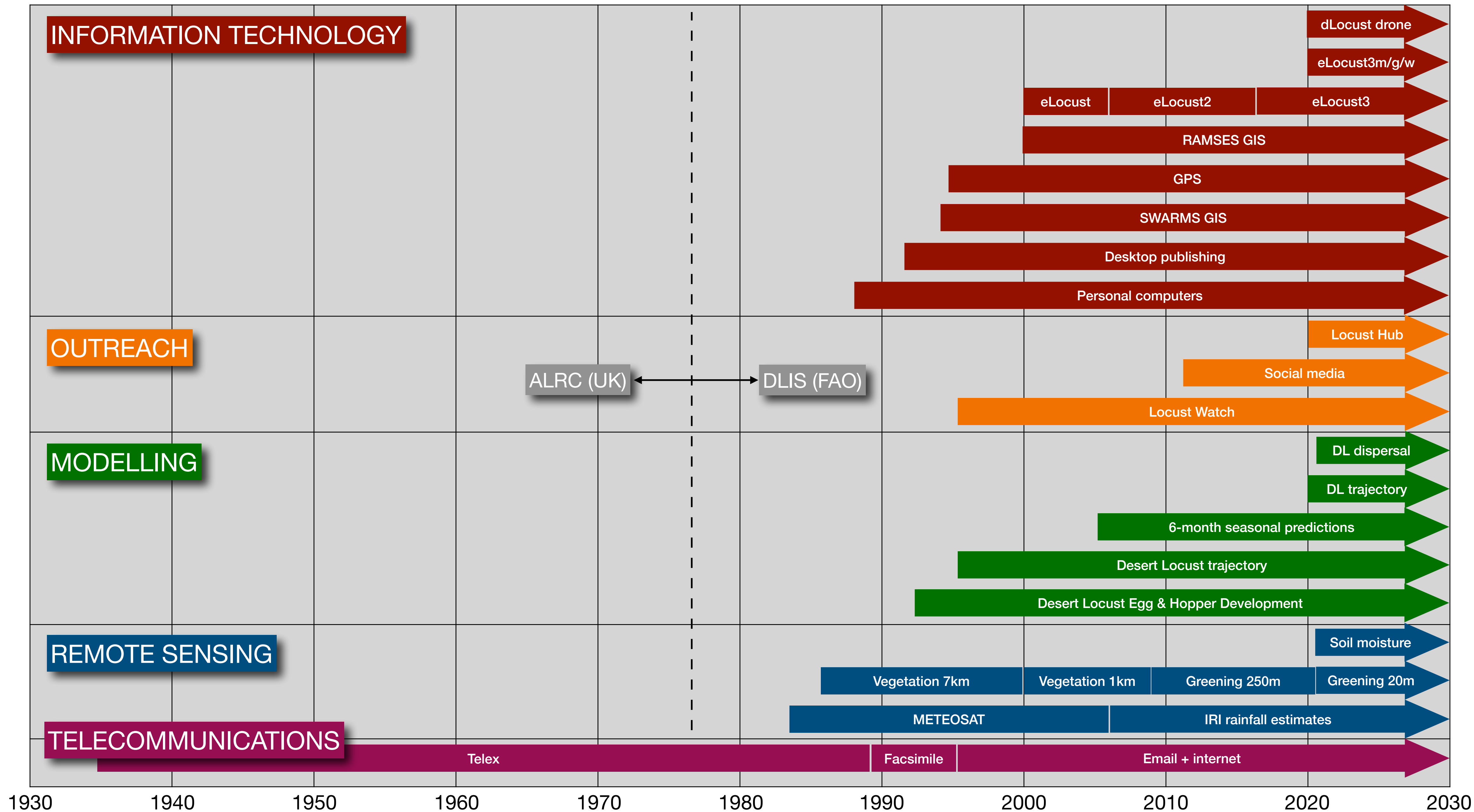


DESERT LOCUST

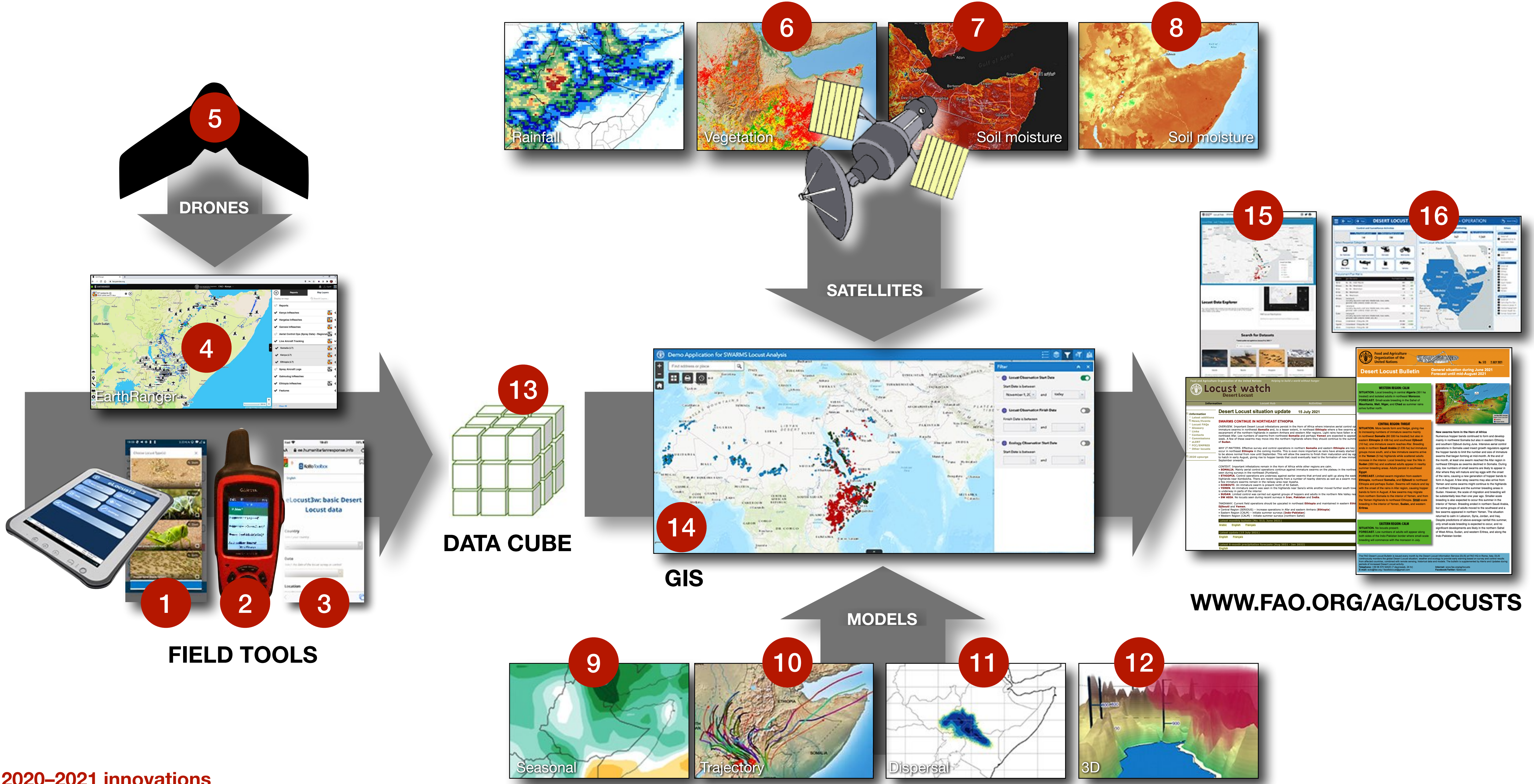
16 INNOVATIONS (2020–2021)



FAO DESERT LOCUST INFORMATION SERVICE (DLIS)
Keith Cressman, Senior Locust Forecasting Officer



2020–2021 innovations



FAO Global Desert Locust Early Warning System

eLocust3

Tablet & app for data collection and real-time transmission

WHAT IT IS

- A rugged handheld tablet for data collection and reporting in the field
- Automatic location coordinates
- Data transmission by satellite in real time (requires subscription)
- Submit photos
- Digital library of references and user manuals
- Available in English, French, Arabic
- Operational on 1 January 2015 for national locust teams

BENEFITS

- Complete data on ecology, weather, locusts, control, safety
- 3D navigation to recent rain and green vegetation areas
- Web-based [GeoFlex platform](#) to view data
- Automatic data integration into RAMSES GIS (daily)
- Automatic data integration into EarthRanger (real time)

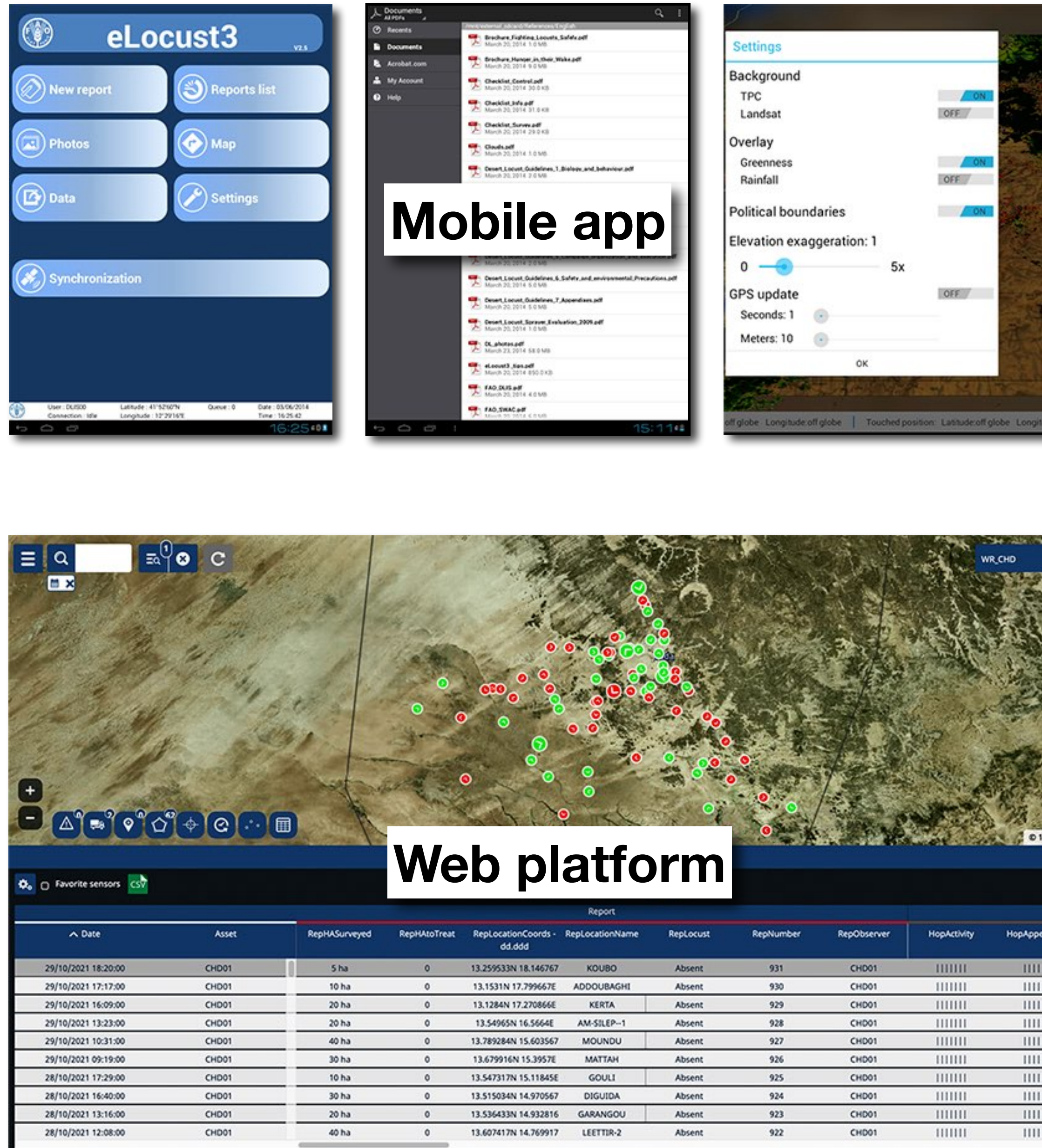
MORE INFO

- Learn [how to use](#)

Developed in partnership with Novacom (France)

Mobile app

Web platform



1

eLocust3m

Mobile app for basic data collection and real-time transmission

WHAT IT IS

- A smartphone app for data collection and reporting locusts in the field
- Automatic location coordinates
- BASIC and PRO options for general and experienced users
- Submit photos and videos
- WhatsApp-like chat with in-country users
- Available in local languages

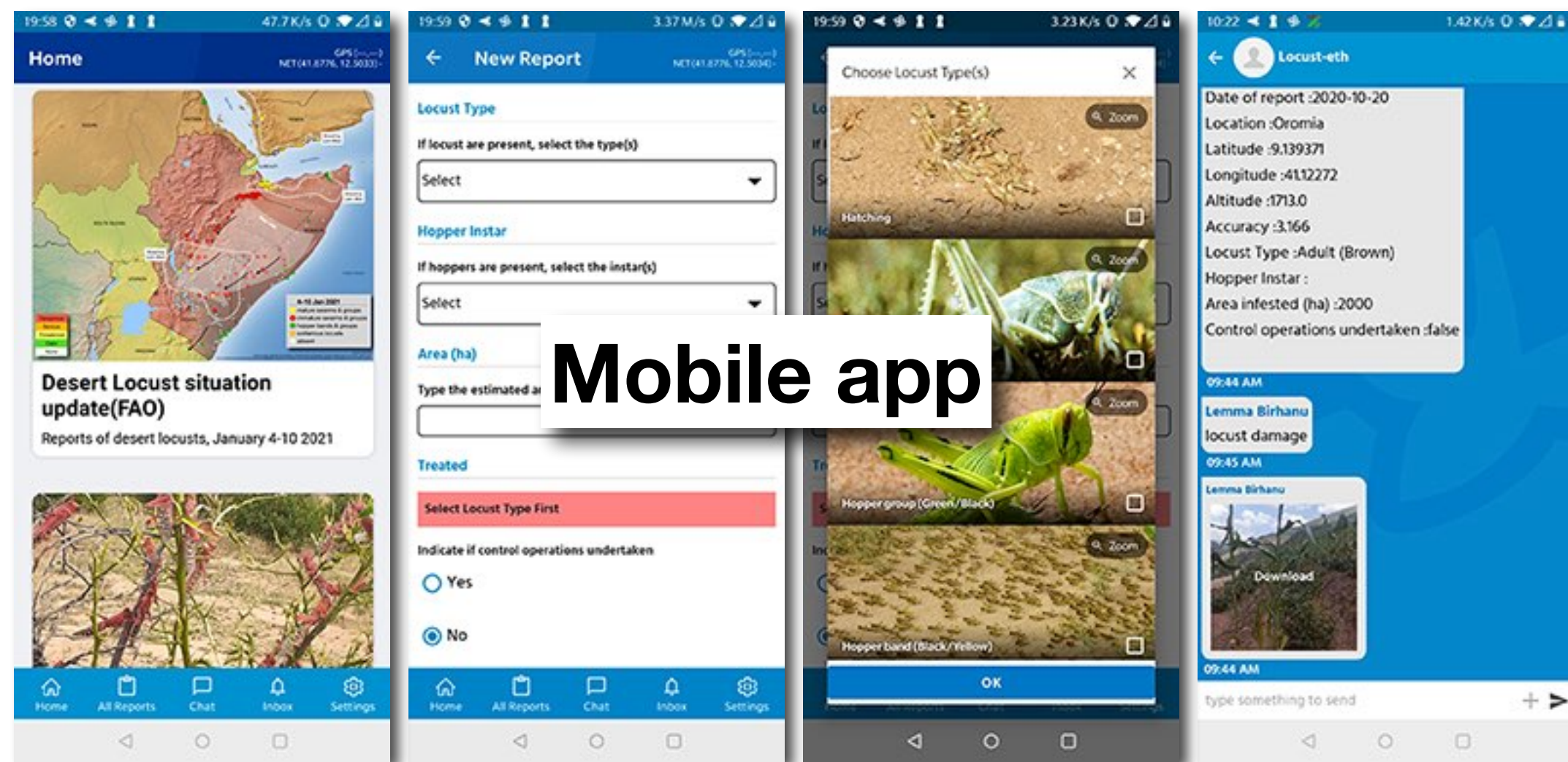
BENEFITS

- Data validated by artificial intelligence (AI)
- Web-based [Plant Village platform](#) to view data
- Automatic data integration into RAMSES GIS (daily)
- Automatic data integration into EarthRanger (real time)

