Regional Training Seminar for WOAH National Focal Points on Veterinary Laboratories

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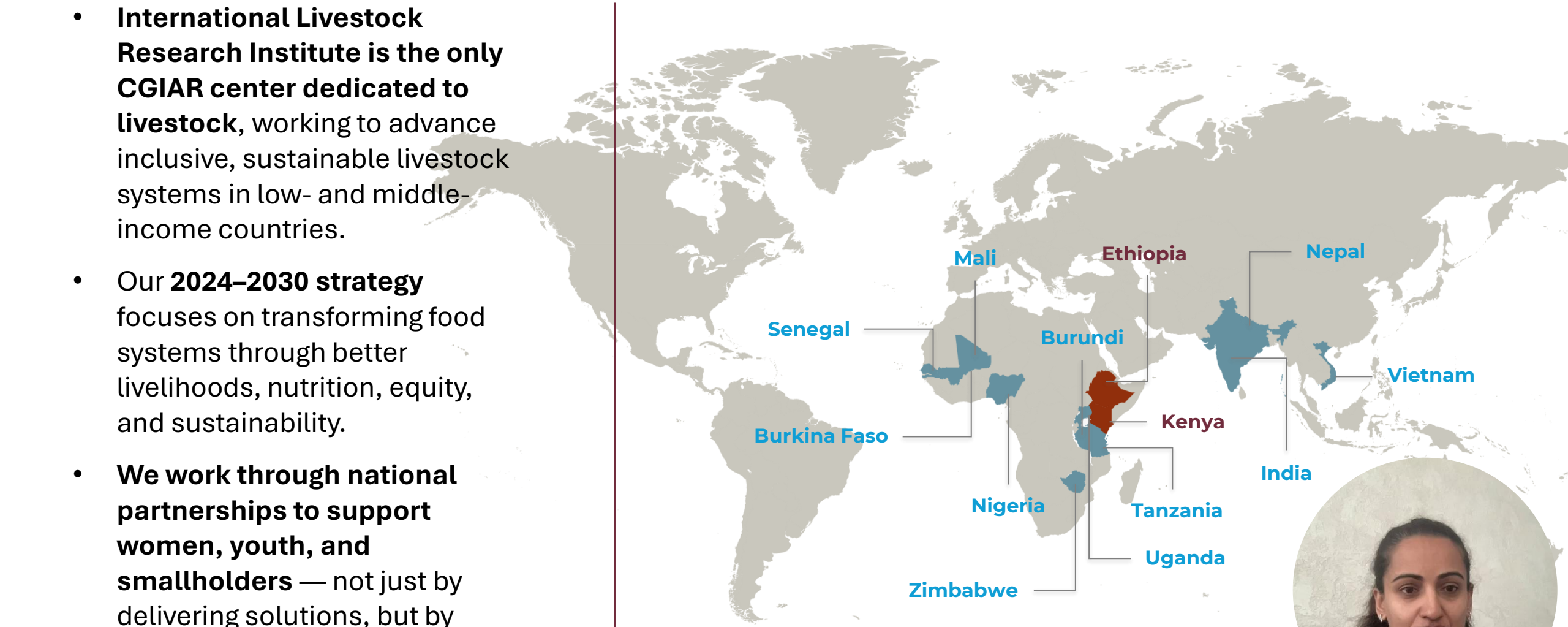
Presentation overview

- ILRI Overview
- Innovations in the lab: Emerging Diagnostic Technologies
- Laboratories' role in outbreak investigation, risk analysis, disease surveillance, and international trade

ILRI today: charting a new strategic direction

- **International Livestock Research Institute is the only CGIAR center dedicated to livestock**, working to advance inclusive, sustainable livestock systems in low- and middle-income countries.
- Our **2024–2030 strategy** focuses on transforming food systems through better livelihoods, nutrition, equity, and sustainability.
- **We work through national partnerships to support women, youth, and smallholders** — not just by delivering solutions, but by building capacity and systems that last.



