



**Towards a More Effective Response to Desert Locusts and their Impacts  
on Food Security, Livelihoods and Poverty**

**Multilateral Evaluation of the 2003–05 Desert Locust Campaign**

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## Table of Contents

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	Pages
<i>Preface</i>	1
<i>List of Acronyms</i>	2
<i>Executive Summary</i>	5
<b>I. Introduction</b>	<b>25</b>
<b>A. BACKGROUND OF THE EVALUATION</b>	25
<b>B. OBJECTIVES</b>	26
<b>C. APPROACH AND METHODOLOGY</b>	26
<b>II. The Desert Locust</b>	<b>29</b>
<b>A. THE DESERT LOCUST ENIGMA – AN OVERVIEW</b>	29
<i>Desert Locust Control Approaches</i>	29
<i>Desert Locust Monitoring and Forecasting</i>	31
<b>B. FROM THE RECESSION PHASE TO THE UPSURGE IN 2003–05</b>	31
<b>C. DEVELOPMENT OF IMPROVED DESERT LOCUST CONTROL AND FORECASTING MEANS</b>	33
<i>Desert Locust Control Means</i>	33
<i>Improved Desert Locust Forecasting</i>	33
<b>D. ORGANIZATIONAL STRUCTURES FOR DESERT LOCUST CONTROL</b>	34
<b>III. Planning and Implementation of the 2003–05 Desert Locust Control Campaign</b>	<b>36</b>
<b>A. FUNDING OF THE CONTROL CAMPAIGN</b>	36
<b>B. APPEALS FOR FUNDING OF CONTROL OPERATIONS AND MOBILIZATION OF RESOURCES</b>	36
<b>C. MONITORING AND CONTROL OPERATIONS</b>	40
<b>D. EFFICACY OF THE CONTROL OPERATIONS</b>	41
<b>E. PUBLIC AWARENESS, COMMUNICATION AND TRAINING</b>	42
<i>Public Awareness and Communication</i>	42

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<i>Training</i>	44
F. ROLE AND ACTIVITIES UNDERTAKEN BY THE AFFECTED COUNTRIES	45
G. SUPPORT PROVIDED FOR THE CAMPAIGN	46
H. ROLE AND ACTIVITIES UNDERTAKEN BY FAO	50
<i>Project Management and Operations</i>	50
<i>Procedures and Systems Functionality</i>	55
<i>ECLO as a Functional Entity</i>	56
<i>Monitoring and Reporting</i>	57
<i>Project Revisions</i>	58
I. KEY ISSUES FOR AFFECTED COUNTRIES AND DONORS	59
IV. Analysis of the Control Campaign	61
A. IMPACT ON THE FOOD SECURITY SITUATION AND LIVELIHOODS OF AFFECTED COMMUNITIES	61
B. ECONOMIC BENEFITS AND COSTS	67
C. IMPACT ON HUMAN HEALTH AND THE ENVIRONMENT	69
D. INSTITUTIONAL AND ORGANIZATIONAL ASPECTS	73
<i>Institutional arrangements</i>	74
E. TECHNICAL QUALITY AND ADEQUACY	75
F. EFFECT AND IMPACT OF THE CONTROL CAMPAIGN	77
<i>Affected Rural Communities</i>	78
<i>Affected Countries</i>	78
<i>Donors</i>	79
V. Sustainable Desert Locust Control	81
<i>Preventive control strategy at country level</i>	81
<i>Strengthening of the Commission de Lutte contre le Criquet Pèlerin dans la Région Occidentale</i>	83
<i>FAO responsibilities</i>	84
<i>Donor support for Desert Locust control</i>	85
<i>Implementation of Desert Locust emergency campaigns</i>	85



### *Preface*

- i. The proposal for an evaluation of the 2003–05 Desert Locust campaign was formulated at the extraordinary session of the Desert Locust Control Committee in December 2004. At that time, it was not yet evident that the ongoing campaign would soon come to an end. However, the purpose – to draw lessons from the current campaign for future control operations – remained valid. After various preparatory discussions, the evaluation was officially endorsed by all stakeholders in August 2005. In view of the broad interest of the various stakeholders, the terms of reference had to cover a wide range of activities and subsequently expanded the task of the evaluation team.
- ii. Special thanks are due to all the team members for their invaluable contributions to the evaluation and for accepting responsibilities above and beyond their original expectations. Over a period of four months, the team evolved from being somewhat heterogeneous to become a well-functioning group in which each member contributed conscientiously and effectively to the elaboration of the final report. The report and its recommendations are a team product, unanimously endorsed by all members of the evaluation team.
- iii. The evaluation could not have been undertaken without the strong support of all the stakeholders. During the country visits, in which a wide range of activities were undertaken in a short period of time, no efforts were spared by the various authorities to provide the team with the necessary information. These visits enabled the team to obtain an in-depth understanding of the range of practical aspects of the campaign. In particular, interviews with farmers and field staff showed that the campaign had been of a much larger magnitude than most team members thought. The countries, within the limits of their resources, had tried to address the Desert Locust invasion to the best of their ability.
- iv. The FAO staff involved in the campaign provided the team with a very wide range of information and ideas during the extensive and frank discussions at the beginning of the evaluation. In addition, follow-up queries were always handled in an efficient manner. The guidance and administrative support received from the FAO Evaluation Service were essential in the overall management of the evaluation. The desk studies undertaken by Luisa Belli and Patrick Tesha greatly facilitated the work.
- v. Without the financial support of some donors, this evaluation could not have been possible. In addition, various donor representatives provided valuable inputs to the evaluation through direct contacts and discussions, and by responding to a wide range of issues on questions in the questionnaire distributed by the evaluation team. The opinions, conclusions and recommendations expressed in the report represent exclusively those of the evaluation team, and do not necessarily represent those of the cooperating parties in the 2003–05 Desert Locust campaign.
- vi. On behalf of all the team members, I would like to extend my most sincere gratitude to all concerned. The evaluation proved to be a real challenge but, thanks to all your help, we have produced a document that we hope will contribute to strengthening the Desert Locust monitoring and control capacity. This would certainly be a big relief for the many African households that are destined to face recurrent Desert Locust invasions, without substantial means to stand up to the challenges they pose.

*Lukas Brader  
Team Leader*

*List of Acronyms*

<b>ADB</b>	African Development Bank
<b>AELGA</b>	Assistance for Emergency Locust/Grasshopper Abatement project (USAID), formerly known as the Africa Emergency Locust/Grasshopper Assistance project
<b>AELP</b>	Africa Emergency Locust Project (World Bank)
<b>AGP</b>	Plant Production and Protection Division (FAO)
<b>AGPP</b>	Plant Protection Service (FAO)
<b>CAP</b>	Consolidated Appeals Process
<b>CERF</b>	Central Emergency Response Fund
<b>CILSS</b>	Comité permanent inter-États de lutte contre la sécheresse dans le Sahel (Permanent Interstate Committee for Drought Control in the Sahel)
<b>CLCPRO</b>	Commission de lutte contre le criquet pèlerin dans la région occidentale (Commission for Controlling the Desert Locust in the Western Region)
<b>CRC</b>	Commission for Controlling the Desert Locust in the Central Region
<b>DGPS</b>	Differential global positioning system
<b>DLCC</b>	Desert Locust Control Committee
<b>DLCO-EA</b>	Desert Locust Control Organization for Eastern Africa
<b>DLIS</b>	Desert Locust Information Service (FAO)
<b>EC</b>	European Commission
<b>ECLO</b>	Emergency Centre for Locust Operations
<b>EMPRES</b>	Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>FEWS NET</b>	Famine Early Warning System Network (USAID)
<b>FPMIS</b>	Field Programme Management Information System (FAO)
<b>GIEWS</b>	Global Information and Early Warning System (FAO)
<b>GIS</b>	Geographical information system
<b>GPS</b>	Global positioning system
<b>IASC</b>	Inter-agency Standing Committee
<b>ICRISAT</b>	International Crops Research Institute for the Semi-Arid Tropics
<b>IFAD</b>	International Fund for Agricultural Development
<b>CERES LOCUSTOX</b>	Foundation CERES/LOCUSTOX Centre de Recherche en Ecotoxicologie pour le Sahel
<b>NGO</b>	Non-governmental organization
<b>OCHA</b>	Office for the Coordination of Humanitarian Affairs
<b>OCLALAV</b>	Organisation commune de lutte antiacridienne et de lutte antiaviaire (Joint Anti-Locust and Anti-Aviarian Organization)

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<b>OECD/DAC</b>	Organization for Economic Co-operation and Development/Development Assistance Committee
<b>OSRO</b>	Office for Special Relief Operations; project symbol for extrabudgetary funded emergency projects
<b>PCC</b>	Poste de commandement central
<b>QUEST</b>	Quality, Environment, Health and Treatments
<b>RAMSES</b>	Reconnaissance and Management System of the Environment of Schistocerca
<b>SWARMS</b>	Schistocerca Warning Management System
<b>TCE</b>	Emergency Operations and Rehabilitation Division (FAO)
<b>TCEO</b>	Emergency Operations Service (FAO)
<b>TCP</b>	Technical Cooperation Programme (FAO)
<b>UEMOA</b>	Union économique et monétaire ouest-africaine (West African Economic and Monetary Union)
<b>UNJLC</b>	United Nations Joint Logistics Centre
<b>USAID</b>	United States Agency for International Development
<b>WFP</b>	World Food Programme



### *Executive Summary*

1. The evaluation was undertaken from November 2005 to March 2006. This included planning activities to be carried out by the team, briefings by various stakeholders and by persons directly involved in the Desert Locust control campaign, collection and analysis of information from the affected countries and from donors through two questionnaires, desk studies and reviews of the activities carried out by FAO in relation to the Desert Locust control campaign (for which two consultants were employed), visits to a number of countries affected by the 2003–05 Desert Locust upsurge, and review of a range of publications relevant to the evaluation. The 2003–05 Desert Locust upsurge was almost completely limited to the Western Region, consequently the evaluation and recommendations are focused on this region.

#### *(1) KEY ASPECTS OF THE CAMPAIGN*

2. The evaluation team considers the following as the key aspects of the 2003–05 Desert Locust control campaign.
- a) Within a very short period, from June to December 2004, a very wide geographical area in the Western Region was invaded by large and very dense Desert Locust populations.
  - b) The 2003–05 upsurge started in the Sahel region, while in the past swarms originating from the Central Region breeding areas, around the Red Sea coasts and in the interior of the Sudan and Saudi Arabia, have usually preceded Desert Locust population explosions in West and Northwest Africa.
  - c) Donors generally considered that they were not adequately informed by FAO on the actions to be undertaken to address the Desert Locust invasion, and on the potential impact of the invasion on the food security situation, which led to delays in donor response. This delayed reaction may also be a sign of a lack of trust in the way Desert Locust emergencies are handled by the various parties concerned.
  - d) Donors and affected countries believed that costs of the control operations would have been reduced, and the impact of the locust invasions more limited, had interventions started earlier.
  - e) The control strategy focused on killing the maximum number of locusts and saving crops and pasture. The measures taken in a number of countries to minimize the impact of the control operations on the environment and human health were inadequate.
  - f) The Desert Locust invasion had serious consequences on the food security situation of more than eight million people in the Sahel region, for whom food assistance and rehabilitation measures were not initially foreseen. However, in early 2005, a UN appeal was launched for Western Africa seeking funding for agricultural rehabilitation measures to address the combined effect of drought and locusts.
  - g) Substantial costs were also incurred by the affected countries, which had not been foreseen in their national budgets, resulting in less resources being available for other national development activities.
  - h) Algeria, the Libyan Arab Jamahiriya and Morocco were well prepared to face the invasion and also provided substantial assistance to countries in the Sahel during the campaign. The latter were generally inadequately prepared and unable to launch timely, effective control operations to minimize damage to crops and pastures.
  - i) The effective control operations, especially aerial control undertaken during the autumn and winter of 2004 by Algeria and Morocco, combined with poor locust breeding conditions in northwestern Africa owing to unusually cool weather, led to the rapid decline of the upsurge in early 2005. This avoided renewed invasions of the Sahel countries in 2005 and demonstrated that Desert Locust invasions can be stopped with currently available techniques.

- j) The Sahel countries, depending on their state of alertness and the availability of resources, have contributed to the control campaign to the best of their ability. In all affected countries, staff, often working under harsh conditions, spent enormous efforts to limit the impact of the Desert Locust invasion.
- k) There were large differences in the efficiency of the control operations carried out by the countries, resulting in control costs ranging from US\$13 to over US\$200 per hectare from one country to the other.
- l) During the campaign, an estimated 12.9 million ha were sprayed with over 13 million liters of pesticides. More than 6.3 million liters of pesticides were left over at the end of the campaign. This was partly caused by the fact that, in a number of cases, additional quantities of pesticides were purchased towards the end of the campaign against the advice of technical staff. These pesticide stocks may represent a substantial disposal problem in the near future. This could have been avoided through better coordination, and if contractual arrangements for the rapid provision of pesticides had been in place.
- m) Donors contributed generously to the campaign costs. The relatively late arrival of the bulk of the donor contributions and the early ending of the campaign have resulted in a significant amount of unspent financial resources. These could help strengthen the national locust control units in the frontline countries in the Sahel.
- n) The total costs of control operations amounted to at least US\$280 million, most of which were provided by the affected countries, especially Algeria, Morocco and the Libyan Arab Jamahiriya. The so-called traditional donors and FAO contributed over US\$80 million. Considerable assistance was also provided to the affected countries by both traditional and non-traditional donors through bilateral means. In addition, more than US\$90 million were spent on food assistance, as well as for the rehabilitation of communities affected by the upsurge. Thus, the total costs of the campaign may be estimated at about US\$400 million.

(2) *PLANNING AND IMPLEMENTATION OF THE 2003–05 DESERT LOCUST CONTROL CAMPAIGN*

3. The primary responsibility for organizing the control campaign resides with the affected countries. Countries resort to the international donor community and FAO for support when they do not have the required resources to undertake the necessary surveillance and/or control measures. FAO and the donors endeavor to respond through a planned and prioritized approach. In this FAO takes into account governing bodies' policy directives and the advice of the Desert Locust Control Committee and of the Regional Locust Control Commissions.

4. Following a review of the various activities undertaken with respect to the planning and implementation of the 2003–05 Desert Locust control campaign,

**It is recommended that:**

1. FAO define, in clear terms, the different categories of emergencies and establish the criteria to decide which ones would make use of the Consolidated Appeals Process (CAP), for which guidelines have been published by the Office for the Coordination of Humanitarian Affairs (OCHA). When an emergency is not considered complex, the Organization should also spell out the specific rules that will apply and make them known to all concerned;
2. in future campaigns, in the affected countries, through the appropriate committees, effective exchange of information be ensured among the various stakeholders involved to avoid duplication of efforts and unnecessary high costs;
3. FAO initiate discussions with donors to arrive at a common format for both the funding agreements and the subsequent project document. Such formats should be as simple and user-friendly as possible, but detailed enough to ensure a clear understanding by all the interested parties of what is at stake;
4. FAO initiate discussions with donors on the opportunity of having, in future campaigns, only one or two multidonor projects, and those projects be deemed regional in geographical coverage to facilitate dealing with a pest that knows no national frontiers. Due attention should be given during the negotiations to how donor visibility and preferences, as well as applicable policy and regulatory requirements, would be factored into any multidonor arrangement that is reached;
5. the rather ad hoc procurement requirements be transformed by FAO into systems and methods that are specific to Desert Locust control and to similar emergency operations in which FAO is involved, as was also recommended by the Technical Group of the Desert Locust Control Committee (DLCC) in early May 2005 in its workshop on contingency planning for Desert Locust control;
6. the FAO Plant Production and Protection Division plan ahead and set up a well researched roster of dependable, experienced and qualified candidates to fill expert positions pertaining to Desert Locust control, especially in the field, and tries to ensure that their conditions are known and are acceptable to FAO;
7. delegation of authority for operational activities, lasting for the duration of the Desert Locust campaign, be given by FAO to the lowest possible level;
8. a single unified command and wide delegation of authority be bestowed in a future FAO Emergency Centre for Locust Operations (ECLo) and that it be recognized as an operational entity, with its own accounting code rather than that of the Office for Special Relief Operations (OSRO), to facilitate the identification of regular programme and extrabudgetary appropriations put at its disposal by the Organization;
9. FAO strive to present a clear strategy to the donors at the time of launching the appeals that is part of the relief–rehabilitation–development continuum, by focusing not only on the immediate problem of eliminating Desert Locusts but also on related humanitarian and livelihood protection issues.

5. The above recommendations require appropriate action from FAO to ensure that it is well prepared to address future Desert Locust emergencies. The necessary proposals should be prepared by both the technical and administrative units of FAO in consultation with relevant stakeholders.

### (3) ANALYSIS OF THE CONTROL CAMPAIGN

#### *Impact on the food security situation and livelihoods of affected communities*

6. Officially, the impact of the Desert Locust invasions is considered to be very limited by the national authorities in almost all the affected countries. However, data collected by the evaluation team indicate that the invasions had a major impact on the food security situation and on the livelihoods of the affected communities. The control campaigns were focused mainly on the protection of regions with a high production potential. Consequently, regions with low agricultural potentials have suffered significantly from Desert Locust infestations, and losses to crops and pastures have resulted in (i) relatively severe food shortages; (ii) strong price movements in the markets; (iii) insufficient availability of grazing areas; (iv) selling of animals at very low prices in order to meet the subsistence needs of the households and to buy feed for the remaining animals; (v) early transhumance of the herds (migration to better grazing areas by pastoralists); (vi) severe tension between the transhumance pastoralists and the local farmers over resources, and heavy pressure of the animals on the transhumance zones; and (vii) extensive migration to urban areas.

7. The evaluation team came to the conclusion from information collected from various sources in the course of the visits to the affected countries that the number of people in the Sahel that have suffered to varying degrees from the Desert Locust invasions may be estimated at over eight million, distributed as shown in Table 1.

**Table 1. Number of people affected to varying degrees by the Desert Locust invasions**

Burkina Faso	500,000
Mali	1,000,000
Mauritania	1,300,000
Niger	3,000,000
Senegal	1,580,000
Chad	1,000,000
<b>Total</b>	<b>8,380,000</b>

8. The Desert Locust invasions have made the long-term food security of the local populations even more uncertain, by aggravating the poverty and vulnerability of households already living under very precarious conditions, in regions where food insecurity is almost structural. The impact of reduced and irregular distribution of rainfall on crops in 2004 was very strongly aggravated by the Desert Locust invasions; the locust passage changed the situation from limited crop losses to almost complete destruction. In response to this situation, pastoralists adopted the solution of early transhumance.

9. With respect to the incidence of the Desert Locust invasion on markets, it should be noted that the shortage of cereals had important implications on price levels, causing a significant increase, out of reach of a large majority of the households. For livestock the inverse movement occurred; the sharp drop in animal prices in the market resulted in a strong reduction of the value of the herds and of the purchasing power of the producers. The famine in the pastoral zone in Niger in 2005 is one of the most dramatic examples of the link between the drop in price of cattle, its influence on incomes and food availability at household level.

10. Completing the work undertaken by the evaluation team, a survey was carried out in Burkina Faso, Mali and Mauritania in February/March 2006 to determine the impact of the Desert Locust invasion on the food security and subsistence means of the rural populations. In Burkina Faso and Mali, three zones were selected, and in Mauritania four, and a total of 30 villages were covered by the survey in each country. This has led to the following conclusions.

11. The losses caused by the Desert Locust invasion in 2004 have been evaluated at 80 percent of the expected cereal production in the zones investigated in Burkina Faso, 90 percent in Mali, and 90–100 percent in Mauritania. For the staple leguminous crops (cowpea and groundnut), losses were close to 85–90 percent of the expected production in 2004 in the affected zones in the three countries. One-third of the pastures were also lost in the same zones in Mali and Burkina Faso. The most important losses were observed in Mauritania, where they reached 85 percent of the fodder production. The majority of households were forced to decrease their food consumption, and the volume and number of daily meals were reduced.

12. In 2004, external aid to the areas surveyed in Burkina Faso, essentially in the form of food aid, was provided to 90 percent of the households, who each received on average 140 kg of cereals, representing 8 percent of their food deficit. In Mali, 75 percent of the households received on average 300 kg of cereals, covering 15 percent of their deficit. In Mauritania, 65 percent of the households received on average 130 kg of cereals, representing 10 percent of their deficit. Although the 2005 agricultural season has been relatively satisfactory, household food consumption has nowhere reached pre-locust invasion levels. The consumption of cereals and food legumes during 2005 was about 10 percent below the 2003 level in Burkina Faso and Mauritania. This persistence of the famine in 2005 concerned 30 percent of the households in Mali and 40 percent of the households in Burkina Faso, while at the same time external food aid tended to be withdrawn from the villages, because the crisis was considered finished.

13. In 2004, the average household expenditures for the purchase of food had to be multiplied by three or four depending on the zone studied. To face this increase, household heads had to reduce non-food expenditures: clothing, social expenditures, travel, and sometimes health and schooling. At the same time, they sought supplementary monetary revenues through departure to urban areas to seek employment opportunities or the development of non-agricultural activities. As these strategies proved insufficient to cover the food deficit, farmers had to sell part of their capital, such as their livestock. Women sold personal goods, in particular jewellery. They often incurred debts themselves through women's associations, became involved in extra-agricultural activities and reverted to gathering wild food products for the provision of food for the family (Burkina Faso). To address the food deficit, many household heads have also become indebted. Mauritania is the most affected, with 60 percent indebted households, followed by Mali (45 percent) and Burkina Faso (33 percent).

14. The long-term effects of the locust invasion were the same in all interview zones. They included the departure of young people, increased poverty of the households, reduction of the agricultural workforce and increase of food insecurity. The relative importance of the different types of impacts varies in the countries and zones surveyed. The departure of young people is perceived in all the village communities as the most important impact of the 2004 crisis.

15. In general, at the beginning of 2006, less than 10 percent of the households had reconstituted their livestock. More than 50 percent of the households in Burkina Faso, 30 percent in Mali and 40 percent in Mauritania have not yet been able to repay the debts contracted in 2004. Only 10–20 percent of the households so far have been able to reconstitute their cereal reserves. The security offered by livestock in case of a major problem has been strongly reduced, leaving the households even more vulnerable when facing future crises.

16. The consequences of the crisis still being visible in 2006, only sustained assistance can slow down the degradation of the socio-economic situation of many households. However, as noted by the evaluation team, given the scant attention paid to the socio-economic dimensions of

the impact of the Desert Locust control campaign, the assistance provided so far has not always been targeted in an adequate and satisfactory manner.

17. On the basis of the foregoing,

**The evaluation team recommends that:**

10. strategies be adopted by the affected countries to ensure that locust control operations are carried out both in zones with high production potential and in zones with low production potential, where agriculture is usually practiced by farmers with very limited resources.

***Economic benefits and costs***

18. The total cost of the locust control campaign 2003–05, including food aid and rehabilitation projects, was about US\$400 million. Data on crops and pastures saved by the locust control operations have not been collected in a systematic manner in any of the affected countries. The campaign succeeded in protecting the subsistence means of some affected communities: in these cases, benefit/cost analysis shows a ratio of 1.5 to 1. The evaluation team did not have the means to carry out an in-depth macroeconomic study of the campaign; however, it addressed in particular the socio-economic impact at the community level.

19. For the determination of benefit/costs ratios of future locust control campaigns,

**It is recommended that:**

11. mechanisms be put in place by the countries concerned to estimate the total benefits of the control campaign (value of production saved and additional benefits);
12. relevant national structures be involved in the collection of the necessary data and in the preparation of these benefit estimates (agricultural statistics services, etc.).

***Impact on human and animal health and the environment***

20. As in preceding Desert Locust campaigns, chemical control remained the most utilized approach, if not the only one, during the 2003–05 campaign to address the locust invasions. Compared to previous campaigns, increased attention has been paid to human and animal health, and environment matters, during this campaign. However, the negative consequences of the pesticides used were not always easy to determine. Gaps exist between the official figures and the information collected in the treated areas, but, in the absence of monitoring of these impacts in a regular and timely manner, it was not possible to obtain reliable data.

21. The national locust control units in the Maghreb countries and in Mauritania have usually been able to ensure medical protection for and monitoring of the professional staff involved in Desert Locust control. In most Sahel countries, nearly all staff members from the Plant Protection Services who participated in the Desert Locust control operations had not undergone cholinesterase tests before the start of the campaign, although they were usually performed afterwards. However, without the availability of a pre-treatment reference, the determination of a possible effect of pesticide contamination on the cholinesterase level becomes erratic.

22. To minimize the risks to the safety and well-being of the populations, and to ensure the effective protection of the environment,

**It is recommended that in the countries concerned:**

13. the capacity of environment and health professionals be strengthened through training aimed at understanding and respecting norms and quality standards, environmental procedures and regulations, and precautionary, reduction and mitigation measures, and that these professionals be provided with logistics and financial means to carry out quality tests and field inspections;
14. those who apply pesticides be trained and sensitized to ensure that they fully understand and follow the rules and regulations pertaining to the use of pesticides;
15. medical surveillance of specialized staff involved in chemical control be ensured, including provision of adequate protection kits;
16. the involvement of village and phytosanitary brigades in the chemical locust control campaign operations be stopped on safety grounds, but their locust monitoring capacities be strengthened.

23. Only 30–80 percent of the empty pesticide containers were collected, according to information received from the Sahel countries. In the countries where village brigades were a key part of the chemical control operations, plastic containers of 1–5 litres have been provided to facilitate the handling of the pesticides. These containers are frequently used for domestic purposes and hence have often been a major source of contamination.

**It is recommended that:**

17. ordering and distribution of pesticides in containers of less than 50 litres be avoided by all parties concerned and that pesticides be purchased in metal containers of a large capacity (100–200 litres);
18. drum crushers be introduced in all countries affected by the Desert Locust for the destruction of metal containers and recycling of crushed containers by foundries be promoted by the national locust control units;
19. in collaboration with FAO and the Commission de lutte contre le criquet pèlerin dans la région occidentale (CLCPRO) member countries, an agreement be developed with pesticide manufacturers concerned for the recovery of their containers.

***Institutional and organizational aspects***

24. All partners have directly or indirectly supported the overall strategy for locust control during the campaign. This consisted of the timely detection of the different Desert Locust populations and elimination through chemical control. In the Sahel countries, owing to inadequate means, control operations were in general carried out after agricultural production areas had

already been invaded. In Algeria and Morocco, these operations concentrated on eliminating the locusts before they reached these areas.

25. Countries differed considerably with respect to the type of personnel involved in the control operations. In some, control operations were exclusively carried out by well-trained professionals, in others they involved a wide range of people with limited or no experience. The affected countries are responsible for the planning and implementation of Desert Locust control operations. To carry out these responsibilities in an effective manner, the frontline countries (Chad, Mali, Mauritania and Niger) should establish autonomous national locust control units and provide them with adequate resources. Coordination of the various activities at the national level varied considerably, from virtually no specific arrangements, to the establishment of a range of committees at different technical and political levels.

26. FAO has the following responsibilities with respect to Desert Locust forecasting and control operations: (i) as a forum for discussion for the development of appropriate policies, strategies, and plans; (ii) coordinating knowledge and information related to the distribution and abundance of Desert Locusts, covering the daily monitoring of locust and environmental conditions on a global scale, leading to regular bulletins, early warning, alerts and forecasts of timing, location and scale of breeding and migration; (iii) strengthening of National Locust Control Units and promoting collaboration at the regional level, within the framework of the Regional Desert Locust Control Commissions; and (iv) declaring Desert Locust emergencies, organizing international assistance and providing technical advice in support of the control activities to be undertaken.

27. However, the capacity of FAO to carry out these responsibilities effectively is limited. It should be emphasized that FAO does not coordinate the control operations at the field level. This is the responsibility of the countries, over which FAO has no direct control. The specific organizational aspects linked to the management of the 2003–05 campaign by FAO were characterized by appeals to donors since February 2004 and the re-establishment of ECLO in August 2004. However, ECLO was constrained by the established administrative and financial procedures, as it had not been given special delegation of authority for handling the Desert Locust emergency, as had happened during the 1986–89 campaign. Donor resources became available mainly during September to December 2004, when Desert Locust invasions were already taking place on a very large scale.

28. *A number of comments on the above matters have been received from donors through responses to a questionnaire. With respect to the implementation of Desert Locust control operations, 62 percent of the donors consider that FAO involvement should be limited mainly to coordination and information activities. Only one donor felt that FAO should be involved mainly in project execution; instead, 31 percent favoured involvement in both types of activities.*<sup>1</sup> The evaluation team believes that FAO continues to be the logical choice for the implementation of multilateral Desert Locust control campaigns. However, it should try to do so in a much more effective manner and allow staff responsible for the various project activities to take decisions and carry out their responsibilities expeditiously.

