Utilization of the Rift Valley fever decision support tool in Kenya: Successes and challenges

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Utilization of the Rift Valley fever decision support tool in Kenya: Successes and challenges

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Abbreviations

AU-IBAR    African Union-Interafrican Bureau for Animal Resources
CDC       Centers for Disease Control and Prevention
DST       Decision Support Tool
DVO       District Veterinary Officer
DVS       Department of Veterinary Services
EMPRES    Emergency Prevention System for Animal Health
EMPRES-i  Web-based application of the Emergency Prevention System for Animal Health
FAO       Food and Agriculture Organization of the United Nations
GOARN     Global Outbreak Alert and Response Network
GLEWS     Global Early Warning System
KARI      Kenya Agricultural Research Institute
KES       Kenya shilling(s)
NDVI      Normalized Difference Vegetation Index
NGO       non-governmental organization
OIE       World Organisation for Animal Health
RVF       Rift Valley fever
USD       United States dollar(s)
WHO       World Health Organization
Summary

This study was carried out to identify successes and challenges associated with the utilization of the Rift Valley fever (RVF) Decision Support Tool (DST) in Kenya. The DST was developed by various stakeholders from government and non-government sectors following the 2006-07 outbreak of RVF in East Africa. It identifies events leading to the RVF outbreak, classified as decision points, and matches them with interventions that could be implemented at each point. Currently, the framework identifies 12 decision points1 and 13 interventions2.

Three activities were used in the study, namely, (1) a review of literature to describe systems/models that could be used with the DST and to identify how other frameworks/DSTs have been used to support disease control policies; (2) focus group discussions and key informant interviews involving decision-makers in the Department of Veterinary Services (DVS), local and international organizations, farmer groups etc. and (3) a stakeholder workshop to validate findings obtained and develop recommendations on ways of improving awareness and utilization of the framework.

Three parameters were used to verify uptake and implementation of the framework:

(i) Whether there had been an official recognition of the DST as a component of the RVF control policy in the DVS (this did not include other relevant departments, e.g. Public Health and the Zoonotic Disease Unit, because they were not included previously in the dissemination of DST).

(ii) Level of utilization of the framework indicated by the proportion of key decision-makers that had the framework and the number of decision points that had been covered at any one time.

(iii) Perceptions on the convenience of its application.

An additional parameter – the ability of the DST to guide and promote good/effective responses – was considered at the design stage of the study but this was not used because, since the DST was developed and disseminated, there has not been an outbreak of RVF for it to be utilized in full (beyond the early warning stage). The review of literature described some of the systems and models that can be used with the DST. Some of these systems e.g. the Global Early Warning System (GLEWS), Africa Real Time Environmental Monitoring Information System and the web-based application of the Emergency Prevention System for Animal Health (EMPRES-i) of the Food and Agriculture Organization of the United Nations (FAO) were regarded as being useful for staging the DST for they provide early warning signals that define the escalation of risk and hence a change in the decision level from normal to the early warning stage. Others such as risk maps generated from a range of statistical models would be useful for identifying risk zones where interventions suggested by the framework would be applied. The review also identified challenges associated with the implementation of decision support systems in general, e.g. technical issues on operationalization of the models, bureaucratic hoops and lack of incentives, culture, attitude and resource challenges. These issues were incorporated into data collection instruments for the focus group discussions and key informant interviews.

1 1-Normal situation between outbreaks; 2-Early warning of RVF issued e.g. by Global Emerging Infections Surveillance and Response System; 3-Localised prolonged heavy rains reported by eye witnesses; 4-Localised flooding reported by eye witnesses; 5-Localised increases in mosquito population reported by eye witnesses; 6-First detection of suspected RVF case in livestock by searching or rumours by herders; 7-Laboratory confirmation of RVF cases in livestock; 8-First rumour or field report of first human cases; 9-Laboratory confirmation of first human case; 10-No new human cases for six months; 11-No clinical livestock cases for six months; 12-Post-outbreak recovery and reflection.

2 Capacity building and training, communication, coordination, early warning systems, quarantine, vector control, surveillance, disease control, trade and markets, funding, post-outbreak recovery and reflection, institutions and policies, research impact assessment and risk assessment.
Focus group discussions and key informant interviews were carried out between May and September 2012 in Nairobi, Garissa, Mombasa, and Nakuru while the stakeholder workshop was held in Naivasha, Kenya in September 2012. These surveys confirmed that the DST had been incorporated into the RVF contingency plan but less than 10% of the decision-makers, mostly from the provincial and district centres, were aware about the DST. Challenges associated with the utilization of the framework were classified into four categories namely: (i) resource/funding constraints, (ii) inefficient response measures, (iii) low morale among local veterinary staff and (iv) poor coordination and communication. The DVS had developed a budget of 66,015,880 Kenya shillings (KES) (790,609 United States dollars [USD]) as the national RVF emergency fund. However, no funds had been allocated to the budget. These issues were discussed at the stakeholder workshop held in Naivasha, Kenya in September 2012. Its recommendations were:

• There is need for the RVF task force to establish a budget and an emergency fund to support the contingency plan/DST. The disease control agents, especially the District Veterinary Officers (DVOs), also need adequate financial support to run other basic disease surveillance and control activities. Some of these funds can be secured by establishing collaborative activities with relevant non-governmental organizations (NGOs) and international bodies such as FAO, the World Health Organization (WHO) and the World Organisation for Animal Health (OIE). However, DVOs and other sub-national agents need to be facilitated by the national authorities (e.g. through provision of information and authority) to develop proposals for such engagements.

