

# Foot-and-mouth disease (FMD) in Tanzania: conjectured status and upcoming FMD research initiatives in Southern and Eastern Africa

**Christopher Kasanga**<sup>1</sup>, Raphael Sallu<sup>2</sup>, Joseph Genchwere<sup>1</sup>, Frederick Kivaria<sup>5</sup>, Rudovick Kazwala, Chanasa Mpelumbe-Ngeleja<sup>2</sup>, Sarah Cleaveland<sup>4</sup>, Tiziana Lembo<sup>4</sup>, Philemon Wambura<sup>1</sup>, Mmeta Yongolo<sup>2</sup>, Ezekia Ranga<sup>5</sup>, Julius Keyyu<sup>6</sup>, Donald King<sup>3</sup> and Mark Rweyemamu<sup>1</sup>

<sup>1</sup>**Sokoine University of Agriculture, Morogoro, Tanzania**

<sup>2</sup>**Central Veterinary Laboratory, Tanzania**

<sup>3</sup>**Institute for Animal Health, Pirbright, United Kingdom**

<sup>4</sup>**University of Glasgow, United Kingdom**

<sup>5</sup>**Department of Veterinary Services, Dar-es-Salaam, Tanzania**

<sup>6</sup>**Tanzania Wildlife research Institute, Arusha, Tanzania**



**GFRA Scientific Workshop, Hazyview, RSA: 17th April 2012**

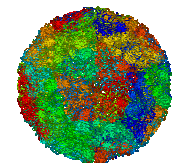




# A: FMD background in Tanzania



- Foot-and-mouth disease (FMD) is endemic in Tanzania
- First FMD outbreak reports ~ 1954
- Animal affected: Cattle, Pigs, small ruminants, wild animals
- Outbreaks occur in different geographic regions
- Factors associated with outbreaks are not clearly known
- Spatio-temporal distribution of FMD virus has not been clearly investigated

