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منظمة الأغذية  
والزراعة  
للأمم المتحدة

联合国  
粮食及  
农业组织

Food  
and  
Agriculture  
Organization  
of  
the  
United  
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Organisation  
des  
Nations  
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pour  
l'alimentation  
et  
l'agriculture

Organización  
de las  
Naciones  
Unidas  
para la  
Agricultura  
y la  
Alimentación

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## DESERT LOCUST CONTROL COMMITTEE

### Thirty-ninth Session

Rome, 10-13 March 2009

### Assessment of national early warning systems and recommendations for improvement (Agenda Item 15)

#### Introduction

The early warning of locust outbreaks, upsurges and plagues is the core element in the preventive control strategy adopted by the DLCC members and FAO in order to manage Desert Locust populations in affected countries. Early warning relies on the timely collection and transmission of high quality field data on a regular basis. In most countries, ecological and locust data are collected by national survey and control teams, entered into a custom handheld device called eLocust2 and transmitted by satellite in real time to the national locust centre. The designated locust information officer at each locust centre manages and analyzes the data within a custom geographic information system, RAMSES. The GIS is a tool that allows the analyst to overlay field data with remotely sensed satellite-based maps that show where rains may have fallen, vegetation may be green, surveys were undertaken and where locusts are present in order to graphically display the current situation and understand how it developed. When compared to historical data that are easily accessible in RAMSES, locust developments in the coming weeks can be predicted that are useful for planning, guiding survey teams and prioritizing control operations.

FAO's Desert Locust Information Service (DLIS), the regional locust commissions and the EMPRES programme have invested substantial time and resources in strengthening national capacities in data collection, analysis and reporting. New technologies are constantly being identified and increasingly adopted for use by national locust centres to facilitate early detection and reporting. Furthermore, a national locust information officer is seconded to DLIS for 11 months every year to receive advanced training in data management, analysis, remote sensing and forecasting that is funded by the DLCC.

As a result of these efforts, countries have made good progress in reporting that has led to significant improvements in Desert Locust monitoring, early warning and control. Nevertheless, it is unreasonable to assume that high quality national reporting and information systems can function without continued inputs and support by all stakeholders. This paper presents a brief overview of the current state of the early warning system, recent developments and suggested improvements.

### **Data collection (eLocust2)**

Since eLocust2 was developed in 2004, DLIS has distributed 234 units to affected countries, allowing field officers to record ecological, rain, locust and control data in English or French and send it by satellite in real time to their national locust centre. The data correspond to that on the *FAO Desert Locust Survey and Control Form* (endorsed by the 33<sup>rd</sup> session of DLCC). The intended objective was that all field teams use eLocust2 during survey and control operations. This goal has nearly been achieved as most of the teams in 20 locust affected countries use it, including all frontline countries except Chad and Djibouti<sup>1</sup>. DLIS maintains a contingency stock for rapid deployment in emergencies. Starting last year, subscription and transmission costs of eLocust2 were paid by the trust funds of the regional locust commissions<sup>2</sup>, which frees national locust programmes from this responsibility.

In the past two years, an increasing number of countries have been using eLocust2 during survey and control operations. This has allowed more data to be collected in the field and transmitted quicker and more reliably to national locust centres. For example, data from 4,100 survey stops in 16 countries were sent by eLocust2 in the last quarter of 2008.

Surveys should always be conducted according to the standard methodology indicated in the *FAO Desert Locust Guidelines* and *Standard Operating Procedures for Survey*. If non-standard methods are used, there is a risk that estimates of locust numbers will not reflect the actual situation, it will be difficult to compare survey results from different teams and countries, and early warning will not be reliable.

### **Data analysis (RAMSES)**

RAMSES has been installed in 18 countries where trained national locust information officers use it to manage, display and analyze locust and environmental data. Consequently, data quality has improved but still some of the data that DLIS received in 2007-08 was incomplete, incorrect or duplicates. Further training is required to overcome these difficulties as well as to increase user skills in data analysis.

