

REPORT OF THE

**Held in Rome, Italy
12-16 October 1970**

FOURTEENTH SESSION OF THE FAO DESERT LOCUST CONTROL COMMITTEE



FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Meeting Report
No. AGP:1970/M/6

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Food and Agriculture Organization of the United Nations
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INTRODUCTION

The Thirteenth Session of the FAO Desert Locust Control Committee, which was held in Rome from 6 to 10 October 1969, recommended (Report, para. 96) that its next session should be convened in October 1970 to be preceded by a three-day meeting of technical experts. Accordingly, the Director-General of FAO invited the following Governments to be represented by delegates at the Fourteenth Session:

Afghanistan	Niger
Algeria	Nigeria
Bahrein	Pakistan
Cameroon	People's Republic of Southern Yemen
Central African Republic	Portugal
Chad	Qatar
Dahomey	Saudi Arabia
Ethiopia	Senegal
France	Sierra Leone
Ghana	Somali Republic
Guinea	Spain
India	Sudan
Iran	Syrian Arab Republic
Iraq	Tanzania
Israel	Togo
Ivory Coast	Tunisia
Jordan	Turkey
Kenya	Uganda
Kuwait	United Arab Republic
Lebanon	United Kingdom
Libyan Arab Republic	United States of America
Mali	Upper Volta
Mauritania	Yemen Arab Republic
Morocco	

He also invited representation of the United Nations Development Programme (UNDP) and the World Meteorological Organization (WMO). The League of Arab States, the Desert Locust Control Organization for Eastern Africa (DLCO-EA), the Organisation Commune de Lutte Antiacridienne et de Lutte Antiaviaire (OCLALAV) and the International African Migratory Locust Organization (OICMA) were invited as observers. In addition, he invited the following Governments and Organizations to send technical experts to take part in the three-day meeting which preceded the main session of the FAO Desert Locust Control Committee:

Ethiopia
France
India
Iran
Morocco
Pakistan
Sudan
United Arab Republic
United Kingdom
United States of America

and

DLCO-EA
OCLALAV

The Session was opened by Dr. O.E. Fischnich, Assistant Director-General, Agriculture Department, who, on behalf of the Director-General of FAO, welcomed the participants and stressed the importance of the matters to be discussed. He expressed satisfaction that all governments and regional organizations maintained sustained vigilance in the appropriate seasons and areas, had undertaken control measures whenever needed and thus helped to keep the recession in being. He emphasized the need for continuing this policy in future. He pointed out that, as recommended by the last session of the Committee, FAO had organized an extensive survey of the Red Sea coastal area and that a report was being submitted to the Committee for consideration and advice for future action.

He further pointed out that following the decision taken at the Thirteenth Session of the FAO Desert Locust Control Committee arrangements were made to discuss technical matters in a special meeting held the previous week. Its report had been prepared and was available to the Committee for discussions.

Officers of the Session

The Committee unanimously elected the following officers:

Chairman: Mr. Salah Jum'a (Jordan)

Vice-Chairman: Mr. Nezil Mahjoub (Tunisia)

Drafting Committee:

Delegates of Algeria, Ethiopia, France, Ghana, Pakistan and the United Arab Republic, and the FAO Secretariat.

Mr. Gurdas Singh, Mr. R.M. Skaf, Mr. P. Tirot, Mr. S.S. Pruthi, Mr. A. Khasawneh and Miss C. Hemsted of the FAO Secretariat served as Technical Secretaries.

Acknowledgments

Before the close of the session the delegates expressed their sincere thanks to Mr. Salah Jum'a for serving as Chairman of the Session and for his most able and sympathetic guidance of the discussions. The Committee also placed on record their appreciation for the efficient manner in which the FAO Secretariat had discharged its various duties.

The Committee recorded its deep appreciation for the most valuable services rendered by Mr. M.F. Leheta during his assignment with FAO as FAO Regional Officer, Jeddah, and FAO Inter-Regional Officer, Beirut, and in particular, the delegates referred to the important role played by Mr. Leheta in promoting the establishment of the Commission for Controlling the Desert Locust in the Near East. It was due to his endeavours that all the countries of the Near East were represented at the First Session of the Commission.

Obituary

The Committee paid tributes to late Sir Boris Uvarov whose death had deprived the science of entomology of one of its eminent men, best known for his work on the phase theory of locusts.

On the establishment of this Committee he was appointed its first Consultant and played a major part in various international meetings. In 1959 he retired as Director of the Anti-Locust Research Centre, London,

but remained as a Consultant and began a new book on grasshoppers and locusts. Its first volume was published in 1966 and he was working on the second volume until shortly before his death. The Committee pointed out that he would have wished nothing better for his memorial than that the work he had begun and fostered should continue and expand.

PARTICIPATION IN THE SESSION

The following delegates from Member Nations of the Food and Agriculture Organization of the United Nations and Specialized Agencies, observers and members of FAO staff participated in the Session and contributed to the discussions summarized in this report.

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AGENDA

1. Opening of the Session
2. Election of the Chairman and Vice-Chairman
3. Adoption of the Agenda
4. Election of the Drafting Committee
5. The Desert Locust Situation during 1969/70 and Forecast
6. Progress Report of the UNDP(SF) Further Assisted Desert Locust Project (1.5.1969 - 30.6.1970)
7. Anti-Locust Measures Undertaken by Various Countries and Regional Organizations (November 1969 to September 1970)
8. Matters Arising out of the Thirteenth Session of the FAO Desert Locust Control Committee:
 - (a) Consideration of the Report of the Technical Consultation;
 - (b) Special Survey Report of the Red Sea Coast during Winter/Spring of 1969/70;
 - (c) Requirements of Different Countries for Training of Technical Personnel in Various aspects of the Desert Locust Problem;
 - (d) Report on Insecticide Residue Studies.
9. Status of Various Desert Locust Regional Organizations:
 - (a) South-West Asia
 - (b) Near East
 - (c) Eastern Africa
 - (d) North-West Africa
 - (e) West Africa
10. International Desert Locust Trust Fund 161
11. Other Business
12. Date and Place of Next Session
13. Adoption of Report.

SUMMARY OF DISCUSSIONS

Desert Locust Situation from October 1969 to September 1970

1. The Committee had before it a summary of the Desert Locust situation prepared by the Desert Locust Information Service (DLIS). This was brought up-to-date by information supplied by the delegates.

General Features

2. Locust numbers declined rapidly in late 1968 and early 1969. A recession became established. Once again the need was to recognise upsurge situations and take action to prevent these from developing into a plague. The largest infestations during the period August 1969 to September 1970 were in Western Africa. Here, exceptional rains allowed a succession of successful breedings. As a result, a potentially dangerous situation had developed which, if unchecked, might well lead to a sequence of swarm breeding.

Western Africa

3. Scattered locusts invaded west-central Mauritania in June and July 1969 and started to breed there. Rainfall in the summer was heavy in this area and there was a good cover of vegetation. In consequence, the hoppers were very dispersed and so were difficult to detect and to control. Rain continued to fall and breeding continued in the autumn of 1969 in an unusual manner. Control was carried out from August to December.

4. The adults from this breeding, which survived control, migrated in a northward direction and scattered locusts were reported in northern Mauritania and extreme western Algeria in January, February and March 1970. Exceptional rainfall occurred early in 1970 in both these areas as well as in Spanish Sahara. It was thought that the most important breeding was taking place in Spanish Sahara, and this was confirmed by a special survey of the southern part of that country carried out in late March and early April. Several bands and areas infested with hoppers at lower densities were found. In late April the first adults from this breeding invaded southern Mauritania. In May, a number of small swarms were reported mainly by local people but subsequently the number of sightings decreased and it was likely that the swarms dispersed.

5. In north-eastern Mali and north-western Niger a similar sequence of events had occurred. Although rainfall in the Adrar des Iforas, Tamesna and Air areas in the summer and autumn of 1969 was neither as heavy nor as widespread as in Mauritania, significant amounts of rain were nevertheless recorded at some stations and breeding was prolonged. As in west-central Mauritania, the infestations were mainly dispersed and difficult to attack but the scale of infestation was certainly smaller. Small numbers of adults persisted, especially in Tamesna of Niger, throughout the winter but most of the locusts which survived control were likely to have migrated generally north-westwards, mainly to southern and central Algeria.

6. In Algeria control on a small scale was carried out in April and May against young adults and hoppers.

7. However, substantial rain did fall in late May in the Adrar des Iforas of Mali. Small groups of adults reached the Adrar des Iforas and along with the populations already existing laid following the rain of late May. Breeding here had been highly successful and extensive control of the hoppers and young adults was undertaken. The campaign lasted through June, July and early August. In all 47,828 hectares had been controlled. By mid August fledging was effectively at an end, but a second summer breeding

had further started. This second summer breeding had been on at least as large a scale as the first one. In September about 47,000 hectares were controlled in the Adrar des Iforas.

