

International Livestock Research Institute

Workshop report

Evaluation of a risk map and decision support frameworks for managing
Rift Valley fever in the Republic of South Sudan

Bernard Bett, Aluma Araba, Cristobal Verdugo and Jada Rombe






October 2013



© 2013 International Livestock Research Institute (ILRI)



This publication is copyrighted by the International Livestock Research Institute (ILRI). It is licensed for use under the Creative Commons Attribution-Noncommercial-Share Alike 3.0 Unported License. To view this license, visit <http://creativecommons.org/licenses/by-nc-sa/3.0/>. Unless otherwise noted, you are free to copy, duplicate, or reproduce, and distribute, display, or transmit any part of this publication or portions thereof without permission, and to make translations, adaptations, or other derivative works under the following conditions:

-  **ATTRIBUTION.** The work must be attributed, but not in any way that suggests endorsement by ILRI or the author(s)
-  **NON-COMMERCIAL.** This work may not be used for commercial purposes.
-  **SHARE ALIKE.** If this work is altered, transformed, or built upon, the resulting work must be distributed only under the same or similar license to this one.

NOTICE

For any reuse or distribution, the license terms of this work must be made clear to others.

Any of the above conditions can be waived if permission is obtained from the copyright holder.

Nothing in this license impairs or restricts the author's moral rights.

Fair dealing and other rights are in no way affected by the above.

The parts used must not misrepresent the meaning of the publication. ILRI would appreciate being sent a copy of any materials in which text, photos etc. have been used.

AUTHORS

Bernard Bett, International Livestock Research Institute

P.O. Box 30709-00100, Nairobi, Kenya

Aluma Araba, Ministry of Agriculture, Forestry, Tourism, Animal Resources, Fisheries, Cooperative and Rural Development

P.O. Box 126, Juba, South Sudan

Cristobal Verdugo, International Livestock Research Institute

P.O. Box 30709-00100, Nairobi, Kenya

Jada Rombe, Ministry of Agriculture, Forestry, Tourism, Animal Resources, Fisheries, Cooperative and Rural Development

P.O. Box 126, Juba, South Sudan

CITATION

Bett B, Araba A, Verdugo C and Rombe J. 2013. *Evaluation of a risk map and decision support frameworks for managing Rift Valley fever in the Republic of South Sudan*. Workshop report. Nairobi, Kenya: ILRI.

Contents

Acronyms and abbreviations	iii
Acknowledgements.....	iv
Executive summary	v
1 Background	1
2 Workshop objectives	1
3 Session highlights.....	2
3.1 Session 1: Official opening.....	2
3.2 Session 2: Technical presentations	2
3.2.1 Presentation I.....	2
3.2.2 Presentation II.....	3
3.2.3 Presentation III.....	4
3.3 Session 3: Group discussions and presentations	4
3.3.1 Eastern Equatoria.....	4
3.3.2 Upper Nile	6
3.4 Session 4: Plenary discussions	7
3.5 Session 5: Presentation on the RVF risk map.....	9
3.6 Session 6: Discussions on RVF decision support tools	9
3.7 Session 7: Recommendations	10
4 References	11
Annex I: List of participants.....	12
Annex II: The latest copy of RVF decision support tool	13
Annex III: The workshop Program.....	14
Annex IV: Checklist for break-out group discussions.....	15

Acronyms and abbreviations

ARFS	Animal Resources and Fisheries Sector
AU IBAR	African Union Interafrican Bureau for Animal Resources
CAMP	Comprehensive Agricultural Development Master Plan
CDC	Centers for Disease Control and Prevention
DST	Decision Support Tool
EES	Eastern Equatoria State
FAO	Food and Agriculture Organization of the United Nations
HPAI	Highly pathogenic avian influenza
IEC	Information, Education and Communication
IGAD	Inter-Governmental Authority for Development
ILRI	International Livestock Research Institute
MAFTARFC & RD	Ministry of Agriculture, Forestry, Tourism, Animal Resources, Fisheries Cooperatives and Rural Development
NASA	National Aeronautics and Space Administration
NDVI	Normalised Difference Vegetation Index
NGO	Non-governmental organization
RVF	Rift Valley fever
TADS	Transboundary Animal Diseases
UN	United Nations
UNEP	United Nations Environmental Programme
VSF-B	Vétérinaires Sans Frontières Belgium
VSF-G	Vétérinaires Sans Frontières Germany
VSF-S	Vétérinaires Sans Frontières Switzerland
WHO	World Health Organization

Acknowledgements

We greatly appreciate the support we received from the Ministry of Agriculture, Forestry, Tourism, Animal Resources, Fisheries, Cooperative and Rural Development (MAFTARF & RD). We are also grateful to all the participants for finding time to attend the meeting. This meeting was supported by agriculture-associated diseases theme of the CGIAR Research Program on Agriculture for Nutrition and Health.