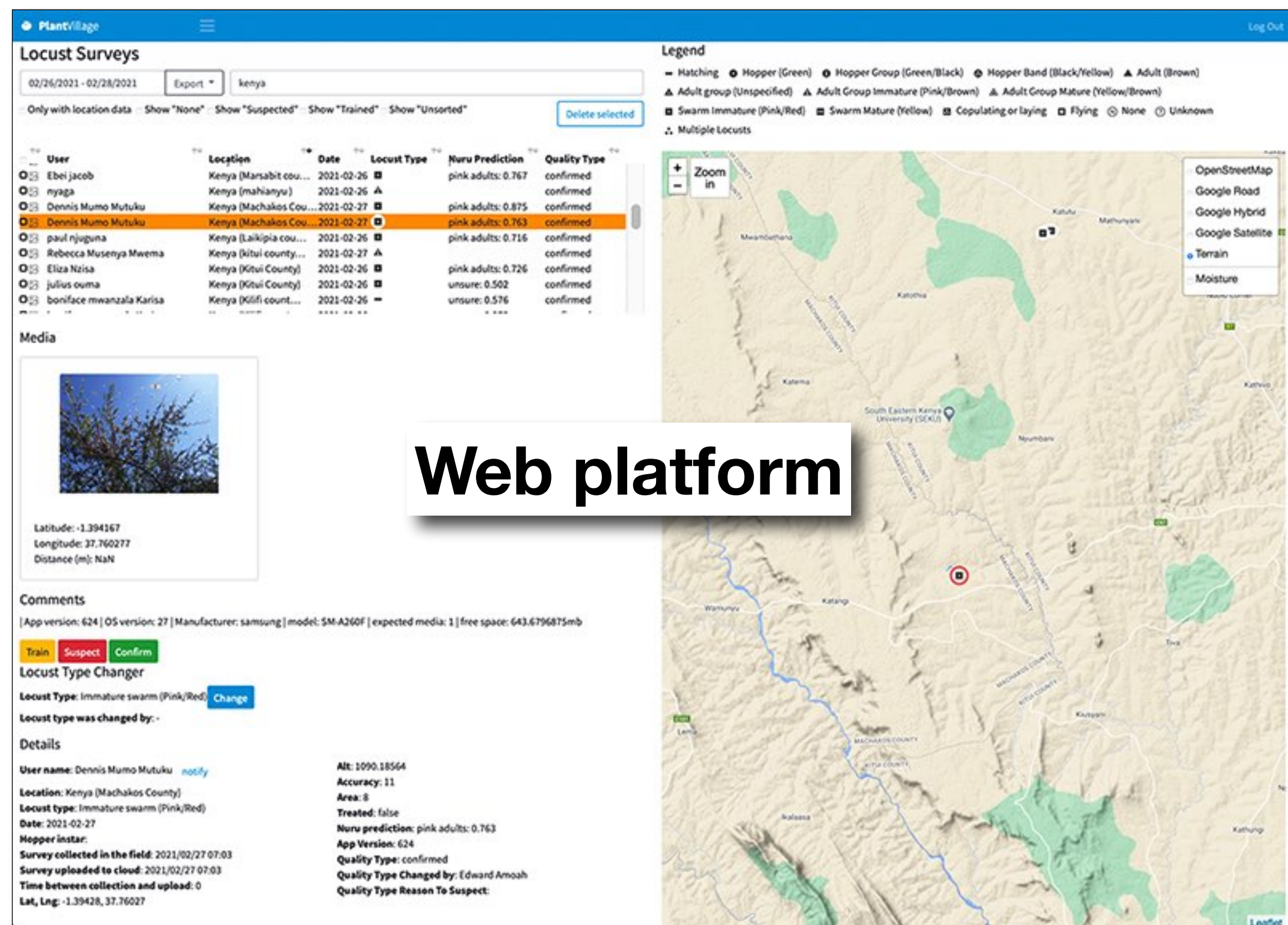
MORE INFO

- Download from [Google Play Store](#) and [App Store](#)
- Learn [how to use](#)

Developed in partnership with Penn State University (USA)



Mobile app



Web platform

2

eLocust3g

GPS app for basic data collection and real-time transmission

WHAT IT IS

- A custom app for Garmin inReach Explorer+ GPS
- Automatic GPS coordinates
- Select Locust Type from a list
- Real-time data transmission from anywhere at anytime
- Available in English and French

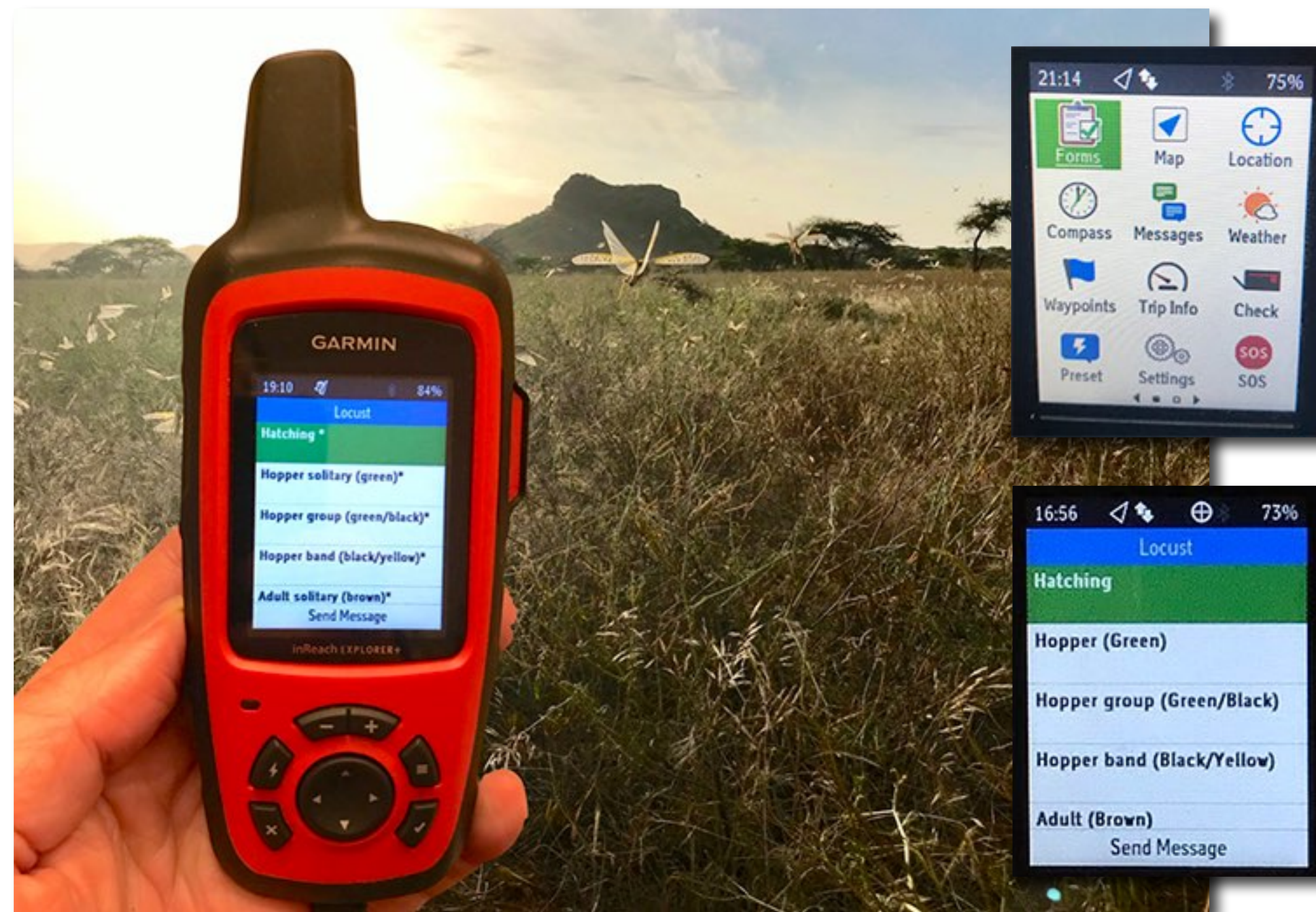
BENEFITS

- Real-time tracking of survey and control teams in the field
- Web-based [Garmin platform](#) to manage GPS devices and data services
- Share data maps with decision makers and field coordinators
- Automatic data integration into RAMSES GIS (6-hourly)
- Automatic data integration into EarthRanger (real time)
- Monthly data services subscription

MORE INFO

- Learn [how to use](#)
- See [how to use](#)

Developed in partnership with Garmin (USA)



3

eLocust3w

Mobile app

Internet form for basic data collection and real-time transmission

WHAT IT IS

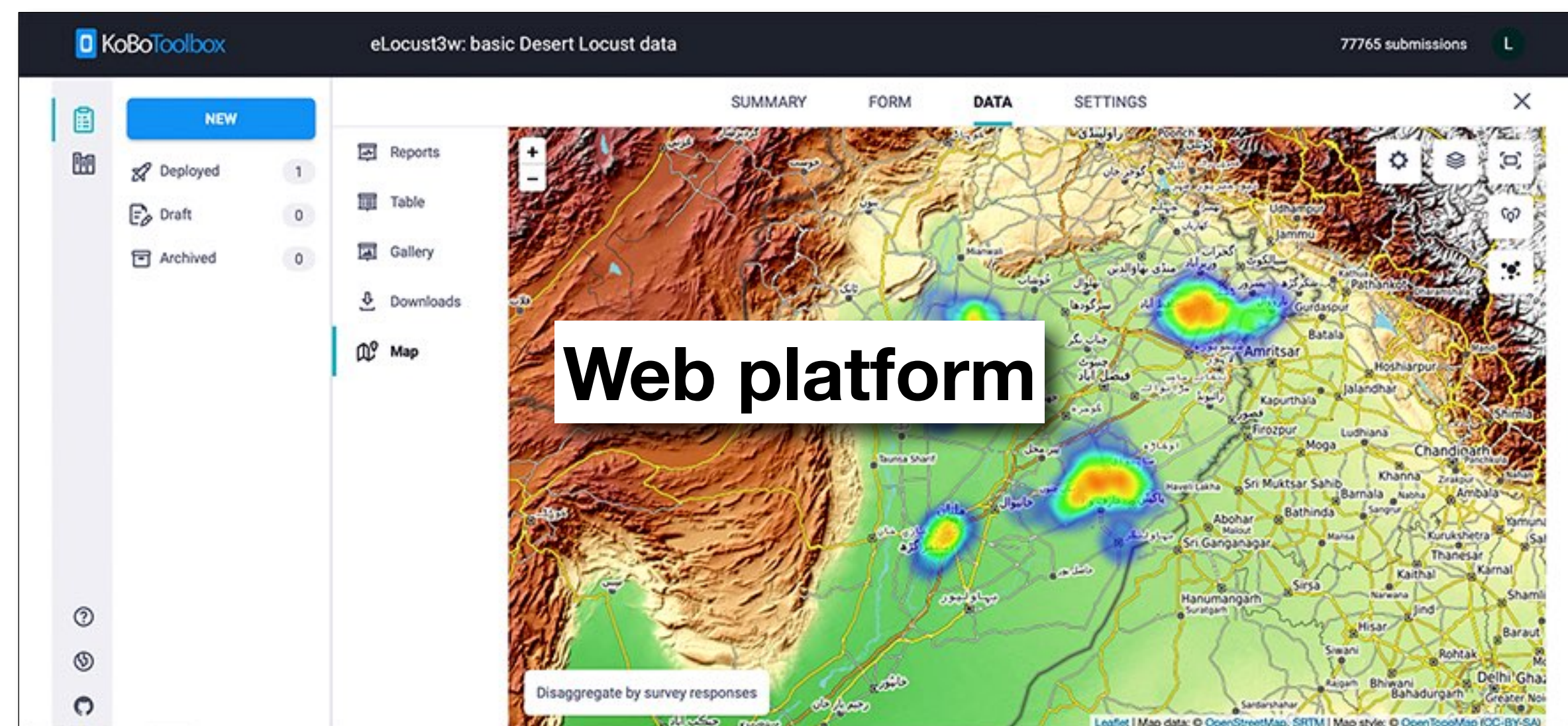
- App for fast manual entry of data in the field or office
- Automatic or manual location coordinates
- Select Locust Type by check boxes
- Submit photos and videos
- Available in English

BENEFITS

- Web-based [Kobo platform](#) to enter, view and download data
- Data integration into RAMSES GIS (download)

MORE INFO

- Access the [form](#)
- See [how to use](#)



Geospatial web app for managing aircraft in locust operations

WHAT IT IS

- A geospatial app for tracking of aerial and ground teams
- Management of resources and logistics
- Manual entry of field data
- Map display of locusts, operations and assets
- Available in English

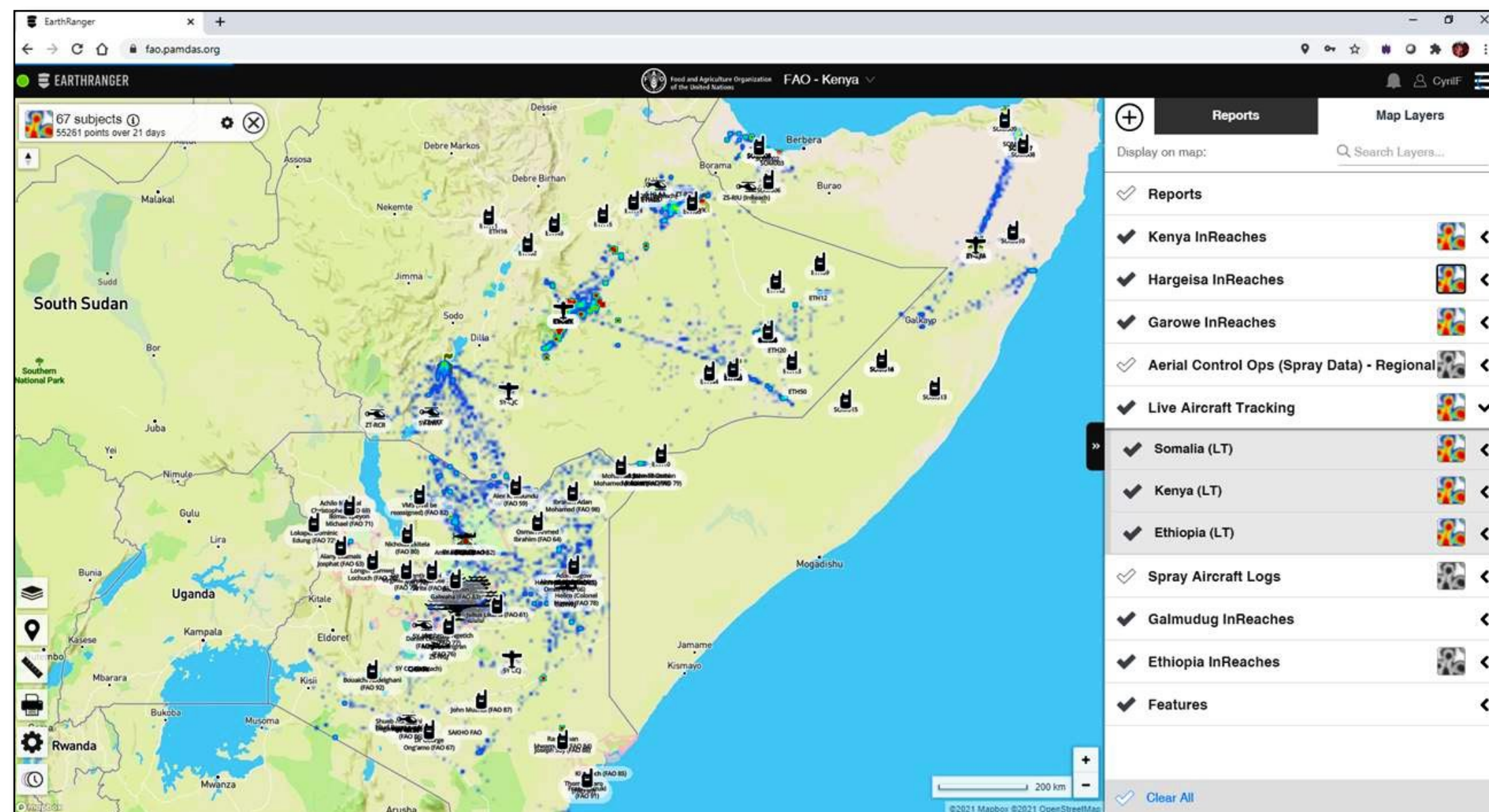
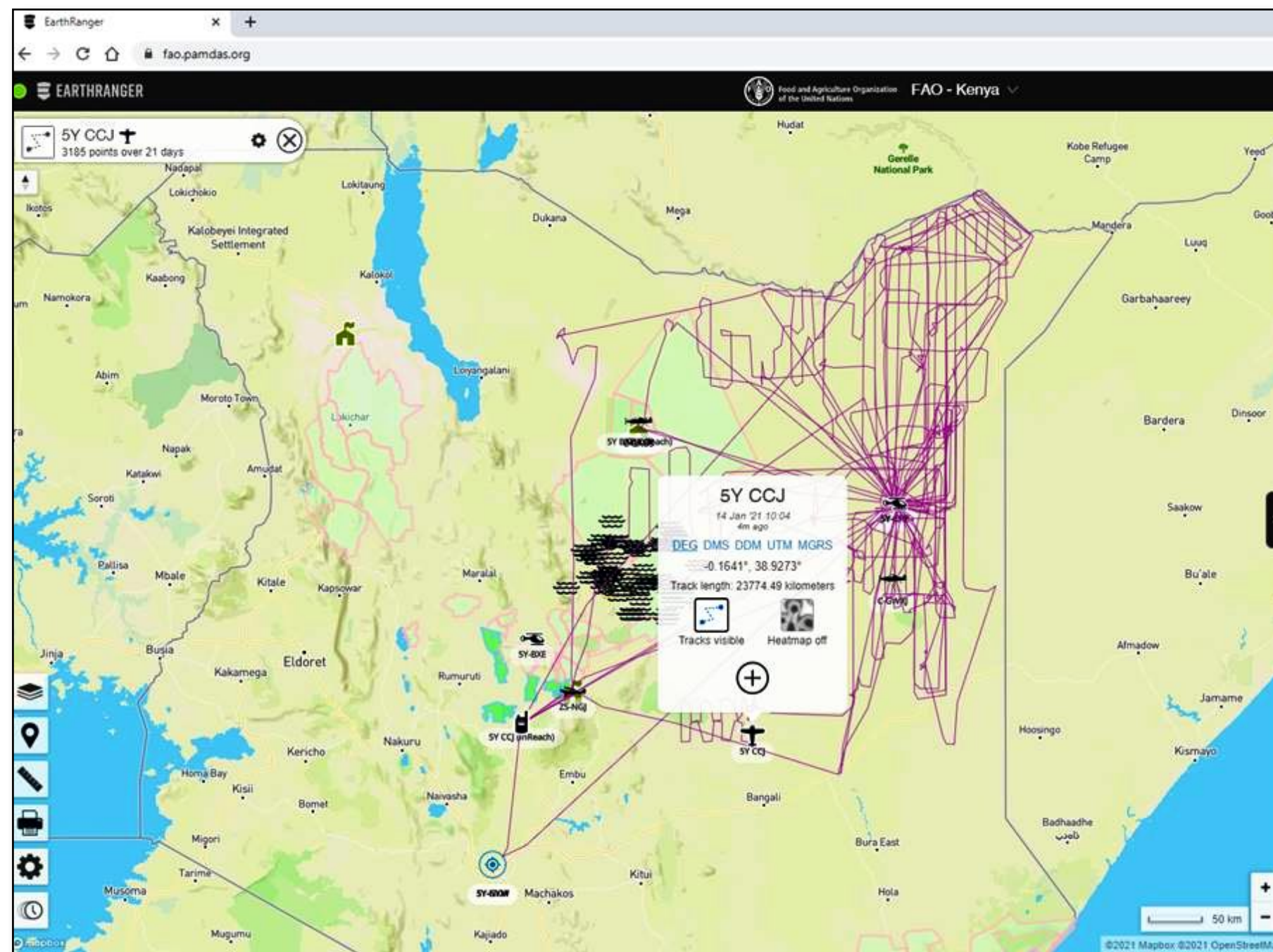
BENEFITS

