Decision support framework for managing RVF in the Horn of Africa

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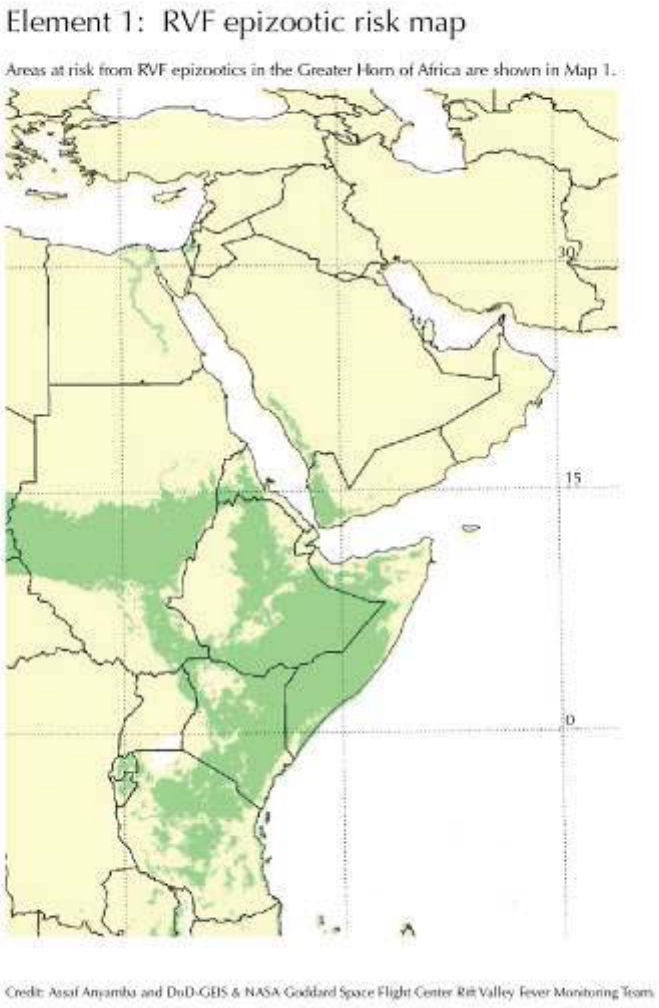
Overview

- ILRI RVF Research Program
  - Decision Support Framework (DSF)
  - RVF Modelling
  - RVF Risk Factors
  - Economic Scenario Analysis of DSF
- Risk-Based Decision Support Framework
  - 2006-2007 Impact Study
  - Process and Publication
  - Future Directions

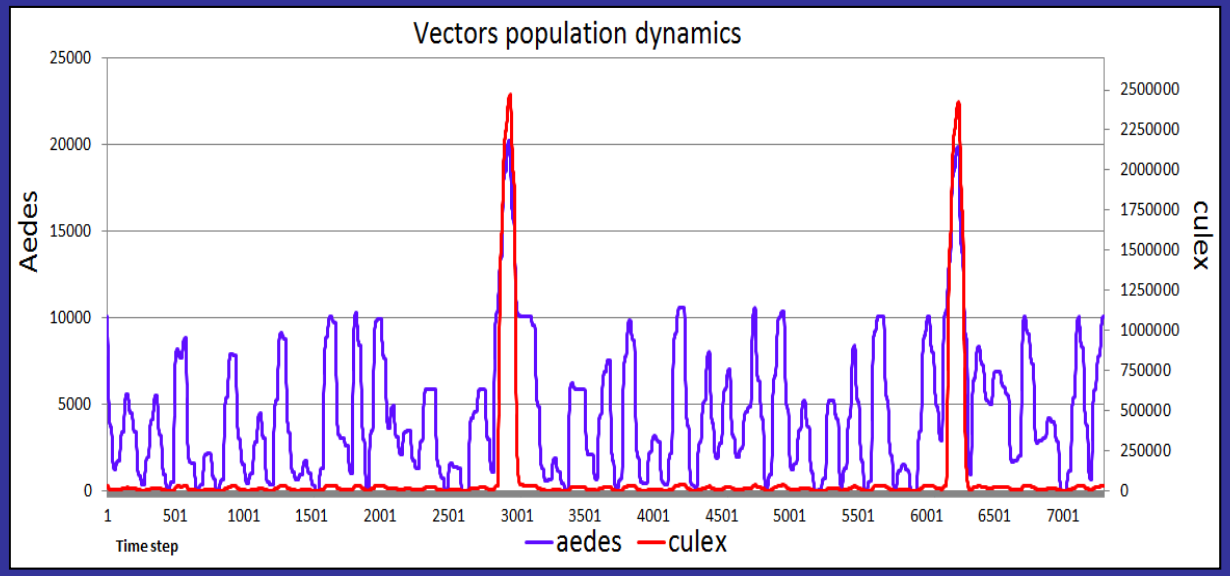
Risk-Based Decision Support Framework (DSF)

