

REPORT OF THE SECOND SESSION OF THE EXECUTIVE COMMITTEE
OF THE COMMISSION FOR CONTROLLING
THE DESERT LOCUST IN THE EASTERN REGION
OF ITS DISTRIBUTION AREA IN SOUTHWEST ASIA

Held in

New Delhi, India

1- 3 March 1967

INTRODUCTION

In accordance with the recommendations of the Second Session of the Commission for Controlling the Desert Locust in the Eastern Region of its Distribution Area in Southwest Asia, the Director-General of the Food and Agriculture Organization of the United Nations, at the kind invitation of the Government of India, convened the Second Session of the Executive Committee of the Commission from 1 to 3 March 1967 at New Delhi.

The Session was opened by Dr. Sardar Singh, who welcomed the participants on behalf of the Government of India. He emphasized the importance of field research particularly during the present recession period. He hoped that the members of the Executive Committee had come with full information on various research projects which they had carried out in their respective countries during the past year and the Committee would have the benefit of their experience. He stressed the importance of coordination and strengthening of the research work on the lines suggested by the 13th Session of the FAO Technical Advisory Committee on Desert Locust Control. He hoped that the Committee would be able to discuss the research work done at the various field research stations during 1966 and would be able to prepare appropriate proposals for future, keeping in view the present recession of the Desert Locust plague.

Officers of the Session

Chairman: Dr. Sardar Singh, India

Vice-Chairman: Mr. Rashid Ahmed, Pakistan

The work of drafting the report was entrusted to the FAO Secretariat.

Mr. Gurdas Singh and Mr. Taqi Ahsan of the FAO Secretariat acted as Technical Secretaries.

PARTICIPANTS IN THE SESSION

Members of the Executive Committee

Afghanistan

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India

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AGENDA

The Executive Committee agreed upon the following Agenda:

1. Opening of the session
2. Adoption of the agenda
3. Election of the Drafting Committee
4. Coordination of the Desert Locust Research in the Region
5. Consideration of candidates for advanced training
6. Election of the Chairman and Vice-Chairman of the Executive Committee for 1967
7. Any other Business
8. Place and date of next session
9. Adoption of the report

SUMMARY OF DISCUSSIONS

Coordination of Research

1. The Executive Committee reviewed the research work carried out at the various research stations located in the Member Countries and noted the work done, particularly in India and Pakistan. The Members were also encouraged by the research work recently initiated in Iran and hoped that with the equipment and facilities now available, the programme would make further progress in the coming years. The progress reports of various Field Research Stations are given in Annex I.
2. While reviewing the progress of field research of various research stations, the Executive Committee emphasized the need for more detailed observations on locust populations and their habitat during the recession period. In connection with the use of light traps, it was decided that this work should be continued both for detecting the presence of locust populations and for making observations on the displacement of solitary-living locusts during night time. It was noted that observations were being taken only upto about 11 P.M. The Committee considered that these observations should be extended to early hours of the morning, i.e. till about 3 a.m., depending on the prevailing temperature conditions. Such observations might help to determine the optimum time for detection and displacement of scattered populations. It was further suggested that larger number of stations may be established with bottled gas and also with ultra violet light.
3. The Members noted that the work on mapping and fuller analysis of the past locust population data and the possibility of improving population assessment procedure as recommended by the First Session of the Committee (Report, para.2) had not been initiated at any of the field research stations. The need to undertake this work at the earliest opportunity was emphasized.
4. It was noted that FAO had made provision for short term fellowships for facilitating training in analysis of old data in relation to weather. The Executive Committee urged the Member Countries to avail of this opportunity. The FAO Secretariat informed the Committee that in view of the limited number of scholarships under this project, it would not be possible to grant more than two awards to the candidates from this Region.

5. Morphometric studies undertaken in the past and still being continued in India and Pakistan have not been properly analyzed for obtaining results of practical value. Such observations were, however, considered valuable for determining the type of population. It was recommended that this work should be also utilized for identifying the immigrant populations bred in different ecological and climatic conditions from the local stock. The training on this aspect of the problem could be combined with the fellowship for analyzing data in relation to weather as given in paragraph 4.
6. The Committee recommended that in addition to the programme of work suggested at its First Session (Report, para.2), the Special Survey teams should map ecologically important areas suitable for the Desert Locust populations with a view to reduce the area of observation in future.
7. Certain localities in the Indo-Pakistan region are invariably known to harbour desert locust populations throughout the year. It was suggested that such localities may be studied in greater detail from the climatological, physical and ecological aspects with a view to finding out the reasons for such concentration of populations.
8. Detailed studies on the effect of low temperature applied at certain periods of the life history of hoppers on their fledging should be undertaken. The Pakistan representative agreed to communicate the procedural details of their experiment to the FAO Secretariat for circulation to the other field research stations.
9. The technique for using antibiotics for disinfecting egg pods from bacterial and other infections as employed by the Pakistan Field Station may be passed on to FAO Secretariat for circulation to other field research stations in the region.
10. It was recommended that annual progress reports for field research stations should be sent to FAO Regional Locust Secretariat by the end of January each year.

Fellowships

11. The Committee considered and agreed to the nomination of Mr. Yacob Movasach Saket of Iran for advance training to be administered by FAO and to be financed from Trust Fund 123 for a period of 2 years.
12. The Executive Committee reiterated that the Government of Iran should ensure that Mr. Saket, on return to Iran after completing his fellowship would mainly engage himself on Desert Locust research or control or both for a minimum period of 5 years.
13. It was decided that FAO would invite the Member Governments of the Commission to nominate candidates for 1968 fellowship as soon as possible.
14. The Committee noted that Mr. Fariduddin of Pakistan, who was selected last year, was now undergoing training at the Imperial College, London, and making satisfactory progress. Another trainee Mr. Mohammed Sarwar Noorzai from Afghanistan was also accepted by the Agricultural College, Karadg, Iran, for a period of 5 years. The Committee recommended that another similar scholarship be awarded to Afghanistan for the academic year starting from October 1967.

Chairman and Vice-Chairman of the Executive Committee 1967/1968

15. The Executive Committee unanimously elected the representatives of Afghanistan and Iran on the Executive Committee as Chairman and Vice-Chairman, respectively, for a period of one year.

DATE AND PLACE OF THE NEXT SESSION

16. According to the recommendation of the First Session of the Commission (Report, para.36) the annual session of the Executive Committee should normally precede the annual session of the Commission, and the date and the place of the next session would be decided accordingly.