29. From an organizational and technical point of view, the campaign has suffered from a lack of effective contingency plans at the national, regional and international levels. The collection and transmission of data among the countries, the Regional Commission and FAO headquarters, has been handled reasonably well. It has also suffered from a lack of active involvement of all the relevant parties, especially donors and affected countries, in Desert Locust monitoring and control matters. The linkages between Desert Locust recession, the pre-emergency

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<sup>1</sup> In the report, comments received from the affected countries and the donors through two separate questionnaires have been included. To facilitate the identification of these comments, they are presented in italics.

and emergency phases should be better understood by all stakeholders to allow for timely and effective reaction and action by all concerned.

### ***Technical quality and adequacy***

30. One of the most important constraints noted during the Desert Locust control campaign was the insufficient availability of well-qualified human resources in most of the countries concerned, in particular the Sahel countries. In a crisis situation, the staff of the control structures in these countries is strengthened by people from various departments, who generally do not possess sufficient knowledge to be able to undertake the monitoring and control activities appropriately.

31. With respect to pesticides, most of the products used during the Desert Locust control campaign are on the list of products recommended by the FAO Pesticides Referee Group. In a small number of cases, other products were used. Specialists agree that, in an invasion situation, the best means to return as quickly as possible to remission is still the utilization of conventional pesticides with a rapid knock-down effect. Alternative control means, such as entomopathogenic fungi and pheromones, are ecologically highly attractive, but do not kill locusts rapidly. Further tests are needed to determine how they can be used most effectively. The management of pesticide stocks has become a major preoccupation for the locust control authorities, who try through different measures to ensure better storage based on the available means, while waiting for the construction of the appropriate stores.

32. The effectiveness and efficiency of the control operations undertaken in the various countries are, to a large extent, expressed by the costs of the control operations per hectare. Based on the data collected from eight countries, it was shown that these costs ranged from US\$ 13 to over 200/ha. These costs are largely dependent on the effective planning of the campaign and the timely provision of the various campaign inputs. These data show that there is considerable scope for improvement in a number of countries.

33. Given the wide range of the costs of the Desert Locust control operations in the affected countries during the 2003–05 campaign,

#### **It is recommended that:**

20. a study be undertaken jointly by FAO and the countries concerned to identify the reasons for the high costs of Desert Locust control operations in some of the affected countries, as a basis for the development of guidelines for the more efficient control of locusts.

### ***Overall appreciation of the effect and impact of the control campaign***

34. The following impressions have in particular been obtained by the evaluation team in the course of the country visits. Donors, affected countries and populations are unanimous in their opinion with respect to the importance of the potentially devastating effect of the Desert Locust invasions and their negative repercussions, combined with those of drought, on the productive activities and on household food security. They also share the conclusion that costs of the control operations would have been less, and the impact of the invasion more limited, had control operations been launched in time to avert major invasions.

#### ***Affected populations***

35. From the local populations' point of view, on balance the result of the campaign is mixed: while they recognize that the control operations have had an irrefutable impact, they were

unhappy about the late start, which has entailed heavy consequences in terms of prolonged exposure to damage by locusts. Within a couple of hours, some lost a considerable part of their capital. Notwithstanding the severe losses of crops and other assets, there is general agreement among the local populations that the disaster might not have been avoided, but it could have been reduced, if assistance had been provided at the appropriate moment. These groups and communities, the appeals of which have not been heard, had the impression that they were abandoned by the authorities.

#### *Affected countries*

36. Agricultural losses, according to the majority of the countries affected in 2003–05, could have been less. The level of damage caused was linked to a certain number of factors, in particular the shortage of resources. Clearly, the importance of the development of the Desert Locust has been underestimated by the technical ministries, and the countries were taken by surprise by the rapid evolution of the events. Also, because of lack of preparedness, they depended largely on the assistance provided by the international donor community, and on that matter the affected countries were unhappy about the slowness in the provision of aid.

#### *Donors*

37. From the donors' point of view, notwithstanding the overall delay experienced in the provision of assistance, the control objectives have been met in general terms, and the campaign has been largely successful considering the fact that the control operations have contributed to a reduction of the locust populations and have limited the losses to crops and pastures. The donors recognize, however, that rural communities in certain places have been heavily affected and that there was a need to provide rehabilitation assistance. Donors agree with the affected countries that support for the control campaign has been provided late, but they differ in opinion on the reasons for the delays. Some mention the heavy bureaucracies and the lengthy administrative procedures within donor agencies; others note the weaknesses of the organization charged with this task.

### (4) *SUSTAINABLE DESERT LOCUST CONTROL*

38. The evaluation team concluded that in future the frequency and impact of Desert Locust invasions can be significantly reduced, provided effective action is taken on the following general recommendations for which further elaborations are provided in the report. It has been suggested to prioritize these recommendations. However, the evaluation team believes that, to arrive at lasting improvements with respect to sustainable Desert Locust control, they must be handled as a comprehensive package that requires urgent attention and follow-up action by all concerned stakeholders.

39. Contrary to the current situation, effective Desert Locust control requires a much better awareness and more effective and joint involvement in the various activities to be undertaken by all groups concerned. These include FAO, the DLCC, the Regional Desert Locust Control Commissions, the affected countries and the donors. The transition from, and the linkages between, a Desert Locust recession situation, through a pre-emergency stage, to a full-scale emergency should be well understood by all stakeholders to allow them to take timely and effective action. These stages are all too often looked at as independent events. Better awareness of the above facts and appropriate institutional arrangements to address them are essential to the implementation of the recommendations listed in this report.

40. Given also the fact that this evaluation has covered only one of the three major regions of the Desert Locust invasion area, the evaluation team considers that, in addition to the implementation of the recommendations presented in this report, action should be taken on how they might affect Desert Locust survey and control efforts in the other two regions. FAO should take the lead on this in close collaboration with relevant stakeholders.

***Preventive control strategy at country level***

41. The Western Region, covering West and Northwest Africa, contains important seasonal breeding areas that can result, as shown by the 2003–05 events, in large-scale outbreaks and invasions when ecological conditions become favorable. The seasonal breeding areas in the Sahel are mainly located in the so-called frontline countries (Chad, Mali, Mauritania and Niger). Regular surveying and monitoring in these breeding areas would allow control of Desert Locust populations at an early stage before they invade larger areas and become difficult to contain. So far, only Mauritania has established the necessary institutional framework for the implementation of a preventive control strategy.

**21. It is recommended that:**

- a) an effective preventive Desert Locust control strategy be put in place in all the countries of the Western Region where seasonal breeding areas exist to reduce the risk of future outbreaks and upsurges, through the timely detection of a pre-emergency situation. The implementation of such a strategy could avoid crop and pasture losses, and considerably limit control costs by intervening at an early stage with limited scale control operations, and allow implementation of safer and environmentally friendlier control means;
- b) an autonomous and operational national locust control structure, with the authority to take technical and administrative decisions as regards Desert Locust operations, be created in each of the frontline countries. This structure must be granted effective financial, material and policy support by the governments concerned. The structure should be able to take full advantage of the material, financial and technical resources received during the 2003–05 upsurge;
- c) an adequate national budget be allocated for the operation of the national locust control structure to ensure the sustainability of the preventive control strategy;
- d) the EMPRES programme in the Western Region be effectively supported by the CLCPRO member countries and by the donors;
- e) countries in the Sahel exposed to Desert Locust invasions maintain a capacity to control locusts within the Plant Protection Services and ensure that the experience gained during the 2003–05 campaign is captured, disseminated and preserved, through appropriate avenues such as training;
- f) the human capacity in acridology be strengthened for the timely replacement of the current Desert Locust specialists, many of whom will reach retirement age in the next 10–15 years.

42. Details of the requirements for the effective strengthening of the national locust control units in each of the frontline countries have been defined recently on the occasion of the first meeting of the Steering Committee of the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES) programme for the Western Region, held from 4

to 6 March 2006 in Algiers.<sup>2</sup> For example, the minimum number of monitoring and control teams has been estimated at six for Mali, ten for Mauritania, five for Niger and four for Chad.

43. The total costs for the establishment and operation of the National Locust Control Units in each of the four countries over the period 2006–09 have been estimated at US\$21.9 million. From these estimates, it is evident that, for an average insurance premium of some US\$5 million per year, a new Desert Locust outbreak may be either avoided, or certainly be of much less importance than during the 2003–05 upsurge.

***Strengthening of the Commission de Lutte contre le Criquet Pèlerin dans la Région Occidentale***

44. The CLCPRO is responsible, among others issues, for the strengthening of national locust control units, through its own programmes and in collaboration with the EMPRES Western Region programme. However, the limited role and responsibilities of CLCPRO in the Western Region with respect to Desert Locust control operations, compared with the activities undertaken in the past by the Organisation commune de lutte antiacridienne et de lutte antiaviaire (OCLALAV), undermines its visibility and recognition by the member countries and the units within them.

45. In order to enable the CLCPRO to carry out its mandates and responsibilities in the region in a more effective and efficient manner,

**22. It is recommended that:**

- a) the CLCPRO Secretariat role and responsibilities be reviewed and that it be provided with adequate resources to be able to effectively carry out its responsibilities in the medium and long term. The Secretariat should be the main contact with the countries in the region both during recessions and emergencies;
- b) in the case of a new emergency, additional financial and operational responsibilities be delegated to the CLCPRO Secretariat, by member-countries, donors and FAO;
- c) in order to strengthen the CLCPRO and ensure a more efficient execution of its activities, the different components of the EMPRES Western Region programme be realigned immediately within the domain of the Secretariat in much the same way the Central Region programme was incorporated into the Central Region Commission structure.

46. FAO should, as a matter of urgency, develop the necessary plans for the implementation of this recommendation, including the way in which the CLCPRO Secretariat should be strengthened during the period of an emergency, to be able to undertake such additional responsibilities effectively.

***FAO responsibilities***

47. The Desert Locust is a threat to agricultural production in countries in Africa north of the equator, the Near East and Southwest Asia. Considering FAO's overall mandate with respect to Desert Locust monitoring and control activities for more than five decades, it has a clear

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<sup>2</sup> Programme EMPRES en Région Occidentale. *Rapport de la Première Réunion du Comité de Pilotage*. Alger, Algérie, 4-6 mars 2006. FAO, mars 2006.

responsibility to provide the necessary services to these countries so that they can prevent Desert Locust outbreaks and control upsurges effectively.

48. For FAO to continue to carry out its responsibilities for Desert Locust prevention and control in an effective manner,

**23. It is recommended that:**

- a) as a first step, the human capacity of the Desert Locust Information Service, which is currently staffed by only one professional officer, be increased, while at the same time a review is undertaken of the critical mass needed in the Locust and Other Migratory Pest Group to carry out its wide range of responsibilities effectively;
- b) FAO and member countries provide adequate recognition and support to the DLCC and take full advantage of the Desert Locust Technical Group to review the needs for the development of improved Desert Locust survey and control means, and prepare appropriate proposals;
- c) arrangements be made to enable FAO representatives, in the case of a new Desert Locust emergency, to collaborate effectively with and assist the countries in the steps to be undertaken in coordinating and mobilizing the necessary international assistance by presenting well defined action plans and proposals on how to implement these plans, and by determining the international support needed for them.

49. FAO should develop the necessary plans and undertake the actions required to implement this recommendation. It should commit itself to ensuring that it is able to continue carrying out its mandated responsibilities with respect to Desert Locust forecasting and control in an efficient and effective manner. This will have budgetary implications, but the evaluation team considers that these are justified because this is a core FAO function, and thus should be paid for from its own resources. As a consequence, it may have to drop less essential activities.

***Donor support for Desert Locust control***

50. Effective control of a migratory pest such as the Desert Locust, which can move from one country to another within a matter of hours and days, requires flexibility in the planning and implementation of control operations. For the resources to be used most effectively, they should preferably be available for the control operations to be undertaken in the whole of the invaded region, and not restricted for activities in one particular country. Harmonization of project procedures, as recommended in the Organization for Economic Co-operation and Development/Development Assistance Committee (OECD/DAC) declaration of 2005, will also be an important element for the rapid implementation of control activities. A working document on alternative funding arrangements for Desert Locust control campaigns has been prepared by the FAO Secretariat for the next session of the DLCC.

24. **It is recommended that:**

- a) in case of a new emergency, opportunities be explored for the establishment of multidonor regional funds in support of regional control programmes facilitating the effective implementation of future Desert Locust control campaigns. Due attention should be given to how donor visibility and preferences can be factored into such a multidonor arrangement;
- b) FAO and donors explore the possibility of developing a mechanism that would allow flexibility in reorienting and reallocating donor funds at FAO with minimal administrative effort to respond effectively to emergencies as they surface or as the situation continues to evolve. Such a tool should be put in place during the budget negotiation process so that the project documents will explicitly capture the importance of flexibility;
- c) in future, to assist affected populations, provisions be made in Desert Locust control project agreements, for part of the financial resources to be reserved for food aid and rehabilitation activities as needed.

51. FAO, in close collaboration with interested donors, should take advantage of the experience gained during this campaign to develop the necessary plans and agreements for the implementation of this recommendation. It should ensure, together with the international donor community and the affected countries, that it is able to continue to carry out its responsibilities with respect to Desert Locust forecasting and control in an efficient and effective manner.

***Implementation of Desert Locust emergency campaigns***

52. Addressing Desert Locust upsurges and plagues in an effective manner requires the availability of well-defined contingency plans at national, regional and international levels, which were mostly lacking during the 2003–05 campaign. These plans should preferably be developed as an integral part of the national food security risk management plans and ensure the permanent engagement of all stakeholders. Both the preventive and emergency control operations require the regular involvement and support of donors, the affected countries, FAO, the CLCPRO and other interested partners.

53. In order to be well prepared for an eventual new Desert Locust upsurge,

**25. It is recommended that:**

- a) contingency plans be developed for the medium- and long-term management of the Desert Locust risk, including action plans for locust monitoring and control at national, regional and international levels. These action plans should indicate: (i) the main activities to be undertaken (including those related to food aid and rehabilitation of the affected populations) and their provisional costs; (ii) the available financial resources, their origin (internal budgets, external resources) and the activities that will be covered by them; (iii) additional financial needs. These plans will be the basis for the preparation of annual work plans and budgets;
- b) in future emergencies, funding appeals be based on well-defined contingency plans and follow the principles and guidelines endorsed for appeals by the Inter-agency Standing Committee (IASC);
- c) strategies be adopted to ensure that locust control operations are carried out both in zones with high production potential, as well as in zones with low production potential, where agriculture is usually practiced by farmers with very limited resources.

54. With respect to FAO's operational procedures,

**26. two options are recommended for future action:**

- a) either FAO develops and introduces appropriate arrangements to address future Desert Locust emergencies in a more effective and expeditious manner;
- b) or opportunities for outsourcing most of the operational responsibilities should be pursued.

55. Given its specific responsibilities with respect to Desert Locust monitoring and control, FAO should take the leadership to develop the necessary contingency plans in close collaboration with the various stakeholders. In these plans, FAO should indicate how, in future emergencies, it will ensure that the Inter-agency Standing Committee (IASC) guidelines for appeals will be followed. At the same time, the Organization should reassess its capabilities to implement Desert Locust control emergency projects. If it is concluded that FAO should continue to be involved with this, then it should explore ways and means how this can be done in a more effective manner. Alternatively, it should develop plans for how these activities can be best outsourced.

***Institutional arrangements***

56. In the course of the evaluation, concerns have been raised on the effectiveness of the current institutional arrangements for Desert Locust control. Some of these have already been addressed in the above recommendations. From a more general point of view, it is essential that: (i) better recognition be given to the fact that Desert Locusts are a permanent major threat to the

food security and livelihood situation of large numbers of people in countries that already require very substantial international development assistance; (ii) strong support is provided by the countries concerned and the international community to address the necessary Desert Locust monitoring and control activities effectively during the recession, pre-emergence and emergency phases; and (iii) that a productive partnership is created with the active support and trust of all concerned.

57. A much better understanding is needed of the role and responsibilities of all the stakeholders, the affected countries, the donors and FAO, and the way the DLCC and Regional Commissions promote and ensure effective Desert Locust monitoring and control. For example, the evaluation team had the impression that, with respect to the Desert Locust emergency, some affected countries seem to consider that action to be undertaken is in the first place a responsibility of FAO and the Regional Commissions. Also, donors and affected countries consider a Desert Locust emergency as a unique, stand-alone, event. It is essential to recognize that there is a continuum from recession, through pre-emergency to emergency. Limiting the frequency and importance of Desert Locust outbreaks and upsurges requires the involvement and support for the whole chain of activities related to these three phases.

58. To achieve this,

**27. It is recommended that:**

- a) the DLCC be transformed from an essentially technical committee into a mechanism in which all parties (affected countries, donors and FAO) determine their joint interests and activities, and deal directly with donors to determine joint work programmes;
- b) Regional Commissions meet regularly at a high level to ensure member country support for the decisions taken;
- c) a multilateral agreement for Desert Locust control be developed for the formal permanent engagement and support of all key stakeholders.

***Assistance provided by Maghreb countries***

59. A very special aspect of the 2003–05 control campaign was the solidarity demonstrated by the Maghreb countries towards neighbouring countries in the Sahel. The transboundary nature of the Desert Locust invasions calls for the countries to pool available resources for the mutual benefit of the whole region. The strong control capacity available in the Maghreb countries offers a unique opportunity to address eventual new Desert Locust outbreaks in the Sahel countries more effectively. These outbreaks always precede the movement of swarms to the Maghreb countries by a couple of months.

**28. It is recommended that:**

- a) an appropriate action plan and legal framework be developed for the joint use of the existing control capacity in the Maghreb countries within the Western Region, under the supervision of CLCPRO;
- b) agreements are established among the various countries in the region to encourage, organize, facilitate and implement joint cross-border operations;
- c) cost estimates are developed to determine the amount of donor assistance required to use the Maghreb control teams and aerial resources in the Sahel countries effectively in case of a new emergency.

60. CLCPRO should take the necessary initiatives for the establishment of such an integrated Desert Locust control system for the Western Region. This should include matters such as the operational modalities, the necessary legal arrangements, steps needed to call this control system into action, the financial requirements for such a force and the international support needed for its effective intervention in the frontline countries.

***Socio-economic impact***

61. It is generally accepted that gregarious Desert Locusts need to be controlled, notwithstanding the fact that precise data on the damage that can be caused have not been collected systematically. Consequently, the calculation of benefit/cost ratios of the control operations remains a speculative exercise. A World Bank discussion paper on Desert Locust management (Joffe, 1995)<sup>3</sup> suggests that locusts are not particularly serious pests in aggregate, and that Desert Locusts are unlikely in modern times to trigger widespread food insecurity. However, the evaluation team noted that such impacts have been very significant at the level of the affected communities, especially in the Sahel countries. In these countries, at least eight million people have suffered destruction of all or part of their food crops.

62. The control campaigns were focused primarily on the elimination of locust populations, while little attention was paid to the impact on food security and sustainable livelihood aspects. These impacts could not be evaluated in a complete manner because of: (i) the absence of an agreed upon methodology to evaluate these types of impacts; (ii) the lack of a global intervention framework that takes into account the social, economic and nutritional aspects; and (iii) the insufficient involvement of the different competent technical services/structures.

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<sup>3</sup> Joffe, S.R. 1995. *Desert Locust management. A time for change*. World Bank Discussion Papers. Washington, D.C., World Bank,

**29. It is recommended that:**

- a) a jointly agreed methodology to evaluate the socio-economic impacts of Desert Locust invasions be developed by the different authorities concerned;
- b) a global intervention framework that addresses effective assessments of the socio-economic impact of Desert Locust invasions and control operations be established;
- c) in case of a new emergency, economic, social and nutritional impact studies, integrating a broader spectrum of relevant disciplines and competencies, be carried out in a timely, systematic and multidisciplinary manner.

63. The DLCC should establish a multidisciplinary working group to develop proposals for the implementation of this recommendation. This working group should pay special attention to the specific actions needed at the national level to plan for and carry out the necessary impact studies.

***Human and environmental health***

64. Human and animal intoxications and negative environmental effects have been noted in certain countries. It has not always been easy to determine the undesirable consequences of the use of pesticides. Most of the affected countries do not have an environmental impact research strategy, specialized laboratories or a sufficient number of qualified staff to follow the fate of the pesticides in the environment, and within the framework of a public health policy. Large quantities of pesticides are still available in the countries affected by the Desert Locust invasion. Estimated at 6.2 million liters, they are either leftover from the 2003–05 campaign or come from purchases made after the campaign in order to be prepared for an eventual new invasion. This was partly caused by the fact that in a number of cases additional quantities of pesticides were purchased towards the end of the campaign against the advice of technical staff. To address health and environmental concerns more effectively,

**30. It is recommended that the affected countries:**

- a) procure only pesticides registered with the Comité Permanent Inter-États de Lutte contre la Sécheresse dans le Sahel (CILSS) and create the necessary conditions for the appropriate use of these pesticides;
- b) take the necessary steps to strengthen environmental compliances and enforce the application of regulations and rules for the safer handling, use and storage of pesticides;
- c) avoid placing unnecessary pesticides orders and overestimating pesticide needs;
- d) strengthen the technical capacity of the QUEST (Quality, Environment, Health and Treatments) trained specialists in collaboration and agreement with the EMPRES Western Region programme and the CERES-Locustox in Senegal, and ensure their linkage to the national locust control units in order to undertake in-depth operational health and environmental reviews;
- e) pursue, in collaboration with FAO, CLCPRO, donors and pesticide producers, the establishment of pesticide contractual arrangements, including a pesticide bank mechanism, to reduce the accumulation of pesticide stocks and for the disposal of empty containers.

65. The countries affected by the Desert Locust should determine the steps needed to implement this recommendation under their specific circumstances and develop the necessary action plans. If an effective preventive control strategy is put in place, as recommended, the negative effects of chemical control operations on public welfare and the environment will already be strongly reduced.

***Research***

66. Research activities related to Desert Locust have not generated much interest over the last decades. However, without effective research there will be no improvements in Desert Locust control operations.

**31. Consequently, it is recommended that research studies aimed at the following issues are encouraged:**

- a) improving operational Desert Locust monitoring and control techniques;
- b) developing alternative control means;
- c) using technologies such as satellite imagery and differential global positioning systems (DGPS), that will greatly improve survey, monitoring and control operations;
- d) gaining better understanding of population dynamics of the Desert Locust during the solitary phase; and
- e) determining the overall impact of Desert Locust invasions on the economies of the affected countries.

67. FAO should determine, in consultation with the DLCC, Regional Desert Locust Commissions and research institutions, what specific steps are needed to move forward in these specific areas, which are of major importance for the further improvement of the efficiency of Desert Locust monitoring and control operations.

## I. Introduction

### A. BACKGROUND OF THE EVALUATION

68. Desert Locust, *Schistocerca gregaria* (Forsk.) is a major threat to agricultural production in countries in the arid and semi-arid regions of Africa mainly north of the equator, in the Near East and in Southwest Asia. In these regions, rural populations are already farming under very harsh conditions and encounter major difficulties in meeting their subsistence requirements.

69. The Desert Locust is a very opportunistic insect, once it has changed under favourable environmental conditions from the solitary into the gregarious phase, i.e. the phase when locusts group together in hopper bands and swarms. It can travel long distances and ravage whatever crop and pasture it encounters. The 2003–05 upsurge<sup>4</sup> offers a classic example of this characteristic, which makes it so difficult to forecast accurately the development and spread of the Desert Locust, and subsequently undertake survey and control actions in a timely and effective manner.

70. In the past, according to available records, swarms originating from the Central Region preceded Desert Locust population explosions in the Western Region.<sup>5</sup> However, the 2003–05 upsurge was the first in the Western Region in which swarms from the Central Region played no part. Within 12 months the situation changed from solitary locusts, scattered over the northern part of the Sahel region, where they caused no damage, into one where swarms were spreading into pasture and crop land over an area extending from Chad to Mauritania, and from Morocco to the Libyan Arab Jamahiriya. Thus, within a very short period of time, an extremely wide area was threatened by Desert Locust populations that were larger and denser than those encountered during the 1986–89 campaign. During the 1986–89 campaign, over a three-year period, 16.9 million ha were treated in the Central and Western Regions, compared to 12.9 million ha over some 15 months during the 2003–05 upsurge in the Western Region.

71. Swarms move with prevailing winds and can cover over 100 km per day. When the conditions in the newly invaded places are dry, and do not offer suitable conditions to feed and multiply, they continue to move. As such, in early summer 2004, in Mali and Niger, swarms moved straight to the centres of these countries because of dry conditions in the north. At the end of the summer, when crops and pastures dried up in most of the Sahel, the locusts moved to Mauritania where suitable feeding and breeding conditions were still prevalent.

72. Under suitable environmental conditions, adult Desert Locusts can start laying eggs after 4–6 weeks. However, in the autumn and winter of 2004, the large populations that had moved from Mauritania to the south of the Atlas Mountains in Morocco and Algeria encountered unusually cool conditions and stayed immature for several months. This created good opportunities for the national teams in the two countries to control these locusts effectively, and to end the 2003–05 upsurge.

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<sup>4</sup> An outbreak is described as a marked increase in locust numbers owing to concentration, multiplication and gregarization, which, unless checked, can lead to the formation of hopper bands and swarms. An upsurge is described as a period following a recession marked initially by a very large increase in locust numbers and contemporaneous outbreaks followed by the production of two or more successive seasons of transient-to-gregarious breeding in complementary seasonal breeding areas in the same or neighbouring Desert Locust regions. A plague is described as a period of one or more years of widespread and heavy infestations, the majority of which as hopper bands or swarms. A major plague exists when two or more regions are affected simultaneously.

<sup>5</sup> The Desert Locust invasion area has been divided into three major regions: Western, Central and Eastern Region. The Western Region consists of 23 countries in Northwest and West Africa, the Central Region contains 27 countries of East and Northeast Africa and the Near East, the Eastern Region consists of 6 countries in Southwest Asia from Iran to Bangladesh.

73. The 2003–05 upsurge has been addressed through a control campaign with survey and control operations carried out in 24 countries, and supported by 27 donors. During the special session of the Desert Locust Control Committee (DLCC) in December 2004, it was considered that the necessary lessons should be drawn from the current campaign for improving Desert Locust control. It was suggested that an evaluation of the whole Desert Locust campaign, including the activities carried out by FAO and all the other relevant institutions, should be organized. During a meeting of the stakeholders convened by the FAO Director-General on 29 August 2005, the evaluation was endorsed by all parties concerned. It was also decided to put in place a Steering Committee for the evaluation with representation from all the partners in the Desert Locust campaign.

## B. OBJECTIVES

74. As stated in the terms of reference adopted by the Steering Committee, “the objectives of the evaluation are to serve the needs of all partners in the campaign (i.e. affected countries, donors working directly with affected countries and donors working through FAO, Desert Locust organizations, and FAO), in order to strengthen future response capacity. Based on a comprehensive evaluation of the efficiency, effectiveness and impacts of the roles and activities undertaken by all partners in the locust campaign, the evaluation should first and foremost provide findings and recommendations to be considered by all partners in strengthening future work to prevent and counter future locust outbreaks and upsurges. The evaluation will also provide accountability to all partners on the efficiency and effectiveness of resources deployed in the campaign”. The terms of reference are in Annex I.

## C. APPROACH AND METHODOLOGY

75. The evaluation team was composed of the following experts:

Brader, Lukas	(Netherlands)	Agronomy/Crop Protection, Team Leader
Djibo, Hadiza	(Niger)	Sociology
Faye, Francois Gabriel	(Senegal)	Natural Resource Management
Ghaout, Said	(Morocco)	Locust Operations
Lazar, Mohamed	(Algeria)	Locust Operations
Luzietoso, Philippe Nguala	(DRC)	Rural Economics and Poverty
Ould Babah, Mohamed Abdallahi	(Mauritania)	Locust Operations

76. The evaluation was undertaken from November 2005 to March 2006. This included planning of activities to be carried out by the team, briefings by various stakeholders and by persons directly involved in the Desert Locust control campaign, collection and analysis of information from the affected countries and donors through two questionnaires, desk studies and reviews of the activities carried out by FAO in relation to the Desert Locust control campaign (for which two consultants were employed), visits to the countries affected by the locust upsurge, and review of a range of publications relevant to the evaluation. Furthermore, an in-depth survey aimed at assessing the impact of the locust invasion on food security and livelihoods was carried out during February and March 2006, in Burkina Faso, Mali and Mauritania. The full report is available as a separate document.

77. A questionnaire was prepared by the evaluation team for the affected countries, to obtain the following information: national structures, plans and guidelines for Desert Locust control; organization of the control campaign; human and material resources available; training activities; type, amount and adequacy of assistance received; areas infested and sprayed; damage estimates including health and environmental effects and impact on livelihoods; and left-over pesticides and

storage facilities. The questionnaire was sent to 19 countries, and 17 replied.<sup>6</sup> The information gathered through the responses was integrated, where pertinent, in the present report.

