PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

# Decisive Steps Towards Control of the Desert Locust, 1952-62

J. Roy

*Phil. Trans. R. Soc. Lond. B* 1979 **287**, 301-304
doi: 10.1098/rstb.1979.0063

*Phil. Trans. R. Soc. Lond.* B **287**, 301–304 (1979)
*Printed in Great Britain*



# RECENT DEVELOPMENTS IN LOCUST CONTROL

## Decisive steps towards control of the Desert Locust 1952–62

By J. Roy
*Senior Officer, Locust Control and Emergency Operations,*
*Food and Agriculture Organization of the United Nations, Rome, Italy*

Before the 1940s, Desert Locust control in West Africa was essentially defensive, to reduce crop damage if possible. As recommended by B. P. Uvarov, the new strategy was to operate preventively in desert areas, where swarming began. In the decade 1952–62, additional biological information, efficient control techniques and adequate operational organization were sought and found. FAO has since actively spread information and help over the whole Desert Locust area.

### 1. Introduction

The absence of the large destructive swarms of Desert Locusts during the last 15 years tends to cause people to forget the latent danger of seasonal outbreaks of this pest. Only preventive measures taken to prevent Desert Locust populations developing in their permanent habitats can protect crops in certain tropical countries of Africa and Asia. It is too often forgotten that invasions of Desert Locusts are the result of a natural, spontaneous process which would not fail to recur if, owing to indifference or lack of vigilance, the preventive measures taken since 1962 were to be relaxed.

As the idea of danger fades, understandably people tend to forget the considerable efforts made by international bodies, specialists, and locust research and control services to achieve this result. It is interesting to scan the means that have led to this success, from which lessons may help to point to solutions to problems of controlling other crop pests.

The phase theory put forward by Uvarov in 1921 has been the basis for localizing populations in all phases, for following their evolution, and for studying their breeding habits, movements and behaviour in relation to environmental factors, to determine where, when and how best to intervene to check plagues. The accumulation of knowledge of the biology and ecology of the Desert Locust took a long time and involved considerable resources in men and materials. It took many years of work to develop high-yielding control techniques and to set up control units able to tackle concentrations of the insects far from the storage points of materials and a very long way from maintenance facilities. These efforts really started to bear fruit at the end of the 1950s, but not until the 1960s was a technical solution found to the essential problem posed by the Desert Locust, namely by setting up a control system to prevent the seasonal upsurges that usually took place in uninhabited regions.

Previously the control of these insects had had little effect. With no system of reporting and hence of forecasting, the cultivated zones were invaded by the migrating swarms without being able to prepare in advance the existing control facilities, which in any case were pitifully inadequate for the scale of a plague.

All the countries subject to locust invasions participated, as far as they could, in the research and control work which made progress possible, over the years, from a defensive position to an offensive one, which has won for us the present prolonged recession.

Parallel with the work in East Africa, Saudi Arabia and the eastern parts of the Desert Locust invasion areas, a considerable effort was made in West Africa from 1951 onwards to control plagues, no longer with 'backs to the wall' emotion in the cultivated areas, but in places from which invasions start, in other words in the locusts' zones of gregarization.

At the beginning it did not seem possible that potential outbreak areas existed in the Sahara nor that Desert Locust populations could even exist in this immense desert region during the driest and hottest period of the year. It was generally agreed that the specimens occasionally found in this zone during recessions had originated elsewhere. To verify this hypothesis would have necessitated extensive surveys in this vast zone. The shortage of resources from which anti-locust services were suffering immediately after the war made it impossible to embark on such a task.

## 2. 1950 AND AFTER

Not until 1950–1, when the first signs of a new plague appeared in the east, was a survey of the whole Sahara undertaken. The work done before and during the war by Zolotarevsky, Murat and then Volkonsky had drawn attention to the existence in the Sahara of ecological zones which could become favourable environments for Desert Locusts and for locust breeding after either winter rains, originating from the Canaries or the Mediterranean, or the summer rains of the tropical monsoons. The surveys were therefore concentrated into the zones affected by these rains in the southern Sahara. They were organized by the French Anti-Locust Office and the North African countries, in liaison with the French West African service. Teams explored Mauritania, the southernmost part of Algeria, northern Mali, northern Niger and northern Chad to make as many different observations as possible, and to report.

These extensive surveys quickly detected the presence of Desert Locusts wherever the minimum conditions for their survival existed.

However, it was the discovery of a transient concentration in Tamesna, to the west of Aïr in Niger, in January 1952 which led to the launching of the first offensive in the Sahara. The survey teams working in southern Algeria and in Niger converged on Tamesna and were joined by members of the Niger Agricultural Service bringing materials, with the help of various vehicles assembled for the occasion. The direction of this mixed assemblage was entrusted to the then recently established federal anti-locust service of French West Africa.