LIST OF WORKING PAPERS

- DL:EC:2/1 - Progress Report on the Field Research Stations ending December 1966 and Future Programmes in Pakistan (submitted by the Government of Pakistan).
- DL:EC:2/2 - Curriculum Vitae of Candidate for Higher Training.
- DL:EC:2/3 - Field Station for Investigations on Locusts, Bikaner - Annual Progress Report, 1966 and Programme of Work, 1967 (submitted by the Government of India).

I N D I A

FIELD STATION FOR INVESTIGATIONS ON LOCUSTS
BIKANER

Annual Progress Report, 1966
and Programme of Work, 1967

The Field Station for Investigations on Locusts was set up in March 1957 at Bikaner. The main activities of the Station include work on the biology, ecology and field-control of the Desert Locust (Schistocerca gregaria Forsk.). Besides, investigations are carried out on the Migratory Locust (Locusta migratoria Linn.), Bombay Locust (Patanga succincta Linn.) and grass-hoppers of arid and semi-arid regions of India. A brief review of the research work undertaken upto 1965 at the Station was included in the report of the Fourteenth Session of the FAO Technical Advisory Committee under Progress Report of the Field Research Stations.

The Second Session of the Commission for Controlling the Desert Locust in the Eastern Region of its Distribution Area in South-West Asia approved broad guidelines for the research programmes during the present recession which may be profitably taken up by the National Research Organisations consistent with present facilities and resources. The Programme was also subsequently approved by the Fourteenth Session of Technical Advisory Committee and the Tenth Session of the Desert Locust Control Committee of FAO held in May-June, 1966 in Rome. The research work undertaken, on different items, at Bikaner during 1966 is described as follows:

(a) Study of behaviour of scattered locusts: half a dozen locals in the desert area are under constant periodic observations since 1964 to record locust populations, vegetations and weather conditions. The collections are morphometrically analysed. There were wide fluctuations in numbers of locusts being nil in January and April and 750 per sq.km. in Bikaner in September, 1966. Most of the individuals were solitariform, some transitiform. The absence of over-wintered individuals in the area prior to June and thereafter presence of yellow winged adults indicated that those were immigrants and not local-bred.

Diurnal behaviour of locust adults both in the field and the laboratory (6'x5'x4' cages) is being studied along with data on air and soil temperatures, relative humidity, wind speed and sun light. In summer basking commenced around 07.30 hours and roosting for the night at 18.30 hours, while in winter the timings were 09.30 and 16.30 hours respectively. Commencing half an hour after dusk and lasting for two hours each day, observations were made at a number of places in Rajasthan, using Aldis lamp, mercury vapour lamp and ordinary patromax lamp to record locust movements at night. No locusts were, however, spotted flying through the light beam of Aldis lamp. Although many other species of grass-hoppers and insects were attracted by light, locust adults were collected only once during the conduct of these experiments. This may be due to very low populations present in the area and still lower transfer of individuals. Further observations are continued.

(b) Rate of sexual maturation in relation to food, temperature and soil-moisture: studies on the food preference of desert locust and the effect of different food plants on locust physiology such as maturation, colouration and excretion were carried out. Larval period was shortest (27-32 days) in case of hoppers fed on kanti (Tribulus terrestris) and longest (74 days) for those fed on melon leaves and vines (Citrullus vulgaris) temperature range 25.30°C). The food affected the colour and size of the faecal pellets and to some extent their shape and size. Faecal pellets were of the

largest size (9.17 mm long x 1.6 mm thick) in case of hoppers fed on bajri (Pennisetum typhoideum) and smallest (5.45 mm long x 1.13 mm thick) in case of ak flowers (Calotropis procera).

The incubation period, hatchability percentage and weight of hoppers on emergence in relation to soil moisture were investigated. Eggs were not deposited in soil having 1% moisture; those laid in 24% moisture were infested by moulds and no hatching occurred; the percentage of hatchability was maximum and the average weight of hoppers on emergence minimum in soil with 4% moisture.

The effect of daily photoperiod (10 hours and 15 hours) on locust adults and their progeny ($F_1 + F_2$, etc) revealed that total number of egg-pods laid (37) was more in case of adults kept at 10 hour photoperiod as compared to those at 15 hours (6 egg-pods); the increase in photoperiod delayed maturation of adults; the average weight of freshly hatched hoppers, whose parents had been kept at 15 hour photoperiod, was more (28.0 m.gm.) to those whose parents were kept at 10 hours (20.8 m.gm.).

(c) Quantitative estimates of egg mortality under widest possible range of natural conditions: large scale solitary breeding during 1966 was not observed, excluding the possibility of field observations. It is proposed to undertake this work in field cages.

(d) Rate of maturation from fledging time to egg-laying in natural and semi-natural conditions: regular breeding of locusts in field-cages continued to record seasonal history in semi-natural conditions. Field observations through regular surveys were also recorded.

(e) Laboratory studies on the effect of environmental factors on morphometric characters: exotic and local bred locusts (607 specimens were examined biometrically during the year 1966. By E/F ratio, they were 53% solitaria, 27% transiens and 20% gregaria, while by F/C ratio they were 64% solitaria, 26% transiens and 10% gregaria. The gregaria specimens were mostly from those bred in the laboratory.

During August 1966, 1570 specimens were collected from a small area near Agnao (Bikaner) and out of them 200 random specimens were examined morphometrically. Sexual dimorphism percentage of characters E (length of elytron) & F (length of hind femur) was found to be 17 and 16 respectively showing that the phase-status of the population was still solitaria. Mean morphometric measurements of characters C (width of head at genal level), P (length of pronotum at keel), E and F of this population were comparatively tested with biometrical data of the specimens collected from locust concentrations at the start of 1949 plague. The mean values with standard errors are given below:

Character	Mean value of Agnao population		Mean value of initial concentration	
	Males	Females	Males	Females
C	6.433±0.058	7.382±0.022	6.60±0.033	7.41±0.041
P	9.575±0.059	10.933±0.038	9.76±0.054	10.94±0.088
E	51.92±0.144	60.922±0.261	51.46±0.29	59.73±0.42
F	25.711±0.078	29.893±0.198	24.92±0.16	28.35±0.25

RATIOS

P/C	1.4893±0.0045	1.4817±0.0054	1.483±0.007	1.477±0.008
E/F	2.0195±0.018	2.04±0.006	2.06±0.010	2.12±0.011
F/C	3.9968±0.0097	4.0502±0.011	3.790±0.024	3.824±0.027

It may be concluded that both the populations were basically solitaria, with slight change in some characters.