78. Likewise, a questionnaire was prepared to seek information from donors concerning their involvement in the Desert Locust control campaign and the way they have perceived the overall management of the campaign, as well as suggestions for improvements. The questionnaire was sent to 39 donors and completed by 14 (36 percent).<sup>7</sup> The 14 respondents had contributed in total, through FAO, US\$45 636 340, or 62 percent, of the total extra-budgetary funding received by FAO for the Desert Locust 2003–05 campaign. Seven of these donors had provided an additional US\$29 647 096 in the form of bilateral assistance directly to the affected countries. The information gathered through the responses was integrated, where pertinent, in the present report.

79. A stakeholder workshop was held on 11 November 2005 to seek the opinion of a broader range of partners for the identification of issues to be examined in the course of the evaluation, and of importance to the further strengthening of Desert Locust monitoring and control. It included representatives of the Australian Plague Locust Commission, the UN Office for the Coordination of Humanitarian Assistance (OCHA), the World Food Programme (WFP), the International Research Institute for Climate and Society – Columbia University and FAO. The following topics were discussed during the workshop:

- Overview of the 2003–05 Desert Locust upsurge
- Desert Locust monitoring and control strategy
- Raising funds for Desert Locust control activities
- Public health and environmental concerns
- The potential use of remote sensing in Desert Locust monitoring
- Communications and public awareness

80. On 14 November 2005, the Steering Committee endorsed the terms of reference of the evaluation, as well as the draft work plan prepared by the evaluation team. Discussions with various FAO staff members involved in the Desert Locust control campaign were held from 15 to 17 November 2005.

81. From 10 to 20 December 2005, field missions to Egypt, the Libyan Arab Jamahiriya, the Sudan, Saudi Arabia, Tunisia and Yemen were carried out. From 15 January to 5 February 2006, Algeria, Burkina Faso, Chad, Mali, Mauritania, Morocco, Niger and Senegal were visited. In these countries, discussions were held with the national authorities, staff involved in the Desert Locust survey and control operations, donor representatives, local communities directly affected by the locust invasion and non-governmental organizations (NGOs).

82. Country visits gave the evaluation team an excellent insight into how the various countries had addressed the locust invasion and into the problems encountered in the course of the control operations. In addition, through discussions at various levels, the evaluation team was able to collect more comprehensive data with respect to both the socio-economic impact of the Desert Locust invasion, and the human and environmental health impact. A report was prepared for each country visit, following a checklist and outline developed previously by the team. A summary of findings and conclusions of the evaluation team in each of the countries visited, is presented in Annex II.

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<sup>6</sup> This included 13 countries from the Western Region (Algeria, Burkina Faso, Cape Verde, Chad, the Gambia, Guinea, Guinea-Bissau, Mali, Mauritania, Morocco, the Niger, Senegal and Tunisia) and 4 from the Central Region (Eritrea, Saudi Arabia, the Sudan and Yemen). In the Western Region, all countries were affected by the Desert Locust upsurge; in the Central Region the upsurge was limited to Saudi Arabia and the Sudan.

<sup>7</sup> Respondents were: African Development Bank (ADB), Austria, Canada, the European Commission, Finland, France, Germany, Morocco, the Netherlands, the Sudan, the West African Economic and Monetary Union (UEMOA), the United Kingdom/Department for International Development (DFID), the United States Agency for International Development (USAID) and the World Food Programme.

83. The team assembled during the week of 20–24 February 2006 at FAO in Rome to discuss and agree on the main findings and recommendations of the evaluation, and to initiate writing of the draft report. The draft report was reviewed by a Peer and Stakeholder Workshop, 22–23 May 2006.

84. In addition to the terms of reference, the following general principles have been used as a benchmark against which to judge the effectiveness of the control campaign:

- a) The operational objectives of the Desert Locust control campaign 2003–05 were:
  - preventing the Desert Locust from invading cropping areas, and protecting the subsistence means of the affected populations to guarantee their food security; and
  - ending the Desert Locust upsurge.
- b) The control approach concerned primarily the elimination, through chemical treatments, of the gregarious populations in the Western and Central Regions of the Desert Locust invasion area.
- c) For the locust control campaign to be successful, it had to be undertaken in a well coordinated manner at three levels:
  - the affected countries have the primary responsibility for the survey and control operations. An effective national capacity is required for this, and needs to be supported and strengthened accordingly;
  - a regional approach is essential to ensure timely exchange of information and effective coordination and collaboration among the countries in the Regions; and
  - at the international level, whereby FAO, through its Desert Locust Information Service (DLIS), collects and analyses the data required for forecasting the expected Desert Locust developments, in order to be able to alert the countries concerned and the international community about the types and level of action and support required, and to organize the international assistance.
- d) All parties involved should respect the agreed rules and regulations on the appropriate use of the locust control means and monitor the effectiveness of the control operations, as well as possible human and environmental health effects.

85. Formal evaluations of earlier Desert Locust campaigns had never been undertaken. However, a detailed review of the 1986–89 campaign was carried out by Gruys (1991)<sup>8</sup>. The report of this review was not published as an FAO paper, and its recommendations were not presented to the DLCC. Consequently, action on these recommendations is not reported.

86. A review of the 1992–94 Desert Locust upsurge was carried out by McCulloch (1994)<sup>9</sup>. Again, this report was not published by FAO and was not reviewed by the DLCC. The review presents a set of lessons learned and some 50 recommendations.

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<sup>8</sup> Gruys, P., 1991. Grasshopper and Locust Campaigns 1986-1989 and FAO's Role. A Review, 3<sup>rd</sup> Draft, 1 February 1991. FAO, Rome (unpublished paper)

<sup>9</sup> Mc Culloch L., 1994. A preliminary review of the responses to the 1992-94 Desert Locust upsurge, FAO, Rome (unpublished paper)

## II. The Desert Locust

### A. THE DESERT LOCUST ENIGMA – AN OVERVIEW

87. In most years, the Desert Locust is a solitarious insect that lives in arid regions that stretch from Mauritania in West Africa to western India, an area equivalent to 16 million km<sup>2</sup>. This is known as the recession area. Under favorable conditions, when rainfall has led to the development of vegetation favored by Desert Locusts, they multiply rapidly and increase as much as fourteen-fold every generation, about every ten weeks. There are two stages that occur before a plague, outbreak and upsurge. Outbreaks occur locally in a single country or may occur simultaneously in several countries, when locusts breed and increase in number in relatively small areas. The behavior and physical appearance of the locust change as they become increasingly crowded and form ever-denser groups. If left uncontrolled and given favorable weather and habitat conditions, this gregarization process can continue, causing hoppers to form hopper bands and adults to form swarms. Outbreaks can eventually develop into upsurges that can affect an entire region.

88. Once locusts are fully gregarious, their maturation becomes synchronized and they behave as a single homogenous entity. If control is unsuccessful, a plague can occur that may affect part of a continent or the entire recession area. Not all outbreaks develop into upsurges, and not all upsurges develop into plagues. Even under optimum conditions, it usually takes at least a year or more before a plague develops. Some 40 countries spread over 32 million km<sup>2</sup> can be affected by locusts during a plague;<sup>10</sup> under a major plague the number of countries infested can reach more than 60.

#### *Desert Locust Control Approaches*

89. Controlling Desert Locust populations is a complex matter and, while ways and means to achieve this have been discussed and studied for over 90 years, consensus among the various specialists on the best approach to address outbreaks has been emerging slowly.<sup>11</sup> Two factors are inherent to the success or failure of locust control strategies. Desert Locusts ignore international boundaries, so lasting solutions require international cooperation and intervention in all infested areas. In addition, locusts are an intermittent problem (Figure 1) and interest in, and funds for, control and research rise during severe outbreaks, upsurges or plagues, when swarms threaten major crop areas, and fall during recessions. This lack of sustained interest accounts for control teams being ill-equipped and ill-prepared to use the latest techniques each time an upsurge or plague begins.

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<sup>10</sup> Cressman, K. 2005. *A Desert Locust upsurge in West Africa: an initial review*. Unpublished paper. FAO, Rome.

<sup>11</sup> This chapter has been largely extracted from Magor, J.I., Ceccato, P., Dobson, H.M., Pender, J. and Ritchie, L. *Preparedness to prevent Desert Locust plagues in the Central Region, an historical overview*. FAO, 2005. A review commissioned by FAO EMPRES Central Region.

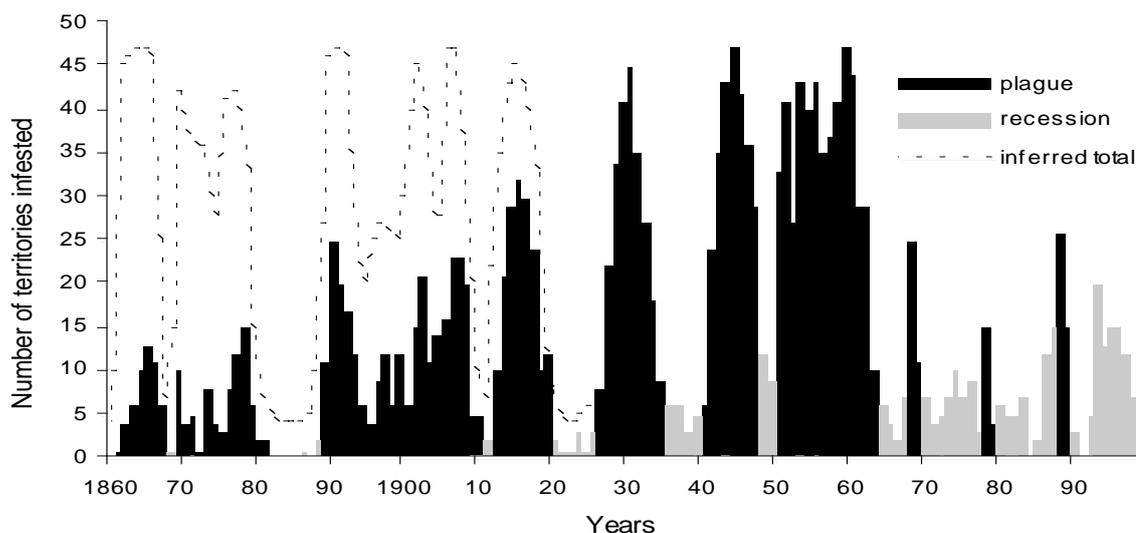


Figure 1. Territories infested by swarms during plagues and recessions 1860-1999

90. FAO convened an International Conference on Desert Locust Control in Rome in October 1951. This conference recommended that the general coordination of plans throughout the Desert Locust area could best be achieved through FAO. Consequently, the FAO Conference held later in 1951 established a Technical Advisory Committee on Desert Locust Control. This was later named the Desert Locust Control Committee (DLCC).

91. The long-term strategy for Desert Locust plague control was discussed at the Thirteenth Session of the DLCC held in October 1969. It highlighted that seasonal breeding areas in Chad, Mali, Niger, northern Senegal and parts of Mauritania and Western Sahara should be closely surveyed from June to September. In northern Mauritania and northern Spanish Sahara surveys should be carried out from October to March. The Committee was of the opinion that the concerted control operations undertaken by national and regional organizations under proper coordination played an important part in bringing about the reduction of plagues.<sup>12</sup>

92. Discussions have continued until today on the best timing of control operations. Research during the 1970s suggested that controlling initial gregarious populations might not end upsurge sequences, whereas controlling later populations that were gregarious and infested a much-reduced area did. Bands and swarms of gregarious locusts might occupy an area up to 1 000 times smaller than a similar number of solitary locusts. It had also been argued that delaying control until the late upsurge stage maximized efficiency in terms of kill per unit of insecticide. Since then, this concept has been widened by proposing that swarm control is more efficient than hopper control, especially when using non-persistent chemicals, because the area that needs to be sprayed is much smaller for swarms than it is for bands. However, waiting until the late upsurge stage requires countries to have the necessary capacity to treat large infested areas rapidly.

93. These differences of opinion on tactics to adopt for Desert Locust control remain unresolved, and in turn lead to different perceptions of the success or failure of the control strategy. However, the 2003–05 campaign has shown again that national authorities often have their own reasons for using certain control tactics against Desert Locust invasions. Further, during this upsurge, aircraft were not specifically used to control flying swarms, although on many occasions swarms were sprayed that included both flying and sedentary locusts. Late in the

<sup>12</sup> FAO. 1969. *Report of the Thirteenth Session of the FAO Desert Locust Control Committee*. Rome.

campaign, investigations were made into whether any of the contracted companies and their pilots would be willing to test the feasibility of deliberately spraying flying swarms. Agreement was obtained from those that had aircraft with rear-directed air intakes, but by then suitable opportunities did not materialize. Other companies/pilots were unwilling to try the technique, which was used successfully in the 1960s, because they considered it too risky.

#### *Desert Locust Monitoring and Forecasting*

94. Locust forecasting is not a precise science and keeping track of the movements of Desert Locust populations is a difficult task in a system necessarily based on incomplete data. Populations in some areas may remain undetected for many months and forecasters have to assume the potential of such populations to multiply and change phase in areas where suitable rains fall.

95. The vast, sparsely inhabited recession area and the seasonal mobility of the Desert Locust present major problems for establishing the population dynamics of this species. Two reasons have been suggested as to why the early stages of outbreaks are rarely recorded and, by extension, why population studies have proved so difficult. First, solitary hoppers are easily overlooked, even by experienced observers, because they usually conceal themselves in the vegetation. In addition, first generation hoppers often develop in remote and inaccessible areas. Second, the change from this cryptic, sedentary behavior to visible, spontaneous marching occurs rapidly and can easily be missed between surveys. Current survey methodologies may be inadequate and may underestimate Desert Locust numbers present during rainy periods in green vegetation.

96. The 1986–89 plague was no exception to this. The first heavy rains fell in the summer of 1985. They gave rise to a few, very localized outbreaks as expected. A year later, in September and October 1986, a few weeks before the appearance of swarms, surveys across the Sahel found very few locusts despite habitats being recorded as highly suitable for breeding throughout the summer. As a result, no special warnings were issued.

### **B. FROM THE RECESSION PHASE TO THE UPSURGE IN 2003–05**

97. Well before the 2003–05 upsurge, the weak capacity of Western Region countries to set up and carry out an effective preventive strategy to control Desert Locusts was well known. The proposal to extend the EMPRES programme to this region was formulated in 1997, and action was taken in 2001. Unfortunately, owing to lack of funding, the programme is not yet fully operational. At a meeting held in Paris in July 2003, donors acknowledged the incapacity of Western Region countries to tackle a new upsurge, as well as the need for a massive international emergency operation should this occur. This was what indeed happened only a few weeks later. During the summer of 2003, from July to September, there were exceptionally heavy and widespread rains in the region, including in the recession areas of the Desert Locust, creating optimal conditions for their development and reproduction. In Mauritania, substantial rainfall in October further enhanced the process.

98. The FAO Desert Locust Bulletin No. 299 (August 2003) issued by DLIS on 4 September 2003 indicated that if rains continue Desert Locust populations could become more significant and that it was important that all affected countries carry out regular surveys and report their results in a timely manner.

99. The Thirty-seventh Session of the DLCC was held at FAO in Rome from 22 to 26 September 2003. In the report, it is noted that vast areas of Desert Locust habitats had received good rains in the previous three months and were favorable to breeding. It was recommended that, in the short term, a special and urgent effort be made to study the immediate impact that exceptional rainfall conditions might have on the population dynamics of the Desert Locust and on the vegetation with which the species was associated.

100. In another recommendation, the Committee recognized that the conditions were very favorable for locust breeding over extensive areas of primary locust habitat in the Central and Eastern Regions, albeit locust populations were very low, and recommended that national locust units in key locust countries maintain vigilance and carry out regular surveys in the following months. In the report, it is also noted that the Desert Locust situation had remained calm since the last session of the DLCC, held in September 2001. However, the Secretary of the Western Region Commission commented that he and others in the region felt that the following two months could be critical.

101. The following two months proved indeed to be critical. Within one month, outbreaks were confirmed in Mauritania, Niger and the Sudan, and FAO issued an alert, expressing concern that the situation might deteriorate further and that an outbreak could also develop in Mali. In February 2004, FAO declared that a Desert Locust upsurge was taking place in West Africa. At the end of the month, the Organization appealed for international assistance on behalf of the affected West African countries. In the request sent to donors, it was stated that the upsurge could evolve into a major plague unless there was rapid reinforcement of control operations. Thus, at the beginning of 2004, the Desert Locust situation had changed from a recession that had started in 1998 to an upsurge.

102. The 2003–05 upsurge started with at least two breeding cycles occurring in southern Algeria, Mauritania, Mali and Niger during the spring and summer of 2003. One generation developed in Western Sudan and, during September–October 2003, another generation developed in Mauritania, Mali and Niger, causing locusts to increase in number and form groups in October. Further breeding also occurred in the Sudan.

103. During November 2003 to February 2004, locust swarms moved north from summer breeding areas in the Sahel and invaded southern Algeria and Western Sahara. A much larger invasion occurred in February 2004, reaching northwest Algeria, Morocco, Madeira and the Canary Islands. Swarms moved across the Red Sea from the Sudan and reached Saudi Arabia in November 2003, where another breeding cycle took place.

104. During March to April 2004, swarms spread out across Northwest Africa from Morocco and Algeria, invading Tunisia and the Libyan Arab Jamahiriya. Large-scale breeding occurred in Northwest Africa during the spring of 2004 and new swarms started forming in late May. A smaller movement took place from Saudi Arabia to the Sudan in March. Limited infestations persisted during the spring of 2004 in parts of Mali and Niger, where some breeding occurred, but in northern Mauritania they remained widely distributed. Control operations in the Sudan and Saudi Arabia carried out between October 2003 and April 2004 stopped the upsurge in the Central Region.

105. From June to August 2004, spring generation swarms invaded the Sahel in massive numbers from Northwest Africa, arriving in Mauritania, northern Mali, Senegal, Cape Verde, Mali, Niger, Chad and Burkina Faso. At least one breeding cycle occurred in all these countries during the summer.

106. From October 2004 to November 2004, summer generation swarms invaded Northwest Africa from the Sahel, arriving in the Libyan Arab Jamahiriya, Algeria, Western Sahara and Morocco, the Mediterranean coast of the Libyan Arab Jamahiriya and Tunisia. A few swarms reached the Canary Islands, southern Portugal and Madeira. Some swarms moved across the Libyan Arab Jamahiriya to the eastern Mediterranean, reaching Crete, northwest Egypt, Cyprus, Lebanon, Israel, the Sinai, Jordan, Saudi Arabia and the Syrian Arab Republic, eventually moving south along the Red Sea to northeast Sudan in December.

107. A small second generation occurred in late summer of 2004 in the Sahel and swarms reinvaded Burkina Faso and Senegal and moved along the southern circuit, invading the Gambia, Guinea Bissau and Guinea.

108. Details of the area treated in each country are presented in Annex III. Control operations increased with each season of breeding. Initially some 62 000 hectares invaded by the summer 2003 populations were treated, mainly in Mali and Mauritania (October- November 2003), followed by more than 1.1 million hectares of autumn-/winter-bred populations (December 2003– March 2004). Some 5.1 million hectares of spring-bred populations were treated in Northwest Africa (April–July 2004), and nearly 6.5 million hectares of summer 2004 population were treated in Mali, Mauritania, Senegal and, in particular, in Algeria and Morocco (August 2004–February 2005). During the whole campaign, 13 048 610 hectares were treated in all Desert Locust regions between October 2003 and December 2005<sup>13</sup>. Owing to the unusually cold weather conditions in Algeria and Morocco during the winter of 2004/2005, adult locusts remained immature for a long period, offering ample opportunities for effective control. These control operations, in conjunction with unfavorable weather conditions preventing renewed breeding, proved decisive in ending the Desert Locust upsurge.

### C. DEVELOPMENT OF IMPROVED DESERT LOCUST CONTROL AND FORECASTING MEANS

#### *Desert Locust Control Means*

109. The plague during the 1940s saw the large-scale production and use of poisoned baits in coordinated campaigns that aimed to re-establish a recession. The 1949–63 plague saw spraying widely adopted, but dusting and baiting continued. Techniques developed during this plague were ultra low volume (ULV) spraying and its associated equipment, as well as spraying swarms in flight or when they are settled on the ground.

110. By the end of the 1966–69 plague, non-persistent contact pesticides began to replace dieldrin to protect users and the environment. Awareness that chemical pesticides might cause environmental pollution increased during the 1986–89 plague and led to the banning of organochlorine dieldrin and to moves to develop and introduce alternative control means, including biopesticides. Three of these, the insect growth regulator diflubenzuron, the phenylpyrazole fipronil and a myco-pesticide based on *Metarhizium anisopliae* var. *acridum* have shown promise for adoption in Desert Locust control, but they have yet to be fully tested and registered for use against the Desert Locust in the Western Region.

111. Most specialists agree that in an invasion situation the only means to return as quickly as possible to the recessions is the utilization of conventional pesticides with a rapid knock-down effect and kill. Alternative control means such as entomopathogenic fungi and pheromones are environmentally highly attractive and could have a future in preventive control operations. Their effective use in emergency campaigns merits further testing.

112. FAO set up an independent body of experts known as the Pesticide Referee Group in 1989 to prepare lists of products based on trials carried out to show their effectiveness against locusts and grasshoppers, together with dose rates. Information on their speed, mode of action and environmental side effects is included as a guide for potential users.

#### *Improved Desert Locust Forecasting*

113. The basic features of the early warning system, collecting, transmitting and analyzing information on locusts, weather and habitat remain unchanged but, since the mid-1980s, the manual systems have been replaced with computer-based systems, and have become more precise since the introduction of GPS technology in the early 1990s. New operational products to estimate rainfall and vegetation include: (i) the interface to analyze long-term series rainfall estimates from remotely sensed data; (ii) the use of satellite data to identify vegetation developing in remote

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<sup>13</sup> However, it should be noted that “area treated” is calculated on the basis of the amount of pesticide used divided by the recommended dosage rate, and may not always be a reliable estimate of “area treated”.

areas; and (iii) experimental seasonal forecasts of rainfall and temperature six months in advance. These products are still being further developed and refined.

114. New tools have also considerably improved the timeliness and capacity to analyze field data to monitor Desert Locust developments and to forecast and provide up-to-date information on potential outbreaks. These include:

- eLocust, a hand-held computer and software to register and transmit locust, weather and habitat observations made during field surveys;
- a computerized Geographic Information System (GIS) for data management, analysis and research called SWARMS (Schistocerca Warning Management System) to replace the manual mapping and analysis techniques developed over the previous 60 years; and
- RAMSES (Reconnaissance and Management System of the Environment of Schistocerca), a less complex system than SWARMS, for use by the national locust information officers for storing data and producing locust distribution maps, as well as for the transmission of data to FAO for use in SWARMS. Since RAMSES does not allow data analysis, it would be useful to update it with that capability.

115. These new tools have led to a significant improvement of the DLIS as shown during the 2003–05 campaign. However, it should be emphasized that correct field data remain the most important input for the effective use of these new systems. For this, continued efforts need to be undertaken to equip and train national surveillance teams of the countries in the Desert Locust recession area. Under the current conditions, with limited capacity in certain key regions, it is still not possible to know exactly which area is infested.

116. Thus, notwithstanding these very positive developments, effective monitoring of locust populations and action preparedness remain key elements in Desert Locust control. At a workshop on contingency planning for Desert Locust control held at Nouakchott in May 2004, it was concluded that advance warning of outbreaks was still rather problematic and was probably only possible at one-month's notice with low reliability. Upsurges could only be forecast up to three months in advance with relatively low reliability, while the forecast period for the development of a plague was around six months, but reliability was higher. The short time available for advanced warning of the onset of locust outbreaks and upsurges reinforces the importance of having realistic contingency plans in place to enable countries to respond rapidly and adequately (FAO, 2004).<sup>14</sup>

#### **D. ORGANIZATIONAL STRUCTURES FOR DESERT LOCUST CONTROL**

117. National locust control units of the countries located in the Desert Locust recession area are the basic structures for survey and control operations. They are responsible for monitoring locust populations, for transmitting the necessary data to the DLIS managed by FAO and for control operations against gregarious locust populations.

118. Almost all countries in the recession area are members of one of the three Regional Commissions for Desert Locust control. These are the Commission pour la Lutte Contre le Criquet Pèlerin dans la Région Occidentale (CLCPRO), the Commission for Controlling the Desert Locust in the Central Region and the Commission for Controlling the Desert Locust in the Eastern Region. The obligations of members of the Regional Commissions are the following:

- Members undertake to maintain, through the Secretary of the Commission, a regular exchange of information on the current locust situation and the progress of control campaigns within their countries and, also, to transmit such information regularly to the FAO DLIS in Rome.

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<sup>14</sup> FAO. 2004. *Rapport Huitième Sessions du Groupe Technique du Comité de lutte contre le criquet pèlerin*. Atelier sur les Plans d'Action Prévisionnels pour la Lutte contre le Criquet Pèlerin. Nouakchott, Mauritanie, 2 au 7 mai 2004. Rome.

- Members undertake to carry out all possible measures to control plagues of the Desert Locust within their countries and to reduce crop damage by adopting jointly agreed procedures. These procedures include, among others, the establishment of an autonomous national Desert Locust control unit.

119. The Regional Commissions have been created under the DLCC, which currently has 65 member countries, and reports to the Director-General of FAO on policy and technical matters. The DLCC is a forum that brings all interested countries and organizations together once every two years, or more often in emergency situations. The purpose is described as being to keep the Desert Locust situation under review and to promote the overall coordination of work by various national and regional anti-locust organizations and commissions.

120. To bolster an effective approach to the locust problem, over the years FAO has been given the responsibility of providing member countries with technical advice and assistance to strengthen their capacity to prevent or mitigate the damage caused by Desert Locust invasions. This has been further strengthened since the mid-1990s through the EMPRES programme. An Emergency Centre for Locust Operations (ECLLO) was set up in the 1980s to manage the 1986–89 campaign, and re-established in August 2004.

121. The Locust and Other Migratory Pests Group in FAO monitors the global Desert Locust situation, based on reports received from national locust units, and keeps affected countries and donors informed of expected developments. The DLIS builds this information into an analysis of the situation relating to possible locust outbreaks and upsurges at the national, regional and international levels. DLIS issues regular monthly bulletins, forecasts and warnings, and supplies countries with remote sensing images. Other locust species are also monitored but in much less detail and less systematically than the Desert Locust.

122. FAO has the following responsibilities with respect to Desert Locust forecasting and control operations:

- A forum for discussion for the development of appropriate policies, strategies and plans. This is mainly carried out through the DLCC, which is supported by the Desert Locust Technical Group and the Pesticides Referee Group, but also at the regional level through the Regional Commissions.
- Coordination of knowledge and information related to the distribution and abundance of Desert Locusts. This work is undertaken by DLIS, as described above, based on inputs received from the countries.
- Strengthening of National Locust Control Units and promoting collaboration at the regional level, within the framework of the Regional Desert Locust Control Commissions.
- Declaring Desert Locust emergencies, organizing international assistance and providing technical advice in support of the control activities to be undertaken.

123. However, the capacity of FAO to carry out its responsibilities effectively is limited, because headquarters staff consists of only four professionals, of which only one staff member is employed to operate the DLIS. Also, there is concern with respect to, for example, the lack of progress in the preparation of contingency plans, and the deficiencies in the development of improved Desert Locust survey and control means. It should be emphasized that FAO does not coordinate the control operations at the field level. This is the responsibility of the countries, over which FAO has no direct control.

### **III. Planning and Implementation of the 2003–05 Desert Locust Control Campaign**

#### **A. FUNDING OF THE CONTROL CAMPAIGN**

124. The primary responsibility for organizing the control campaign resides with the affected countries. Countries resort to the international donor community and FAO for support when they do not have the required resources to undertake the necessary surveillance and/or control measures. FAO and the donors endeavor to respond through a planned and prioritized approach. In this, FAO takes into account governing bodies' policy directives and the advice of the DLCC and of the regional Desert Locust control commissions.

125. The current approaches and structural relationships by which FAO engages in major emergencies, such as that of the Desert Locust, are not well defined. The result is that communication on who does what and when is somewhat blurred and needs to be improved.

126. Requests for assistance received by FAO are appraised at administrative and technical levels. If a request is adjudged to merit a response and is in compliance with FAO's Technical Cooperation Programme (TCP) criteria, operational feasibility and within the financial possibilities of TCP, the Organization approves the assistance from its TCP resources pending the arrival of more substantive assistance from donors.

