Spatial analysis and transmission drivers for peste des petits ruminants in Uganda

Joseph Nkamwesiga[1,2], Fedor Korennoy[3], Paul Lumu[4], Peninah Nsamba[5], Frank Nobert Mwiine[5], Kristina Roesel[2], Barbara Wieland[6,7], Andres Perez[8], Henry Kiara[2], Dennis Muhanguzi[5]

[1]*International Livestock Research Institute (ILRI), Uganda,* [2] *Institut für Virologie, Freie Universität Berlin, Germany,* [3]*Federal Center for Animal Health, Vladimir, Russia,* [4]*MAAIF, Uganda,* [5]*Makerere University, Uganda,* [6]*Institute of Virology and Immunology (IVI), Mittelhäusern, Switzerland ,* [7]*University of Bern, Switzerland,* [8]*University of Minnesota*

22 September 2022

Introduction

- Peste des petits ruminants (PPR) is a disease of small ruminants
  - Caused by PPR virus, a negative sense morbillivirus
  - Global Annual economic losses ~USD 1.5 – 2.1 billion
- An effective PPR vaccine is commercially available
  - There is need to devise efficient vaccination strategies
  - To guide risk-based PPR vaccination programs, we fit a purely spatial model to identify high risk PPR zones

Methods

- Descriptive analyses
  - Data summaries
- Regression models
  - Logistic model
  - Negative binomial model
- Space–time analysis
  - Space-time cube
  - *Getis-Ord Gi** statistics
- Emerging Hot Spot analysis
  - *Mann–Kendall* statistics

Key Findings

Table 1: PPR drivers as revealed by the Logistic regression model

Variable	β	SE	z value	Pr (>|z|)
(Intercept)		2.514	2.549	0.01081 *
Annual rainfall	-0.852	0.001	-1.735	0.08269
Road length	1.231	0.003	2.591	0.00957 **
Small ruminant density	1.057	0.006	2.043	0.04103 *
Soil Water Index	1.055	0.005	2.091	0.03653 *
Median annual wind speed	-1.385	1.175	-3.071	0.00213 **

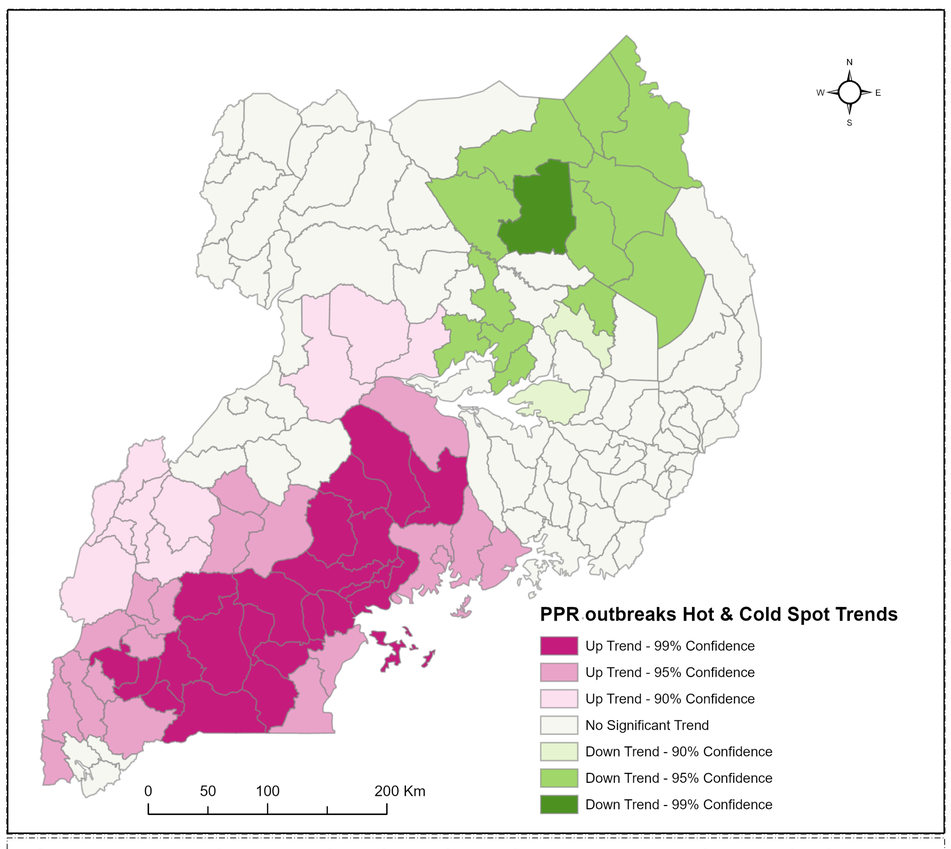

Fig.1: Map of Uganda showing down, up and no-obvious trend categories in Karamoja subregion, central - southwestern Uganda and West Nile & Teso regions respectively

Conclusions & limitations

- Variables in table 1 were the most important drivers for PPR transmission
- The south-western districts are on an up trend for PPR outbreaks; should be targeted to block future outbreaks
- Our models used passive outbreak reports; thus, we could have missed some of the outbreaks due to low reporting

Contribution to Uganda's livestock development agenda

- This may be used to guide targeted vaccine-distribution to maximise the impact of vaccination while reducing costs
- These findings provide a basis for a more robust timing and prioritization of control measures to contribute to the global goal of control and eradication by 2030

Joseph, Nkamwesiga
J.Nkamwesiga@cgiar.org
ILRI c/o Bioversity International
P.O. Box 24384, Kampala Uganda
+256 392 081 154/155

ILRI thanks all donors and organizations which globally support its work through their contributions to the CGIAR Trust Fund.