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DESERT LOCUST CONTROL COMMITTEE

Thirty-eighth Session

Rome, 11-15 September 2006

NEW TECHNOLOGIES AND PUBLICATIONS
(Agenda Item 10)

1. INTRODUCTION

Desert Locust upsurges and plagues are often opportunities to introduce and evaluate new technologies under actual field conditions to improve survey, reporting, forecasting and control because of a heightened interest and the availability of extra-budgetary and external funds for locust control. Similarly, it is a time when new publications and other informative material are produced and disseminated to increase the awareness and understanding of Desert Locusts and emergencies.

2. NEW TECHNOLOGIES

2.1. Data management and transmission

eLocust2. Survey and control operations, campaign planning and implementation, forecasting, and requests for assistance all depend on high quality, complete field data received in a timely manner. This data represents the foundation of early warning and preventive Desert Locust management. In the past, data was haphazardly collected and recorded by field officers in locust-affected countries. It would eventually reach national locust centres, often late and incomplete. In 2000, the FAO Locust Group, specifically the Desert Locust Information Service (DLIS), developed a handheld device, called eLocust, for locust survey and control officers to record data in the field and transfer it via HF radio modem or download it directly to a computer. Although the concept was shown to be useful, the methodology needed improving. In 2005, eLocust2 was developed by the French Space Agency (CNES) that addressed the shortcomings of the original eLocust by improving its ruggedness, ease of data entry, data quality and data transmission via satellite in real time. eLocust2 was tested extensively in the field by field officers in several countries in the Western and Central Regions prior to its finalization. Some 160 units were procured and have been delivered to frontline countries. FAO is paying for the transmission costs, only incurred when data are sent via satellite rather than downloaded to a PC, during the first year. Thereafter, it is expected that the FAO Regional Locust Commissions will assume this responsibility. So far, the Central Region Commission has agreed to this at its last session in Qatar. It is intended that all survey and control teams are equipped with eLocust2 in locust-affected countries. This will not only improve the quality and timeliness of information from the

field but it will reduce the difficulty of managing large volumes of data during locust emergencies. Nevertheless, a mechanism will need to be developed to insure that additional eLocust2 units can be rapidly procured and delivered for use by the increased number of teams during upsurges and plagues. There should be a sufficient number of locust officers who already know how to use eLocust2 that can train new users in their country.

RAMSES**.** In 1998, FAO developed a custom geographical information system (GIS) called RAMSES (**R**econnaissance **A**nd **M**anagement **S**ystem of the **E**nvironment of ***S****chistocerca*) for locust-affected countries to manage and analyze locust and environmental data. RAMSES is to be used by the nationally designated Locust Information Officer in frontline countries. So far, the system has led to an improvement in the quality of the field data and better decision-making. Recently, a new version of RAMSES was developed based on user suggestions that is more powerful yet easier to use, and is able to import eLocust2 data and display high resolution satellite imagery.

SWARMS. IN 1994, FAO and the University of Edinburgh developed a similar but much more sophisticated GIS called SWARMS (***S****chistocerca* **War**ning and **M**anagement **S**ystem) to allow DLIS to manage and analyze locust, weather and environmental data on a global scale. RAMSES data files sent to DLIS by affected countries are imported into SWARMS as well as data from other sources such as daily and decadal rainfall estimates (satellite-based from Columbia University's IRI Centre, and model-based estimates from Meteo Consult), rain station data (Meteo France), temperature estimates (Meteo Consult), seasonal temperature and rainfall forecasts (World Climate Service), meteorological data to operate models estimating egg and hopper development rates and locust migration trajectories, SPOT-VGT and MODIS satellite imagery to identify areas of green vegetation. SWARMS maintains historical locust records from the early 1930s onwards. The system is constantly being improved to allow the display of new data sets as they become available, including the linking of locust data to Google Earth and NASA's World Wind project. To assist with these developments, a GIS expert is currently based in DLIS until the autumn of 2006.

