CHAPTER 1
INTRODUCTION

Since late 2003, avian influenza (often referred to in the media as 'bird flu'), has become one of the most publicized emerging infectious diseases. This followed the detection of highly pathogenic avian influenza (HPAI) caused by viruses of the H5N1 subtype in many countries in Asia. These Asian-lineage HPAI viruses produced fatal disease in poultry, wild birds, humans and other mammals, with subsequent spread of disease to some 60 countries across three continents. Affected countries and the international donor community have mobilized hundreds of millions of dollars to assist in controlling this disease, mainly because of concerns about the potential of these viruses to unleash a global pandemic of human influenza.

Avian influenza is not a new disease and much has been done in the past to investigate, control and eradicate it – especially HPAI – in poultry. The knowledge derived from these earlier encounters with the disease provides a useful framework on which to build the new body of information arising from its recent, almost global spread, which has reshaped many long-held views about avian influenza. Yet there is still much that remains to learn about this disease.

The overall objective of this paper is to review the many issues surrounding the emergence, persistence, spread and control of avian influenza, focusing on the current epizootic of H5N1 HPAI. It highlights what is known and not known about the disease, and examines some of the speculation and issues relating to its emergence and control. It specifically examines factors associated with the poultry subsector[1] that may have contributed to its emergence and spread, and also the impact of the disease (and of the measures used for its control) on smallholders and the rural poor in developing countries.

The paper explores the various mechanisms of persistence and spread of H5N1 HPAI viruses - both proven and possible - in order to understand better the sources of virus and the modes of transmission. It does this in an effort to separate science from perception, and to highlight areas where uncertainty remains.

It examines many of the unresolved questions regarding the emergence of HPAI (and, specifically, of H5N1 HPAI since 1996), using lessons from previous outbreaks of avian influenza as a guide (Chapter 2).

The crucial role of ducks in the genesis of the current outbreak and as reservoirs of infection is highlighted, as are ways that risk can be contained. The paper also examines the roles played by different poultry species, wild birds, and human-mediated (anthropogenic) factors in the emergence and spread of this disease (Chapters 3 and 4).

Live-bird markets have been blamed for maintaining and spreading avian influenza viruses and pose major challenges to veterinary authorities. The role of these markets in the spread and maintenance of HPAI and other avian influenza viruses is discussed, along with information on methods that have been used to prevent infection in these markets (Chapter 4).

Chapter 5 examines the structure of the poultry subsector in infected and at-risk countries, provides some information on how the various components have evolved, and explores the link

[1] The poultry subsector of the livestock sector. This term is used throughout this document to describe all poultry producers rather than the term 'poultry industry' which tends to exclude village level producers.

between this evolution and the emergence and persistence of avian influenza. It also reviews features of different poultry production systems and how they have been classified, and discusses a number of aspects relating to *biosecurity*, a term that has been used widely during this outbreak.

One school of thought suggests that intensive farming has been pivotal in the emergence and spread of H5N1 HPAI, whereas others see it largely as a disease of smallholder poultry, brought about by failure or inability to implement appropriate biosecurity/disease management systems in smallholder flocks as they expanded to meet market demands. The paper argues that both have played a role, and any attempt to blame a particular practice or sector for emergence of this disease fails to recognize the complexity of the poultry subsector (including the quality of farm management) and the pitfalls and benefits of the various management systems from a veterinary, social and economic perspective.

Chapter 5 also examines the rapid development of the poultry industry in Asia and Africa, areas generally lacking the veterinary infrastructure needed to monitor animal health. It argues that this development created a virtual 'time bomb' that 'exploded' when H5N1 HPAI, a major disease of public health significance, emerged.

Poultry rearing has played a crucial role in rural development due to the low setup cost and the potentially high returns for smallholders when they expanded their flocks. Many smallholders have responded to market demands created by large urban centres to rear additional poultry, but have found that without concurrent increases in measures to prevent disease (such as enhancement of farm biosecurity), they were vulnerable to disease. Chapter 5 reviews these factors, as well as the consequential effects of disease even on smallholders with uninfected flocks who have suffered through loss of market access. This is particularly true in places where the public and authorities have demanded that poultry be grown under 'safe', certifiable H5N1-free conditions, or where bans have been imposed on the sale and keeping of live poultry in urban areas.

Most commercial producers have been affected by market crashes of some kind. Some are likely never to return to poultry production, while those that remain may no longer have access to the markets they relied on before the outbreaks occurred. These issues are also discussed in Chapter 5.

The paper discusses the changes in the structure of the poultry subsector that are already occurring, and examines how the disease will influence the rate of these changes. Some, such as moves to centralize slaughter of poultry in some countries, are likely to be accelerated by the H5N1 panzootic, whereas others (such as the move towards intensive production, which is driven largely, but not entirely, by market forces) will occur regardless of the occurrence of HPAI.

Though this disease has had significant direct social and economic effects on producers – especially smallholders – the direct cost of the disease has been dwarfed by the costs and losses associated with control and preventive measures. Market shocks associated with largely misplaced (but understandable) public fears regarding safety of poultry products have also had a devastating impact on poultry producers and related trades. These concerns, fuelled in part by the media, have led to a marked but temporary fall in sales and prices of poultry products in a number of countries both during and after outbreaks. Even countries with no cases of disease in poultry have suffered a fall in demand for poultry, leading to reductions in sales and exports.

Many poultry producers and decision-makers are asking how best to prevent the spread of HPAI to their country or, if it is already present, how to prevent further spread and/or development of endemic infection while minimizing damage to their country's economy. The various control and

preventive measures currently employed are examined in detail (Chapter 6). Information is provided to support the view that the mix of measures used must be appropriate to the country and the extent of infection.

The paper suggests that although intensive rearing of poultry has played a role in the emergence of highly pathogenic avian influenza viruses in the past, such farms can also be more readily protected in the face of infection through rigorous implementation of biosecurity (and other disease prevention) measures than less biosecure smallholder flocks reared outdoors. However, the risk to these small flocks depends on the levels of infection in the area around the farm or in enterprises linked to the farm; they may still remain free from infection in places where the threat of infection is low. The problems faced by the smallholder sector in implementing biosecurity measures are discussed, along with the socioeconomic aspects of moves to enhance biosecurity.

The paper looks specifically at what is known about the effects of HPAI and associated control measures on the rural poor and other vulnerable households. For countries with a large number of backyard producers, poultry production is a significant contributor to the livelihoods of many of these households. Poultry meat and eggs represent an excellent source of supplementary income and essential nutrients for the poor, particularly for children and women. The economic and potential nutritional losses faced by poor producers in these countries can be devastating, depending on the strategies chosen to control HPAI. Such producers have already been adversely affected by the disease, and more importantly by the control measures introduced.

Achieving an appropriate balance between preventing spread of a disease that could have potentially serious global human health consequences, providing consumers with affordable food perceived to be 'safe', and protecting the livelihood of poor smallholders is perhaps the greatest challenge facing authorities when making decisions related to control of H5N1 HPAI. This paper recognizes that it will not be possible to control this disease without incurring some costs and affecting some producers, but looks at ways to minimize the impact of these measures on vulnerable producers.

Institutional factors, such as the extent of central support for programmes and the degree of provincial autonomy, have played a major role in the effectiveness of control strategies. These issues are discussed in Chapter 7.

There are many areas where additional research and investigations are needed to help in controlling this disease. This is an area that has been considered previously by a number of groups, and is the subject of ongoing work by a range of research organizations. This paper lists and briefly considers some of the critical areas where further studies are needed to address problems, and makes a plea to researchers to ensure that they discuss their research with disease control authorities to ensure that the results of their research assist in solving problems identified by the latter (Chapter 8). A considerable body of work is currently being undertaken, and results from this will no doubt reveal new information relating to H5N1 HPAI that was not available when this document was prepared. Much of it will likely be published in the so-called 'grey' literature (i.e. documents not in refereed publications but in the form of consultant's reports, mission reports and conference proceedings, etc.) rather than scientific papers. This document attempts to synthesize important parts of the material already published, arguing that continuous assessment of this material is critical for a full understanding of the disease.

The main findings of the paper are summarized in Chapter 9, where scientists (both biological and socioeconomic) are challenged to take a multidisciplinary approach to understanding the information and resource needs of disease managers. This will allow them to deliver effective control and preventive strategies acceptable both economically and socially to producers and

upstream and downstream players, as well as the global community. The opportunities afforded by the shift from emergency management of this disease to development of long-term strategies need to be grasped, and international agencies have an obligation to guide national governments towards policies that minimize the adverse effects that can accompany changes to production and marketing systems.

Since Asian-lineage H5N1 HPAI viruses were first detected in geese in 1996, it has become apparent that subsequent events have not always been predictable. Influenza experts have had to review accepted dogma on avian influenza and its control and prevention as a result of the many unexpected events that the panzootic has thrown up. The paper stresses the need for decision-makers in both affected and at-risk countries to be prepared to make decisions under conditions of uncertainty for some time to come, because they will inevitably lack some of the required information when implementing control strategies. They may also need to modify their approach as more information about the disease and the effects (both positive and negative) of control and preventive measures becomes available. This flexible, iterative approach should be incorporated into all avian influenza control and preventive plans and programmes.