

## Desert Locust Threat to Agricultural Development and Food Security and FAO/International Role in its Control

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### Abstract

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The Desert Locust remains a major threat for food safety and social stability, in particular for many rural populations living from an agriculture at high climatic risk. To control the invasions represents a high cost for the affected countries, the international community and a threat for the environment. FAO and its Locust and Others Migratory Pests Group play, at the international level, an irreplaceable part in the coordination of the activities for monitoring and control. During the last years, they had a driving role to reinforce the regional co-operation, to improve the techniques for survey and control, to promote via the EMPRES program a renovated preventative strategy. This program is vital to ensure the sustainability of the early warning system to prevent in the future major plagues of the Desert Locust.

**Key words :** Desert locust, *Schistocerca*, control, plague prevention, FAO

### Introduction

The Desert Locust, *Schistocerca gregaria* (Forskål 1775) represents a major threat to agriculture within a very large area extending from the Atlantic Ocean and North Africa to the Middle East and Southwest Asia. This locust lives in desert and semi-desert areas. It is a much dreaded insect due to the important damage it can inflict on agro-sylvo-pastoral production during invasion periods and the resulting socio-economic and environmental disturbances. One of its main characteristics is that it has a highly-developed migratory capacity over long distances, making the problem one of international scope.

From time to time, outbreaks, upsurges and invasions develop – linked to periods of favorable rainfall. They are interrupted by recession periods during which the solitary populations of the Desert Locust are only present in very small numbers and distributed over a restricted area referred to as the recession area, mainly desert and far from cultivated lands. This area covers 16 million km<sup>2</sup> and particularly concerns the Saharan zones. On the contrary, during invasions, the gregarious populations can occupy a much larger area including 65 countries in Africa, the Middle-East and Southwest Asia, covering a territory of 29 million km<sup>2</sup>, extensively cultivated and populated by more than one billion people.

These Desert Locust invasions, known for thousands of years, can follow one another at a high frequency if no control measures are taken. The recession periods are generally short whereas the invasions can last for one decade or more. From 1860 to 2003, eight invasion periods followed each other, some lasting over 22 years: 1860-67, 1869-81, 1888-1910, 1912-19, 1926-35, 1940-47, 1949-62 and 1987-89. This last invasion - followed by local upsurges in 1992-94 and 1997-98 – once again opened the debate on the economic importance of this species, the usefulness of setting up an updated prevention system as well as initiating international cooperation on this issue once again.

### 1. Importance of the Desert Locust threat

The Desert Locust is undoubtedly the most frightening member of the Acrididae, threatening a very large number of countries. Many stories, data and testimonies attest to the economic and social importance of the Desert Locust over the past centuries (damage has been reported since the most ancient times) just as in recent years. At the local level, crop losses can be total in just a few hours (6, 27). This locust was responsible for many famines in the past in countries where invasions took place, the most recent having been recorded in Ethiopia and in Sudan in the 1950's.

When an invasion occurs, all types of vegetation are subject to attack. Damage can be considerable on all types of crops: annual rain-fed crops as well as perennial crops, tree cultivation and irrigated crops which are even more sensitive since they are exposed throughout the year. The invasions can result in the abandoning of crops and rural migrations. Pastoral zones are also subject to major destruction, affecting both total biomass production and its palatability for livestock. Locally, food competition between locusts and livestock can lead to a deterioration of the vegetation and the soils, especially in places where the ecological balance is precarious (which is the case in all of the countries of the Sahel). Locust invasions can therefore lead to desertification at the local level. Moreover, the development of major irrigation systems in the Sahara countries over the last decades has increased the economic risks of invasions. Finally, the fact that these invasions tend to occur during periods when rainfall is highly favorable to the development of crops increases their economic impact.