Executive summary

A two-day workshop was held in Juba, the Republic of South Sudan on 15-16 October 2013 to: (i) evaluate a draft Rift Valley fever (RVF) risk map that has been generated from statistical analyses conducted at ILRI, and (ii) review the existing RVF Decision Support Frameworks and determine how to utilize them in the development of RVF Contingency Plans. A total of 25 participants drawn from the Ministry of Agriculture, Forestry, Tourism, Animal Resources, Fisheries, Cooperative and Rural Development (MAFTARFC & RD), non-governmental organizations (NGOs), International Livestock Research Institute (ILRI), Food and Agriculture Organization of the United Nations (FAO) South Sudan and four states (i.e., Eastern Equatoria, Jonglei, Upper Nile and Lakes) (Annex I) attended the meeting.

The first day of the meeting focussed on RVF risk mapping. Technical presentations on the current knowledge on RVF, timelines on historical epidemics that have occurred in the country as well and responses that were implemented were presented by participants from MAFTARFC & RD, FAO and ILRI. These presentations were succeeded by group discussions to further characterise the outbreaks that occurred in 2007 in Upper Nile and Eastern Equatoria states. These discussions identified areas where the outbreaks occurred, types of livestock that were affected, human involvement, factors that make the affected areas be vulnerable to the disease and measures that were put in place by local and international institutions to manage the outbreaks. Risk factors identified from these discussions (e.g., high population of sheep and goats, altitude, topography/floods, presence of wildlife, high frequency of livestock movement, and high temperatures) were used to rank the other remaining eight states according to their suitability for RVF occurrence. This was followed by a presentation covering analyses that were being done at ILRI to generate a RVF risk map for the entire IGAD region. A draft risk map that had been generated from these analyses for the Republic of South Sudan was then presented for more focussed discussions.

The second day of the meeting focussed on the RVF Decision Support Tool (DST) (Annex II). A presentation was made to demonstrate how the DST was developed. The presentation reviewed the timelines constructed following in the 2006/2007 in the northeastern Kenya and how these timelines were used to formulate decision points identified in the DST.

Kapoeta East, Kapoeta North and Kapoeta South Counties in Eastern Equatoria state and Renk, Mellut, Maban and Chemudi Counties in Upper Nile state were identified as the areas that had RVF outbreaks in 2007. In all these sites, small ruminants (mainly sheep) and humans were affected. Measures that were implemented by the government, with support from local and international NGOs, included active surveillance, sample collection, provision of laboratory supplies and development of information, education and communication (IEC) materials. The participants indicated that Jonglei State has similar ecological features as Upper Nile and East Equatoria states and so it should also be considered as having a high RVF risk despite that no cases were reported there. The meeting noted that the level of underreporting of disease outbreaks is quite high throughout the country and it is likely that the RVF outbreaks that occurred in East Equatoria and Upper Nile states in 2007 received tremendous attention because of the human cases that occurred there. From the simple ranking exercise based on the presence of predisposing factors for RVF, Upper Nile, Eastern Equatoria, Jonglei and Unity states were identified as the states with the highest risk of RVF compared to the others.

The last session of the meeting reviewed ways in which knowledge generated from research could be used to guide the development of a contingency plan for managing the disease. Reference was made to a template for an RVF contingency plan that has been developed by FAO found at <http://www.fao.org/docrep/005/y4140e/y4140e00.HTM>. The template has 10 sections including: (i) nature of the disease, (ii) Risk analysis for RVF, (iii) prevention strategies, (iv) early warning contingency plan, (v) strategies for control and eradication of RVF, (vi) organizational arrangements for RVF emergencies, (vii) support plans, (ix) action plans and (x) appendices (Geering et al. 2002). The meeting was informed that the RVF Decision Support Tool (Appendix II) that was developed in Kenya following the 2006/7 outbreak is in fact an action plan that could be used to develop Section IX of the contingency plan. The meeting was also notified that the African Union Interafrican Bureau for Animal Resources (AU IBAR) was developing standard methods and procedures for harmonizing interventions for trade-sensitive transboundary diseases (TADs) in the IGAD region.