- Participatory Process:
  - Risk map
  - Matrix of actions matched to events
    - RVF epizootic events list
    - Action categories
    - Stakeholder built
  - Selected information, resources and references



RVF Modellng

- A spatial, agent based, stochastic model
- Mechanisms of RVF persistence
- Predict risk, impact of RVF and interventions



Risk Factor Analysis

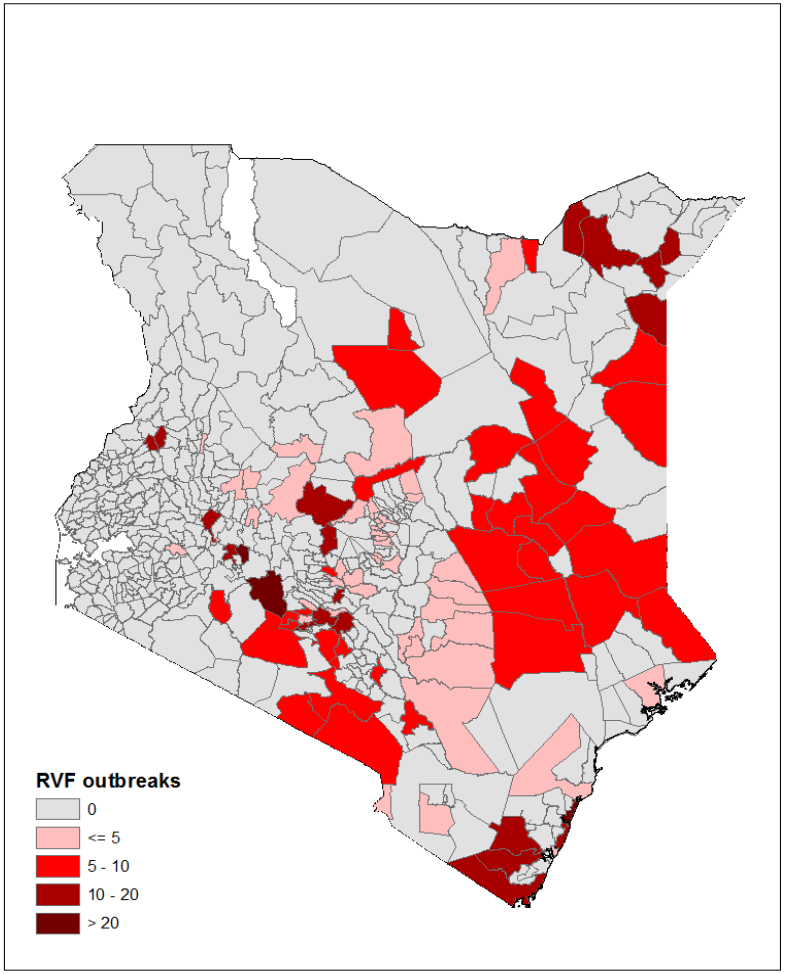
- Descriptive analyses
- Regression models:
  - Generalized Linear Mixed models
    - Poisson model for incidence
    - Logit models for prevalence
  - MCMC/spatial multiple membership model
    - To account for spatial autocorrelation