2.2. Remote sensing

MODIS. Since 2005, FAO DLIS has been providing locust-affected countries with high resolution (250m) MODIS satellite imagery to help detect areas of green vegetation. MODIS imagery is gradually replacing 1 km resolution SPOT-VGT imagery. This imagery is used to help guide survey teams to areas where locusts may be present and to reduce the large areas that must be monitored. Higher resolution imagery reduces the occurrence of false positive incidents, that is, where the image suggests that it is dry when in fact it is sufficiently green for Desert Locusts. The FAO Remote Sensing Centre will assume responsibility for distributing MODIS imagery every 16 days as country-defined windows in order to minimize the time required for downloading an image. MODIS imagery is best viewed within the RAMSES GIS.

Rainfall estimates. FAO and WMO jointly organized two regional workshops (Niamey, Niger (April 2005) and Muscat, Oman (April 2006)) that brought together locust directors and meteorological forecasters from affected countries to discuss the meteorological data requirements of national locust units for survey and control operations. In both workshops, locust personnel clearly indicated that they needed daily and decadal satellite-based rainfall estimates throughout the year supplemented by temperature maps and wind charts during emergencies. Columbia University (USA) and the FAO Remote Sensing are developing rainfall estimate maps that will be provided to each country so that they can display and analyze them within RAMSES.

Seasonal forecasts. Within the framework of emergency assistance provided by The Netherlands and in collaboration with the World Climate Service (USA), FAO DLIS is experimenting with the use of seasonal forecasts that predict rainfall and temperature anomalies and probabilities up to six months in advance. These forecasts are being cautiously introduced into the six week and seasonal locust forecasts provided by DLIS, including the forecast presented at this session of the DLCC. So far, the accuracy of the seasonal forecasts is variable depending on the time of year and region. In any case, seasonal forecasts represent another tool that the DLIS forecaster can use to supplement other locust, ecological, weather and historical information.

2.3. Improved control

DGPS and track guidance. During the past few years, the precision of pesticide applications during locust control operations has improved significantly with the increased reliance on differential geographic positions (DGPS) and track guidance systems used to guide the operator when applying pesticide. Initially, these systems were limited to aircraft but they have recently expanded for use during ground control operations with vehicle-mounted sprayers. During the 2003-2005 upsurge, all aircraft contracted by FAO were required to have DGPS and track guidance systems. The use of these systems has contributed to a reduction in pesticide wastage and related negative effects on the environment.

Bio-pesticides. As part of FAO's continual search for alternative products to conventional pesticides for locust control, several field trials were conducted in 2004 and 2005 using *Metarhizium anisopliae* var. *acridum* against hopper bands. The positive results suggest that in some situations this product can replace chemical pesticides by effectively combating locusts but minimizing any effects on the environment. A workshop on bio-pesticides is scheduled to held in February 2007.

Alternate products. Other methods of reducing the impact of chemical pesticides on the environment is to use alternate products such as hormones (Insect Growth Regulators or IGRs), to spray strips instead of applying full-cover treatments or to reduce the amount of active ingredient (dose rate) of a conventional pesticide or improve the efficacy of a bio-pesticide by combining it with pheromones such as PAN (Phenylacetonitrile). Further research and field trials are required before these methods become operational.

2.4. Improved information

LocustWatch. During the 2003-2005 upsurge, the Locust Group redesigned its website, called LocustWatch[1], and included updated information about the locust situation and emergency operations as well as locust-related activities, publications, reports, bulletins and other documents. DL Mapper provides interactive access to locust data and DL Chaser can be used to estimate swarm migration routes. Recently, a colour-coded warning system has been introduced to indicate different threat levels.

Google Earth / World Wind. eLocust2 data transmitted by satellite can be viewed on Google Earth, allowing national locust directors to monitor the situation and teams in the field. A similar system to display survey and control results via the Internet on World Wind[2] is under development in collaboration with NASA.

SMS updates. DLIS is investigating the possibility of sending out brief locust situation updates by SMS to mobile telephone users.