• Field officers require more technical guidance and support in the implementation of the tool. It was suggested that this could be achieved by offering DST training in continuous professional development sessions, seminars, colleges, etc. The study also established that the tool has not been disseminated widely and in fact most DVOs and other stakeholders from NGOs were not aware about its existence.

• Existing private-public partnerships should be strengthened and new ones initiated to ensure smooth implementation of the contingency plan/DST especially during emergencies. Experiences from previous outbreaks suggest that interventions implemented could have achieved greater impacts had implementation efforts been sufficiently coordinated. The disease control agents therefore need to strengthen linkages with trader associations, the police/security forces, border patrols, community representatives etc. especially during the inter-epidemic periods. Some of these interventions could be addressed through the refinement of the veterinary policy to highlight key partners and areas where collaborative efforts would be more beneficial.

• Present a summary of the DST in posters and brochures to enhance its readership and dissemination. It was suggested that laminated cards or A4 posters be made for different audiences. They would contain the basic steps with quick instructions of what to do and who to contact at each step. A number of stakeholders e.g. farmer groups could help distribute these materials to create more awareness and hence compliance.

• The workshop was informed that most respondents interviewed in the DST assessment studies regard the decision points defined in the DST as being numerous (12 in total) with some of them being too close in time to be considered as being independent decision points. The workshop recommended having five key decision points, namely: normal, early warning, pre-outbreak, outbreak and step-down phases with the DST stages being classified under them (five stages) while retaining the detailed information presented in the DST. A small group of experts was formulated to review the structure of the DST and refine the budget that had been proposed.

This study was successful in identifying successes and constraints to the implementation of the DST. FAO had initially suggested hosting an interactive website in a decision tree structure that would enable users to quickly access the relevant information for a particular decision point of interest. Work is underway to develop DST dissemination materials and additional analyses are being done to determine benefits and costs of the RVF interventions captured in the DST. This would make a valuable component of an interactive website; the user could weigh different choices at each stage based on the benefits and costs involved and decide whether to act at that stage or wait until later. These activities are meant to generate additional information for effective decision-making.
Introduction

RVF outbreaks occur as explosive events that follow periods of prolonged heavy rainfall. They usually have a rapid onset and progression that has been difficult to predict in good time. The early warning message that preceded the 2006-07 RVF outbreak in East Africa, for example, was given in mid-September 2006 while a consolidated warning was given in November 2006 when initial cases of the disease had already occurred (FAO-WHO 2008). Such delays in prediction, coupled with poor surveillance systems, weaken the capacity of public and animal health departments to implement effective response measures. Surveys conducted in Kenya after the outbreak indicated that the severity of the epidemic was exacerbated by delays in recognizing the risk and in taking decisions to prevent and control the disease (ILRI 2009). The surveys also noted that the country lacked a well-documented contingency/emergency plan for RVF and pre-allocated emergency funds, particularly within the livestock sector. These experiences made it necessary to refine the RVF contingency plans and develop the RVF DST to guide responses to future RVF epidemics (Consultative Group for RVF Decision Support 2010).

The development of the RVF contingency plan was commenced by the DVS soon after the 2006-07 RVF outbreak in East Africa, through a consultative process, based on the template provided by FAO at http://www.fao.org/docrep/005/y4140e/y4140e00.HTM. It was thereafter officially adopted in April 2010. At the same time, a consultative process was initiated that led to the development of the DST based on the findings of a study that had developed a timeline of events that led to the outbreak (Jost et al. 2010). That study was implemented in Northeastern Province, Kenya and Arusha, Tanzania. The timeline developed is summarized in Table 1. The DST identifies 12 decision stages and 13 interventions that could be implemented with the following assumptions:

- A national RVF emergency fund has been established and procedures and modalities put in place to enable the fund to be made available rapidly in response to predetermined criteria.

- An effective communication system has been established including a clear chain of command from the Director of Veterinary Services to the field which facilitates early and effective communication back up the chain from field to the Director and effective communication between the veterinary department and other relevant ministries and departments, such as health, planning and finance, and the provincial administration.

- The above are captured in a government-approved RVF contingency plan.
<table>
<thead>
<tr>
<th>Events</th>
<th>Northeastern Province, Kenya</th>
<th>Arusha, Tanzania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start of heavy rains and appearance of mosquito swarms</td>
<td>Mean interval in days: 23.6 (11)</td>
<td>Mean interval in days: 56.7 (6)</td>
</tr>
<tr>
<td>Average reported start date: mid-October 2006</td>
<td>Start of heavy rains</td>
<td>Average reported start date: early November 2006</td>
</tr>
<tr>
<td>Earliest reported start date: early August 2006</td>
<td>Appearance of mosquito swarms</td>
<td>Earliest reported state date: mid-September 2006</td>
</tr>
<tr>
<td>Average start date: late October 2006</td>
<td>Could not accurately assess</td>
<td></td>
</tr>
<tr>
<td>Earliest start date: early October 2006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First appearance of mosquito swarms and first suspected RVF case in livestock</td>
<td>16.8 (11)</td>
<td>25.0 (4)</td>
</tr>
<tr>
<td>First suspected RVF case in livestock</td>
<td>First suspected RVF case in livestock</td>
<td>Average date: mid-December 2006</td>
</tr>
<tr>
<td>Average date: mid-November 2006</td>
<td>Early date: mid-October 2006</td>
<td>66.7 (4)</td>
</tr>
<tr>
<td>Earliest date: early October 2006</td>
<td>First suspected RVF case in humans</td>
<td>First suspected RVF case in humans</td>
</tr>
<tr>
<td>Average date: late October 2006</td>
<td>Early date: late January 2007</td>
<td>113.1 (7)</td>
</tr>
<tr>
<td>Earliest date: early October 2006</td>
<td>First veterinary service response</td>
<td>First veterinary service response</td>
</tr>
<tr>
<td>Average date: mid-December 2006</td>
<td>Average date: mid-January 2007</td>
<td></td>
</tr>
<tr>
<td>Earliest date: mid-December 2006</td>
<td>First public health service response</td>
<td>First public health service response</td>
</tr>
<tr>
<td>Average and earliest date: mid-December 2006</td>
<td>Average date: mid-March 2007</td>
<td></td>
</tr>
<tr>
<td>First suspected human case and first public health service response</td>
<td>30.0 (4)</td>
<td>18.3 (3)</td>
</tr>
</tbody>
</table>