The 5th instar hoppers collected from Agnao area were kept crowded under semi-natural conditions till fledging. They remained crowded from 10-13 days during larval

period. The resultant adults were morphometrically examined and the following is a summary of their phase status by various ratios.

Phase	RATIOS								Average % of Phase
	C/O	P/C	H/C	M/C	E/C	E/W ₁	E/F	F/C	
<u>Solitaria</u>	60	50	10	100	100	16.7	67	50	56.75
<u>Transiens</u>	40	30	70	0	0	33.3	33	50	32
<u>Gregaria</u>	0	20	20	0	0	50.0	0	0	11.25

(f) Study of the probable role of natural causes: an analysis of the field locust situation during 1963 in Bajju area of Kolyatji (Bikaner) revealed that apart from wind and rain, state of vegetation plays an important part in concentrating locusts. Areas harbouring the weed plants, T. terrestris, which stay green when other plants have dried up, should be carefully surveyed to locate locust populations. Several such complimentary areas in the region may be potential inhabiting and breeding grounds for locusts, which may give rise to incipient gregarisation before development of actual swarming behaviour.

(g) Testing of promising insecticides: the toxicity of sumithion (oil solution), Bacillus thuringiensis, Datura (Datura sp.) and Calotropis, (suspensions of leaves, flowers and fruits), neem (Azadirachta indica) kernels was investigated against locust adults and hoppers in the laboratory. Sumithion (4 ug/mg) killed 20% of adults in 6-10 hours, while mortality in case of 5th instar hoppers was 60%. The mortality in case of datura leaves and flowers (suspension) was 20% after 12 days of feeding. Bacillus treated leaves when fed to 2nd instar hoppers resulted in 20% mortality. Different suspensions of leaves and fruits of Calotropis gave a kill from 10-80% after 10 to 12 days of feeding on treated leaves of cabbage, neem kernel suspension (0.1% at 60 gls/acre) was found to have repellent action, as area eaten in case of treated leaves was about half that of untreated leaves. Suspensions prepared from freshly crushed kernels were more potent than stale preparations.

(h) Mapping and analysis of past locust populations: the work is likely to be undertaken, when the additional staff is sanctioned.

(i) Developing techniques for raising of large cultures of the desert locust: sizeable stock of locusts is being maintained in laboratory and field cages. To facilitate disinfection and general hygiene, wooden cages are being replaced by stainless steel ones.

(j) The use of gamma radiation: it is not proposed to develop such facilities at FSIL at this stage.

In addition to the above items, work is under way on the bionomics and control of Bombay locust, Migratory locust and grass-hopper, Oedaleus, sp.

A project to strengthen the existing staff is under consideration of the Government. It is hoped that it would be possible to undertake more extensive and intensive research on various items, when additional facilities become available.

Programme for 1967

The following items of work are proposed to be taken up:

1. Studies on the incubation period of locusts with reference to different soil temperatures and difference in viability of hoppers hatched from such eggs.

2. Studies on the effect of different moisture contents of soil on the incubation length of the resultant hopper and adult colouration, fecundity and maturation, morphometrics, etc.
3. Effect of various photoperiods on life stages of the desert locusts.
4. Effect of different densities on the behaviour of solitary and gregarious locusts.
5. Effect of low temperatures and low pressure on locust biology.
6. Light trap studies of solitary and gregarious adults of locusts.
7. Gregarization of desert locusts in the presence of other grasshoppers.
8. Life history studies of other grasshoppers naturally occurring in the desert.
9. Quantitative survey of possible biotic factors available in the desert for controlling locusts.
10. Correlation of weather with locust swarm movements - as available in previous years.
11. Phenology of certain desert plants in Bikaner District.
12. Studies on different doses of some newer insecticides on different stages of hoppers of locusts with special reference to differences in post treatment temperatures.
13. Studies on the natural depletion of some locusticides sprayed/dusted on desert soil/vegetation - assessment as suggested in the FAO Circular November 66 on Programme for Field Research Stations.
14. Survey of Bombay and Migratory locusts to find out their natural habitats in India.

PAKISTAN

PROGRESS REPORT ON THE FIELD RESEARCH STATIONS ENDING DECEMBER 1966 AND FUTURE PROGRAM IN PAKISTAN

Laboratory Studies

Locust Breeding

1. A permanent and ample stock of desert locust adults and hoppers is always required for various experiments carried out in our laboratory. For this purpose locust breeding is undertaken with great care. Locust breeding on a large scale in the laboratory is a task which requires great skill, experience and hard work. Our staff is well trained in all aspects of locust breeding and as such we are able to maintain sufficient stock of locust adults and hoppers around the year.

Biological Experiments

2. Along with the breeding of the locust, various side experiments on the biology of locust, such as:

- (i) number of egg pods laid by a female
- (ii) number of eggs per pod
- (iii) percentage of emergence

- (iv) causes of mortality in the embryonic stage
- (v) incubation period of eggs under different conditions
- (vi) duration of different hopper stages, etc.

are carried out and other aspects of locust behaviour under laboratory conditions are taken into consideration. During the year under report, our findings on some of these experiments are summarized below.

3. Usually the egg pods have been found to contain 15 eggs, while the maximum and minimum records of eggs per pod were 114 and 29 respectively.

4. The incubation period and the duration of different stages of desert locust vary with the changing weather conditions. During the cold days of winter these periods are extended while in summer they are much shorter. A comparison between these periods recorded during winter and summer is given below:

Winter Season		Summer Season	
Temp. range = 65-88°F		Temp. range = 86-95°F	
R.H. range = 24-60%		R.H. range = 52-64%	
1. Incubation period	25 days	11-12	days
2. First stage	6 days	3-4	days
3. Second stage	5 days	4-5	days
4. Third stage	7 days	4-5	days
5. Fourth stage	9 days	4-7	days
6. Fifth stage	15 days	5-7	days

5. Percentage of emergence from the egg pods has been found out to be nearly 50, while 50% of the total eggs were rendered sterile by various agents, such as dehydration, the presence of soil nematodes, bacteria, fungi, etc. These organisms were isolated from the unhatched eggs and were identified as:

Fungus

1. Fusarium sp.

Nematodes

2. Rhabditis sp.
3. Cheilobus sp.
4. Aphlenchus avenae

Elimination of Diseases from Locust Culture

To get rid of the diseases of locust culture the following measures have been adopted.

6. Washing and sterilizing: the cages, tubes, plates, etc. are washed with soap and water and are sterilized in hot air sterilizer. Germicides like Detol are also used for disinfecting cages and equipments for locust rearing and breeding.