In the past, losses due to Desert Locust invasions were unfortunately too rarely evaluated. However, some figures are very conclusive. In Algeria, in 1866, losses were estimated at 19,652,981 French francs (equivalent to 52 million euros in 2003) and at £4,500,000 in only one season in 1954-55 in Morocco. In 1941, locusts totally destroyed one million vine-plants in Libya, 55,000 tons of cereals in 1954 in Sudan and 16,000 tons of millet in 1951 in Senegal. At the time of the last invasion in 1987-1989 in Mauritania,

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losses were estimated at approximately 60% of the 200,000 ha of attacked grazing land, at 70% of the 200,000 ha of rain-fed crops and at 50% of the 400,000 ha of irrigated crops. In Niger, these losses were estimated at approximately 50% of the one million ha of grazing land and at about 33% of approximately 12,000 ha of attacked rain-fed crops. In Mali, the losses were estimated from 65% to 90% of the 700,000 ha of grazing land, from 5 to 75% of the 300,000 ha of rain crops, from 85% to 100% of the 550 ha of market gardening crops and 35% of the 200 ha of perennial crops (arboriculture) (2).

In spite of these facts, there was a tendency to consider that the threat had disappeared in recent years or was not as important as in the past. The economic impact of the Desert Locust was called into question. Information on the damage was regarded as too old or too vague. The damage during the last invasion seemed relatively minor. The importance granted to the Desert Locust seemed to be exaggerated because of the spectacular character of the invasion phenomenon and of the inevitable political pressures which accompany them. The current control strategy was regarded as being unprofitable and having to be revised (14, 22, 28).

It was undoubtedly forgotten that despite the ineffectiveness of control organizations at the time of the 1987-89 invasion, control measures were massive and much more effective than in the past, thanks to recent technological progress and to major contributions from donors. It is not possible to compare damage and the recent invasions with those previous to 1960, since control measures were very rudimentary at that time and prevention strategy was non-existent. All in all, the macro-economic impact of the invasions, so important in the past, has now decreased thanks to modern methods for monitoring and control (17).

The affected countries are well aware of the problem and its importance. Doubts most certainly arose from the fact that various donor countries involved in locust control campaigns demanded a more accurate estimate of the damage and a better justification of control measures. A precise assessment of control measures is, in fact, very difficult and some consider it to be impossible in Africa (19). However, a recent economic study concluded that even if the likelihood of damage causing a threat to food safety at the level of a country is low, this damage could be considerable at the local level. The probability of annual damage of several tens of millions of dollars is far from negligible (13). Moreover, these studies - far from reaching a consensus - do not take losses to grazing lands, the risks faced by the local economy and the social disturbances which can result from an invasion into account. The micro-economic consequences, difficult to quantify, can be catastrophic when the invasions are not stopped at an early stage. At the local level, the destruction of harvests can be total. The impact on on-farm consumption and the fragile economy of populations that depend on high-risk climatic agriculture can be enormous. The social consequences of invasions are such that the Desert Locust is often treated like a national priority. In fact, regardless of the cost-benefit ratio, the Desert Locust is and must be controlled. The economic aspect is just part of the problem; the social aspect could be just as important. For some people, to deny the importance of the Desert Locust problem and the possible extent of the damage is proof of total ignorance of the reality on the ground during an invasion (23).

However, the view that the justification for locust control is self evident does not appear to be universally held. Unfortunately, studies undertaken so far have been either too academically oriented, too limited in scope or too subjective

to satisfactorily address the issue. Some consider that the approach taken during recent years to study the socio-economic impact of the Desert Locust and its control is disappointing (10).

This economic debate on the impact of the Desert Locust was undoubtedly necessary but remains a controversial subject. It introduced a doubt - a healthy measure from the scientific point of view - but is also responsible for slowing down emergency measures necessary to restore an effective prevention control system. This system had been weakened by a recession period that lasted too long and was largely the consequence of the effectiveness of the prevention measures in effect since the 1960's (17, 23, 26). Unfortunately, this delay was not without consequences, leading to the continuous degradation of local expertise over the years and diminishing the capacity of the countries concerned to face the problem. The longer the question of justifying locust control remains unresolved, the more damage that will be done to the perceptions of the donor community whose contributions remain necessary to establish a sustainable locust management system for the Desert Locust. A more holistic approach to the question of the costs and benefits of locust control is urgently needed. This approach should cover the whole spectrum of economic, environmental, social and political issues (10).