Recommendations

Recommendations made are listed below. The Director of Vector and Disease control was requested to coordinate the implementation of these recommendations.

- **Action: FAO and World Health Organization (WHO)**

These United Nations (UN) agencies are requested to facilitate the formulation of an inter-sectoral committee that would help in the management of zoonotic diseases including RVF. Some of the zoonotic diseases – mainly brucellosis, trypanosomosis, and anthrax – are among the diseases that have been prioritized for intervention in the Comprehensive Agricultural Development Master Plan (CAMP). It was pointed out that a one-health/multi-sectoral approach to the management of these diseases would be more beneficial than if each sector implemented their respective programmes alone. In the past, an inter-sectoral committee has been formulated to address epidemics of zoonotic pathogens such as H5N1 highly pathogenic avian influenza (HPAI) and RVF but their mandates were not sustained. The meeting further suggested that funds should be set aside for facilitating such a team in order to be sustainable.
- **Action: The MAFTARFC & RD**

The Ministry was asked to build the capacity of their epidemiology unit through staff recruitment and training so that the unit can be more proactive in disease surveillance and response. The workshop suggested that states should be involved in the development of the unit.
- **Action: ILRI**

The meeting noted that the risk map would be beneficial especially if socio-economic data were included to allow for the estimation of the impacts of the disease. Some of the participants indicated that they worked in some of the areas where the risk was perceived to be high and they would be willing to participate in the validation of the map as well as in the collation of socio-economic data. ILRI experts were therefore urged to promote risk mapping of RVF in the Republic of South Sudan that combines the risk of the occurrence of the disease as well as vulnerability indices.

1 Background

The Republic of South Sudan is one of the countries in eastern Africa region that have had periodic outbreaks of RVF. The country (including Sudan) has had reported outbreaks in 1936, 1973, 1976, 1981 and 2007. The recent outbreak affected at least two states: Upper Nile and East Equatoria. The impact of that outbreak is however not known because no systematic surveys were done to ascertain its incidence and spatial extent. It is presumed that the human cases that occurred in Upper Nile and Eastern Equatoria states prompted a local and international response.

Many countries in the Horn of Africa have made tremendous progress in the development of RVF risk maps and contingency plans to improve their response capacity. RVF risk mapping is one of the most important tools, since it can be used to guide decision making as well as for the identification of appropriate interventions and amount of resources required by area based on human and livestock densities, location and socio-economic practices (e.g. pastoralism, sedentary agriculture etc.). Reliable maps based on precipitation patterns, normalised difference vegetation index (NDVI), sea surface temperatures and outgoing long-wave radiation anomalies have been produced by Anyamba et al. (2009) from the National Aeronautics and Space Administration Goddard Space Flight Centre. The current work (being implemented in the IGAD region including Tanzania) attempts to refine the RVF risk maps by incorporating additional variables such as soil types, land use changes, altitude and livelihood patterns in the analysis. The maps will also show local administrative units that the local institutions can easily recognise and relate with. It also aims to assist countries refine their contingency plans by promoting the use of RVF Decision Support Tool (DST) as an action plan.

2 Workshop objectives

- To review the current situation of RVF in South Sudan
- To evaluate the draft RVF risk map that has been generated from statistical analyses conducted at ILRI,
- To review the existing RVF Decision Support Frameworks and determine how to utilize them in the development of RVF Contingency Plans.

3 Session highlights

The workshop had a total of five sessions. The highlights of these sessions are outlined below and the program used is given in Annex III.

3.1 Session 1: Official opening

The meeting was officially opened by Prof Erneo Ochi, the Director of Research and Development, MAFTARF & RD. He welcomed all participants and gave an overview on RVF situation in the Republic of South Sudan. He indicated that RVF outbreak was reported in Greater Kapoeta and Northern Upper Nile State (Renk County) between September 2007 and February 2008. Survey was conducted and samples were collected from livestock in Kapoeta and Renk areas. Prof Erneo asked the workshop facilitators to share lessons learnt from the other East African counties on the disease to help the country develop her contingency plans.