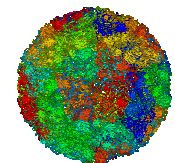




# Samples and analysis

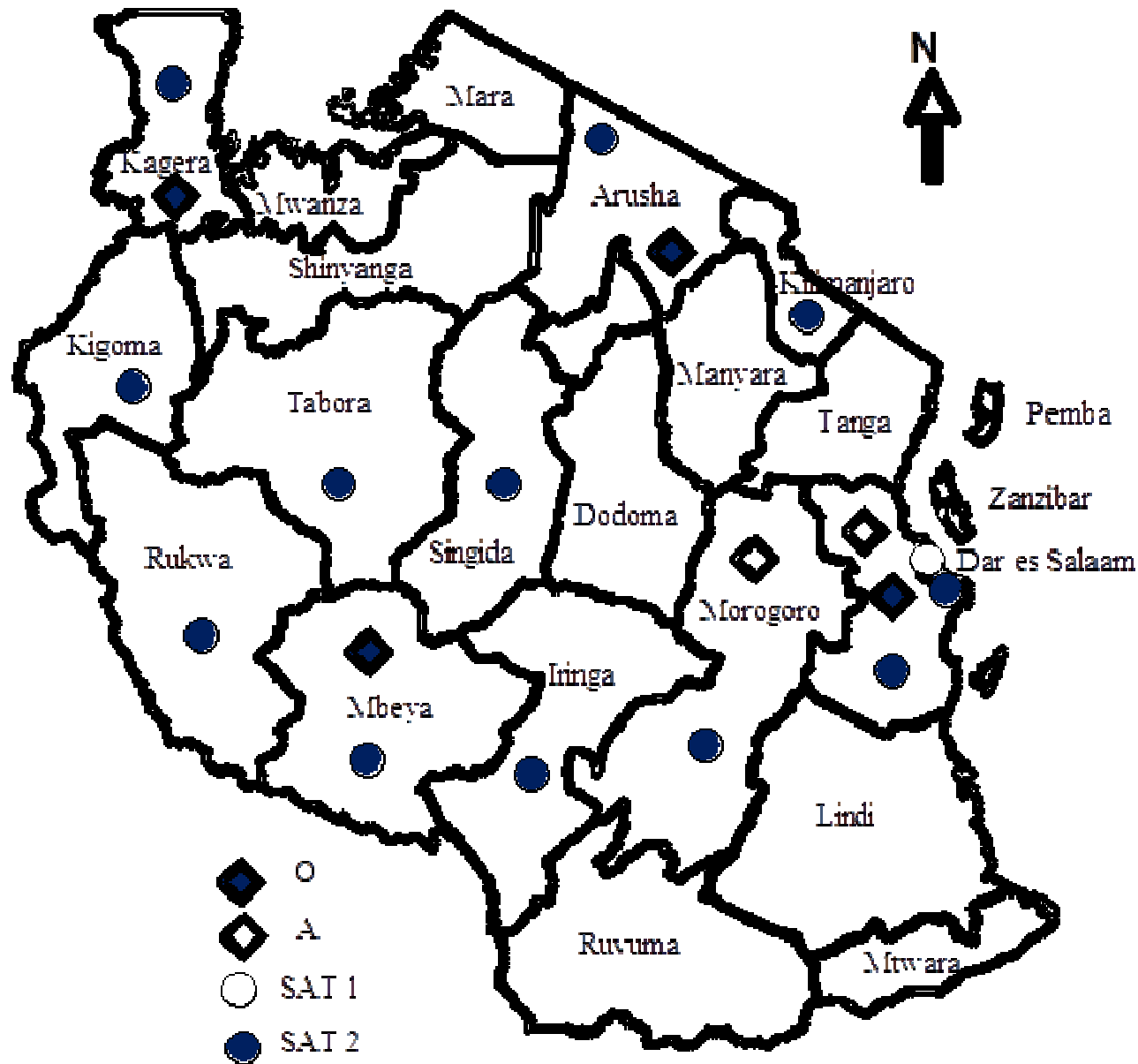


- Epithelial tissues and whole blood (~serum) were collected from different regions of Tanzania (2003-2010) and the Lake zone (2010-2011), and submitted to the CVL for analysis
- Animals involved: mainly cattle
- Samples were analyzed by serotype-specific antigen ELISA and NSP ELISA targeting the 3ABC region (~ SVANOVIR® FMDV 3ABC-Ab ELISA)