## 2. Desert Locust Control organization

Two types of structures intervene in the control of the Desert Locust: (i) the national locust control units which ensure the monitoring and control operations in their own territory, and (ii) regional organizations in charge of coordination, information dissemination and promotion of research and training activities.

In the event of a Desert Locust invasion, large-scale chemical control still remains the only reliable method to stop this plague, despite the many technical advances that have been made in recent years and the possibility of using some biological methods (i.e. mycopesticides) in the near future. At the time of the last invasion in 1987-1989, 26 million hectares were treated in 23 countries (5 million in Morocco, 2.2 in Algeria, 1.25 in Niger, 1.7 in Mali, 1.25 in Mauritania, 2.0 in Senegal, 0.1 in Chad, etc.). These treatments required about 32,000 tons of pesticides, with an obviously negative impact on human populations and the environment in often fragile ecosystems of the desert and semi-desert areas of Africa. These curative control operations had a considerable cost, estimated at 315 million dollars, primarily supported by the donor countries. Morocco only experienced minimum damage but at the cost of a powerful curative control system that cost the country 62 million dollars (2).

Taking this major threat to food safety and to the social stability of many rural populations as well into account, in addition to the high costs and the many disadvantages of curative control, setting up an effective prevention system represents a major challenge in the strategy to fight poverty in many countries, particularly in the Sahel.

Field observations and research carried out over several decades (in fact, throughout the 20th Century), have shown that upsurges and invasions of the Desert Locust are linked to favorable periods of rainfall in reduced zones - outbreak areas - whose boundaries have been gradually identified. These outbreak areas must be constantly monitored and the first outbreaks must be destroyed in priority by control

measures over limited areas, before the cultivated zones are attacked and the invasion has a chance to spread (20).

This strategy implies an early warning and monitoring capability, as well as the possibility to react quickly to undertake necessary prevention measures in due time. The experience of people in the field has shown that the longer we wait to apply control measures, the more the problem worsens and the more the difficulties to solve it grow exponentially (18). Moreover, given the large number of countries concerned, this strategy also implies the existence of effective international cooperation, for both monitoring and control.

The natural risk represented by the invasions of the Desert Locust can thus be managed effectively at this time by applying a prevention strategy with a scientific basis. The recurring costs of prevention and the treated surfaces represent only a small part of emergency aid and surfaces treated during curative control operations, respectively. This strategy has been applied with some degree of success since the 1960's and has been recommended since then by the FAO (3, 4, 12). At that time, new methods of monitoring and control radically changed the basis of the problem in just a few years: new pesticides, new ULV application methods, efficient aerial spraying, barrier treatments, etc. They were highly instrumental in preventing major invasions, reducing the frequency of invasions and improving outbreak control (3, 17, 23, 26). Recently, the comparison of various control campaigns confirmed that rapid intervention in the first outbreak areas leads to much better control of the upsurges (24).

As for the economic impact of this locust, the recent invasion of 1987-89 cast doubts on the validity and efficacy of this prevention strategy. In fact, the fact that this invasion occurred is by no means indicative of a failure in the prevention strategy which had been applied at that time. Various reasons were mentioned – security problems, wars that would have made it difficult or impossible to gain access to some key areas. Actually, this invasion was able to develop only because of the progressive weakening (related to a calm locust situation) of the prevention system, locust units and organizations set up in the 1960's (11, 17). It is mainly the sustainability of this prevention system that is in question.