3.2 Session 2: Technical presentations

Three technical presentations were made in the first session to set the background for the workshop.

3.2.1 *Presentation I*

The first presentation was given by Cristobal Verdugo (ILRI) on the current knowledge on RVF.

Key points made in the presentation include:

- RVF is a viral zoonosis with outbreaks associated with abnormally high rainfall
- Mosquitoes in six mosquito genera are capable of being infected but not all of them can be/are efficient vectors
- The susceptibility of livestock to the disease varies by species; sheep are the most susceptible species followed by goats, cattle and camels in that order. Abortion rates in sheep approaches 100%
- Humans get exposed to the disease through a direct contact with infected animals, e.g. when offering care to the sick, slaughtering or ingestion of infected meat and milk. Infection through a bite of infected mosquito is also possible. Most of the cases in humans however pass as flu-like syndromes



Plate 1: Cristobal Verdugo presenting on the current knowledge on RVF

3.2.2 *Presentation II*

The second presentation was given by Nimaya Mogga, a Livestock Officer with FAO South Sudan. He indicated that:

- The Republic of South Sudan falls in the RVF risk zone (as per the recent map developed by NASA); the country was last affected by the disease in September 2007 – February 2008. Outbreaks were reported in Renk and Kapoeta.
- Outbreaks were reported from these areas following human exposure
- Nimaya also gave historical perspectives on RVF in the former Sudan. He indicated that:
 - o in 1936, a serological screening of 164 sera from humans found out that 7% of the samples were positive
 - o In December 1973, an epidemic that involved sheep, goats and cattle occurred in Kosti (White Nile), El Dueim and Sennar
 - o In June 1976, dairy farms in Khartoum North were affected following the importation of cattle from the White Nile. Two human cases were reported in this epidemic
 - o In 1981, 3% of 846 human sera from military recruits, patients hospitalised from Khartoum and Gezira were found to be positive for RVF
 - o In September – October 2007, over 30% human mortalities were reported from White Nile, Sennar, Khartoum and Gezira states
- He indicated that following the 2007 outbreak, a TCP project was formulated to control the disease. No results were however provided for the samples that were collected during the outbreak investigation. The project launched awareness campaigns, developed information, education and information (IEC) materials and offered a course for human and animal health workers. A sero survey conducted in greater Kapoeta was also conducted by the government veterinary with the funds from the TCP. Another survey on the RVF vectors was conducted in the affected areas of the whole country (Sudan) but not laboratory results were provided.



Plate 2: Nimaya Mogga presenting on FAO's experiences on RVF in the Republic of South Sudan

3.2.3 *Presentation III*

The third presentation was given by Prof Erneo Ochi, the Director of Research and Development, MAFTARFC & RD. He gave an overview on the prevalence of RVF in the Republic of South Sudan; key points made include:

- The country is endowed with a lot of natural resources; livestock population is estimated to be 11.7 million cattle, 12.1 million sheep, and 12.4 million goats. From the 2008 census, human population is estimated to be 8.26 million.
- RVF is one of the main diseases in the country and little progress has been made towards understanding its epidemiology in the country
- No confirmatory diagnoses were provided for the outbreaks that occurred in 2007 in Renk and Upper Nile. However, in Sudan, 747 human cases were recorded with 230 mortalities
- A sero-surveillance survey that was done in Kapoeta revealed the presence of IgM antibodies
- The control of the disease is complicated by lack of facilities (laboratories, vehicles, health), low human capacity (numbers and technical capacity), inaccessibility of RVF hotspots during rains
- There are, however, some opportunities that can be used as entry points. These include: political will, peace and stability, economic growth, presence of key stakeholders. There is need therefore to strengthen veterinary extension, improve the overall surveillance system, conduct epidemiological studies and mobilize resources for the disease management.

3.3 Session 3: Group discussions and presentations

Two groups were constituted to characterise the outbreaks that were reported in 2007 in the Upper Nile and East Equatorial states. Questions used to guide these discussions are given in Annex IV.

Notes made by each of the groups are outlined below.

