1st Aug-15 Oct.	Planning and organization of ground control equip.
Aerial Treatment Specialist	1	20 Aug-15 Oct.	" " " " " "
Modelist	1	1st July-25 Oct.	Operations Center, training, collection of field data
Programmer	1	15 Jul-25 Oct.	" " "

TABLE NO 17

DESIGNATION	NATIONAL PARTICIPATION IN M CFA F	NEEDS	AMOUNT QUANTITY	AMOUNT ESTIMATED PRICE IN CFA F
- AERIAL CONTROL COST	-			
. Pesticides				956
. Aerial intervention cost				212.5
. TOTAL (1)				1,168.5
- GROUND CONTROL COST				
. Pesticides	202			749.5
. Equipments	72			33.5
. Intervention vehicles				395
. Transport & delivery vehicles				69
. Fuel and Lubricants	150			27.5
. Radio Network				25
. Miscellaneous				64.55
. Spare parts & Tyres				34.0
. Labor & field trips	40			57.5
				1,455.15
- COMMAND CENTER EQUIPMENT COSTS				21.35
- TRAINING PROGRAM COSTS				19.16
- EVALUATION OF THE PESTICIDE IMPACT ON NON TARGET PESTS AND THE ENVIRONMENT.				
. Evaluation of the efficiency of treament equipment				53
. Evaluation of the impact of treatments on the applicators and the environment				15
				108.51
- NEEDS IN TECHNICAL ASSISTANCE				
- HUMAN RESOURCES	p.m.			?
- OPERATION COST	80			
GRAND TOTAL (1)	644 (2)			2,732.16

N.B.: (1) The pumping stations, the Kerosene, the technical assistance and the radio ICOM IC 735 costs are not taken into account in these total amounts.

(2) This amount regroups the working fuel, temporary labour, some products, and equipments financed by the National Budget.

DEBRIEFING

WEST AFRICAN GRASSHOPPER/LOCUST TECHNICAL ASSISTANCE TEAM

at

The Office of U.S. Foreign Disaster Assistance
Operations Center
Room 1262 A
N. S.

on

April 6, 1987

* * * * * * * * * * * * * * * * *

PRESENTED BY:

George Cavin
Jack Henderson
Bob Herald
Ellis Huddleston
Bob Thibeault

March, 1987 — April, 198

TEAM	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31/	1	2	3	4	5
SENEGAL:	ARRIVE Dakar																													LEAVE Daka
Seethhaler	X																													
Huddleson	X																													X
THE GAMBIA:																														
Voss					X																				Leave Banjul					X
REGIONAL: WORKING WITH: THE GAMBIA, MALI, MAURITANIA, SENEGAL																														
Thibeault	X				Arrive Banjul			X			Arrive Dakar			X			Arrive Nouakchott			X			Arr Dakar			X	Lv Dakar		
											Dakar/Mali Meetings																			
Herald	X				Arrive Banjul			X			Arrive Dakar			X			Arrive Nouckchott			X			ARR Dakar			X			Leave Daker	X
											Dakar/Mali Meetings																			
Cavin	X							X			Dakar/Mali			X						X						X				X
Henderson	X													X						X						X				X

* All dates are approximate

Amended 4/1/87:0079:p-2

WEST AFRICAN TECHNICAL ASSISTANCE TEAM

REGIONAL TEAM

Bob Thibeault
Team Leader, Disaster Specialist
Bob Herald
Logistics Specialist
George Cavin
Entomologist & Pesticide Specialist
Jack Henderson
Aerial Spray Specialist

THE GAMBIA

Regional Team

Carrol Voss
Entomologist and Aerial Spray Specialist

MALI

Regional Team
(Team met with Wilber Thomas, Deputy Mission Director of Mali in Dakar)

MAURITANIA

Regional Team

SENEGAL

Regional Team

Carl Seethhaler
Logistics Specialist
Ellis Huddleston
Entomologist

O V E R V I E W

The West African technical assistance team visited SENAGEL, THE GAMBIA and MAURITANIA to assist in fine tuning the 1987 Grasshopper/locust country control plans. Additionally, team members met with Wilber Thomas, Deputy Mission Director AID/Mali to discuss the Mali control effort.

COMMON ISSUES

- In calculating aerial spray hours, should drift spray or non-drift spray data be used?