However, the DST has not been widely used as envisaged. Preliminary surveys conducted in Kenya in the initial two years following the dissemination of the DST indicated that only 10.2% (6/59) of the senior veterinary officers from the national, provincial and district veterinary centres had received the RVF DST and were conversant with its content (Gachohi et al. 2012). This study was designed to identify challenges associated with dissemination and application of the DST. Parameters developed to guide the research included:

(i) Has there been an official recognition of the DST as a component of the RVF control policy in the DVS?

(ii) What is the level of utilization of the framework (as per the proportion of key decision-makers that had the framework and the number of decision points that had been covered at any one time)?

(iii) What are some of the perceptions on the ease of use of the DST?
Methodology

Review of literature

A review of literature was carried out to identify systems and models that could be used with the DST as well as to describe successes and challenges associated with the implementation of the DST in general. The review used a ‘funnelling in’ approach which commenced with general searches that were subsequently refined until most of the information that was being pursued had been obtained.

An initial systematic search of published articles was undertaken using the online databases PubMed and MEDLINE and selected search engines, including Google, to identify relevant studies and reviews on decision support systems worldwide, using key words/Medical Subject Headings. All permutations of Medical Subject Headings were entered and each search was conducted twice to ensure accuracy. Keywords used included decision support tool, framework, policy, stakeholders, barriers, attitudes, perceptions, processes, user experience, usability, uptake and dissemination. Summaries of returned articles were reviewed and articles where the abstract indicated potentially useful information were retrieved. Reference lists of identified articles and key reviews were also considered. Where suitable papers did not provide adequate information, authors were contacted by e-mail and requested to provide further information.

Other sources of information used included ‘grey’ literature (including unpublished conference proceedings) and personal contacts with researchers known to have contributed to the development of a particular DST.

Key informant interviews

Key informant interviews were administered to the heads of various departments at the DVS headquarters in Kabete, Nairobi in May and July 2012. Other informants were representatives from:

- African Union-Interafrican Bureau for Animal Resources (AU-IBAR)
- NGOs including Vétérinaires sans Frontières Belgium, Switzerland and Germany
- FAO
- Farm Africa
- Kenya Agricultural Research Institute (KARI)
- Centers for Disease Control and Prevention (CDC) Kenya
Interviews were structured around a pre-developed checklist (Annex I) of issues of concern, even though not necessarily in the same order. Informants were allowed to follow the natural progression of the conversation in order to explore and capture emerging issues. Key issues covered included barriers and incentives, decision-making skills, technical and knowledge support, funding and RVF intervention options.

Focus group discussions

Focus group discussions involved RVF control agents in the field (DVOs) and other stakeholders from various animal health sectors in Kenya. These discussions began in July 2012 after the development of a survey checklist. The same checklist (Annex I) was used to collect data on successes and challenges related to the implementation of the DST. Discussions were flexible and covered all key topics for all the focus groups convened although the order of the checklist questions was not always maintained since discussions were allowed to flow freely. Those interviewed included:

- Veterinary officers in the three RVF hotspots: Northeastern, Rift Valley and Coast provinces
- Representatives from the Kenya Livestock Producers’ Association and the East African Farmers’ Federation and other local livestock keepers from Northeastern, Coast and Rift Valley provinces.

Stakeholder workshop

A stakeholder workshop was held on 25 September 2012 in Naivasha, Kenya. A total of 19 participants drawn from various institutions attended. Discussions were guided by findings of the appraisal studies that had been done to collate experiences, attitudes and perceptions from decision-makers on the applicability of the DST.
Results

Findings from the review of literature

Findings from the review of literature are classified into two sections. The first focuses on early warning systems and risk models and how the DST can be integrated into these systems and the second outlines challenges that are associated with the utilization of such decision support systems in general.

Early warning systems and risk models

Early warning systems constitute a critical component of DST since they are useful for staging the DST. Messages generated from these systems define RVF risk levels, leading to the identification of an appropriate decision point to focus on. Risk maps, on the other hand, are useful for identifying risk zones where interventions suggested by the framework would be applied.

Early warning systems

- GLEWS (www.glews.net) is a system developed jointly by FAO, OIE and WHO. It systematically collects, verifies, analyses and responds to information from a variety of sources, including unofficial media reports and informal networks. The system minimizes unjustified duplication of efforts by linking and utilizing alert messages from different systems and organizations including FAO’s Emergency Prevention System for Animal Health (EMPRES), WHO’s Global Outbreak Alert and Response Network (GOARN) and OIE’s World Animal Health and Information Database. These linkages also help to improve accuracy. The network is managed by a GLEWS task force which is responsible for setting up working groups and identifying diseases of interest. The GLEWS working groups are then involved in tracking trends of the identified diseases, conducting epidemiological analyses, modelling, forecasting as well as risk assessment. After each outbreak debriefing meeting, the GLEWS working groups submit a report including recommendations and conclusions to the GLEWS task force for review and clearance. The task force is responsible for issuing early warning disease alerts and general risk communication.