Risk Factor Analysis - predictors

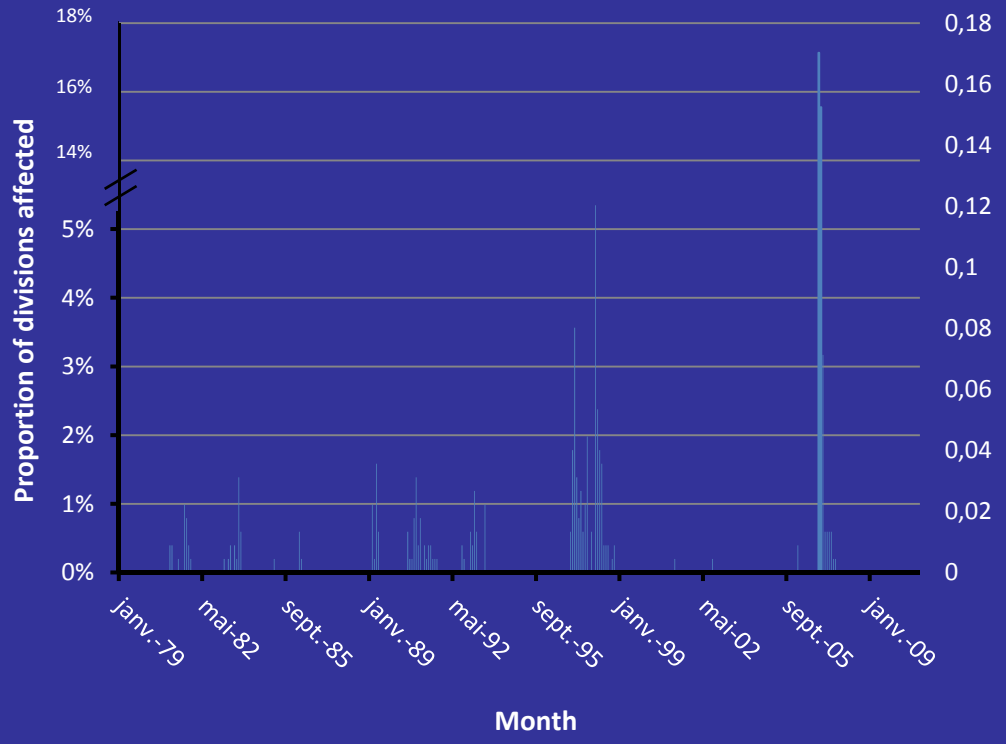
Variable	Source	Description
Livelihood zones	FEWSNET	Livelihood practices as at 2006
Land cover	FAO on-line database	Global land cover data, 2000
Precipitation	ECMWF	Monthly minimum, maximum and average for the period: 1979 - 2010
NDVI	Spot Vegetation	Monthly average, minimum, maximum values from: 1999 - 2010
Human population	Kenya National Bureau of Statistics	Human and household census for 1960, 1970, 1980, 1990, 1999
Elevation	CSI SRTM	
Soil types	FAO	FAO's Harmonized World Soil Database (HWSD), 2009
Wetlands (area as % of total)	ILRI GIS Unit	
Parks/reserves (area as %)	ILRI GIS Unit	

Risk Factors

Divisions that have had RVF outbreaks
in Kenya between 1912 and 2010



Temporal distribution of RVF outbreaks: 1979 - 2010



- 505 divisions -1999 population census
- 20.2 % (n = 102) of the divisions have had an outbreak at least once
- Mean outbreak interval : 5.4 (4.4 – 6.4) years

Models for the persistence of outbreaks

		Multi-level Poisson model		MCMC/Bayesian model	
Variable	**Level**	**β**	**SE**	**β**	**SE**
Fixed effects					
Constant		-3.74	0.69	-6.18	0.92
Precipitation		0.11	0.03	0.16	0.04
NDVI		2.68	0.80	3.29	0.83
Soil types	Solonetz	1.34	0.49	1.64	0.62
	Luvisols	1.24	0.45	1.80	0.59
Elevation	< 2300 m	0.00	-	0.00	-
	≥ 2300 m	-2.99	0.64	-3.79	0.95
Random effects					
Livelihood zones		3.16	0.61	9.37	3.02
Deviance				841.57	

Sandik Case Definition: RVF Compatible Event

- Abortion
- Heavy rains and mosquitoes
- Froth from the nose, often with epistaxis
- Salivation
- Fever
- Death, particularly in young animals

An outbreak in sheep and goats involving abortions during periods of heavy rain and abundance of mosquitoes, with two or more other listed clinical symptoms being observed in the herd, should be reported as RVF compatible disease to public health authorities. Cattle in the same area will be affected with similar but less severe symptoms, and rarely camels.

Average Timeline

Average time from:

- Onset of rains to mosquito swarm: **33.1 days**
- Mosquito swarm to first animal case: **19.2 days**
- First animal case to first human case: **21 days**
- First humane case to medical service intervention: **35.6 days**
- First medical service intervention to first veterinary intervention: **12.3 days**
- First animal case to veterinary service intervention: **68.9 days**

Risk Factors		Cases		Response	
Rains	Vectors	Livestock	Human	Human	Vet
33.1 days	19.2 days	21 days	35.6 days	12.3 days	

So why was the response so late?

- All or nothing decision
- Waiting for perfect information
- Risk avoidance

Optimal Decision-Making

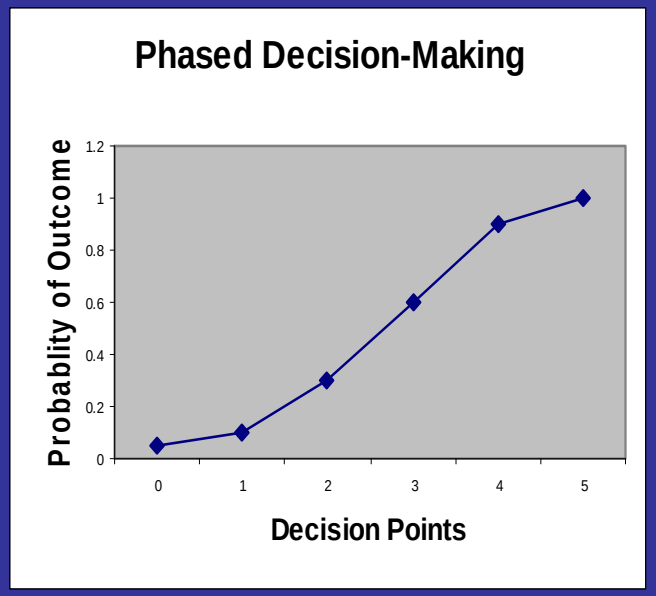
- Recognizes
  - The need to balance the need information against the need for a timely response
  - That information will be imperfect
  - That decision making involves taking risk
- How can we make decision-making less risky
  - Phased
  - Shared