8. Few locusts were reported from Chad and Libya.

Eastern Africa

9. Eastern Africa had been almost free of locusts throughout the period under report. In December 1969, January and March 1970, scattered adults were found in the coastal area of south-eastern United Arab Republic but these locusts did not appear to have survived and bred. An infestation estimated to number five million mature adults was found on the Red Sea coastal plain of Ethiopia near the Sudan border in late February and early March. In addition, a few locusts were found on the coastal plains of Ethiopia and Sudan in March and April. The only locusts discovered in the summer breeding area of Sudan were two adults reported in August.

Near East

10. In the Arabian Peninsula very few locusts were reported. Numbers on the Tihama of Saudi Arabia and the Yemen Arab Republic as well as the coastal plain of Southern Yemen were very small throughout the winter and spring. Very few locusts were known to have been present in the spring breeding areas of central and northern Saudi Arabia. However, exceptional heavy rains fell in July over the mountains of the southern Hejaz, Asir, Yemen and western Southern Yemen, resulting in suitable conditions for breeding. Exceptional rain had also fallen in the normally arid southern areas of Muscat and Oman. There were substantial falls in early June produced by a tropical storm and further falls in mid August. Between these two major spells of rain there was evidence of further falls in some places. Certainly conditions had been suitable for breeding but it was not known if any locusts were present to take advantage of this.

South-West Asia

11. The locust situation in the Indo-Pakistan desert area was quiet in the summer of 1969; a few adults persisted in Rajasthan, India, during the winter. Breeding in Baluchistan of Pakistan in the spring of 1970 was on a small scale but continued into the summer; a few hoppers were found in the Dasht Valley in Pakistan in July. During 1970 widely scattered adults were found in the summer breeding area of India and Pakistan but everywhere in very small numbers. Rain in July and early August over parts of this area had been sufficient for breeding but no significant infestations resulted.

Forecast

12. In western Africa it was likely that scattered young adults resulting from breeding in the part of Mauritania south of about 18°30' north had started to move northwards. Recently substantial rain had fallen in southern Mauritania and southern Spanish Sahara, and it was likely that scattered breeding was now in progress in southern Spanish Sahara and adjacent parts of Mauritania.

13. Scattered young adults in substantial numbers were likely to result from summer breeding in north-eastern Mali, north-western Niger and parts of southern Algeria. The heaviest infestations had recurred in the Adrar des Iforas of Mali. One or two small swarms might form here. Both the swarms and the scattered adults were likely to move northwards and north-

westwards. The scattered locusts would reach the Ahaggar area and areas to the north and west although some scattered adults would persist in north-eastern Mali and north-western Niger. Scattered locusts might reach western Algeria and adjacent parts of northern Mali and southern Morocco. One or two small swarms might reach southern Morocco and the northern part of Spanish Sahara.

14. In eastern Africa scattered adults in small numbers were likely to occur on the Red Sea coastal plain of Ethiopia and the adjacent coastal plain of Sudan, and scattered laying might take place.

15. In the Arabian Peninsula scattered adults in small numbers would appear on the coastal plain of Southern Yemen and the Tihama of Yemen and Saudi Arabia and small scale breeding was likely to take place. Scattered hoppers were likely to be present in parts of the interior of Muscat and Oman, particularly in the wadis draining from the Hajar mountains towards the interior where a few bands might occur. Two generations of breeding were likely to have occurred as a result of exceptional summer rains in this area. Scattered adults were likely to result and migrate westwards.

16. Scattered young adults would result from widespread but low density breeding in the summer breeding area of India and Pakistan. Most of these adults would migrate to winter/spring area of Baluchistan of Pakistan and Iran.

Control Operations Undertaken in Various Countries from October 1969 to September 1970

17. With the exception of Western Africa there had been a general decline in the locust activity during the period under report. Control operations were only undertaken in Algeria, Mali, Mauritania and Niger where a total infested area of 112,527 hectares was treated using 50.9 tons of BHC bait and 67,498 litres of various liquid insecticides, as given below:

Country	Period	Area treated (ha) adults and hoppers	Insecticides	
			Tons/bait	Litres/Liquid
Algeria	April/May 1970	1,130	48.5	
	Aug/Sept 1970	46	2.4	
		1,176	50.9	BHC bait
Mali	November 1969	184	140	Dieldrin 5%
	December 1969	40	25	Dieldrin 5%
	June 1970	11,720	2,000	Dieldrin 20%
			6,355	Dieldrin 5%
	July 1970	29,970	4,590	Dieldrin 20%
			16,675	Dieldrin 5%
	August 1970	6,136	3,845	Dieldrin 5%
			680	Dieldrin 20%
	September 1970	45,795	13,905	Dieldrin 5%
			9,760	Dieldrin 20%
		93,845	57,975	

p.t.o.

Country	Month	Area treated (ha) adults and hoppers	Insecticides	
			Tons/bait	Litres/Liquid
Mauritania	October 1969	11,570	6,825	Dieldrin 5%
	November 1969	2,820	175	Dieldrin 20%
			590	Dieldrin 5%
	December 1969	210	110	Fenitrothion
	January 1970	1,835	165	Dieldrin 20%
			1,065	Dieldrin 5%
	February 1970	605	305	Dieldrin 5%
	March 1970	103	38	Fenitrothion
		17,143	9,268	
Niger	November 1969	363	255	Dieldrin 5%
TOTAL		112,527 ha		
		50.9 tons BHC bait		
		67,498 litres of Dieldrin 5% and 20% + Fenitrothion		

18. The Committee, recognizing the potentially dangerous situation in Western Africa and the importance of scattered populations in other areas, emphasized the need for constant vigilance and adequate control measures, particularly in Western Africa, and for maintaining sustained surveillance in all other areas during the appropriate seasons. The Committee reiterated its earlier recommendation that all Governments and regional organizations should take adequate measures to ensure control of any infestations in future in their respective areas, even if these were not of immediate economic importance.

Resources Available for Anti-Locust Operations

19. The Committee at its Twelfth Session requested FAO to keep under review the availability of resources for anti-locust operations with the various national and regional organizations. Accordingly, the information was collected and is given in Appendix IV.

Progress Report of the UNDP(SF) Further Assisted Desert Locust Project (1.5.69 - 30.6.70)

20. The Eleventh Session of the FAO Desert Locust Control Committee approved proposals for a further extension of the UNDP Assisted Desert Locust Project from 1.5.68 to 30.6.70 to permit the implementation of certain stated objectives of the Project which it had not been possible to complete during the period from June 1960 until April 1968. These objectives fell under the following main chapters of the Project:

- (i) Reporting and Forecasting
- (ii) Survey and Reconnaissance
- (iii) Research

Reporting and Forecasting

21. During the period under review, the FAO Radio Communications Officer visited Afghanistan, Bahrein, Iran, Morocco, Southern Yemen, Syrian Arab Republic, Tunisia, Trucial States, United Arab Republic and Yemen Arab Republic to assist in installation of further radio sets and for imparting training in operating such equipment.

22. On request from Governments, additional equipment was supplied and/or ordered for Bahrein, Mauritania, Morocco, Qatar, Southern Yemen, Syrian Arab Republic and the Trucial States. By 30 June 1970 part of the equipment was still undelivered to a number of countries. Appendix II summarizes the situation as at 30.6.70 and the map gives an idea of the entire international radio network.

23. An interesting development was the link-up of direct communications between Yemen Arab Republic, Southern Yemen and DLCO-BA headquarters in Asmara. It was hoped to develop this policy also in other neighbouring countries facing the same problem.

24. Training: The training courses held during 1969 in Algiers and Baghdad, in collaboration with ITU, proved highly beneficial to the participants of a number of countries. There were, however, a certain number of governments who were unable to nominate candidates due to want of suitable persons with the required educational qualifications and linguistic background. It was, therefore, decided to conduct a special course, in cooperation with ITU, for Arabic speaking trainees.

25. At the kind invitation of the Government of the Yemen Arab Republic, the course was held at the Agricultural Centre in Sana'a from 1 March to 20 April 1970. Six participants from Somalia, Southern Yemen and the Yemen Arab Republic attended the course.

26. Desert Locust Information Service (DLIS): The Desert Locust Information Service continued to provide the monthly locust situation summary and forecast to the governments and organizations concerned.

27. Meteorological and Climatic Studies: A document containing statistical information on the number of days of 10 mm of rain and more, covering the entire Desert Locust area, had been published.

Research

28. Field Research Stations: Close contact was maintained with the field research stations with a view to assisting them in planning their programmes and obtaining information regarding the work completed at such stations. A report on this had been compiled and circulated for information to all concerned.

29. Advisory Visits: At the request of the Government of Iran an advisory visit was arranged for an expert from Pakistan to visit Bandar Abbas research station in Iran for a period of one month. On the basis of his recommendations, additional equipment was supplied to this station and the work reoriented keeping in view the facilities and the technical competence of the available staff.