Innovations in the Lab: Emerging Diagnostic Technologies for Animal Health

Why innovations matter

- In the face of rising disease threats, such as zoonoses, transboundary outbreaks, antimicrobial resistance, traditional diagnostics are no longer enough

- Many of these are lab-bound, slow, and resource-intensive

- Innovations are bridging gaps between detection and decision making – faster, smarter, and more portable technologies

- Tools help us to move from reactive to proactive approaches for Animal Health

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CRISPR-based technologies

- Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)
- Gene editing tool – scissors
- Allows scientists to cut DNA at a specific location to add or remove and or change parts of the genetic code
- It's fast, precise, and powerful—used to improve crops, fight diseases, and, in ILRI's case, develop vaccines and disease-resistant livestock

Next generation sequencing technologies and genomic surveillance

Whole genome sequencing (WGS): Supports pathogen characterization, clade identification, and vaccine targeting

Metagenomics: Allows us to identify unknown or multiple pathogens directly from complex samples (e.g., tissue, blood, or environmental samples)

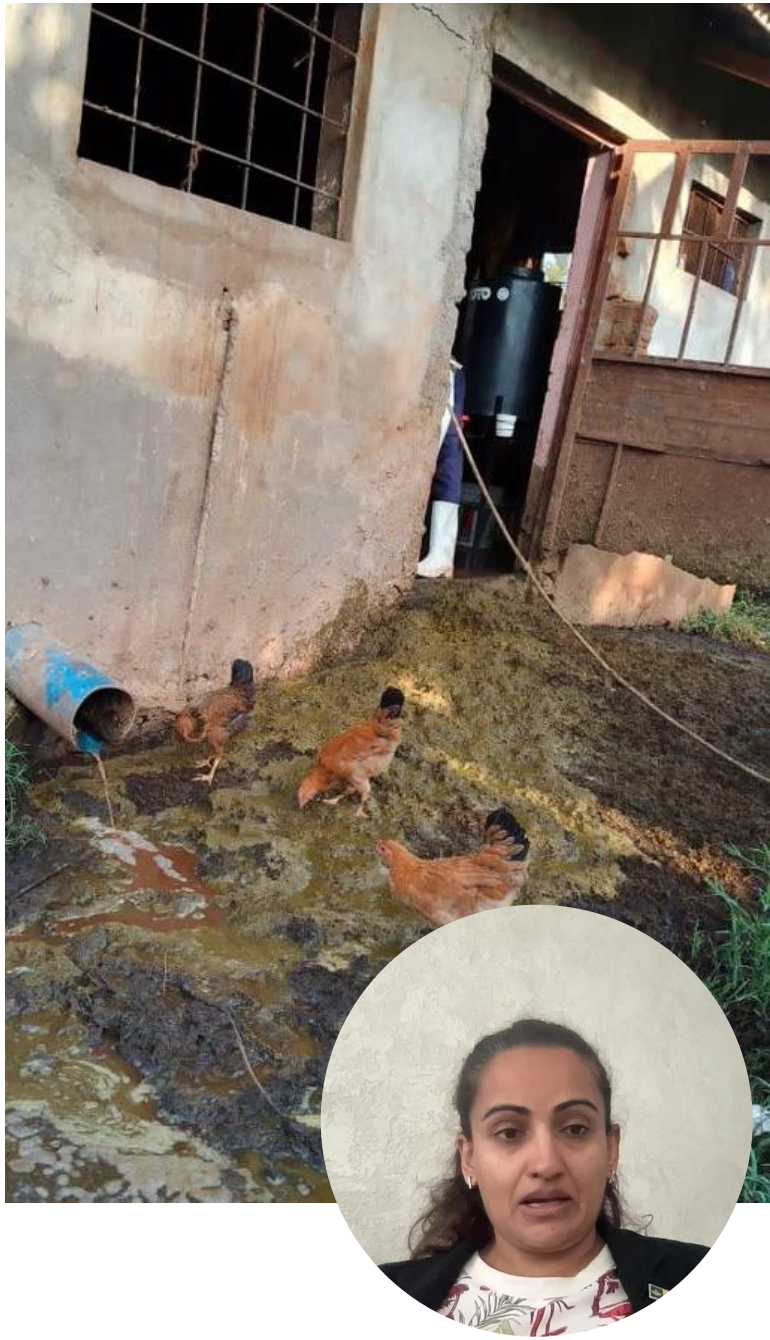
Portable sequencing (e.g., Oxford Nanopore MinION): Now enables mobile labs to conduct real-time outbreak analysis even in remote are

Animal Waste Surveillance – case study

- By sampling runoff from livestock farms or shared animal watering points, labs can detect circulating pathogens, emerging zoonoses, and even antimicrobial resistance genes.