- Africa Real Time Environmental Monitoring Information System (http://gcmd.nasa.gov/records/GCMD_CIESIN0122. html) – This system, developed jointly by FAO, the National Aeronautics and Space Administration Goddard Space Flight Center, the University of Reading and the National Aerospace Laboratory of the Netherlands, uses remote sensing techniques for surveillance and forecasting under the Global Information and Early Warning System. It generates products such as 10-day and monthly cold cloud density maps for Africa and the Near East (resolution 7.6 km), 10-day and monthly estimated rainfall maps for the southern Sahara, the Sahel, Sudan, and the tropical countries of West Africa (resolution 7.6 km), 10-day and monthly composite vegetation index maps for Africa and the Near East. In addition to these products, the system maintains a 10-year vegetation index archive on a 10-day and monthly basis.

- EMPRES-i (http://www.fao.org/foodchain/empres-prevention-and-early-warning/en/) is a web-based system designed by FAO to support disease control agents through collation, analysis of, and access to, animal disease data. EMPRES-i
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was particularly used to convey information on increasing RVF activity in the Horn of Africa in 2006-07. It enables users to easily access data that can be used for further analysis e.g. as charts or maps. EMPRES-i information sources include country or regional project reports, field mission reports, partner NGOs, cooperating institutions, government ministries of agriculture and health, FAO in-country representatives or other United Nations parties, public domains, the media and web-based health surveillance systems. For verification purposes, EMPRES-i uses official and unofficial sources of information such as in-country assistance projects and personal contacts with NGOs and other institutions. It therefore provides updated information on global animal disease distribution and current threats at the national, regional and global level for priority animal diseases. It also provides access to publications, manuals and other resources, such as contact details of chief veterinary officers and FAO/OIE reference laboratories.

- **GOARN** (http://www.who.int/csr/outbreaknetwork/en/ ) – This is a technical collaboration between institutions and networks to promote rapid identification, confirmation and response to outbreaks of international importance. Its steering committee guides the network's activities including the development of guiding principles for outbreak alert and response and operational protocols to standardize epidemiological, laboratory, clinical management, research, communications, logistics support, security, evacuation and communications systems. The network receives technical and operational resources as well as alerts from scientific institutions in member states, medical and surveillance initiatives, regional technical networks, networks of laboratories, United Nations organizations (e.g. the United Nations Children's Fund and the United Nations High Commissioner for Refugees), the Red Cross (International Committee of the Red Cross, International Federation of Red Cross and Red Crescent Societies and national societies) and international humanitarian NGOs (e.g. Médecins sans Frontières, International Rescue Committee, Merlin and Epicentre).

**Risk models**

In addition to these systems, dynamic models such as the differential equation model developed by Gaff et al. (2007) can also aid in the staging of the DST since they predict changes in RVF risk over time. This model specifically highlights virus persistence for over 10 years provided that contact rates between hosts and the two mosquito species are maintained in an isolated system.

Another study done in Kenya described the use of a regression model to compute relative risks of RVF based on geographic, geologic and meteorological data such as normalized difference vegetation index (NDVI), and land use patterns (Hightower et al. 2012).

Other models have focussed on the risk of RVF with respect to movement of animals and their products through trade (Davies 2006). All of them used qualitative methods and none has specific focus on eastern Africa. One study in Egypt highlighted the possibility of spread of the RVF virus by insects carried by wind and animal movements though trade.

Spatial analysis techniques were used to correlate RVF activity and increased NDVI (Linthicum et al. 1987). One study done in Kenya highlighted the possibility of forecasting RVF outbreaks two to five months in advance by associating the outbreaks with sea surface temperatures and NDVI data (Anyamba et al. 2009). Time series analysis of combined sea surface temperatures and NDVI anomalies were also found to be indicative of intensity and duration of RVF outbreaks in Africa (Anyamba et al. 2002).

A subsequent study using the same methodology was used to provide a two-to-six-week warning for the Horn of Africa that facilitated outbreak response and mitigation activities (Anyamba et al. 2009). These studies used spatial techniques for mapping combined with time series analysis, remote sensing data and other statistical analysis methods (Figure 1a). Additional analyses have also been conducted to predict the distribution of the RVF hotspots based on the data on RVF epizootics obtained from Kenya (Bett et al. 2013). These models utilize climate, remote sensing, geological and limited socio-economic data; their output is demonstrated in Figure 1b.
Their main limitation, however, is availability of data that can be used to drive these systems. In addition, climate models which determine the level of risk do not always give reliable predictions especially in western Africa, the Middle East and Madagascar (FAO-WHO 2008).

