

A Collaborative Research
Project Funded by:



Implemented by:



Key Findings

- Evidence from Thailand, Viet Nam and Cambodia strongly suggests that larger-scale poultry flocks (>1,000 birds) are at higher risk of HPAI than many of their small-scale, backyard counterparts.
- To more effectively manage HPAI risks and reduce unnecessary hardship for the rural poor; pathways for HPAI virus introduction and propagation need to be carefully assessed.



Controlling Avian Flu and Protecting People's Livelihoods in the Mekong Region

HPAI Research Brief | No. 5 - Year: 2008

Flock Size and HPAI Risk in Cambodia, Thailand, and Viet Nam

J. Otte, D. Pfeiffer, R. Soares-Magalhaes, S. Burgos, and D. Roland-Holst

Highly pathogenic avian influenza (HPAI) caused by the H5N1 strain was first reported in Southeast Asia in late 2003, although the H5N1 virus is now considered to have emerged as early as 1996 when it was first identified in geese in Guangdong Province in southern China. Since then, HPAI has spread rapidly and over large distances with outbreaks occurring in domesticated poultry and some wild bird populations in Mongolia, southern Russia, the Middle East and, in 2005, in Europe and Africa.

In East Asia, several major epidemic waves have occurred in Indonesia, Thailand, and Viet Nam. The widespread practice of smallholder backyard poultry keeping in these countries is frequently cited as one of the primary risk factors for these outbreaks and the persistence of the virus in domestic poultry populations. This perception of smallholder risk has in turn animated a broad spectrum of control measures, including widespread culling and prescriptions for relatively expensive production technologies. These measures directly challenge the economic viability of an important subsistence activity and income source for the rural poor. The costs of re-stocking and changing production methods could force smallholders to abandon poultry keeping altogether and significantly undermine their food security and livelihoods. In particular, denying them an important and growing market for their agricultural products closes a gateway out of poverty.

Given the likely adverse impacts of such policies on rural poor majorities, it is essential to carefully assess the evidence regarding HPAI risk in smallholder poultry flocks.

The Risk of HPAI Infection in Relation to Flock Size

Because the majority of HPAI outbreaks in Asia have been reported in smallholder ‘backyard’ flocks, there is an assumption these small flocks, with typical flock sizes of well under 50 birds, largely, but not exclusively kept for home consumption, have an inherently higher risk of contracting and thereby disseminating HPAI than larger market-oriented flocks maintained in poultry operations following the specialized, high-input production models of industrialized countries. This assumption was tested using HPAI reports from Cambodia, published data from the first 2004 HPAI epidemic and concurrent active surveillance programme in Thailand, and data collected in Viet Nam by the national animal health authorities during the second, third and fourth epidemic waves.

Thailand

The Thai poultry sector is very heterogeneous. In 2004, commercial broiler enterprises, consisting on average of 3,500 birds per flock, constituted only two percent of all flocks but accounted for nearly sixty percent of the standing poultry population. On the other hand, ‘backyard’ flocks, with an average flock size of 30 birds, constituted approximately three quarters of flocks, but account for only around one fifth of the standing poultry population.

The relative proportion of flock types (as defined by the Thai animal health authorities) with detected HPAI infection and their crude risk of detected HPAI infection in 2004, the year with the highest HPAI incidence in Thailand, is shown in Figures 1 and 2.

Figure 1: HPAI infections registered in Thailand in 2004 (n=1,769) by flock type

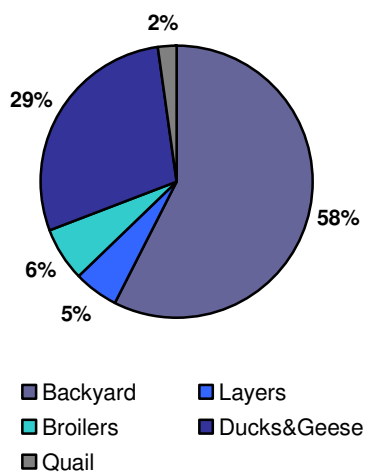
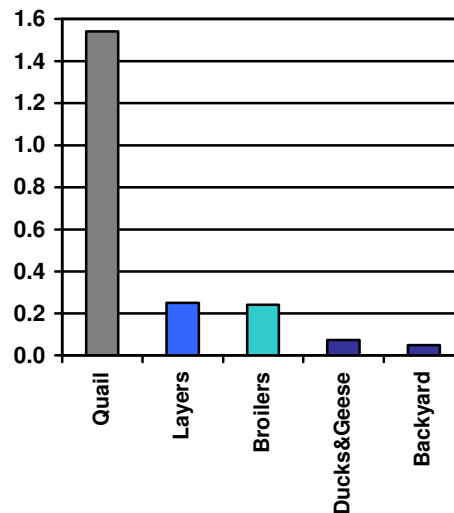


Figure 2: Risk of detected HPAI infection (%) in Thailand in 2004 by flock type



Although, for example, layer flocks (average flock size of 700 birds) only constituted one percent of all flocks, they accounted for five percent of all registered infected flocks (an HPAI infection / detection risk of slightly above two per thousand flocks). The HPAI infection / detection risk in broiler flocks was similar to that in layers; while quail flocks, with an average flock size of around 1,400 birds, showed the highest risk of detected HPAI infection, reaching

more than 15 per thousand flocks. Against previous assumptions, backyard flocks showed the lowest risk of detected HPAI infection, 0.5 per thousand flocks, less than one quarter that of layer and broiler flocks.