127. To address Desert Locust upsurges and plagues in an effective manner requires the availability of well-defined contingency plans at national, regional and international levels, which were mostly lacking at the beginning of the 2003–05 campaign. Such plans should, at the national, regional and international levels:

- articulate the problem, its implications for agriculture and food security, livelihoods of vulnerable populations and the national economy;
- describe the establishment of the national coordinating structures to ensure effective synergy among all actors and stakeholders, including donor coordination;
- define the steps to be taken to cope with the specific requirements of a Desert Locust emergency;
- determine the responsibilities of the various actors and stakeholders;
- provide the detailed technical specifications of the inputs needed for the campaign;
- outline the logistic support required during the control operations;
- indicate the national budget allocation for all the components of the control campaign and provide a cost estimate of the additional resources required, as well as potential funding sources;
- specify the actions to be taken for the rapid mobilization of existing/additional resources (e.g. aircraft, staff, pesticides) together with indicative estimates of the level of resources required under different scenarios; and
- identify critical issues likely to constrain the response and develop approaches to minimize/eliminate these constraints.

#### **B. APPEALS FOR FUNDING OF CONTROL OPERATIONS AND MOBILIZATION OF RESOURCES**

128. Requests for assistance to combat the Desert Locust upsurge were received by FAO in the course of 2004 from individual countries after the upsurge situation exceeded national resources. Subsequently, mainly following consultations among CLCPRO member countries, requests that had subregional, regional and interregional dimensions were also received. Subsequently, FAO approved 22 projects within the Technical Cooperation Programme, worth in total US\$6 million, in support of the Desert Locust campaign in the affected countries and regions.

129. Notwithstanding the concerted effort to respond to the various requests for assistance through FAO TCP, it soon became clear that the magnitude of the problem was far beyond the

capacity of this programme. Consequently, FAO resorted to resource mobilization, on behalf of the affected countries, through specific appeals to donors. However, while the procedure for handling requests from affected countries for emergency assistance is well defined and adhered to strictly within the Organization's TCP, there does not appear to be such a clear-cut one for handling appeals to potential donors for resource mobilization for major emergencies.

130. Strictly speaking, the Organization on such occasions should follow the principles and guidelines endorsed for appeals by the Inter-agency Standing Committee (IASC), of which FAO is a full member. These guidelines describe the logical sequence of analysis of the crisis at hand, the assessment of needs, the building of scenarios, the setting of goals, the identification of roles and responsibilities, and the planning of the response culminating with the appeal for funds. There is no evidence that the current Desert Locust upsurge was at any time determined to be a major or a complex emergency by the IASC and subsequently taken on by the UN Resident Coordinators in the respective affected countries as meriting a response within the framework of the Consolidated Appeals Process (CAP).

131. Nonetheless, what started off to be an emergency of rather limited proportions, turned out to be a major one judging from the extent to which it involved senior FAO management in the launching of the appeals and subsequently in the planning of locust control operations. Since at the beginning of the campaign the main task was to scale-down the locust invasion, calling for technical support by FAO and not involving other UN agencies, it was not deemed to require a multisectoral response transcending the mandate of FAO. As part of FAO standard practices in addressing emergency situations, FAO contacted the Office for the Coordination of Humanitarian Affairs (OCHA) to obtain advance financing from CERF,<sup>15</sup> as part of CERF's function to advance funds upon written confirmation of funding approved by a donor. This made it possible to take action while awaiting cash transfer of approved donor funding. The World Food Programme (WFP) was also requested to assist in the assessment of food aid needs and the damage caused to livelihoods of local communities.

132. Taking into account the technical nature of controlling the Desert Locust invasion, FAO decided to write and talk directly to donors to solicit support on behalf of affected countries. In this latter context, the Organization launched three appeals for assistance. The first, dated 23 February 2004, was in the form of a letter from the Assistant Director-General of the Technical Cooperation Department to various donor countries. This appeal was for a total of US\$9 million on behalf of Mauritania (\$6 million) and Mali, Niger and Chad (\$1 million each). While the letter acknowledged that the locust situation could deteriorate and become a major plague in West and North Africa, it only laid emphasis on the shortage of pesticides in these four countries. On 8 April 2004, the Director-General chaired a donors' meeting during which he issued a second appeal for US\$17 million – the original US\$9 million and US\$8 million for Morocco.

133. The third appeal was a letter dated 7 July 2004 from the FAO Director-General to heads of state of donor countries and heads of financial institutions. In his letter, he requested, on behalf of the affected countries, US\$30 million for a large-scale emergency response that would comprise measures to protect human health and the environment and avoid accumulation of obsolete pesticides.

134. The response to the first appeal letter was very limited (Italy with US\$370 029 and Norway with US\$143 351), in spite of the fact that it was followed up by various meetings with representatives of donor countries in Rome. It should be noted that at the time this appeal was issued, more than US\$700 000 were already available from a United States Agency for International Development (USAID) regional grant to be used for this purpose.

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<sup>15</sup> CERF is the Central Emergency Response Fund managed by OCHA to be used to meet interim appeal requirements to enable agencies and organizations to respond rapidly to an unusually urgent situation.

135. At a ministerial meeting of affected countries convened in Algiers in July 2004, a scenario of needs ranging between US\$58 million and US\$83 million emerged, depending on the pattern of the evolution of the Desert Locust situation. Other meetings organized by the affected countries included:

- A meeting hosted by the President of Senegal on 31 August 2004 where funding requests were presented for Burkina Faso, Cape Verde and the Gambia for an amount of US\$8.2 million, and for Chad, Mali, Mauritania, Niger and Senegal for a total of US\$54.5 million.
- A meeting hosted by Tunisia on 6 November 2004 with participation of the Ministries of Agriculture of Algeria, the Libyan Arab Jamahiriya, Mauritania, Morocco and Tunisia, during which the estimated funding requirement for the winter campaign was established at US\$97 million.

136. The question arises as to why most donors did not react as desired when the first appeals were launched. From the responses provided through the questionnaire sent by the evaluation team, it can be concluded that the initial alerts did not provide adequate details concerning the plans to be implemented, activities to be undertaken and costs, and did not address environmental and human health concerns. It was also not clear how this initial appeal differed from Desert Locust appeals of previous years that did not lead to humanitarian crises. It was suggested that a realistic description could have been provided about the possible impact on the food security situation if appropriate action was not undertaken. Also, the involvement of donors at field level should have been encouraged through better communication via the FAO Representatives in the countries. Donors stated that decisions pertaining to the mobilization of resources for official development assistance are usually taken locally.

137. FAO's early warning system and appeals procedure were rated as less than satisfactory by 44 percent of the donors and as better than satisfactory by 56 percent. Details concerning various aspects of these activities are presented in Table 2.

**Table 2**

Question	Judgment
Timeliness of alert	Better than satisfactory
Quality of technical information provided in alerts	Better than satisfactory
Timeliness of appeals	Better than satisfactory
Rationale of funding requests	Less than satisfactory
Effectiveness of communication on appeals	Less than satisfactory
Specification of needs	Less than satisfactory
Specification of costs	Less than satisfactory

1–5 = less than satisfactory; 6–10 = better than satisfactory

138. Of the donors responding, 50 percent considered that the delay from the first alert in October 2003 to the start of wide-scale control operations in August 2004 increased the costs of the control operations greatly, 40 percent somewhat and 10 percent not at all. With respect to the locust damage caused, 56 percent believed that damage increased greatly owing to the delays.

139. Furthermore, donors considered that alerts and briefings outside Rome, for example through the Humanitarian Liaison Working Group or coordinating briefings, appeals and plans with key humanitarian partners such as OCHA, WFP and the UN Joint Logistics Centre (UNJLC) could have served to signal the UN humanitarian system's assessment and advise that this was a humanitarian response. However, FAO failed to explain their appeal rationale, or the rapid increase in amounts appealed for, giving the donors a sense that they might be handling the situation opportunistically, which in turn bred scepticism and further delay.

140. Technical information and communications provided by FAO on the development of the locust situation during the campaign were rated as satisfactory by 75 percent of the donors. It was suggested that communications could be further strengthened through a more active involvement of the international media, national and rural radio stations, and television in the countries affected by the Desert Locust, as well as of donor representations in the field. Frontline countries should have means and equipment to conduct regular surveys and be able to raise alerts themselves in a timely manner. Donor visibility in the FAO projects should be improved.

141. The usefulness of the FAO DLIS was considered more than satisfactory by 93 percent of the affected countries that responded to the questionnaire; 87 percent noted that DLIS provided information in a timely manner. Technical advice provided by FAO was also rated better than satisfactory in 93 percent of the cases. A slight majority of the countries felt that the effectiveness of FAO in mobilizing resources was medium. The overall effectiveness of FAO was also considered medium. About half of the member countries of the Regional Commissions noted the lack of effectiveness of the CLCPRO.

142. In the early stages of the upsurge, donors stated that there did not seem to be a system in place in FAO where one could obtain a clear picture on actual needs, projected allocation and current mobilization of resources for locust operations. Improvements were seen later in the campaign with respect to the clarity and frequency of information dissemination including online access. A clearer picture should also have been provided of the specific roles and responsibilities of different actors in the campaign. More information on needs and donations should have been communicated throughout the campaign to the donor representations in the field. The flux of information from Rome was insufficient and often late.

143. The Desert Locust Bulletin was a good tool for communication, as well as the briefings organized by FAO, in the view of donors. The FAO Web site also provided good information, but a clear description of the potential locust impact on food security and national economies was missing. At the height of the Desert Locust upsurge the media were interested in the issue but, as usual, shifted soon to other topics. FAO should have continued providing the international media with material throughout the campaign and also assisting developing country authorities and press to access and utilize information on the issue. It was also suggested that the DLIS should be strengthened.

144. In the second half of 2004, donors reacted very positively, approving 46 projects with a total budget of US\$74.3 million. In addition, US\$6.2 million were approved from FAO's Technical Cooperation Programme under 22 projects. This positive reaction of the donors should not lead the Organization to complacency; rather, it should be a constant reminder of the need to package appeal processes in a much better way. At the same time, FAO could remind donors that it is their Organization, with the necessary technical competence, and that it is ready to continue to play the traditional role of a neutral and an honest broker in Desert Locust control operations.

**Thus, it is recommended that:**

1. FAO define, in clear terms, the different categories of emergencies and establish the criteria to decide which ones would make use of the Consolidated Appeals Process (CAP), for which guidelines have been published by OCHA. When an emergency is not considered complex, the Organization should also spell out the specific rules that will apply and make them known to all concerned.

### C. MONITORING AND CONTROL OPERATIONS

145. Notwithstanding the fact that signals of an increase in Desert Locust activity were already observed in the summer of 2003, the frontline countries did not take adequate measures to address the problem. This was mainly due to:

- the absence of independent anti-locust control structures in several key countries;
- the insufficiency, or even absence, of human, material and financial means to start the campaign;
- the inaccessibility of certain seasonal breeding areas of the Desert Locust, mainly owing to insecurity;
- the lack of contingency plans to manage the risk at national, regional and international levels; and
- the delay in the implementation of the EMPRES programme in the Western Region.

146. At the beginning of the 2003–05 campaign, only 12 monitoring and control teams were operational in the whole of the Sahel region, including six teams in Mauritania, with a maximum control capacity of 1 000 hectares per day. These teams were able to carry out monitoring and control operations mainly thanks to financial assistance from CLCPRO, FAO and USAID grants provided through FAO. Subsequently, the worsening of the situation was confirmed and the need to strengthen the control capacity became a priority. A critical lack of qualified staff, vehicles, monitoring and spraying equipment, pumping material, GPS and maps, protective clothing, pesticides, aircraft and operational funds became apparent.

147. When donors became convinced of the seriousness of the situation and started contributing, in some cases the lack of effective planning and coordination led to a duplication of efforts, as in the case of pesticides and airplanes. For example, in Senegal, the number of airplanes reached 20 by mid-October 2004 while the spray targets had already considerably diminished because of swarms migrating to Mauritania and the Maghreb.

148. A donor coordination group was established in ten countries, or in over 80 percent of the affected countries reporting on this matter. However, donor coordination was considered poor in more than 50 percent of the countries. Fifty-four percent of the countries believe that the Desert Locust upsurge would have been controlled earlier if national control campaigns had started earlier. The situation would have been even better if control operations had started earlier in the neighboring countries. All countries are unanimous that this would have facilitated control of the Desert Locust upsurge sooner. In 83 percent of the cases, countries considered that control operations carried out in a timely manner in their own countries would have had a positive effect in the neighboring countries. These opinions confirm that effective Desert Locust control should be based on a well-coordinated regional approach.

149. Although delivered late, the contributions of the funding agencies met an important part of the needs, and made it possible to strengthen the capacities of the countries to control the invasion. For example, in Mauritania, the number of ground intervention teams reached a

maximum of 32 in October 2004, and the number of aerial control teams increased from one to six during the campaign, with the result that the daily treatment capacity strongly improved to reach 41,000 hectares per day. This made it possible to treat, in total, 1,384,000 hectares, 80 percent of which by aircraft.

150. During the two control campaigns 2003/2004 and 2004/2005, treatments were carried out on some 12.9 million hectares requiring the use of a total quantity of about 13 million liters of pesticides in the ten countries of the Western Region. Algeria and Morocco alone sprayed 9,430,404 hectares, or 75 percent of the total area treated. The aerial control used by the two countries was an important factor in avoiding damage to the major cropping areas. In Morocco, 95 percent of the area treated was covered by a fleet of 46 airplanes during the first campaign and 62 during the second. Algeria mobilized 12 airplanes for the first campaign and 52 for the second.

151. The control operations have necessitated, for the whole of the Western Region, the mobilization of about US\$280 million for the acquisition of pesticides, deployment of aircraft, spraying and communications equipment, vehicles, protective clothing, etc.

#### **D. EFFICACY OF THE CONTROL OPERATIONS**

152. The objectives of the control campaign are to protect crops and pastures of the communities affected by the invasion, and to stop the invasion, by destroying the Desert Locust with pesticides and other means. At the level of the countries, the official information received by the evaluation team from the national services responsible for locust control shows that the losses suffered from the Desert Locust invasion are generally considered as limited. However, the team has noted that because of the strategies adopted by the countries and a lack of effective control means in the Sahel countries, serious losses occurred in various places and food security was ensured only for some of the affected communities in the Sahel countries.

153. Two different control strategies were implemented during the 2003–05 campaign:

- The Maghreb countries, especially Algeria and Morocco, have generally effective operational national units for locust monitoring and control. Thus, they carry out regular and effective monitoring activities, especially in spring during recessions, and throughout the year during emergencies. Tunisia and the Libyan Arab Jamahiriya increase the number of surveys when there is a threat of invasion. These surveys allow them to follow the locust situation in the seasonal breeding areas and, when necessary, to control Desert Locusts outside cultivated areas. The protection of crops in these countries was effective and virtually complete and losses suffered were generally very limited. However, substantial Desert Locust populations survived in uncultivated areas in the southern parts of these countries, which re-invaded the Sahel during June to August 2004.
- On the other hand, survey and control teams in the Sahel countries lacked sufficient resources and were unable to carry out regular monitoring and control operations. Overwhelmed by the large swarms, they were forced to focus control interventions on destroying locusts in the cropping areas. Although they later received external assistance, most of the affected farmers suffered relatively high losses owing to the late arrival of assistance.

154. According to figures provided by the authorities concerned, control activities undertaken permitted the saving of more than 24,000 hectares of food crops and over 75,000 hectares of pastures in Chad, almost 63,000 hectares of food crops and 49,000 hectares of pastures in Burkina Faso, and in Morocco protection of some 30,000 hectares of citrus plantations and 20,000 hectares of vegetable crops, mainly grown for export purposes. Algeria succeeded in avoiding losses in the major production areas in the northern part of the country.

155. Affected countries stated that locust damage estimates were carried out in 54 percent of the countries, especially where a high level of Desert Locust infestation occurred. Guinea, Niger and Senegal reported that the livelihoods of women and children were more affected by the Desert

Locust infestations than those of men. In 70 percent of the cases, a reply was not given to this question. Only Mali, Morocco and Senegal reported that estimates were made of crops saved as a result of the control operations. In future, the monitoring of damage caused by locusts should be integrated into the countries' overall contingency plans.

156. The following working hypotheses may be formulated for the crops saved in Chad and Burkina Faso:

- Sorghum and millet are the most cultivated crops in the zones infested by the Desert Locust, and their average estimated yields are about 600 kg/ha: the campaign 2003–05 has avoided losses by Desert Locusts of about 14,400 tonnes of cereals in Chad and 37,000 tonnes of cereals in Burkina Faso.
- The carrying capacity of the pastures in infested areas is about one animal of 250 kg for 5 hectares: the campaign has saved pastures for about 15,100 animals in Chad and for 9,700 animals in Burkina Faso.

157. These results were only possible where the control operations were carried out in an effective and timely manner, immediately at the beginning of the invasion of the areas concerned. In most places infested by the Desert Locust, where these conditions have not been met, the late control has only served to avoid the further spread of the invasion. In these areas, crops and pastures have often been seriously damaged. For example, in certain provinces of the Sahel region of Burkina Faso, the losses caused by the Desert Locust have been estimated at 58 832 tonnes, including 49 049 tonnes of millet, 9 782 tonnes of white sorghum and 4 325 tonnes of cowpea. In Senegal, losses attributed to locust attacks were close to 47 500 tonnes.

158. During the visits to Algeria and Morocco, the evaluation team discussed the opportunities for using the control capacity in these countries to assist the frontline countries in the Sahel in a well-organized and timely manner in case of new emergencies. Such an approach and set-up could take advantage of the experience gained in the course of the assistance provided during the 2003–05 upsurge. In both countries, the idea was well received and it was felt that these suggestions merited further elaboration. Consequently, a recommendation on assistance provided by the Maghreb countries is presented in section V.

## **E. PUBLIC AWARENESS, COMMUNICATION AND TRAINING**

### *Public Awareness and Communication*

159. The control of the Desert Locust cannot be won without the involvement of local communities in the campaigns. Training, sensitization and communication are essential elements in this, as stated unanimously by the locust-affected countries visited by the evaluation team. Consequently, in the course of the 2003–05 campaign, information/sensitization activities were undertaken for the benefit of the populations, aimed at attracting attention to the risks linked to the use of pesticides and to provide the populations with details on the evolution of the locust threat, and on the zones to be treated.

160. According to country responses to the evaluation questionnaire, local populations were informed on environmental and human health risks in 82 percent of the 14 countries replying. The majority used radio and television, as well as printed materials and posters, for this purpose. It was felt that as a result of these activities 50–75 percent of the people concerned were aware of the potential problems, and 12 countries concluded that these results were better than satisfactory.

161. While the importance of the participation of local populations and communities in the control of the Desert Locust is recognized by all, on the contrary, the form that this participation should take has led to disagreement between those that are for and those that are against the involvement of the affected communities in chemical control operations. For the latter, the involvement of the populations must be limited to matters such as locust monitoring, informing the authorities concerned and mechanical control, as handling of pesticides is considered too dangerous to human health. In 2005, FAO established a policy discouraging the involvement of

farmers/villagers in the application of pesticides. However, this policy has not been widely publicized outside the various locust fora.

162. Within the framework of the information and awareness campaigns, multiple and diverse means have been used, including radio and television (programmes in national and official languages), imams in the mosques, criers at markets and teachers in schools, as well as the press and print notices, fliers, brochures and posters. The staff of the plant protection or extension services, and of the members of the monitoring and control teams, also directly passed the necessary instructions to the local populations. It is interesting to note that in Chad, in order to reach a female target group, women leaders received some training, and were equipped with radios operating without batteries, also distributed to other villagers.

163. The countries, while differing in the manner in which they handled information, differed also in the way they carried out their control campaigns. To illustrate these differences, two cases are presented: one where information was withheld and, at the other end of the chain, the wide-scale diffusion of information to the general public.

*The example of Tunisia and the strategy of limited information to avoid alarm*

164. This strategy consisted of working under the greatest secrecy, with severe instructions to “stay calm, be discrete and efficient”. In order to avoid the creation of alarming and unfounded rumors and their implications, the efforts to inform populations (in particular beekeepers and herders) in the infested zones were reduced to the strict minimum. In fact, the latter were only warned directly of the potential side effects of the treatments by the regional staff.

165. Control being considered a technical matter, the information was restricted to locust experts, and its distribution was limited as much as possible at the local, national and international levels. Consequently, neither FAO nor the media were informed at the beginning of the locust threat. The instructions to maintain silence were such that the campaign came to an end without, in certain cases, even the inhabitants of the infested zones and the staff of the Ministry concerned becoming aware of the events.

166. Locust control was carried out solely by the staff of the Plant Protection Service who, according to the statements of the authorities concerned, followed the FAO guidelines closely. The involvement of the rural communities was limited to the provision of tractors and water tanks.

*The example of Mali and the choice of widely spread information*

167. The strategy adopted in Mali consisted of:

- the creation of a special information space at the Office de la Radio et de Télévision du Mali for the daily transmission of information on the infested zones, the areas treated, the control means used and, finally, the contributions to the campaign of various people;
- the regular interventions by the Minister of Environment and Hygiene as spokesman for the government after each interministerial meeting to report on the situation and to announce new measures taken; and
- the organization of a press caravan to ensure that the realities encountered at the field level were well reflected and that a balanced view was presented on the efforts undertaken by the rural populations, the donors and the authorities.

168. From the two examples presented, it may be concluded that a well focused and limited sensitization and information campaign for the rural populations may prove to be effective in the case of an invasion of limited importance. On the contrary, in countries experiencing very high levels of locust infestation and having modest resources, it is necessary to establish intensive sensitization, communication and training programmes.

169. The sensitization/information campaigns have been carried out in the different countries in a more or less successful and efficient manner. However, the cases where a specific

communication strategy was developed and where experts were called in to implement the campaigns were rare, resulting partly in the following insufficiencies:

- Impact studies have not been undertaken and, considering the lack of follow-up studies, it is barely possible to judge the real effect of the communication methods employed in the course of the campaign. However, in certain cases when folders in French were distributed in places where most people were illiterate, one may question the real effect.
- Transport problems have, in certain cases, prevented information materials reaching their intended destination.
- With the exception of the Chad case mentioned above, there did not seem to be cases where women received information directly. The tendency was to provide it to the men and they were expected to transmit the messages to the women.

170. Greater efficiency of the information and sensitization campaigns requires the establishment of a communication strategy. This would permit, among others, identification of the best adapted channels to reach the target groups, women in particular.

### *Training*

171. The availability of sufficient well-trained human resources constitutes an undisputed pre-condition for the successful implementation of locust monitoring and control activities. Each national locust unit must have a well-qualified and experienced team of management staff, technical personnel and field operators to carry out, in a regular and effective manner, the necessary monitoring and control operations. During the 2003–05 Desert Locust invasions, the shortage of qualified staff in all areas, but especially of experienced locust specialists, at national, regional and international levels, became very apparent. The main reasons for this are:

- inadequate interest of the countries to support training owing to the long time lapses between periods with high locust activity (10–20 years);
- absence of national preventive control strategies fostering the establishment and maintenance of effective national locust control units and promoting the development of specialized human resources;
- universities' current limited interest in this type of training; and
- lack of financial resources.

172. Few countries have organized training of village brigades, facilitating their involvement in chemical control operations, as in Burkina Faso. In this country, the management of the Plant Protection Service defends the idea that the campaign could not have been carried out in an adequate manner without the involvement of the village brigades.<sup>16</sup> It is interesting to note that the team charged with the technical support of these brigades counted female technicians among its members. After an initial surprised reaction, they have been accepted without difficulties by the local communities.

173. Niger<sup>17</sup> also opted for the involvement of phytosanitary brigades, but the evaluation team, in the course of its field visits in this country, was unable to collect the necessary information on training activities. In Senegal, a project supporting animal production has reserved an amount of US\$20 000, in the regions of Louga, Saint-Louis and Matam, for training of members of committees for the control of bush fires, which were transformed during the campaign into locust

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<sup>16</sup> Given the fact that the question of village brigades divides opinions, the European Commission, to clarify the situation, has planned to carry out a study in March 2006 on the village brigades in the Niger, of which the objective is to identify the means needed to include the latter in certain plant protection operations for which privatization is planned.

<sup>17</sup> In the Niger, the Plant Protection Service (PPS) has overseen the strengthening of the capacities of the phytosanitary brigades since their creation in 1974. While only 300 brigadiers participated in the locust control campaign of 2003–05, there are in total 40 000 in the Niger. The brigadiers are considered as an extension arm of the PPS at the village level. They are farmers specially trained and, according to the PPS, they handle the chemical control techniques perfectly.

control committees. The project has also encouraged herders to participate in the control and to transmit the necessary information.

174. In the Western Region, there are currently only some 20 locust specialists, of which half have the necessary experience. Moreover, the average age of senior staff and experienced field prospectors is about 45 years. Thus, during the next invasion in 10–20 years' time, almost all these experienced staff members will be retired. Their replacement can only be assured if training activities are strengthened immediately. To overcome this shortage at least partly, both CLCPRO and DLCC finance annually a Ph.D. fellowship. However, this is not sufficient to cover all the current needs. A larger programme should be established through special projects to train specialists and technical staff involved in monitoring and control operations. Such a programme would permit, over time, to:

- carry out monitoring and control operations in conformity with the required efficacy, quality and safety norms;
- update staff capabilities based on the results of scientific and technical progress made with respect to locust biology, insecticides, transmission of data, satellite imagery, GIS, etc.;
- develop a network of locust specialists in the region addressing the locust problem through a harmonized approach, while prioritizing, over time, prevention as the best control means;
- carry out research resulting in improved Desert Locust control; and
- have a pool of resource personnel for use at regional and international levels.

175. Drawing lessons from the 2004 summer Desert Locust control campaign, and benefiting from donor contributions, FAO has already prepared and implemented a large training programme for staff involved in Desert Locust monitoring and control operations in ten Sahel countries in accordance with recommendations adopted by the first meeting of the Executive Committee of the CLCPRO (Niamey, Niger, 16–20 June 2004). The details of this programme (see Annex IV), which is based on the training programmes developed by the EMPRES programme in the Central Region, were developed by an international consultant in close collaboration with FAO staff, and are aimed in particular at training master-trainers.

## **F. ROLE AND ACTIVITIES UNDERTAKEN BY THE AFFECTED COUNTRIES**

176. The evaluation team visited all the countries affected by the Desert Locust 2003–05 campaign. Detailed reports have been collected in a separate document. The information below stems from the country visits and from the evaluation questionnaire that was sent to affected countries.

177. All countries in the Central Region have a national locust control unit. In the Western Region, this is the case for eight of the 13 countries, including the four frontline countries. However, in most cases these units are part of the existing plant protection structure and do not have the required operational and financial autonomy.

178. In all the frontline countries, a national coordinating structure was established and, in 90 percent of them, a national action plan was developed. In eight countries, this plan was updated at least once every three months, in one country at least once every six months, and in five at least once every year.

179. Seven out of 16 countries reported having emergency funds for Desert Locust control operations. These were Algeria, Eritrea, Morocco, Saudi Arabia, the Sudan, Tunisia and Yemen. According to the field missions, these funds enabled control operations to be carried out in a timely manner.

180. Nine countries reported having national contingency plans, including five countries in the Western Region that experienced heavy Desert Locust infestations.<sup>18</sup> These plans are a major tool to address locust infestations more effectively. However, to undertake the necessary control operations effectively, reliable warnings on Desert Locust outbreaks, upsurges and invasions are a prerequisite, together with adequate human, operational and financial resources. This was not the case in the Sahel countries.

181. During remission periods, in countries with seasonal breeding areas in the Western Region, Desert Locust monitoring and control operations are carried out by the national locust control units, where these exist. The latter have been established in Algeria, the Libyan Arab Jamahiriya, Mauritania and Morocco. In Chad, Mali and Niger, such units have been set up within the Plant Protection Services, but do not have sufficient autonomy.

182. During invasion periods, the control campaigns are often managed centrally. The establishment of a "Poste de commandement central" (PCC) is the structure encountered in certain countries, especially in the Maghreb. This PCC has as its mandate to manage and coordinate all the monitoring and control operations, by providing the necessary resources and by taking appropriate measures for the effective use of the available ground or aerial locust control means. The PCC operates according to a closely defined schedule; at the height of the crisis often on a 24-hour basis. It calls upon the assistance of various government structures, including departments of the Ministries of Agriculture, Interior, Environment, Health and Transport, and of the Meteorology and Remote Sensing Services, as well as the army.

183. The PCC is usually headed by the Minister of Agriculture or his or her representative, but can also be placed under the responsibility of the "Gendarmerie royale" as was the case in Morocco, or the national locust control unit, as was done in Mauritania. These PCCs are complemented by regional control centers that have the primary responsibility of coordinating the control operations in specific areas. Sometimes interministerial committees are established under the chair of the Prime Minister, such as in Mali. Additional committees have been established, for example, to ensure a proper exchange of information between the national authorities and the donor community.