Figure 1. Spatial distribution of RVF risk in the greater Horn of Africa estimated from remote sensing and climate data (Anyamba et al. 2009; Figure 1a) and based on the analysis of RVF epizootics (Bett et al. 2013; Figure 1b)

![Figure 1a](image1.png)  ![Figure 1b](image2.png)

### Barriers that impair the use of decision support systems and research outputs

Most publications on decision support systems do not provide information on the challenges that impair uptake and levels of utilization of these systems yet a few of them get assimilated into policy frameworks following their dissemination. A large proportion of these systems are interactive, computer-based tools (such as EpiMAN-FMD (Sanson et al. 1999), classical swine fever decision support system (Crauwels et al. 2001), geographical information systems etc.) with tremendous potential to enhance disease control. Though the DST has not yet been computerised, it is assumed that some of the limitations associated with the use of decision support systems would be relevant for this study. These limitations were classified into four main categories:

- **Technical challenges**
- **Culture change/attitude challenges**
- **Bureaucratic hoops and incentives**
- **Resource limitations and ineffective dissemination models**

#### Technical challenges

Decision support systems require appreciable levels of technical and infrastructural prerequisites for them to be used effectively, particularly on how to process input and output data. Stephens and Hess (1996) describe a study carried...
out to assess the uptake of a PEARCH crop environment computer model that was developed to aid understanding on how crops respond to arid environments. The utilization of the model was impaired by multiple factors including challenges associated with organizing meteorological data for the model. In healthcare, electronic decision support systems are expected to aid decision-makers access knowledge stored electronically. This might help them make conscious choices regarding health and interventions. However, barriers to adoption of such tools have mainly been related to low computer literacy among general users.

The DST shares some of these challenges with regards to the definition of credible decision triggers (based on forecasting models) given that these triggers have to be identified based on reliable prediction systems. Forecasting models, on the other hand, also have their own assumptions and limitations that can be applied to the DST.

Culture change/attitude challenges

Changes in policy may be met with resistance especially when there is lack of understanding on the benefits of the changes or when implementers have alternative options. Wallace et al. (2013) give a comprehensive review of the barriers that impair uptake of scientific evidence by decision-makers: physicians, nurses and medical personnel. The review classifies obstacles encountered into knowledge, attitude and behaviour challenges. Knowledge indicates awareness of and familiarity with information and might be influenced by dissemination levels etc. Negative attitude and behaviour, on the other hand, come from lack of perceived usefulness of the product. The review observes that lack of access to information and limited awareness are significant barriers to uptake of evidence. Innvaer et al. (2002) identified similar barriers and suggested that some of these could be due to:

- Absence of personal contacts between the researchers who generated the outputs and policymakers
- Lack of timeliness or relevance of the research evidence
- Mutual mistrust, including perceived political naivety of scientists and scientific naivety of policymakers
- Power and budget struggles
- Poor quality of research
- Political instability and high turnover of policymaking staff

They propose that two-way communication between researchers and policymakers would facilitate a mutual understanding of a policy question and knowledge needed. Lomas (1997) further states that researchers and policymakers have to view research dissemination and uptake as a communication process between the two sides.

Bureaucratic hoops and incentives

It is believed that no matter how valuable a support tool is, institutional or high-level administrative support is required for it to make meaningful impact. An assessment of the effectiveness of the Intersectoral Action Plan for Health and its Health Impact Assessment Tool in Slovakia established that tools that had been institutionalized, for example Environmental Impact Assessment, worked well compared to those that had not (Mannheimer et al. 2007). Furthermore, the study established that politicians, though supportive of the action plan, had not allocated the required operational budgets. The public servants therefore felt that there was not enough support, resources and training for continuous and routine implementation of the plan. This suggests that decision-makers and politicians need to change their mind-sets in favour of new policies and support tools before they are introduced. New policies and tools, especially if they challenge the status quo or professional prowess, might have far-reaching consequences on tastes, preferences and sensibilities of those who are expected to implement them.
DSTs also ought to enhance horizontal, intersectoral coordination to boost capacity and information exchange. However, such tools need to be institutionalized within and between sectors given that informal working principles do not always hold.

Resource limitations and ineffective dissemination models

Funding bodies do not often provide support for the translation of research outputs into policy (Poulos et al. 2007). Funding periods for these systems are usually too short to ensure effective dissemination (Myers et al. 2000). It is often assumed that the users have been integrated into the research work to enable them take over when funding comes to an end. It is slowly being realized that some of the partnerships formed in the course of a scientific research are not institutionalized and so there is usually no assurance that the research outputs will be carried over.

Dissemination channels used need to identify distinctions across audiences being targeted, ways of enhancing the utilization of a tool and means of addressing negative perceptions on convenience of usage. Lomas (1997) indicates that researchers get ‘one-size-fits-all’ dissemination process and hence fail to tailor the content, timing, setting and format to the audience. A survey conducted by Wilson and Opolski (2009) on barriers for the implementation of a cardiovascular computerised decision support tool suggested ways of enhancing the uptake of the tool e.g. (i) using financial incentives, (ii) joint promotion with a professional body and (iii) undergraduate medical education. For the financial incentive model, users of the tool were provided with a one-off payment linked to a formal agreement for them to install and use the tool in their practice. Payment would be made to the user once evidence is received that the tool is being used and the target number of users has been met. The second dissemination method involved a joint promotion of the system as a valuable decision-making tool by a leading professional body which would allow the users to know that a peak body had endorsed the materials and information within the program. The last method on undergraduate training involved integration of the decision support system in undergraduate training providing students with knowledge and understanding of electronic tools that would be used.

Key informant interviews

A total of 23 key informants, mostly senior veterinary officers and heads of departments at the DVS headquarters in Kabete (9) as well as local representatives from NGOs, KARI, CDC Kenya, AU-IBAR and Farm Africa (14), were interviewed to collate information on:

- whether or not the DST had been used to manage RVF
- extent of usage of the DST
- perceptions on the convenience of usage of the DST
- ability of the DST to guide and promote good responses

Focus group discussions

Three focus group discussions were conducted in Nakuru, Garissa and Mombasa to collate views and perceptions of DVOs and farmer representatives from the three RVF hotspots – Northeastern, Rift Valley and Coast provinces. Each group was composed of 7-9 people. The results of these discussions are presented with those of the key informant interviews.
Use of DST and its ability to guide and promote good responses

It was established that the DST had been incorporated into the RVF contingency plan developed by the DVS and it constitutes Chapter 8 of the RVF action plan. The decision points were classified under the action points defined in the FAO’s guide for developing a contingency plan as outlined in Table 2.