30. High-Level Training: Mr. A.M. Nacro of Upper Volta, who continued his fellowship at the Faculté d'Orsay, Paris, would complete his studies by 1971. During this period he would spend one month at the Anti-Locust Research Centre, London. Mr. K.J. Musa of the Somali Republic and Mr. A.M.A. Karrar of the Sudan were admitted at the Imperial College, London, in October 1969. Mr. F.R. Kalcuttawy of Saudi Arabia had to discontinue his studies after the period of one year.

31. Sampling of Insecticide Residues: In view of the concern expressed by various Member Nations of FAO on the use of persistent insecticides for locust control, it was considered necessary to find out the possible residues in soil, vegetation, etc. of the areas sprayed during the last upsurge. This work was initiated in cooperation with the DLCO-BA and a large number of samples were collected and were being analyzed. Detailed results would be published as soon as possible.

32. Technical Series: Research workers at the various field research stations continued to present papers for publication. Altogether, during the period under review, 14 technical papers were received, edited and published in the Technical Series. The Series had been widely circulated and had aroused considerable interest among research workers. Subject to the availability of funds it was proposed to continue this publication in future.

33. Disposal of Equipment: Action for the transfer of title of equipment was suspended until all items supplied under the Emergency Allocation were included. By a letter of 6 April 1970 the UNDP authorized the transfer of Emergency Allocation items on the same basis as equipment supplied previously. However, by 30 June 1970 not all deliveries had been effected. Consequently, the formalities of transfer of title to the recipient countries and regional organizations would take place when deliveries were completed.

Emergency Measures

34. By July 1969 it was recognized that the emergency assistance provided by the UNDP through FAO had achieved its immediate purpose, namely prevention of the outbreak from spreading. At a meeting between representatives of the UNDP and FAO, consideration was given to what further measures were needed to terminate the upsurge and keep locust populations below a dangerous level in future. It was recognized that there were four areas of key importance requiring further UNDP/FAO assistance. Accordingly, the following supplementary assistance was provided:

(a) West Africa (OCLALAV)

Personnel - Provision of a Consultant for 2 months with local supporting staff;

Equipment and supplies - Ten additional vehicles to replace those worn out during recent control activities; equipment to the value of \$11,000 for the establishment of a field research station in Mali;

Aerial operations - Provision (on loan) of one Dornier aircraft fitted with spraying gear, to be placed at the disposal of OCLALAV which would be responsible for the crew, and other operational costs, including periodical major overhaul;

Training - Fellowships of 3 months each for 4 OCLALAV trainee pilots.

(b) People's Republic of Southern Yemen

Personnel - 1 Locust Officer for 12 months;

Equipment and supplies - 4 vehicles, 2 radios, 1 micronair and other control equipment:

insecticides: 20 tons BHC dust
600 IGS Dieltrin 20%
250 IGS BHC 15% liquid

Local operating costs - Blanket provision of \$10,000 for salaries of local personnel; travel subsistence and incidentals on surveys; POL and maintenance of vehicles, etc.

(c) Yemen Arab Republic

Equipment - 6 vehicles and 5 radios;

Local operating costs - Blanket provision of \$10,000 for salaries of local personnel; travel subsistence and incidentals on surveys; POL and maintenance of vehicles, etc.

(d) Aerial photography - An amount of \$40,000 was earmarked for further experimental work on the detection of non-swarmling locusts by aerial photography. This would be a follow-up of the experimental work undertaken in 1968, the results of which were reviewed by the Consultation on Desert Locust Field Research, held in Beirut in March 1969, which strongly recommended the continuation of research in this field.

35. The total amount made available by the UNDP for the above operations was \$328,300 including \$32,500 for Agency Overhead Cost. Immediate steps were taken for the implementation of the above.

Assessment of the Situation - June 1970

36. Project operations were scheduled to end on 30 June 1970 but the Project had been extended for further six months for winding-up operations. This work of so vast a Project would extend over a period of between 1 to 2 years including such matters as disposal of equipment, completion of fellowships awarded, editing, translation, publication of technical reports, general assessment of projects and publication of a report covering the extension period.

37. The nature of the Desert Locust problem was such that action by individual governments alone would never be sufficient. Survey, control, research and training should continue at the national and regional level and in this respect the various regional bodies would assume responsibilities within the scope of their financial resources. FAO would, nevertheless, continue to play its role in providing coordination and guidance in research, survey and control, in acting as a "clearing house" for information on aid-giving and aid-receiving countries and/or agencies, in identifying needs and availability of resources at national and regional basis; in

providing assistance for initial emergency action; and in servicing various Commissions, Committees, Panels, etc.

38. At the international level FAO would continue to publish the Desert Locust Newsletter and other technical publications from time to time; in addition, provision was made under International Trust Fund 161 for contributing to the cost of the Desert Locust Information Service (DLIS) and for other services or activities of international nature, in conformity with the draft budget approved (para. 96).

39. Of the 42 governments participating in the Project, there would be a few that from time to time would need further assistance in the strengthening of their own locust organizations. At the time of closure of the Project some Governments were in fact still receiving assistance from the UNDP. The Committee hoped that the UNDP would continue to maintain their interest in the locust problem and provide assistance to various countries as demanded by the locust situation and their requirements.

40. The Committee, while noting that the UNDP(SF) Assisted Desert Locust Project would be finally concluding on 31 December 1970, unanimously expressed its appreciation of the very valuable assistance provided by the UNDP over the past ten years and recognized that various advancements and a very considerable degree of international cooperation in every sphere of the Desert Locust research and control which existed today were made possible through this Project. The Committee availed themselves of this opportunity to pay tributes to all those who had contributed to the success of the Project.

Technical Matters

41. The Committee considered various technical matters which were discussed in detail by a group of experts prior to its session and adopted the recommendations contained in paragraphs 42 to 63.

The Role of Control in the Decline in Numbers of the Desert Locust in Late 1968 and Early 1969

42. The Committee welcomed the study made by the Anti-Locust Research Centre on the above subject and noted that in mid 1968 it seemed that a plague of the Desert Locust had started. Swarms invaded Mauritania and the summer breeding areas of India and Pakistan in late July; swarm breeding was in progress in northern Ethiopia; more important swarms resulting from spring breeding in Saudi Arabia had invaded the south-west of the Arabian Peninsula. Yet by mid 1969 virtually no bands or swarms were reported and since then few swarms had been seen and those that had been sighted were probably all small. Such swarms and bands as had formed since mid 1969 were unlikely to have a history of persistent gregarious behaviour linking them with the swarms of mid 1968.

43. The Committee noted that a full study on the role of control in the decline in Desert Locust populations had not yet been completed. However, by March 1969 the entire coherently swarming population had ceased to exist. On the basis of available information on the control operations undertaken, this had been to a very large extent due to man's action without which the plague could have continued. Nevertheless, natural factors might have played a certain role; this was difficult to evaluate due to lack of information and study. In future, detailed observations might be necessary to obtain a more precise answer in this respect.

44. The Committee underlined the importance of properly coordinated and timely control operations undertaken by various national and regional organizations, duly assisted through various sources, since these had played a major role in producing a recession of the Desert Locust. In addition, they recommended that emphasis should be laid upon continuous surveillance in all areas and control of dangerous locust populations if chances for future resurgence of plagues of the Desert Locust were to be averted.

Survey and Assessment of Desert Locust Populations not in Swarms or Hopper Bands

45. At its Thirteenth Session the FAO Desert Locust Control Committee, while discussing the surveys conducted as part of the long-term strategy of Desert Locust plague control proposed by FAO (Report, para. 66), noted that so far no standard method had been applied for making objective estimates of locust populations, though a number of techniques of varying validity and under different conditions were in use. The Committee, therefore, recommended that the various regions should send to FAO details of the method used in assessing and reporting locust populations in their respective areas. On the basis of this information FAO was asked to appoint an expert to study the whole question and to recommend the best method which could be applied in all regions. Accordingly, a short-term consultant was appointed to review this question.

46. The Committee considered the report submitted by FAO on the subject and reviewed the different methods of estimating the density and the size of locust populations in current use. The salient feature emerging from this review was the great diversity of approach and a lack of standardisation not only in the methods of quantitative assessment and recording of locust populations but also in the methods of surveys themselves. The impression was that, while the complexity of the Desert Locust problem was certainly the underlying cause, some of the diversity and confusion could be due to a lack of general agreement about the objectives and purposes of the survey.

47. With a view to ensure an effective plague prevention strategy, the surveys while endeavouring to locate any gregarious populations which might be present, had also the task of discovering and assessing the importance of locust populations not in swarms or bands, so as to ensure early destruction of any populations deemed to be potentially dangerous. The best approach to fulfil this was (a) to concentrate on surveying the seasonal breeding areas at appropriate times, (b) to locate the probable locust habitats resulting from recent rainfall and (c) to look for locusts within them. Since the area to be surveyed was large and rapid transport was required, stage (b) was most easily and efficiently performed by aircraft and since the recession populations were often cryptic and invisible from the air, stage (c) required ground survey.