184. At the operational level, the locust control means are provided initially by the Ministry of Agriculture, the Ministry of Finance and sometimes by the army. The rural populations are involved in all the countries to signal the presence of the locusts. The latter have also been engaged in the chemical control operations, with the exception of Algeria, Mauritania, Morocco and Tunisia. Aerial and ground control teams from the Maghreb countries have helped in the control operations in the Sahel countries. It should be noted that the populations in Mali and Senegal have been mobilized in an exceptional manner and provided substantial financial and material assistance to the campaign.

## **G. SUPPORT PROVIDED FOR THE CAMPAIGN**

185. The total multilateral assistance provided through FAO for the 2003–05 locust control campaign amounted to US\$74.3 million, of which US\$50.4 million were disbursed through FAO projects by the end of 2005, in addition to FAO's own resources amounting to US\$6.2 million. Donor contributions, ranging from US\$40 000 to almost US\$30 million, were provided by the following donors: African Development Bank (ADB), Agence Intergouvernementale de la Francophonie, Australia, Austria, Belgium, Canada, the Czech Republic, the European Commission (EC), Finland, France, Germany, Greece, the International Fund for Agricultural Development (IFAD), Ireland, Islamic Development Bank, Italy, Japan, Luxembourg, the

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<sup>18</sup> The FAO Locust Group has ranked the countries with respect to the level of infestation during the 2003–05 Desert Locust control campaign as follows. Low: Cape Verde, Eritrea, Guinea Bissau and Yemen; medium: Burkina Faso, Chad, Egypt, the Gambia, Guinea, the Libyan Arab Jamahiriya, Saudi Arabia, the Sudan and Tunisia; high: Algeria, Mali, Mauritania, Morocco, the Niger and Senegal.

Netherlands, Norway, Portugal, Saudi Arabia, Spain, Sweden, United Kingdom of Great Britain and Northern Ireland, United Nations Development Programme and the United States of America.

186. With respect to the multilateral assistance provided through FAO, the EC was the most important single donor with a budget of almost US\$30 million for emergency projects in five countries (Chad, Mali, Mauritania, Niger and Senegal), starting in October 2004. This very important contribution was possible due to the decision by each of the five locust-affected countries to use the funds earmarked under the so-called Enveloppe B of their National Indicative Programmes with the EC, which can be mobilized for emergency operations. In addition to the provision of locust control means and pesticides, and hiring of aircraft, the EC locust programme also included support for environmental and coordination activities.

187. Bilateral assistance was also provided to the affected countries, including from a number of African countries, for example the Gambia, Mauritania and Senegal. Responses to the evaluation questionnaire to donors, as well as information collected in the countries, indicate that donors providing only bilateral assistance included Brazil, China, the Republic of Korea, Morocco, the Sudan and UEMOA. The European Commission, France, the Netherlands and USAID provided both bilateral and multilateral assistance; while the ADB, Austria, Canada, Finland and the United Kingdom made all their contributions in a multilateral manner, through FAO. Details of two donors are missing. In a number of countries, different NGOs have made specific contributions to the control operations.

188. The total amount of bilateral assistance provided to the affected countries is difficult to ascertain with accuracy. The available data indicate that it was at least US\$50,543,838, or some 60 percent of the multilateral assistance mobilized by the donors through FAO, and practically the same amount as spent by FAO by the end of 2005. The bilateral aid was higher than in preceding campaigns.

189. The Maghreb countries, Algeria (US\$20 million), the Libyan Arab Jamahiriya (US\$4 million) and Morocco (US\$8 million) provided US\$32 million of bilateral assistance to the Sahel countries. This allowed the strengthening of various control actions from the beginning of the campaign in the autumn of 2003 until the end of 2004 and proved to be a crucial resource before the arrival of the multilateral assistance. It also allowed some teams to be retrained.

190. The World Bank financing to the Locust Campaign consisted of the following two contributions: (i) **The Africa Emergency Locust Project (AELP)** made available US\$60 million in IDA credits in September 2004 to seven countries (Chad, Niger, Burkina Faso, Mali, Mauritania, Senegal and the Gambia), using the Bank's Operational Policy for emergency relief operations (OP8.50). Government contribution to this project was estimated at US\$13 million. The decision to prepare the project was made on 9 September 2004 and, on 22 September, US\$12.4 million was immediately made available for disbursement to the countries as credit advances. The purpose of the project is *"to reduce the vulnerability of the concerned countries to prevent future infestations by supporting improved strategies for prevention, early warning, reaction and mitigation, both at the national level and at the regional level"*. The funds were made available for emergency locust control, emergency relief to restore agriculture productivity of affected populations, preventive control operations and project management. Provisions were made to allow speedy procurement, including single source selection and procurement through FAO. Countries prepared Pest Management Plans and Environmental and Social Impact Assessments as required under the World Bank's environmental and social safeguard policies. As part of the project legal agreements, countries committed to implementing the project in coordination with FAO, EMPRES and CLCPRO, as well as other countries in the region. The Bank coordinated the implementation of the AELP in close cooperation with FAO for major project needs, such as determining the amount of pesticides needed (on three occasions in 2004–05, the Bank objected to procuring pesticides because the needs were not substantiated sufficiently by the countries). (ii) **Within the existing Mali Agriculture Producer**

**Organizations' Project (PASAOP)**, a reallocation of US\$3.7 million towards locust control was made in August 2005.

191. Responses to the donors' questionnaire indicate that two of the 12 donors considered that their own agency had reacted to the Desert Locust emergency in a less than satisfactory manner and ten (83 percent) as better than satisfactory (1-5 is rated as less than satisfactory, and 6-10 as better than satisfactory). Further details are provided in Table 3.

**Table 3**

Question	Average judgment	
	Number of replies	Rating
Appropriateness of the assistance provided	9	good
Timeliness of response	8	satisfactory
Speed in releasing funds	8	satisfactory
Quality of inputs	8	satisfactory
Attention to environmental aspects	8	satisfactory
Attention to human health aspects	8	satisfactory
Coordination with other donors	9	satisfactory
Connectedness to response to other emergencies including drought	9	good

Poor 1–3, satisfactory 4–7, good 8–10

192. Affected countries' statements through the evaluation questionnaire indicated that bilateral assistance was considered less than satisfactory in 45 percent of the cases, especially by countries experiencing a medium level of infestation. In many cases, the assistance was provided late and did not match the country's priorities. The same problems occurred with the assistance provided through FAO, which matched priority needs in only 23 percent of the countries, and arrived late in 45 percent of them. Delays were experienced especially in the provision of various inputs: pesticides, control equipment and aircraft. In a few cases, the inputs planned were never delivered. Affected countries were of the opinion that if assistance had been better streamlined and coordinated, most technical and logistic matters could have been addressed in a much more effective manner.

193. Actions by the Maghreb countries in support of the Sahel countries were a confirmation of the effective north–south relationships and regional solidarity, and are in line with the objectives of the CLCPRO. The Maghreb authorities are unanimous in that the best way to protect their countries against possible locust invasions is effective control in frontline Sahel countries. They consider that one hectare treated there at the appropriate time would save 10–15 hectares from treatment in their own countries. Thus, the Maghreb countries are willing to support the Sahel countries in the form of intervention teams and equipment, pesticides and flying hours, and to carry out joint operations in the border areas during remission periods. Algeria has also provided satellite maps, allowing the frontline countries to plan their campaigns better.

194. It was not always possible to obtain a detailed overview of the total campaign costs. Table 4 provides the figures collected during the field visits for most countries. They may be considered as the minimum amounts spent on control operations and strengthening of the national control facilities. By adding to these figures the approximate costs of the campaigns in the Libyan Arab Jamahiriya (US\$6 455 380) and Tunisia (US\$5 527 560), calculated on the basis of the area treated, it appears that the overall campaign costs for the whole of the Western Region amounted to about US\$280 million. Substantial additional funds were spent by the countries concerned and

the international community to assist the affected populations through additional food aid (over US\$90 million) and for the rehabilitation of subsistence means. Thus, the total campaign costs, including rehabilitation/post-upsurge assistance, are estimated to be in the order of US\$400 million.

**Table 4**

Country	Area treated (ha)	Total expenditures (US\$)
Algeria	4,600,000	101,000,000
Burkina Faso	24,865	1,621,556
Chad	27,265	4,700,000
Mali	339,764	10,173,000
Morocco	4,854,211	79,000,000
Mauritania	1,255,882	18,176,000
Niger	272,428	7,600,000
Senegal	765,987	42,400,000
<b>Total</b>	<b>12,140,402</b>	<b>264,353,496</b>

195. Where donor assistance was channeled through FAO, donors had no direct involvement in the activities undertaken. FAO operated the relevant projects in direct collaboration with the beneficiary countries. Donors generally felt that inadequate visibility was given by FAO to their specific contributions. Bilateral donors were involved more directly in rendering their assistance operational at the country level, in particular when Desert Locust control teams were dispatched to the beneficiary countries.

196. Much of the bilateral assistance was carried out independently of other ongoing efforts. This made it very difficult for FAO to know or coordinate action and avoid, for example, duplication of support efforts, non-compliance with standardized procedures and products, unnecessary accumulation of pesticides stocks, non-utilization of contracted flying hours. In a number of cases this resulted in unjustifiable high costs. This matter merits serious attention in future to ensure a better flow of information, planning, and synergy between activities carried out at the multilateral and bilateral level. Had there been a functional country (donor) coordination/steering committee, which could coordinate external assistance in line with the needs in each of the affected countries, this could have been avoided. In the case of Desert Locust operations, such a committee is normally created jointly by the host-country and FAO.

197. Again, responses to the donors' questionnaire show that some donors considered that a better response to the campaign could have been provided if an emergency fund had been established covering a range of agricultural disasters. The strengthening of networks among donors and various partners and the improvement of coordination at the regional level could also be of significance in this respect. Lack of reliable data and information constrained timely responses. In 50 percent of the cases, donors made use of their own experts for advice on technical matters related to Desert Locust control.

198. Given the demonstrated strong and positive interest of bilateral donors and African countries to provide assistance in the 2003-2005 Desert Locust campaign,

**It is recommended that:**

32. in future campaigns, in the affected countries, through the appropriate committees, effective exchange of information be ensured among the various stakeholders involved to avoid duplication of efforts and unnecessary high costs.

199. Further details of the assistance provided to the campaign are presented in Annex V.

## **H. ROLE AND ACTIVITIES UNDERTAKEN BY FAO**

### *Project Management and Operations*

#### *Donor agreements*

200. As listed above, in total 27 donors became involved in the Desert Locust control campaign through FAO and together they supported 46 projects for the benefit of 18 beneficiary countries at the national, regional and interregional levels. This entailed drawing up separate donor agreements for each of the 46 projects with a total budget of US\$74.3 million. In a number of cases, donors resorted to existing general agreements with the Organization as the conduit for the release of funds. This was the most efficient mechanism. In another group, specific donor agreements were drawn up to cater for the resources released for the Desert Locust emergency. A third category of donors entered funding agreements with FAO for the first time. This entailed a host of clearances covering legal, operational and financial aspects and the attendant lead time required to finalize them. Once the donor agreements were signed with FAO, the next stage was to translate these into operational documents in the form of project documents and a plan of operations.

#### *Project documents*

201. Some donors required that requests for funding be accompanied by a project proposal, containing sufficient detail to permit technical and, to some extent, operational scrutiny. The resulting project documents did not need to be signed by the donor if they emanated from an already signed donor agreement. They did however, need to be cleared for operational and financial consistency within FAO and subsequently signed with the beneficiary countries' authorities before being declared operational. However, in many cases, project implementation was started well before the project document was completed. The approach followed was to commit donor funding as soon as a written donor agreement had been received.

202. The Emergency Operations and Rehabilitation Division (TCE) is the designated operating division and the budget holder for emergency projects when they are declared operational. This division is therefore responsible, in close collaboration with other units in FAO headquarters and in the decentralized offices, for the effective delivery of the foreseen inputs and attainment of the project objectives.

203. The Emergency Operations Service (TCEO), which was the unit within TCE and ECLO responsible for the preparation of project documents and their subsequent submission for approval, did not consider there was any evidence of inordinate delays in the preparation and

approval of project documents. Considerable gains in time for preparation and approval of project documents were made, by developing standard templates to suit each donor's requirements. Once those staff involved in initiating and clearing of project documents became familiar with the various templates, there was a relatively smooth flow of project documents.

204. In principle, project documents are signed between FAO and the beneficiary country concerned after a due process of consultation with the country when the document is being formulated to emphasize the principle of country ownership of the activities envisaged. The requirement of obtaining the signature of the beneficiaries was not applied systematically for project documents prepared for regional or interregional Desert Locust control projects. This practice could be, and has been, challenged by the beneficiaries when they realized its implications *vis-à-vis* the ownership of the envisaged activities and their commitment to see them through.

205. A considerable amount of work could have been avoided if it had been possible to operate within the framework of a multidonor project set-up, instead of one project per donor as was the case. Possibly, if the donors had been sensitized on the benefits of contributing to a multidonor emergency response project, when the appeal letters went out, they would have responded positively.

206. Project documents were generally considered to be prepared in a satisfactory manner according to 75 percent of the donors. Good and poor judgments scored low on this matter. The appraisal of various project details is presented in Table 5; surprisingly, all are rated as less than satisfactory. Less than half of the donors commented on these questions.

**Table 5**

Question	Judgment
Quality of projects documents	Less than satisfactory
Timeliness of project formulation	Less than satisfactory
Level of detail	Less than satisfactory
Details on inputs	Less than satisfactory
Details on budget	Less than satisfactory
Flexibility on inputs	Less than satisfactory
Flexibility on duration	Less than satisfactory

1–5 = less than satisfactory; 6–10 = better than satisfactory

207. Four donors indicated that they had allocated funds for the emergency based on the understanding of the seriousness of the situation, and that a detailed project document was not a priority. The rest of the donors felt that the quality of the project documents should be improved, in particular by additional information on the adopted control strategies. It was also noted that project documents should be based on the real needs of the countries. Almost half of the donors (44 percent) stated they would be willing to contribute to a regional control programme without separate project documents for each of the donor contributions.

208. *One donor noted that in an emergency dealing with “moving targets” and a constantly changing situation, the definition of a strategy, control methods and instruments seems to be more important than detailed planning at the start of the project. Aspects not sufficiently taken into account were human health, training and environmental issues which turned out to be bottlenecks during implementation of the various activities. An emergency project document could have been prepared for each affected country, with an FAO project manager, rather than having a project designed for each contribution received.*

209. *Project objectives should be better defined as well as the real needs. Project documents should follow a results-based approach and have a log-frame with quantifiable indicators. One donor noted that it did not have the impression of really having received a project document based on detailed preparatory studies on which ex-ante financial evaluations had been made. However, it was noted by the same donor that this is not uncommon in emergency financing for which the normal donor project requirements are not suitable.*

210. To gain time in dealing with donor fund agreements and the subsequent preparation of relevant project document/plan of operations/memorandum of understanding for emergency operations,

**It is recommended that:**

33. FAO initiate discussions with donors to arrive at a common format for both the funding agreements and the subsequent project document. Such formats should be as simple and user-friendly as possible, but detailed enough to ensure a clear understanding by all the interested parties of what is at stake;
34. FAO initiate discussions with donors on the opportunity of having one or two multidonor projects, and that such projects be deemed regional in geographical coverage to facilitate dealing with a pest that knows no national frontiers. Due attention should be given during the negotiations to how donor visibility and preferences, as well as applicable policy and regulatory requirements, would be factored into any multidonor arrangement that is reached.

*Work planning and delivery of inputs*

211. The project document is the overall instrument governing project implementation and spells out the objectives of a project and the expected end-of-project results. Each project document usually includes a preliminary work plan, which is developed in greater detail once operational approval has been accorded.

212. Although managerial responsibility for the Desert Locust campaign was assigned, through ECLO, jointly to the Directors of TCE and the FAO Plant Production and Protection Division (AGP), when it came to designating a budget holder and assigning operational responsibilities for the related projects, FAO placed both responsibilities on the shoulders of the Director of TCE. One would conclude therefore, that TCE was to take the lead in the process of the preparation and updating of the detailed work plans but, by virtue of the special status accorded to the Desert Locust control emergency operations by the establishment of ECLO, the process became a joint effort of TCE and AGP.

213. To be able to start implementing agreed projects, the funds approved by the donor concerned should be available in the FAO bank account. However, in various cases, the time from the moment the project was signed to the deposit of funds into the FAO bank account was too long for an emergency. An analysis of 44 projects approved before 10 March 2005 showed an average time lapse of 58 days between the project approval date and the receipt of funds in the FAO bank account. For 22 projects it was less than 30 days, but for 8 projects it was more than 100 days.

214. Project implementation within the context of emergencies is very much an event driven process. In the case of Desert Locust control, it is always affected by rapidly changing situations to which, a purely input delivery approach response adopted without adequate technical backing,

would be a recipe for disaster. The need to combine speed, timeliness, logistics, flexibility and technical quality makes the locust control operations, although entailing primarily the delivery of inputs, quite complex; they therefore merit careful planning.

215. At the field level, FAO representations generally lacked the necessary technical capacity to play a strong role with respect to coordination and technical support for the campaign. Project execution was completely centralized at FAO headquarters. This was partly overcome through the recruitment by FAO in the course of the campaign of international locust/logistics consultants to assist the affected countries and to support the FAO representations. The shortcomings of the centralized FAO approach were frequently mentioned in the course of the various discussions with national authorities and donor representatives. With respect to the implementation of Desert Locust control operations, 62 percent of the donors stated through the questionnaires that FAO involvement should be limited mainly to coordination and information activities. Only one donor felt that FAO should be involved mainly in project execution; instead 31 percent was in favor of both types of activities.

216. There is a feeling though within ECLO that because the Desert Locust menace evolves so fast and often in an unpredictable fashion, little would be gained by investing in detailed planning or programming for the corresponding control measures. The decision of FAO to constitute ECLO contradicts that perception and points instead to the need for an entity vested with enough powers and resources to enable it to adopt a strategic and a planned approach to the Desert Locust control operations.

217. In spite of this underlying assumption, ECLO does not appear to have acted on it. The result is that the campaign was waged using the modality applicable to any other emergency project that TCE handles. Even though TCE fully realized that the special situation pertaining to Desert Locust control operations required a common implementation strategy, programme and detailed operational plans, there were constant underlying difficulties in reaching technical decisions rapidly by AGP, allowing TCE to proceed with project implementation. ECLO management seems to have been content to have the two entities that were brought together under its umbrella from the Locust Group in AGP and the Emergency Operations Unit in TCE to co-exist side by side with each other, with each entity doing their own thing. The fact that ECLO is for the most part a headquarters-based entity with little or no field representation significantly contributed to the inability to provide rapid response and take swift actions.

218. The positive results achieved by ECLO during this campaign seem to be due more to the dedication and efforts of all the staff involved, than by design. In fact, if ECLO were to be challenged, it would be hard to show the blueprint it adopted in order to achieve the results and, more importantly, the catalogue of lessons learned and the way they could be used in strengthening measures to prevent and counter future locust outbreaks and upsurges.

219. In the absence of detailed project work plans, most of the collaborating units had either only a copy of the project document or the administrative from requesting action, to go by. It was not until the situation became clearer that more effort was deployed to define the specificity of the action and the expected lead time required for its accomplishment. At that point, the initiator was most probably already in a panic mode and drawing conclusions that the procedures of the organization on the matter were cumbersome and not user-friendly.

#### *Procurement*

220. It has been suggested that speedier procurement for emergencies requires FAO to accept running risks after weighing very carefully the levels of the risk/benefit it is willing to accept. A more perceptive culture of trying to ensure value for money as against sticking strictly to the rules spelt out in the Organization's manuals would go a long way in rendering the procurement process more proactive.

221. For 29 projects, data were collected to determine the time passed between the receipt of funds by FAO and the handing over of the inputs to the recipient country. For these projects, it took on average 48 days to deliver the inputs, and for five projects at the end of 2005, inputs had not yet been delivered after 125 days or more. For emergency projects, these delays seem to be excessively long.

222. These delays were to a certain extent due to the lack of an overall plan for the activities to be undertaken. In addition, some procurement actions had to be funded by more than one project, requiring complex and time consuming financial management. Local procurement, which could have been undertaken for certain items, was not encouraged, partly because of the strict approach by the Plant Protection Service (AGPP) with respect to technical specifications.

**It is recommended that:**

35. the rather ad hoc procurement requirements be transformed by FAO into systems and methods that are specific to Desert Locust control and to similar emergency operations in which FAO is involved, as was also recommended by the Technical Group of the DLCC in early May 2005 in its workshop on contingency planning for Desert Locust control.

*Personnel (operations)*

223. Within TCE the onset of the locust upsurge meant that additional resources had to be mobilized, mainly by recruiting consultants and short-term staff to cope with the new operational requirements. Although this was coupled with a certain amount of internal shifting of staff within the division, it inevitably resulted in having a high turnover and a team that was not fully conversant with the nature and complexity of locust operations.

*Personnel (technical)*

224. As regards technical and professional support, the core team in the Locust and Migratory Pests Group of AGP is geared to deal with levels of activities during periods of remission rather than upsurge. When an upsurge occurs, additional technical human resources are sought from elsewhere by recruiting consultants and, in rare cases, fixed term experts, from outside FAO.

225. Given the very specialized, rather unique and intermittent nature of locust control and operations, the number of experts on the subject matter is limited to a circle of a few individuals. AGP should try to take a pro-active approach to stem this predicament by drawing up, well in advance of requirements and in close collaboration with TCE, an updated roster of potential experts and ascertain their availability and their terms. If their terms differ from the current personnel and administrative procedures, negotiations should be initiated up front in order to arrive at a *modus vivendi* and, where necessary, obtain any required waivers for them well ahead of the time they were likely to be fielded.

**It is recommended that:**

36. the FAO Plant Production and Protection Division plan ahead and set up a well researched roster of dependable, experienced and qualified candidates to fill expert positions pertaining to the Desert Locust control, especially in the field, and tries to ensure that their conditions are known and are acceptable to FAO.

*Training*

226. The irregular occurrence of Desert Locust upsurges underscored above would suggest that institutional memory within FAO, the donor community and at country level on how to handle such upsurges is also likely to be limited, particularly at the operational level. It was therefore, imperative to ensure up front that those concerned and involved in the operations were well-informed of the latest state-of-the art techniques to combat the hazard and were of one mind on the subject matter. The ongoing investment by the Locust Group in ECLO on the training of trainers at country level is important to note, as well as the effort to organize at Dakar, albeit slightly late in the crisis, the meeting of the FAO Representatives in the locust-affected countries.

*Procedures and Systems Functionality*

227. Much has been said on whether FAO has a comparative advantage in handling the delivery of inputs in emergency operations, especially the logistics pertaining to a hazard such as the one posed by the Desert Locust that occurs in an almost unpredictable frequency. This includes the need to change administrative and personnel rules, regulations and procedures of the organization, to align them more closely to the requirements of operating emergency projects. During face to face discussions with staff involved in ECLO activities, it was difficult for those contacted to pinpoint specific operational, procedural or system bottlenecks that needed to be ironed out. The often repeated issues were the time it takes from start to end of a procedure because of the large number of clearances required and, the delays experienced in some of the steps.

228. Most procedures require time, which may be difficult to compress beyond a certain critical minimum. What is important is to ensure that the process flow does not get hindered by too many steps or runs into bottlenecks. With the current technological development and given that all staff in headquarters are networked, it should be possible to find ways to speed up the process and cut down the movement of hard copies through clearances. For example, in TCEO six clearances were needed to extend the assignment of a consultant in the field, while in AGP project documents required clearance by the Head of the Locust Unit, the Chief of AGPP and the Director of the Division.

229. As far as delays are concerned, it would appear that some of them are not due to procedural or system weaknesses, but are rather attributable to shortage of human and financial resources. FAO does have, however, a mechanism to provide advance funding to facilitate the initiation of Trust Fund project operations pending the deposit of funds by donors. Advance funding has been mobilized through CERF, as mentioned previously.

230. Purchasing of pesticides was handled in a more effective manner when market surveys were carried out to determine, prior to the issuance of the purchase orders, which providers were able to deliver the pesticides needed for Desert Locust control in a timely manner, and at an acceptable cost.

231. Good priority setting is perhaps one way of minimizing delays. While the staff members directly involved in ECLO knew where their priorities were, the same cannot be said of the other units in FAO involved in the campaign in an auxiliary capacity. In an emergency, all those concerned in the chain of operations must perceive things in the same way and thereby align their priorities to the ongoing emergency. When these administrative units were queried as to why they did not respond faster to demands made on them by ECLO, the answer was that they were short of staff. Nonetheless, the units affirmed that as soon as they realized that a request submitted to them for processing pertained to emergency operations, they gave it priority almost to the detriment of their everyday jobs.

232. Delegation is another essential ingredient necessary for speedy decision-making and hence effective planning. The further down it can be taken the better, particularly when operating in an emergency mode. In the case of the Desert Locust, the limited circle of experts and the fact that input delivery revolves around procurement of a narrow spectrum of pesticides, spraying equipment, tools and protective clothing, and that contracting is focused on hiring of aircraft and helicopters, would make it quite easy to define a specific framework for delegation of authority in these areas.

**It is recommended that:**

37. delegation of authority for operational activities, lasting for the duration of the Desert Locust campaign, be given by FAO to the lowest possible level.

### *ECLO as a Functional Entity*

233. When ECLO was established by FAO in 1986 it was to deal with FAO's responsibility in the then ongoing campaign against the Desert Locust upsurge. The ECLO of 2004 was to strengthen FAO's response to an exceptional situation. The nuance between the two objectives may have led to the later ECLO being placed under dual direction and not having the "extensive delegated authority in order to permit fast decision and to expedite operations including the procurement of supplies" foreseen in the former.

234. ECLO does not appear to have exploited the opportunity of operating as a unified and seamless entity, which would in any event have been difficult with the dual direction (AGP and TCE). While the AGP staff directly involved in operations against locusts and other migratory pests were assigned to ECLO, the latter was, according to the terminology used in the Director-General's Bulletin establishing ECLO, only supposed to be supported by operational staff from TCE. Nonetheless, TCE staff did a good job of mustering, and eventually delivering on the substantial amounts of funds made available to wage the Desert Locust control campaign.

235. There is no doubt that if the ECLO directorate had been individual instead of dual and had had a similar carte blanche in terms of delegation of authority as in 1986–89, operational issues pertaining to recruitment of personnel, purchasing and contracting of control means for example, would have been less time consuming.

236. That would have also engendered an improvement in the process flow of some of the transactions initiated by operations officers as they would all gravitate to one focal point of approval instead of two. The situation whereby the Director of TCE as budget holder for Desert Locust control projects could not make commitments without technical clearance from AGP was overly cumbersome and unnecessary. It also led to turf protection tendencies.

**It is recommended that:**

38. a single unified command and wide delegation of authority be bestowed in a future ECLO and that it be recognized as an operational entity, with its own accounting code rather than that of OSRO, to facilitate the identification of regular programme and extrabudgetary appropriations put at its disposal by the Organization.

*Monitoring and Reporting*

237. Upon the establishment of ECLO at the end of August 2004, FAO's Field Programme Management Information System (FPMIS) was adapted to meet specific reporting requirements with respect to ECLO activities for FAO's senior management, representations and ECLO staff. Further donor-related funding information was made available regularly to the public through FAO's Web site. Subsequently, access to the FPMIS locust projects was extended to include also countries affected by Desert Locusts and donors.

238. Many donors, in the quest for visibility and recognition of their contributions to the Desert Locust control campaign, were quoted in the media as having made contributions of funds to assist but, all too often, there was a gap between the public announcements of their contributions and the actual written agreement between the donor and FAO and the subsequent deposit of funds. Data extracted manually showed that a good part of the assistance came when the locust upsurge was at a very advanced stage suggesting that, if the assistance had come earlier, it might have been possible to contain the upsurge to lower proportions.

239. The other area of monitoring that was to be handled primarily from headquarters was that of measuring the rate of project delivery against approved budgets, prescribed inputs and the timeliness of the actions in respect of the agreed project start and ending dates.

240. This monitoring was also expected to keep an eye on the way the needs were being met as project delivery progressed and, based on the needs assessment drawn up at the start of operations, to forecast future needs and adjustments to be made in delivery plans as necessary to avoid in-country accumulation of pesticides and or other inputs such as aircraft flying hours. However, in the absence of an overall action plan for the entire campaign and detailed project work plans it has not been possible to translate this expectation into reality.