3.3.1 *Eastern Equatoria*

Areas affected by the outbreak in 2007 in the state

- Kapoeta East, North and South Counties

Livestock species affected by the disease include:

Sheep

One person died from the disease

Key signs observed in livestock (and humans if applicable)

- a) Sheep – high abortion rates but low mortality
- b) Human- Haemorrhagic fever

Interventions that were put in place to manage the outbreak

- a) A team from national ministry and Eastern Equatorial state was formed to investigate the outbreak and sample was collected from sheep, goats and cattle for serological screening. Positive samples were found only in sheep
- b) Entomological survey was later done in 2010 to identify mosquito species. However, the results were not shared with government of South Sudan

Factors that make the areas identified above to be vulnerable to the disease

- a. Heavy rains
- b. Flood
- c. Drought
- d. High population of sheep and goats
- e. Relative high humidity and temperature
- f. Presence of vectors
- g. Uncontrolled livestock movement. Cross-border livestock movement between Kenya, South Sudan and Ethiopia

Measures that the national and local governments have put in place to mitigate the impacts of such outbreak in future

- a) Government is putting in place policies and infrastructure to address any future RVF outbreaks in South Sudan
- b) Enhance collaboration with development partners and other stakeholders
- c) Provide resources
- d) implementation of the policy and mobilization of resources

Other measures that should be put in place to improve the response capacity

- a) Formulation policy framework
- b) Capacity building to improve human resources and infrastructure
- c) Community sensitization and mobilization (awareness)
- d) Emergency Preparedness and Response
- e) Surveillance
- f) Regional approach and coordination
- g) One Health Approach
- h) Vector control
- i) Vaccination
- j) Research

3.3.2 Upper Nile

Areas affected by the outbreak in 2007 in the state

- Chemudi
- Renk
- Mellut
- Maban

Humans and livestock were affected by the disease. The livestock species affected included sheep and goats.

Key signs observed in livestock (and humans if applicable)

- c) Sheep – high abortion and mortality rates
- d) Human- Haemorrhagic fever

Interventions that were put in place to manage the outbreak

Awareness

- Sample collection and safety precautions
- Formulation of a multi-disciplinary team (FAO/WHO/ARFS/MARF/MOH/CDC/Ministry of Wildlife/UNEP) and constitute a response team
- Supply of laboratory materials to support the central laboratory
- Training of laboratory personnel in diagnostic techniques
- Development of IEC materials
- Joint training of vets and human health personnel

Factors that make the areas identified above to be vulnerable to the disease include:

1. Flooding
2. Large population of sheep and goats
3. Seasonal livestock movement
4. Presence of mosquitoes
5. High temperatures
6. Irrigation at Jauda

Measures that the national and local governments have put in place to mitigate the impacts of such outbreak in future

1. Improve service delivery
2. Surveillance
3. Vaccination against other diseases
4. Strengthen reporting system
5. Public health awareness
6. Strengthen diagnostic capacity at national level
7. Monitoring and early warning

Other measures that should be put in place to improve the response capacity

Table 1: RVF mitigation measures that can be implemented by the government, community and other stakeholders

By government	By community	By stake holders
<ul style="list-style-type: none"> • Enforce policy to regulate livestock movement • Strengthen surveillance and reporting system • Interagency collaboration(one Health • Contingency plans prepared • Public awareness 	<ul style="list-style-type: none"> • Awareness • Early reporting • Isolate cases • Local knowledge 	<ul style="list-style-type: none"> • Linkages with regional bodies/ and research institutions-ILRI/IGAD • Formation of interagency response team

NB: The outbreaks in the two states, Upper Nile and Eastern Equatoria were reported between September 2007 and February 2008. Interventions were implemented from January 2008.

3.4 Session 4: Plenary discussions

Attempts were made to rank the states based on the range of risk factors that could predispose an area to RVF; Table 2 gives the results of this exercise. States that have the highest risk factors include Upper Nile, Jonglei, Unity and Eastern Equatoria. This distribution of risk factors can be considered while validating the risk map.