After more than 10 years, much debate and consideration of other possibilities, prevention remains the option considered to be the most effective, least expensive and least detrimental for the environment. It is also the strategy which makes it possible to maintain and develop essential local expertise in the affected countries. The current trend is towards the reinforcement of the capacities of the concerned countries in order for them to be able to conduct - this time on the long term – prevention operations and to decrease their dependence on donors (5, 7, 9, 21). The flexibility of the prevention control system is certainly a key issue (17, 25).

### **3. Necessity of International Cooperation**

The Desert Locust represents a completely specific problem compared to the other problems of crop protection. The great mobility of the swarms, the distances that they are able to cover (some crossed the Atlantic Ocean from Africa to the Caribbean in October 1988), the seasonal complementarity of the breeding zones located in different countries and the need for preventing the invasions in order to avoid their catastrophic consequences, impose the

necessity of bilateral, regional and international cooperation on this issue. This cooperation must make it possible to maintain a good network for monitoring and control, a fast exchange of locust information between the various countries concerned, close coordination of prevention and control actions and a permanent dialogue on technical problems and control strategy. Not a single country or group of countries can separately carry out effective control against the Desert Locust. International coordination is necessary. The FAO, as an agency of the United Nations specialized in food and agriculture, naturally plays a key role in this area (23).

This internationalization of the Desert Locust problem goes back, in fact, to the 1920's, with the first international conference on locust control held in Rome under the auspices of the International Institute for Agriculture and which resulted in an "International Convention for the control of locusts and grasshoppers". Since that time, cooperation has not ceased to develop, thanks, in particular, to the efforts of B.P. Uvarov and some other pioneers like B. N. Zolotarevsky and P. Vayssière who played a fundamental role in the internationalization of locust control in Africa (17). Between the two wars, international conferences on the locust problem followed one another. Cooperation became a true reality in the 1950's, just after the creation of the FAO and with the beginning of independence for many countries located in the Desert Locust invasion area. The FAO very rapidly set up the Desert Locust Control Committee (DLCC) in 1954. Since that time, it has continued to play an active role to promote international locust control cooperation.

### **4. The FAO Mandate and its role in Desert Locust Control**

As mandated by its Member States, the FAO ensures the coordination of monitoring and control activities of the Desert Locust (1). FAO input primarily comes from the activities of its Locust and Other Migratory Pests Group, the driving force behind this coordination and part of the Plant Protection Service (AGP-P). The Group plays a major role in the early warning system of the Desert Locust. Via its Desert Locust Information Service (DLIS), it issues a monthly locust situation and forecast Bulletin. The Bulletin is based on reports from the affected countries, as well as on the analysis of the ecological conditions in the habitats of the locust (using satellite remote sensing data, weather reports related to rains and direction of the winds, etc.). In the event of an emergency, the bulletin is updated more frequently and alerts are issued. These bulletins are sent to the concerned services and countries by mail, fax, e-mail and are now available on Internet.

In addition, the FAO provides a forum for the meetings of the Desert Locust Control Committee. The DLCC meets every two years. It relies on the Locust Group and coordinates activities related to the Desert Locust on an international scale: to follow the activity of the locust over its whole invasion area, to define control strategy, to mobilize the necessary resources for emergency control operations, to promote research and any actions aimed at reinforcing prevention strategy, to encourage the coordination of the control campaigns and to strengthen international cooperation. The DLCC is formed by representatives from all of the countries affected by the Desert Locust as well as those which take part in the locust control campaigns. Every year, the Member States of the DLCC contribute financial aid to an international trust fund (n° 9161 – Desert Locust).

The DLCC is linked in the field by three regional Commissions (Central Region, Southwest Asia and the very recent commission for the Western Area, CLCPRO) as well as by an inter-state organization, the Desert Locust Control Organization for Eastern Africa (DLCO-EA). These organizations, created under the auspices of the FAO and at the request of the affected countries, benefit from the regular support of the FAO which finances, in particular, the positions of Secretary of the Regional Commissions on its regular budget. These Commissions are mandated to promote all actions, research and training necessary to ensure effective prevention control and to be able to deal with any invasion of the Desert Locust.