- Should control be in both crop lands and grasslands?

- Missing links in communication system. (except Mali)

- Lack of transportation equipment.

- Maintenance program needed for vehicles and equipment.

- Best control is with the first generation.

- Probabilities of success in 1987 hinge to a large extent on weather conditions.

-Control Effort

* Training - survey
* Ground dusting and Spraying with farmers and CPS personnel
* Aerial Treatment (small planes)

T H E G A M B I A

- Donor committee had not met.

- In last year's campaign, the FAO representative played a major role as Chairman of the Steering Committee (Donor Committee). The permanent Secretary, Ministry of Agriculture, would chair the committee this year.

- FAO representative to be on home leave beginning April 20, 1987.

- Grasshoppers are non-migratory in nature.

- Rains to begin mid-May in the east and about June 1st in the west.

- West Gambia should be the area of highest infestation

- Donors agreed on need for three full-time technical assistance personnel:
  * Entomologist, U.S. Donor
  * Assistant Coordinator (Entomologist) Netherlands Donor
  * Logistician (needed)

- Command Center - without communication equipment

- National Election just completed
- OEO/OFDA conducting training in country

GAMBIA COUNTRY PLAN

(As proposed by the Host Government)

I. Anticipated Hectares Infested

300,000 ha.

II. Anticipated Timing for Control

Phase I - June-August
Phase II - Sept-October

III. Control Operations

Phase I : Ground - 110,000 ha. Cropland
57,000 ha. Forest and Grassland
Air - Desire on standby basis in event of need in forest areas

Phase II : Air - 105,000 ha.

IV. Pesticides

Needs	On Hand
a. Dust - 350 MT*	4 MT
b. Liquid (ULV equivalent) - 50,000 Liters	25,840 Liters**
c. Wettable Powder	.8 MT Carbaryl 85

V. Equipment

Needs	On Hand
a. Pesticide Application	
Hand Dusters - None	949
Knapsack sprayers - None	278
Motorized Knapsack Sprayers - 434	134
Truck Mounted Sprayers - 18	4 Functional
Truck Mounted Dusters - 4	6
b. Vehicular	
4 Wheel drive pickups - 12	-

VI. Aircraft

4 to 6 Single Engine

VII. Donor Coomitments

FAO : 6 Months Technical Assistance - 1 Dutch Entomologist
UK : 140 MT Propoxur Dust - Not yet firm
U.S. : Technical Assistance - $96,000

* Sufficient to treat 35,000 Ha.
** Liquid pesticide on hand sufficient to treat 63,000 Ha. on ground

Doc 3656A

19

THE GAMBIA - Follow Up

- Country plan to be approved by donors
- Donors to request assistance from their respective capitals
- Donors to supply logistician to complete TA team in The Gambia (possibly UK or EEC)
- Command Center needs to be established at a central location with a reliable communication system.
- Chemicals and supplies need to be ordered ASAP.

M A U R I T A N I A

- 3 pests
  * desert locust
  * solitary grasshoppers
  * migratory grasshoppers

- Rains should begin in May in southern Mauritania

- Grasshoppers will primarily be along the southern border

- locust breed in the central portion of the country

- CPS organization includes 23 mobile teams

- The Oclalav H.Q. at Aioun is in need of extensive repairs and rehabilitation

Team met with mission staff and identified possible uses for counterpart funds

* transport for fuel and pesticide
* storage facilities for pesticides
* purchase fuel, oil and maintenance parts for vehicles and aircraft
* Salaries and per diem for field personnel

Funding of these four catagories would total over $500,000 U.S.

- spray planes for Mauritania must take off and land in Mauritania

- FEW all weather roads

- Spray planes used last year did not have the range to spray along the Mali/Mauritania border

- FAO - providing training in country

- U.S. sending 2 persons to Prifas and 4 persons to Dakar for Grasshopper/locust training

MAURITANIA COUNTRY PLAN

(As proposed by the Host Government)

1. Anticipated Infestation 1987

a. Grasshopper - 300,000 ha. Phase I and Phase II estimate.
b. Desert Locusts - 100,000 ha.

