Pest forecast
Climate, disease, poverty and One Health

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Global contexts – livestock domains

Adapted from Smith J 2011

Food and Nutrition Security

Human and Animal Health

Poverty Reduction and Growth

Natural Resource Management

Climate change (temperatures to rise by 1-3.5°C by 2100)

Feeding the world (2.5 billion more to feed by 2050)

Land use change

Urbanization/irrigation

Biodiversity change

Environmental degradation

Note: Per capita consumption of major food items in developing countries – kg per capita per year (index numbers 1961=100).
Source: The State of Food and Agriculture 2009.
Emerging Zoonotic Disease Events, 1940–2012
Potential Hotspots in US, Western Europe, Brazil, Southeast Asia

Most emerging human diseases come from animals. This map locates zoonotic events over the past 72 years, with recent events (identified by an ILRI-led study in 2012) in blue. Like earlier analyses, the study shows western Europe and western USA are hotspots; recent events, however, show an increasingly higher representation of developing countries.

Greatest Burden of Zoonoses Falls on One Billion Poor Livestock Keepers

An ILRI study shows that zoonotic diseases are major obstacles in pathways out of poverty for one billion poor livestock keepers. The diseases mapped cause 2.3 billion human illnesses and 1.7 million human deaths a year. In poor countries, the diseases also infect more than one in seven livestock every year.

LEGEND
Number of poor livestock keepers per square kilometre
- 1–5
- 5–20
- 20–50
- 50–100
- Above 100

Map by ILRI, from original published in an ILRI report to DFID: Mapping of Poverty and Likely Zoonoses Hotspots, 2012.
Climate sensitive zoonoses & poverty

Importance index

Salmonellosis
Campylobacteriosis
Cryptosporidiosis
Leptospirosis
Botulism
Endoparasitosis
Listeriosis
Toxoplasmosis
E. coli
Anthrax
Liver fluke
Tryps
Ectoparasitosis
Under-nutrition
Malaria in Finland

One Health

Animal/Plant – Human – Environmental Health

Focus hazards and risks

• Zoonoses and FBD
• Aflatoxin in maize
• Rubber leaf disease
Early Warning and Forecasting System concept

- Met-Data
- Model development: Forecast, mapping
- Decision support tools
- Notification to farmers
- Climate sensitive diseases data
  - Surveillance system
  - Field survey
- Responses
  - Vaccination
  - Harvesting
  - Selling

Adapted from ICRAF (2014)
End-to-End Early Warning and Forecasting System for Rubber fall

Met-Data
Communication
Forecast
Decision Support
Notify
Coordinate
Farmers
Field-Data
Aflatoxin: A Fungal Toxin Infecting the Food Chain

Persistent high levels of aflatoxins—naturally occurring carcinogenic byproducts of common fungi on grains and other crops—pose significant health risks to animals and humans in many tropical developing countries.

Chronic exposure to aflatoxins leads to liver cancer and is estimated to cause as many as 26,000 deaths annually in sub-Saharan Africa. This infographic depicts the ways that aflatoxins persist throughout the food chain. At each level, research can help understand how to manage risks.

**Susceptible Crops**
- Field crops infested with aflatoxin
- Oil seeds
- Cereals
- Tree nuts
- Spices

**Poor Storage**
- Toxins increase during storage

**Animal Consumption**
- Animals and dairy are infected from contaminated feed

**Impact on Dairy Production**
- Livestock produce less, loss of income and food

**Impact on Human Health**
- Consumers experience liver cancer, poisoning
- Linked to stunting and immunosuppression

**Human Consumption**
- Humans consume toxins in staple foods and dairy products

Aflatoxins in maize (n= 2,370)
Annual incidence rates for lepto and VE in humans

*Previous study showed that 60~71% of VE were caused by JE in Vietnam*
RVF outbreaks follow periods of excessive rains (TRMM precipitation data from NASA)

Interaction between environmental factors, immunity in the disease occurrence and impacts
Concept of climate and weather-sensitive disease explored and promoted

Researchers and policy makers will have evidence on spatial hotspots for climatic sensitive zoonoses and temporal risk patterns in order to better target surveillance and response

Better understanding of the relative importance of risk factors for diseases and pests in different contexts

One health weather based pest forecasting piloted for rubber, aflatoxins and weather sensitive disease