7. The sand is sterilized by heating it for several hours in an oven at a temperature of about 280°C. To minimize the chances of infection during incubation the egg pods are carefully removed from the oviposition tubes and are placed in a dessicator for incubation.

8. For the control of bacterial and fungal diseases, we have started experiments with some selected antibiotics on the growth inhibition of Serratia sp. (a bacterium). From the results of the experiments so far conducted the antibiotics have been classified into the following three categories according to the degree of their effectiveness:

Maximum growth inhibiting	:	Tetrarco Albamycine Sigmamycine
Medium growth	:	Achromycine Terramycine Ledermycine Terracaph
Least growth inhibiting	:	Chloromycitine

9. Sulfadiazine and Streptopenicillin were found to have no inhibitory effect.

10. In addition to the bacterial and fungal diseases, two Coleopterous larvae were recorded on the egg pods of the desert locust. These larvae were reared in the laboratory and the resultant adults have been sent to our Museum Section for identification.

Other Observations

11. Low temperature, besides extending the duration of different stages of desert locusts, also affects the physiology of hoppers. During the month of January it was found that the fifth stage hoppers did not moult properly and the resulting adults were deformed and died within 2-4 days after fledging. This deformation was recorded in 23% of the total adults and may be ascribed to the unfavourable weather conditions. These conditions also affected the adult locusts adversely. They grew weak and fell an easy prey to various diseases. To cope with the situation we have made adequate arrangements for heating the rearing room by providing electric heaters in the room and bulbs in the individual cages, whereby we could get healthy locust generation.

Pathogenetic Experiments

12. Recently we have started another experiment. A partheogenetic generation of desert locust is being brought up in the laboratory to see if this generation shows any deviation from the usual behaviour of desert locust. At the time of the preparation of this report (end of December), the hoppers were in I-IV stage. The experiment is in progress.

Morphometric Studies

13. For the last four years there is a lull in locust activity in this region and as such we could not get a good number of locusts from the field for these studies. However, every year after the monsoon rainfalls, a few specimens of desert locust are available in the coastal areas of Karachi and Bela. The few specimens collected from the field are measured morphometrically to determine the phase of the locust in the field. During the year under review, only one female locust was collected from Naka Khairi, two males and two females from Pasni and five males and eight females were collected from Tharparkar area. Most of these locusts were found to be transitiform or solitariform.

Regional Cooperation

14. Twenty-four oviposition tubes containing egg pods and about 100 hoppers of the fifth and fourth stage were supplied to the FAO Regional Locust Officer, Teheran, for starting locust rearing and breeding in that country.

Other Experiments

15. In addition to the experiments described above, the following experiments are also in progress:

- (i) Effect of population density on the development of desert locusts
- (ii) Studies on the embryonic development of hoppers
- (iii) Starvation endurance of hoppers
- (iv) To find out relation between the number of eye stripes and sex ratio among desert locusts
- (v) Histological differentiation of radiated and non-radiated desert locusts
- (vi) Study of haemocytes in different stages of locusts.

Field Studies

16. Several field surveys of coastal areas of Karachi and Bela Pasni and Tharparkar districts were conducted during the period under report. The following program of work was chalked out for execution during this period.

Work Undertaken

- 17. (i) Study of locust habitat during recession
- (ii) Topography of locust habitat
- (iii) Study of fauna of locust habitat
- (iv) Study of flora of locust habitat
- (v) Study of field ecology
- (vi) Parasites, predators and disease of desert locust found in the field
- (vii) Migration of solitary locust
- (viii) Morphometrical studies of specimens collected
- (ix) Behaviour of solitary desert locust in relation to environmental conditions
- (x) Determination of incubation period of eggs under different conditions of hopper stages and maturation period
- (xi) Study of the physical and biotic factors responsible for gregarization and disposal of desert locust.

Population

18. The solitary locust population remained at its lowest ebb during the period under report. One solitary locust was recorded during the month of February 1966 from the coastal area of Pasni. Then again three locusts were collected from the same area during October, 1966.

19. In the coastal area of Karachi and Bela the locust population remained almost nil. Here, too, only one solitary locust was collected on 27 October from near Nakakhari beach.

20. During the survey of Tharparkar desert, in the months of August to September 1966, 15 locusts were collected from Khokhropar, Khinsar, Pabusar (Rann of Kutch), Turdost and Bombaykatar.

Topography

21. Topography of the coastal area of Karachi and Bela and Tharparkar desert was studied. These studies proved to be very useful in finding suitable areas for egg-laying.

Fauna

22. During the present recession the absence of certain birds from the locust habitat is a clear proof that there is a definite correlation between locust population and other fauna in the desert. With this in view, the study of birds, lizards and other insects was undertaken. Large number of these animals have been collected and identified. The studies are continued.

Flora

23. It is observed that due to lack of rains during the last three to four years, there were few grasses in the desert. Other plants and trees have also shown very little leaves on them. More than 100 plants have been collected from different parts of the desert. These have been identified. The physiological condition of the plants at different times of the year was also recorded.

Meteorological Data

24. Except Pasni and Karachi we have no other meteorological observation of our own. But the meteorological data of some important places was obtained from the Meteorological Department. Temperature, humidity, soil moisture, etc. were recorded in the field during surveys. Studies of clouds and wind speed, will be started as soon as a cloud atlas is available.

Biological Control

25. The few specimens of desert locust collected from the field have shown no disease or parasite on them. No case of predating on desert locust was recorded. Although few birds which are very common in the field were seen predating on insects.

Migration

26. Several observations were made in vertical beam of 40 w spot light during night halt in the desert. No locust was noticed passing through the light. No other case of migration of the solitary locust was physically recorded. Locust caught from Pasni and Karachi areas had seven eyestripes whereas specimens collected from Tharparkar desert had either six eyestripes or the eye strips were not clear. The E/F and F/C ratios have revealed that the specimens of Karachi and Pasni were purely solitary whereas those found in Tharparkar desert were either solitary or transient phase.

Behaviour and Biology

27. Due to very low population of solitary locust in the field, these studies could not be undertaken in their natural environment. But similar studies were conducted under laboratory conditions which will be helpful for comparing results of the field studies when there is an opportunity for it.

Physical factors

28. The desert locust habitat in Pakistan has received very little rainfall during the last four to five years and therefore there is very little soil moisture and vegetation in the field. This situation of drought has largely affected the solitary locust population of this area.

Future Program of Work

29. In addition to the experiments described above, emphasis will be laid on the following experiments during the coming year.