2. Timing for Control

a. Phase I - July-August
b. Phase II - Sept-October

3. Controls Planned (Hectares)

a. Ground - 100,000 ha.
b. Aerial - 307,000 ha. (220,000 grasshoppers; 100,000 Cropland, Pastureland and Desert Locust)

4. Pesticides

Needed	On Hand
a. Dust - 1200 MT	40 MT
b. Liquid (ULV equivalent) - 54,000 Liters	25,000 Liters

5. Equipment

Needed	On Hand
a. Vehicular	
Passenger carrying - 34	20 (not assured)
Trucks - 8	

b. Aircraft
1 Helicopter - Survey
4 Aircraft - Thrush Type

c. Ground Application
Sufficient equipment available but asking for some additional in event of breakdown - specifics not available

6. Communications

Needed	On Hand
Radios - HF single side band - 28	13
VHF hand held - 6	6

7. Donor Commitments

Japan - 800 MT Propoxur 2% Dust
10 Vehicles
30,000 Liters ULV Pesticides

France - 10,000 Liters ULV Pesticides
80 Hours Helicopter Flying Time (Survey)
1-4 Wheel Drive Vehicle with Sprayer-Duster

EEC - $105,000

FAO - Training - Value $20,000

USAID - Training - Two CPS Agents to Montpellier
Four CPS Agents to Dakar
PL480 funding for construction of storage facilities and some other operational costs - total amount not yet confirmed

Doc 3645A

MAURITANIA - Follow UP

- Why are there an additional 15 radios needed for this year's campaign?
- Counterpart funds need to be used as much as possible
- USAID - detailed budget for '87 grasshopper/locust control campaign, including use of counterpart funds
- Maintenance program for vehicles and equipment

M A L I

- Pests
  * Migratory grasshoppers
  * African migratory locust
  * Desert locust
- Rains to begin in May in southern Mali
- Highest area of infestation should be in southwest Mali
- Egg pod surveys are being conducted. Heavy infestation reported
- FAO to provide with donor support:
  * Entomologist
  * Project Coordinator
  * Logistician
- Communications network - OK
- Distribution of materials will be difficult
- Donors meeting once a month
- GRM training 40 extension agents

MALI COUNTRY PLAN

(As proposed by the Host Government)

I. Anticipated Hectares Infested

525,000 Ha.

II. Anticipated Timing for Control

Phase I - June-August
Phase II - Sept-November

III. Control Operations

Phase I	:	Ground	- 75,000 Ha.
		Air	- 100,000 Ha.
Phase II	:	Air	- 350,000 Ha.

IV. Pesticides

Needs	On Hand
a. Dust - 600 MT	100 MT (Ger. 1986)
b. Liquid (ULV) - 225,000 Liters	60,000 Liters

V. Equipment

Needs	On Hand
10 Vehicles	Not Determined
10,000 Dusting bags	" "

VI. Aircraft

Needs
Estimated 750 spray hours

VII. Donor Commitments

Norway	- $1.5 million 50,000 Ha. Ground Treatment 150,000 Ha. Air (Helicopter)
France	- Technical Assistance - 4 persons
Canada	- $1 million estimated
Italy	- Technical Assistance - Ground Application

Germany	- 160 Tons Propoxur 2% Dust (Formulated in Bamako from 4 MT Propoxur)
U.K.	- 250 Tons Dust 5 Vehicles (May reduce dust and provide more vehicles)
Japan	- 150 MT Dust (Formulated in Bamako)
USAID	- 32,000 Liters ULV Malathion Technical Assistance - $160,000 Vehicle Rental - $10,000 Dusting Bags (10,000) - $8,500
GOM	- 14 Field Control Teams

Doc 3646A

MALI - Follow Up

- Can vehicles be leased for prepositing of chemicals and supplies?
- Will donor committee meet more often till decisions are made on who will supply needed funds for the control effort?
- A close eye needs to be kept on the prepositing program.
- If donors are unable to fulfill their committments, this should not necessitate the U.S. supplying the item or items.

S E N E G A L

- GOS does not want FAO to have a leading role - because of poor job performance last year
- Donors wanted U.S. to take the lead in the control effort
- One problem that all donors had with last year's operation was that there was no focal point for information
- Vehicles are a problem in that those delivered for use by CPS were given to other divisions in the Agriculture Ministry
- Pest - migratory grasshopper (OS)
- Donors felt there was a need for detailed, accurate survey and timely reporting
- Vehicles were available in parts of the country, but they were only allotted small amounts of fuel to function
- Aircraft operations should be turnkey operations such as the Canadian planes operation in Senegal
- French representative in Senegal requested assistance from PRIFAS. PRIFAS declined.