241. The following comments were received from donors on project implementation and reporting. FAO project implementation and reporting was considered less than satisfactory by 60 percent of the donors. Timeliness of inputs, quality of reporting, timeliness of reporting and visibility of the donor agency's contribution were all rated as less than satisfactory to poor. Project implementation could be improved through enhanced communication with the field, by delegating operational decisions to the country level, and by simplifying the FAO procedures.

242. Reporting has been perceived as weak by most of the donors. It should be improved by respecting the reporting schedules and by giving a better picture of all the actors. *Affected countries should be more involved in the reporting. One donor noted that very little reporting on the operation was received, even when FAO was requested to confirm that its contribution had been well utilized, no information was provided, even informally. It had been promised in early 2005, but did not arrive until October 2005. Another donor noted that their field monitoring reported that delivery of inputs, as well as technical support delivery, was less than optimal. They had not received formal project reports from FAO and therefore it was difficult for them to judge specifically how it could be improved.*

243. *It was noted that the quality of reporting in areas such as emergency pest operations often lacked analytical interpretations on impacts and/or implications on food security, human health, environment, host-country and regional capacities and others as applicable. This affected the quality of the reports, especially in areas where actual measurable results according to specific indicators could have made a significant difference.*

244. *Another aspect that needs closer attention is visibility of donor contributions. It is not uncommon to come across a national and/or regional beneficiary and hear that donor contributions are either absent or insignificant and that most of the assistance is coming directly from FAO. This issue has been raised and discussed at various venues but the donors still need their share of recognition.*

### *Project Revisions*

245. Recognizing that complex emergencies especially those pertaining to biological phenomena evolve extremely rapidly and therefore lead to rapidly changing needs, provision should always be built in the donor agreements during negotiations to cater for possible shifts of the original scenario. This should also allow for flexibility for FAO to respond to such changes through, for example, a simple exchange of an e-mail with the donor rather than undertaking lengthy negotiations.

246. Such a move is contingent, however, on the donors being kept well-informed of the evolving scenarios as they unfold and not be taken by surprise at or near the end of project date. Proposals for a revision should be seen by donors as indeed a response to changed circumstances and not as an afterthought that arises because the Organization finds itself with some unspent funds in hand.

247. The combination of effective control operations and unfavorable weather conditions in northwest Africa during the winter of 2004/2005, have led to a rapid suppression of the upsurge. This has resulted in an unspent amount estimated at US\$25 million by the end of 2005 out of the total US 74,160,068 that was available. This unspent money is spread over some 30 projects. Negotiations are now in progress with the donors to obtain their concurrence and approval to continue disbursing these funds to take care of elements such as strengthening the survey capacity of national teams during the remission period, to correctly dispose of pesticide containers, to continue the assessment of possible negative impact of the chemicals used on the environment, and to bolster research on more user-friendly control measures that can be used in any future upsurges.

248. Concern has been expressed over the limited attention being paid to the opportunity of deploying the unspent funds to improve the livelihoods of the pastoral and peasant populations re-establishing their productive capacities that were destroyed by the locust invasion. The fact that the appeals for locust control were not comprehensive enough and coordinated with other aspects of the relief-rehabilitation-development continuum strategies could make it difficult now to demonstrate to donors that there is a need to take advantage of the unspent funds to address that aspect during the ongoing project revisions.

**It is recommended that:**

39. FAO strive to present a clear strategy to the donors at the time of launching the appeals that is part of the relief-rehabilitation-development continuum, by focusing not only on the immediate problem of eliminating Desert Locusts but also on related humanitarian and livelihood protection issues.

## I. KEY ISSUES FOR AFFECTED COUNTRIES AND DONORS

249. Responses from the questionnaire to affected countries indicate the following as key issues to improve Desert Locust control:

- creation of an emergency fund;
- timely mobilization of resources;
- improvement of regional coordination;
- training of staff in countries in the recession area; and
- preparation of national action plans.

250. On the other hand, the following areas are considered by the donors as high priority for the improvement of Desert Locust monitoring and control activities:

- strengthening of Desert Locust monitoring at national, regional and international level;
- strengthening Desert Locust control capacity nationally and regionally;
- improved contingency planning;
- coordinated framework for rapid response, including donors;
- greater attention to the environment;
- greater attention to human health;
- greater attention to effects on human livelihoods of locust damage and any rehabilitation needs;
- clearer definition of institutional roles;
- avoidance of the over supply of pesticides; and
- more effective procurement procedures in the affected countries.

251. In addition, donors stated that more research should be undertaken with respect to Desert Locust surveillance, population dynamics and control, environmental and public health protection, socio-economic impact, biological control, institutional mechanisms and control interventions.

252. Furthermore, a number of concluding questions were raised in the questionnaire to donors concerning key issues to improve future arrangements for Desert Locust operations. The replies received are summarized below.

253. **Is there sufficient clarity with respect to an effective Desert Locust control strategy?**

- a) *The preventive control strategy is the only strategy through which a Desert Locust invasion can be avoided. This strategy has been adopted by all the countries concerned during meetings of the DLCC and by the FAO Council through the EMPRES programme. Through this latter programme well-coordinated and effective control can be achieved.*
- b) *The strategy to overcome Desert Locust invasions should be clarified to both donors and recipient countries. However, the preventive control strategy is well defined, but should be implemented. It is necessary to ensure a better operational basis for the FAO strategy for Desert Locust control. The three phases of preventive control, invasion control and post-invasion activities should be better articulated, as well as the role of the different partners at the national, subregional/regional and international levels.*
- c) *Some donors noted that in any control strategy there should be more clarity on how economic, social and environmental matters will be addressed, and on how different options can limit the impact of the control operations in these areas.*
- d) *With a pest such as the Desert Locust and the vast areas it occupies, the much coveted strategies including integrated pest management (IPM) are often hard to implement. While the various components of this strategy have proven effective and applicable to some degree, the holistic approach is far from being operational. It is likely that this will remain so for some time. Efforts by FAO/EMPRES, the Assistance for Emergency Locust/Grasshopper Abatement project (AELGA – formerly known as the Africa Emergency Locust/Grasshopper Assistance project),*

*national units in the Sahel, the Maghreb, etc., have yielded promising results and need to be encouraged and supported.*

**254. Desert Locusts can move rapidly from one country or region to another. Consequently, flexible control approaches are required. How can this best be addressed given the administrative procedures for allocating financial resources?**

- a) *The responses show that when well-documented requests for funding and budgets are submitted early there can be more flexibility. The creation of some form of a fund for emergency situations with the necessary flexible control procedures should be considered. This is not only a question of administrative constraints, but also a matter of donor priorities for certain countries and geographical areas. Reallocation of funds from one country programme to another is administratively very difficult. Therefore, Desert Locust control campaigns should be planned from the start on the basis of regional programmes, instead of on specific country programmes.*
- b) *The regional and subregional organizations (CLCPRO) with good linkages at the national level and effective institutional relations constitute the best framework to coordinate the cross-border aspects of locust control and to carry out control operations in an effective and responsible manner.*

**255. What were the main reasons for the delays in donors' reaction to the request for support for the control campaign and how could the availability of funding be speeded up?**

- a) *Undoubtedly, at the beginning of the Desert Locust upsurge, there was insufficient awareness of the seriousness of the situation and of the potential spread of the risk. Facing many requests, donors have a tendency to react only when the crisis is really present and their public opinion has been sensitized by the international media. The main reasons also include donor's own decision-making and fund-releasing procedures. FAO rules should be changed to allow some actions to be taken based on pledges, and not wait for the actual disbursement of funds.*
- b) *At the beginning, there was a lack of publicity concerning the Desert Locust upsurge. Insufficient information and explanation were presented in documents sent to donors. Such documents should present information responding to the donors' development policies. In fact, this can be considered as a matter of how convincing the information will be and whether the "broader picture" is clear. In the absence of well-vetted national/regional/ international coordination, donors often go bilateral. Donors also may choose the bilateral route for political reasons.*

**256. How can capacity be raised rapidly in response to a crisis?**

- a) *Response capacity can be raised rapidly by establishing proper contingency plans and a pesticides bank. FAO should also establish a targeted intervention fund, with clear guidelines for its operation, so that it can rapidly undertake the necessary actions. Such a fund should solicit replenishment by donors upon submitting the necessary justifications.*
- b) *Planning in advance and building capacity in the affected countries is essential in this respect. Strengthening of institutional aspects should be undertaken and increased investments should be made in research and monitoring to ensure that outbreaks will be forecast in a timely manner. This should be based on a continuous dialogue between the research community and the end-users. Testing of new control methods between outbreaks should also be carried out.*
- c) *Standby mechanisms that are sensitive to this type of hazard, including the identification of experts, need to be established. Effective and efficient use of the Central Emergency Response Fund should be employed. The FAO operational*

- capacity to carry out training programmes could be strengthened so that capacities are in place when required.*
- d) *Raising capacity can be adequately addressed if it is part of a more realistic and sustainable approach within the IPM strategy. The focus here should be on capacity development for a preventive strategy that could significantly reduce the need for delayed emergency operations. A well-thought-out IPM strategy could, in principle, not only contribute but enhance a rapid response capability of affected countries.*
  - e) *One also needs to be more realistic in formulating short-, medium- or long-term response strategies. In most Sahel countries where technical, material or financial resources are often scarce, the likelihood and the need for emergency responses will continue to be more frequent. This will obviously require some sort of contingency plan to establish a surge capacity within the affected countries.*

257. The nine recommendations presented in this section require appropriate action from FAO to ensure that it is well prepared to address future Desert Locust emergencies. The necessary proposals should be prepared by both the technical and administrative units of FAO in consultation with relevant stakeholders.

#### **IV. Analysis of the Control Campaign**

##### **A. IMPACT ON THE FOOD SECURITY SITUATION AND LIVELIHOODS OF AFFECTED COMMUNITIES**

258. Officially, the impact of the Desert Locust invasions is considered by the national authorities as very limited in almost all the affected countries. However, the data collected by the evaluation team indicate that they have had a major impact on the food security situation and the subsistence means of the affected communities. Two major factors may explain this apparent contradiction.

259. First, the control campaigns concerned only to a limited extent the regions with low crop production potential, which are usually occupied by vulnerable, subsistence-level rural communities. The campaigns were focused in particular on the protection of regions with a high production potential such as the Souss valley in Morocco, which occupies about 200 000 ha and where citrus and vegetables are grown for export; the northern part of Algeria, which represents some 30 percent of the total country area and which is the main agricultural production area; and the Senegal river valley where irrigated agriculture is common.

260. Second, the total amount of losses caused by the Desert Locust to crops and pastures has not been evaluated systematically. This is due to the lack of a generally accepted methodology to determine losses as and when needed, and the insufficient involvement of the relevant national structures in the monitoring and evaluation of the economic, social and nutritional impacts.

261. The regions with low agricultural potential have suffered to a varying degree losses to crops and pastures resulting in (i) relatively important food shortages, (ii) strong price movements in the markets, (iii) insufficient availability of grazing areas, (iv) selling of animals at very low prices, in order to meet the subsistence needs of the households and to buy feed for the rest of the animals, (v) early transhumance of the herds, (vi) severe tensions between the transhumant pastoralists and the local farmers, and heavy pressures of the animals on the transhumance zones, and (vii) extensive migration to urban areas.

262. Based on the various data collected from various sources in the course of the visits to the affected countries, the evaluation team came to the conclusion that the number of people in the Sahel having suffered to varying degrees from the Desert Locust invasion may be estimated at over eight million, distributed as follows.

**Table 6**

Burkina Faso	500,000
Mali	1,000,000
Mauritania	1,300,000
Niger	3,000,000
Senegal	1,580,000
Chad	1,000,000
<b>Total</b>	<b>8,380,000</b>

263. The Desert Locust invasions have worsened the food situation of the local populations, by aggravating the poverty and vulnerability of the households already living under very precarious conditions. In fact, the locusts have in many respects considerably accentuated the chronic, even structural deficiency in most of the regions.

264. The Desert Locust invasions have not only increased the difficulties of the households to cover their food needs, but they have also created pockets of famine in all the Sahel countries, necessitating emergency interventions. A number of examples demonstrate the spread of this phenomenon. In Senegal according to a report of a WFP/FAO assessment mission undertaken in 2004, some 124,300 rural households, 20 percent of the total population, were in need of agricultural emergency assistance. During the same period following a WFP study in Mauritania, close to 60 percent of the households interviewed were either in a food insecure situation, or have become increasingly vulnerable to food insecurity; the number of people having received some form of assistance was as high as 400,000, or about one-seventh of the national population.

265. The households most heavily affected by the locust invasion were in most of the cases those with chronic vulnerability. While the evaluation team did not have the opportunity to carry out interviews with households headed by women, there is little doubt that these households, with a higher degree of poverty, find themselves in a more critical situation than those headed by men. This higher degree of poverty is a result of the lack of control over the productive resources and the resulting benefits.

266. The impact of the Desert Locust invasions in particular on crops has been worsened by shortage and irregular distribution of rainfall in 2004. The locust infestations combined with this climatic hazard, in these essentially rainfed agricultural production systems, had considerable consequences for cereal, leguminous (pulses) and vegetable production. After the locust passage the situation worsened from limited crop losses caused by rain shortage to almost complete destruction. In many cases, the losses of the principal food crops, millet, sorghum and cowpea, ranged from 60 percent to 90 percent, reaching even 100 percent. Although relatively modest within the context of the overall national economy, the damage and losses at the level of the affected communities turned out to be disastrous in many cases.

267. This is clearly shown by the following examples. Compared to 2003, during the month of November 2004, the production in the Sahel provinces of Burkina Faso experienced a reduction of 90 percent in Oudalan, 78 percent in Séno, and 74 percent in Soum province, mainly as a result of heavy Desert Locust infestations. The total production losses caused by the Desert Locust were estimated at 58,832 tonnes (millet 49,049 tonnes, white sorghum 9,782 tonnes and cowpea 4,325 tonnes).<sup>19</sup>

<sup>19</sup> Direction Générale pour la Provision de la Sécurité Alimentaire, Enquête dans les zones touchées par le criquet pèlerin du 5 au 14 novembre 2004.

268. In Mali in the northern and northeastern part of the country, the dominant food crops cowpea, millet and sorghum have been heavily affected: for example, in the Nara district the losses have been estimated at 75 percent of the total production. For cowpea, the most important crop to cover the hunger period, the losses were 100 percent, while they ranged from 50 to 80 percent for the other staples.

269. In Mauritania, no region has been spared by the Desert Locust invasions, which resulted in a cereal deficit of 187,000 tonnes. While the spread of the losses varied, all crops including cereals, vegetables, and date palms suffered from the invasion. The losses caused to rain-fed crops have been estimated at more than 70 percent. For date palm production, a yield reduction of 80 percent compared to normal years, resulted from the invasion of Desert Locusts in many regions (Adrar, Inchiri, Tiris Zemour and Tagant).

270. In Niger, the combined effects of drought and Desert Locust invasions have caused food shortages in 3,755 villages which are located mainly in the northern regions of Tillaberi, Maradi, Zinder and Tahoua. The cereal deficit in 2004 was estimated at 27 percent, or about 223,487 tonnes. More than three million people in some 3,000 villages located in the agropastoral zones of the centre and the north of the country entered into a food insecurity situation.

271. In Senegal, the damage and losses caused by the locusts to rainfed crops, in particular millet and sorghum – and sometimes cowpea and groundnut – were serious but localized and ranged from 30 to 70 percent, affecting in particular the agropastoral regions located in the north and centre of the country. The most heavily affected regions were Louga, Matam, Dakar, Thiès and Diourbel. Luckily, the groundnut basin, and the Kaolack, Kolda, Ziguinchor and Tambacounda regions, as well as the Senegal river valley crucial for the production of rice and vegetables, were spared by the invasion, avoiding a major food crisis in the country. According to a GIEWS<sup>20</sup> report, the cereal production of the regions devastated by the Desert Locust represented only 20 percent of the national production.

272. Other production systems and dry season crops, especially fruit and vegetable production, practiced in particular by women, have also not been spared by the Desert Locusts. Complete harvests have been destroyed, depriving the producers of significant revenues in a couple of hours and aggravating the precariousness of their food situation. In general, vegetable crops constitute the second source of income for both the peri-urban and the rural population.

273. There are many examples of dramatic situations created by locust infestations of crops, but in particular one example will be cited of a women producers group in Mauritania met by the evaluation team. The losses of their small vegetable production fields (about 50 m<sup>2</sup>) were in the order of US\$ 200–300, leading to a significant reduction of their financial resources. Knowing that women have a very strong tendency to use their income for the improvement of the nourishment and well-being of the family, especially the children, the consequences of this loss of revenue are clear especially at the nutritional level.

274. The consequences of the Desert Locust invasion for animal production have been equally ill-fated, causing the destruction of pastures, as well as a reduction in harvest residues used for forage. For example, in Niger a reduction in forage production of 4,460,000 tonnes has been recorded in the infested areas. Towards mid-September 2004, two-thirds of the losses are estimated to have been caused by drought and one-third by Desert Locusts, by crop loss assessment missions. An additional negative effect of the invasion of pastures by locust swarms is the fact that cattle refuse to eat vegetation heavily contaminated by locust excrement.

275. In response to this situation and in certain cases because of fear that their animals might be poisoned by pesticides, nomads adopted the solution of early transhumance. However, this led to overgrazing, and generated and exacerbated conflicts between pastoralists and local sedentary

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<sup>20</sup> Global Information and Early Warning System.

farmers who had not yet completed their harvests. It has also entailed conflicts between herders competing for the use of water holes, pastures, and crop residues.

276. The loss of forest natural resources, in particular the destruction of *Balanites*, *Acacia* and *Ziziphus* widely consumed by women and children, had a major impact on the nutritional status of women and children. Reduced access to plants, fruits, leaves and other wild food products, which constitute a non-negligible source of vitamins and medicines, can seriously influence the nutritional and health status.

277. Completing the work undertaken by the evaluation team, a survey was carried out in Burkina Faso, Mali and Mauritania in February/March 2006 to determine the impact of the Desert Locust invasion on the food security and subsistence means of the rural populations. In Burkina Faso and Mali, three zones were selected and in Mauritania four, and a total of 30 villages was covered by the survey in each country. This has led to the following conclusions.

#### *Losses caused by the Desert Locust invasion*

278. The losses caused by the Desert Locust invasion in 2004 have been evaluated at 80 percent of the expected cereal production in 2004 in the zones surveyed in Burkina Faso, 90 percent in Mali and 90–100 percent in Mauritania. For staple leguminous crops (cowpea and groundnut), losses are close to 85–90 percent of the expected production in 2004 in the three countries. One-third of the pastures have been lost in the affected zones in Mali and Burkina Faso. The most important losses were observed in Mauritania, in the range of 85 percent of the fodder production. With respect to forage trees and products collected for human consumption, losses have been close to 50 percent in Mali and Burkina Faso, and they were higher than 80 percent in Mauritania.

279. Moreover, the zones affected by the Desert Locust invasion suffer in a chronic manner from lack and poor distribution of rainfall. During 2004, pockets of drought were noted in the north of Mauritania. The distribution of rainfall has been geographically very irregular in Burkina Faso. In Mali, the beginning of the agricultural season was hampered by shortage of rainfall. In a number of situations, this led to the need to re-sow crops. However, the losses attributable to rainfall problems were limited in space (oases in Mauritania, zone of Gao in Mali). In more than 80 percent of the investigated villages, the Desert Locusts were the primary cause of the crop losses and the food crisis in 2004.

280. The majority of the people interviewed were rather critical of the efficacy of the locust control campaign. Problems mostly cited were the delays in the mobilization of resources by the authorities and the organizations concerned, the lateness of the insecticide treatments, often undertaken after the losses had been inflicted, the lack of and poor efficacy of the pesticides used, the lack of spraying equipment available for use by the populations. The treatment with hand-held equipment by the local populations was often seen as inappropriate considering the extent of the invasion, with the exception, however, of treatments carried out on small areas, such as the oasis of Atar in Mauritania or the vegetable zones of the Dogon area in Mali.

#### *Food security situation*

281. In 2004, the cereal deficit had reached 80 percent of the consumption of the villages surveyed in Burkina Faso, 85 percent in Mali, and 95 percent in Mauritania. Moreover, for the staple leguminous crops, groundnut and cowpea, the deficit was between 80 and 95 percent of the consumption needs. The shortage of food products has caused strong price increases in 2004 and a chronic shortage of certain basic products in the local markets.

282. The majority of the households were forced to reduce their food consumption. The volume and number of daily meals were reduced, certain traditional plates based on millet were no longer on the menu in Mali and Burkina Faso. In 2004, the consumption of cereals was generally reduced by between 15 and 17 percent in the countries studied. As a result of these restrictions, the individual consumption of cereals has been reduced to 145 kg/person/year in

Mali, 155 kg/person/year in Mauritania, and 160 kg/person/year in Burkina Faso. These amounts do not satisfy the basic calorie needs in the Sahel countries, where cereals constitute the basis of the diet.

283. A strong disequilibrium in food rations was linked to the quantitative reduction of the meals. The consumption of groundnuts by the households fell by 67 percent in Burkina Faso, the consumption of cowpea was reduced by 35 percent in Mali and by 20 percent in Mauritania. In more than half of the households in the three countries studied, certain foodstuffs had to be rationed or left out. This was in particular the case for meat, fish, salads and vegetables, as well as certain food stuffs considered as luxury, such as coffee, tea and spices. Certain households had to give up milk and infant food products, oil and enriched flour.

284. External aid in the surveyed areas, essentially in the form of food assistance, was provided in 2004 in Burkina Faso to 90 percent of the households contacted, who each received on average 140 kg of cereals in 2004, representing 8 percent of their food deficit. In Mali, 75 percent of the households received on average 300 kg of cereals, covering 15 percent of their deficit. In Mauritania, 65 percent of the households received on average 130 kg of cereals, representing 10 percent of their deficit. Social solidarities (in different forms) have helped less than 10 percent of the households in Burkina Faso and Mauritania, and 20 percent in Mali. Family solidarities have been very active in Burkina Faso and especially in Mali, where about half of the households received benefit in the form of gifts of food or money. The evaluation team also gathered evidence that remittances from relatives in Europe were the main source of relief in many rural areas in Mali and Senegal.

285. Although the 2005 agricultural season was relatively satisfactory, food consumption in 2005 has not regained the level prior to the crisis. The consumption of cereals and food legumes has remained during 2005 about 10 percent below the level of 2003 in Burkina Faso and Mauritania. The average consumption of cereals has even continued to decrease in the affected zones in Mali, to some 20 percent below the level of 2003.

#### *Loss of capital and debt burden of households*

286. In 2004, the average expenditures of the households for the purchase of food had to be multiplied by three or four, depending on the zone. To face this increase, the household heads had to reduce non-food expenditures: clothing, social expenditures, travel, and sometimes health and schooling. At the same time, they searched for supplementary monetary revenues through departure to urban areas to seek employment opportunities or the development of non-agricultural activities, such as gold panning in Burkina Faso.

287. As these strategies proved insufficient to cover the food deficit, household heads had to sell part of their capital such as their livestock. Burkina Faso, where the number of animals per household was the highest in 2003, has been the most affected by de-stocking of animals. The sale of animals, which began in 2004 and continued into 2005, took place in 85 percent of the households. On average, more than half of the total cattle, goats, sheep, camels and poultry were sold. In Mali, the sale of animals affected 70 percent of the households and concerned in particular small ruminants and poultry, which decreased by about 35–40 percent; the number of cattle and camels decreased by about 20 percent. In Mauritania, the situation appears unclear. Massive sale of cattle, goats, sheep, camels and poultry occurred only in three of the zones studied, where total numbers decreased by 40–55 percent. However, it seems that in the fourth zone (Timbedra), certain agropastoralists have been able to profit from the food crisis by purchasing animals at a low price.

288. To address the food deficit, many household heads have also indebted themselves. Mauritania is the most affected with 60 percent indebted households, followed by Mali (45 percent) and Burkina Faso (33 percent).

*Vulnerable groups: women and children*

289. As vulnerability varied according to gender and social and economic status, the survival strategies and the operating margins were also different from one to the other. Whereas men often reacted with exodus, women used a range of diversified strategies. The survey indicates this took place mostly in Burkina Faso and Mali, where women have an increasingly important place in the management of the household. They sold their own animals, in particular poultry and small ruminants and sold personal goods, in particular jewellery. They have often incurred debts themselves through women's associations; they became involved in extra-agricultural activities – gold panning in Burkina Faso and handicrafts in Mali – and they reverted to gathering wild food products for the provision of the family (Burkina Faso).

290. The food shortages in 2004 and 2005 had important repercussions on their health and that of their children; 80 percent of the women interviewed in Mauritania, 40 percent in Burkina Faso and in Mali complained about loss of weight, a state of weakness due to malnutrition, tiredness due to excess work, and problems of pregnancy and childbirth in 2004. Depending on the zones and the countries, 40–70 percent of the children suffered weight losses and health problems linked to malnutrition. These effects were exacerbated by the fact that at the same time 20 percent of the households in Burkina Faso, 25 percent in Mali, and 12 percent in Mauritania had to reduce their health expenditures to purchase food.

*The long-term impact of the locust invasion*

291. The long-term effects of the locust invasion were the same in the different interviewed zones: they included the departure of young people, increased poverty of households, reduction of the agricultural work force, and increase of food insecurity. The relative importance of different types of impacts varies in the countries and zones surveyed.

292. The 2004 crisis provoked a massive and lasting departure of young people, in search of subsistence means in urban areas, and to escape from the agricultural activities of which the results are becoming too uncertain. This departure of young people was perceived in all the village communities as the most serious impact of the 2004 crisis.

293. In this respect, other sources indicate for Burkina Faso, a new phenomenon: during 2004 whole families moved on a large scale towards the cities. This proved fatal in a number of cases for people at an advanced age, for weak people and for small children. Moreover, these movements increase the risk of depopulation of the agricultural zones and exacerbate urbanization problems.

294. Impoverishment resulted from the general reduction of the household capital as a result of the use of all savings, and the sale of properties and animals. In general, at the beginning of 2006 less than 10 percent of the households had reconstituted their livestock. More than 50 percent of the households in Burkina Faso, 30 percent in Mali and 40 percent in Mauritania have not been able to repay the debts contracted in 2004.

295. The reduction of the agricultural production capacity of various households was in the first place the result of the reduction in the labor force, due to the departure of family members, in particular the younger ones, as well as to the persisting famine affecting work capacities. Locally, the reduction of the cultivated areas is exacerbated by the lack of seeds, production means or irrigation water. Overall, 40 percent of the households reduced the areas cultivated in 2005 in Burkina Faso, 25 percent in Mali and 15 percent in Mauritania.

296. The reduction of the production capacity was also the result of the impoverishment of the pastures and the degradation of the forest zones, initially caused by the invasion of the locusts and further aggravated by the following overexploitation of these resources.

297. So far, only 10–20 percent of the households have been able to reconstitute their cereal reserves. The household food consumption has nowhere reached the level prior to the locust invasion. This persistence of the famine in 2005 concerned 30 percent of the households in Mali and 40 percent of the households in Burkina Faso, while at the same time the external food aid had a tendency to be withdrawn from the villages, because the crisis was considered over. The security offered by livestock in case of major problems has been strongly reduced, leaving households even more vulnerable to face future crises.

298. With respect to the impact of the Desert Locust invasion on markets, the evaluation team's findings were that the shortage of cereals had important implications on the price levels, causing them to increase in a significant manner, out of reach of the large majority of households. According to a FAO/WFP assessment mission in the region of Kaolack in Senegal, one kg of millet increased from US\$0.15 in September 2004 to US\$0.23 in October of the same year, and the price of maize increased from US\$0.14–0.16 to US\$0.20.

299. For livestock, the inverse movement occurred: lambs for which the price range was between US\$60–80 in 2003 were sold off on average for US\$30. The fall in animal prices in the market resulted in a strong reduction of the value of the herds and of the purchasing power of the producers, and the impossibility to purchase the necessary consumption goods. The famine in the pastoral zone in Niger in 2005 was one of the most dramatic examples of the link between the drop in price of cattle, its influence on the incomes and the availability of food for the households.

300. In spite of the multiple survival strategies adopted, these were not adequate to re-establish the food security situation, even progressively and slowly. Critical as it was, the situation required external assistance, which was provided to the countries by multiple technical and financial partners, in particular through emergency food aid or rehabilitation projects. It is regrettable that, in some of these projects, seeds provided by FAO were of poor quality and of the wrong varieties.

301. As the consequences of the crisis are still visible in 2006, only sustained assistance can slow down the degradation of the socio-economic situation of many households. However, as noted by the evaluation team, given the scant attention paid to the socio-economic dimensions of the impact of the Desert Locust control campaign, the assistance provided so far was not always targeted in an adequate and satisfactory manner.