# Geographic distribution of FMDV serotypes detected in Tanzania between 2003 and 2010

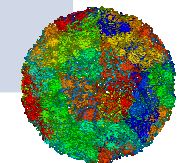




## FMDV serotypes detected in Tanzania (by Ag-ELISA) between 2003 and 2010

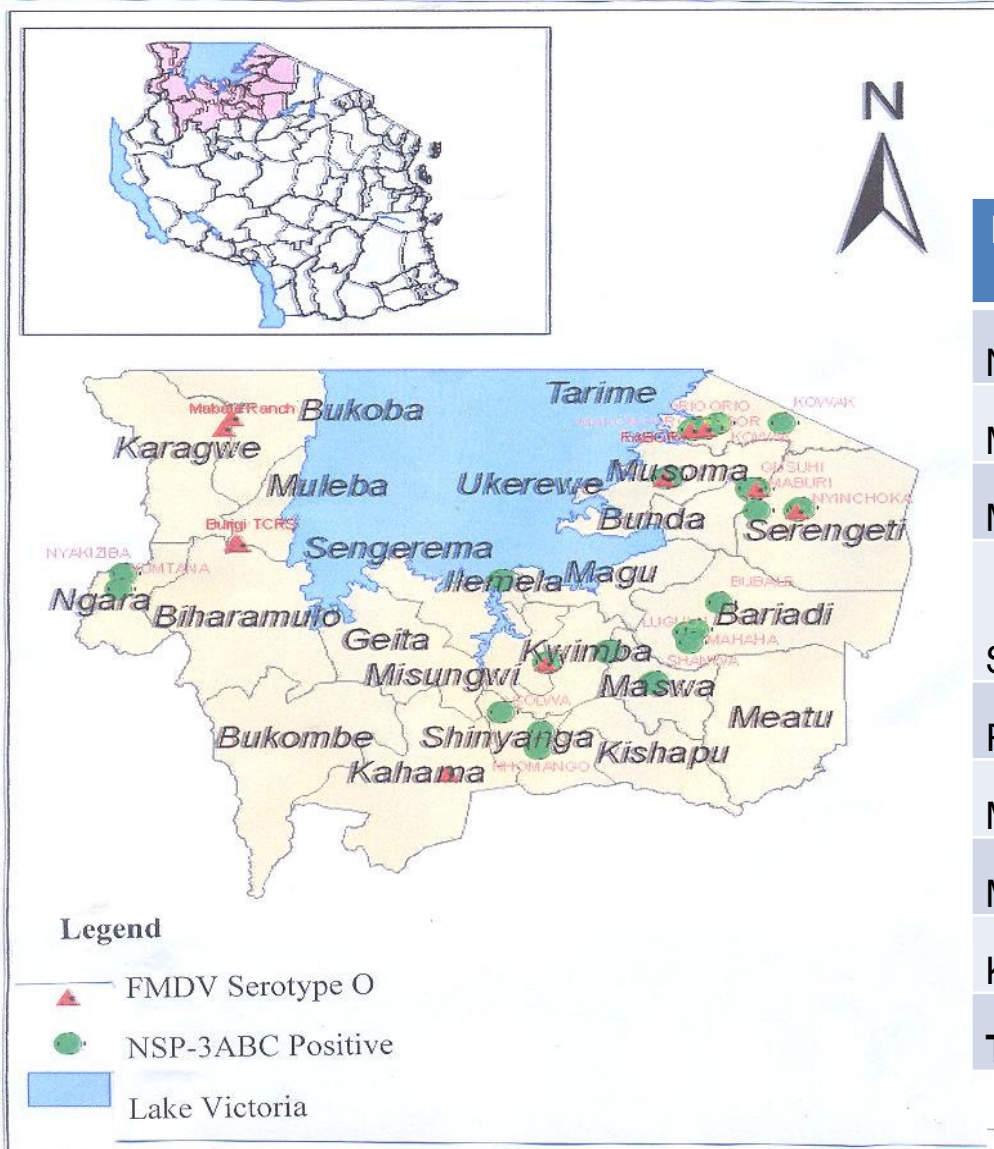


Year	Sample tested (sample positive)	O	A	SAT 1	SAT 2
2003	42 (19)	2	0	5	12
2004	39 (19)	4	0	6	9
2005	28 (10)	1	0	3	6
2006	57 (27)	10	0	4	13
2007	45 (29)	12	0	7	10
2008	35 (15)	4	0	4	7
2009	60 (27)	2	7	6	13
2010	58 (21)	2	0	10	9
<b>Total</b>	<b>364</b>	<b>37</b>	<b>7</b>	<b>45</b>	<b>78</b>





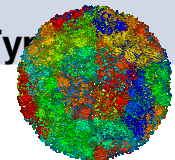
# Typing of FMD virus detected in the Lake Zone of Tanzania from 2010 to 2011



## Note:

-Serotyped by antigen ELISA following FMD outbreaks

District	Number tested (N)	Number positive (n)	Serotype
Ngara	2	0	-
Misungwi	10	2	Type O
Musoma	2	2	Type O
Serengeti	5	3	Type O
Rorya	2	2	Type O
Misenyi	3	3	Type O
Muleba	2	2	Type O
Kahama	2	1	Type O
<b>Total</b>	<b>28</b>	<b>15</b>	<b>Type O</b>



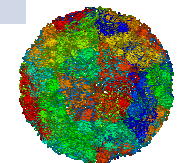


## Seroprevalence of FMDV infection in the Lake Zone of Tanzania from 2010 to 2011



District	Number tested (N)	Number positive (n)	% positive
Bariadi	15	13	86.7
Ilemela	4	1	25
Kwimba	13	12	92.3
Maswa	5	4	80
Musoma	7	7	100
Misungwi	27	24	88.9
Ngara	19	12	63.2
Rorya	13	11	84.6
Serengeti	17	16	94.1
Shinyanga	13	7	53.8
<b>Total</b>	<b>133</b>	<b>107</b>	<b>80.5</b>

**Note:** Serology conducted by NSP ELISA targeting the 3ABC gene

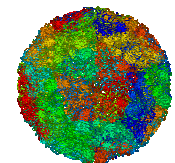




## Discussion, conclusion and recommendations



- Antigenes for serotypes O, A, SAT 1, and SAT 2 have recently been detected in different areas of the country
  - The four serotypes circulate in Tanzania
- Seroprevalence of FMDV in the Lake zone is high (80.5%) and could be ascribed to serotype “O” virus infection
- The presence of multiple serotypes complicates control of FMD in the country
- Consistent studies are required to establish the spatio-temporal distribution of FMDV serotypes in Tanzania







