



Food and Agriculture
Organization of the
United Nations



World Organisation
for Animal Health
Founded as OIE

8th PPR GREN

Episystem approach: review of its
understanding and application

Arnaud Bataille

CIRAD

Montpellier France

Co-chair PPR episystem Working Group



Episystem approach - Background

What are episystems? Why are they important?

Episystem = interconnected populations capable of maintaining circulation and transmission of the virus indefinitely

Episystem approach - Background

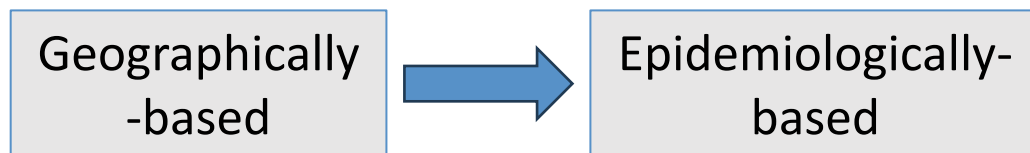
What are episystems? Why are they important?

Episystem = interconnected populations capable of maintaining circulation and transmission of the virus indefinitely

Understanding them allows:

- Identification of populations critical for **virus persistence**.
- **Targeting** surveillance and vaccination to interconnected populations rather than just geographical areas.
- Identify how to **break chains of transmission**, essential for elimination.

Episystem approach → shift in surveillance & control:



Episystem approach - Background

Geographical scale of episystems

The small ruminant population of a country is usually part of **multiple episystems at different geographical scales** (local, national, transnational...). Surveillance and control of PPR in episystems that cross national borders requires cross-border collaboration and harmonization.



Identifying and characterizing episystems

How to Identify and Characterize PPR Episystems:

- Connectivity
- Population dynamics
- Transmission patterns

Data sources:

- Population and movement data
- Epidemiological data
- Phylogenetic data



Episystem approach - Background

- Episystem approach central to phase II and III of PPR GEP
- Activities concerning episystems are managed by PPR secretariat
- An episystem working group was initiated during the 2023 PPR GREN meeting
- WG focal points: Arnaud Bataille, Jeff Mariner, Sherry Johnson
- 54 members on whatsapp; 55 members on email list
- Main objective of WG: provide expertise and support to PPR secretariat towards PPR eradication through an episystem approach
- Since 2025: Javier Guitan -FAO PPR secretariat support on PPR epidemiology and episystem

Episystem approach - Timeline

2022-2024

- November 2022: launch of PPR GEP blueprint integrating the episystem approach
- PPR GREN 2023: new PPR GREN WG on episystems (55 members)
- 01/2024: work of WG on the episystem guidelines drafted by Jeff Mariner
- 01-06/2024: Production and revision of guidelines for targeted PPR vaccination using the episystems Approach Production and revision of guidelines for PPRV sequence data analysis to help identify episystems
- 03-06/2024: production of animal mobility protocol
- 04/2024: Lake Chad episystem workshop

Episystem approach - Timeline

2025

- 01/2025: 7th PPR GREN – first episystem session
- 01/2025: Sharepoint for episystem WG
- 02/2025: meeting of episystem WG to discuss how to support PPR secretariat activities
- 04/2025: Episystem workshop – China, Mongolia, Central Asia
- 06/2025: Mano River Episystem workshop
- 10/2025: Presentations on episystems during SADC roadmap meeting

Episystem research articles

No research published on identification of episystems yet

Few publications from PPR GREN members mentioning episystems (in addition to FAO/WAHOH announcements):

- Balamurugan, et al. Assessment of post-vaccination immune response to peste des petits ruminants virus in small ruminants in the central and western regions of India. *VirusDis.* 33, 413–421 (2022).
- Bataille, A., & Baron, M. D. (2024). Rinderpest and peste des petits ruminants: state of play in disease eradication efforts. *Rev Sci Tech, Special Edition*, 43-52.
- Courcelle, M., et al. (2024). Comparative evolutionary analyses of peste des petits ruminants virus genetic lineages. *Virus Evolution*, 10(1).
- Kock, R., et al. (2025). PPR Infection Crossing Between Domestic and Wild Hoofed Mammals: Does This Matter for Virus Eradication? In M. Munir & M. Abubakar (Eds.), *Peste des Petits Ruminants Virus* (pp. 99-127).

Priority recommendations include *precisely characterizing PPR episystems*

Challenges identified:

- Episystem approach **not yet widely known** by research and veterinary communities
- WG not involved in FAO/WOAH regional actions in relation to episystems because still quite high level workshop interactions, not yet concrete steps towards implementations
- **No strong connection** between the political level/vet services workshop and the GREN community expertise/field actions
- Info on workshops arriving late to WG, so limiting the level of support possible
- Need better communication and clear agreement on **how the WG can support the PPR secretariat**

See report on episystem discussions

Main points:

- The episystem approach is still poorly known and poorly understood at all levels
- all available resources should be allocated to **engage actors in the approach** and produce the analyses necessary to identify episystems in time for their integration in up-coming actions
- **Data and expertise from multiple sources are needed** for identification of episystems. Therefore, all PPR GREN members should be ready to contribute

Some priorities:

- Systematic gathering of information on key transmission factors (animal movement, density, etc.)
- Collection and analysis of **data on animal mobility** with the aim of episystem identification identified as first priority

Specific recommendations to the PPR GREN members and epi WG :