- (i) Study of the desert locust habits and habitat (behaviour, weather conditions, topography, vegetation, etc.) during recession
- (ii) Investigation of the critical soil moisture and its level for egg-laying and incubation
- (iii) Use of gamma radiation in the sample labelling
- (iv) Effect of gamma radiation on the mortality, development and sterility of desert locust

- (v) Study of the night flights of desert locusts with the help of search light
- (vi) Studies on the gregarization, groups of locusts, displacement of the groups and dispersal of the groups
- (vii) Morphometric studies of the desert locust
- (viii) Testing of insecticides
- (ix) Studies on the causes of mortality of locust hoppers in the embryonic stage and just after emergence
- (x) Study of the parasites and diseases of the locust.

I R A N

Summary of Progress of Field Research

The Government of Iran decided in 1966 to open the Locust Laboratory at Ahwaz instead of Shiraz and the Field Laboratory at B. Abbas instead of Zahiden, as these places are more suitable climatically for locust breeding and they are situated in a more representative locust habitat. Consequently experimental work was started in Ahwaz in July 1966. It was intended to start work as soon as possible so that the staff already posted at Ahwaz for other research work was asked to make a beginning with locust work. It was proposed to recruit staff specially for locust research, but due to some administrative reasons, it was not possible to do so. Now it is hoped that the staff would be recruited soon and the experimental work at Ahwaz will get going. The Field Laboratory at B. Abbas will be opened after arrangements are completed at Ahwaz, and that would not be later than another 3 or 4 months.

Experimental work which was started in Ahwaz in July 1966 could not make much headway, despite repeated efforts of supplying locust stock from Teheran. It is proposed to keep rearing locusts in the Plant Pests and Diseases Research Institute, Teheran, for supplying material to Ahwaz and B. Abbas. At Teheran it is also intended to perform some experiments, such as insecticidal trials etc., and train the new staff to be recruited for Ahwaz and B. Abbas.

Lack of proper staff at Ahwaz was one reason for the slowness of progress. The laboratory equipment supplied by the F.A.O. also was not received in time. Now it is strongly hoped, that with the new staff and the equipment available, work would proceed more satisfactorily.

The detail of the experimental work done in Teheran is as follows:-

Locusts were bred in aluminium cages. These cages were kept in a glass house with a range of temperature 20-35°C and relative humidity 40% - 70%. Three generations were reared under these conditions. Locusts were fed on green wheat, alfa alfa and maize leaves and dry wheat bran. One experiment is being done with *Scelio* sp. which destroys locust eggs. Report on this will be given when completed.

Programme of Work for 1967

Six survey outposts are proposed to be opened in Chahbar, Jask, Iranshahr, Jiroft, Bushire, with headquarters at Kirman. These outposts will provide information about locust incidence in the country, which will be supplemented by the locust surveys conducted by the research staff at Ahwaz and B. Abbas.

Efforts will be made to undertake all research work on the lines as recommended by the First Session of the Executive Committee on field observations and under natural conditions.

In the two laboratories, observations will be made on the following:-

- (1) Observations on the incubation period in semi-natural conditions at Ahwaz and B. Abbas
- (2) Observations on the post-embryonic development in semi-natural conditions
- (3) Observations on sexual maturity
- (4) Number of generations in a year in semi-natural conditions
- (5) Biometrical study of the specimens
- (6) Correlation of meteorological factors and incidence of locusts
- (7) Collection of past locust data
- (8) Trials of various insecticides used in locust control under laboratory conditions
- (9) Study of parasites and predators

Country	Annual Contributions	Amount Paid	Balance Outstanding
India	10,000.00	10,000.00	-
Pakistan	10,000.00	10,000.00	-
Total	20,000.00	20,000.00	-

Particulars	1966-67	1967-68	Total
1. Expenditure	10,000.00	10,000.00	20,000.00
2. Supplies	-	-	-
3. Equipment	-	-	-
4. Travel	-	-	-
5. Government Services	-	-	-
6. Grants and Subsidies	-	-	-
Total	10,000.00	10,000.00	20,000.00

APPENDIX II

TRUST FUND NO. 123

Statement of Account from Inception through 31.12.1966 (Provisional)

(expressed in US dollars equivalents)

Receipts

Sums received in 1965 in respect of 1965	<u>US\$</u>	<u>US\$</u>
Government of Afghanistan	2,750.00	
Government of India	26,965.55	
Government of Pakistan	16,699.93	
Sums received in 1966 in respect of 1965		
Government of Iran	25,000.00	
Sums received in 1966 in respect of 1966		
Government of Afghanistan	2,750.00	
Government of India	<u>26,987.04</u>	101,152.52

Obligations 1965/1966

	<u>Cash Expenditure</u>	<u>Unliquidated Obligations</u>	
1. Personal Services	29.54	600.00	
2. Supplies	-	-	
3. Equipment	7,940.39	-	
4. Travel	1,786.81	-	
5. Contractual Services	200.57	-	
6. Grants and Subsidies	<u>2,373.71</u>	<u>14,531.29</u>	
	12,331.02	15,131.29	
Project Servicing Costs *%	<u>923.89</u>	<u>1,815.75</u>	
	13,254.91	16,947.04	<u>30,201.95</u>
Unobligated Cash Balance			70,950.57
Unliquidated Obligations			<u>16,947.04</u>
Cash Balance at 31.12.66			87,897.61 =====

* 5% on codes 2, 3	\$ 397.02	
12% on codes 1,4,5,6	<u>526.87</u>	<u>1,815.75</u>
	<u>923.89</u>	<u>1,815.75</u>
	Total PSC	\$ <u>2,739.64</u>

2,739.64

TRUST FUND NO 123

Statement of Contributions from Participating Governments as at
31.12.1966 - (Provisional)

Country	Annual Contributions due US\$	Amount Paid US\$	Balance Outstanding US\$
Afghanistan	1965 2,750.00 1966 2,750.00	2,750.00 2,750.00	- -
India	1965 27,000.00 1966 27,000.00	26,965.55 26,987.04	34.45 12.96
			47.41
Iran	1965 25,000.00 1966 25,000.00	25,000.00 -	- 25,000.00
			25,000.00
Pakistan	1965 16,700.00 1966 16,700.00	16,699.93 -	.07 16,700.00
			16,700.07
	<u>142,900.00</u>	<u>101,152.52</u>	<u>41,747.48</u>

APPENDIX IV

PROGRAM OF WORK AND BUDGET FOR 1967

In view of the continuation of the recession the program of the Commission will be broadly the same as for 1966.