The current version of RAMSES in English, French and Arabic uses software that is no longer supported by the vendor and it is not compatible with the Vista operating system<sup>3</sup>. Some users have reported that it is complicated and difficult to operate.

### **Reporting**

In 2007-08, DLIS received 1,449 reports and messages containing RAMSES data, decadal, fortnightly and monthly situation reports, and informal notes from 21 locust affected countries. Reports were also received regularly from the Desert Locust Control Organization for Eastern Africa (DLCO-EA) and the UN Mission for the Referendum in Western Sahara (MINURSO).

<sup>1</sup> eLocust2 and RAMSES systems are expected to be established in Chad in spring 2009.

<sup>2</sup> €1,695 were paid for subscription and activation, and €3,427 for data transmission by CLCPRO (€10,283), CRC (€15,073) and SWAC (€8,713) from 1 January to 31 December 2008.

<sup>3</sup> RAMSES uses ESRI's ArcView 3.x

Each piece of information was evaluated for quality and timeliness<sup>4</sup>. Using 2006 as a benchmark for measuring progress since the last DLCC session, the 2007-08 results presented in Table 1 show that:

- DLIS received about 20 percent more reports in 2007 compared to 2006 and 2008
- reporting quality improved in 2007 but declined slightly in 2008
- timeliness improved in 2007 and to a lesser extent in 2008
- reporting frequency in 2008 was about the same as in 2006 but was less in 2007

Several national trends were evident from the analysis:

- Increased reporting often coincided with increased locust activity (Saudi Arabia, Sudan and Yemen in 2007, I.R. Iran and Somalia in 2008)
- There was a significant decline in the number of reports received in 2007-08 compared to 2006 from Algeria, Mali and Niger – the latter two probably due to reduced surveys because of insecurity
- Reporting quality improved significantly<sup>5</sup> in Chad, Mali and Tunisia but declined in Djibouti, I.R. Iran, Morocco, Oman, Pakistan, Saudi Arabia and Yemen
- The primary causes for a decline in reporting quality were duplicate or incomplete data, or a failure to provide a brief synopsis with the data
- Timeliness improved in Algeria and Chad but declined significantly in I.R. Iran, Morocco, Oman, Pakistan and Saudi Arabia
- Reporting frequency improved significantly in Chad, Djibouti, I.R. Iran, Niger and Senegal but declined in Oman and Tunisia
- Most countries reported at least once per month in 2008 except for Algeria, Chad, Djibouti, Morocco, Niger, Oman, Senegal and Tunisia
- Most countries now prepare a decadal, fortnightly or monthly locust situation bulletin on a regular basis and, in most cases, the quality of these bulletins have improved dramatically with the inclusion of satellite-derived imagery and RAMSES maps

### **New technologies and developments**

A new version of eLocust2 software is being tested by national users in response to requests for the inclusion of additional data. Whenever changes are made to eLocust2, subsequent modifications must be made to the GIS used by countries (RAMSES) and DLIS (SWARMS). Hence, there will be a new version of RAMSES this year. A custom programme, eLocust2Mapper, is under development that is a more robust and streamlined method to check data transmitted by eLocust2 before it is added to the RAMSES database. Several national locust information officers are currently testing the latest beta version.

FAO is collaborating with several institutes to improve rainfall estimate maps and MODIS remote sensing imagery for the detection of green vegetation. Good progress has been made in both areas.

- The Université catholique de Louvain (Belgium) has improved the post-processing of MODIS imagery and developed a new product that shows the evolution of vegetation development for the previous 11 decades (10-day periods) for each 250m pixel and indicating the onset of green vegetation, ephemeral vegetation (false starts), the disappearance of vegetation at the end of its developmental cycle and evergreen vegetation that is of less importance to Desert Locust.
- The Flemish Institute for Technological Research (Belgium) is working on new ways to send MODIS imagery to national locust information officers in affected countries.