- Automatic data integration from eLocust3m/eLocust3g (real time)
- Automatic data integration into RAMSES GIS (daily)
- Online reporting (real time)

MORE INFO

- Learn [more](#)

Developed in partnership with Vulcan and 51 Degrees (USA, Kenya)



5

dLocust

Using drones to find green vegetation and locusts

WHAT IT IS

- Portable, battery operated, rugged fixed-wing drone
- 80 km distance and 90 minute endurance
- Desert tested and developed specifically for locust operations
- dLocust app for planning, operations and results
- Vegetation and locust detection, long-range and site surveys

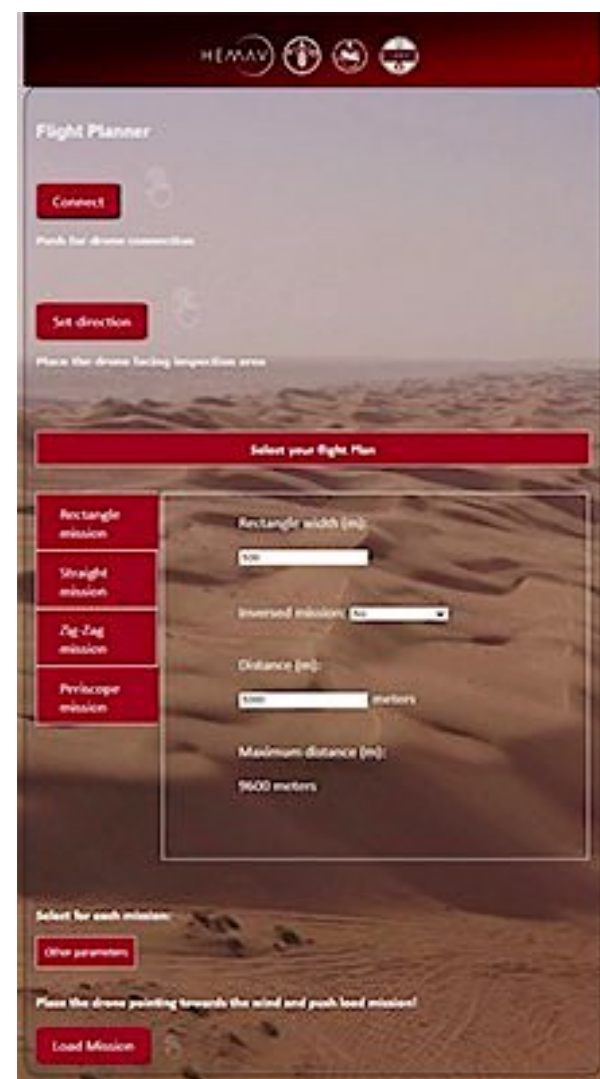
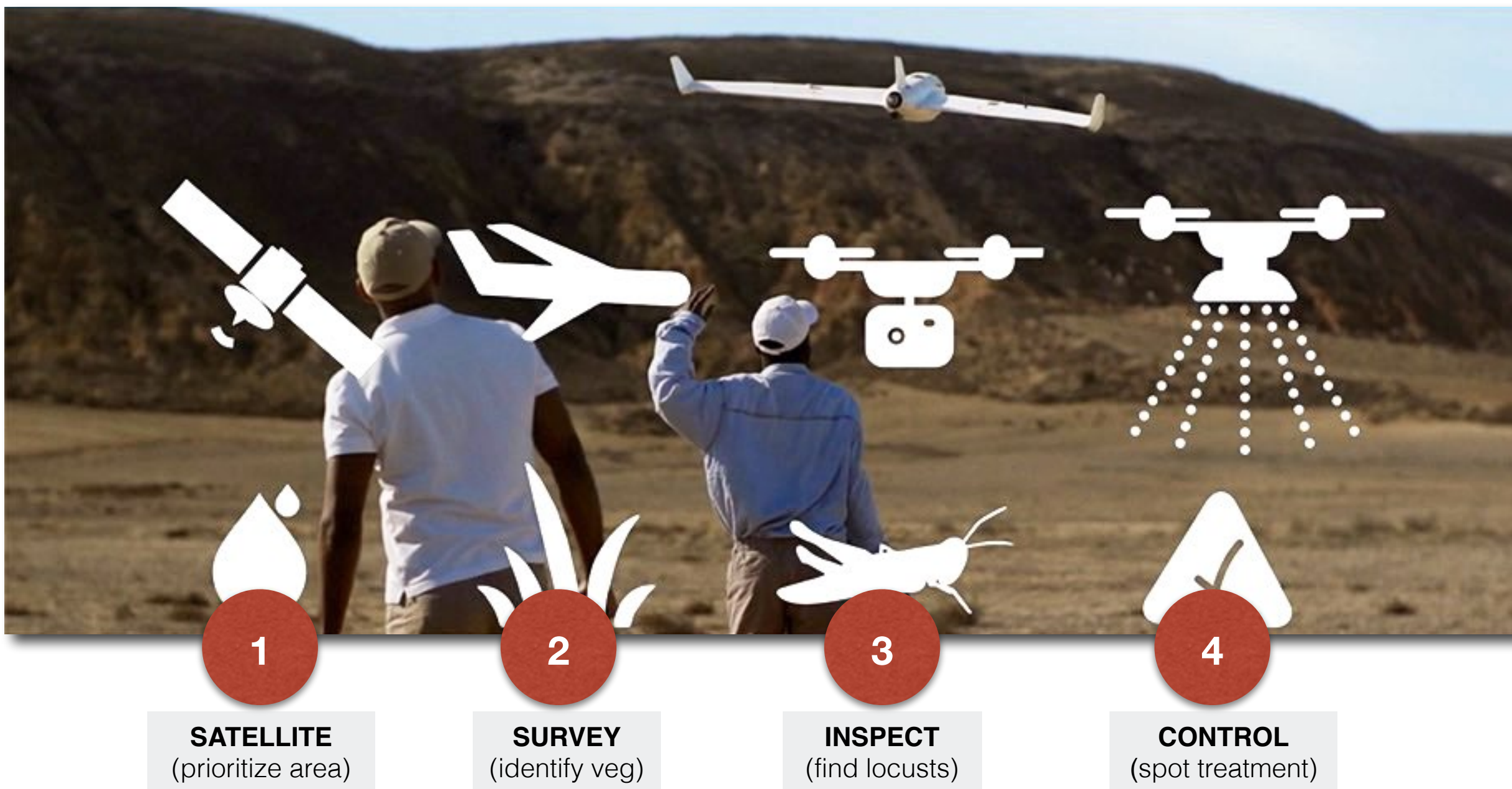
BENEFITS

- Bungee launch and parachute landing
- Monospectral (vegetation) and visual (locust) cameras
- dLocust app compatible with eLocust3 and mobile devices
- Real-time onboard data processing
- Online and field training on ops and maintenance
- Owned and operated by national locust programmes

MORE INFO

- See the [concept](#)
- View the [presentation](#) and learn [more](#)

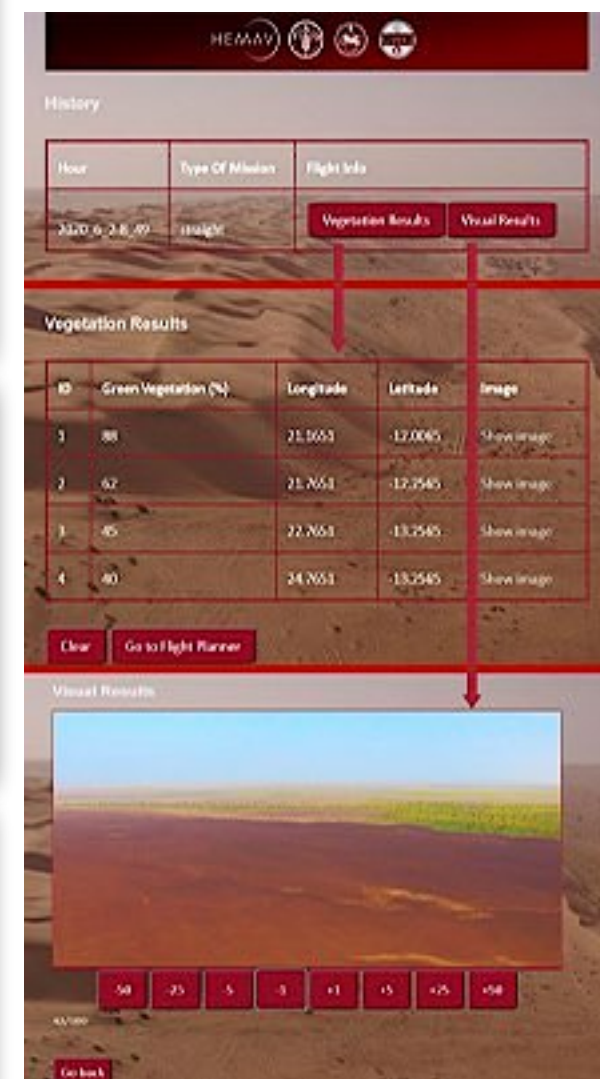
Developed in partnership with HEMAV (Spain)



Take-off



Landing



Rainfall

Earth observation (remote sensing) maps to detect rainfall

WHAT IT IS

- Satellite-derived rainfall estimates
- Updated daily, every 10 days, monthly
- Used for planning and guiding survey teams to potential locust areas
- Helps to forecast locust developments

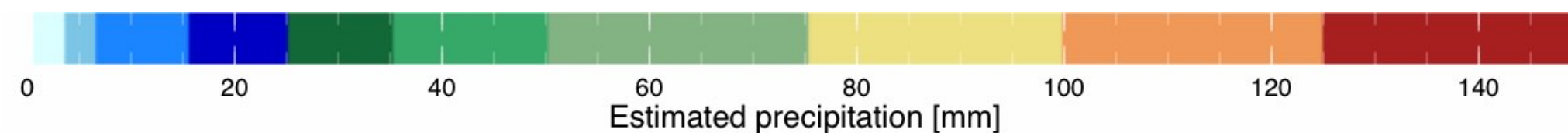
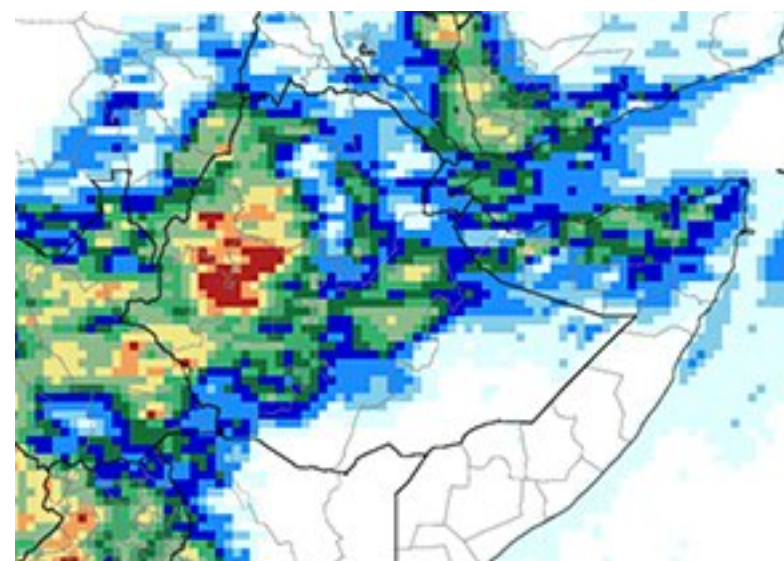
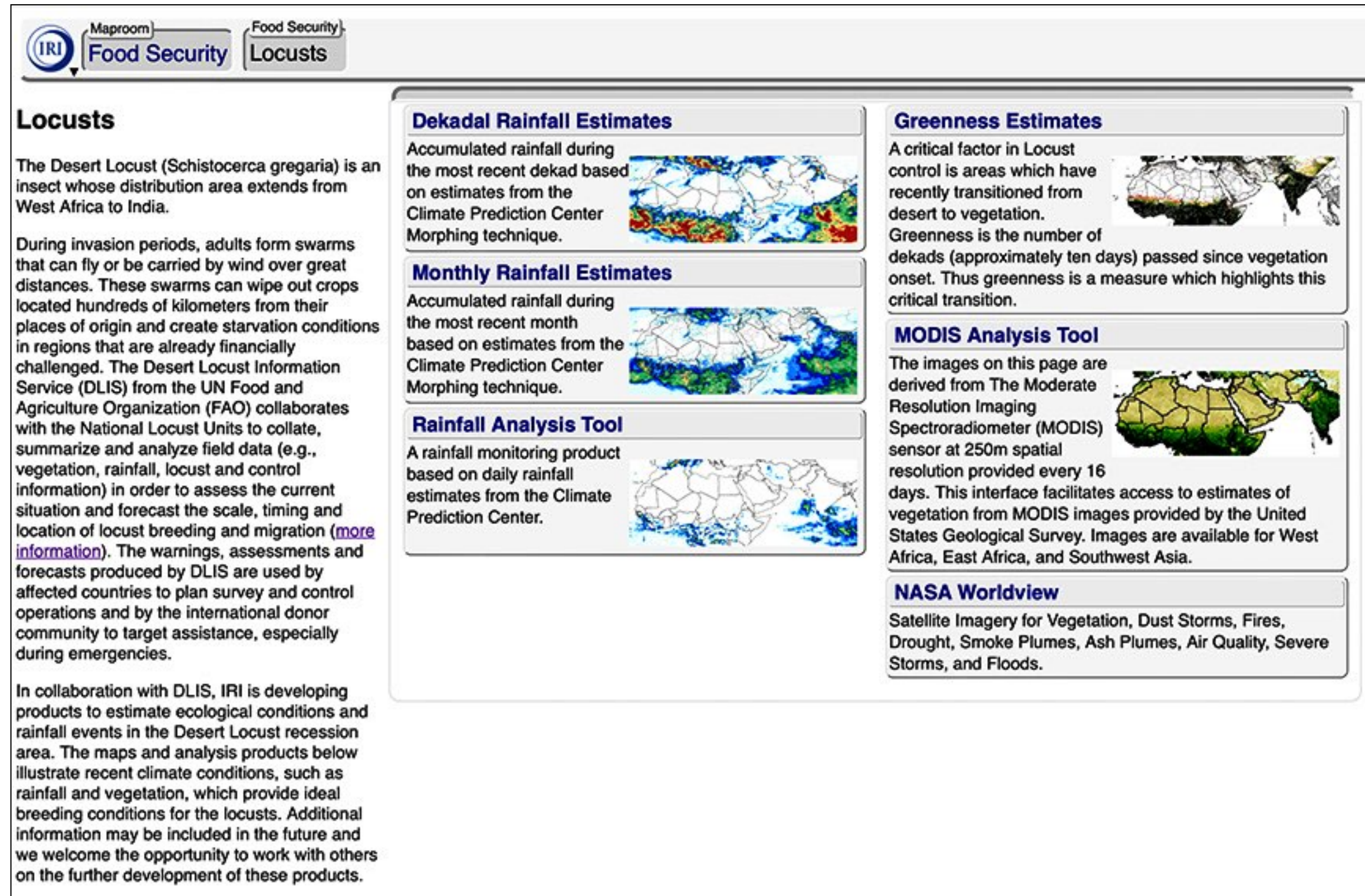
BENEFITS