# B: Diagnostic and research capacity for FMD in Tanzania



## Diagnostic capacity:

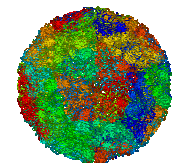
- Conventional (Ag-ELISA, NSP-ELISA and LPBE-ELISA) and molecular techniques (conventional RT-PCR and real-time RT-PCR) are in place and operational
- Lab at CVL elevated to BSL 3
- DNA sequencing capacity available (3500 ABI Genetic Analyzer installed at SUA) and operational

(Mainstreaming DNA sequencing in Southern and Eastern Africa)



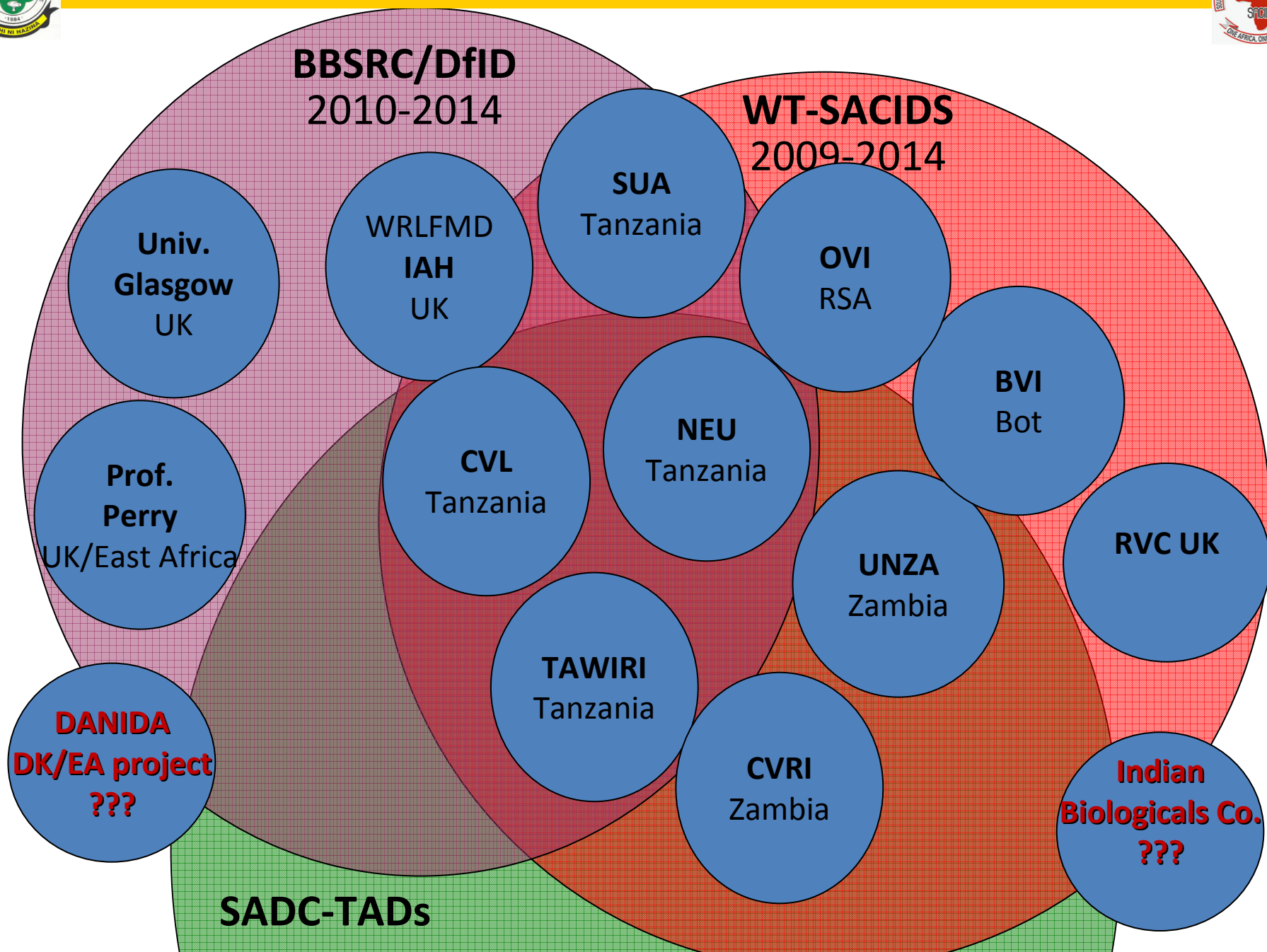
## Research capacity:

- Several initiatives (SACIDS, SADC-TADs, BBSRC-CIDLID, e.t.c, are in place to foster collaborative FMD research in Tanzania and the Southern and Eastern Africa
- Substantial research facilities are in place





# Collaboration/partnership for FMD research in Africa





# Focus of the SACIDS FMD CoP



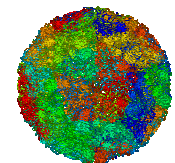
To study FMD endemicity in Southern Africa region:

## Study approach:

Community of Practice Approaches to foster Collaborative Research Partnerships with Others

## Key research Qn:

What contributes to FMD endemicity in Southern and East Africa and what options for its risk management?

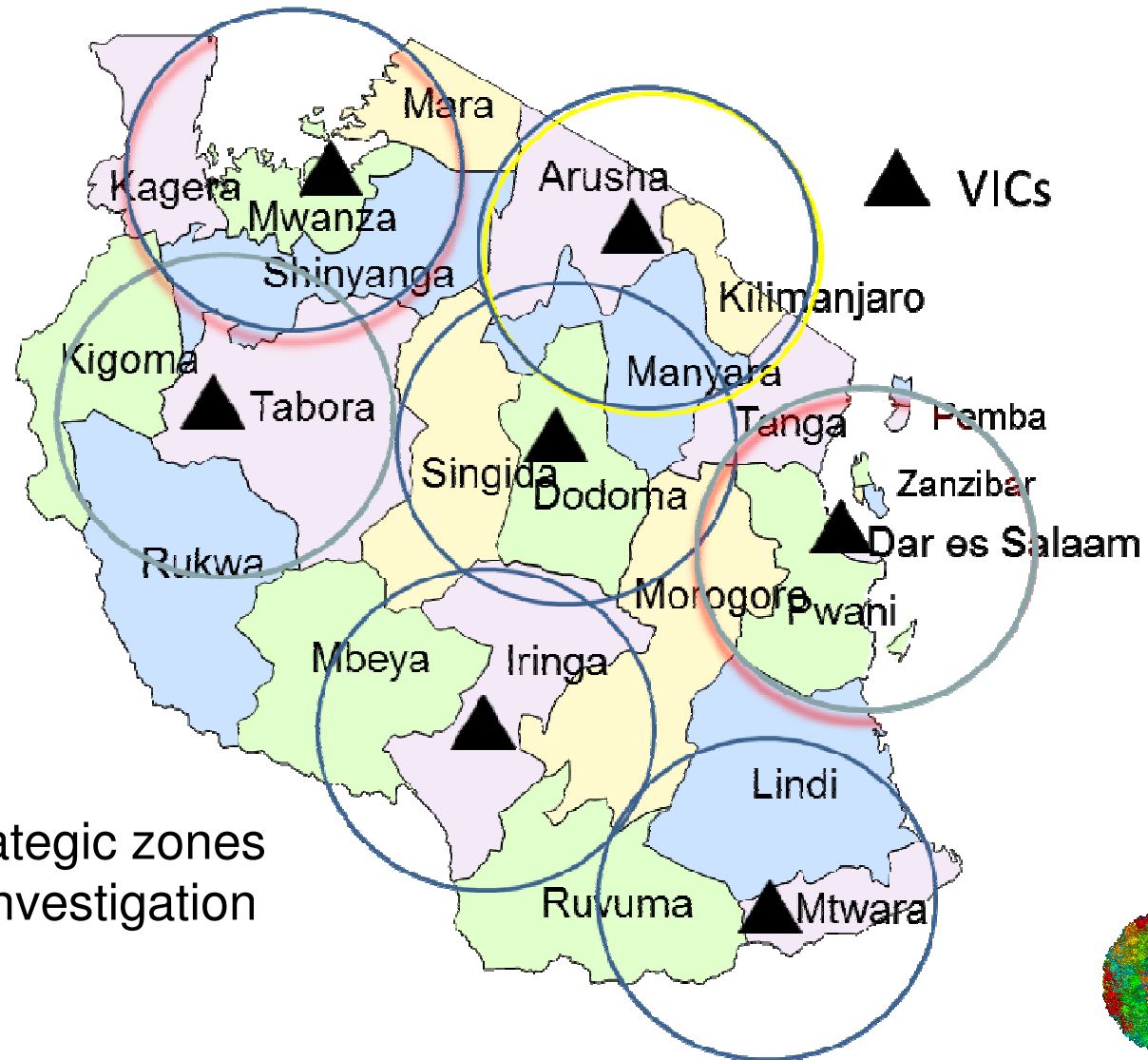




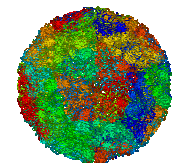
# FMD study areas in Tanzania



## Strategic focus areas



**Note:**  
Circles indicate strategic zones for FMD outbreak investigation and surveillance

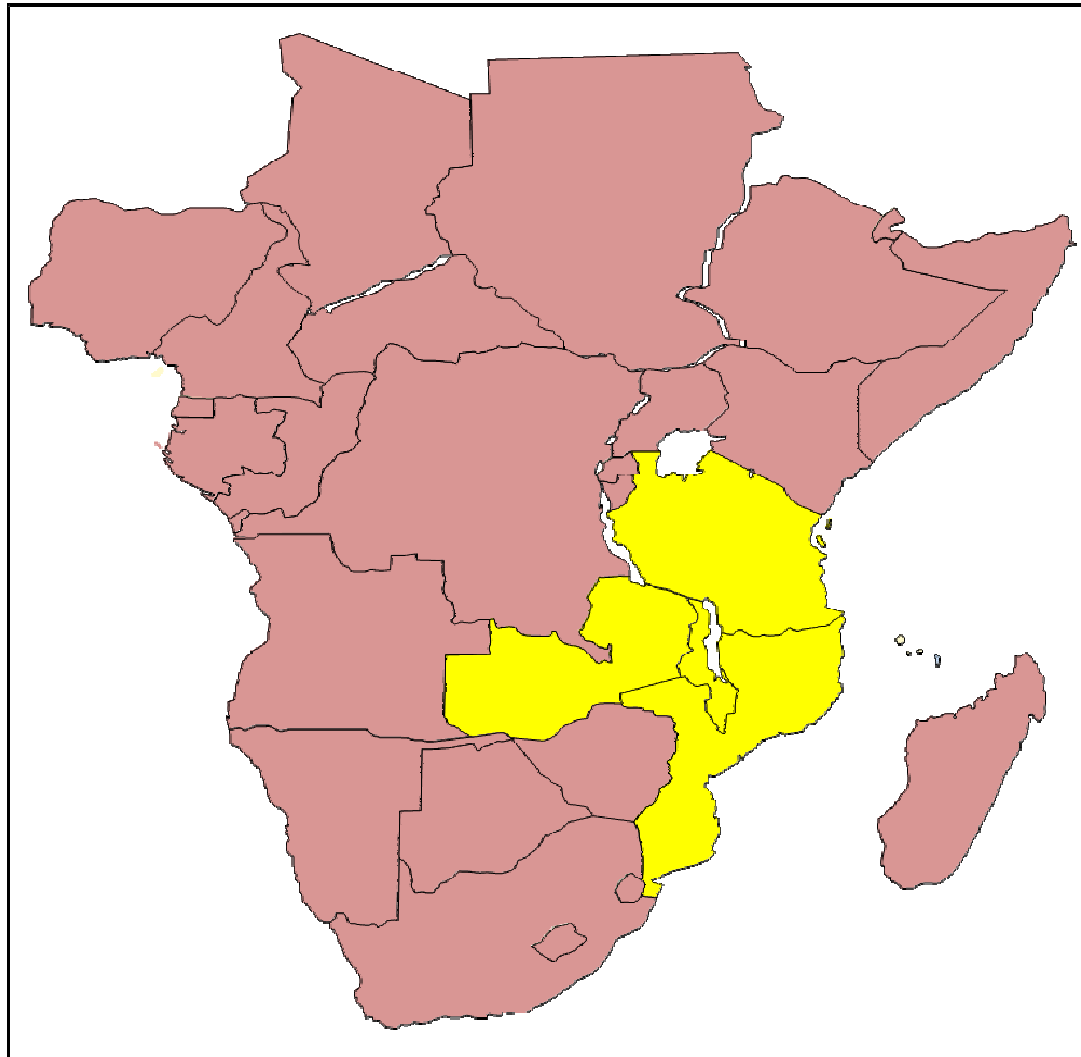




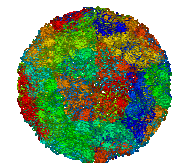
# The study area in Southern Africa



Selected areas in Tanzania, Zambia, Mozambique and Malawi are involved for FMD endemicity study in both domestic and wild animals



**Note:** Yellow colour indicates countries for FMD endemicity study in Southern Africa





# The current research team in the FMD CoP:



Category	Name	Short Title	Country and Sponsor