302. On the basis of the foregoing,

**The evaluation team recommends that:**

40. strategies be adopted by the affected countries to ensure that locust control operations are carried out both in zones with high production potential and in zones with low production potential, where agriculture is usually practiced by farmers with very limited resources.

## **B. ECONOMIC BENEFITS AND COSTS**

303. The evaluation team did not have the means to carry out an assessment of the macroeconomic impact of the Desert Locust upsurge. As discussed above it concentrated on socio-economic aspects. Anyhow, it is generally accepted that gregarious Desert Locusts need to be controlled notwithstanding the fact that precise data on the damage that can be caused have not been collected systematically. Consequently, the calculation of benefit/cost ratios of the control operations remains a speculative exercise. A World Bank discussion paper on Desert Locust

Management (Joffe, 1995)<sup>21</sup> suggests that locusts are not particularly serious pests in aggregate, and that Desert Locusts are unlikely in modern times to trigger widespread food insecurity.

304. An FAO study concluded that the current Desert Locust control strategies are risk averse and that affected countries and the international donor community are absorbing substantial net economic costs. This study has been criticized, among others for having excluded the social dimension of the locust threat (FAO, 2000),<sup>22</sup> but at that time very little data on this aspect existed. A recent study to determine the economic costs and benefits of locust control in Eastern Australia considered the agricultural production at risk if locust control operations had not been carried out. It showed a benefit/cost ratio of 6.5.<sup>23</sup>

305. A number of additional studies concerning the impact of Desert Locust invasions have not led to conclusive results. However, data collected in the course of this evaluation show that, in the Sahel countries affected by the recent invasion, 10-50 percent of the total population has been suffering serious losses, directly or indirectly.

306. Nevertheless, while questions remain with respect to the economic impact of Desert Locust invasions, agreement emerges that effective surveillance and control mechanisms can prevent, and thus drastically reduce the costs of controlling new locust invasions. Therefore, investments in maintaining effective early warning and control systems would have a high pay-off compared to the cost of controlling new upsurges and plaques.

307. For this reason the Desert Locust component of EMPRES was initiated in 1994. EMPRES is fully operational in the Central Region, and recently funding has been agreed for its implementation in the Western Region. The programme aims at strengthening the capabilities and capacities of the national, regional, and international components of the Desert Locust management system in the region to implement effective and efficient preventive control strategies based on early warning and timely, environmentally sound, control interventions.

308. In the Central Region, notwithstanding substantial locust activity in 2003 and early 2004 a locust upsurge was avoided. This may be seen as proof of the effectiveness of the EMPRES programme, but it has to be said that rainfall conditions in the Central Region were much less widespread and more limited in their distribution than in the Western Region. The potential benefits to be drawn from early warning systems were also the criteria used for the implementation from 2004 onwards of the World Bank-funded Africa Emergency Locust Project in seven countries in West Africa.

309. Data on crops and pastures saved by the locust control operations were not collected in a systematic manner in any of the affected countries during the 2003–05 campaign. Consequently, only two specific cases could be used to determine benefit/costs ratios, presented in Annex VI.

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<sup>21</sup> Joffe, S.R., 1995. *Desert Locust management. A time for change*. World Bank Discussion Papers. The World Bank, Washington, D.C.

<sup>22</sup> FAO, 2000. *Report on Desert Locust Economics Meeting*. FAO Rome, 28–30 June 2000. EMPRES Programme for the Central Region. Rome.

<sup>23</sup> Love, G. & Riwoe, D. 2005. *Economic costs and benefits locust control in Eastern Australia*. Report prepared for the Australian Plague Locust Commission, Canberra. Australian Bureau of Agriculture and Resource Economics.

310. For the determination of benefit/costs ratios of future locust control campaigns,

**It is recommended that:**

41. mechanisms be put in place by the countries concerned to estimate the total benefits of the control campaign (value of production saved and additional benefits);
42. relevant national structures be involved in the collection of the necessary data and in the preparation of these benefit estimates (agricultural statistics services, etc.).

### C. IMPACT ON HUMAN HEALTH AND THE ENVIRONMENT

311. As in previous Desert Locust campaigns, chemical control remained the most utilized, if not the only approach, during the 2003-2005 campaign to address the locust invasions. The amount of pesticides used in all the affected countries was in the order of 13 million liters, sprayed over a total area of about 12.9 million hectares.

312. Currently, in the region there are no other effective and efficient control means to replace synthetic pesticides for large-scale Desert Locust control operations. The idea of carrying out certain control operations with alternative control means and at lower environmental costs is sometimes considered. However, biological control does not seem to be a viable option yet. It takes over ten days for locusts to die after being treated with currently available alternative bio-control means. Some of these new control means have been further tested in the course of the 2003–05 campaign and these tests will hopefully provide better insight under which conditions these products might prove effective.

313. According to the responses to the evaluation questionnaire for affected countries, national guidelines for the safe and effective use of pesticides against Desert Locust have been developed in 12 countries. All countries provided in-service training for their staff to strengthen their Desert Locust monitoring and control capabilities. Half of the countries reported that over 75 percent of staff members receive training each year. Training was generally rated as effective.

314. Environmental and health indicators were monitored in 64 percent of the countries; this reached a level of 100 percent in countries with high infestation. The number of instances of pesticide contamination was minimal according to the replies received. The main causes for the lack of environmental monitoring were the lack of rules and procedures, the absence of action plans, shortage of financial/logistical resources and expertise. Eight countries reported that they adhered to the necessary pesticide safety procedures. Six countries checked the incidence of exposure to pesticides and used cholinesterase tests. The use of protective clothing was rated as better than satisfactory by 13 countries (87 percent). Efforts were made to build awareness concerning environmental and health hazards, and for the development of guidelines for control operations. The evaluation team considers that in future, countries should strive to conform with and apply the rules and regulations that have been set.

315. Pesticide application rates were checked in 11 countries, the proper storage of pesticides was monitored in 12 countries, pesticide stocks remained in 12 of the countries, and pesticide quality was monitored in eight countries. Proper pesticide storage remains a problem, particularly in some Sahelian countries. In four out of 11 countries providing information on this matter, pesticides were stored in residential areas. The same number of countries indicated that pesticides were stored in the open air. There is a large quantity of left-over pesticides in the affected countries which constitutes a potential danger.

316. Half of the countries provided details on the collection of containers; on average 70 percent have been collected. In 30 percent of the cases these containers were stored without full security. Four countries reported that empty pesticide containers were destroyed; in three countries they were partially recycled.

317. Compared to previous campaigns, in 2003–05 significant progress was made with respect to human and animal health and environment matters. Following the creation of Ministries of Environment during the 1990s, strategies for improved health protection and management of the environment have, or are being developed, in many of the affected countries. Frameworks for compliance strategies and enforcement programmes have been initiated (national environment action plans, environmental codes, water codes, etc.) and during the 2003–05 campaign, technical rules and regulations were adopted, usually based on the DLCC-approved FAO Desert Locust Guidelines for locust control. All projects implemented by FAO had a human health and environmental component.

318. Indeed, at present procedures and rules have been put in place in the CILSS member countries to register pesticides used for locust control. Although these represent an essential framework of basic principles to develop successful environmental and public health management strategies, they are only a first step.

319. In some countries, regulations and rules on pesticides were not set through a process involving all responsible and concerned state ministries (agriculture, environment, health, etc.). For this reason, these regulations and rules are often inconsistent or even contradictory, making it difficult or impossible to apply them. In addition, some technical regulatory measures rely on expensive or unavailable technologies, making their adoption and application difficult.

320. The second essential step concerns compliance in implementation of the set of requirements. Compliance is achieved when the necessary pre-conditions are met and the desired health and environmental results are achieved.

321. During the Desert Locust campaign of 2003–05, most countries made an effort to overcome some of the barriers to compliance through different approaches. They usually provided training to strengthen human capacities. Technical assistance has also been provided to countries with limited resources in the area of public health and environmental quality management. Mass media have been used to educate the public about the potential threat to human health and the environment of the pesticides used for Desert Locust control. In Niger, where a low percentage of empty containers were collected, financial incentives were offered to encourage the phytosanitary brigades to comply with the requirements for reducing or eliminating the potential negative impact of these containers within the local communities.

322. Some Maghreb countries (Algeria and Morocco) have developed and implemented a compliance plan including monitoring, but most countries have yet to put in place systems to effectively consolidate their health and environmental management capabilities and to develop a comprehensive monitoring/evaluation plan as an integral part of good Desert Locust control practices. Furthermore, experience gathered in the affected countries has shown that promoting compliance alone does not result in effective public health and environmental protection, since compliance strategies require a mix of promotion and enforcement.

323. Enforcement is the third and last step to sustainable health and environment management and consists of a set of specific practices and procedures required by law to directly or indirectly reduce or prevent health and environmental risks. It includes actions (i) to achieve compliance by pesticide producers and chemical control operators and (ii) to correct or stop activities endangering environment and public health. In general, countries concerned by locust control, including most Maghreb countries, have not fully reached it yet.

324. Cases of pesticide poisoning and pollution were reported by local people in the countries concerned, in particular the Sahel countries. The negative consequences of the pesticides used

were not always easy to demonstrate. Gaps exist between the official figures and the information collected in the treated areas, but in the absence of monitoring of these impacts in a regular and timely manner, it was not possible to obtain reliable data. Unlike the Maghreb countries, a good number of the Sahel countries do not have an appropriate strategy for environmental impact evaluation, and also lack specialized laboratories and well-qualified staff.

325. In certain affected countries such as Burkina Faso and Niger, Desert Locusts are a well-appreciated source of protein, and they are sold at a high price compared to staple food products, such as rice and millet. However, in the absence of proper controls due to the lack of laboratories assessing pesticide residue, there are no means to determine if locusts sold in the local markets are free of pesticides.

326. Considering the foregoing, to minimize the risks to the safety and well-being of the populations, and to ensure the effective protection of the environment,

**It is recommended that in the countries concerned:**

43. the capacity of environment and health professionals be strengthened through training aimed at understanding and respecting norms and quality standards, environmental procedures and regulations, and precautionary, reduction and mitigation measures, and that these professionals be provided with logistics and financial means to carry out quality tests and field inspections;
44. those who apply pesticides be trained and sensitized to ensure that they fully understand and follow the rules and regulations pertaining to the use of pesticides.

327. The involvement of all the concerned authorities in the planning and organization of the campaign and the preparation of contingency plans has often been lacking at the beginning of the control operations, especially in the Sahel countries. If environmental specialists and those concerned with registration and safe use of pesticides, as well as the communication experts and other experienced personnel had planned the work together before the start of the campaign, they could have integrated environmental and health concerns earlier in the formulation of the various programmes.

328. The national locust control units in the Maghreb countries and in Mauritania have usually been able to ensure the medical protection and monitoring of the professional staff involved in Desert Locust control. This was the case, for example, for the unit in Morocco, which employs a full-time medical doctor, who liaises with the physicians of the Ministry of Health at the decentralized level of the Wilayas (provinces) to ensure the medical surveillance of the staff based in the regional command posts for the locust control operations. In Algeria, the National Toxicology Centre is responsible for testing cholinesterase levels of professional staff.

329. In most of the Sahel countries, very few staff members from the Plant Protection Services who participated in the Desert Locust control operations have undergone cholinesterase tests before the start of the campaign, though this was usually done afterwards. However, without the availability of a pre-treatment reference, the determination of a possible effect on the cholinesterase level becomes erratic. The village brigades, because of their number and spread in the county, have worked under poor protection and medical surveillance.

330. To ensure the safety of staff involved in chemical control operations is well taken care of,

**It is recommended that:**

45. medical surveillance of specialized staff involved in chemical control be ensured, including provision of adequate protection kits;
46. the involvement of village and phytosanitary brigades in the chemical locust control campaign operations be stopped on safety grounds, but their locust monitoring capacities be strengthened.

331. Large quantities of pesticides are still available in the countries affected by the Desert Locust invasion. Estimated at 6.2 million liters, they are either leftover from the 2003–05 campaign or come from purchases made after the campaign in order to be prepared for an eventual new invasion. This was partly caused by the fact that in a number of cases additional quantities of pesticides were purchased towards the end of the campaign against the advice of technical staff. These stocks are often stored under less than optimal conditions, particularly in the Sahel countries, which may have a negative impact on their expiry date. Thus, these products could increase the existing stocks of obsolete pesticides, which are already a challenge in terms of management and destruction in countries concerned. Some 20,000 liters of diflubenzuron provided by FAO are stored in Mali and Niger. They could not be used because of the corrosive effect on the aircraft spraying equipment.

332. In certain countries, such as Niger and Senegal, a drop in the quantity of leftover pesticides since the end of the campaign was noted. In Senegal, the stock has decreased from 877,700 to 672,760 liters from April 2005 to December 2005 and in Niger from 232,495 to 187,590 liters. An explanation was not provided to the evaluation mission.

333. To avoid the accumulation of large stocks, the establishment of a pesticide bank for the benefit of Desert locust operations has been discussed on various occasions. This could be in the form of contractual arrangements with pesticide producers to ensure that pesticides are available at short notice and delivered when and where needed. It could also include promoting triangular arrangements whereby, for example, FAO facilitates the transfer of a certain amount of pesticides from one country to another. Such arrangements, if successful, would reassure affected countries that pesticides supplies would be available in good time and would avoid accumulation of large quantities of pesticides that could later become obsolete. Another option could be to establish a special fund and procedures that would allow pesticides to be purchased at short notice.

334. Only 30–80 percent of the empty pesticide containers were collected according to information received from the countries. The highest levels of collection were attained with the 100–200 liter containers, in those countries where control operations were carried out by professionals only. In the Sahel countries where village brigades were a key part of the chemical control operations, plastic containers of 1–5 liter were provided to facilitate the handling of the pesticides. These containers were frequently re-utilized for domestic purposes and were often at the origin of contaminations. Sensitization efforts of the population showing the dangers of these containers and inviting the farmers to return them had some effect, but fell short of expected results.

335. The management of empty containers was also a preoccupation for the countries concerned. The storage of empty containers requires large spaces. Independent of how these containers are stored, in the long term they become a contamination source. An effective solution has been found for containers of 200 litres, through the use of drum crushers. A few countries

affected by the Desert Locust have obtained crushers that wash, decontaminate and compress metal containers, for subsequent recycling in foundries. But this new technology cannot be used for plastic containers of any capacity.

336. Considering the above-mentioned aspects,

**It is recommended that:**

47. ordering and distribution of pesticides in containers of less than 50 liters be avoided by all parties concerned and that pesticides be purchased in metal containers of a large capacity (100–200 liters);
48. drum crushers be introduced in all countries affected by the Desert Locust for the destruction of metal containers, and recycling of crushed containers by foundries be promoted by the national locust control units;
49. in collaboration with FAO and the CLCPRO member countries, an agreement be developed with pesticide manufacturers concerned for the recovery of their containers.

#### **D. INSTITUTIONAL AND ORGANIZATIONAL ASPECTS**

337. All partners have directly or indirectly supported the overall strategy for locust control during the campaign. However, lack of experience and means did not allow most countries to carry out the necessary monitoring and control operations in an effective manner. Countries differed considerably with respect to the type of personnel involved in the control operations. In some it was exclusively done by well-trained professionals, in others it involved a wide range of people with very limited or no experience. The evaluation team considers that Desert Locust control campaigns should be carried out by appropriately qualified staff.

338. Coordination of the various activities at the national level varied considerably, from virtually no specific arrangements to the establishment of a range of committees at different technical and political levels. Countries may have different requirements in this respect, but as a minimum a national coordination committee should be established, preferably under the chair of the Minister of Agriculture, as well as a joint government/donor committee.

339. Donors were asked, through the questionnaires, what were, in their opinion, the main strengths and weaknesses of the international coordination of and support for the locust campaign, including coordination between the different donors and the affected countries. Their responses indicate the following.

340. *The role of FAO in locust control, given to it by its member countries, is to coordinate the control and to strengthen the information system at the international level. FAO became involved in project execution because of the lack of alternative mechanisms. For the Western Region this should be the CLCPRO, provided that it becomes an effective operational structure, which together with the national structures should manage the locust control operations.*

341. *Most of the affected countries, especially in the Sahel, are not able to effectively organize and execute large-scale locust control operations and the related logistics, be it preventive or invasion control. In addition, the FAO Desert Locust prevention and coordination programmes, for example EMPRES, are not fully operational in one of the two regions where it has been initiated. Consequently, there is often likely to be a gap that needs to be filled. If FAO were to engage in coordination, for which it has capabilities that many other bodies lack, or project*

*execution only, then these gaps must be filled otherwise. The long-term aim should be that the countries themselves and their regional organizations would have the capacity to take the responsibility for the execution of projects.*

342. *Locusts are a regional problem, thus it is good that FAO and regional organizations are available to deal with these aspects. A weakness is the lack of clarity concerning the different roles of different actors, and how these relate to each other. This may result in duplication of efforts and waste of time and resources. In addition, the level and quality of information is not always sufficient. Weak points also include lack of qualified staff, lack of equipment for the national locust control units in the frontline countries and lack of an annual budget for locust control in the countries concerned to ensure preventive monitoring and control operations. The circulation of locust information between countries should be mentioned as a strong point.*

343. *Certain donors have not played the coordination game: little money passed through FAO and little information was provided on what they financed. The affected countries have sometimes also not played the game; they have chosen the multidonor card, meeting with the donors one after the other without providing information on what was discussed with the other, and have often preferred direct financing for more visibility with respect to the public opinion, or for other reasons.*

344. *FAO has here a great role to play and it should somehow be able to strengthen its coordinating role among the international community, including non-governmental organizations. If FAO could place more emphasis on coordination and leave the execution wherever possible to other organizations, it could increase its credibility as a liaison agent and information distributor. In such a case the affected countries would rely more on FAO and report to it about all bilateral arrangements, as would be the case for donor countries and international organizations.*

345. *Considering the overall results with respect to locust control during the last campaign, the response of the international community, while somewhat late, has limited the damage. The coordination at the field level was not easy because of the many partners involved and the lack of an intervention framework. Proper appeal documents were not produced for the donors. The FAO field level capacity and operational presence were limited.*

346. *Coordination by itself is a daunting task when it comes to the Desert Locust given the areas it covers and its spontaneity. An absolute reliance on central coordination is unrealistic for the Desert Locust response. It is important to recognize that while the central coordination may work well for communicating with the field representatives, there is a justified need for initiating coordination efforts at the regional and national levels. FAO, regional organizations and national government efforts in organizing country/regional coordinating committees is an instrument that needs to be strengthened as it is the first line of communication with donors in areas where the actual problem can be described.*

347. *The evaluation team believes that FAO should continue to be the logical choice for the implementation of multilateral Desert Locust control projects. However, it should try to do so in a much more decentralized manner, allowing staff responsible for the various project activities to take decisions and carry out their responsibilities in an expeditious manner.*

#### *Institutional arrangements*

348. *A much better understanding is needed of the role and responsibilities of all the stakeholders, the affected countries, the donors and FAO, and the way the DLCC and Regional Commissions promote and ensure effective Desert Locust monitoring and control. For example, the evaluation team had the impression that with respect to the Desert Locust emergency some affected countries seem to consider that action to be undertaken is in the first place a responsibility of FAO and the Regional Commissions. Moreover, donors and affected countries consider Desert Locust emergencies as a rather unique, stand-alone, event. It should be recognized that there is a continuum from recession, through pre-emergency to emergency.*

349. Limiting the frequency and importance of Desert Locust outbreaks and upsurges requires the involvement and support for the whole chain of activities related to these three phases. Taking out an insurance contract when the house is already on fire is not a realistic and cost-effective approach. A more serious commitment to the various developments by the various stakeholders should ensure better preparedness when emergencies arise, and limit the type of financial and socio-economic consequences, such as occurred during the 2003–05 campaign.

350. Desert Locusts are and will stay a permanent threat to the food security and livelihood situation for the rural populations living in the harsh arid and semi-arid regions. Over the last 50 years monitoring and control means have been developed that allow to follow better the Desert Locust developments and to control locusts more effectively. As such the importance of this threat can be significantly reduced, provided conditions are created to use these means in an optimal and effective manner. To achieve this, the countries concerned and the international community must follow this threat on a regular basis.

351. As discussed in this report, there is a need to support and implement clear operational strategies and plans. In the Western Region for the short term this is to a large extent addressed through the EMPRES programme. But it should be ensured that the arrangements put in place are also adequately supported in the longer term. The EMPRES programme for the Central Region also needs to be adequately maintained.

352. The member countries of the CLCPRO must ensure that at the national and regional level effective monitoring and control operations are well sustained. The operational effectiveness of CLCPRO, and the other Regional Commissions, is determined by the commitment and engagement of their member countries. Given the economic situation in the Sahel, the donor community should be ready to provide complementary support to the inputs provided by the countries themselves.

353. It is essential that: (i) better recognition be given to the fact that Desert Locusts are a permanent major threat to the food security and livelihood situation of large numbers of people in countries that require already very substantial international development assistance; (ii) strong support be provided by the countries concerned and the international community to effectively address the necessary Desert Locust monitoring and control activities during the recession, pre-emergence and emergency phases; and (iii) that a productive partnership be created with the active support and trust of all concerned.

354. Specific recommendations on this matter are formulated later in the report.

## **E. TECHNICAL QUALITY AND ADEQUACY**

355. One of the most important constraints noted during the Desert Locust control campaign was the insufficient availability of well-qualified human resources in most of the countries concerned, in particular in the Sahel countries. In a crisis situation the staff, which constitutes the backbone of the control structures in these countries, are strengthened by people from various departments who generally do not possess sufficient knowledge to be able to undertake appropriately the monitoring and control activities. The consequences have, in particular, been perceived in the course of the first part of the campaign by the quality of the information collected. This sometimes left much to be desired, in particular with respect to the areas infested and treated, and with details on the efficiency of the treatments, which were not always undertaken in an effective manner. The poor status of the equipment, especially the means used for ground control operations and sometimes even for aerial control (as in Niger) was not always sufficient to reach the anticipated results.

356. The lessons learned during the first part of the campaign permitted to undertake a series of measures to improve the technical quality of the interventions through training programmes organized by the countries themselves in the case of the Maghreb, and by FAO for most of the

Sahel countries. These training activities have covered various themes linked to locust control, including environmental monitoring aspects.

357. To assist the Sahel countries to manage the Desert Locust crisis better, FAO with the financial support of the donors, made use of the services of 22 international consultants, nine of whom were employed in the frontline countries for technical advice and assistance. FAO also contracted 14 airplanes equipped with the DGPS track-guidance system to monitor the quality of the chemical control operations better. In addition to the provision of 50 four-wheel drive vehicles, a large number of new types of sprayers, better adapted to locust control, were mounted on vehicles. A significant amount of high-performance communication equipment has been provided to countries. This has improved in a very significant manner the collection and transmission of Desert Locust field data.

358. Regrettably, the majority of the countries involved in the Desert Locust upsurge did not have an effective contingency plan for the campaign. The DLCC had insisted in its extraordinary meeting, held from 29 November to 2 December 2004, on the importance of having such plans to be able to respond accurately at different levels to the locust threat. Its technical group had organized a workshop on this topic at Nouakchott in Mauritania to assist the countries in the formulation of these plans. These plans have been further developed for the frontline countries on the occasion of a meeting organized jointly by FAO and the World Bank at Bamako, Mali, in April 2005.

359. With respect to pesticides, almost all used during the Desert Locust control campaign were part of the list of products recommended by the FAO Pesticides Referee Group. Chlorpyrifos, malathion, fenetrothion and deltamethrin were the most used. Deltamethrin has a more interesting knock down effect and degradation speed, but its relatively high price limits its use to special crop situations, such as in the case of Morocco.

360. While the Maghreb countries have bought with their own resources almost all the pesticides needed, the Sahel countries have received most of them through donations, either through FAO or bilaterally. FAO made sure that rules and regulations concerning the use of phytosanitary products were followed in the countries concerned and did not provide products not officially approved. This was not always the case with some of the donations received from local sources.

361. The management of pesticide stocks has become a major preoccupation for the locust control authorities, who tried through different measures to ensure better storage based on the available means, while waiting for the construction of the appropriate stores. The best example is Morocco which has storage conditions that meet agreed international standards.

362. The effectiveness and efficiency of the control operations undertaken in the various countries are to a large extent expressed by the costs of the control operations per hectare. Unfortunately, the evaluation team was unable to obtain a detailed overview of all the expenditures for all countries, particularly those related to capital costs. However, based on the data it was able to collect, the following table was composed for most of the affected countries. This should be taken as a first estimate, which compares country figures that may or may not include capital or mortgage costs. The costs for the control operations are largely dependent on the effective planning of the campaign and the timely provision of the various campaign inputs, in particular those for aerial treatments, but also the available infrastructure such as the distance between airfields and the areas to be treated. Table 7 shows that there is considerable scope for improvement in a number of countries.

**Table 7. Approximate costs of the Desert Locust control operations carried out during the 2003–05 campaign**

Country	Area treated (ha)	Total expenditures (US\$)	Control costs (US\$/ha)
Algeria	4,518,842	101,000,000	22.35
Burkina Faso	27,159	1,621,556	59.71
Chad	22,816	4,700,000	206.00
Mali	385,591	10,173,000	26.38
Morocco	4,854,211	79,000,000	16.27
Mauritania	1,383,499	18,176,000	13.14
Niger	224,604	7,600,000	33.84
Senegal	774,591	42,400,000	54.74
<b>Total/Average</b>	<b>12,191,313</b>	<b>264,670,556</b>	<b>21.71</b>

363. Control operations can also be further improved and costs reduced through research. The evaluation team considers that the principal research themes emerging from the 2003–05 campaign concern the following.

- improvement in the use of satellite images for the identification of favorable Desert Locust breeding areas, for effective preventive control;
- determination of the reproduction potential of the Desert Locust under natural conditions and the exact number of generations that it can produce under optimal conditions;
- understanding the behavior of the Desert Locust during the solitary phase, its population dynamics and the factors leading to gregarization;
- improvement of pesticide spraying techniques, including the reduction of dosages;
- enhancing the efficacy of biopesticides, and determination of their impact on public health and the environment;
- socio-economic impact of the Desert Locust invasions;
- causes of abortion in cattle after consuming Desert Locust excrements.

364. Given the wide range of the costs of the Desert Locust control operations in the affected countries during the 2003–05 campaign,

**It is recommended that:**

50. a study be undertaken jointly by FAO and the countries concerned to identify the reasons for the high costs of Desert Locust control operations in some of the affected countries, as a basis for the development of guidelines for the more efficient control of locusts.

## F. EFFECT AND IMPACT OF THE CONTROL CAMPAIGN

365. The following impressions stem mainly from the evaluation team's country visits. Donors, affected countries and populations are unanimous in their opinion with respect to the importance of the potentially devastating effect of the Desert Locust invasions and their negative repercussions, combined with those of drought, on the productive activities and on household food security. They also share the conclusion that costs of the control operations would have been less and the impact of the invasion more limited, had control means been available earlier.

Finally, they would like to see in case of another upsurge that countries are well equipped to conduct under better conditions the control campaigns against Desert Locust.

### *Affected Rural Communities*

366. As mentioned above, whereas at the macroeconomic level crop and pasture losses were considered limited by the national authorities, at the microeconomic level, productive capabilities of the local populations have been profoundly affected.

367. Notwithstanding the existence of a latent fatalism, there is a strong conviction among the local populations that the disaster might not have been avoided, but it could have been significantly reduced if help had been provided at the opportune moment. These groups and communities, the appeals of which have not been heard, had the impression that they were abandoned by the authorities.

368. Opinions about the campaign's results at local level are mixed: while local populations recognize that the control operations had an irrefutable impact, they are unhappy about the late start which has entailed heavy consequences. Some lost within a couple of hours of invasion a considerable part of their capital. The example of animal losses experienced by many women in a village (Damane) located in the region of Inchiri in Mauritania is significant in this respect; they lost more than one-third of their sheep. One can easily imagine the repercussions of such events on these destitute people and their families.

369. Far from accepting matters as they were, the populations have used all possible means within their reach (for example, digging trenches to collect the hoppers, and using fire to kill them), and those that had the financial resources have sometimes invested important amounts of money to purchase their own pesticides. For example, a farmer in the region of Louga in Senegal spent US\$500 to treat 79 hectares without satisfactory results. Certain producers traveled to request assistance from the agricultural services in their region, however, without obtaining the necessary help.

370. The quality of the assistance provided after the invasion has also justified complaints by the local populations: more than half of the households identified to receive food assistance are still waiting. The distribution of seeds not adapted to the local conditions and not corresponding to the needs of the beneficiaries is another example of inadequate support. With respect to agricultural emergency aid, doubts have been raised by the evaluation team on the equitable distribution of seeds between households headed by men and households headed by women.