48. Based on the experience gained, the Committee considered that the following procedure for the assessment of Desert Locust populations could be profitably adopted:

Assessment

49. (a) Adult Populations: Vehicle transects were appropriate in all areas and habitats where there was no hindrance in the use of motor vehicles. Flushability would vary with the vegetation of the habitat, the weather and the age and physiological condition of locusts, but once it had been estimated for given conditions, valid population estimates should be possible.

Calibration for different conditions was required and was best left to an experienced scientist. In the meantime the equivalent strip of 1.20 m (based on counting only the locusts rising directly ahead of the vehicle) established for a Land Rover in open annual steppe vegetation up to 1 m. height and 50% cover would probably fit reasonably well with most conditions found in the Desert area with the possible exception of the tall dense grasslands, and dense tussock-grass steppes of e.g. Panicum turgidum. Distribution was often patchy and this patchiness was important in bringing about early aggregation. For this reason counts were best done in 100 m. lengths and for this purpose a hectametric speedometer counter was essential. Foot transects were appropriate in all cases where a vehicle might not be used.

- (b) For translating the figures obtained from the counts into area densities, it was considered that the measure used should allow estimation of the smaller ecological units such as patches of vegetation in wadis, dunes, depressions and fields where locusts were frequently found. Therefore, an hectare (100 x 100 m) would be a more realistic unit by substituting the distance of one hectare for one kilometre. The area of the infestation should be given in all cases as well as the density.
- (c) Hopper Populations: Solitary living hoppers were inconspicuous and might not be found except by careful examination of the vegetation, usually requiring search on foot. The sample and the unit used depended on the pattern of the vegetation of the habitat. If the vegetation was in the form of isolated bushes, tussocks or clumps, it was simpler to use these as a unit and to count the number of hoppers in so many of such individual plants or units. To establish the density of hoppers per unit area, it was then sufficient to calculate the number of plants per unit area. Where the vegetation formed a mat or a carpet, it was easier to count the hoppers per unit area, the most convenient one being the square metre. The area of the infestation should be given in all cases as well as the density.
- (d) Proposed Standard Form for Reporting: The most effective way of standardizing surveying and reporting procedures and techniques was the adoption of an agreed form of report with recommended subject headings and instructions about the manner of conducting and recording field observations. For this purpose, the Committee approved the form (Appendix I) for adoption by all concerned.

50. The Committee recommended that the above procedure of assessing and recording locust populations should be tried for a period of one year to begin with, and requested national and regional organizations to put up suggestions for any modification of this procedure based on the experience gained. At the same time the Committee emphasized the need for providing training in the various regions on the method of survey, assessment and recording of populations, with the view to facilitate adopting the new procedure.

51. The Committee recognized that general-surveys did not allow time for prolonged studies at any one site, and recommended that the results of such surveys would be particularly enhanced if repeated visits were arranged to the population sites with a view to study on a number of successive occasions during the season the progressive development and changes in the population and the habitat. This would further help in understanding the phenomenon of gregarization and dissociation.

Control of Locusts by Insecticides and Other Alternatives

52. The Committee's attention was drawn to worldwide concern over the use of persistent organochlorine insecticides for the control of insect pests and of the anxiety expressed by some countries over the continued use of such insecticides in locust control. It was noted that dieldrin and BHC the two insecticides mostly employed in locust control, were used safely and effectively for many years. Moreover, the quantity of dieldrin, the most persistent, used for locust control during the recent years had been negligible in relation to total worldwide use. Dieldrin was used mainly against locust hoppers outside cultivations by trained personnel applying specialized methods of application, using extremely low dosages of 10-20 g/ha. While other insecticides could be used for hopper control, the cost of application would be very high. The same was true if BHC in oil solution was to be replaced by some other insecticides for swarm control.

53. The Committee recognized the need for finding alternative insecticides and the importance of carrying out laboratory and field trials on some new compounds and recommended that this work should be carried out whenever facilities were available. The Committee noted with satisfaction that a project on "Study of Toxicological and Residue Implications of Using Alternative Chemicals for Locust Control in East Africa" had been established under FAO/SIDA Cooperative Programme to undertake research at DLCO-EA Headquarters in Asmara and hoped that, in view of the importance of this work, additional resources and staff would be available to expand and expedite the work particularly on finding alternative compounds. While work in this direction proceeded, research should also be undertaken to reduce further the already existing low dosages of insecticides required for locust control leading to increased safety margin.

54. The Committee was of the opinion that, in view of the availability of stocks of insecticides with the various national and regional organizations, it would be necessary to continue to utilize the existing insecticides for control of locusts with emphasis on their proper and safe use until such time alternative insecticides equally effective and economical for large-scale application were found.

55. The Committee also considered the use of possible alternative methods of control by chemosterilants and through the use of hormones and pheromones, either to kill the insects immediately or acting by indirect means to prevent their reproduction or development. It was emphasized that all these ideas were still in their infancy and that research work for a number of years would probably be necessary before it was likely to be practicable.

Desert Locust Information Service (DLIS) - Summary

56. The Committee considered the revised version of the DLIS Summary and agreed that the new format, without the forecast map, might be tried for a period of six months, and thereafter FAO, having received comments from various Governments, should give consideration to any modification and its subsequent continuation on the basis of the experience gained.

Aerial Photography

57. The Committee, having noted that the trials undertaken during 1968 on detection of low density Desert Locust populations by aerial photography had given encouraging results, recommended at its Thirteenth Session that further trials should be continued and calibrated against observations on Desert Locust behaviour. Accordingly, trials were carried out in March/April 1970 in Mauritania.

58. In comparison with the trials carried out in 1968 a number of technical improvements, both in the techniques and method, had been achieved. The introduction of the Bimat process had enabled the development of films on the spot. As a result of the utilization of the improved altimetric radar and the introduction of a spacer in the camera, it was now possible to take photographs at a scale 1:100 which were sharp and without ground movement blurs.

59. The success in obtaining maximum detection of Desert Locust populations was directly related to the behaviour of the insects at the time of taking photographs. It was found that maximum percentage of locusts was visible on a hot calm day at about 9:30 hours with air and ground temperatures at 22°C and 28°C respectively. On the other hand, on a windy and cool day locusts remained hidden up to 11:30 hours with air and ground temperatures reaching 20°C and 35°C respectively. In the latter case, locusts still hidden under the vegetation could be as much as 20% to 30% of the total population. It was indispensable to take photographs while the sun was relatively low (about 50°). Lower sun heights were not desirable otherwise the shadows cast by the vegetation became too elongated, masking the small denuded interplant zones.

60. It was found that the results obtained from aerial photography at a scale of 1:100 under best conditions of locust visibility were comparable to those obtained by ground surveys, whereas those photographs obtained on 1:200 scale were four times less. It was also seen that the image of the flying locust could easily be identified on the photographs. Based on this, a new photographic technique could be developed. A low flying aircraft could induce flushing of high proportion of the hidden insects which could be photographed with a camera placed at an appropriate position and angle of the aircraft.

61. The Committee, while noting the encouraging results obtained from this trial, recognized that further work to improve the operational aspect of this method was necessary and recommended that upon availability of funds further work on this project should be continued. The Committee further noted that certain developments were taking place in space and airborne research which was likely to provide extremely useful information on ecology, soil moisture, rainfall, etc.

Radar

62. The Committee considered a report submitted by the Anti-Locust Research Centre. It seemed that radar at present was a complex and sophisticated piece of equipment and needed the services of a highly skilled technician for its operation and analysis of results. At this stage it could only be considered as a research tool particularly for studying night flying of solitary locust populations. It was, however, not possible at present to define its use in future for operational purposes. The Committee learnt that the radar equipment was going to be used in Australia for detection of locust populations and evinced keen interest in the results obtained.

Infra-Red for the Detection of Locusts

63. The Committee received a report on the laboratory studies made by the Anti-Locust Research Centre on the use of infra-red radiation to detect locusts. The Committee noted that emission from locusts in the infra-red covered a wide range and a similar range to that of the likely locust habitats. In a similar way locusts proved not to have distinct reflectance characteristics different from their likely background. There thus seemed little chance of detecting locusts by infra-red methods.

Cost Benefits

64. As many new remote sensing techniques were being devised, it was important to know not only the technical merit of the approach being tested but also its economics as compared to other new as well as conventional methods.

Report on the Special Survey of the Red Sea Coast during Winter/Spring of 1969/70

65. In accordance with the recommendations of the Thirteenth Session of the FAO Desert Locust Control Committee (Report, para. 68) and on the basis of a draft plan of operation, FAO in collaboration with the respective national and regional organizations organized a special survey of both sides of the Red Sea during winter/spring of 1969/70 and submitted a detailed report.

66. The Committee appreciated the joint effort made by all concerned and was impressed by a very comprehensive report presented on the subject.