Table 2: Relative distribution of the various risk factors of RVF across the states of the Republic of South Sudan

Risk factor	Eastern Equatoria	Jonglei	Unity	Lakes	Upper Nile	Central Equatoria	Western Equatoria	Western Bahr el Ghazal	Northern Bahr el Ghazal	Warrap
Range of livestock movement	+++ (Toposa)	++ (Restricted movement)	+++	++ (Warrap, WE, CE & Unity States)	+++	++	+	++	++	++
Mean rainfall density	++ (Kapoeta Counties)	+++	+++	+++	++	++++	++++	+++	+++	+++
Mean temperature	+++ (Kapoeta Counties)	++	++	++	+++	++	++	+++	+++	+++
Floods	+(rain flood)	+++ (eastern)	+++ (half/ha lf)	++ (western)	+++ (western)	+	+	+	+++	+++
Livestock density (Sheep & Goats)	+++ (Kapoeta Counties)	++	+++	++ (more goats than sheep)	+++ (nomadic Goats)	+	+	++	++	++
Wildlife density	+++ (Guns)	+++	++	++	++	++	+++	++	+	+
Altitude	Low	Low	Low	Low	Low	High	High	High	Flat	Flat

The symbol + indicates presence; the higher the number the more prevalent the risk factor

3.5 Session 5: Presentation on the RVF risk map

A presentation outlining the types of analyses that have been done to generate an RVF risk map for the eastern Africa region was made. These analyses have utilized historical data on RVF outbreaks obtained from the Department of Veterinary Services, Kenya. The presentation highlighted descriptive analyses and regression models that have been employed in the work. Two main regression models that have been used include:

- A mixed effects logistic regression model with precipitation, NDVI, soil types, altitude (as fixed effects) and livelihood zones (as a random effect).
- Spatial membership multiple model that adjusts for a neighbourhood structure using Markov Chain Monte Carlo technique.

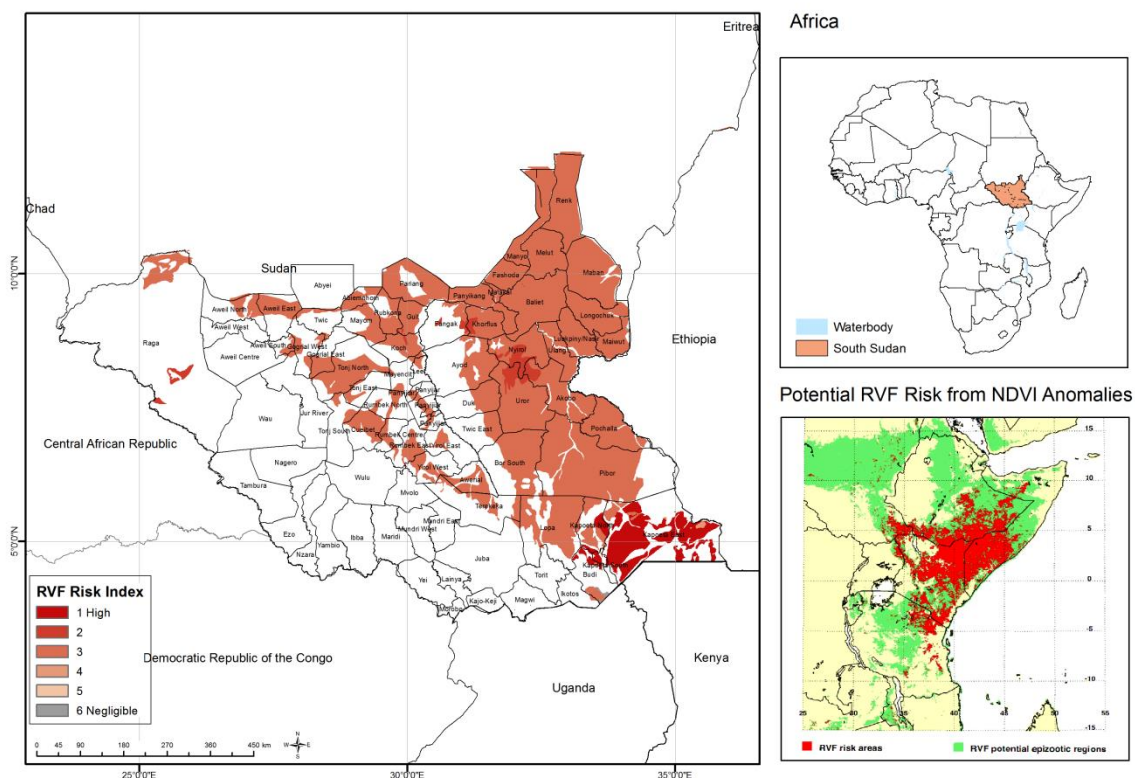


Figure 1: Draft RVF risk map for the Republic of South Sudan. The inset map on the bottom right is a similar map that was developed by NASA (Anyamba et al. 2009)