1. Secretariat

US\$

The Commission will continue to meet the cost of convening its annual sessions and those of the Executive Committee, including travel expenses of delegates, and other incidental expenses. In addition, the Commission will meet travel expenses of the FAO Secretariat within the region to attend the Sessions and to coordinate the program.. 10,000

2. Research

The Commission will employ one or more high level consultant to coordinate programs of the various research stations in the region and will also make provision for replacing or supplementing existing research equipment. 11,000

3. Training

The Commission will provide one high level fellowship to a young qualified research worker from the Region for advanced training in specific research problems. 10,000

4. Surveys

The Commission will contribute to the cost of travel of teams on the Supplementary Surveys conducted jointly by Indian and Afghanistan Government teams in Afghanistan, and by Iranian and Pakistan teams in Iran and southwest Afghanistan, or in such other areas as may be decided upon by the interested governments in the light of the prevailing situation. 24,000

5. Reserves

The Commission will make provision for replenishment of the reserves of insecticides and supplies at Kandahar, Jodhpur, Bandar Abbas and Karachi up to an amount of US\$ 5,000. A further US\$ 5,000 will be provided for replacing or supplementing vehicles and control equipment. 10,000

6. Project Servicing Costs

In accordance with the Organization's Financial Rules, Project Servicing Costs will be charged at the rates of:

5% on purchases of supplies and equipment	\$ 20,000	\$ 1,000	
12% on other expenditure	\$ 45,000	\$ 5,400	<u>6,400</u>
		Sub-total	71,400

carried forward US\$ 71,400

7. Unused Balance

Subject to appropriate provision being made for expenditure under any of the preceding headings that may have been initiated but not finalized, any unspent surplus at the end of the financial year shall be transferred to an Emergency Reserve Fund to be used at the discretion of the Executive Committee to meet unforeseen emergency expenditure. 50

8. Emergency Reserve Fund

Apart from furnishing of additional equipment, insecticides and other supplies needed to deal with desert locust situations beyond the control of the national services of any member country, the Emergency Reserve Fund may be used for subsistence of aircrews and POL for aircraft provided by member countries for aerial operations. -

Total US\$ 71,450

Summary by Expenditure Code

<u>Code</u>		<u>US\$</u>
1	<u>Personnel Services</u>	
	Consultant's fees	4,000
	Temporary Staff for meetings	<u>1,000</u>
		5,000
2	<u>Supplies and Materials</u>	
	Insecticides - replenishment of reserves	5,000
	Operational supplies for surveys	<u>5,000</u>
		10,000
3	<u>Property and Equipment</u>	
	Control equipment	5,000
	Research equipment	<u>5,000</u>
		10,000
4	<u>Travel and Transportation</u>	
	Travel of Consultant	2,000
	Travel of Regional Locust Officer	1,000
	Travel of Delegates and Staff to meeting	6,000
	Subsistence on Surveys	10,000
	Transportation (POL etc., Surveys)	<u>6,000</u>
		25,000
5	<u>Contractual Services</u>	
	Repairs, maintenance, storage	3,000
	Translation, printing	1,000
	Other meeting expenses	<u>1,000</u>
		5,000
6	<u>Grants and Subsidies</u>	
	Fellowships	10,000

Code

US\$

carried forward65,000

7 Project Servicing Costs

Codes 2 and 3 - \$20,000 at 5%	1,000	
Codes 1, 4, 5, 6-\$45,000 at 12%	5,400	6,400

8 Unallocated

Unused surplus on Codes 1-6 to be transferred to Emergency Reserve Fund

Total US\$	50	71,450
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Summary by Expenditure Code

Code	US\$	Description
1	10,000	Personnel Services
2	4,000	Consultant's fees
3	5,000	Temporary Staff for meetings
4	10,000	Supplies and Materials
5	5,000	Control equipment
6	2,000	Travel of Regional Board Officer
7	10,000	Travel of delegates and staff to meeting
8	25,000	Subsistence on travels and transportation (POL etc., suits)
9	2,000	Contractual Services
10	1,000	Repair, maintenance, storage
11	1,000	Translation, printing
12	1,000	Other meeting expenses
13	10,000	Grants and Subsidies
14	10,000	Fellowships

PROGRAM OF WORK AND BUDGET FOR 1968

The following relates only to those aspects of the Program of Work and Budget that will be funded from Trust Fund 123.

1.	<u>Secretariat</u>	<u>US\$</u>
	The Commission will continue to meet the cost of convening its annual sessions and those of the Executive Committee, including travel expenses of delegates, and other incidental expenses. In addition, the Commission will meet travel expenses of the FAO Secretariat within the region to attend the Sessions and to coordinate the program.	10,000
2.	<u>Research</u>	
	The Commission will employ one or more high level consultant to coordinate programs of the various research stations in the region and will also make provision for replacing or supplementing existing research equipment.	11,000
3.	<u>Training</u>	
	The Commission will provide one high level fellowship to a young qualified research worker from the Region for advanced training in specific research problems.	10,000
4.	<u>Surveys</u>	
	The Commission will contribute to the cost of travel of teams on the Supplementary Surveys conducted jointly by Indian and Afghanistan Government teams in Afghanistan, and by Iranian and Pakistan teams in Iran and southwest Afghanistan, or in such other areas as may be decided upon by the interested governments in the light of the prevailing situation.	24,000
5.	<u>Reserves</u>	
	The Commission will make provision for replenishment of the reserves of insecticides and supplies at Kandahar, Jodhpur, Bandar Abbas and Karachi up to an amount of US\$ 5,000. A further US\$ 5,000 will be provided for replacing or supplementing vehicles and control equipment.	10,000
6.	<u>Project Servicing Costs</u>	
	In accordance with the Organization's Financial Rules, Project Servicing Costs will be charged at the rates of:	
	5% on purchases of supplies and equipment	\$ 20,000 \$ 1,000
	12% on other expenditure	\$ 45,000 \$ 5,400
		<u>6,400</u>
	Sub-total US\$	71,400

carried forward US\$ 71,400

7. Unused Balance

Subject to appropriate provision being made for expenditure under any of the preceding headings that may have been initiated but not finalized, any unspent surplus at the end of the financial year shall be transferred to an Emergency Reserve Fund to be used at the discretion of the Executive Committee to meet unforeseen emergency expenditure.

50

8. Emergency Reserve Fund

Apart from furnishing of additional equipment, insecticides and other supplies needed to deal with desert locust situations beyond the control of the national services of any member country, the Emergency Reserve Fund may be used for subsistence of aircrews and POL for aircraft provided by member countries for aerial operations.

