Driving preparedness and anticipatory actions through innovation:

A web-based Rift Valley fever Early Warning Decision Support Tool

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The Food and Agriculture Organization of the United Nations (FAO) has developed a web-based Rift Valley fever (RVF) Early Warning Decision Support Tool (RVF DST), which integrates near real-time RVF risk maps with geospatial data, RVF historical and current disease events from EMPRES Global Animal Disease Information System (EMPRES-i) and expert knowledge on RVF eco-epidemiology. The tool is used to build capacity for early warning and forecasting at country level, and demonstrates how near real-time modelling, risk forecasting and digital innovation can enhance preparedness and anticipatory actions.

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Combining comprehensive data and expertise

The RVF DST brings together a wealth of relevant data for monitoring climate variability and other RVF risk factors, including:

- observed and forecasted precipitation and anomalies;
- Normalized Difference Vegetation Index and anomalies;
- land surface temperature;
- El Niño forecasts;
- estimates and geographic distribution of susceptible, at-risk livestock species;

- past and current RVF occurrences;
- human populations;
- market places;
- road networks;
- animal trade routes;
- water bodies and irrigation areas;
- land cover; and
- soil.

In addition, the tool offers expert knowledge on RVF eco-epidemiology (such as the FAO–International Livestock Research Institute Decision Support Framework), risk assessment and categorization, analytical functions and charts of trends in major risk factors, as well as recommended actions to guide appropriate responses to RVF at country level. An automated risk analysis report with charts of major risk factors, estimated animals at risk and risk maps can be downloaded.

Collaboration and One Health guidance

The RVF DST, developed as part of the early warning component of EMPRES, is being implemented by FAO's Emergency Centre for Transboundary Animal Diseases (ECTAD) to strengthen RVF preparedness, response and contingency plans. It was created through the input of a pool of international, regional and national experts, as well as epidemiologists from national veterinary services. Adopting a collaborative approach has helped to ensure the sustainability of the RVF DST by cultivating ownership among the beneficiaries.

Supporting decision-making with real-time data

Developed in 2019, the RVF DST was integrated in the online FAO Hand-in-Hand geospatial data platform in July 2020 and piloted in three RVF endemic countries in East Africa – Kenya, Uganda and the United Republic of Tanzania – to provide decision-makers with near real-time RVF risk maps and assessments, which are updated on a monthly basis at 250 metres of spatial resolution. Covering the period of January 2003 to the present day, the data is provided in near real time.

The Hand-in-Hand geospatial platform is a web-based dashboard providing a suite of geospatial data from FAO and other agencies for use by all countries and partners, promoting transparency and collaboration. The platform has significantly increased the interoperability of FAO geospatial data and the cost-effective maintenance and sustainability of different FAO geospatial applications, including the RVF DST.

The RVF-DST will soon be accessible to countries through the EMPRES-i country interface directly, to forecast areas at high risk of RVF. EMPRES-i is a web-based application that provides updated information on global animal disease distribution and current threats at national, regional and global level. Timely and reliable disease information enhances early warning and response to transboundary animal diseases (TADs) including RVF, and supports their progressive control and elimination.

The RVF DST has enhanced the Organization's capacity to identify high-risk areas and issue alerts and early warning messages for prevention and control in countries at risk of RVF occurrence. These alerts and messages are issued well before the reporting of the first signs of RVF infection in the countries with a prediction capacity of at least 1-2 months.

The outputs of the tool can be used together with results from other RVF monitoring and surveillance activities (such as sentinel herd monitoring) and expert knowledge for near real-time validation of the RVF potential hotspots to inform decision-makers and support early response.

Overall, the RVF DST has contributed to an improved state of vigilance and preparedness in the Eastern African region and enhanced collaboration between FAO, national veterinary services and strategic regional partners such as the World Health Organization (WHO), the Intergovernmental Authority on Development (IGAD), and the World Organisation for Animal Health (OIE) beneficiaries.

Key facts

1. RVF is an acute, vector-borne, viral and zoonotic disease that has severe impacts on livelihoods, national and international markets, and human health.
2. The disease has been observed in sheep, goats, cattle, buffaloes, camels and humans and is spread primarily by mosquitoes and the movement of animals.
3. Heavy rains and prolonged flooding increase habitat suitability for vector populations, determining massive hatching of RVF competent mosquitoes (e.g. *Aedes* and *Culex*), thus influencing the risk of RVF emergence, transmission and spread.
4. The dynamic prediction model calibrated by FAO builds upon the work by Anyamba *et al.* (2009), which utilizes vegetation and rainfall anomalies as a proxy for ecological dynamics to map areas at potential risk of RVF in Eastern Africa.
5. The FAO RVF Early Warning panel of experts verifies the risk areas with the experts on the ground and assesses if conditions warrant an RVF alert (FAO, 2019).
6. The RVF DST is the result of an initial collaboration with the National Aeronautics and Space Administration and other partners on RVF risk monitoring and forecasting.

Future developments

Future analyses and developments of the system should include:

▶ a dedicated ground truthing system for the timely verification of risk areas and weather conditions on the ground and integration of socio-economic and animal movement data;
▶ the scaling up of the tool to other regions such as western Africa; and
▶ capacity building to enhance risk-based surveillance.

References

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