3.6 Session 6: Discussions on RVF decision support tools

The last session of the workshop focussed on how to transform the knowledge that has been generated from research into the disease control tools and frameworks. The workshop was taken through the existing tools that can be employed for managing the disease in the country. These tools include:

- I. Contingency plan
- II. Decision Support Tool
- III. Standard Methods and Procedures

Contingency Plan

A template that has been developed by FAO for developing a Contingency Plan for RVF (<http://www.fao.org/docrep/005/y4140e/y4140e00.HTM>) was briefly reviewed focussing on the suggested format and contents:

1. Nature of the Disease
2. Risk Analysis for RVF
3. Prevention Strategies
4. Early Warning Contingency Plan
5. Strategies for Control and Eradication of RVF
6. Organizational Arrangements for RVF Emergencies
7. Support Plans
8. Action Plans
9. Appendixes
10. Training, testing and revising the contingency plan

Decision Support Tool

The meeting was taken through the process that led to the development of a decision support tool provided as Annex III. Its development was based on participatory surveys that were done in the northeastern Kenya following the 2006/7 RVF outbreak. The meeting was also notified that the DST is basically an action plan that can be incorporated into the Contingency Plan in Chapter 8.

Standard Methods and Procedures

The workshop was briefly informed about plans that are being made, with the leadership of AU IBAR to develop standard methods and procedures for harmonizing interventions for transboundary diseases, including RVF, across the IGAD countries and Tanzania. These documents would be circulated to all the member states once they have been finalised and approved.

3.7 Session 7: Recommendations

The last session concentrated on the development of the workshop recommendations. The recommendations made are outlined below. The Director of Vector and Disease control will be expected to ensure their full implementation.

- **Action: FAO and World Health Organization (WHO)**

These United Nations (UN) agencies are requested to facilitate the formulation of an inter-sectoral committee that would help in the management of zoonotic diseases including RVF. Some of the zoonotic diseases – mainly brucellosis, trypanosomosis, and anthrax – are among the diseases that have been prioritized for intervention in the Comprehensive Agricultural Development Master Plan (CAMP). It was pointed out that a one-health/multi-

sectoral approach to the management of these diseases would be more beneficial than if each sector implemented their respective programmes alone. In the past, an inter-sectoral committee has been formulated to address epidemics of zoonotic pathogens such as H5N1 highly pathogenic avian influenza (HPAI) and RVF but their mandates were not sustained. The meeting further suggested that funds should be set aside for facilitating such a team in order to be sustainable.

- **Action: MAFTARFC & RD**

The Ministry was asked to build the capacity of their epidemiology unit through staff recruitment and training so that the unit can be more proactive in disease surveillance and response. The workshop suggested that states should be involved in the development of the unit.

- **Action: ILRI**

The meeting noted that the risk map would be beneficial especially if socio-economic data were included to allow for the estimation of the impacts of the disease. Some of the participants indicated that they worked in some of the areas where the risk was perceived to be high and they would be willing to participate in the validation of the map as well as in the collation of socio-economic data. ILRI experts were therefore urged to promote risk mapping of RVF in the Republic of South Sudan that combines the risk of the occurrence of the disease as well as vulnerability indices.

The meeting was officially closed by Prof Erneo. In his closing remarks, he thanked all the participants for their participation. He also indicated that Geographical Information Systems (GIS) analyses can be very beneficial for disease surveillance and management.

4 References

Anyamba A, Chretien JP, Small J, Tucker CJ, Formenty PB, Richardson JH, Britch SC, Schnabel DC, Erickson RL and Linthicum KJ. 2009. Prediction of a Rift Valley fever outbreak. *Proceedings of the National Academy of Sciences of the United States of America* 106(3): 955–959.