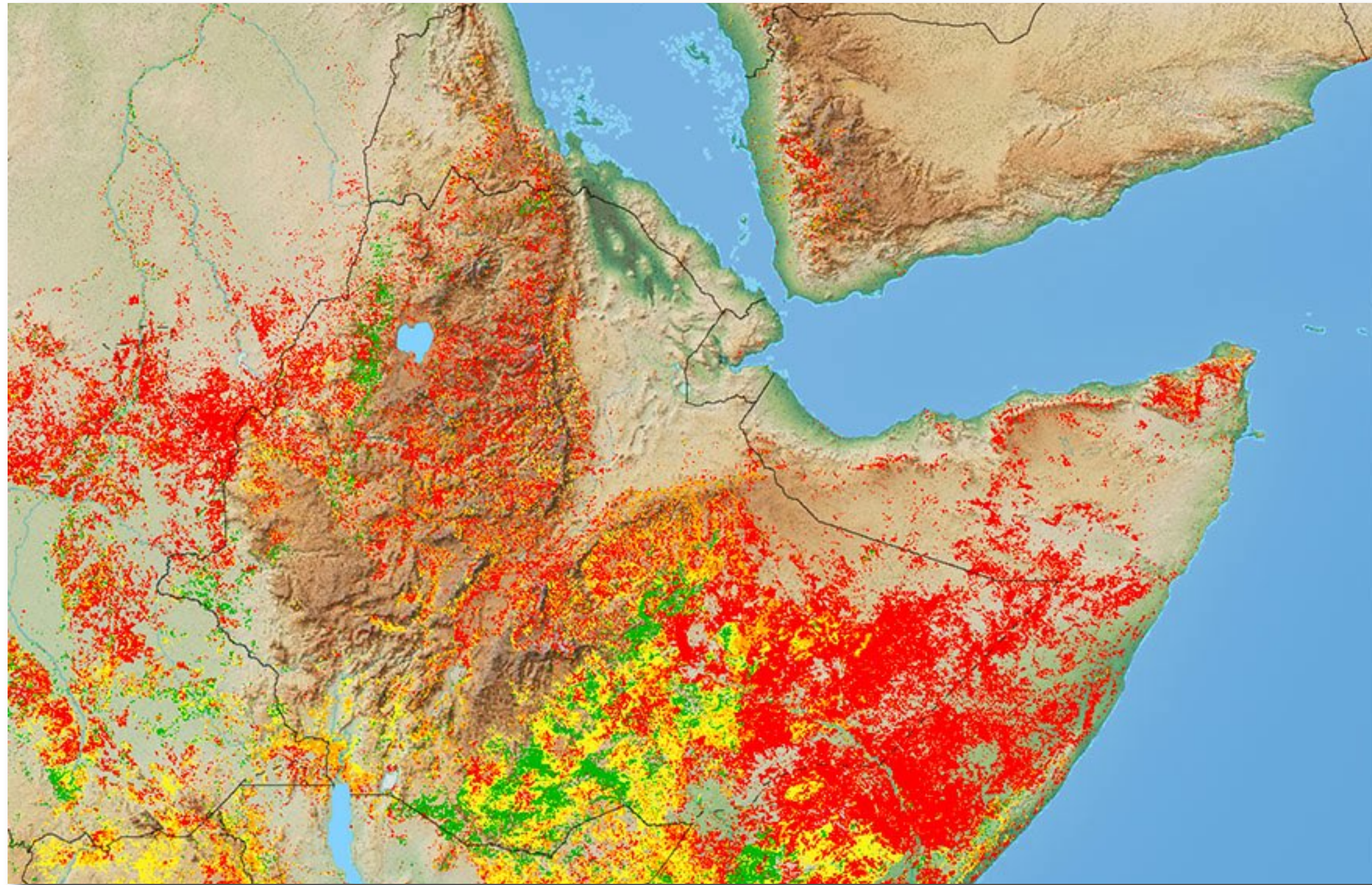
- Online viewing and data download
- Geotif format for RAMSES and SWARMS GIS integration

MORE INFO

- Learn more about [International Research Institute for Climate and Society](#)
- Access [IRI](#) rainfall estimate products

Developed in partnership with Columbia University's IRI (USA)





Earth observation (remote sensing) maps to detect green vegetation

WHAT IT IS

- Dynamic greenness map updated every 10 days
- Shows onset of green annual vegetation over a 3 month period
- Used to guide survey teams to potential locust areas
- Helps to forecast locust developments

BENEFITS

- 20-meter resolution from Sentinel-2 satellite
- Supersedes 250-meter resolution MODIS satellite imagery
- Geotif format for RAMSES and SWARMS GIS integration

Developed in partnership with EC Joint Research Centre (Italy)

Earth observation (remote sensing) maps to detect soil moisture

WHAT IT IS

- Two soil moisture map products using different methodologies
- Updated daily (NASA) and every 10 days (Lobelia)
- 15-day nowcast (NASA)
- Used for planning and guiding survey teams to potential locust areas
- Helps to forecast locust developments

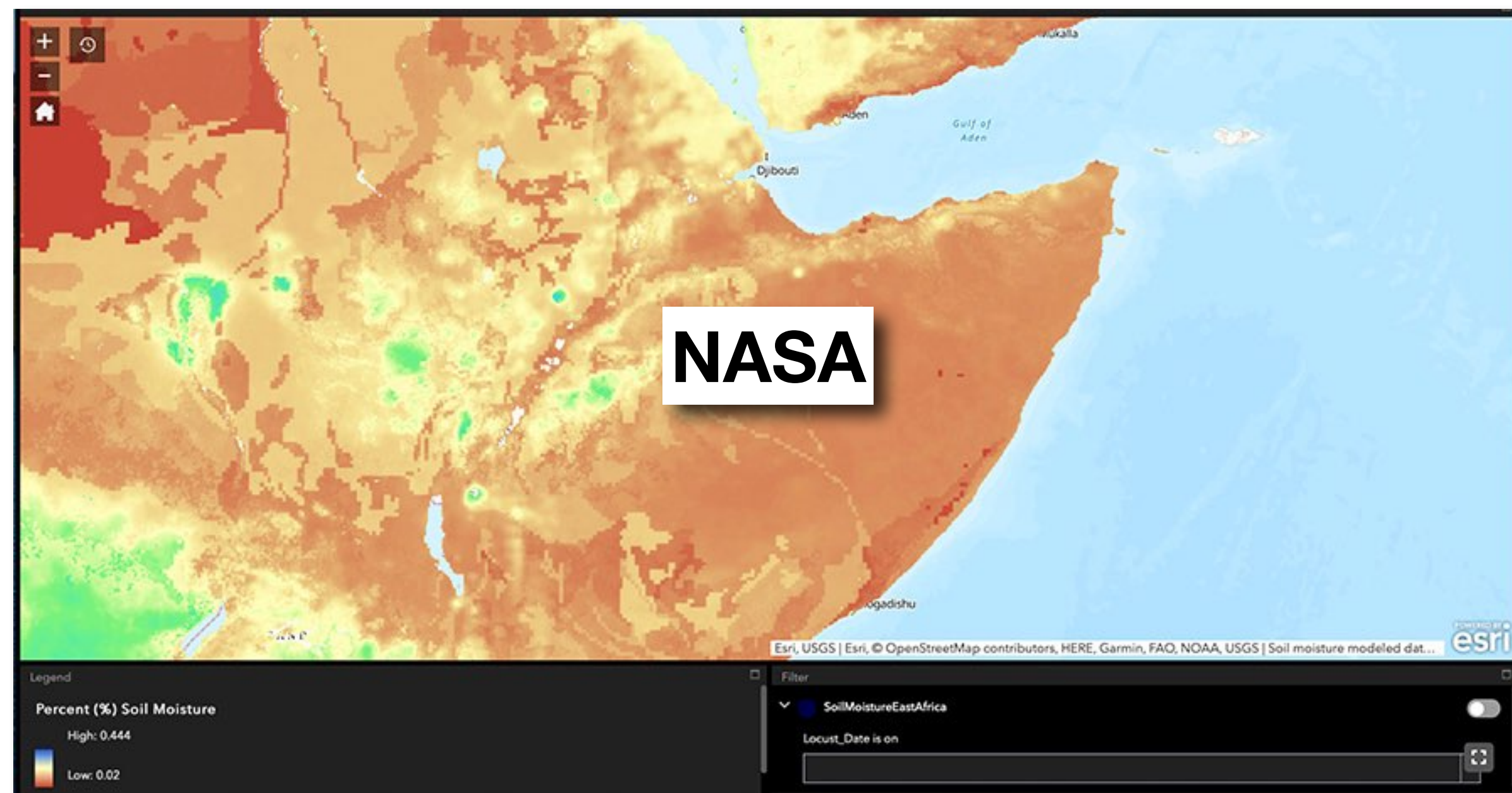
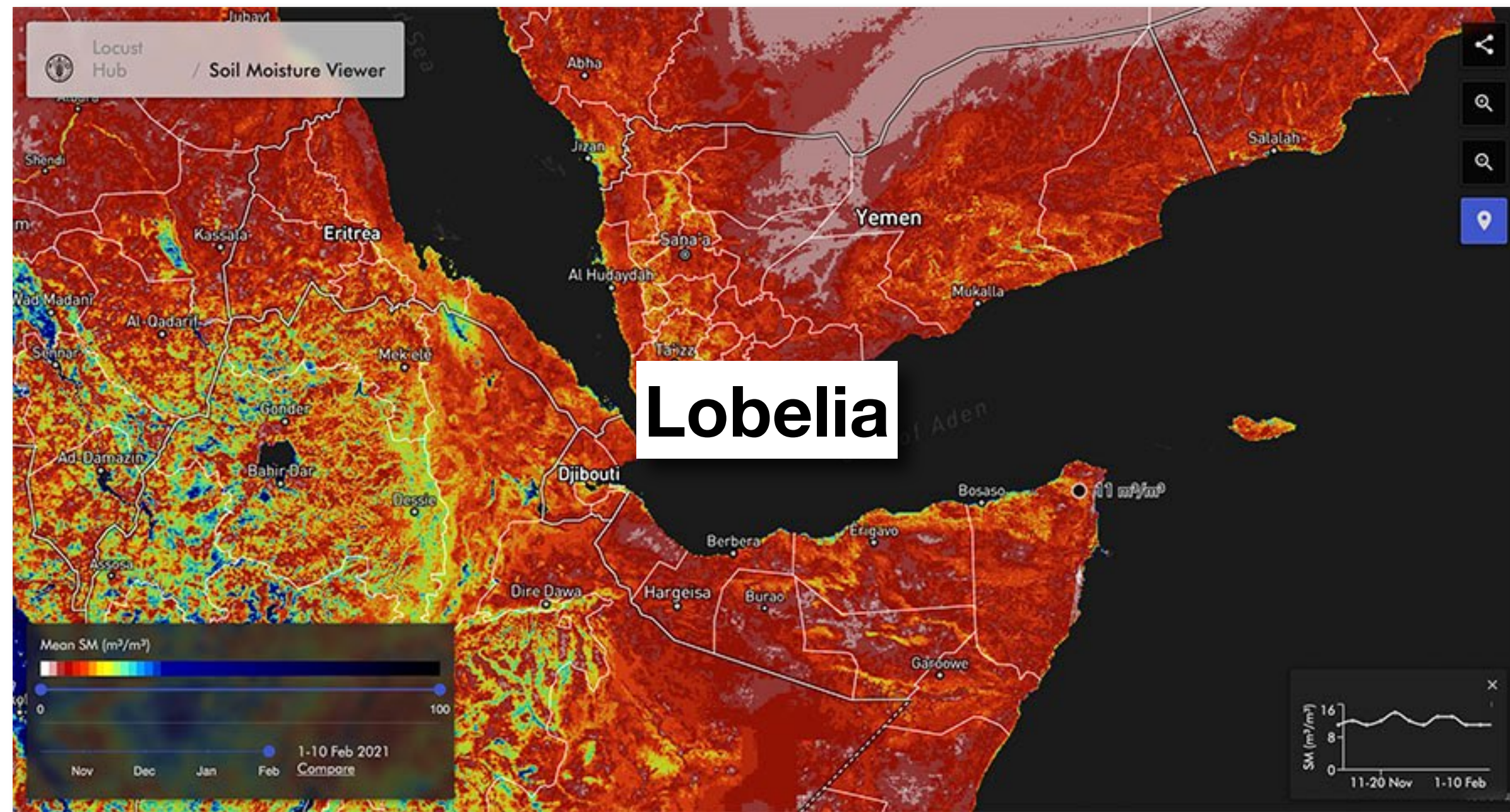
BENEFITS

- Soil moisture in top 10cm of ground at 1 km resolution
- NOAH (NASA); Sentinel-1 SAR with SMOS (Lobelia)
- Online viewing and data download
- Geotif format for RAMSES and SWARMS GIS integration
- Integration with FAO/ESRI Locust Hub

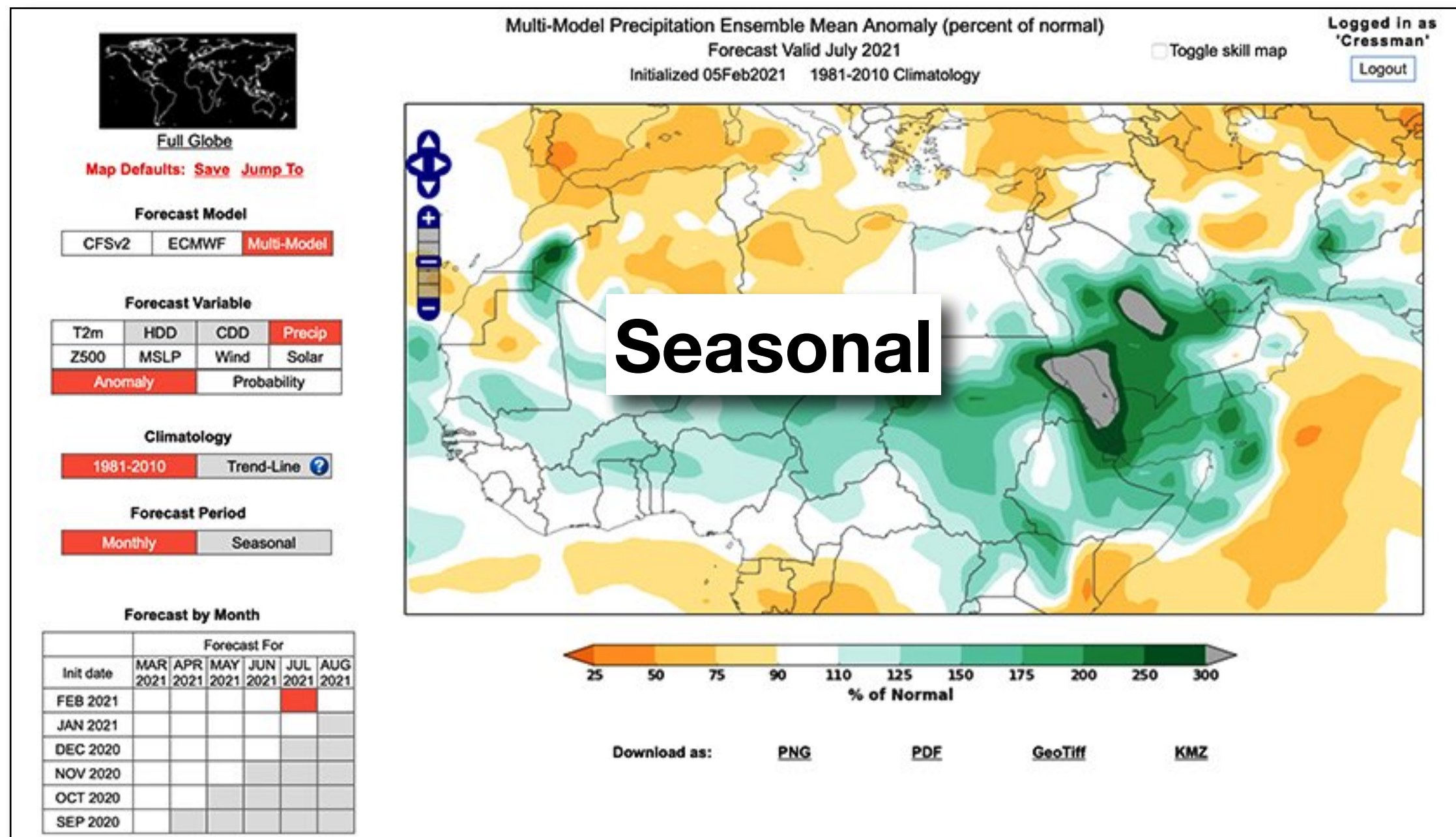
MORE INFO

- Learn about the isardSAT's [SMELLS](#) project
- Learn about NASA's [SERVIR](#) project
- Access [NASA](#) soil moisture viewer
- Access [Lobelia](#) soil moisture viewer