- **Support to episystem workshops** organised by FAO and WOAHA
RESULTS: presentations by WG chairs done to explain the approach in workshops
- Organisation of **targeted online working groups** focusing on specific regions to put in motion efforts to identify episystems (focus on regions with planned control programme, or regions with good starting material)
RESULTS: no online focus group so far
- Preparation of a **set of protocols** for data collection for episystem study (animal mobility, other common risk factors, risk mapping etc...)
RESULTS: some protocols ready and in episystem WG sharefile
- Linking with other WG to **identify new knowledge** that can impact episystem identification (e.g. role of atypical hosts- wildlife)
RESULTS: presentations by WG chairs during wildlife meeting

Specific recommendations to the PPR secretariat and GREN bureau:

- To **involve very early the WG** in preparation of episystem workshops
- To prepare a **short communication material** targeting decision makers based on episystem guidelines (to sell the approach during key coming meetings)
- To **publish the episystem guideline document** at least in English version so it can be referred to within the PPR GREN committee when conducting and publishing research, and so it can be accessible to stakeholders
- To get **more field epidemiologists, modellers in the GREN**, push for episystems studies presented at the next GREN meeting

RESULTS: Some more field epidemiologists, modellers , but not episystem studies published

Progress related to episystems – List of episystems identified

episystem name	scale	countries	source document	participatory evidence	animal mobility evidence	phylogenetic evidence
Karamojong cluster	transnational	Uganda, Kenya, South Sudan, Ehtiopia	PPR GEP II & III	yes	yes	yes
Lake Chad Bassin	transnational	Central African Republic, Chad, Cameroon, Nigeria, Niger	PPR GEP II & III	unclear	yes	unclear
Mano River	transnational	Guinea, Liberia, Sierra Leone	PPR GEP II & III	unclear	yes	unclear
Sahel episystem	transnational	Burkina Faso, Chad, Mali, Mauritania, Niger, Senegal	PPR GEP II & III	unclear	unclear	unclear
Somali communities	transnational	Ethiopia, north-eastern Kenya, Somalia, Djibouti	PPR GEP II & III	unclear	unclear	unclear
Massai communities	transnational	Kenya, Tanzania	PPR GEP II & III	unclear	unclear	unclear
China - Mongolia - Kazakhstan - Russia region	transnational	China, Mongolia, Kazakhstan, Russia	PPR GEP II & III	unclear	unclear	unclear
North eastern India	National	India	7th PPR GREN	unclear	unclear	unclear

Progress related to episystems – research using methods relevant for episystems

Expert capacity to use
animal mobility data to start
defining episystems

Maybe not accessible to all
countries/regions



RESEARCH ARTICLE

**Combining market surveys and participative
approaches to map small ruminant mobility in
three selected states in northern Nigeria**

Wiley
Transboundary and Emerging Diseases
Volume 2025, Article ID 6620243, 8 pages
<https://doi.org/10.1155/tbed/6620243>

WILEY

Research Article

Mapping Small Ruminant Trade Networks in Ethiopia's Somali Region and Borena Zone: Implications for the Spread of Peste des Petits Ruminants Virus

Asrat Arke Ashango,¹ Hika Waktole,² Samson Leta,³ and Haileleul Negussie ¹

¹Department of Veterinary Epidemiology and Public Health, College of Veterinary Medicine and Agriculture, Addis Ababa University, Bishoftu, Ethiopia

²Department of Veterinary Microbiology, Parasitology and Poultry Health, College of Veterinary Medicine and Agriculture, Addis Ababa University, Bishoftu, Ethiopia

³Department of Biomedical Sciences, College of Veterinary Medicine and Agriculture, Addis Ababa University, Bishoftu, Ethiopia

Phylogeographic understanding of PPR distribution

Geographically delimited lineages and sublineages (for lineage IV)

Clear separation between Northern Africa, Sub-saharan Africa, Middle East and Asia

Ethiopia and Sudan with Northern African cluster

Kenya, Tanzania, and Uganda with lineage III

Some countries at borders of lineage distribution (Uganda, DRC)

Can help supporting regional efforts towards epistystem identification



Progress related to episystems – Pan-African programme for PPR eradication (PPR PAPS)

EU funded, led by AU-IBAR and AU-PANVAC, with support of WOAHA and FAO

- Taking a regional approach with strategies being prepared for the different regions
- Includes information on animal mobility and production of regional risk maps
- will to integrate the episystem approach in activities implemented in this project
- Major opportunity to operationalize the episystem approach
- Possible PPR GREN role in supporting scientifically-sound episystem identification

Next steps

- Steps needed towards operationalization of episystem (must happen in 2026!!)- moving towards FAO/WOAH operational workshops?
- Role of PPR GREN in this operationalization (Support with design? Recommendations on design? Reviewing results?)
- Clear and wide communication on episystems and associated guidelines and protocols so it can be picked up by decision-makers, project coordinators, researchers
- Better link between PPR GREN, researchers, vet authorities, field actors



Food and Agriculture
Organization of the
United Nations



World Organisation
for Animal Health
Founded as OIE

Thank You

Questions on the episystem approach

Javier.GuitianMartinez@fao.org

arnaud.bataille@cirad.fr

PPR secretariat

Join the PPR GREN episystem WG:

arnaud.bataille@cirad.fr

saJohnson@ug.edu.gh

Exchanges with PPR experts on
episystems

ppr-gren_episystem@cirad.fr

Join the group!

Guidelines soon publicly available
through share point