FAO had also used the DST to stockpile vaccines following warnings of heightened risk towards the end of 2012. These developments suggest that a number of institutions had started using the DST though no outbreak had ever occurred since it was developed for a conclusive determination on its suitability/ability to guide and promote good responses.

Extent of usage of the DST

Only 10.6% of all respondents (5/47) in both the key informant interviews and focus group discussions were aware of the existence of the RVF DST. Most of the respondents who were aware of it were senior officers at the DVS in Kabete. It was therefore established that usage of the DST was still limited to the national (veterinary) headquarters given that a majority of the districts/DVOs had not received it nor been sensitized on its application. The focus group discussions identified a number of constraints that had curtailed the widespread dissemination and application of the DST:

- Resource and funding constraints
- Inefficient response measures
- Low morale among veterinary service providers
- Poor coordination and communication

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Resource and funding constraints

The focus group discussions established that the DST had been incorporated into Kenya’s RVF contingency plan and its operational budget (amounting to KES 66,015,880 or about USD 790,609) developed and assimilated into the department’s strategic plans, including Vision 2030 and the medium-term expenditure framework. However, participants stated that the government had not provided the funds and the DVS was exploring ways of supporting the budget, including developing proposals targeting bilateral funds. The department had been hoping to secure and ring-fence these funds especially during inter-epidemic periods as it builds the response capacity. It was also indicated that it is better to raise funds during inter-epidemic periods given that the bureaucratic and slow procedures involved in raising and mobilizing funds would frustrate emergency responses to be used during the high-risk periods.

The department intends to lobby for the required funds but it needs more input on costs and benefits of RVF control to incorporate these in its proposals. It also suggests that social-economic surveys should identify and prioritize issues at the local level that can be used to leverage funding.

Inefficient response measures

Issues raised under this theme focussed on technical challenges that hamper the implementation of the RVF response measures identified in the DST. Participants underscored the need for better and cheaper diagnostic tests that can be used in remote areas to enhance surveillance during inter-epidemic and epidemic periods. It was pointed out that field workers collected samples and sent them to the Central Veterinary Laboratories in Nairobi for confirmatory analyses with initial testing being done at the regional veterinary laboratories. It was indicated that the turnaround time for samples processed at the Central Veterinary Laboratories was too long and so the stock owners had lost patience with the system. Officers who managed sentinel herds indicated that they were not being allocated enough resources for periodic sampling of the animals. Funds assigned to them were not adequate for purchasing consumables and fuel or vehicle repairs and replacing animals that had seroconverted.

Participants suggested that community animal health workers could help in disease reporting in pastoral areas where they offered clinical services. Various models of linking these community animal health workers with veterinarians (as described in reports on the delivery of animal health services) were identified, e.g. linking them with local private veterinarians who operate agro-veterinary stores.

Discussions were held on the need for safer and more effective vaccines while recognizing that existing vaccines caused side effects e.g. abortion. The rate of production and dissemination of these vaccines was also thought to be inadequate. These factors, together with poor acceptability, contributed to low vaccination coverage. Other factors that were attributed to low vaccination coverage included poor security in most RVF hotspots, poor road network and low operational budget. These factors compromised the ability of the department to administer effective vaccination drives. Some of the NGOs had therefore stepped in to support the department although some of their campaigns focussed on defined target areas given their interests to integrate interventions at the community level. The focus group discussions suggested that the DVS needed to play a more critical role in coordinating disease control interventions implemented by the NGOs to ensure that plausible targets (e.g. spatial and population coverage, frequency and safety) were achieved.

Participants indicated that the DVS did not have the capacity to implement vector control measures. This activity was being implemented by the Ministry of Health although its focus was to control mosquitoes in settlement areas and not in watering and animal grazing sites. The DVS was requested to strengthen its capacity to manage RVF especially during the inter-epidemic period when it was possible to cover wide areas.
Low morale among veterinary service providers

DVOs generally felt that RVF was not being taken seriously given that the DVS focussed more on diseases that are perceived as causing the greatest economic burden. They thought that their directors had not prioritized RVF given that it was a zoonotic disease that could be addressed by multiple institutions such as the Zoonotic Disease Unit. They offered suggestions on how to enhance their participation in RVF management policy, namely:

- training on the disease epidemiology, syndromic surveillance, budgeting and cost-benefit analyses, and the use of DST.

- more interaction between researchers and implementers to better understand exposure patterns as well as harmonise response procedures.

- provision of an effective infrastructure/funding for the DST implementation.

- employing more staff as well as retaining the existing ones given that there is a high turnover of staff and it would be difficult to maintain the institutional memory required for effective management of RVF given its long inter-epidemic period.

Poor coordination and communication

The DVOs indicated that the DST and RVF contingency plan had not been disseminated effectively as most of them and their NGO partners had not received it. They observed that there is a need for the DVS to develop modalities of enhancing the utilization of the DST, for example, by assigning specific individuals, offices or other institutions the role of disseminating the DST. They added that the government needs to enforce animal health policies, particularly in the arid and semi-arid areas where the disease is endemic, for the disease control and coordination efforts to be felt on the ground. Some of these efforts could be implemented through the Zoonotic Disease Unit.