SENEGAL COUNTRY PLAN

I. Anticipated Hectares Infested

1,220,000 to 1,320,000 ha

II. Anticipated Timing for Control

Phase I - mid June - mid August
Phase II- mid August - early October
Phase III - October - November

III. Control Operations

Phase I:	Ground	- 270,000 ha
	Air	- 100,000 to 2100,000 ha
Phase II:	Ground	- 140,000 ha
	Air	- 500,000 ha
Phase III:	Ground	- 110,000 ha
	Air	- 100,000 ha

IV. Pesticides

Needs (Ground)	On Hand
a. Dust - 2,300 MT	1,792 MT
b. Liquid (ULV) - 204,900 liters	64,900 liters

Needs (Aerial)		
a. Liquid (ULV)	200,000 liters	None

V. Equipment

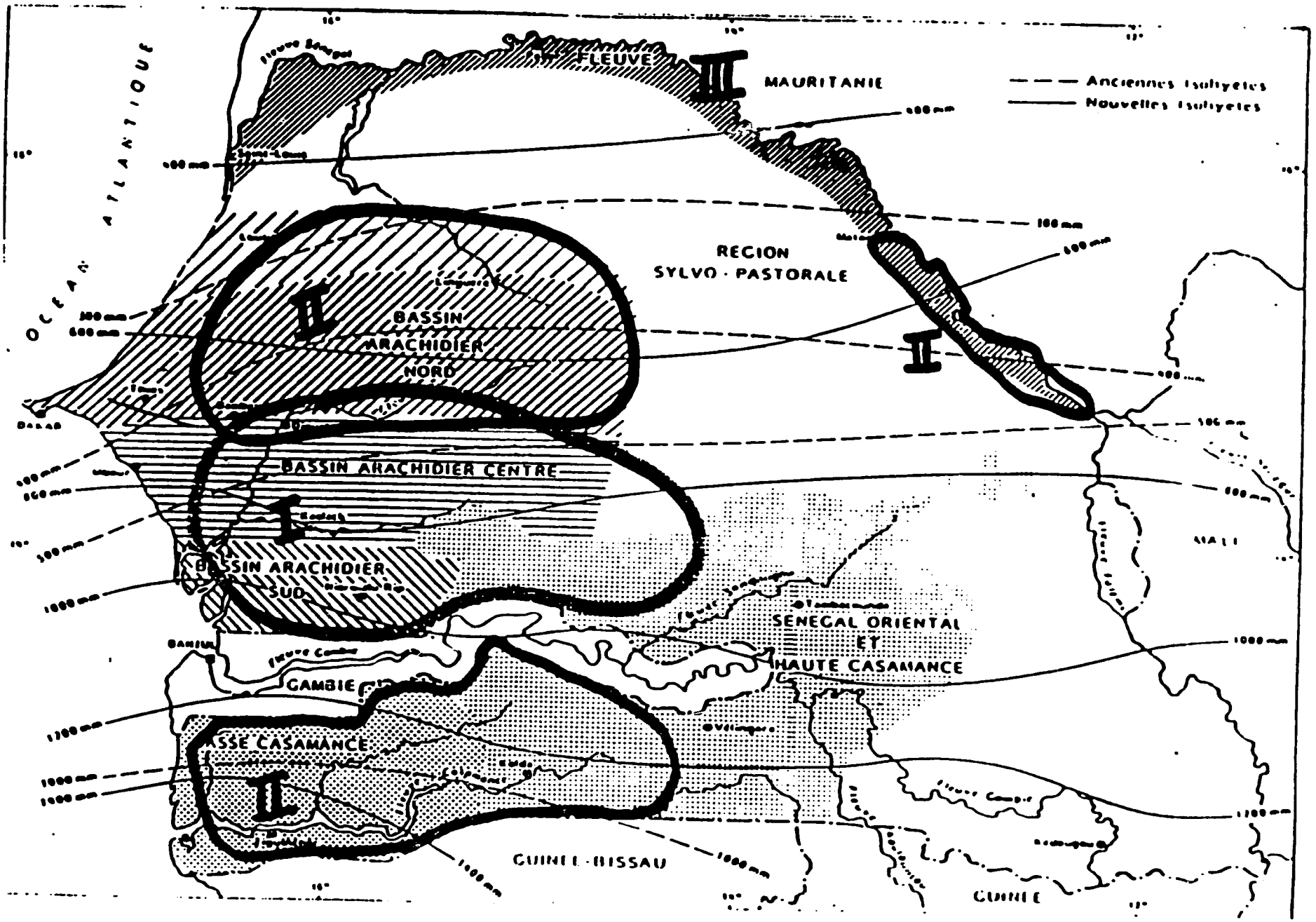
Needs (In excess of that presently available)
a. Equipment $900,000
b. Operations $900,000