371. Finally, the negative effects of chemical treatments need to be considered. The local populations interviewed mentioned that these treatments have entailed illness and even deaths among animals after eating locusts or treated vegetation, or through direct pesticide contact. However, for the moment it is not possible to confirm such assertions.

372. Considering the reality that another Desert Locust upsurge cannot be excluded, it is essential that in future campaigns, appropriate measures are taken for a better targeting of the interventions, taking care of gender differences, along with other concerns. In this respect, the recommendations presented in the chapter on the socio-economic impact should be properly considered.

### *Affected Countries*

373. Losses according to the majority of countries could have been less. Their overall importance was linked to a certain number of factors, in particular the shortage of resources. Clearly, the importance of the development of the Desert Locust has been underestimated by the technical ministries, and the countries were taken by surprise by the rapid evolution of the events. Moreover, because of lack of preparedness, they depended largely on the assistance provided by the international donor community, and on that matter the affected countries have deplored the slowness in the provision of aid.

374. Some of the affected countries experienced great difficulties in informing the general public in a satisfactory manner concerning the delays experienced in the control operations. These were mainly due to the insufficient availability of logistic, human and financial means, which did not allow them to manage the locust invasions effectively. Consequently, at the beginning of the invasion, farmers short of other possibilities have undertaken traditional control methods while waiting for the arrival of the control teams. However, in many cases the teams arrived too late. Apart from the donors, FAO has also been pointed at as being responsible for the late start of the control operations. While technical staff acknowledged the shortcomings in the national locust control structures and capabilities, such arguments were not advanced during the discussions with government officials. In some countries the evaluation team almost got the impression that the affected countries considered that Desert Locust control was primarily the responsibility of FAO and the international donor community.

375. Besides the late provision of the control means, other insufficiencies have also become apparent. These insufficiencies are linked in particular to: (i) the manner in which in certain cases the sensitization and information campaigns have been managed, and (ii) to the lack of preparation and insufficient equipment and protection kits for the members of the village brigades or the village control committees. The length and complexity of political bargaining have also been mentioned with respect to the delays in certain countries in the presentation of financial requests.

376. With respect to the after-crisis question, in many countries it has been admitted that this was not beyond criticism and the following matters have been mentioned:

- Within the framework of the actions undertaken to attenuate the effects of the crisis on the affected populations, such as the provision of food or seeds, efforts have been made to avoid any idea of favoritism, but these have not always succeeded. As a result, the most vulnerable households have not always been helped.
- Little attention has been paid in certain countries to environmental questions and to human health.
- The lack of a system of reliable agricultural statistics, as a basis for the evaluation of the impact of Desert Locust invasions.

#### *Donors*

377. From the donors' point of view, notwithstanding the delay experienced in the provision of assistance, the control objectives have been met in general terms, and the overall campaign has been successful considering the fact that the control operations have contributed to a reduction of the locust populations and have limited the losses to crops and pastures. The donors recognize, however, that populations in rural communities in certain places have been heavily affected and that there was a need to provide rehabilitation assistance. For this a whole series of joint missions have been undertaken in the Sahel countries. This included, for example, a mission to evaluate agricultural production and food availability conducted jointly by FAO, WFP, CILSS and the USAID Famine Early Warning System (FEWS NET), and accompanied by two observers from the EC and USAID, as well as representatives from different ministries.

378. The above-mentioned mission had as its objective to evaluate the impact of the locust infestations on crop, animal and biomass production and on the degree of vulnerability of households, and to evaluate the resulting overall food security situation. On this basis it should have been possible to determine the food aid needs for 2004/2005, taking into account the imports and food aid already provided by the international community. Following these missions, a certain number of interventions have been undertaken through direct food aid or rehabilitation projects. In relation to this, it is worth mentioning that according to certain donor representatives, determining the target groups was inspired sometimes more by political than by humanitarian considerations and the most affected communities and households were not always those identified for receiving help.

379. Donors agree with the affected countries that support for the control campaign was provided late, but they differ in opinion on the reasons for the delays. Some mention the heavy bureaucracies and the lengthy payment procedures of donor countries; others note the weaknesses of the organization charged with this task. Donors recognize that at the beginning they gave too little credit to the announcements made concerning the importance of the Desert Locust upsurge and have largely ignored the appeals launched by FAO. They admit that FAO had sounded the alarm bell early. However, effective publicity was lacking, especially with respect to the potential impact on the food security situation. Consequently, the donors were not in a position to appraise the seriousness of the situation, and felt no need to react.

380. When donors became aware of the unfolding crisis, which in certain countries took catastrophic forms, they were ready to provide the support requested. But a number of pre-conditions were not fulfilled relating to the necessary technical information and properly formulated appeals. From their point of view this situation was caused by various factors including the structural, institutional and operational weakness of the affected countries, which led in certain cases to a policy of wait and see, even immobility and inertia.

381. Donors consider that the absence of a clear response from the authorities in the affected countries does not seem to be unique to the locust situation, because the same type of attitude is also noted in relation to other emergencies such as cholera. It is possible that, for example, electoral motives explain the desire to underestimate the extent of a disaster. This way of addressing disasters has undoubtedly played a role in the non-availability of resources at the right moment and, consequently, in the delays encountered at the beginning of the campaign. Moreover, a majority of the affected countries did not engage the necessary financial and logistic resources that one might expect from them. With the exception of certain countries, they were not ready to face the crisis.

382. In some countries, donors consider that another reason for the delays was the inability of the FAO representation to play its coordination role, handicapped as it was by a shortage of human resources. In the best of cases the information arrived too late, and in the worst it was provided in a drop-wise manner and did not meet the needs. But in other countries the FAO representation was considered as an exemplary agency with a remarkable aptitude for awareness building, information sharing and mobilization matters.

383. All in all, the donors recognize:

- to have underestimated the importance of the threat as a result of lack of convincing information on the evolution of the Desert Locust;
- that most of them are not emergency institutions, and thus their rules are not adapted to a locust crisis; and
- to have paid inadequate attention to the environmental monitoring aspects.

384. Notwithstanding all these facts, the help provided to the affected countries in the form of financial, material or institutional support has allowed better control of the Desert Locust infestations and a strengthening of the control capacities of the countries.

385. In future, it is essential to:

- identify more sustainable means for Desert Locust control;
- do everything to be ready to react at the appropriate moment;
- integrate the consequences of the control operations in the technical assistance projects, to manage the post-crisis period better; and
- ensure that structures and means for effective preventive control are better supported, while keeping in mind that structures with capacities of this type, such as OCLALAV, have regretfully not survived, because of lack of support from their member countries.

## V. Sustainable Desert Locust Control

386. The evaluation team came to the conclusion that in future the impact of Desert Locust invasions can be significantly reduced, provided effective action is taken on the following general recommendations for which further supporting information is provided in the report. It has been suggested to prioritize these recommendations. However, the evaluation team believes that to arrive at lasting improvements with respect to sustainable Desert Locust control they must be handled as a comprehensive package that requires urgent attention and follow-up action.

387. Contrary to the current situation, effective Desert Locust control requires a much better awareness and more effective and joint involvement in the various activities to be undertaken by all groups concerned. These include FAO, the DLCC, the Regional Desert Locust Control Commissions, the affected countries and the donors. The transition from, and the linkages between, a Desert Locust recession situation, through a pre-emergency stage, to a full-scale emergency should be well understood by all stakeholders to allow them to take timely and effective action. These stages are all too often looked at as independent events. Better awareness of the above facts and appropriate institutional arrangements to address them are essential to the implementation of the recommendations listed in this report.

388. Given the fact that this evaluation has been limited to only one of the three major regions of the Desert Locust invasion area, the evaluation team considers that, in addition to the implementation of the recommendations presented in this report, action should be taken on how they might affect Desert Locust survey and control efforts in the other two regions. FAO should take the lead on this in close collaboration with relevant stakeholders.

### **Preventive control strategy at country level**

389. History has shown that the Central Region, mainly the seasonal breeding areas along the Red Sea coasts and in the hinterland in the Sudan and Saudi Arabia, has been the epicentre for Desert Locust outbreaks where swarms originate and invade the Western Region. However, the 2003–05 upsurge which originated in the Western Region independently from the Central Region is unusual in the development of Desert Locust outbreaks. The Western Region also contains important seasonal breeding areas, which can result, as shown by the recent events, in large-scale outbreaks and invasions when ecological conditions become favorable.

390. The seasonal breeding areas in the Sahel are mainly located in the so called frontline countries (Chad, Mali, Mauritania and Niger). Regular surveying and monitoring in these breeding areas would allow controlling Desert Locust populations at an early stage before they invade larger areas and become difficult to contain. So far, only Mauritania has established the necessary institutional framework for the implementation of a preventive control strategy. The EMPRES – Desert Locust component that pursues this objective has been put in place in the Central Region since 1997 and has led to very promising results. This programme contributed to the early action that avoided, with the help of less favorable rainfall, major Desert Locust outbreaks and invasions in the Central Region during the 2003–05 upsurge. In contrast, the EMPRES programme in the Western Region did not become fully operational during the recent upsurge; an opportunity missed in the region.

391. Considering the experience of the 2003–05 upsurge,

**51. It is recommended that:**

- a) an effective preventive Desert Locust control strategy be put in place in all the countries of the Western Region where seasonal breeding areas exist to reduce the risk of future outbreaks and upsurges, through the timely detection of a pre-emergency situation. The implementation of such a strategy could avoid crop and pasture losses, and considerably limit control costs by intervening at an early stage with limited scale control operations, and allow implementation of safer and environmentally friendlier control means;
- b) an autonomous and operational national locust control structure, with the authority to take technical and administrative decisions as regards Desert Locust operations, be created in each of the frontline countries. This structure must be granted effective financial, material and policy support by the governments concerned. The structure should be able to take full advantage of the material, financial and technical resources received during the 2003–05 upsurge;
- c) an adequate national budget be allocated for the operation of the national locust control structure to ensure the sustainability of the preventive control strategy;
- d) the EMPRES programme in the Western Region be effectively supported by the CLCPRO member countries and by the donors;
- e) countries in the Sahel exposed to Desert Locust invasions maintain a capacity to control locusts within the Plant Protection Services and ensure that the experience gained during the 2003–05 campaign is captured, disseminated and preserved, through appropriate avenues such as training;
- f) the human capacity in acridology be strengthened for the timely replacement of the current Desert Locust specialists, many of whom will reach retirement age in the next 10–15 years.

392. Details of the requirements for the effective strengthening of the national locust control units in each of the frontline countries have been defined recently at the occasion of the first meeting of the Steering Committee of the EMPRES programme for the Western Region, held from 4–6 March 2006 in Algiers.<sup>24</sup> For example, the minimum number of monitoring and control teams has been estimated at six for Mali, ten for Mauritania, five for Niger and four for Chad. The estimates of the total costs for the establishment and operation of the National Locust Control Units in each of the four countries are given in Table 8.

<sup>24</sup> Programme EMPRES en Région Occidentale. *Rapport de la Première Réunion du Comité de Pilotage*. Alger, Algérie, 4-6 mars 2006. FAO, mars 2006.

**Table 8. Total costs Desert Locust preventive control (US\$)**

Country	2006	2007	2008	2009	Total
Chad	2,258,230	519,384	615,184	834,884	<b>4,227,682</b>
Mali	2,962,205	642,895	770,895	840,135	<b>5,216,130</b>
Mauritania	4,766,544	988,974	1,306,654	1,382,934	<b>8,445,106</b>
Niger	1,592,607	659,483	753,603	864,123	<b>3,869,816</b>
<b>Total</b>	<b>11,579,586</b>	<b>2,810,736</b>	<b>3,446,336</b>	<b>3,922,076</b>	<b>21,758,734</b>

393. For 2006, most of the costs are already covered by ongoing projects, in particular those financed by the African Development Bank and the World Bank. The current shortfall for 2006 is US\$1 485 542, but this should be partly covered by the national contributions which have not yet been included in the current estimates. For the following years there is still a substantial need for additional donor contributions. The costs for 2006 include important amounts for equipment and constructions.

394. From these estimates, it is evident that for an average insurance premium of some US\$5 million per year a new Desert Locust outbreak may be either avoided, or certainly be of much less importance than the 2003–05 upsurge.

### **Strengthening of the Commission de Lutte contre le Criquet Pèlerin dans la Région Occidentale**

395. The CLCPRO is responsible, among others, for the strengthening of national locust control units, through its own programmes and in collaboration with the EMPRES Western Region programme. However, the limited role and responsibilities of the CLCPRO in the Western Region with respect to Desert Locust control operations, compared to the activities undertaken in the past by OCLALAV, undermine its visibility and recognition by the member countries and the units within them.

396. In order to enable the CLCPRO to carry out its role and responsibilities in the region in a more effective manner,

#### **52. It is recommended that:**

- a) the CLCPRO Secretariat role and responsibilities be reviewed and that it be provided with adequate resources to be able to effectively carry out its responsibilities in the medium and long term. The Secretariat should be the main contact with the countries in the region both during recessions and emergencies;
- b) in the case of a new emergency, additional financial and operational responsibilities be delegated to the CLCPRO Secretariat, by member-countries, donors and FAO;
- c) in order to strengthen the CLCPRO and ensure a more efficient execution of its activities, the different components of the EMPRES Western Region programme be realigned immediately within the domain of the Secretariat in much the same way the Central Region programme was incorporated into the Central Region Commission structure.

397. The EMPRES programme for the Western Region of which the CLCPRO Secretary is the coordinator, has become operational in 2006. This already provides an opportunity for the CLCPRO to play a much more effective role in the preventive control activities in the Western Region. FAO had decided to station the second professional officer foreseen under the ADB project in Dakar. The evaluation team considers that such an arrangement does not make optimum use of the available human resources and recommends that all the components of the EMPRES programme be regrouped at the CLCPRO Secretariat. In that case, the CLCPRO Secretariat will have adequate human resources to carry out its various responsibilities until the end of the EMPRES programme in 2009.

398. FAO should as a matter of urgency develop the necessary plans for this, including the way in which the CLCPRO Secretariat should be strengthened during the period of an emergency, to be able to effectively undertake such additional responsibilities.

### ***FAO responsibilities***

399. The Desert Locust is a threat to agricultural production in countries in Africa north of the equator, the Near East and Southwest Asia. Given FAO's overall mandate with respect to Desert Locust monitoring and control-related activities for more than five decades, it has a clear responsibility to provide the necessary services to these countries so that they can prevent Desert Locust outbreaks and effectively control upsurges. While this involves activities at the national, regional and international level, the process has to start at the national level. This requires that the countries recognize Desert Locust prevention and control as a matter of the highest importance, that they take the necessary steps to effectively address the problem, and are able to decide when assistance is needed beyond their own capacities.

400. For FAO to continue to carry out its responsibilities for Desert Locust prevention and control in an effective manner,

#### **53. It is recommended that:**

- a) as a first step, the human capacity of the Desert Locust Information Service, which is currently staffed by only one professional officer, be increased, while at the same time a review is undertaken of the critical mass needed in the Locust and Other Migratory Pests Group to carry out its wide range of responsibilities effectively;
- b) FAO and member countries provide adequate recognition and support to the DLCC and take full advantage of the Desert Locust Technical Group to review the needs for the development of improved Desert Locust survey and control means, and prepare appropriate proposals;
- c) arrangements be made to enable FAO representatives in the case of a new Desert Locust emergency to collaborate effectively with and assist the countries in the steps to be undertaken in coordinating and mobilizing the necessary international assistance by presenting well-defined action plans and proposals on how to implement these plans, and by determining the international support needed for them.

401. FAO should develop the necessary plans and undertake the actions required to implement this recommendation. It should commit itself to ensuring that it is able to continue to carry out its mandated responsibilities with respect to Desert Locust forecasting and control in an efficient and effective manner. This will have budgetary implications, but the evaluation team considers that

these are justified because this is a core FAO function, and thus should be paid for from its own resources. As a consequence, it may have to drop less essential activities.

### ***Donor support for Desert Locust control***

402. Effective control of a migratory pest like the Desert Locust, which can move from one country to another within a matter of hours and days, requires flexibility in the planning and implementation of the control operations.

403. During the 2003–05 campaign, the Maghreb countries supported all or the major part of the control activities at national level with their own resources, whereas most of the resources used for controlling Desert Locust invasions in the Sahel were provided by the international donor community and by the Maghreb countries. In the Sahel, the campaign was negatively affected by delayed action, which showed shortcomings of the current funding arrangements. To use such resources most effectively they should preferably be available for the control operations to be undertaken in all the areas infested by the Desert Locust, and not restricted for activities in one particular country. A working document on alternative funding arrangements for Desert Locust control campaigns has been prepared by the FAO secretariat for the next session of the DLCC.

**54. It is recommended that:**

- a) in case of a new emergency, opportunities be explored for the establishment of multidonor regional funds in support of regional control programmes facilitating the effective implementation of future Desert Locust control campaigns. Due attention should be given to how donor visibility and preferences, as well as applicable policy and regulatory requirements can be factored into such a multidonor arrangement;
- b) FAO and donors explore the possibility of developing a mechanism that would allow flexibility in reorienting and reallocating donor funds with minimal administrative effort to respond effectively to emergencies as they surface or as the situation continues to evolve. Such a tool should be put in place during the budget negotiation process so that the project documents will explicitly capture the importance of flexibility;
- c) in future, to assist affected populations, provisions be made in Desert Locust control project agreements, for part of the financial resources to be reserved for food aid and rehabilitation activities as needed.

404. FAO, in close collaboration with relevant donors, should take advantage of the experience gained during this campaign to develop the necessary plans and agreements, for the implementation of this recommendation. It should ensure, with the international donor community and the affected countries that it is able to continue to carry out its responsibilities with respect to Desert Locust forecasting and control in an efficient and effective manner.

### **Implementation of Desert Locust emergency campaigns**

405. Addressing Desert Locust upsurges and plagues in an effective manner requires the availability of well-defined contingency plans at national, regional and international levels, which were mostly lacking during the 2003–05 campaign. These plans should preferably be developed as an integral part of the national food security risk management plans and should ensure the

permanent engagement of all the stakeholders. Such plans at national, regional and international levels, should:

- articulate the problem, its implications on agriculture and food security, livelihoods of vulnerable populations, and the national economy;
- describe the establishment of the national coordinating structures to ensure effective synergism between all actors and stakeholders, including donor coordination;
- define the steps to be taken to cope with the specific requirements of a Desert Locust emergency;
- determine the responsibilities of the various actors and stakeholders;
- provide the detailed technical specifications of the inputs needed for the campaign;
- provide details of how the inputs will be used in terms of human health and environmental safeguards and how this will be monitored;
- outline the logistic support required during the control operations; and
- indicate the national budget allocation for all the components of the control campaign and provide a cost estimate of the additional resources required, as well as potential funding sources.

406. Consequently, in order to be well prepared for an eventual new Desert Locust upsurge,

**55. It is recommended that:**

- a) contingency plans be developed for the medium- and long-term management of the Desert Locust risk, including action plans for locust monitoring and control at national, regional and international levels. These action plans should indicate: (i) the main activities to be undertaken (including those related to food aid and rehabilitation of the affected populations) and their provisional costs; (ii) the available financial resources, their origin (internal budgets, external resources) and the activities that will be covered by them; (iii) additional financial needs. These plans will be the basis for the preparation of annual work plans and budgets;
- b) in future emergencies, funding appeals be based on well-defined contingency plans and follow the principles and guidelines endorsed for appeals by the Inter-agency Standing Committee (IASC);
- c) strategies be adopted to ensure that locust control operations are carried out both in zones with high production potential, as well as in zones with low production potential, where agriculture is usually practised by farmers with very limited resources.

407. For contingency plans to be executed successfully it is essential that the project activities, undertaken in support of them, are carried out in the most expeditious manner, under effective leadership and with delegation of authority to the lowest possible level. FAO encountered difficulties in meeting such criteria during the 2003–05 campaign, notwithstanding the tremendous efforts undertaken by all concerned.

**56. Two options are recommended for future action:**

- a) either FAO develops and introduces appropriate arrangements to address future Desert Locust emergencies in a more effective and expeditious manner;
- b) or opportunities for outsourcing most of the operational responsibilities should be pursued.

408. Given its specific responsibilities with respect to Desert Locust monitoring and control, FAO should take the leadership to develop the necessary contingency plans in collaboration with the various stakeholders. In these plans FAO should indicate how, in future emergencies, it will ensure that the IASC guidelines for appeals will be followed. The Organization should at the same time reconsider its capabilities to implement Desert Locust control emergency projects. If it is concluded that FAO should continue to be involved with this, then it should explore ways and means to do this in a more effective manner. Alternatively, it should develop plans for how these activities can be best outsourced.

***Institutional arrangements***

409. In the course of the evaluation, concerns have been raised on the effectiveness of the current institutional arrangements for Desert Locust control. Some of them have already been addressed in the above recommendations. From a more general point of view, it is essential that (i) better recognition be given to the fact that Desert Locusts are a permanent major threat to the food security and livelihood situation of large numbers of people in countries that already require very substantial international development assistance; (ii) strong support is provided by the countries concerned and by the international community to effectively address the necessary Desert Locust monitoring and control activities during the recession, pre-emergence and emergency phases; and (iii) that a productive partnership is created with the active support and trust of all concerned.

410. A much better understanding is needed of the role and responsibilities of all the stakeholders, the affected countries, the donors and FAO, and the way the DLCC and Regional Commissions promote and ensure effective Desert Locust monitoring and control. For example, the evaluation team had the impression that with respect to the Desert Locust emergency some affected countries seem to consider that action to be undertaken is in the first place a responsibility of FAO and the Regional Commissions. Also, donors and affected countries consider Desert Locust emergencies as a rather unique, stand-alone, event. It is essential to recognize that there is a continuum from recession, through pre-emergency to emergency.

411. To achieve this,

**57. It is recommended that:**

- a) the DLCC be transformed from an essentially technical committee into a mechanism in which all parties (affected countries, donors and FAO) determine their joint interests and activities, and deal directly with donors to determine joint work programmes;
- b) Regional Commissions meet regularly at a high level to ensure member country support for the decisions taken;
- c) a multilateral agreement for Desert Locust control be developed for the formal permanent engagement and support of all key stakeholders.

412. FAO should take the leadership on the implementation of this recommendation in close collaboration with relevant stakeholders. The various structures exist already, but their terms of reference should be reviewed to make them more effective tools in managing the Desert Locust threat. It will also require that each of the responsible groups, national units, FAO, DLCC and CLCPRO be provided with the means to carry out their tasks effectively. The donors should take steps to follow the developments more closely than in the past and commit themselves to provide the necessary assistance. Direct financial support to the national units in the front-line countries could be an important element in this respect, provided there is strong long-term commitment of the national authorities.

***Assistance provided by Maghreb countries***

413. A very special aspect of the 2003–05 control campaign was the solidarity demonstrated by the Maghreb countries towards neighbouring countries in the Sahel. The transboundary nature of the Desert Locust invasions calls for the countries to share available resources for the mutual benefit of the whole region. The strong control capacity available in the Maghreb countries offers a unique opportunity to address new Desert Locust outbreaks more effectively in the summer breeding areas in the Sahel. These outbreaks always precede the movement of swarms to the Maghreb countries by a couple of months.

414. To strengthen the Desert Locust control capacity in the Western Region,

**58. It is recommended that:**

- a) an appropriate action plan and legal framework be developed for the joint use of the existing control capacity in the Maghreb countries within the Western Region, under the supervision of the CLCPRO;
- b) agreements are established among the various countries in the region to encourage, organize, facilitate and implement joint cross-border operations;
- c) cost estimates are developed to determine the amount of donor assistance required to use the Maghreb control teams and aerial resources in the Sahel countries effectively in case of a new emergency.

415. CLCPRO should take the necessary initiatives for the establishment of such an integrated Desert Locust control system for the Western Region. This should include matters such as the operational modalities, legal arrangements, steps needed to call this control system into action, the financial requirements for such a force and the international support needed for its effective intervention in the frontline countries.

***Socio-economic impact***

416. It is generally accepted that gregarious Desert Locusts need to be controlled notwithstanding the fact that precise data on the damage that can be caused have not been collected systematically. Consequently, the calculation of benefit/cost ratios of the control operations remains a speculative exercise. A World Bank discussion paper on Desert Locust Management (Joffe, 1995)<sup>25</sup> suggests that locusts are not particularly serious pests in aggregate, and that Desert Locusts are unlikely in modern times to trigger widespread food insecurity. However, the evaluation team noted that such impacts have been very significant at the level of the affected communities, especially in the Sahel countries. In these countries at least eight million people have suffered the destruction of their food crops. In addition substantial costs were also incurred by the affected countries which had not been foreseen in their national budgets and which resulted in fewer resources being available for certain national development activities.

417. The control campaigns were primarily focused on the elimination of locust populations, while little attention was paid to the impact on food security and sustainable livelihood aspects. These impacts could not be evaluated in a complete manner because of: (i) the absence of an agreed on methodology to evaluate these types of impacts; (ii) the lack of a global intervention framework that takes into account the social, economic and nutritional aspects; and (iii) the insufficient involvement of the different competent technical services/structures.

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<sup>25</sup> Joffe, S.R. 1995. *Desert Locust management. A time for change*. World Bank Discussion Papers. The World Bank, Washington, D.C.

**59. Consequently, it is recommended that:**

- a) a jointly agreed methodology to evaluate the socio-economic impacts of Desert Locust invasions be developed by the different authorities concerned;
- b) a global intervention framework that addresses effective assessments of the socio-economic impact of Desert Locust invasions and control operations be established;
- c) in the case of a new emergency, economic, social and nutritional impact studies, integrating a broader spectrum of relevant disciplines and competencies, are carried out in a timely, systematic and multidisciplinary manner.

418. The DLCC should establish a multidisciplinary working group to develop proposals for the implementation of this recommendation. This working group should pay special attention to the specific actions needed at the national level to plan for and carry out the necessary impact studies.

***Human and environmental health***

419. Human and animal intoxications and negative environmental effects have been noted in certain countries. It has not always been easy to determine the undesirable consequences of the use of pesticides. Most of the affected countries do not have an environmental impact research strategy, specialized laboratories, or a sufficient number of qualified staff to follow the fate of the pesticides in the environment, and within the framework of a public health policy. Large quantities of pesticides are still available in the countries affected by the Desert Locust invasion. Estimated at 6.2 million liters, they are either leftover from the 2003–05 campaign or come from purchases made after the campaign in order to be prepared for an eventual new invasion. This was partly caused by the fact that in a number of cases additional quantities of pesticides were purchased towards the end of the campaign against the advice of technical staff. To be able to address human health and environmental concerns more effectively,

60. **It is recommended that the affected countries:**

- a) procure only CILSS-registered pesticides and create the necessary conditions for the appropriate use of these pesticides;
- b) take the necessary steps to strengthen environmental compliances and enforce the application of regulations and rules for the safer handling, use and storage of pesticides;
- c) avoid placing unnecessary pesticide orders and overestimating pesticide needs;
- d) strengthen the technical capacity of the QUEST (Quality, Environment, Health and Treatments) trained specialists, in collaboration and agreement with the EMPRES Western Region programme and the CERES-Locustox in Senegal, and ensure their linkage to the national locust control units in order to undertake in-depth operational health and environmental reviews;
- e) pursue in collaboration with FAO, CLCPRO, donors and pesticide producers, the establishment of pesticide contractual arrangements, including a pesticide bank mechanism, to reduce the accumulation of pesticide stocks and for the disposal of empty containers.

420. The countries affected by the Desert Locust should determine the steps needed to implement this recommendation under their specific circumstances and develop the necessary action plans. If a preventive control strategy is put in place, as recommended, the negative effects of chemical control operations on public welfare and the environment will already be strongly reduced.

***Research***

421. Research activities related to Desert Locust control have not generated much interest over the last decades because of:

- the episodic nature of the invasions which does not permit production of biological materials in sufficient quantity to carry out research on the viability and efficacy of new products;
- the harsh working conditions in the desert areas that often discourage many researchers from dedicating themselves to the lengthy periods in the field necessary for such studies;
- the lack of sufficient funds to undertake the costly activities associated with research in remote and sometimes insecure areas.

422. However, the development of such research activities is one of the most important means to improve Desert Locust control tools.

61. **Consequently, it is recommended that research studies aimed at the following issues are encouraged:**

- a) improving operational Desert Locust monitoring and control techniques;
- b) developing alternative control means;
- c) using technologies such as satellite imagery and differential global positioning systems (DGPS), that will greatly improve survey, monitoring and control operations;
- d) gaining better understanding of population dynamics of the Desert Locust during the solitary phase; and
- e) determining the overall impact of Desert Locust invasions on the economies of the affected countries.

423. FAO should determine in consultation with the DLCC, Regional Desert Locust Control Commissions and research institutions what specific steps are needed to move forward in these specific areas, which are of major importance for the further improvement of the efficiency of Desert Locust monitoring and control operations.