Total US\$ 71,450

Summary by Expenditure Code

<u>Code</u>		<u>US\$</u>
1	<u>Personnel Services</u>	
	Consultant's fees	4,000
	Temporary Staff for meetings	<u>1,000</u>
		5,000
2	<u>Supplies and Materials</u>	
	Insecticides - replenishment of reserves	5,000
	Operational supplies for surveys	<u>5,000</u>
		10,000
3	<u>Property and Equipment</u>	
	Control equipment	5,000
	Research equipment	<u>5,000</u>
		10,000
4	<u>Travel and Transportation</u>	
	Travel of Consultant	2,000
	Travel of Regional Locust Officer	1,000
	Travel of Delegates and Staff to meeting	6,000
	Subsistence on Surveys	10,000
	Transportation (POL etc., Surveys)	<u>6,000</u>
		25,000
5	<u>Contractual Services</u>	
	Repairs, maintenance, storage	3,000
	Translation, printing	1,000
	Other meeting expenses	<u>1,000</u>
		5,000

<u>Code</u>	<u>DESCRIPTION</u>	<u>US\$</u>
	carried forward	55,000
6	<u>Grants and Subsidies</u>	
	Fellowships	10,000
7	<u>Project Servicing Costs</u>	
	Codes 2 and 3 - \$20,000 at 5%	1,000
	Codes 1,4,5,6 - \$45,000 at 12%	5,400
8	<u>Unallocated</u>	
	Unused surplus on Codes 1-6 to be transferred to Emergency Fund	
	Total US\$	<u>71,450</u>

50

71,450

INDIA

Ministry of Food and Agriculture
New Delhi, India

Telephone: PRODUCTION

Address: (1) Ministry of Food and Agriculture, New Delhi, India

(2) Ministry of Food and Agriculture, New Delhi, India

(3) Ministry of Food and Agriculture, New Delhi, India

(4) Ministry of Food and Agriculture, New Delhi, India

(5) Ministry of Food and Agriculture, New Delhi, India

(6) Ministry of Food and Agriculture, New Delhi, India

(7) Ministry of Food and Agriculture, New Delhi, India

(8) Ministry of Food and Agriculture, New Delhi, India

(9) Ministry of Food and Agriculture, New Delhi, India

(10) Ministry of Food and Agriculture, New Delhi, India

(11) Ministry of Food and Agriculture, New Delhi, India

(12) Ministry of Food and Agriculture, New Delhi, India

(13) Ministry of Food and Agriculture, New Delhi, India

(14) Ministry of Food and Agriculture, New Delhi, India

(15) Ministry of Food and Agriculture, New Delhi, India

(16) Ministry of Food and Agriculture, New Delhi, India

(17) Ministry of Food and Agriculture, New Delhi, India

(18) Ministry of Food and Agriculture, New Delhi, India

(19) Ministry of Food and Agriculture, New Delhi, India

(20) Ministry of Food and Agriculture, New Delhi, India

APPENDIX VI

Survey and Control Potentials in the Member Countries
of the Commission

AFGHANISTAN

Anti-Locust Service

In 1964, the Government of Afghanistan asked for the services of an FAO Locust Officer to help them in establishing an Anti-Locust Service. The FAO Expert was supplied under the Expanded Program of Technical Assistance and the Ministry of Agriculture created the locust organization under its Department of Plant and Animal Protection comprising of the staff listed below. The FAO Locust Officer and Mr. Ajruddin Wais, Director, Locust Control and Plant Quarantine, have been since training the staff and setting up a Reporting and Forecasting Service.

Establishment

<u>Director</u>	Mr. Ajruddin Wais, Director, Locust Control and Plant Quarantine, Ministry of Agriculture, Kabul, Afghanistan	
<u>Technical Staff</u>	6	
<u>Administrative Staff</u>	2	
<u>Transport and General Service Staff</u>	9	
<u>Number of outposts</u>	4	
<u>Transport</u>	Land Rover	4
	Mitsubishi Jeep	6
	Toyota Land Cruiser	2
	Dodge Power Wagon	2
	Bedford Truck	1
) presumed received
<u>Equipment</u>	Hand dusters	353
	Power dusters	10
	Exhaust nozzle sprayers	10
<u>Insecticides</u>	BHC dust 12%	172,803 kgs.
	BHC dust 10%	4,739 kgs.
	Aldrin 50% W.P.	2,100 kgs.
	Aldrin 40% E.C.	10 Gal.
	Aldrex 30% E.C.	207 Gal.
<u>Wireless sets</u>	5 sets. More sets to be supplied.	

INDIA

India has a permanent Locust Warning Organization as a wing of the Directorate of Plant Protection, Quarantine and Storage, Ministry of Food and Agriculture, Government of India. The details of the Organization are given below:

<u>Title and Full Address</u>	Directorate of Plant Protection, Quarantine and Storage, 4/19 Ajmeri Gate Extension, New Delhi, India Telegrams: PROTECTION
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<u>Director</u>	Dr. Sardar Singh, Plant Protection Adviser and Director, Locust Control	
<u>Chief of Research Station</u>	Mr. M.V. Venkatesh, Locust Entomologist, Nagniji Mandir Road, Bikaner, India	
<u>Other Technical Personnel</u>	131	
<u>Senior Administrative and Transport Staff</u>	22	
<u>General Service Staff</u>	160	
<u>Number of Locust Outposts including circle zonal Headquarters in the scheduled Desert Locust Areas</u>	32	
<u>Transport</u>		
Light vehicles	104	
Heavy vehicles	43	
Tractors	8	
	<u>155</u>	
<u>Insecticides</u>		
BHC dust 10%	1,557.00	M/Tons
BHC W.P. 50%	5.50	"
Lindane 25% (W.P.)	00.50	"
Aldrin dust	1.90	"
Aldrin E.C.	6.50	"
Dieldrin W.P.	48.20	"
Parathion dust 2%	0.50	"
<u>Spray Aircraft</u>		
Beavers	7	
Auster	1	
<u>Ground Machinery</u>		
Manually Operated Dusters	10,445	
Manually Operated Sprayers	56	
Power Operated Dusters	173	
Power Operated Sprayers	120	
Exhaust Nozzle Sprayers	20	
Flame Throwers	8	
<u>Wireless Sets</u>	54	

IRAN

The Ministry of Agriculture has decided to establish six outposts in Chahbar, Jask, Iranshahr, Jiroft, Bushire and Kerman. Kerman will be the headquarters of the survey staff. The survey and control will be the responsibility of the Plant Protection Organization of the Ministry of Agriculture.