Eastern Red Sea Coast

67. The main objectives of this operation were to locate and control Desert Locust infestations, even those not of immediate economic importance, to prevent any accumulation and build-up of populations. It was realized that for the sake of uniformity and easy comparison, it was necessary to adopt some common procedure in assessing and reporting locust populations during the Special Operational Survey of the Red Sea coastal areas. With this in view, an informal meeting was held in Asmara of the various technical people directly concerned with the survey on both sides of the Red Sea and in South Yemen, and a common procedure was adopted.

68. At the Thirteenth Session of the Committee it was pointed out that in certain countries resources and/or technical staff might not be available with the national organizations for survey of strategically important breeding areas and it might be necessary to provide outside assistance in such cases. Accordingly, FAO secured the services of two Locust Officers from the United Arab Republic for Yemen and two each from Jordan and Pakistan to work in Saudi Arabia during the survey operations under review. In addition, a consultant was appointed for a period of three months to assist and advise in the conduct of a survey on the eastern Red Sea coast.

69. During January three adults were reported in Jizan area and another three in Arafat near Mecca. In February, 20 individuals per sq. km. were reported in 200 x 40 sq. km. in Qunfida area. During this month scattered locusts numbering about 15 were reported in Jizan over an area of 130 kms. In March, one locust was observed in Qunfida and three solitary locusts were reported from Badr area (Northern Tihama). During this period the north-eastern part of Saudi Arabia (Hail and Lina) was surveyed by the Pakistani mission but no locust activity was reported. In April a few

scattered locusts continued to be present in Qunfida area and ten mature solitary locusts were observed in Badr area at the end of that month. During May a few scattered adults and some hoppers of fourth instar were reported in Wadi Fatmah near Mecca.

70. Drought conditions prevailed in South Yemen during January and February. In March, reports of rains were received from Hadramaut and the north-eastern parts of the country, and scattered rains were reported in the western provinces. Again in April scattered rains occurred along the western and eastern coasts and in some area of Wadi Hadramaut. Vegetation was dry along the coast during the whole period. During February and March only perennial bushes were green in the beds of wadis in the highlands. In April conditions had improved in the wadis of the eastern provinces.

71. Surveys were planned on the basis of the rainfall reports and were carried out in the western provinces in January and February; in the western and eastern areas up to Hadramaut in March and extended up to Thamud and borders of Rub-Al-Khali and Dhufar in April. During the whole period scattered isolated locust adults were observed in Wadi Sahaihia (13 January), Nisab and Qarn Murshed (Lodar) (4 February), Qarn Murshed (Lodar) (13 March), Nagd (Mahara) (13 April), Wadi Biwat Al-Manahil (17 April) and in Wadi Rama (18 April).

72. In the Yemen Arab Republic the coastal areas along the Red Sea, from Midi in the north to Bab El-Mandab in the extreme south, were surveyed from 1 January to 15 April. A survey of the highland areas was also undertaken from 15 April to 15 May 1970. In all, a distance of about 4,000 km. was covered during both surveys. During the period under report the country on the whole received rainfall below average with the result that annuals were rare while perennials were green in some parts and dry in others.

73. During the survey there were a number of ecologically suitable areas but no locust was found with the exception of two locust specimens collected between Behith and Ibbs (1600N - 3310E) on 12 and 13 March. These specimens were grey in colour with yellowish hind wings with solitary characteristics. During the survey of the coastal areas the prevailing wind was southerly and south-easterly. No locust was, however, found in the highland areas.

74. The Committee noted that, due to exceptionally favourable conditions during the end of 1967, there was rapid multiplication of Desert Locust populations in Southern Tihama (Saudi Arabia) resulting in hopper bands and swarmlets. The local breeding was augmented by some invading swarms in early 1968 from outside. Again in the winter/spring of 1968/69 solitary populations were present in different localities along the coast and some hopper bands were also observed, which were subsequently controlled by aerial spraying. As a contrast to the above, solitary populations during 1969/70 were almost absent although Southern Tihama had equally favourable ecological conditions as in the past years. It was rather difficult to explain precisely the circumstances which led to this unusual situation. The absence of any significant locust populations in Southern Tihama could be attributed to spraying undertaken over a million acres in April 1969. Only few locusts could have survived which, it may be said, produced very low populations observed in the Southern Tihama during winter/spring of 1970. Otherwise, fairly high populations could have resulted as breeding conditions continued to be favourable during the spring of 1970.

75. The Committee made special mention of Lith-Qunfida sector (Saudi Arabia) where even during the period under review some scattered individuals were found when the locust population was almost absent in other areas. This confirmed the observations made during the previous years. It was considered that in future special attention should be paid to this area.

Western Red Sea Coast

76. A survey team composed of Ethiopian anti-locust officers and DLCO-EA staff kept the Red Sea coast under constant watch both by air and ground surveys from November 1969 to April 1970.

77. Aerial surveys were conducted at intervals from 11 November 1969 to 22 May 1970 in order to spot possible breeding areas with a view to assist ground survey teams. The surveys covered the Red Sea coastal areas from Massawa to the Sudan border during November/December 1969 and again in February/March 1970. The coastal areas were mostly dry and only low density scattered solitary-living Desert Locust populations were observed during March and April 1970.

78. The Sudan anti-locust staff undertook extensive surveys both by air and ground from mid-February to mid-April 1970 covering the whole area from Shalatein (Sudan-UAR border) to Karora on the Sudan-Ethiopian border. Winter rainfall was poor over the whole area except in the southern sector (Tokar and Agig) which received fairly good rainfall in February. Due to dry conditions prevailing over the whole area, only scattered low density Desert Locust populations were observed during March and April 1970.

General Remarks

79. The populations encountered on both sides of the Red Sea coast were rather low and did not warrant any control operations. As such, phase 2 (spraying) and phase 3 (evaluation of results) of the plan of operation were not carried out and submission of a fuller report, as envisaged by the 13th Session of the FAO Desert Locust Control Committee, was not possible. It was, however, recommended that such survey and properly planned control operations were essential for maintaining the recession and should be continued in future.

Other Areas

Western Africa

80. During the winter/spring of 1969/70 Mauritania was the only country in West Africa which had potentially important populations requiring special attention. Good rainfall was received in Mauritania in October and then in December 1969, thus resulting in favourable conditions for survival and development of locust populations. Accordingly, OCLALAV deputed three field survey teams in the area to work there continuously from December 1969 to March 1970 and again from 2 to 20 May. During this period two aerial surveys were also undertaken: one from 26 February to 3 March and another from 21 to 24 March.

81. In early December important populations of both adults and hoppers were present in Mauritania and by January they covered several thousand hectares with both adult and hopper concentrations. In February limited concentrations reached a density of 10,000 to 15,000 adults per hectare. In March scattered populations, which were widespread, were dispersing due to unfavourable climatic conditions.

82. With a view to keep populations under check, OCLALAV undertook control operations in the infested areas of Mauritania against adult and hopper concentrations (para. 17). In spite of the control operations some of the populations escaped from these areas and moved into the adjoining area of Spanish Sahara where breeding was also taking place in the areas adjoining to Mauritania. The populations together with those locally bred were responsible for producing some small loose swarms by the end of April and early May which finally moved into Mauritania.

83. Closer links were established between OCLALAV and Spanish Sahara during the current year and a number of meetings were held. This resulted in receiving regular information by OCLALAV on meteorological data and on the locust situation from Spanish Sahara authorities. OCLALAV teams conducted surveys of southern and south-eastern Spanish Sahara in March.

South-West Asia

84. Special surveys were undertaken in southern Iran, Pakistan and south-west Afghanistan during the first half of 1970. No locust populations of any significance were observed.

Training Requirements

85. The Committee examined the requirements of the different countries with regard to training of personnel on various aspects of the Desert Locust problem for the next six years (Appendix III) and noted that the information obtained by FAO would facilitate the preparation of coherent plans for training of research and control personnel by prospective donor countries. It was made clear that FAO did not have at present sufficient funds to cover the proposed requirements of various countries but the Organization would participate in promoting and facilitating this programme in collaboration with the countries and organizations who might decide to afford such facilities. The following is a projection of training requirements of various countries during the next six years (1971-1976), as submitted by Governments:

YEAR	NUMBER OF TRAINEES				
	Research	Survey	Control	Aerial Spraying	Radio Maintenance
1971	10	25	22	17	13
1972	14	29	24	17	13
1973	13	24	23	21	13
1974	18	23	24	18	14
1975	18	21	17	17	13
1976	15	21	24	17	12
TOTAL	88	143	134	107	78

86. The Committee emphasized the need for continuous training for which adequate assistance and resources would be required. The training should be designed to enable the various anti-locust personnel to make the best use of the available resources, both for research and control and at the same time to keep them abreast with the fast developing modern techniques. For this purpose it would be necessary to prepare a coordinated scheme on national, regional and international basis after a thorough study of individual requirements of the various countries, in particular as regards the availability of suitable candidates for training and the possibilities of employment on completion of their training.