These results are likely to partly reflect differences in ascertainment, HPAI being more readily detectable in larger commercial operations and more likely to be brought to the attention of animal health authorities by these operators. However, since the active surveillance programmes in place in Thailand were particularly focused on backyard operations, this potential ascertainment bias is unlikely to be the sole explanation for the higher risk of HPAI detection in commercial layer and broiler flocks than in backyard operations (3 out of 4 HPAI outbreaks in backyard flocks would have had to go undetected for the latter to reach the level of HPAI risk seen in layer and broiler flocks).

It is also noteworthy that the Central and Eastern regions of Thailand, the regions with the lowest proportion of backyard flocks (less than 20% of all flocks), and with the largest commercial flocks, constituted the 'epicentre' of the 2004 HPAI epidemic in Thailand.

Viet Nam

The poultry industry in Viet Nam is not as concentrated as in Thailand. More than 90 percent of flocks still consist of less than 50 birds (almost 8 million flocks, many of which are mainly kept for home consumption), while less than 1 percent of flocks are of 1,000 birds or more. Nevertheless, almost 25 percent of the poultry population is raised in these larger, commercial flocks, around half (slightly more than 1 million birds) in small flocks of less than 50 birds (average 15 birds) and the remainder in intermediate size flocks. The larger scale, industrial holdings are situated near main consumption centres, such as Ho Chi Minh City in the Mekong river delta and Hanoi in the Red river delta.

The number of infected flocks by size class and approximate risk of contracting HPAI by flocks falling in different size classes during the second (Dec 2004 to March 2005), third (Oct to Dec 2005) and fourth (Nov 2006 to March 2007) epidemic waves is shown in the table presented below. (Note: during the first wave, infection status was not determined for all flocks suspected of having HPAI.)

HPAI outbreaks during the second, third and fourth epidemic waves in Viet Nam

Flock size class	Second wave		Third wave		Fourth wave	
	Outbreaks	Outbreaks / 1,000 flocks	Outbreaks	Outbreaks / 1,000 flocks	Outbreaks	Outbreaks / 1,000 flocks
1 – 50	93	0.01	48	0.006	34	0.004
51 – 500	447	1.04	160	0.37	44	0.10
501 – 1,000	211	62.13	77	22.67	19	5.59
1,001 – 3,000	182	91.64	77	38.77	15	7.55
> 3,000	72	100.42	50	69.74	2	2.79
Total	1005	0.12	412	0.05	114	0.01

Due to the implementation of vaccination campaigns and other control measures, the overall risk of HPAI infection was significantly reduced from 0.12 in the second wave to 0.05 in the third, and 0.01 per thousand flocks in the fourth wave. During all three waves,

however, infection risk consistently increased with flock size, reaching 100 per thousand flocks in the largest size class during the second wave, which by all standards must be considered extremely high. Analysis of infection risk within the second and third epidemic waves revealed that the larger flocks were more likely to be affected during the early, exponential growth phase of the epidemic than during the receding phase while the opposite was observed for small flocks. This could indicate that initially HPAI was primarily propagated in Viet Nam through the commercial sector, which would be consistent with the geographic clustering seen in Thailand.

As discussed for Thailand, the comparatively low HPAI risk in the smallest flock size group may be partly due to the lower likelihood of disease detection and reporting. However, applying the HPAI risk estimated for the largest flock size class to the smallest flock size class would mean that more than 700,000, 300,000 and nearly 50,000 outbreaks in smallholder flocks would have remained undetected in the second, third, and fourth waves respectively, which seems highly unlikely.

Cambodia

In Cambodia poultry keeping is predominantly a household activity with more than 90 percent of the national flock owned by around 2 million households. The commercial sector is small, comprising some 200 chicken layer and broiler flocks and around 1,000 commercial duck producers.

HPAI was first recorded in Cambodia in a chicken layer farm near Phnom Penh in Jan 2004. A total of 20 outbreaks have been reported to date (14 of these have occurred in March / April of successive years). Three of these 20 outbreaks (15 percent) have been recorded in the commercial sector, affecting flocks of 7,500 layers, 4,500 broilers and 1,600 ducks. Although it is generally acknowledged that there is much room for improving disease surveillance and reporting in Cambodia, and that therefore there probably has been substantial under-reporting of HPAI, particularly in smallholder flocks, the pattern of HPAI risk in Cambodia is consistent with that observed in Thailand and Viet Nam, namely that larger flocks were at higher risk of HPAI infection than smaller flocks.

Conclusions

Our findings indicate that across the three Mekong countries studied, smallholder poultry flocks were consistently at considerably lower HPAI risk than larger scale, market-oriented poultry operations – at least in the initial epidemic waves. In fact, the highest HPAI risk appeared to be associated with those producers best able to finance improved risk reduction measures themselves, i.e. the larger commercial poultry operations. These findings do not imply that HPAI can not spread and / or be maintained in smallholder poultry systems, but that governments can improve national animal health status, conserve public resources, and avoid unwelcome hardship for the rural poor by underpinning their HPAI control policy with formal, evidence-based disease risk assessments.

Disclaimer: The views expressed in this paper are solely those of the authors and do not reflect an official position of DFID, FAO, RVC or RDRC.