- For instance, ILRI and partners have applied this in East Africa to assess AMR gene flow across the wildlife-livestock-environment interface and animal abattoirs

- Cost comparisons between technologies, such as Illumina vs. VirCap-Seq



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Use of mobile phone technologies

- Livestock weight helps farmers effectively manage their stock to make informed decisions on aspects of animal production

- The Africa Asia Dairy Genetic Gains (AADGG) project has created a mobile app called the **Dairy Data App** to help smallholder farmers track the performance of their dairy animals. The app works on Android phones and tablets and allows farmers and extension workers to easily enter data and get instant feedback. It is easier to use and more advanced than the older tools like Open Data Kit (ODK).

A farmer in Migori County in Kenya displays his 'eWeigh' mobile phone app (photo credit: Joseph Oduor).

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Artificial Intelligence

- AI-driven predictive systems for Rift Valley Fever (RVF) in East Africa are being spearheaded by academic and research groups integrating climate, vector, and livestock data

- Their study in Kenya uses **XGBoost machine-learning models** that combine rainfall, humidity, elevation, soil characteristics, and animal density to forecast RVF outbreaks with exceptionally high accuracy (~99.7%)

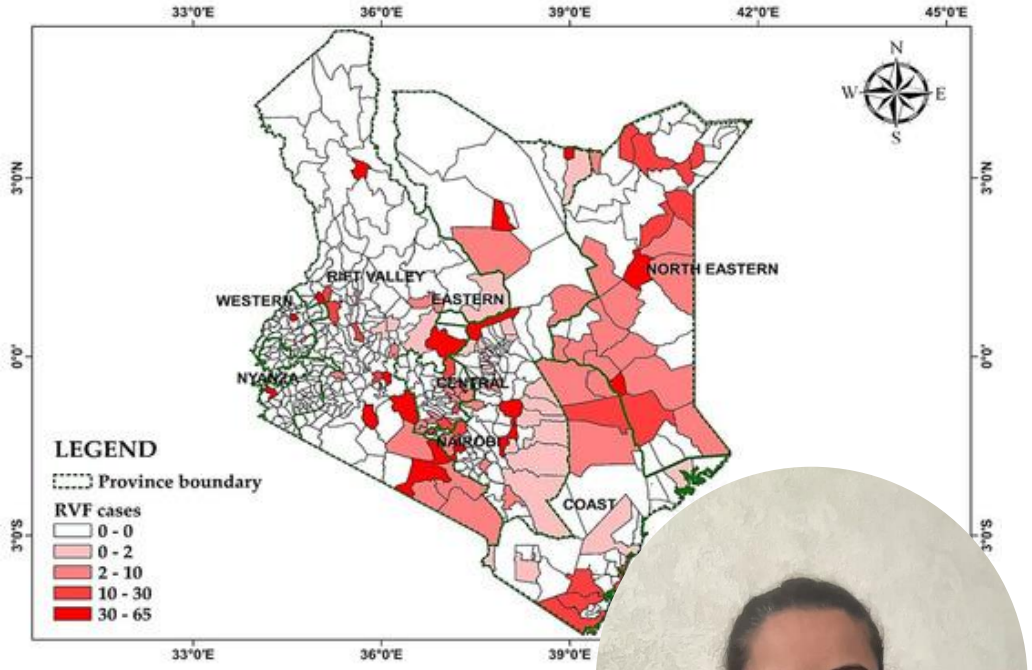
big data and cognitive computing

MDPI

Article

An XGBoost Approach to Predictive Modelling of Rift Valley Fever Outbreaks in Kenya Using Climatic Factors

Damaris Mulwa [1], Benedicto Kazuzuru [1], Gerald Misinzo [2,3] and Benard Bett [4,*]



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Key Messages

- Essential for timely disease detection and response
- Field-adapted tools empower frontline health workers
- Digital and AI-enhanced tools improve speed and accuracy
- Environmental sampling expands surveillance beyond livestock
- Validated diagnostics strengthen surveillance systems and trade
- Public-private innovation accelerates local solutions
- Better diagnostics = stronger One Health outcomes

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The International Livestock Research Institute (ILRI) is a non-profit institution helping people in low- and middle-income countries to improve their lives, livelihoods and lands through the animals that remain the backbone of small-scale agriculture and enterprise across the developing world. ILRI belongs to CGIAR, a global research-for-development partnership working for a food-secure future. ILRI's funders, through the CGIAR Trust Fund, and its many partners make ILRI's work possible and its mission a reality. Australian animal scientist and Nobel Laureate Peter Doherty serves as ILRI's patron.
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