During invasion periods, the FAO plays an important part in the coordination of financial aid provided by the various donor countries. In its capacity as an international agency, it provides technical know-how to countries that request it (by recruiting qualified consultants) and creates assistance projects in the field through its technical cooperation program (TCP). As a measure of the importance it attaches to the reasonable use of insecticides in locust control, the FAO has set up an advisory panel of independent experts, the Pesticide Referee Group, that issues opinions on the proper use of insecticides for locust control.

Another important role of the FAO is to provide discussion forums on all current issues concerning locust control. In the years following the last invasion in 1987-89, debate was once again launched or revived on the economic impact of the Desert Locust, the validity of the prevention control strategy, the environmental impact of pesticides, the possibility of introducing mycopesticides in locust control, etc. The FAO played a major role in the organization of all these debates just as in the diffusion and the implementation of new technologies: satellite surveillance, geographical information systems, high precision application techniques using GPS and DGPS, new insecticides and computerized techniques to collect and transfer field data on the locust situation.

## 5. Recent Developments and Perspectives

Given the progressive weakening of national capacities and regional locust control organizations which led to the 1987-89 invasion, the FAO launched the EMPRES program, the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases, in 1994. It is a special priority program of the Director General of the FAO. A major component of the program concerns the Desert Locust. The EMPRES program is intended to reinforce locust control capacities in the countries with outbreak areas. The program should also strengthen regional and international cooperation on this problem. This program is financed by a group of donor countries as well as by the regular budget of the FAO and is coordinated by the Locust Group. Two components of this program are operational: one, since 1996, for the 9 countries of the Central Area of the Desert Locust Habitat (around the Red Sea) (designated as the EMPRES Central Area Program); the other, since 2001, for the 9 countries of the Western Area (West and North West Africa) (designated as the EMPRES Western Area Program) (5, 7, 9, 21).

The general aim of the EMPRES program is to reduce the risks of an invasion of the Desert Locust and to contribute to the fight against poverty, to food safety and to the preservation of the environment. The success of this program is vital for the future of Desert Locust prevention control. A strong mobilization movement by the donors following the

last invasion made it possible for the program to be funded for the central area (key area in the Desert Locust invasion process). For the Western area, the program has been operating at a standstill since 2001, mainly with subsidies from the FAO who is looking for donors to contribute the necessary funds for its implementation. This current situation leaves the Western area without any effective monitoring system. Any upsurge of the Desert Locust would find the Sahel countries unprepared and would undoubtedly force the international community to contribute large sums of money. Here again, the FAO plays an important role by providing these countries with the necessary technical assistance as well as by mobilizing donors to provide additional funding. EMPRES has recently been granted five millions dollars by the African Development Bank for the Western area. However, some additional funds remain necessary.

A second major issue over these last years had been the reinforcement of regional cooperation with, in particular, the creation of the Desert Locust Control Commission for the Western Area ("Commission de Lutte Contre le Criquet Pèlerin en Région Occidentale" or CLCPRO). This Commission will now play the role of the two regional organizations it replaces for the countries of the Sahel: the "Commission de Lutte Contre le Criquet Pèlerin en Afrique du Nord-ouest" (CLCPANO) and the "Organisation Commune de Lutte Antiacridienne et de Lutte Antiaviaire" (OCLALAV) (8, 15, 16). This new commission must provide improved cooperation between the 9 countries of the Western area directly concerned by prevention control operations. This major institutional change has been eagerly awaited by the donor countries, in particular. It shows the importance that the countries of the Western area give to the preservation of an operational system of prevention control of the Desert Locust, with the support of the FAO which played a major role in this development in order to ensure prevention in the future.