During February and March 1952 a difficult campaign, exhausting both for the staff and the equipment, destroyed some thousands of hectares of hoppers, but at a price out of proportion to the results obtained. The merit of the undertaking was that it clarified the nature of the problems posed by campaigns in the Sahara by revealing the difficulties. These were of various kinds:

(i) The application of BHC dust, in doses of 10–15 kg per hectare, required transporting enormous quantities of the insecticide over considerable distances using very rough tracks: weight was clearly the worst enemy in this type of operation.

(ii) Application of the insecticide took too long, owing to the time taken in frequently refilling the dust-hoppers, but the most serious trouble was caused by convection currents which,




PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

except very early in the morning, raised the cloud of insecticide and carried it far away from the targets; under the conditions of work, vehicles were soon out of action: it was obvious that an excellent mobile repair service was essential.

(iii) Rapid transmission of orders for supplies and of instructions for the work was essential.

(iv) The campaign revealed the full extent of the needs for accommodation and supplies for staff working in very harsh conditions.

In fact it became obvious that only a carefully organized military-type operation could successfully carry out offensive operations against the locusts in the Sahara. There had to be a concentration of high-yielding control facilities in very mobile mechanized units. They had to be able to move from target to target, separated by hundreds of kilometres of desert, sometimes trackless.

The difficulty about insecticide was crucial, for dusts were too heavy and they were so readily carried off the target by convection. Then came the liquid insecticides, in oil solution. The development of a light easy-to-use sprayer, vented into a vehicle's exhaust pipe (exhaust nozzle sprayer) for spraying entirely replaced the heavy, slow, difficult-to-use and inefficient dusters. The name of John Sayer remains linked to this great and practical step forward. See other papers in this symposium: Adefris (§1), Joyce (§3), Rainey, Betts & Lumley (§2*d*), Gunn (second paper, §2*b*).

The introduction of aircraft for spraying oil solutions of insecticide led to developments that provided the weapon for large-scale operations. Long before, aircraft had been tried with dusts, with the same defects as have ground machines. The decrease by a factor of ten or more in the volume of insecticide applied per unit area, and the low volatility of the carefully designed oil solutions, led to their adoption for large-scale campaigns.

Another development in the 1950s which had a decisive influence on hopper control was the adoption of the insecticide dieldrin. Applied in parallel bands some hundreds of metres apart, it made the vegetation poisonous to the locusts, when they moved into a band and fed and accumulated a lethal dose. It was thus possible to achieve excellent results by spraying, at first, a few hundred grammes of dieldrin solution per hectare. To achieve these low doses, new equipment was necessary. The rotary atomizer, an ingenious spinning-cage system attached beneath the wing of an aircraft, solved this problem.

With all this spectacular progress, problems of organization and logistics became increasingly complex owing to the acceleration of the rhythm of control operations.

A full account of these developments would be long but some simple figures indicate the extent of progress. Control work that had required two months of efforts by numerous staff in Niger in 1952 required only half a day's work by an aerial group with three aircraft in 1967. Output has increased still further since then.

The potentialities of these advances could not be fully realised in the early 1960s for two reasons. There was insufficient knowledge of the biology of the species, especially the mechanism of gregarization, the ecological conditions favourable for breeding, and movements of population. Since then, however, new data supplied by Rainey on the relationship between displacements of locusts and meteorology have thrown new light on the movements of the Desert Locust of great importance in understanding the phenomena of gregarization and the development of plagues.

Second, the procedures developed in East and West Africa needed to be adapted to other working conditions in other areas.





PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

In fact, the success of these new methods, if they can be applied throughout the invasion area of the Desert Locust, should prevent any return of the plagues.

## 3. FAO

It was thanks to the UNDP/FAO Locust Control Project that the objectives described could be achieved in locust research and control. This project, the most active phase of which lasted from 1960 to 1965, gave rise to the present international system of preventive control. This is organized at three levels:

at the national level, each country is responsible for preventive control within its territory, either directly or through the agency of inter-State organizations, as in the East and West African countries of the southern Sahara (DLCOEA and OCLALAV);

at the regional level, preventive work is undertaken either by the above-mentioned regional organizations or by the FAO Regional Commissions which ensure co-ordination of activities in the Near East, North-West Africa and South-West Asia;

at the international level, inter-regional co-ordination is ensured by FAO.

Thanks to this machinery, the result of long years of sustained effort, the risks of the appearance of a new Desert Locust plague are very slight; but the danger is, by its nature, permanent. Any relaxation of the present vigilance would therefore lead to new invasions, with catastrophic consequences.





PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES