

World Livestock 2013

Changing disease landscapes



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FOOD AND AGRICULTURE ORGANIZATION OF
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Foreword

We live in an interconnected world. Today's global context provides a myriad of ways in which individual, human lives weave together. When we think of these connections, we often focus on communication, commerce and other human endeavours made possible by scientific and technological advancements. However, this interconnectivity spans far beyond our own species.

In today's world, we humans have become increasingly linked not only to each other, but also to all other life on the planet. Human health has become ever more intertwined with the health of our environment and the animals that populate it – the animals we rely on for food, draught power, savings, security and companionship as well as the wildlife inhabiting sky, land and sea. Diseases emerge, spread and persist in humans, livestock and wildlife, affecting all three with often devastating consequences. We are more in contact with animals than ever before, and livestock and wildlife are more in contact with each other. It is time for us to acknowledge the degree to which our health is connected to the health of animals and the environment. It is time for us to focus on global health.

This is the perspective of the 2013 issue of FAO's *World Livestock – Changing disease landscapes*. It explains the pressures behind the disease dynamics affecting humans, livestock and wildlife and considers the state of livestock and global health with a focus on where health threats are on the rise. It makes the point that livestock diseases need to be part of global health protection efforts that all parts of human society can embrace, develop and implement together.

With regard to the pressures and the state of livestock and global health, this publication shows clearly that disease must be addressed at its source, particularly in animals. Livestock health is the weakest link in our global health chain, and disease drivers in livestock as well as wildlife are having increasing impacts on humans. Over 70 percent of human diseases originate in animals, and our expanding human population is inhabiting more wilderness while becoming ever more reliant on animals for food. Livestock densities are changing, and production systems are impacting each other in new ways. Livestock-related trade is on the rise, and climate change is creating new opportunities for animal diseases to thrive. Food chain dynamics are enabling more diseases to develop more quickly, and the degradation of natural habitats is reducing natural coping mechanisms.

How do we respond? Firstly, we must seek evidence to understand the problems and opportunities for change. This is done through assessments, surveys as well as objective and forward looking analysis. Secondly, we must enable dialogue and information exchange through knowledge platforms, networks and harmonized procedures. Thirdly, we must be the change we seek by raising awareness, promoting health-conscious innovation, improving the way we produce, buy, sell and consume animal products – from 'farm-to-fork' – as well as enhancing how we jointly investigate and respond to health threats. Finally, we must develop tools and guidance built on true incentives for health-positive change.

These efforts must be interlinked within an approach that engages the whole of society for effective collaboration across animal, human and environmental health, from local to global. Financiers, planners and natural resource managers must link their decisions to health coupled with food production needs and nutrition. Policy-makers must consider urban trends and contribute

to ecosystem stability. Veterinarians, physicians, economists, sociologists, and eco-health counterparts must jointly define the risk factors and drivers of today's threats of animal origin. Scientists must take multidisciplinary approaches to address threats and minimize pressures leading to instabilities, identify areas for surveillance and control and contribute to the global dialogue. We must recognize how globalization, population growth and technology push our markets and supply chains closer together to reveal growing threats with widespread impacts.

Through *Changing disease landscapes*, FAO makes the clear argument for action on global health. FAO and its United Nations (UN) partners believe now is the time for policy-makers and decision-takers to move toward a truly global approach to address intertwined health dynamics. This is echoed in the One Health approach and the UN Sustainable Development Goals, and FAO has integrated fully this goal into its vision for development as expressed in FAO's new Strategic Objectives: i) eliminating hunger; ii) improving the sustainability of agriculture, forestry and fisheries; iii) reducing rural poverty; iv) enabling inclusive and efficient agricultural and food systems; and v) increasing livelihood resilience to disasters. Global health plays a key role in all of these, and, in particular, in animal disease prevention and control. Through this strategic and holistic approach, FAO is working to explore synergies across health and development sectors and collaborate with national public and private structures to reduce health risks at the human-animal-ecosystems interface.

By linking our work together thoughtfully and purposefully, we as a global community can shape a healthier and more prosperous world. It is my sincere hope that this publication can contribute to that vision.

For a healthier future,



Ren Wang

Assistant Director General

Agriculture and Consumer Protection Department

Acronym list

AAT	African animal trypanosomosis
AI	avian influenza
ASF	African swine fever
ECF	East Coast fever
EMPRES	Emergency Prevention System
EU	European Union
FMD	foot-and-mouth disease
GDP	gross domestic product
GHG	greenhouse gas
GNI	gross national income
GREP	Global Rinderpest Eradication Programme
HPAI	highly pathogenic avian influenza
HIV	human immunodeficiency virus
IPCC	Intergovernmental Panel on Climate Change
NENA	Near East and North Africa
NGO	non-governmental organization
NWS	New World screwworm
OECD	Organisation for Economic Co-operation and Development
OIE	World Organisation for Animal Health
OWS	Old World screwworm
PRRS	porcine reproductive and respiratory syndrome
RVF	Rift Valley fever
SARS	severe acute respiratory syndrome
UN	United Nations
WHO	World Health Organization

Overview

This publication examines why and how pathogens of animal origin have become a major global public health threat, and what might be done to mitigate this threat. The increasing dynamics of disease at the human–animal–ecosystem interface are explored against the backdrop of changing biophysical and social landscapes. Based on a Pressure–State–Response analysis framework, disease events are described in their agro-ecological and socio-economic contexts.

Human demographic and economic developments are resulting in increased pressure on the earth's natural resources. Both play important roles in the ongoing transformation of farming and natural landscapes. A major feature is the expanding demand for milk, meat and eggs from the rapidly growing middle-income class across the globe. Changes in major land-use systems are assessed for the period 2000–2030, with particular attention to the main land-use dynamics where cropland is being converted to human settlements and related infrastructure; cropland is replacing pastoral systems and forested areas; and pastoral and cropland systems are encroaching onto forested areas. Areas prone to deforestation are highlighted as potential hotspots for the emergence in humans and livestock of pathogens originating from wildlife. The dynamics of food and agriculture are described as the main drivers of disease emergence, spread and persistence in both extensive and intensive livestock systems and in food supply chains. Livestock biomass distributions are assessed in conjunction with farming systems and land pressures to identify areas with enhanced human–livestock interfaces. Developments in South and East Asia – two areas of dynamic change in the livestock sector – are described in detail, focusing on the important smallholder dairy subsector in South Asia and the prominent poultry and pig subsectors in East Asia. Livestock intensification trajectories

are analysed in different geographic areas and for several livestock commodities, to trace possible animal and veterinary public health risks.

Separate chapters discuss changes in the international trade of animals and animal products, and the ways in which this trade may have affected disease occurrence. The implications of climate change and the effects of globalization are also discussed. The evolution of animal health systems is assessed to identify failures and successes in disease control. Tentative livestock disease impact profiles are drawn up to illustrate how disease may interfere with the achievement of sustainable development targets, and to argue for a people-centred approach to health protection. The main impact domains considered are human health, livelihoods, economics and the environment. Particular attention is given to endemic disease burdens in humans and livestock, both in densely populated areas with very high land pressures and in remote dry lands and other harsh environments.

The publication suggests the need for a paradigm shift in risk assessment, with more attention to a health-in-development approach that engages society at large and is built on analysis of the drivers of disease dynamics. Such analysis will be instrumental in defining preventive measures for countering disease emergence, spread and persistence. Four distinct driver-disease complexes need to be addressed: poverty-related endemic disease burdens in humans and livestock; biological threats and biosafety challenges posed by globalization and climate change; food and agriculture-related veterinary public health threats; and the risk of disease agents jumping species from wildlife to livestock and humans. The preventive approach suggested relates disease dynamics and pathogen evolution directly to human behaviour at all points of animal-source food value chains.



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Introduction





Changing disease landscapes

Most of the new diseases that have emerged in humans over recent decades are of animal origin and are related to the human quest for more animal-source food. The emergence of human immunodeficiency virus 1 (HIV-1), bovine spongiform encephalopathy, severe acute respiratory syndrome (SARS) and novel influenza viruses can all be traced back to the consumption of animal-source food, involving both wild meat¹ and livestock products. In response to human population growth, income increases and urbanization, world food and agriculture has shifted its main focus from the supply of cereals as staples to providing an increasingly protein-rich diet based on livestock and fisheries products. The production of animal-source food is at the heart of world agriculture today (Table 1). A quarter of the earth's terrestrial surface is used for ruminant grazing, and a third of global arable land

¹ Wild meat, also known as “bushmeat”, is defined as any non-domesticated terrestrial mammals, birds, reptiles and amphibians harvested for food (Nasi *et al.*, 2008: 50).

TABLE 1
GLOBAL RANKING OF FOOD
AND AGRICULTURE COMMODITIES,
IN VALUE (2010)

RANK	COMMODITY	PRODUCTION VALUE (US\$ BILLION)
1	Rice, paddy	180
2	Cow milk, whole, fresh	180
3	Indigenous cattle meat	172
4	Indigenous pig meat	168
5	Indigenous chicken meat	122
6	Wheat	81
7	Soybeans	66
8	Tomatoes	55
9	Sugar cane	54
10	Maize	54

Source: FAOSTAT.

is used to grow feed for livestock, accounting for 40 percent of total cereal production (FAO, 2012c). Animal agriculture uses far more land resources than any other human activity.

While rice is mainly for human consumption, much soybean and maize production serves to feed animals. The main animal products are

milk, meat and eggs; animal-source foods play an important role in global food security, nutritional well-being and health. However, the rapid growth in livestock production and supply chains is creating public health threats associated with an animal-to-human pathogen shift, which implies pandemic risks, food safety hazards and high burdens of zoonotic diseases, depending on the agro-ecological and socio-economic development context.

Livestock production and supply practices are part of a complex of global factors that drive disease emergence, spread and persistence. Additional drivers considered in this analysis are poverty, malfunctioning health systems, deficient sanitation infrastructure, increased travel and trade, climate change, and increased pressures on the natural resource base, particularly natural ecosystems and wildlife resources.



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Scope of this publication

This publication reviews how pathogens originating in animals are posing growing global health threats, and suggests ways of addressing this situation. Global health is broadly defined to encompass not only the World Health Organization (WHO) definition of human health, based on physical, mental and social well-being (WHO, 1948), but also the health of the earth's natural resource base and the notion of safety in food and agriculture. The publication focuses on pathogens of animal origin that pose direct and indirect public health threats, including endemic livestock diseases that affect mostly the poor sectors of society, wildlife health and ecohealth.²

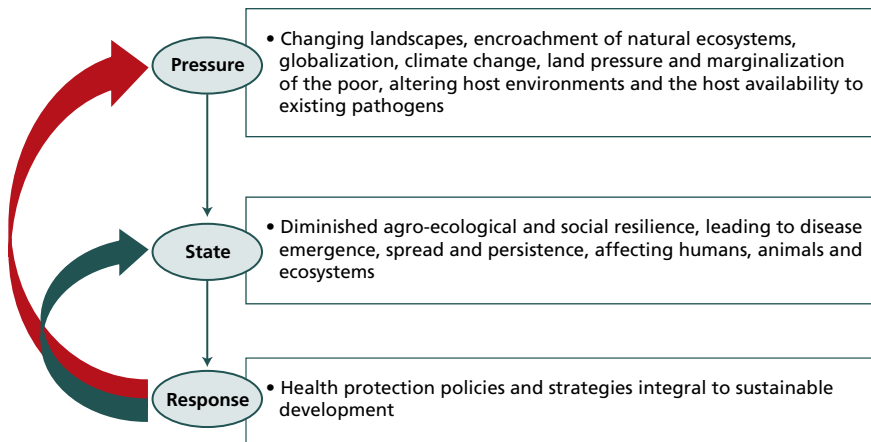
World Livestock 2013 – Changing disease landscapes is the second publication in a series. It follows *World Livestock 2011 – Livestock in food security* (FAO, 2011b), which describes the contributions of livestock to food secu-

urity in different regions and communities. This 2013 edition reviews the global factors driving the ongoing animal-to-human pathogen shifts, explores the consequences and proposes elements of a response to these disease dynamics. To some extent, *World Livestock 2013* parallels FAO's flagship publication *Save and Grow* (2011a). That publication was an elaborate plea for a novel green revolution to ensure the sustainable intensification of crop production and a response to the challenges posed by increased pressures on the natural resource base, including climate change, scarcity of water resources, biodiversity loss, indiscriminate pesticide application and land degradation. Similar principles for sustainable intensification are applicable to livestock production, although in the livestock sector the situation is compounded by emerging global veterinary public health risks, which call for greater emphasis on "safe" livestock production while conserving the natural resource base.

Global health security is the main theme and concern addressed in *World Livestock 2013*. Reference is made to climate change as a disease driver of growing importance; more healthy livestock would curtail greenhouse gas (GHG)

² The term "ecohealth" was coined by the International Association for Ecology and Health (EcoHealth) and means the sustainable health of people, wildlife and ecosystems.

1 A PRESSURE–STATE–RESPONSE FRAMEWORK FOR PLACING HEALTH IN A SUSTAINABLE DEVELOPMENT CONTEXT



emissions. The focus on mitigation and adaptation that drives responses to climate change also applies to the management of new diseases, for which adaptation requires enhanced health systems to address the new disease dynamics, and mitigation requires the strengthening of safety and resilience.

The disease dynamics at the human–animal–ecosystem interface are captured in the Pressure–State–Response framework, which is used in the analysis of environmental challenges. For example, economic and social developments exert *pressure* on the environment (e.g., polluting emissions), which diminishes the quality (*state*) of the environment. These changes have impacts on human welfare, to which society responds. The response may be directed to the pressure and/or the state. Global factors (*pressures*) also cause disease emergence, spread and persistence, with impacts on health and development; the resulting disease (*state*) needs to be confronted through a *response*. At the same time, disease dynamics are an indication of instability or reduced resilience in natural ecosystems, food and agriculture and socio-economic development, and *responses* should recognize and reflect this

causality (Figure 1). To restore safety, health protection policies, strategies and practices will have to become integral parts of the new Sustainable Development Goals³ (Langlois, Campbell and Prieur-Richard, 2012).

Risk assessment of the global context involves analysing how human behaviour changes the availability, use and management of the natural resource base, transforms food and agriculture, and drives socio-economic development (Narrod, Zinsstag and Tiongco, 2012). Such risk assessment, therefore, works at the nexus of food security, public health, human well-being and environmental sustainability and resilience.

The terms *developed* and *developing* countries are used in this analysis for lack of a suitable alternative.

³ During 2013, the UN Open Working Group of the General Assembly on Sustainable Development Goals addressed poverty eradication; food security and nutrition, sustainable agriculture, desertification, land degradation and drought; water and sanitation; employment and decent work for all, social protection, youth, education and culture; and health, population dynamics.

