Early Warning Systems for Desert Locusts
– a West Africa Pilot Project

National Meteorological Service of the Republic of Senegal

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World Meteorological Organization

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Presentation

• Introduction to Locusts

• Meteorological requirements for different life phases of locusts

• Objectives of the West African Pilot Project

• Operational Tools

• Conclusions
What are locusts?

- Locusts are part of a large group of insects commonly called grasshoppers.

- They differ from grasshoppers because they have the ability to change their behaviour and can migrate over large distances (up to 130 km a day).
Locust life cycle
Locust swarms

- Swarms can vary from less than one square km to several hundred square kilometers.

- There can be 40 to 80 million locust adults in each square km of swarm.
Locusts can eat a lot

- A very small part of an average swarm (about one tonne) eats the same amount of food in one day as about 10 elephants, 25 camels, 2,500 people
All the different phases of locust life cycle require ideal meteorological conditions.
Climatic characteristics during peak infestation

- Positive rainfall anomalies in the desert zones in spring
- High rainfall amounts at the beginning and at the end of the cropping season in sub-Saharan Africa
- High rainfall amounts in Spring in North Africa
- Favourable wind direction and persistence
Main objective of the West African Pilot Project

- Development of more effective and efficient operational tools and information for monitoring and predicting locust development and migration

- Build the capacity of the National Services in planning control operations.
Information flow

A Meteo and Remote sensing Information
- Seasonal forecasting
- Short/medium term forecast
- Rain and other parameter estimation
- NDVI analysis

B Locust control
- Locust reproduction and mapping
- Migration monitoring
- Migration forecast

C Food security impact and contingency plan
- Agricultural and livestock production forecast
- Affected population
- Impact scenarios

D Information diffusion
- Internet
- Ranet
- Bulletin
Technological Advances for Producing Operational Tools

• Large amount of meteorological information available through Internet eg., the products of Numerical Weather Prediction Models (NWPs), reanalysis and satellite data.

• These allow the preparation of specific tools through Local Area Models (LAM) and GIS to improve the monitoring and forecasting of locusts.

• Improvements in seasonal forecasting (two months in advance) to provide operational products
Time scales of analysis and operational tools envisaged

• Statistical seasonal forecasting issued every month for the next three months

• Seven day rainfall forecasts based on GFS statistical downscaling at a resolution of 8x8 km

• Daily rainfall estimates from MSG (Meteosat Second Generation) at a resolution of 3x3 km

• Assessment of the geographical extent and severity of locust infestation from MODIS (Moderate Resolution Imaging Spectral Radiometer) NDVI data
Seasonal rainfall forecast

Precipitation percentage anomaly for June 2005
issued March 2005

rainfall mask: < 30mm
Short/medium term forecast
Statistical Downscaling of Global Forecast System

Timing: 00 - 180Hrs
Resolution: 0.1°
Spatial dimension: 18W 49E/3N 28N

Timing: 00 - 180Hrs
Resolution: 1°
Spatial dimension: Global
Rain estimation by MSG

Total precipitation [mm]

Rainfall 130405 – Data: MSG&SSMI – Elab: Ibimet-CNR/LaMMA
Technology transfer

- All the information will be produced in an appropriate user-oriented format and will be diffused through internet based bulletins.

- Regional Training Workshops will be organized to demonstrate the value of the operational tools and information developed in the pilot project for monitoring and predicting locust development and migration.
Invasions du Criquet pèlerin en 2004 au Sénégal

- Les criquets ont envahi le Sénégal de Juillet à Octobre 2004, à l’approche des récoltes

- De nombreux essaims long de 20 km, et large de 5 km capables de dévorer plusieurs milliers de tonnes en une journée ont envahi la partie nord et centre du pays

- 679 communes sénégalaises étaient envahies dont 417 dans la région de St Louis. 164 sites de ponte ont été identifiées à travers le pays

- 13 unités terrestres ainsi que quatre avions ont été mobilités pour circonscrire les essaims au nord et centre du pays et épargner ainsi en partie le grenier agricole du pays

- Conditions météorologiques existantes au Sénégal (Humidité, vent, pluviométrie) étaient favorables à leur développement
Importance du Projet pour Senegal

- Elaboration de produits météorologiques spécifiques pour la lutte préventive et curative contre les invasions de criquets

- Meilleure collaboration entre les différentes structures nationale et sous régionales impliquées dans la lutte contre les criquets avec un renforcement des capacités

- Mise en place d’un système d’alerte précoce efficace et une meilleure circulation de l’information au niveau national et sous régional
Conclusions

• All the different phases in the life cycle of locusts and the migration of locust swarms require ideal meteorological conditions. Hence meteorological information is crucial for locust monitoring and control.

• Comprehensive and accurate meteorological information on both temporal and spatial scales can assist with efficient management of locust monitoring and control.

• NWP and trajectory models offer good possibilities for improving forecasts of locust migration.
Thank you very much for your attention