Developed in partnerships with Lobelia/isardSAT/ESA (Spain) and NASA (USA)



Seasonal



Precipitation and temperature predictions (1–6 weeks, 1–6 months)

WHAT IT IS

- Precipitation and temperature anomaly predictions
- Subseasonal (1–6 weeks) and seasonal 1–6 months) products
- Updated biweekly (subseasonal) and monthly (seasonal)
- Helps to forecast locust developments
- Used to advise field operations

BENEFITS

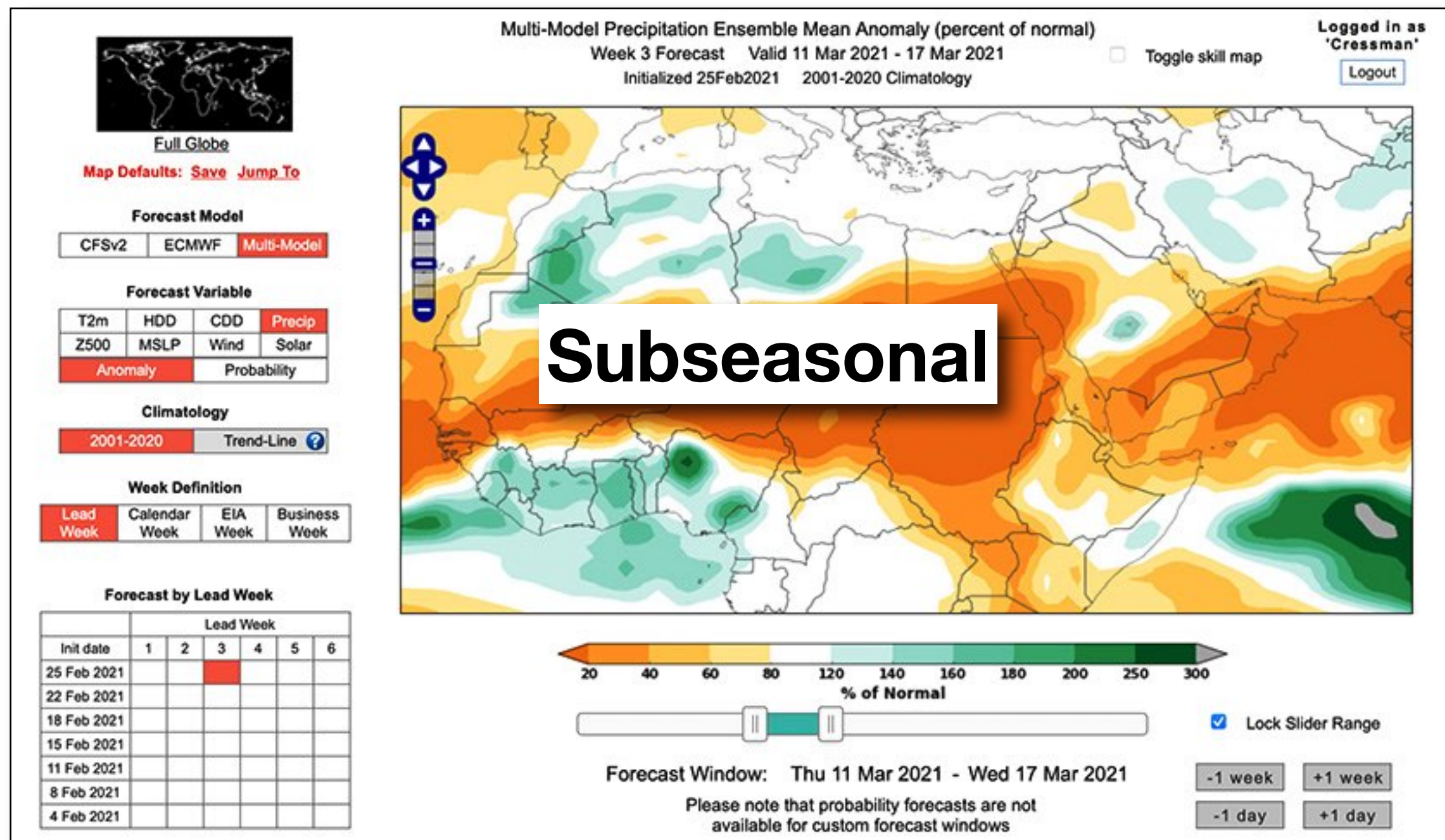
- Online viewer
- Automated data download to SWARMS GIS
- Geotif format for SWARMS GIS integration
- Derived from six different models – best industry standard available
- Annual data provision contract

MORE INFO

- Learn about [Prescient Weather](#)
- Learn about [World Climate Service](#)

Developed in partnership with World Climate Service (USA)

Subseasonal



Trajectory model to estimate swarm migration

WHAT IT IS

- A model to estimate swarm trajectories
- Uses NOAA HYSPLIT model
- Online web app for data inputs, results display, downloading
- Used by DLIS to supplement locust analysis and forecasting

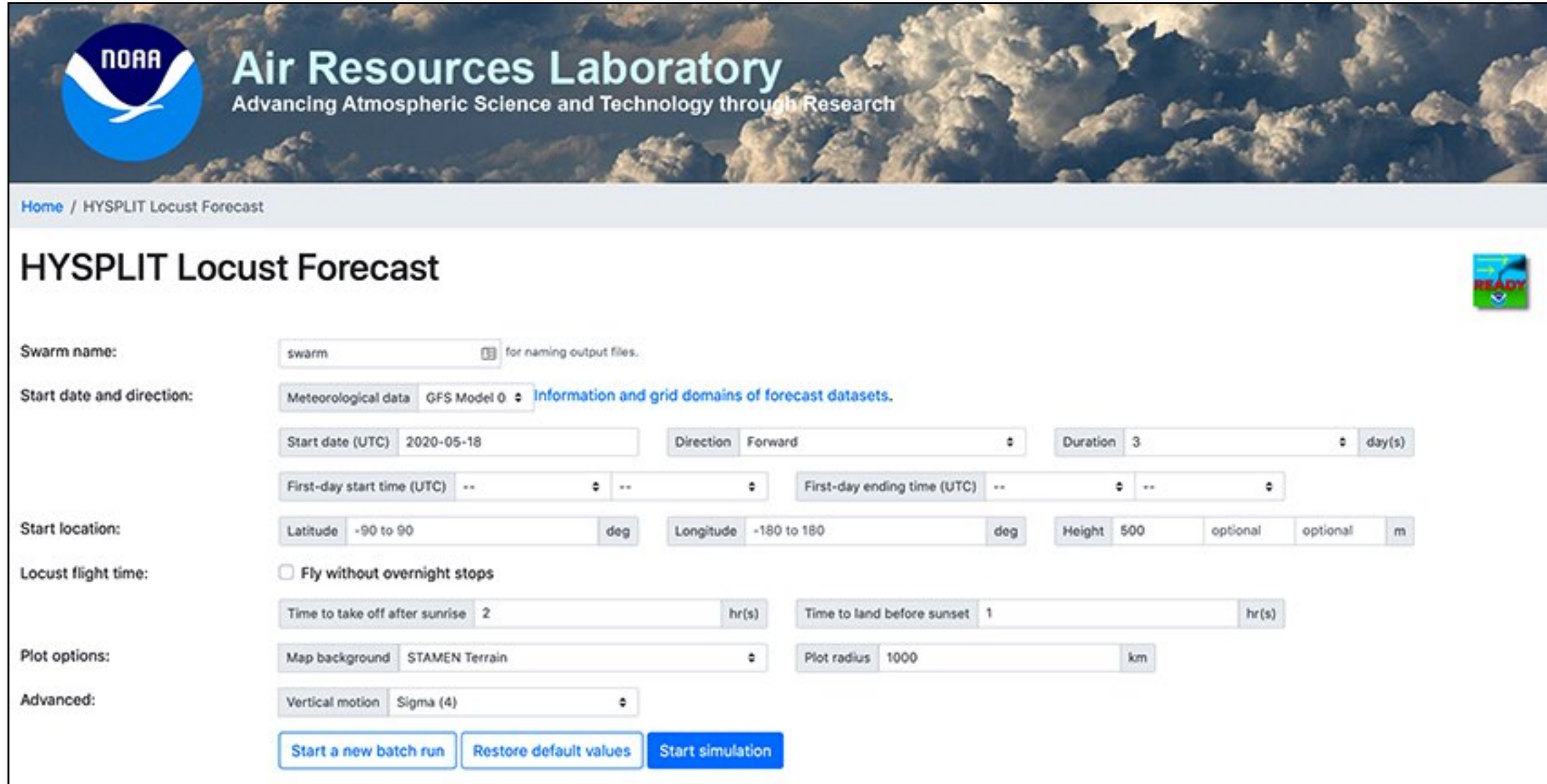
BENEFITS

- Up to 7 days backward and 15 days forward in time
- Up to three different flying heights
- Optional take-off and landing times, and non-stop flying
- Single and batch mode (up to 20 flights)
- Results as PNG, PDF and shapefiles for GIS

MORE INFO

- Learn about [NOAA HYSPLIT](#)
- Access the [model](#)

Developed in partnership with NOAA (USA)



NOAA Air Resources Laboratory
Advancing Atmospheric Science and Technology through Research

Home / HYSPLIT Locust Forecast

HYSPLIT Locust Forecast

Swarm name: for naming output files.

Start date and direction: Meteorological data GFS Model 0 [Information and grid domains of forecast datasets.](#)

Start date (UTC) Direction Duration day(s)

First-day start time (UTC) First-day ending time (UTC)

Start location: Latitude deg Longitude deg Height optional optional m

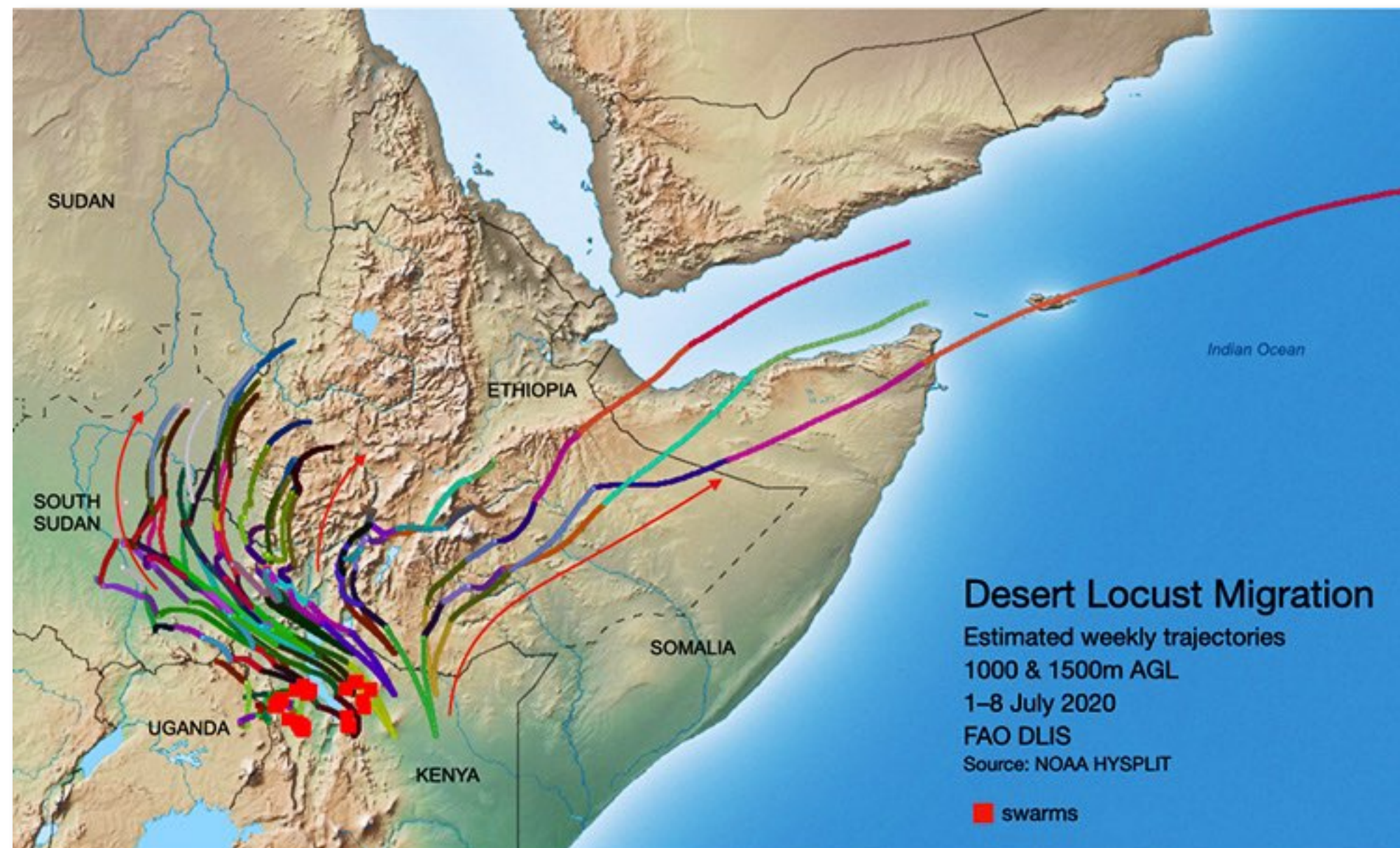
Locust flight time: ☐ Fly without overnight stops