Finally, above and beyond the positive recent developments, both at the technical and the institutional level, one of the major problems of Desert Locust control is that of the sustainability of prevention actions and the entire prevention control system that is presently in the process of being revived (17). Donors, in particular, question the wisdom of implementing a prevention control system which will probably not hold up under an extended recession period. They question the capacity of the affected countries to cover recurring prevention costs on the long term. Sustainability is truly a major challenge. Responses are not only scientific and technical, but also financial, institutional and, in the end, political as well. It is strongly hoped that the present scientific debate – always useful - does not delay the implementation of necessary measures. As a result of its mandate, the FAO - and the Locust Group, in particular, linked by the regional commissions - must play a key role to help the countries meet what is the true challenge of Desert Locust control: the sustainability of prevention actions.

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## المخلص

لوكوك، ميشيل. 2003. المخاطر التي يسببها الجراد الصحراوي للتنمية الزراعية والأمن الغذائي والدور الدولي لمنظمة الأغذية والزراعة في مكافحته. مجلة وقاية النبات العربية. 21: 188-193.

يعدّ الجراد الصحراوي آفة مهمة في عدة دول في أفريقيا والشرق الأدنى. وترتبط الغزوات الطارئة للجراد بالفترات الملائمة من الهطل في المناطق الصحراوية لتفشيها حيث تنشأ الأسراب. وقد تناولت دراسات حديثة ديمومة المخاطر وألقت الضوء على المسائل الاقتصادية والاجتماعية والبيئية التي يحددها، والتي تختلف كلياً عن مشكلات وقاية النبات العادية، وتتطلب لذلك تدخلات نوعية. ويتم تنظيم عمليات الرصد والمكافحة على المستويات الوطنية والإقليمية بدعم من منظمة الأغذية والزراعة وبفضل المفاوضات الثلاثة للمكافحة التابعة لها. وتسهم المنظمة على المستوى العالمي بدور مهم في تنسيق أنشطة الرصد والمكافحة. وتتولى إدارة خدمة تنبؤ وتحذير مركزية وتسهم بدور مهم في تنسيق المساعدة وبخاصة في فترات الأوبئة. وقد أسست لجنة مكافحة الجراد التابعة لمنظمة الأغذية والزراعة عام 1995، وهي مسؤولة عن متابعة تطور الجراد الصحراوي في كامل منطقة الغزو، وتحديد استراتيجيات المكافحة الأكثر ملاءمة، وتحريك الموارد الضرورية لعمليات المكافحة، وتحفيز البحوث الهادفة لتحسين مكافحة الجراد، وتشجيع تنسيق خطط المكافحة المحلية والدولية الموجهة للإجراءات الوقائية. لقد حدثت الجائحة الأخيرة في الفترة ما بين 1987-1989 نتيجة الضعف التدريجي للنظام الدولي للمكافحة (والذي كان وراء فترة الركود/الانحسار الطويلة التي بدأت في الستينات) والذي حرك النقاش ثانية حول أهمية استراتيجيات مكافحة الجراد الصحراوي، والتي أسهمت فيها منظمة الأغذية والزراعة بدور رئيس. ولا تزال استراتيجيات المكافحة الوقائية الممارسة حالياً فضلى الطرائق وتتضمن عنصرين أساسيين: التحذير واتخاذ الإجراء المناسب على نحو مبكر. وفي عام 1994، بدأت منظمة الأغذية والزراعة برنامج EMPRES الهادف إلى تعزيز قدرات مكافحة الجراد في الدول التي توجد فيها مناطق تفشي، ودعم التعاون الإقليمي والدولي في هذا المجال. ويعد نجاح البرنامج المذكور أساسياً لضمان استدامة المكافحة الوقائية وخفض مخاطر الغزو. والمحافظة على الأمن الغذائي في المنطقة وضمان المحافظة على البيئة المهددة بالاستخدام المكثف للكيمويات في حملات المكافحة.

عنوان المراسلة: ميشيل لوكوك، مركز التعاون الدولي للبحوث الزراعية من أجل التنمية (PRIFAS)، مونبليه، فرنسا، البريد الإلكتروني: lecoq@cirad.fr

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