Participants also noted that there was need to synchronize policy issues throughout East Africa to allow for the use of the DST as a common RVF management and control tool given that it is a trans-boundary disease. These attempts were already being explored under the AU-IBAR project entitled Standards Methods and Procedures in Animal Health. Some of the steps that would be taken to achieve this include:

- Disease prioritization surveys to harmonize efforts across borders since RVF may or may not be a priority disease in all the target countries.

- Standardization of disease surveillance and control acts.

- Characterization of RVF control programs in the target countries and the development of a region-wide acceptable standards.

- Identification of a coordinating body (such as the Intergovernmental Authority on Development, FAO or AU-IBAR) to manage these activities.

- Establishment of a database of stakeholders in the field of RVF research through which pertinent information such as research results can be passed along from one institute to another. This will promote information flow between institutions as well as enhance communication and collaboration;

- Strengthening of the existing public-private partnerships to ensure smooth implementation of the DST especially during emergencies. These include linkages with trader associations, the police/security forces, border patrols and community representatives.
Utilization of the Rift Valley fever decision support tool in Kenya: Successes and challenges

There is need for an official platform to facilitate communication and collaboration between government institutions and NGOs as the current ones are based on personal relationships/acquaintances. This hampers collaborations especially during emergencies. Memoranda of Understanding would promote, nurture and guide institutional partnerships that will far outlive individual relationships. District Steering Groups should be set up even in non-arid and non-semi-arid areas to assist in coordination of disease control activities during emergencies. This would ensure sharing of resources as well as tone down excessive institutional competition.

Perceptions on the convenience of usage of the DST

Participants who had used the DST indicated that the number of decision points identified was high and the document was voluminous and so there was need to develop shorter versions of the document (e.g. briefs and leaflets) to improve its distribution and accessibility. Suggestions were also made on the need to improve prediction models.

Stakeholder workshop

Nineteen participants drawn from various institutions attended the workshop convened on 25 September 2012 in Naivasha, Kenya to verify the findings of the focus group discussions including the challenges associated with the utilization of the DST, and identify effective ways of disseminating the tool.

Below is a summary of the key points discussed at the workshop.

- The level of utilization of the DST has been very low. Under 10% of decision-makers had received the tool, partly because the channel that was used for its dissemination (e-mail) is inaccessible for most of the field officers. In addition, the DST was said to be rather long (32 pages). The workshop recommended the development of simpler versions of the document like posters or brochures that would be easier to read and disseminate. These documents could then be distributed during stakeholder meetings and to all the DVS offices throughout the country.

- The DST has been incorporated into the RVF contingency plan that was developed by the DVS in liaison with FAO. The DST forms Chapter 8 of the contingency plan. It was however noted that the DVS should involve other stakeholders in the development of the contingency plan. This would also help transform the contingency plan/DST into a One Health framework when the needs and inputs of the other relevant stakeholders, e.g. Ministry of Health, are incorporated. The workshop came up with a list of stakeholders that could be involved. These were classified into three main groups: advisory or coordination team, response or implementation team and financiers. The contingency plan will need to be revised, spelling out the roles of each stakeholder group.

- The workshop was informed that most respondents interviewed in the DST assessment studies regarded the stages defined in the DST as being numerous (12 in total) with some of them being too close in time to be considered as being independent decision points. The workshop recommended having five key decision points, namely, normal, early warning, pre-outbreak, outbreak and step-down phases, with the DST stages being classified under them (five stages) while retaining the detailed information presented in the DST.

- The workshop observed that RVF response measures, mainly vaccination, movement control and surveillance, are often implemented late, haphazardly and at very low levels of coverage. For example, during the RVF outbreak in 2006-07, vaccination was implemented from February 2007 when the epidemic was tailing off. The coverage attained then was estimated to be 3-18% in cattle, 3-56% in sheep, 1-25% in goats and 2-4% in camels. The DVS indicated that it often faced major challenges in funding RVF control. The DVS was however challenged to explore other channels of mobilizing resources, including developing proposals for external funding.
Discussion

Since the last RVF outbreak in the Horn of Africa 2006-07, efforts have been made to develop decision support tools and frameworks to improve response capacity. The need for decision support tools is informed by the fact that RVF epizootics occur in irregular cycles that offer immense challenges for governments to develop clear intervention strategies in the face of an outbreak after a period of no visible RVF activity. Inter-epidemic periods are characterized by a decline in the levels of awareness; limited resources are therefore shifted to other diseases or more pressing problems (Martin et al. 2008). In addition, future decision-making in RVF control is complicated by uncertainties regarding types of drivers that are critical for the disease occurrence. Though it is suspected that there is a threshold level of precipitation that would heighten the risk of an epidemic, it is likely that a convergence of a number of events (e.g. strong reduction in population immunity, presence/emergence of infectious vectors, persistent precipitation, presence of a critical population of hosts etc.) are required for an outbreak to occur. It is not always possible to predict the convergence of these factors. Therefore, uncertainties about the disease causation impose severe limitations on the choice of interventions.

The DST was developed to help decision-makers in the Greater Horn of Africa take timely, evidence-based decisions to prevent and mitigate the impacts of RVF (Consultative Group for RVF Decision Support 2010). Its development and dissemination was, however, based on four key assumptions suggesting the existence of emergency fund that can be made available based on predetermined criteria, communication system with a clear chain of command, and that during normal situation the users will review the suggested interventions in line with the contingency plan. Observations generated by this study, however, indicate that these assumptions have proved to be the DST's Achilles heel.