Postdoc	Christopher Kasanga	To investigate the <i>evolutionary changes</i> and virus recombination, and predict the possibility for virus escape from the current vaccine strains by whole genome sequencing of selected FMDV serotypes O, A, SAT1, SAT2 and SAT3 detected in Southern Africa	TZ (SACIDS-WT)
PhD	Raphael Sallu	To determine the phylogeography of FMDV in endemic settings in Southern Africa	TZ (SACIDS-WT)
	Yona Sinkala	To investigate the epidemiology of FMD endemicity in Zambia.(PhD)	ZAM (SACIDS-WT)
Res. MSc	Mathias Mkama	Spatial and temporal serosurvey of the distribution of FMDV serotypes in Tanzania	TZ (SACIDS-WT)
	Tingiya Sikombe (Due to start)	Spatial and temporal serosurvey of the distribution of FMDV serotypes in Zambia	ZAM (SACIDS-WT)
	Under recruitment	FMD outbreaks and animal movements in Tanzania	TZ (SACIDS-WT)
	Under recruitment	Simple FMD diagnostic tools for FMD outbreaks investigation: LAMP-technology	TZ (SACIDS-IAEA)
MSc	Joseph Genchwere	Spatial and temporal serosurvey of the distribution of FMDV serotypes (Northern-lake zone TZ)	TZ (SADC-TADs)
	Julius Joseph	Spatial and temporal serosurvey distribution of FMDV serotypes (Eastern-coastal zone TZ)	TZ (ASDP)

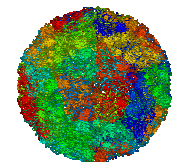
**Two OHMB (MSc) students Have joined:**

**Emma Peter (TZ):**

-Evaluation of serotype-specific real-time RT-PCR for FMDV genome detection