87. The Committee considered that the most economical and best way of organizing training was on a group basis which had a further advantage of facilitating personal contacts among the various workers. While planning the training programme consideration should be given to the level and type of training prior to deciding its programme and establishing the location where this training would be imparted. The need for subsequent refresher courses was also considered vital for keeping in touch with the latest technical developments.

88. The Committee noted the increased interest of UNDP in training, and hoped that assistance could be found to meet additional training requirements in light of the above recommendations (paras. 86 and 87).

Status of Various Desert Locust Regional Organizations

South-West Asia

89. The Sixth Session of the Commission for Controlling the Desert Locust in the Eastern Region of its Distribution Area in South-West Asia was held in Teheran from 14 to 18 April 1970, and was preceded by a three-day Session of its Executive Committee. The Commission reviewed the locust situation within the region and in the neighbouring countries and recommended that the Member Countries should continue to keep their respective potential breeding areas under strict vigilance and emphasized the need for controlling any significant populations likely to result in gregarization.

90. The Executive Committee of the Commission made several recommendations on field research programmes and, in particular, stressed the need for continuing research of applied nature. Mr. M. Shafi of Pakistan was selected for high-level fellowship, and further awards of short-term fellowships, and exchange visits were recommended. It was also agreed that if any additional funds were needed in respect of training, such expenditures could be met from the unobligated cash balance of Trust Fund 123.

Near East

91. All the countries in the Near East, with the exception of Saudi Arabia, had deposited their instrument of acceptance and had become members of the Commission for Controlling the Desert Locust in the Near East. Due to the strategic importance of this country in the field of Desert Locust control in the region, it was decided to postpone holding the Second Session of the Commission to allow some more time to Saudi Arabia to become a member. The Committee stressed the need of Saudi Arabia's participation in the Commission for Controlling the Desert Locust in the Near East. The delegate of Saudi Arabia assured the Committee that the question of membership was under active consideration of his Government and he hoped that Saudi Arabia would soon be a member of the Commission. While considering the strategic importance of Saudi Arabia in the field of Desert Locust work, the Committee recommended that in order to obtain efficient results, research, survey and control should be carried out under a unified direction.

92. The Committee noted with appreciation the contribution made by the Government of Pakistan by sending special survey teams to Muscat and Oman and Saudi Arabia in the past, and the offer to send similar teams in future. Recognizing the importance of survey and control operations in the Territory of Muscat and Oman, the Committee requested the Member Governments of the FAO Desert Locust Control Committee and FAO to use their good offices to facilitate such work in that area.

Eastern Africa

93. The Desert Locust Control Organization for Eastern Africa (DLCO-EA) continued to operate with the usual efficiency. Since the last session of the FAO Desert Locust Control Committee, the Council of the DLCO-EA had its 15th Regular Session and stressed the need for effective and continued vigilance and survey by air and ground to keep the Desert Locust populations at the present low level. Close cooperation between FAO and DLCO-EA continued to be maintained in accordance with the Relationship Agreement between the two organizations.

North-West Africa

94. The Fourth Session of the FAO North-West African Desert Locust Research and Control Coordination Sub-Committee was held in Rabat from 23 to 26 March 1970. The Sub-Committee considered the draft agreement for establishment of the Commission for Controlling the Desert Locust in North-West Africa, and unanimously agreed upon an amended text. It decided to submit it through the Director-General of FAO to the FAO Council (November 1970) for approval and subsequent submission to the Member Nations concerned for acceptance. The Sub-Committee would continue to function as in the past until the establishment of the proposed Commission. Thereafter, FAO would take steps to dissolve it and to transfer the balance of Trust Fund 169 to the Trust Fund of the Commission. It was agreed to establish a Trust Fund for the Commission to which all Member Governments would contribute US\$61,000 annually.

95. The Committee welcomed the above development and hoped that the Commission would be soon formally established.

West Africa

96. The "Organisation Commune de Lutte Antiacridienne et de Lutte Antiaviaire" (OCLALAV) continued to operate as an independent inter-governmental organization and kept FAO informed of its activities. The annual session of its Administrative Council was held in June 1970 in which FAO was represented. In view of the present locust situation in West Africa (paras. 2 to 5) and the financial difficulties that OCLALAV was facing, the Committee decided to recommend that UNDP provide further assistance to this Organization. It was recognized that this would be in the interest of all countries concerned.

International Desert Locust Trust Fund 161

97. The Committee noted with satisfaction that the Trust Fund had contributed to the financing of the various activities (Report of the 9th Session of the DLCC, para. 67) at the international level begun under the UNDP(SF) Assisted Desert Locust Project; in particular, it had provided the government counterpart contribution in cash necessary to permit the further extension of the UNDP(SF) Desert Locust Project for the period 1 May 1968 to 31 December 1970. The Committee, in accordance with the recommendation of the 9th Session of the FAO Desert Locust Control

Committee, reviewed the scope and terms of reference of the Trust Fund. Recognizing the usefulness of the Trust Fund and the need of continuing it, the Committee unanimously approved an annual budget of US\$ 80,000, as detailed in Appendix V, and suggested that the Director-General should be able to change the allocation of sums allotted to different chapters in order to meet the changing needs of the locust situation subject, of course, to the total annual expenditure not exceeding US\$ 80,000. As in the past years, the budgetary period would be the calendar year commencing 1 January in respect of contributions due from governments on 1 July previous. It was also agreed that the cost of further trials of aerial photography could be met from the unobligated balance of the Trust Fund.

98. The Committee noted that 36 Governments had pledged annual contributions totalling approximately US\$ 80,000 to the above Trust Fund as compared with the total of US\$ 100,000 per annum envisaged when the Trust Fund was originally established by the Director-General on the recommendation of the 9th Session of the FAO Desert Locust Control Committee. The Committee requested FAO to write to the Governments who were in arrears to expedite payments and to approach Governments who had not yet pledged contributions to the Trust Fund to do so.

DATE AND PLACE OF NEXT SESSION

99. The Committee recommended that the Director-General of FAO should convene the next Session of the Committee possibly in October 1971, to be preceded by a three-day meeting of technical experts, at a place and date to be determined by him. It was suggested that while deciding the venue of the next Session consideration might be given to convene it in Eastern Africa, if possible.

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2. Anti-Locust Research Centre (DLIS)
College House, Wrights Lane
London, W.8, United Kingdom

(other than obvious swarms or bands)

Originator of Report	Organization and Country
Route	Period

- 1
31
1
- A - The route followed during the survey, giving the itinerary in chronological order. A sketch map indicating the route and areas where locusts were recorded is a most welcome addition to the report.
 - B - Date of survey.
 - C - Locality to be identified by map reference or distance and direction from well-known points.
 - D - Air, ground, motor vehicle, foot, etc.
 - E - Vehicle, foot, transects, etc.
 - F - Give numbers in hectametres. If necessary, this part may be given as an appendix to the report.
 - G - Indicate the beginning and end of transect and points at which locusts were seen.
 - H - Give the numbers per bush or per square metre.
 - I - Instar
 - J - As in the adults. indicate points at which hoppers were seen in relation to the transect.
 - K - Does the infestation correspond to a well-defined area of vegetation like a wadi or a depression? If so, give its dimensions. Are there others like it? Roughly how many? What is roughly their area? Or is the infestation contained within a large, more or less uniform area? Indicate the distance during which locusts were seen and the distance across the area of the vegetation.
 - L - Note in particular any presence of gregarious coloration: in adults traces of pink or bright yellow and in hoppers the occurrence of black pigmentation and the change of ground colour from yellow or brownish to bright yellow.
 - M - No remarks.
 - N - Note the type of terrain (plain, wadi, dunes, hillsides, etc.); the type, cover and condition of growth of the vegetation; soil type (gravel, sand, loam, clay) and depth of moisture from the surface. Note if the distribution of locusts bears any marked relation to any feature of the habitat, specific plants, their cover or development, or, perhaps, type of soil or soil moisture. The recognition of such relationships, which is generally present to a greater or lesser extent, will facilitate the discovery of the largest locust concentrations and should be recorded.
 - O - Any evidence of pairing should be looked for and especially any manifestation of gregarious tendencies. In case of hoppers, note should be made if they have the tendency to move together. Night flying should be recorded. During surveys, especially in desert areas where meteorological stations are few, it is a very useful practice to conduct synoptic weather observations, recording in particular dry and wet bulb air temperature, surface wind direction and strength, cloud type and amount and any weather manifestations such as dust-storms or rain. Information on rain, which is essential for the development of habitats and for reproduction of locusts, is particularly valuable and apart from personal observations all possible sources of information, e.g. local intelligence, should be explored. Apart from observations at synoptic times, it is also advisable to record weather conditions during observations on locusts, and especially when making quantitative estimates by flushing. As a guide to locust behaviour it is also useful to record the surface soil temperature.