VI. Aircraft

Needs
Estimated 1600 spray hours

VII. Donor Commitments - None at this time

SENEGAL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BASSIN
ARACHIDIER
NORD
BASSIN ARACHIDIER CENTRE
BASSIN ARACHIDIER
SUD
SENEGAL ORIENTAL
ET
HAUTE CASAMANCE
GAMBIE
BASSE CASAMANCE
GUINEE-BISSAU
GUINEE
MALI

SENEGAL

TABLE I - ESTIMATED HECTARES TO BE TREATED - 1987

Phase	Farmers (Dust)	CPS (Dust)	CPS (IIIV)	Aerial
I	160,000	30,000	80,000	100,000 to 200,000
II		40,000	100,000	500,000
III	10,000		100,000	100,000
TOTALS	170,000	70,000	280,000	700,000 -- 800,000

SENEGAL

TABLE II - AERIAL APPLICATION - 1987 (Est.)

Phase	U.S.	Canadians and Others
I (Early) Peanut Basin	150,000 ha	50,000 ha
Casamance		50,000
I (Late)and		
II Casamance		120,000
Matam-Bakel		60,000
Peanut Basin	90,000	180,000
III Clean-up Peanut Basin		100,000
TOTALS	240,000 ha 30%	560,000 ha 70%

SENEGAL

TABLE III - USAID STRATEGY - 1987

1. Early aerial intervention to reduce 2nd and 3rd generation.

2. Introduction of bait technology to reduce cost, reduce health hazard, improve control.

3. Guidance for Planning, Survey and Control.

4. Continuing evaluation of all operations.

5. Training of counterparts to reduce future involvement.

SENEGAL

Table IV

COST COMPARISONS

Type	Pesticide $/ha	Application $/ha	Transport $/ha	Total $/ha	Expected Control	Ha/hr
Farmers						
Dust	14-18		4	18-22	40%	.5
Bait	4		4	8	84%	.5
CPS						
Dust	14-18	4	4	22-26	50%	8
Bait	4	4	4	12	88%	8
ULV						
Malathion	2	4	0	6	90%	12
*Carbaryl	4.50	4	0	8.50	90%	12
Fenitrothion	3	4	0	7	90%	12
Aerial						
Malathion	2	3	0	5	90%	470
*Carbaryl	4.5	3.5	0	8	90%	450
Fenitrothion	2	3	0	5	90%	470

*Longer residual may justify additional cost

SENEGAL

TABLE V

RECOMMENDED STRATEGY

I.	Pre-control and Operation		$ 400,000
II.	Ground Control		
	Pesticides (520,000 ha)		
	In stock - 280,00 ha		
	Carbaryl Bait 100,000 ha	250,000	
	Fenitro 500 ULV 140,000 ha @ 8.00/l	560,000	
	Equipment	900,000	
	Operations	900,000	
		2,610,000	$2,610,000
III.	Aerial Application (800,000ha)		
	Pesticides		
	Fenitrothion 1000 ULV (600,000 ha) @ 10/l	1,500,000	
	Fenitrothion 500 ULV (200,000 ha) @ 8/l	800,000	
	Aircraft Operations	1,900,000	
			$4,200,000
IV.	Environment		100,000
			$7,310,000

SENEGAL - Follow Up

- Donated vehicles should be transferred to CPS for use in grasshopper control program
- Results of baiting need to be documented
- Operations Center needs to be functioning by early May
- Holes in communication net need to be filled
- Mission needs to examine whether counterpart funds can be used in this year's campaign
- An economic analysis should be undertaken to determine whether baiting or dusting is more cost effective.