**Frank Banda (ZAM):**

-Serotyping of the Zambian FMDV field isolates by Ag-ELISA and serotype-specific RT-PCR

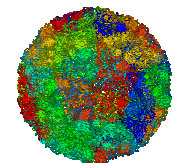




# Upcoming research projects



- **FAO EuFMD project:** Development of serotype-specific molecular assays for FMDV strains circulating in East and Southern Africa
- **RAPIDIA Field:** Joint EU project ~ development and evaluation of viral diagnostic assays in Africa and other parts of the world
- **Tanzanian Govt (COSTECH – NFAST):** Development of control strategies of selected TADs in Tanzania
- FMDV transmission in the African buffalo: *seeking for funds*
- **Using sequence data for epidemiological inferences and policy development in control of infectious diseases:** *seeking for funds*





# Expected outcome and future prospects

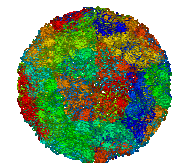


## Expected outcome:

- Elucidation of factors responsible for FMDV endemicity
- Understanding the epidemiology of FMD in the Region ~ through targeted research/studies
- Appropriate recommendation for vaccine(s), vaccination and establishment of proper FMD control strategies in Tanzania and Southern & Eastern Africa

## Future prospects:

- Timely and appropriate diagnosis of FMDV for proper FMD control strategies





# Acknowledgement

**welcome**trust



Directors: CVL and DVS in Tanzania