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<sup>4</sup> The highest quality information contains complete details (i.e. RAMSES data) and a brief analysis or synopsis; information is considered timely if received within five days of the last survey

<sup>5</sup> greater than 10 percent change between 2007 and 2008

- Columbia University's International Research Institute for Climate and Society (USA) produces daily and decadal rainfall estimates that are available for free on the Internet. Recently, they started to provide monthly estimates.
- CIRAD's FFEM project is looking at the improved operational use of remote sensing products for monitoring Desert Locust habitats in West Africa.

DLIS recently established an Internet-based users group to allow national locust information officers to exchange their experience, knowledge and problems in using eLocust2, RAMSES, rainfall estimates and MODIS imagery with each other. This has not only facilitated communication between countries but many useful tips have been shared amongst users and problems solved without having to rely on DLIS.

Lastly, substantial efforts have been made in archiving locust meeting reports and other locust-related information on FAO's Locust Watch web site<sup>6</sup>, which now contains a complete set of reports of DLCC (1955 to present), the Technical Group (1992-2004), and the three regional commissions.

### **Suggested improvements**

National reporting systems in most countries continue to improve but this does not mean countries can afford to be complacent. Further efforts are required to ensure that high quality data are collected regularly in a standardized manner, transmitted quickly and checked before sending to DLIS. Specific action should be taken by national locust programmes in collaboration with EMPRES and DLIS to address the current shortcomings. The DLCC session should consider the following suggestions:

1. A sufficient number of eLocust2 units should be distributed so that all field teams use it regularly during survey and control operations
2. Field teams should take more care when using eLocust2 to enter and transmit survey and control data
3. National locust information officers should:
  - a. make a greater effort to check eLocust2 data before importing it into RAMSES
  - b. develop a system to manage non-eLocust2 data so that it is included in RAMSES and considered when summarizing and analyzing the situation
  - c. always check carefully the RAMSES export file before sending it to DLIS
  - d. include a brief synopsis when sending RAMSES data to DLIS
  - e. not wait until the end of the month to send data to DLIS
4. National Master Trainers should train their field staff in locust survey, reporting and control on a regular and continual basis
5. Support should be provided to national information officers in the use of the latest versions of eLocust2 and RAMSES as well as new technologies through regional workshops and country visits funded by DLCC, the regional locust commissions and EMPRES
6. Alternate methods of estimating hopper and adult numbers during ground surveys should be investigated, perhaps within the framework of the EMPRES programme
7. DLCC should consider funding the development and testing of a new open source version of RAMSES that is compatible with latest operating systems in order to improve data exchange between countries

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<sup>6</sup> PDF versions of each report can be downloaded from <http://www.fao.org/ag/locusts>

Table 1. Overview of reporting in locust-affected countries.

	Quality		Timeliness		Frequency	
	2007-08	trend	2007-08	trend	2007-08	trend
Algeria	-	+	+	=	=	-
Chad	+	-	+	+	+	+
Djibouti	-	-	=	+	+	-
Egypt	-	-	=	+	=	=
Eritrea	=	=	=	+	=	=
Ethiopia	-	-	-	+	=	=
India	-	+	=	+	=	=
I.R. Iran	-	-	-	-	+	+
Libya	+	-	-	-	=	=
Mali	+	+	-	+	=	=
Mauritania	-	-	-	+	=	=
Morocco	-	-	-	-	=	-
Niger	-	-	-	-	+	-
Oman	-	-	-	=	-	-
Pakistan	-	-	-	-	=	=
Saudi Arabia	-	-	-	-	+	=
Senegal	+	-	+	+	+	=
Somalia	+	-	=	-	=	+
Sudan	-	-	-	-	=	=
Tunisia	+	+	=	=	-	=
Yemen	-	-	+	+	=	=

## Notes

1. The 2007-08 column compares reporting in both years:

(+) 2008 better than 2007    (-) 2008 worse than 2007    (=) no change

2. The trend column compares 2007-08 reporting to 2006 reporting to illustrate progress made since the last DLCC:

(+) 2007-08 better than 2006    (-) 2007-08 worse than 2006    (=) no change