APPENDIX II

UNDP(SF) DESERT LOCUST PROJECT

Radio Communications Network - Situation as at 30.6.70

Country	Visits during period 1.5.69 - 30.6.70	Permanent Maintenance Arrangements
Afghanistan	24 days (21.10.69-14.11.69)	1 technician trained in India and Baghdad
Algeria	-	2 technicians trained in Algiers
Bahrain	3 days (21.5.70-23.5.70)	-
Chad	-	OCLALAV - 1 trained in Algiers
Ethiopia	-	DICO-BA engineer
India	-	2 technicians trained in Cairo and Baghdad
Iran	7 days (15.11.69-21.11.69)	2 technicians - 1 trained in India
Iraq	-	2 technicians - 1 trained in Baghdad
Israel	-	MOTOROLA (local firm)
Jordan	-	Meteorological Dept. - 1 trained in Cairo & Baghdad
Libya	-	2 technicians trained in Baghdad
Mauritania	-	Ministry of Communications PTT
Morocco	23 days (4.7.69-26.7.69)	1 technician trained in Algiers
Niger	-	OCLALAV - 1 trained in Algiers
Pakistan	-	2 technicians trained in Baghdad
Qatar (Dubai and Abudhabi)	6 days (24.5.69-29.5.70)	-
Saudi Arabia	17 days (31.1.70-18.2.70 (14.5.70-20.5.70)	Private firm
Senegal	-	OCLALAV

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APPENDIX II (cont'd)

Country	Visits during period 1.5.69 - 30.6.70	Permanent Maintenance Arrangements
Somalia	-	2 technicians trained in Cairo, Baghdad and Sana'a
Southern Yemen	17 days (28.1.70-30.1.70 (10.3.70-12.3.70 (3.5.70-13.5.70	1 technician trained in Baghdad and Sana'a
Sudan	-	1 technician trained in Cairo
Syrian Arab Rep.	24 days (22.8.69-10.9.69 (30.5.70-2.6.70	-
Tunisia	7 days (27.7.69-2.8.69	1 technician trained in Algiers
U.A.R.	21 days (29.9.69-15.10.69 (27.2.70-2.3.70	2 technicians, 1 trained in Baghdad
Yemen	69 days (20.1.70-28.1.70 (3.3.70-3.5.70	2 agriculture and 2 PTT officers trained in Sana'a

TRAINING REQUIREMENTS

YEAR - 1971

COUNTRY	RESEARCH		SURVEY		CONTROL		AERIAL SPRAYING		RADIO MAINTENANCE		
	No of Trainees	LENGTH OF TRAINING IN MONTHS	No of Trainees	LENGTH OF TRAINING IN MONTHS	No of Trainees	LENGTH OF TRAINING IN MONTHS	No of Trainees	LENGTH OF TRAINING IN MONTHS	No of Trainees	LENGTH OF TRAINING IN MONTHS	
		Medium Level	High Level	Medium Level	High Level	Medium Level	High Level	Medium Level	High Level	Medium Level	High Level
North-West Asia											
- Afghanistan	2	6-36	6-12	3-6	3-6	6-9	3-6	1	6	1	3
- India	1	3-6	3-6	-	-	-	-	2	3-6	2	3-6
- Iran	1	12	3	-	-	4	-	1	4-6	1	4-6
East Asia											
- Bahrain	-	-	-	-	-	-	-	-	-	-	-
- Iraq	-	-	-	-	-	-	-	-	-	-	-
- Jordan	1	3	-	-	-	-	-	-	-	-	-
- Kuwait	-	-	-	-	-	-	-	-	-	-	-
- Lebanon	-	-	-	-	-	-	-	1	1	-	-
- Qatar	-	-	-	-	-	-	-	1	1	-	-
- Saudi Arabia	2	48	-	6	6	-	-	1	3	1	6
- Southern Yemen	1	12	-	3	3	-	-	2	18	2	3
- Syrian A.R.	1	36	12	-	-	12	-	2	18	2	18
- Turkey	1	-	3	-	-	3	-	1	12	1	12
- U.A.R.	1	48	-	-	-	-	-	1	4	1	-
- Yemen A.R.	-	-	-	-	-	-	-	-	-	-	-
Eastern Africa											
- Ethiopia	-	-	-	-	-	-	-	1	6	-	-
- French Africa	-	-	-	-	-	-	-	-	-	-	-
- Kenya	-	-	-	-	-	-	-	-	-	-	-
- Somali Republic	-	-	-	-	-	-	-	-	-	-	-
- Sudan (recruitment included under Near East)	-	-	-	-	-	-	-	-	-	-	-
- Tanzania	1	-	-	3	3	-	-	2	6	1	3
- Uganda	4	-	-	6	-	-	-	7	6	-	-
North-East Africa											
- Algeria	2	-	-	3	3	-	-	1	-	1	-
- Libya	1	-	-	3	-	-	-	1	3	1	-
- Morocco	1	-	-	1	-	-	-	1	1	-	-
- Tunisia	-	-	-	-	-	-	-	-	-	-	-
West Africa											
- Cameroon	-	-	-	-	-	-	-	-	-	-	-
- Chad	-	-	-	-	-	-	-	-	-	-	-
- Dahomey	-	-	-	-	-	-	-	-	-	-	-
- Gambia	-	-	-	-	-	-	-	-	-	-	-
- Ghana	-	-	-	-	-	-	-	-	-	-	-
- Ivory Coast	-	-	-	-	-	-	-	-	-	-	-
- Mali	-	-	-	-	-	-	-	-	-	-	-
- Mauritania	-	-	-	-	-	-	-	-	-	-	-
- Niger	-	-	-	-	-	-	-	-	-	-	-
- Nigeria	-	-	-	-	-	-	-	-	-	-	-
- Senegal	-	-	-	-	-	-	-	-	-	-	-
- Sierra Leone	-	-	-	-	-	-	-	-	-	-	-
- Togo	-	-	-	-	-	-	-	-	-	-	-
- Upper Volta	-	-	-	-	-	-	-	-	-	-	-
- DRCO-BA	-	-	-	-	-	-	-	-	-	-	-
- OCEANIC	-	-	-	-	-	-	-	-	-	-	-
- Israel	-	-	-	-	-	-	-	-	-	-	-
TOTAL	10		28		22		17		13		



YEAR - 1976

COUNTRY	RESEARCH		SURVEY		CONTROL		AERIAL SPRAYING		RADIO MAINTENANCE	
	No of Trainees	LENGTH OF TRAINING IN MONTHS	No of Trainees	LENGTH OF TRAINING IN MONTHS	No of Trainees	LENGTH OF TRAINING IN MONTHS	No of Trainees	LENGTH OF TRAINING IN MONTHS	No of Trainees	LENGTH OF TRAINING IN MONTHS
	Medium Level	High Level	Medium Level	High Level	Medium Level	High Level	Medium Level	High Level	Medium Level	High Level
South-East Asia										
Afghanistan	-	-	2	6	2	6	-	12	1	-
India	2	6-36	5	-	5	-	-	-	1	-
Iran	1	3-6	1	-	1	-	-	-	1	3
Pakistan	1	4-6	-	-	1	-	2	4-6	-	3-6
East Asia										
Bahrain	-	-	-	-	-	-	-	-	-	-
Iran	-	-	-	-	-	-	-	-	-	-
Jordan	-	-	-	-	-	-	-	-	-	-
Kuwait	-	-	-	-	-	-	-	-	-	-
Lebanon	-	-	-	-	-	-	-	-	-	-
Qatar	-	-	-	-	-	-	-	-	-	-
Saudi Arabia	2	-	1	6	1	6	-	-	-	-
Southern Yemen	1	12	2	-	2	-	3	6	1	6
Sudan	1	36	1	-	1	-	12	12	2	6
Syrian A.R.	-	-	1	-	1	-	-	12	1	12
Taiwan	-	-	1	-	1	-	-	12	1	12
U.A.R.	1	-	1	-	-	-	-	-	1	-
Yemen A.R.	-	-	-	-	-	-	-	-	-	-
Eastern Africa										
Ethiopia	1	6	-	-	5	6	-	-	-	-
French Africa + Reunion	-	-	-	-	-	-	-	-	-	-
Kenya	-	-	-	-	-	-	-	-	-	-
Senegal	-	-	-	-	-	-	-	-	-	-
Sudan (Recruitment included under East Asia)	-	-	-	-	-	-	-	-	-	-
Tanzania	-	-	-	-	-	-	-	-	-	-
Uganda	-	-	-	-	-	-	-	-	-	-
North-East Africa										
Algeria	1	10	2	3	2	3	1	3	1	3
Libya	1	12	2	3	1	3	1	3	1	3
Morocco	1	1	-	-	-	-	-	-	-	-
Tunisia	-	-	-	-	-	-	-	-	-	-
East Africa										
Cameroon	-	-	-	-	-	-	-	-	-	-
Chad	-	-	-	-	-	-	-	-	-	-
Dahomey	-	-	-	-	-	-	-	-	-	-
Gambia	-	-	-	-	-	-	-	-	-	-
Ghana	-	-	-	-	-	-	-	-	-	-
Ivory Coast	-	-	-	-	-	-	-	-	-	-
Malawi	-	-	-	-	-	-	-	-	-	-
Mauritania	-	-	-	-	-	-	-	-	-	-
Niger	-	-	-	-	-	-	-	-	-	-
Nigeria	-	-	-	-	-	-	-	-	-	-
Senegal	-	-	-	-	-	-	-	-	-	-
Sierra Leone	-	-	-	-	-	-	-	-	-	-
Togo	1	12	-	-	-	-	-	-	-	-
Upper Volta	-	-	-	-	-	-	-	-	-	-
OGADJAT	-	-	-	-	-	-	-	-	-	-
Tanzania	-	-	-	-	-	-	-	-	-	-
TOTAL										
	15		21		24		17		12	