3. NEW PUBLICATIONS AND OTHER MATERIAL

Since the last session of the DLCC, the Locust Group has produced several new brochures and publications in English, French and Arabic that supplement existing material (Annex 1):

- Hunger in their wake: Inside the battle against Desert Locust (brochure)
- Fighting the locusts … safely: Pesticides in Desert Locust control – balancing risks against benefits (brochure)
- Desert Locust Archives 1952 – 2005 (a CD/DVD containing all of the reports received by FAO since 1952)
- Standard Operating Procedures for Desert Locust survey, control and aerial control operations
- Grasshopper identification cards (English only)

[1] www.fao.org/ag/locusts
[2] worldwind.arc.nasa.gov

During the 2003-2005 upsurge, information about the campaign including situation updates and video footage was displayed in the atrium at FAO Headquarters. The display was recently changed to show post-emergency activities that focus on the environment.

4. CONCLUSION

FAO has developed a number of new technologies and publications that have been disseminated for use mainly by affected countries and other interested parties. The primary focus of these items is the locust-affected countries and relevant donors. The DLCC should consider the following questions during the discussion:

(a) What gaps exist in current Desert Locust management that new technologies should address?

(b) What additional publications or information material are required by affected countries and donors to improve Desert Locust management?

Annex 1. Available FAO Desert Locust publications

The following publications and information can be downloaded from the LocustWatch web pages (www.fao.org/ag/locusts – publications section):

- Atlas of Desert Locust Breeding Habitats (1997)
- Brochures
    - Hunger in their wake: Inside the battle against the Desert Locust
    - Fighting the Locusts... Safely
- Desert Locust Bulletins (1994 to present)
- Desert Locust Situation Briefs (1997 to present)
- Desert Locust Technical Series
    - No. 21: Trilingual glossary of terms used in acridology (FAO, 1980)
    - No. 27: Economic and policy issues in Desert Locust management (S. Joffe, 1998)
    - No. 29: Field tests on an integrated Differential GPS navigation and spray monitoring systems (P.S. Ottesen et al, 1999)
    - No. 30: Population dynamics parameters (J. Roffey & J. Magor, 2003)
    - No. 31: Biogéographie du Criquet pèlerin en Mauritanie (M.A. Ould Baba, 2003)
- Evaluation of Spray Equipment Used in Desert Locust Control (1994 and 2002)
- Guidelines
    - FAO Desert Locust Guidelines - Latest edition (2001-2003)
    - FAO Desert Locust Standard Operating Procedures
    - FAO Guidelines for Pesticides Trials on Desert Locust Hoppers
    - FAO Guidelines for IGR Barrier Trials
    - Ground-based Sprayers for Locust and Grasshopper Control
    - Contingency plans
- Locust forms
    - Desert Locust Survey & Control
    - Environmental Monitoring
    - Poisoning Incident
    - SPOT-VGT Validation
    - Spray Monitoring
- Meeting reports
    - Desert Locust Control Committee (DLCC) and DLCC Technical Group
    - EMPRES Central Region – Liaison Officer meetings, Consultative Committee, Evaluations, Programme documents, Progress reports
    - EMPRES Western Region – Liaison Officer meetings, Consultative Committee
    - Joint Surveys
        - Djibouti / N. Somalia
        - Egypt / Sudan Red Sea coast
        - Iran / Pakistan border
        - Sudan Red Sea coast
        - Yemen / Saudi Arabia Red Sea coast
    - Pesticide Referee Group
    - Regional Commissions
        - CLCPANO - Commission for controlling the Desert Locust in Northwest Africa
        - CLCPRO - Commission for controlling the Desert Locust in the Western Region
        - CRC - Commission for controlling the Desert Locust in the Central Region
        - SWAC - Commission for controlling the Desert Locust in Southwest Asia
    - Miscellaneous
        - Bio-pesticides
        - FAO/WFP Crop and food assessment (2004)