Decision Points

- Early warning or alerts
- Localized heavy rains observed
- Localized flooding reported
- Mosquito swarms
- Livestock disease
- Laboratory confirmation
- Human disease
- Laboratory confirmation

Progressive Risk Mitigation

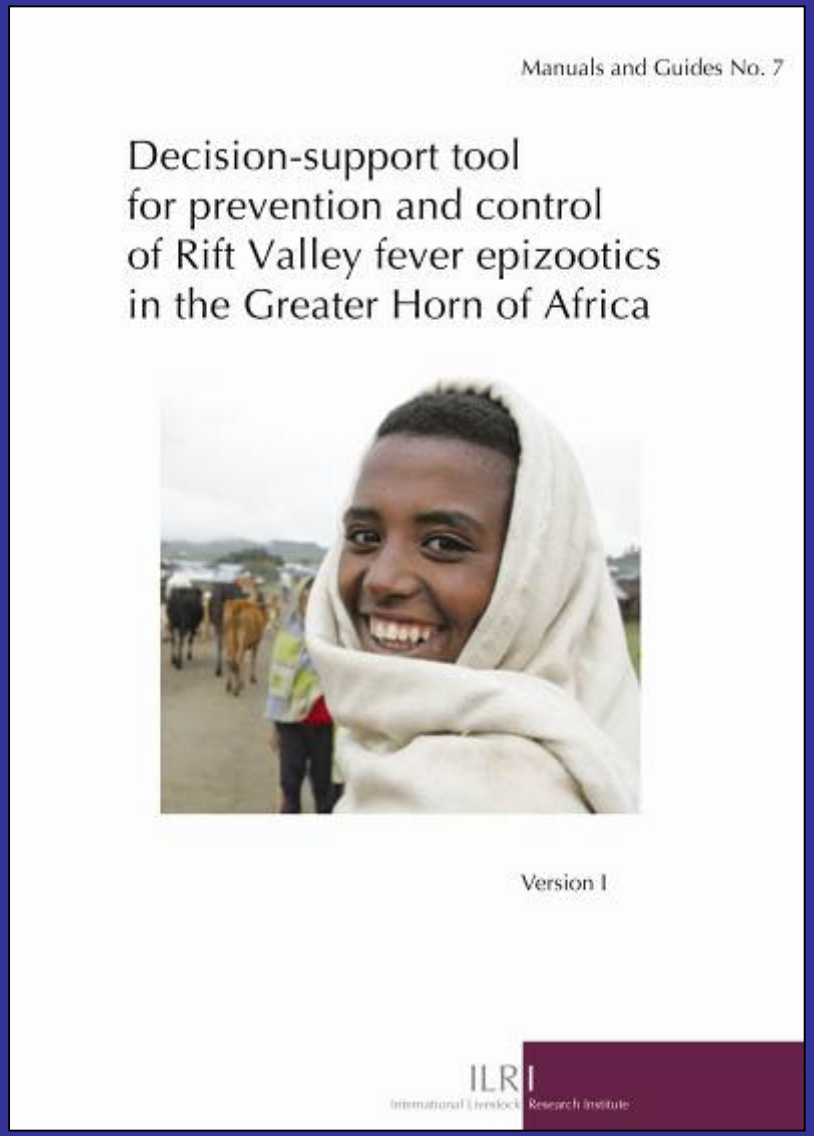
- Consequence x probability of outcome
- Probability increases at each decision point
- Justification for investment in risk mitigation increases
- Risk of making the wrong decision decreases



Decision-Making Trade Off

Methods

- Initial workshop
  - RVF events sequenced
  - Interventions inventoried
  - Actions matched to event sequences
- Expert review
- Follow-up workshop
- Peer review



Tool vs Framework

- Original name caused confusion
  - Informative dialogue
- Modellers assumed it was model
  - Efforts to ‘fix’ the tool
  - The tool itself should output the decision
- Strength of the ‘framework’
  - Created and owned by decision-makers
  - Models can inform the discussion, but not drive the process

The Future

DSF managing risk in trade

- Transparent framework for managing RVF
- Market events and interventions
- Regional meeting in Dubai
  - Horn of Africa, Middle East, OIE
  - regional framework for trade
  - extend to other disease.

– Current Application

- Kenya and Tanzania
- Development partnerships?