APPENDIX IV(a)

Resources Available with Various National and Regional Organizations for 1969/70 for Desert Locust Control

COUNTRIES	PERSONNEL		EQUIPMENT			VEHICLES			INSECTICIDES			AIRCRAFT		ANNUAL BUDGET	
	Technical staff	General staff	Power dusters	Power sprayers	Hand dust & sprayers	Exhaust sprayers	Light	Heavy	Oil x litres	Dust M.T.	Bait M.T.	No.	Curr	x 000	
NEAR EAST															
Bahrain	1	19	8	-	-	-	1	2	-	-	-	-	BD	9	
Iraq	80	-	-	150	-	10	60	-	-	200	100	8	ID	100	
Israel	3	1	...	24	14	...	3	...	289	...	...	...	Is£	57.6
Jordan	82	35	5	351	35	3	15	6	54	60	200	2	JD	47	
Kuwait	33	10	25	29	20	13	13	14	129	80	-	-	...	...
Lebanon	15	37	5	16	50	-	...	...	-	20	-	1	...	...
Qatar	1	3	-	-	-	-	-	...	18	8	25	-	D	1	
Saudi Arabia	16	97	56	234	125	45	343	146	2700	800	2000	-	SR	3000	
South Yemen	18	16	3	-	104	16	6	2	182	70	200	-	US\$	9.7	
Syrian A.R.	120	40	150	70	-	6	90	20	600	400	300	4	...	...
Turkey	44	68	105	-	-	-	62	6	-	250	-	2	...	...
U.A.R.	104	163	24	8	97	13	30	65	115	40	10	-	£Sg	250	
Yemen	32	-	2	4	-	12	9	6	50	48	40	-	YR	54	
Total	549	489	383	886	445	118	632	270	4137	1976	3075	17			
EASTERN AFRICA															
Ethiopia	27	40	-	5	310	20	14	6	1620	305	-	4	ETH\$	620	
Kenya	2	12	-	-	-	2	-	-	1000	-	-	-	...	...
Somali Rep.	51	29	-	51	10	12	18	6	106	10	50	-	So.Sh.	962	
Sudan	181	767	250	-	200	25	55	59	630	2000	4706	7	S£	300	
Tanzania	4	11	2	10	2	2	4	2	40	-	-	-	...	...
Uganda	4	11	4	12	2	2	4	1	50	-	-	-	...	...
DLOO-BA	42	142	-	-	50	122	93	29	4446	31	-	8	K£	320	
Total	311	1012	256	78	574	185	188	103	7892	2346	4756	19			
NORTH-WEST AFRICA															
Algeria	...	...	55	44	350	-	66	121	7600	2500	3300	9	DA	14600
Libya	28	4	-	7	3	50	24	5	130	35	450	1	L£	50	
Morocco	16	67	31	-	-	-	168	166	26600	1235	3000	-	DH	4775	
Tunisia	65	68	110	20	370	-	26	127	200	800	100	10	DT	700	
Total	109	139	196	71	723	50	284	419	34530	4570	6850	20			
SOUTH-WEST ASIA															
Afghanistan	23	22	13	-	414	10	10	7	4	414	-	-	...	...
India	158	295	182	55	9585	21	80	79	496	1370	-	10	Rupe	4490	
Iran	74	78	-	1010	871	50	115	7	2150	-	-	30	...	...
Pakistan	140	305	31	191	679	99	92	12	2359	444	-	10	...	...
Total	3470	700	226	1256	11549	180	297	105	7009	2228	-	50			
WEST AFRICA															
Gambia	30	-	-	4	31	-	1	1	-	-	-	-	CFA.	5000	
Mauritania	15	52	-	15	70	5	9	-	-	15	-	-	Fr.M.	1756	
Mali	5	-	-	-	235	-	-	-	-	19	-	-	CFA	21621	
Senegal	2	6	-	3	300	10	1	22	700	500	-	-	CFA	310000	
OCLALAV	28	157	-	4	-	39	71	110	10778	17	-	5			
Total	80	215	-	26	636	54	82	133	11478	551	-	5			

APPENDIX IV (b)

Aircraft Available with Various National and Regional Organizations for 1969/70 for Desert Locust Control

Country or Organizations	PIPER				CESSNA			UTVA	BEAVER	AERO-COMMANDER (twin-engined)	HELI-COPTERS	UN-SPECIAL-FIELD	GRAND TOTAL
	PA18	Cub	Super Cub	Pawnee	Cherokee 235	180/185	UT/62 O6/A						
<u>NEAR EAST</u>													
Iraq												8	8
Jordan	1										1		2
Lebanon											3		3
Syrian A.R.			4										4
Turkey												2	2
TOTAL	1		4								4	10	19
<u>EASTERN AFRICA</u>													
Ethiopia			4										4
Sudan			2	2		2	1						7
DLCO-EA						2			5	1			8
TOTAL			6	2		4	1		5	1			19
<u>NORTH-WEST AFRICA</u>													
Algeria	1			1				5				1*	9
Libyan A.R.		1											1
Tunisia	5			2				3					10
TOTAL	6	1		3				5				1	20
<u>SOUTH-WEST ASIA</u>													
India													
Iran			27			3			7		3		10
Pakistan									10				30
TOTAL			27			3			17		3		50
<u>WEST AFRICA</u>													
OCLALAV	2				1	2							5
TOTAL	2				1	2							5
GRAND TOTAL	8	2	37	5	1	9	1	4	22	1	7	11	113

* Pilatus

APPENDIX V

INTERNATIONAL DESERT LOCUST TRUST FUND 161
PROPOSED ANNUAL BUDGET 1 JULY 1971 ONWARDS

		US\$
<u>Code</u>		
1	<u>Consultants' honoraria</u>	
	Research projects, lecturers, advisory visits, technical editors, etc.	10,000
2	<u>Expendable supplies</u>	
	Research material	4,100
3	<u>Equipment</u>	
	Research and demonstration equipment	5,000
4	<u>Travel</u>	
	Research projects, advisory visits	10,000
5	<u>Contracts</u>	
	DLIS 20,000	
	Research projects 5,000	
	Publications and miscellaneous <u>5,000</u>	30,000
6	<u>Grants and subsidies</u>	
	Fellowships/training	5,000
		<hr/>
		69,100
Project service costs (approximate)		
	5% on \$ 9,100 500	
	14% on \$60,000 <u>8,400</u>	<u>8,855</u>
		77,955
Unallocated balance		<u>2,961</u>
		80,916

APPENDIX VI

LIST OF WORKING PAPERS

AGP:DL/DLC/70/1	The Desert Locust Situation during 1969/70 and Forecast
AGP:DL/DLC/70/2	Progress Report of the UNDP(SF) Further Assisted Desert Locust Project (1.5.69-30.6.70)
AGP:DL/DLC/70/3	Anti-Locust Measures Undertaken by Various Countries and Regional Organizations (November 1969 to September 1970)
AGP:DL/DLC/70/4	Recommendations of the Technical Consultation
AGP:DL/DLC/70/5	Report of the Special Survey of the Red Sea Coast during Winter/Spring of 1969/70
AGP:DL/DLC/70/6	Training Requirements
AGP:DL/DLC/70/7	Status of Various Desert Locust Regional Organizations
AGP:DL/DLC/70/8	Control of Locusts by Insecticides and Some Possible Alternatives
AGP:DL/DLC/70/9	Survey and Assessment of Desert Locust Populations
AGP:DL/DLC/70/10	Annual Report of the Work of DLIS, 1969/70
AGP:DL/DLC/70/11	The Role of Control in the Decline in Numbers of the Desert Locust in Late 1968 and Early 1969
AGP:DL/DLC/70/13	Technical Innovations in Locust Forecasting
AGP:DL/DLC/70/14	Laboratory Experiments on the Use of Infra-Red for Detection of Locusts
AGP:DL/DLC/70/15	International Trust Fund 161

LIST OF OTHER DOCUMENTS

AGP:DL/70/1	Survey and Assessment of Desert Locust Populations
AGP:DL/70/2	Observations on the Behaviour and Ecology of Low-Density Populations of the Desert Locust (<u>Schistocerca gregaria</u>) with Special Reference to Aerial Surveys by Photography
AGP:DL/70/3	Aerial Photographic Detection of Low-Density Desert Locust Populations in North-West Mauritania