Geering WA, Davies G and Martin V. 2002. *Preparation of Rift Valley fever contingency plans*. FAO Animal Health Manual No. 15. Food and Agriculture of the United Nations, Rome.

Annex I: List of participants

Name	Affiliation
Erneo B. Ochi	Animal Resources and Fisheries sector, MAFTARFC&RD
Aluma Araba	Animal Resources and Fisheries sector, MAFTARFC&RD
Harun K. Kirigia	Animal Resources and Fisheries sector, MAFTARFC&RD
Abera Kebede	Animal Resources and Fisheries sector, MAFTARFC&RD
Michael K Maina	Animal Resources and Fisheries sector, MAFTARFC&RD
Hezron M. Wimbua	Animal Resources and Fisheries sector, MAFTARFC&RD
Joseph M. Mosabi	Animal Resources and Fisheries sector, MAFTARFC&RD
Cristobal Verdugo	ILRI
Martin Barasa	VSF Switzerland
Donato Apari Cholong	EES/Animal Resources
Jada Rome Wani	Animal Resources and Fisheries sector, MAFTARFC&RD
Samson Bringi Francis	Animal Resources and Fisheries sector, MAFTARFC&RD
Akuol Arop Deng	Animal Resources and Fisheries sector, MAFTARFC&RD
Mary Gordon Ayoru	Animal Resources and Fisheries sector, Jongle state
Bernard Bett	ILRI
David Wani	VSF Belgium
Matur Alembany	MARF , Lakes state
Abdurazik Juma	Animal Resources and Fisheries, MAFTARFC&RD
Nimaya Mogga	FAO SS
Michael Otto	VSF Germany
Joseph Justin	Animal Resources and Fisheries, MARF
Rosekellen Njiru	ILRI
Louis Kayanga	MARF Sector, RSS
John Gobek Laku	Animal Resources and fisheries
Stephen Opyeny Deng	SMARF upper Nile

Annex II: The latest copy of RVF decision support tool



DST Version 3.docx

Annex III: The workshop Program

Workshop on RVF Risk Mapping and Other RVF Decision Support Tools for South Sudan

South Sudan Hotel, Juba

15 - 16th October 2013

Time	Item	Presenter/Moderator
08.30 - 09.00	Arrival and registration	ALL
09.00 - 09.15	Introductory remarks and self-introduction	Aluma Araba
09.15 - 09.20	Remarks by ILRI representative	Bernard Bett
09.20 - 09.35	Welcome and official opening of the workshop	MARF
09.35 - 09.45	Adoption of the Agenda	ALL
09.45 - 10.00	Objectives of the meeting	Bernard Bett
10.00 - 10.30	Tea/Coffee Break	ALL
10.30 - 11.30	Group work to prepare presentation by each group	
11.30 - 12.00	Presentation from the state representative	
12.00 - 12.30	Presentation from MARF representative	
12.30 - 13.00	Presentation from the MOH representative	
13.00 - 14.00	Lunch Break	ALL
14.00 - 14.30	Presentation from NGO representative	
14.30 - 15.00	Presentation from WHO/CDC representative	
15.00 - 15.30	Presentation from FAO representative	
15.30 - 16.00	RVF decision support tools – Risk map, DST,	ILRI
16.00 - 16.30	Tea/Coffee Break	ALL
16.30 - 17.00	Recap of day one	

Day Two

08.30 - 09.00	Arrival and registration	ALL
09.00 - 09.05	Review of day one and introduction to day 2	
09.05 - 09.45	Discussions/validation of the tools One-health strategies	
09.45 - 10.00	Recommendations	
10.00 - 10.30	Tea/Coffee Break	ALL

Annex IV: Checklist for break-out group discussions

- Has your area ever had an RVF outbreak?
 - Give the names of the areas affected and a timeline illustrating the number of times these areas have had RVF since 1990
 - For each event in the time line:
 - indicate livestock species affected and whether or not humans were also exposed to the disease
 - Key signs observed in livestock (and humans if applicable)
 - Interventions that were put in place to manage the outbreak
 - Identify factors that make the areas identified above to be vulnerable to the disease

- What measures have the national and local governments put in place any measures to mitigate the impacts of such outbreak in future? What is the role of these governments in the management of the disease

- What other measures should be put to improve the response capacity? (by the governments, communities and other stakeholders)