The key strengths of the study is that it addressed barriers to the utilization of the DST through sequential steps that started with a review of 43 articles, followed by key informant interviews and focus group discussions with stakeholders from diverse backgrounds and lastly, a stakeholder workshop that validated the findings obtained. From these activities, four parameters were identified and used to gauge the level of utilization of DST: (i) whether or not the DST had been used to manage RVF, (ii) the extent of usage, (iii) perception on the convenience of usage, and (iv) its ability to guide and promote good responses.

There were a few challenges associated with the implementation of the study. First, very scanty information regarding uptake and level of utilization of decision support tools was obtained despite a good number (n = 43) of articles reviewed. Most of the articles focused on decision support systems that were mainly being used in the medical field in developed countries. Moreover, most of the systems reviewed had not been applied in official policy settings, suggesting that there could be publication bias acting against systems that get disapproved by policymakers. This might also suggest that the development of decision support systems is seldom linked to desired needs leading to its inability to gain traction in the policy arena. To guard against narrowing the review to a few potentially non-representative articles, those focusing on challenges of uptake and utilization of research outputs in general were included. Second, the fourth assessment parameter envisages a scenario where the DST has been fully utilized through its 12 decision points. Fortunately, the Horn of Africa has not had an RVF outbreak since the DST was developed. Reports relating
to the successful application of the DST represent preparatory activities that were implemented in response to heightened risk of RVF in 2008 and 2012 that never developed into an outbreak.

The results of this study agree with those of one carried out in 2010 to investigate the sources of early warning messages and response measures implemented by the DVS during the 2006-07 RVF outbreak in Kenya (Gachohi et al. 2012). In that study, 10.2% of the survey respondents were aware and had received a copy of the RVF DST. This shows that there have not been any efforts to disseminate and increase awareness and utilization of this tool. In addition, barriers and challenges hindering the uptake of the DST that were identified during the focus group discussions and key informant interviews corroborate those identified from the literature review. To some extent, this is expected because the checklist used to guide the focus group discussions was developed based on the evidence obtained from the review. Nevertheless, the focus group discussions and key informant interviews were conducted in an open manner to encourage and foster the identification of new information leads. The focus discussion groups, for instance, indicated frontline personnel in the DVS (in the districts) lacked the drive to implement RVF control policy for what they perceived to be lack of support and prioritization of the disease at the headquarters. This culture goes against the spirit of the DST which in fact recommends a raft of measures that should be implemented during normal (inter-epidemic) periods e.g. establishment of information systems, risk analyses, training of personnel, pre-testing of messages, among others. These measures, if implemented, would reduce impulsive responses when risk warnings are provided. More work is therefore needed to promote the culture of risk-based decision-making as espoused in the DST.

Resource limitations and underfunding of RVF interventions were identified as critical and long-standing challenges that the department should find innovative ways of addressing e.g. by developing proposals for funding. It was also realized that though the government has not allocated any funds to the RVF emergency fund, it has invested a substantial amount of funds to establish disease-free zones at the Coast Province and in Laikipia, Isiolo and North Rift. This intervention has been supported by proponents of integrated management of trans-boundary animal diseases since it provides a platform for the development of contingency plans for a range of trade-sensitive diseases. The department should, however, not lose sight of the need to develop capacity for managing emergency responses such as the ones needed when RVF outbreaks occur. In the past, it has been criticized for not managing disease outbreaks and balancing investments in disease control against successive surges in case counts. The department in fact has a huge potential to play a coordination role when it does not have adequate funding to implement the interventions.
References


Annex 1: Checklist for discussion points for key informant interviews and focus group discussions

Several factors may prevent a tool from making any significant impact in helping to improve the decision-making process. These can perhaps be grouped into

1. **Limitations due to its constructions or assumptions contained within it**
   - Language/ comprehension/ simplicity
   - General layout

2. **Constraints to its widespread uptake and use**
   - Intellectual constraints
     - Not convinced of applicability or credibility
   - Technical constraints
     - Access to the tool, software, hardware
     - Couldn’t understand the program/need for capacity building
     - Labour intensive
   - Operational constraints/systems analysis
     - Access to meteorological data
     - Lack of technical or intellectual support
     - Perception on the level of coordination between ministries
     - Assessment of the capacity to implement contingency plans e.g. human and financial resources, materials and equipment
     - Unreliable and untimely funding. Implementers feel that not enough resources and training are available for a continuous and routine implementation of tools
• Need for establishment of a technical support facility or other liaison committees by email, fax etc. and training

• Information flow and what needs to be done to increase efficiency

3. Factors preventing it from making meaningful impact on the way people think or behave

• Awareness of the DST and other tools that have been developed for animal health. Identify potential usefulness of these frameworks

• Perceptions on the existing RVF control policies and contingency plans

• ‘Protection’ of a country’s national interests, jurisdictions/boundary issues, security, economic prosperity and ideological goals

• Policy of some institutions to use models developed in-house/political opinion

• Budget ceilings/strict guidelines, limited capacity to generate local resources

• Decision-makers limited in their ability to implement research products due to failure by researchers to include economic evaluations and policy recommendations, alongside evidence of efficacy

• Local customs, values and priorities, regional specificity, differing production system

• Donor preferences playing the largest role in determining policies, but scientific findings should play the largest role

• Organizational factors

• Government instructions, planning, training, supervision, morale of service providers, extent of collaboration between service agencies, relations between service providers and communities

• Poor understanding of the research process by policy-makers and few opportunities to learn

• How does the tool compare with the conventional methods or other new methods that may be available in the short to medium term?

• How does the tool interface with other existing and new methods that may be recommended and implemented in the future?
  • Fits with current practice, norms/values
  • Does not demand change in existing practice
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