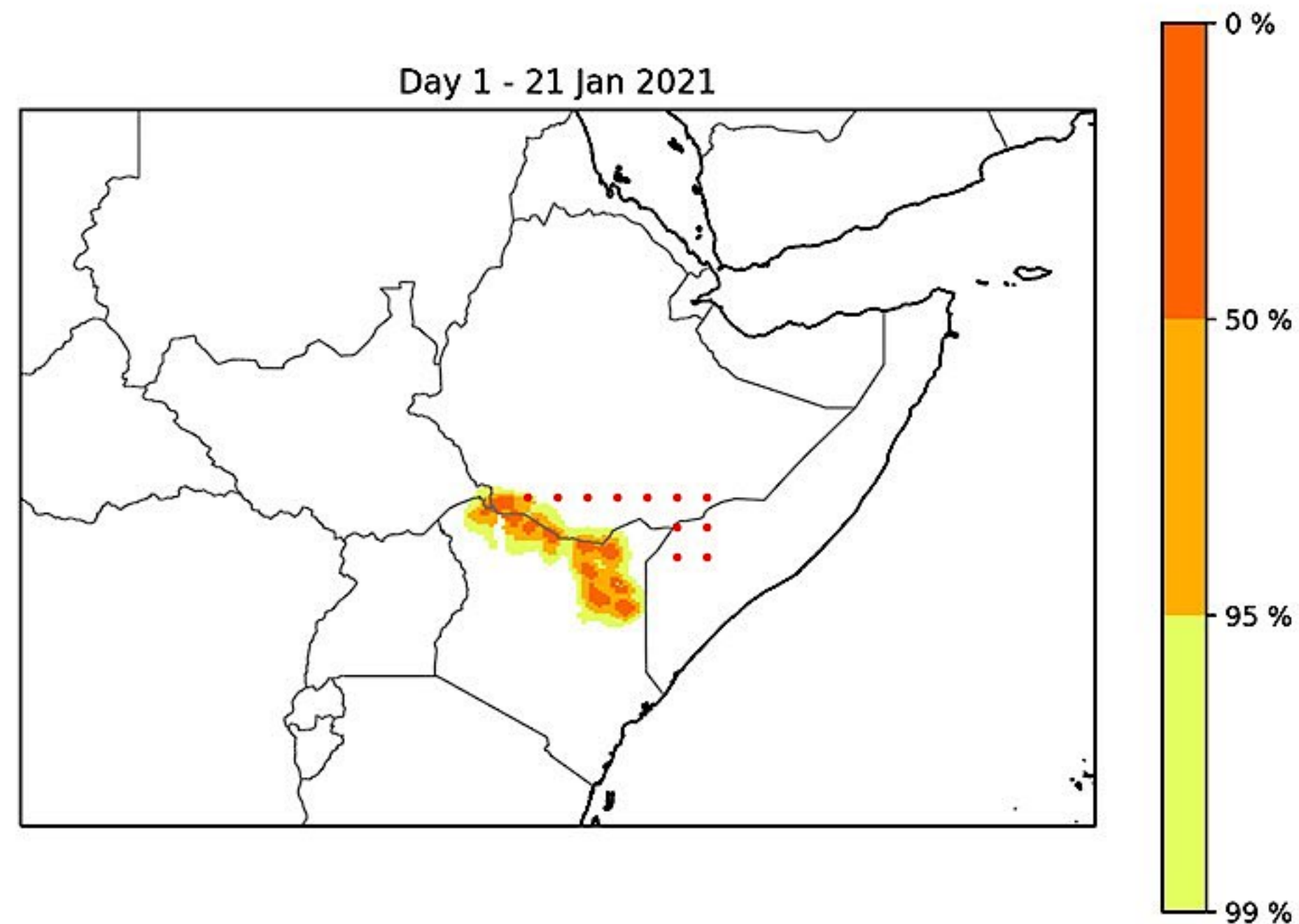
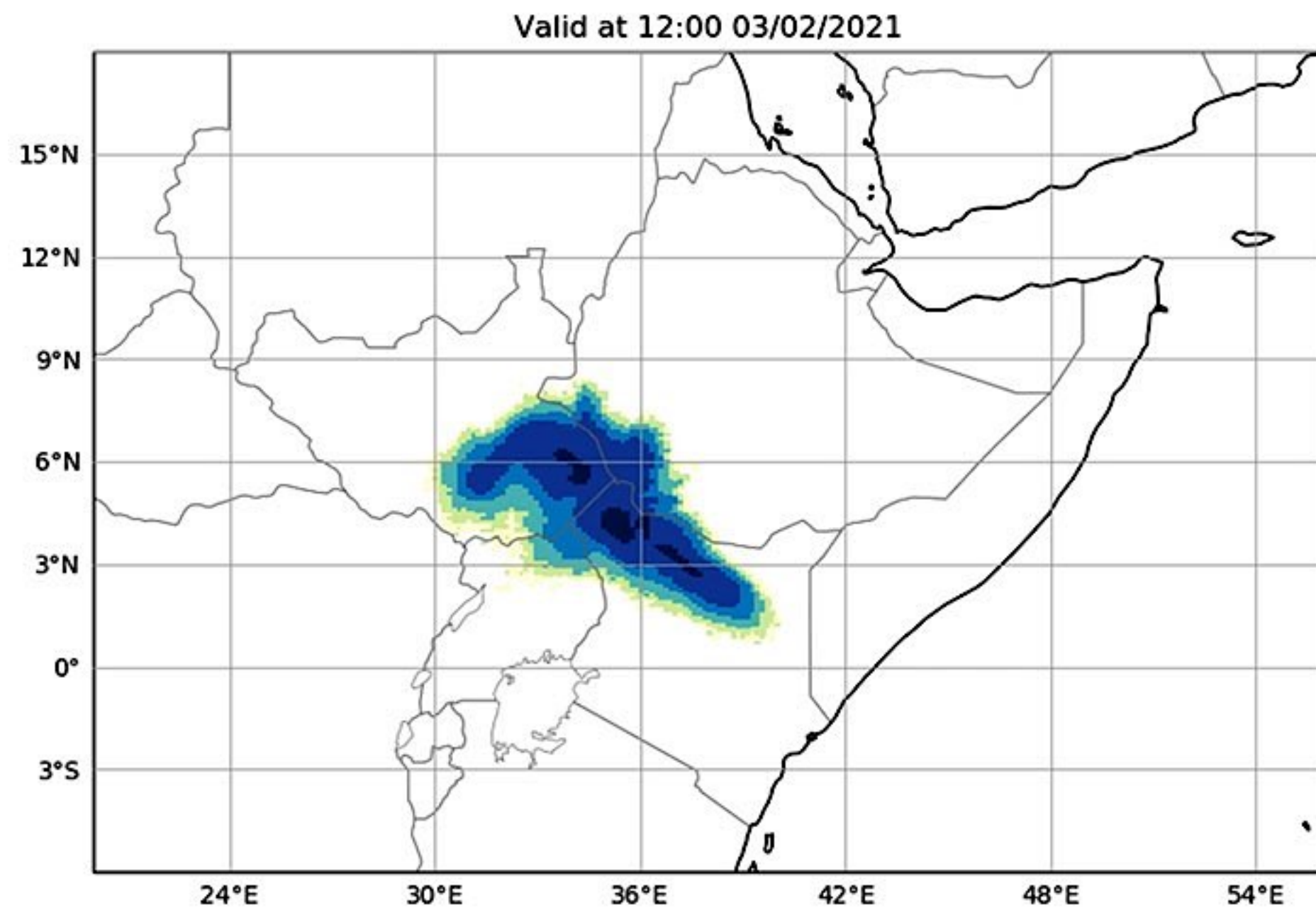
Time to take off after sunrise hr(s) Time to land before sunset hr(s)

Plot options: Map background Plot radius km

Advanced: Vertical motion

[Start a new batch run](#) [Restore default values](#) [Start simulation](#)





Dispersal model to estimate swarm migration

WHAT IT IS

- A model to estimate swarm dispersal
- Uses UK Met Office's NAME model
- Up to 7 days forward in time
- Single point and matrix location sources
- Operated by UKMO upon DLIS requests
- Updated twice/week

BENEFITS

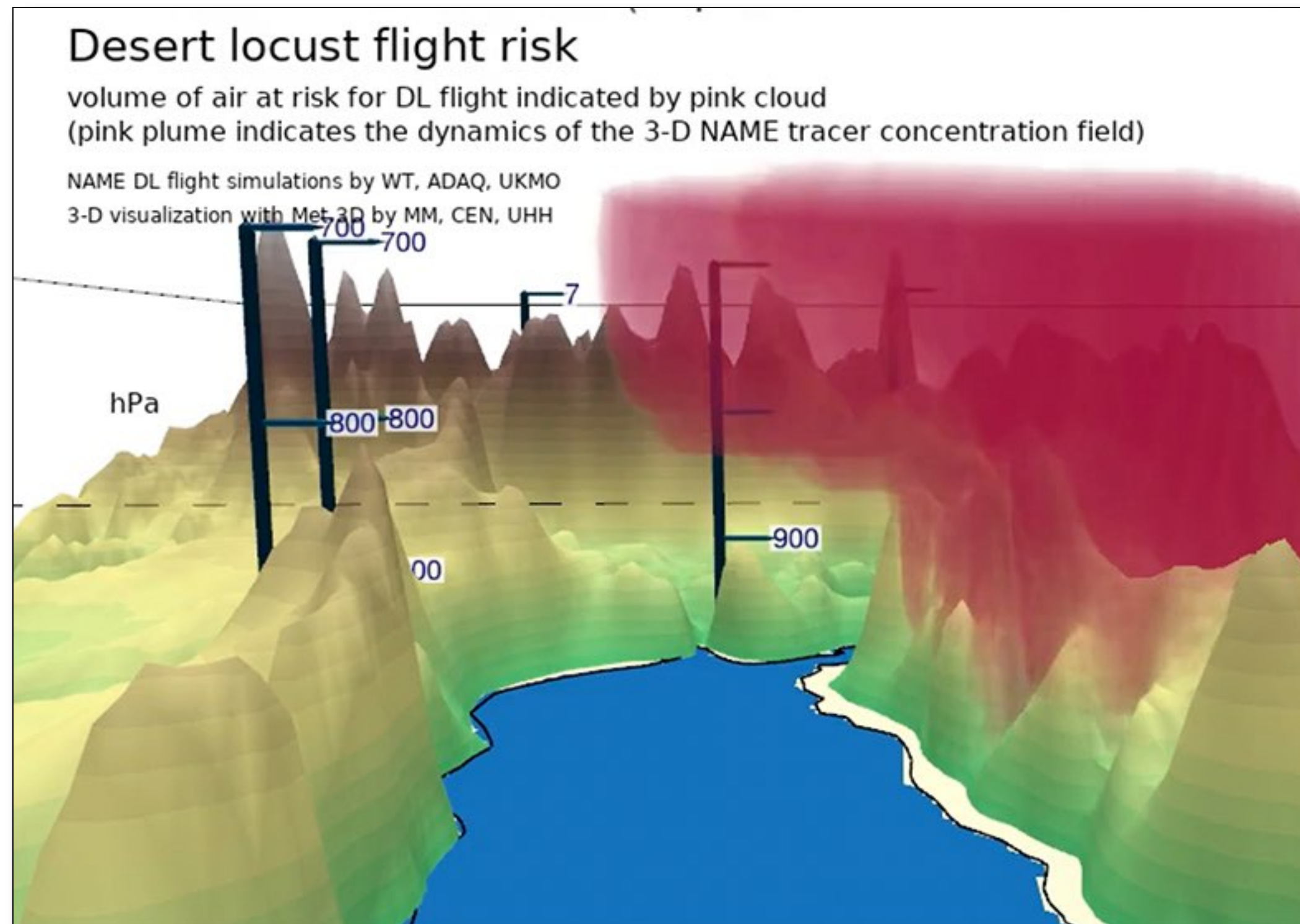
- Visualise swarm migration as video and animated GIF
- Can be used on real reports and for hypothetical situations
- Helps to understand source and destination of swarms
- Used by DLIS to supplement locust analysis and forecasting

MORE INFO

- Learn about [NAME](#)

Developed in partnership with the Met Office (UK)

3D dispersal model to estimate swarm migration



WHAT IT IS

- 3D view of UK Met Office's NAME model
- Custom views and perspectives up to 4 days ahead in time
- Operated by UKMO/Univ. Hamburg based on DLIS requests
- Updated twice/week

BENEFITS

- Helps to visualise impacts of topography on swarm migration
- Used by DLIS to supplement locust analysis and forecasting
- Used to advise locust survey and control operations

MORE INFO

- Learn about [University of Hamburg](#)

Developed in partnership with the University of Hamburg (Germany)

Improving Desert Locust data management and access

WHAT IT IS

- Automated consolidation of individual RAMSES country databases
- Centralised database warehouse
- Rules-based data cleansing and reformatting
- Online data duplication manager using machine-learning
- Remote data exploration with pivot tables and PowerBI reports
- Data extracted via a data cube to SWARMS and others

BENEFITS

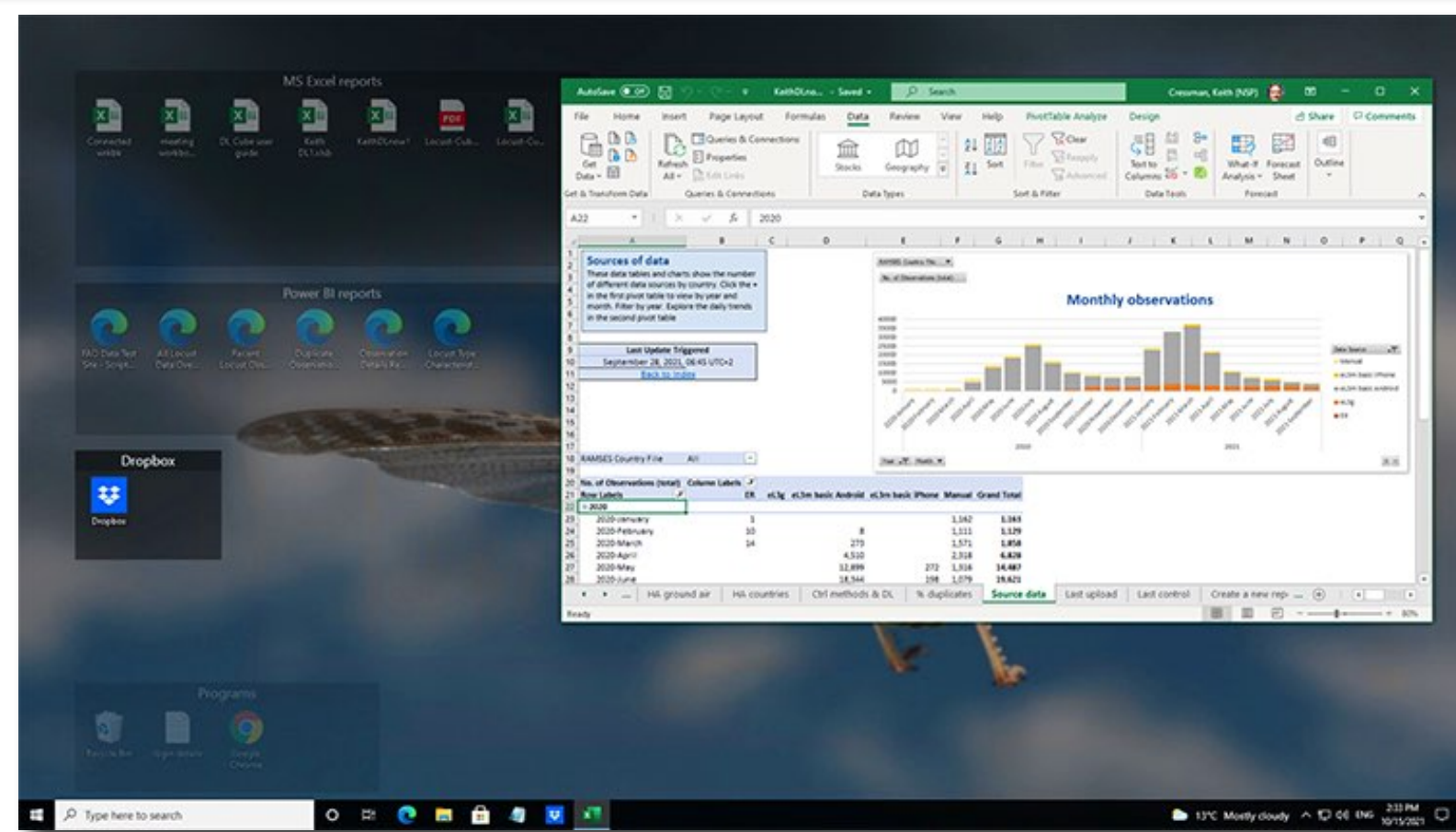
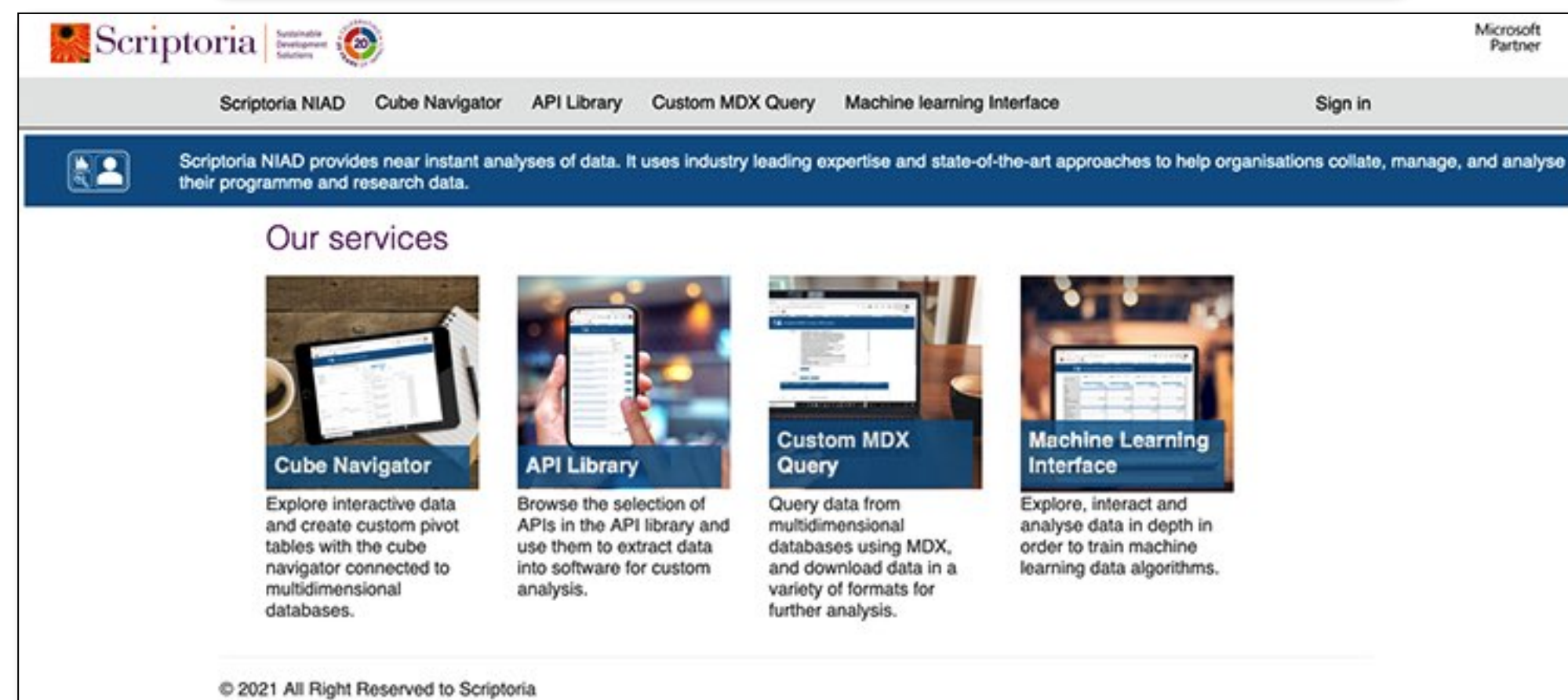
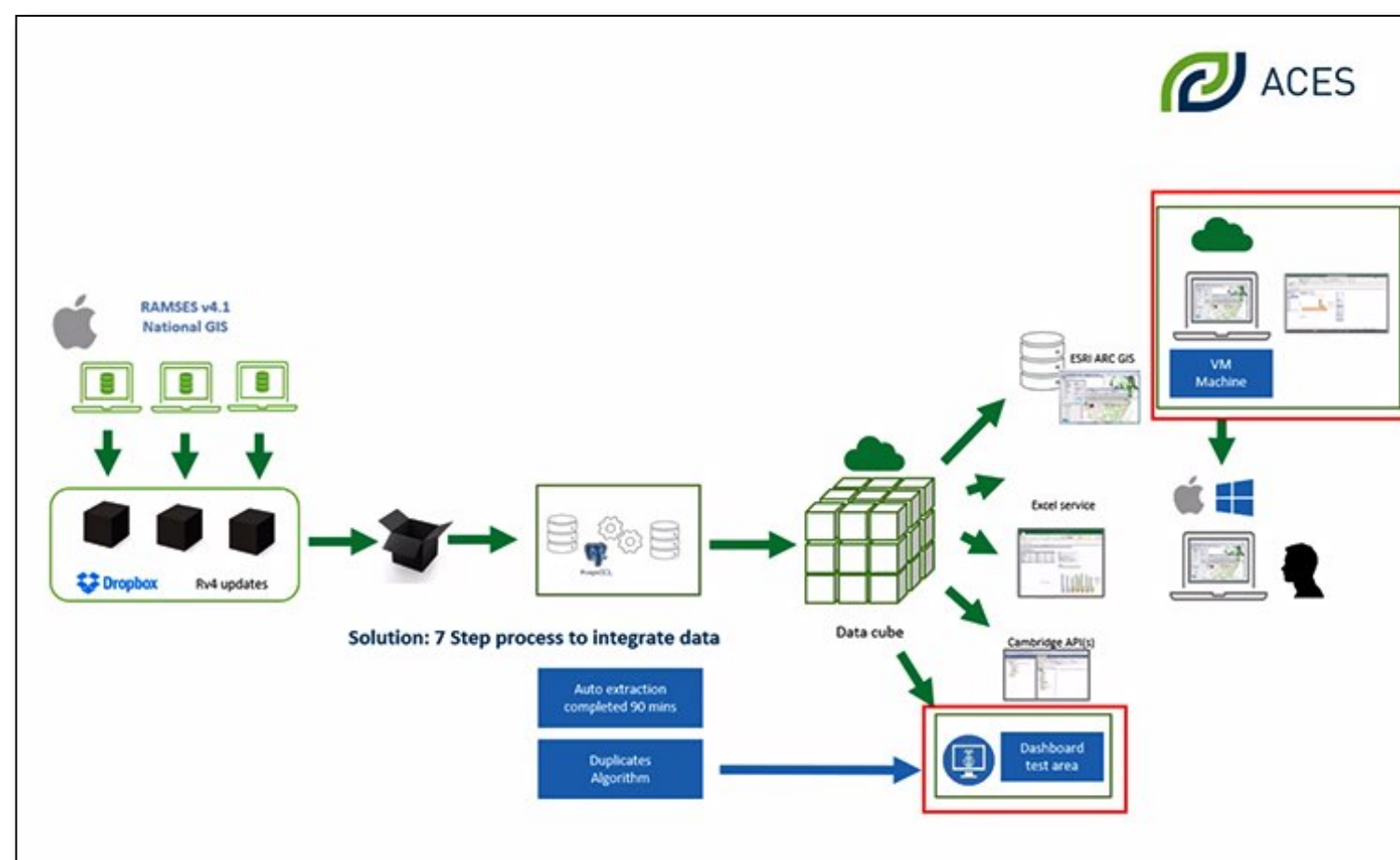
- Automates current data flow from countries to DLIS by 70%
- Extends data access to researchers and other systems
- A single unified source of all locust data
- Used by DLIS to operate FAO's global Desert Locust early warning system