In 1965, it was proposed to have the Locust Laboratory at Shiraz and the Field Laboratory at Zahidan, but in 1966 the Ministry decided to have the Locust Laboratory at Ahwaz and the Field Laboratory at B. Abbas. These two laboratories will be working under the Plant Pests and Diseases Research Institute, Teheran, of the Ministry of Agriculture.

Recruitment of staff for the survey outposts and the laboratories was being made at the time of preparation of this paper.

<u>Title and Address</u>	Plant Protection Organization, Ministry of Agriculture, Government of Iran Teheran, Iran
<u>Director-General</u>	Mr. M. Ayazi, Director-General, Department of Plant Protection, Ministry of Agriculture Teheran, Iran
<u>Chief of Locust Research Section</u>	Mr. A.A. Soltani, Institute of Plant Pest and Disease Research, Ministry of Agriculture, Evin, Teheran, Iran
<u>Other Technical Personnel</u>	20
<u>General Service Staff</u>	30
<u>Transport</u>	
Light vehicles	76
Heavy vehicles	13
	89

These vehicles are located in the locust breeding areas. More vehicles can be mobilized in time of need.

Insecticides

Aldrin 40%	33,905 Litres
Dieldrin 20%	36,870 Litres
Dieldrin Sol. 20%	4,870 Litres
BHC 12%	27,796 Kgs.
Hexachloran 1.5%	19,611 Kgs.
BHC 72% Sol.	8,452 Litres
Heptachlor 4%	189 Kgs.
Bran	675,166 Kgs.

Spray Aircraft

Piper-cubs	30
Cessna	4
Beechcraft	1

Ground Machinery

Power Sprayers	42
Hand Sprayers	758
Hand Dusters	49
Exhaust Nozzle Sprayers	108

<u>Wireless Sets</u>	16
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PAKISTAN

In Pakistan, locust control is the responsibility of the Provincial Government of West Pakistan since 1963, but the Central Government continues to maintain a permanent Locust Warning Organization to act as a shock force for locust control, carry on research and to fulfill its international obligations. The details of staff and other available resources with the two organizations are given below.

	<u>Central Government</u> 1	<u>Provincial Government</u> 2
<u>Title and Address</u>	Department of Locust Warning and Plant Quarantine Ministry of Agriculture and Works Government of Pakistan Malir Halt Karachi-27, Pakistan	Deputy Director of Agriculture (Locust Control) Department of Agriculture West Pakistan Government Lahore Pakistan
<u>Director</u>	Mr. H.M. Abbas Director Department of Locust Warning and Plant Quarantine Malir Halt Karachi-27, Pakistan	
<u>Other Technical Staff</u>	67	73
<u>Administrative and General Service Staff</u>	197	108
<u>Transport</u>		
Light vehicles	128	66
Heavy vehicles	33	14
<u>Insecticides</u>		
BHC (12% Oil Sol.)	3,150 gallons	-
Aldrin 40% E.C.	2,025 gallons	12,600 gallons
BHC 12% Tech.	1,232 Lb.	-
BHC 12% W.P.	292,702 Lb.	65 tons
BHC 50%	5,300 Lb.	-
BHC 10%	16 bags	-
BHC 15%	17,460 gallons	-
BHC 5% dust	-	132 tons
Dieldrin (20% E.C.)	-	8,200 gallons
Dieldrin	32,625 gallons	-
Dieldrin (Oil Sol.)	945 gallons	-
Dieldrin Dust 50% W.P.	124,500 Lb.	-
Diazinon (Tech.)	2 cases	-
Diazinon (Liquid)	1,035 gallons	-
Rice husk	14,305 Mds.	-
<u>Spray Aircraft</u>		
Beaver	13	-

	<u>Central Government</u> 1	<u>Provincial Government</u> 2
<u>Ground Machinery</u>		
Power Sprayers	98	93
Hand Sprayers	51	382
Power Dusters	2	29
Hand Dusters	27	219
Bait Mixer	1	11
Exhaust Nozzle Sprayers	37	55

Wireless Sets 29 -

S U M M A R Y

	<u>Afghanistan</u>	<u>India</u>	<u>Iran</u>	<u>Pakistan</u>		<u>Total</u>
				<u>Central Govt.</u>	<u>Prov. Govt.</u>	
<u>Staff</u>						
Technical	7	133	20	67	73	300
Non-Technical	11	182	30	197	108	528
<u>Transport</u>						
Light vehicles	14	104	76	128	66	376
Heavy vehicles	1	43	13	33	14	109
<u>Insecticides</u>						
Dust and Powder	M/tons 179.6	1,565.4	47.6	275.2	197.0	2,264.8
Oil Solution	"	48.2	84.1	202.6	52.7	387.6
Emul. Concentrate	" 8.3	6.5	7.1	-	34.2	56.1
Technical Materials	"	-	-	0.6	-	0.6
Rice Husk	"	-	675.1	520.1	-	1,195.2
<u>Aircraft</u>	-	8	35	?	-	43
<u>Power Driven Ground Machinery</u>	20	298	150	137	177	782
<u>Hand Driven Ground Machinery</u>	353	10,949	807	79	612	12,800
<u>Wireless Sets</u>	5	54	16	29	-	99

- NOTE: 1. Detail of strengths of the different insecticides are given under each country.
2. Quantities of dusts, powders and inert material are exact, but of solutions and emulsifiable concentrates are approximate, though correct for practical purposes.

APPENDIX VII

LIST OF WORKING PAPERS

- No. DL: SWA:3/1 - The Desert Locust Situation during 1966/67 and Forecast (submitted by FAO)
- No. DL: SWA:3/2 - Special Surveys of southwestern Afghanistan and southern Iran (submitted by FAO)
- No. DL: SWA:3/3 - Program of Work and Budget (submitted by FAO)
- No. DL: SWA:3/4 - Survey and Control Potentials in the Member Countries of the Commission (submitted by FAO)
- No. DL: SWA:3/5 - Report of the Desert Locust Survey and Control during 1966 in Pakistan (submitted by the Government of Pakistan)
- No. DL: SWA:3/6 - Desert Locust Situation in India during 1966/67 and Forecast (submitted by the Government of India)
- No. DL: SWA:3/7 - Anti-locust Survey and Control Potentials available in Afghanistan (submitted by the Government of Afghanistan)
- No. DL: SWA:3/8 - A Review of the Desert Locust Survey and Control Activities carried out in Afghanistan during 1966/67 and Plans for Future (submitted by the Government of Afghanistan)
- No. DL: SWA:3/9 - Report of the Second Session of the Executive Committee of the Commission for Controlling the Desert Locust in the Eastern Region of its Distribution Area in Southwest Asia.