MORE INFO

- Learn about CABI's [ACES project](#)
- Learn about [Scriptoria](#)

Developed in partnership with Scriptoria (UK)

*Developed under CABI's African Crop Epidemiology System (ACES) project
Funded by FCDO (UK), BMGF (USA) and FAO*



SWARMS GIS for global locust monitoring and early warning

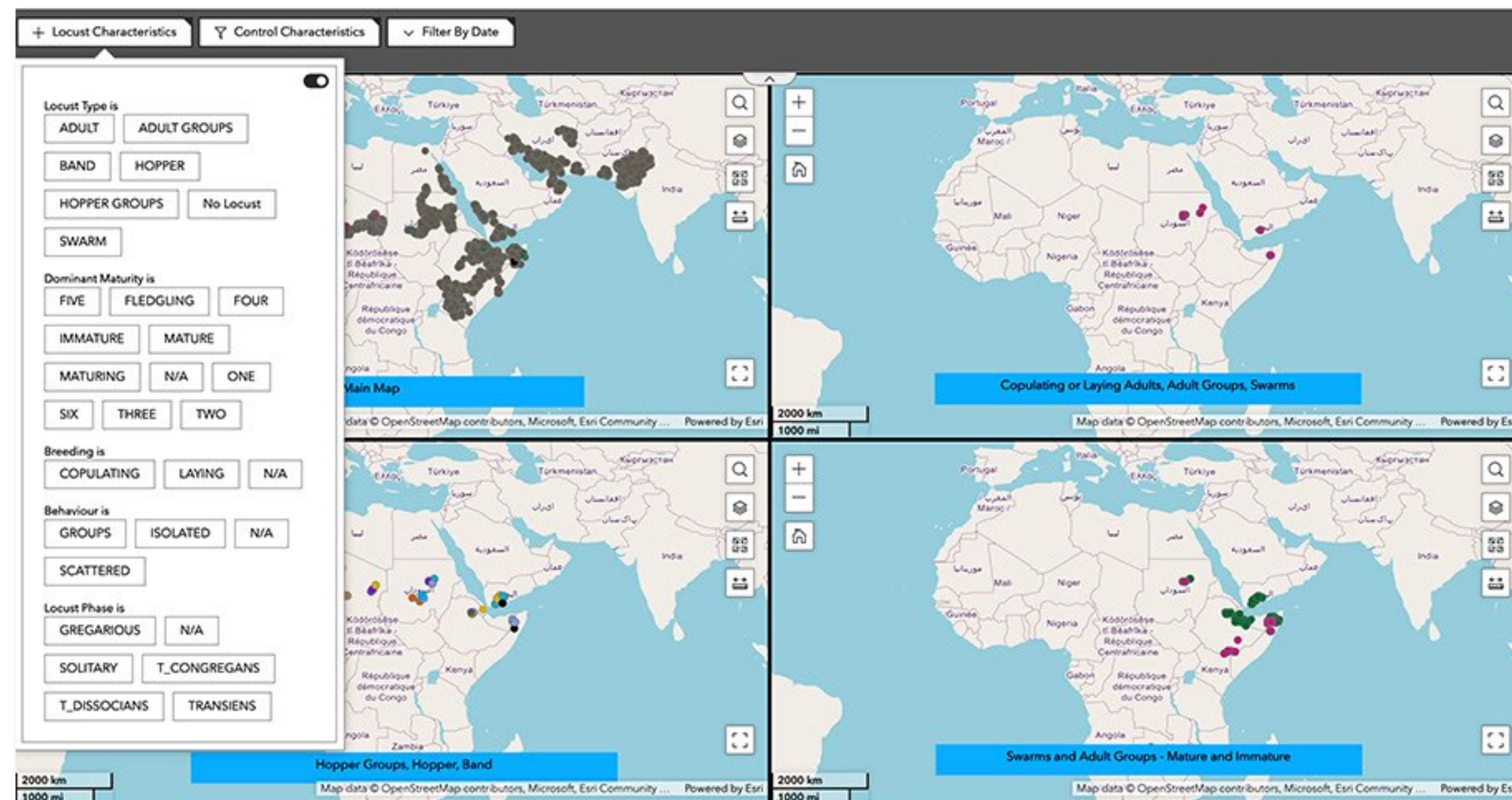
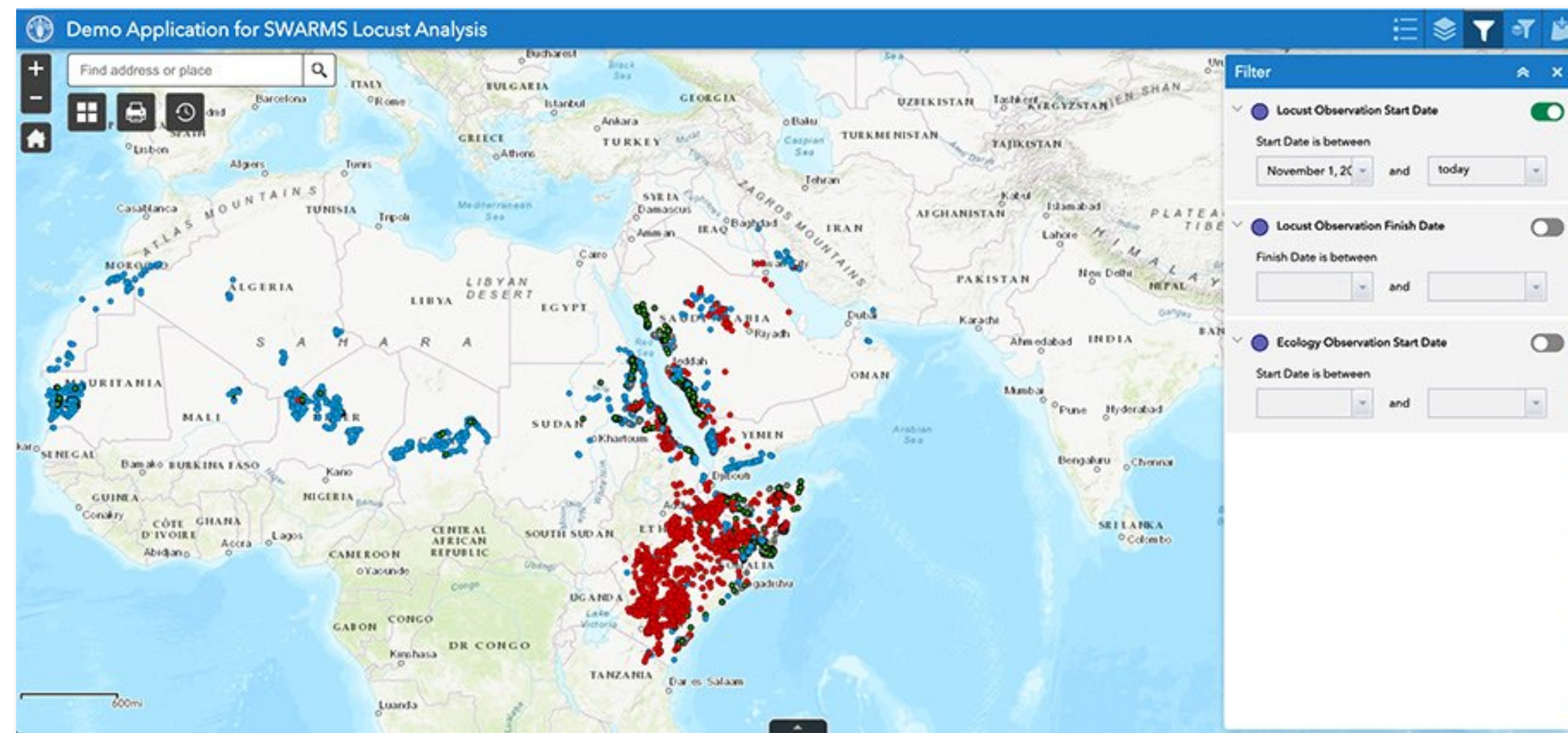
WHAT IT IS

- A geographical information system app that consists of a database and map
- Analysis of weather, environment and locust data
- Used by FAO DLIS for assessment and forecasting
- One of world's first GIS for operational monitoring (1995)
- Relies on ESRI technologies

BENEFITS

- 2020–2021 major upgrade to modern, online version
- Integration of new earth observation products
- Historical locust data from the pre-1960s
- Linked to the Data Cube and Locust Hub
- Near instant analysis of data (NIAD)

Developed in partnership with ESRI (USA)



RAMSES GIS

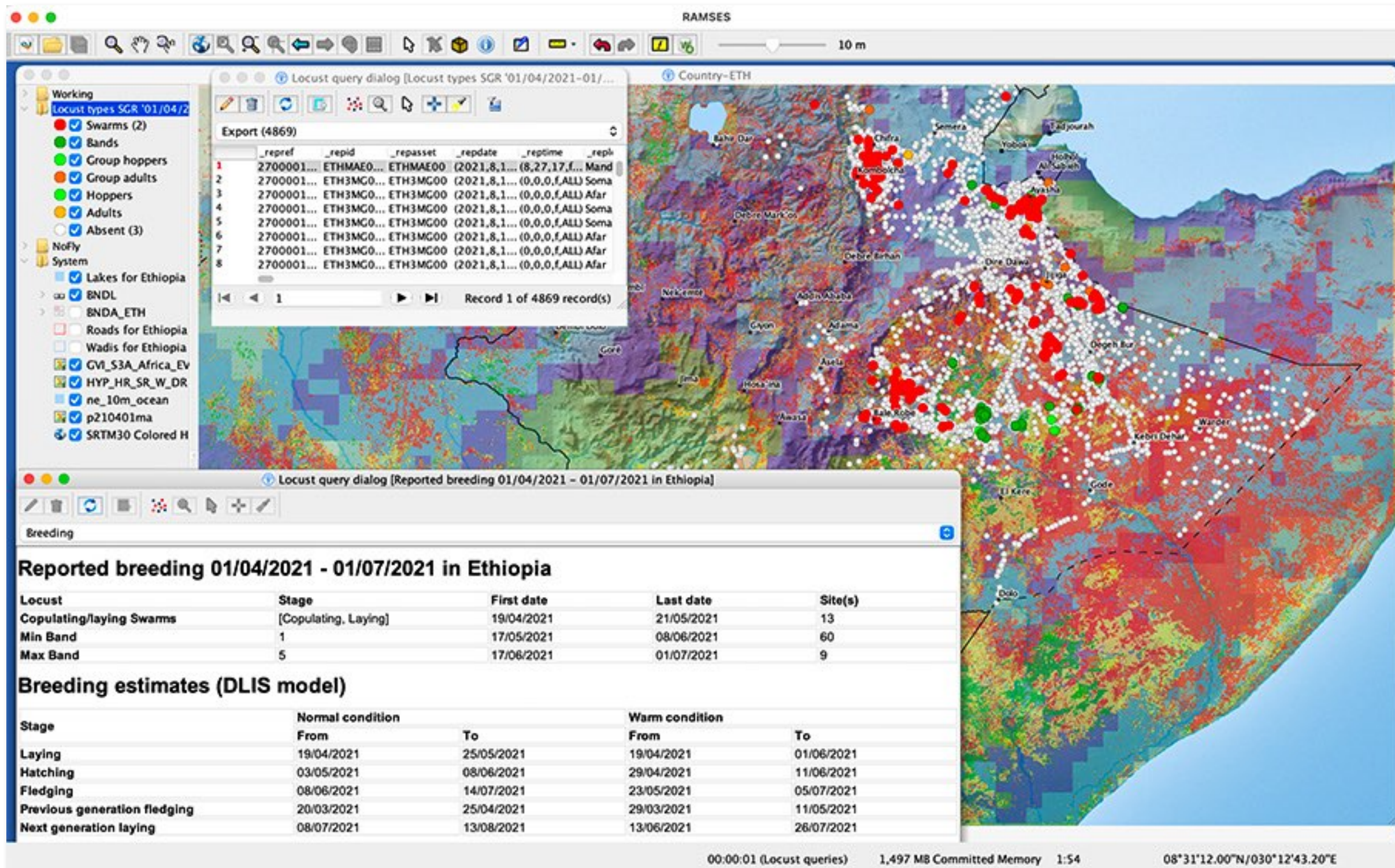
RAMSES GIS for national locust monitoring and early warning

WHAT IT IS

- A geographical information system app that consists of a database and map
- Analysis of weather, environment and national locust and control data
- Used by frontline countries for assessment and planning
- Available in English, French, Arabic for MacOS
- Relies on OpenJump technologies

BENEFITS

- Standardised management and display of geo-spatial data
- Automatic import of eLocust3/m/g/w field data
- Linked to the Data Cube to feed into FAO global early warning system
- 2021–2022 major upgrade and shift to QGIS technology
- Integration of new earth observation products
- Operational since 2000



Open access to Desert Locust data

WHAT IT IS

- An online hub for all locust survey and control field data
- Display data on a map
- Locust data explorer and downloading
- Adult, band, hopper, swarm, ecology, and control datasets
- Updated in near real time (from SWARMS GIS)
- Integrated with soil moisture products
- Unrestricted access and open data policy

BENEFITS

- Allows open access to Desert Locust data
- For researchers and other non-commercial purposes

MORE INFO

- Access the Hub: <https://locust-hub-hqfao.hub.arcgis.com>

Developed in partnership with ESRI (USA)

Locust Hub UPDATED: Locust Watch

Locust Data - Last 7 days (zoom in to access satellite imagery basemap)

Locust Data Explorer

For a more complete look at desert locust data view the Locust Data Explorer to the right. Visualize 3-day, 7-day, 1-month, and 3-month data as well as the complete historic Desert Locust dataset.

FAO Locust Data Explorer

Dashboard to explore recent and historical Desert Locust data.

Search for Datasets

****Latest update was applied on January 21st, 2021.****

Search for Datasets

Adults

Any type or maturity of Desert Locust adults that do not form a group or concentration.

Explore Dataset

Bands

Desert Locust hoppers (wingless nymphs) that form a band.

Explore Dataset

Hoppers

Desert Locust solitary hoppers (wingless nymphs).

Explore Dataset

Swarms

Any maturity of Desert Locust adults that form a swarm.

Explore Dataset

Ecology

Ecological conditions: condition and density of vegetation, moisture of soil.

Explore Dataset

Control Operations

Desert Locust control operations.

Explore Dataset

Current status of Desert Locust emergency response

WHAT IT IS

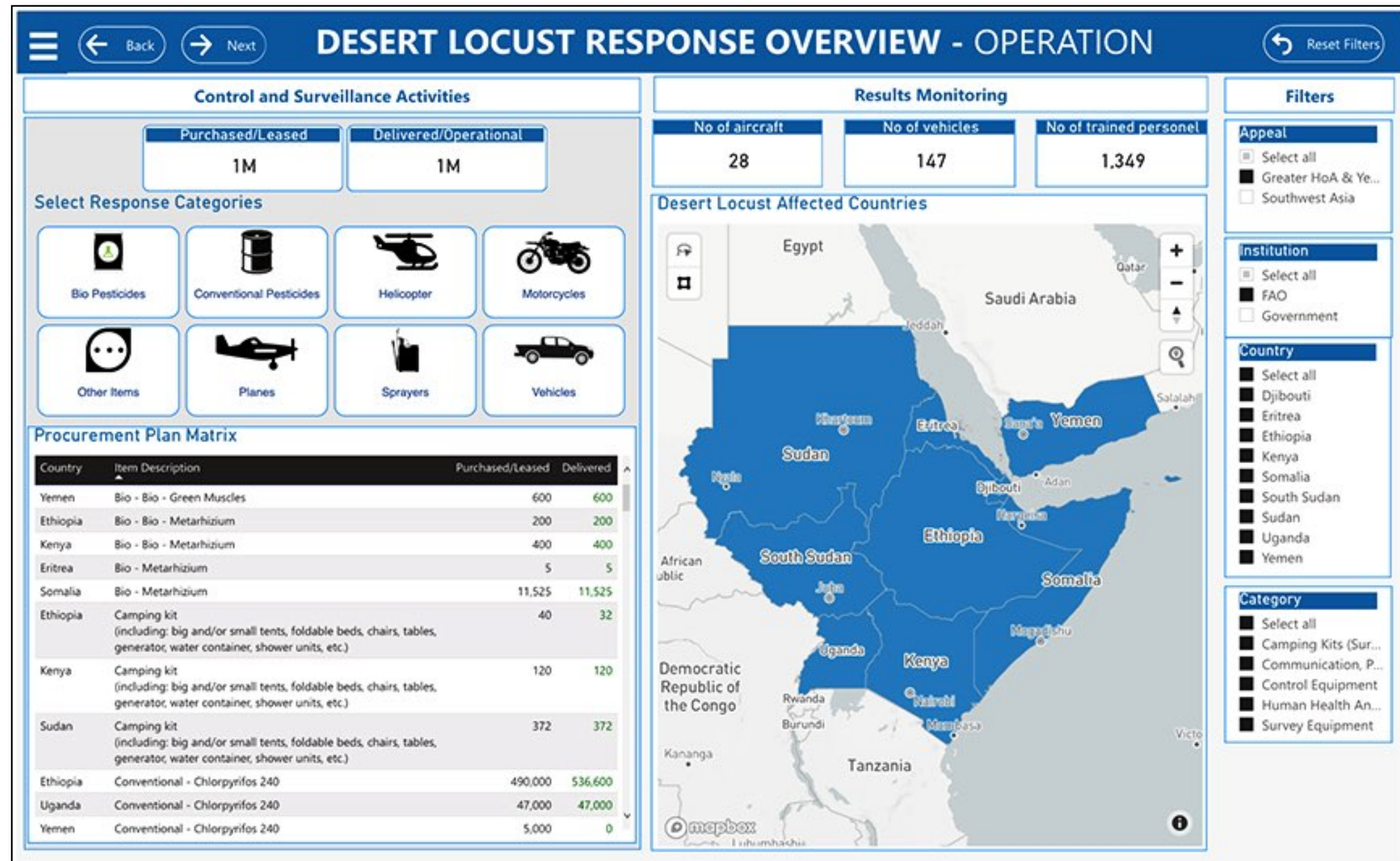
- An online dashboard for the current Desert Locust response
- Five pages at regional and country level
- Snapshot, funding, operation, country, locust situation
- Uses SWARMS GIS survey and control data
- Uses Microsoft Power BI technology
- Djibouti, Eritrea, Ethiopia, Kenya, Somalia, S Sudan, Sudan, Uganda, Yemen

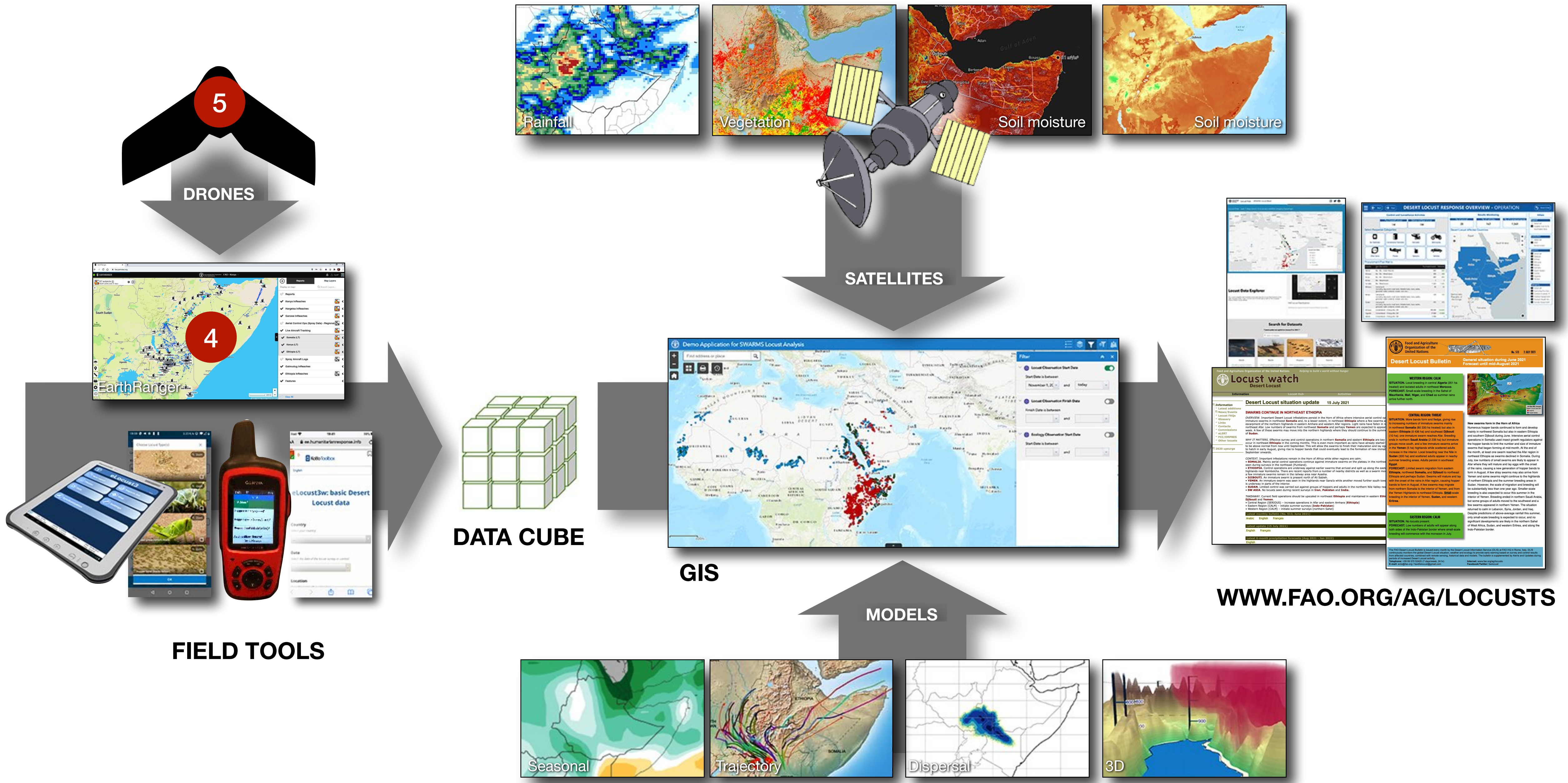
BENEFITS

- Near real time status of assistance, actions, inventories in the field

MORE INFO

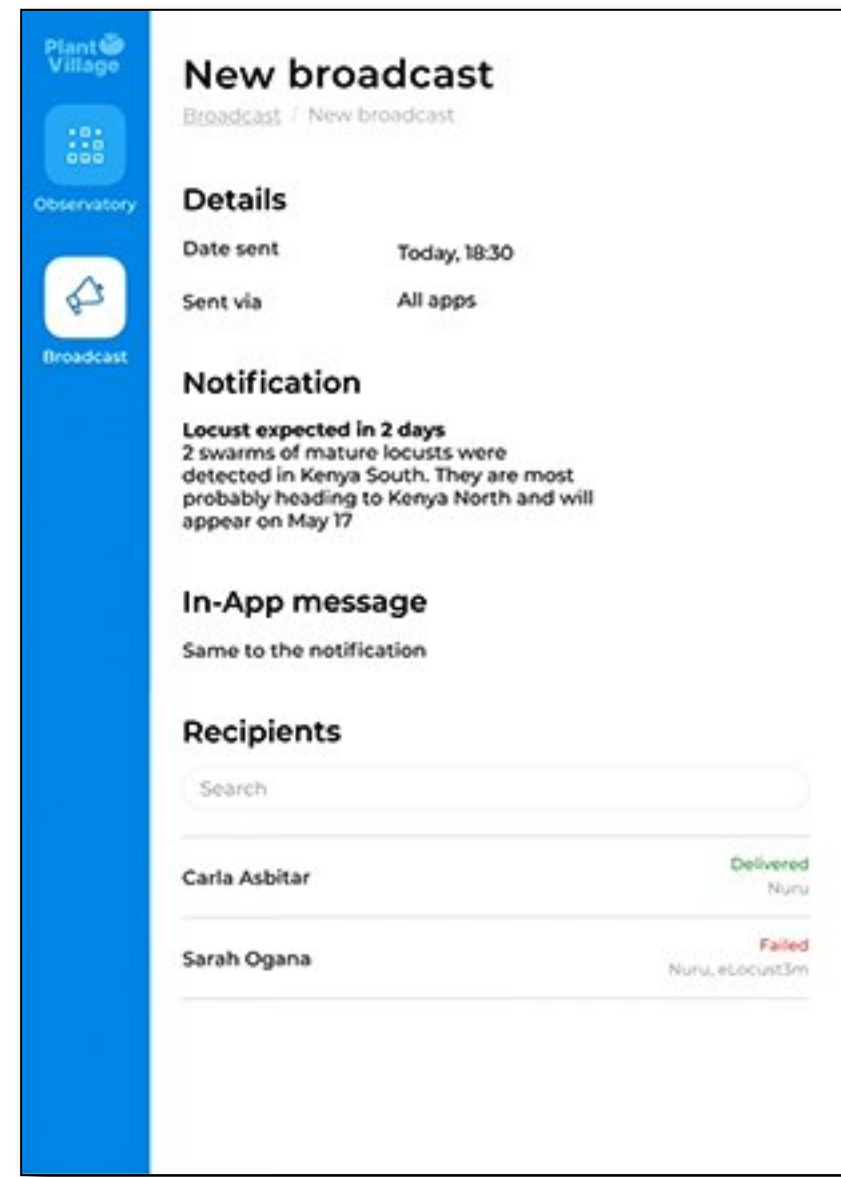
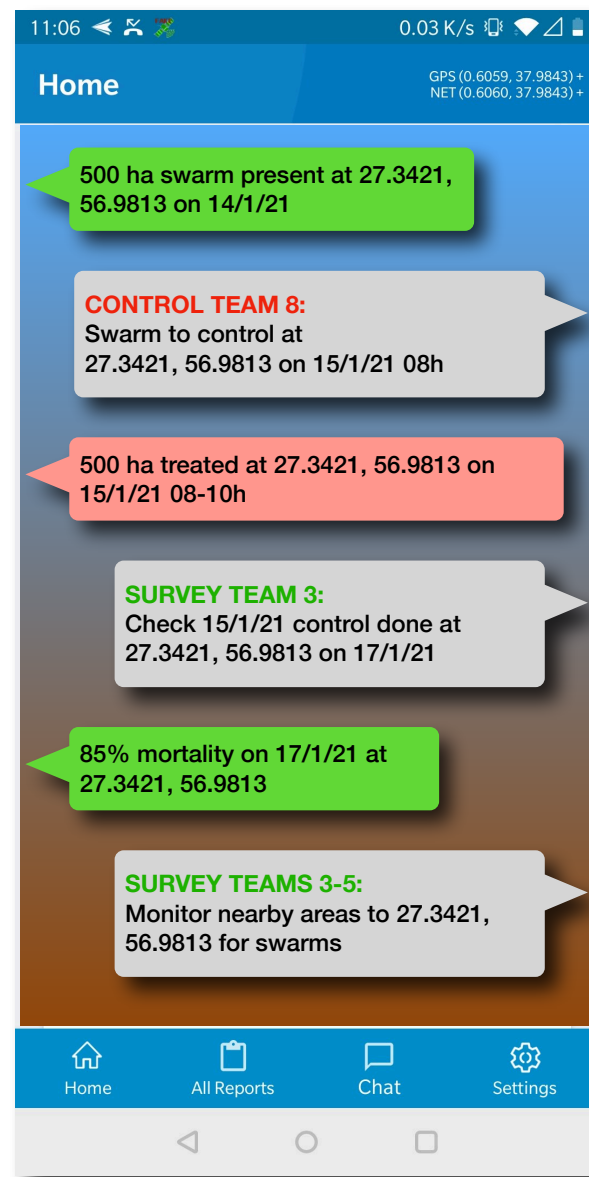
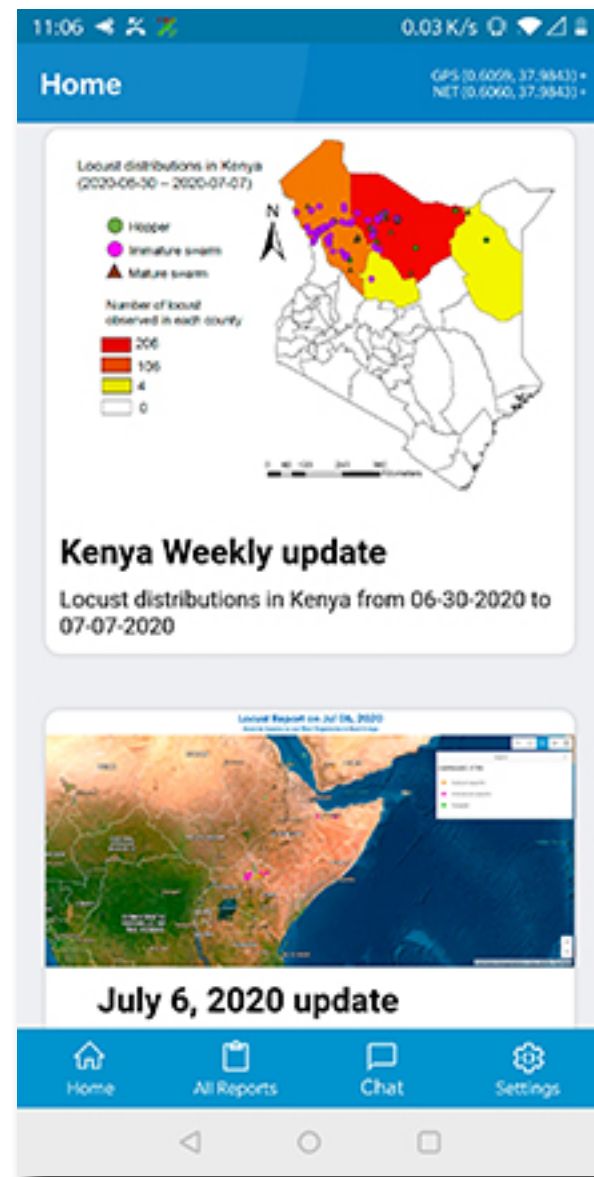
- <http://www.fao.org/locusts/response-overview-dashboard/en/>





FAO Global Desert Locust Early Warning System

works in progress ...



Advisory services

- informing farmers and communities about locusts

Field operations manager

- assign tasks to survey, control and efficacy teams

RAMSES v5 GIS for countries

- enhanced spatial queries and statistical tabulations using QGIS

Modelling

- resource use, optimal control, population dynamics

