

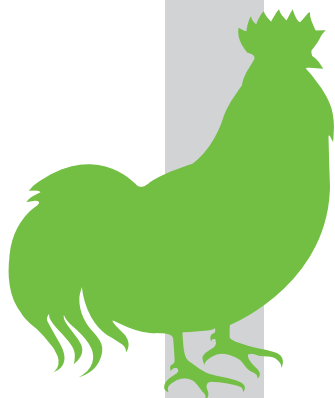
Avian Influenza:

Impacts and Key Policy Messages for Asia

**Findings from the Asia Partnership on
Emerging Infectious Diseases Research
(APEIR)**

June 2013





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Introduction



APEIR applies
a 3-M approach.
It is a multi-country,
multi-disciplinary
and multi-sectoral
research network.



In 2004-2005, outbreaks of highly pathogenic avian influenza (HPAI) in poultry were reported in 8 countries in South East and East Asia (China, Cambodia, Indonesia, Japan, Laos PDR, South Korea, Thailand and Viet Nam) and caused serious damages to the poultry sector. In order to improve regional response to the threat of pandemic influenza through joint research activities and to translate research results into practice, the Asia Partnership on Avian Influenza Research (APAIR) was formed, and the APAIR Coordinating Office (CO) was established in January 2007 and housed at the Health Systems Research Institute (HSRI) of Thailand. APAIR initiated and coordinated joint work among different institutions in the most severely affected Asian countries to fight avian influenza. The International Development Research Centre (IDRC) provided the start up support for APAIR.

In 2009 a new pandemic, H1N1 swine flu, threatened to kill millions around the world. Members of APAIR saw the opportunity to apply lessons learned from avian influenza to this and other infectious diseases. Thus, APAIR expanded its scope to include all emerging infectious diseases and was renamed the Asia Partnership on Emerging Infectious Diseases Research (APEIR).

APEIR is a regional initiative composed of researchers, practitioners and senior government officials from Cambodia, China, Indonesia, Lao PDR, Thailand and Vietnam. APEIR brings together representatives from more than 30 partner institutions (research institutions, universities, ministry departments) to form an alliance to conduct research, mobilize knowledge, and advocate for policy and practice change in agricultural and public health. A steering committee sets the strategic directions of the work of APEIR and appoints and guides the activities of the partnership.



APEIR applies a 3-M approach. It is a multi-country, multi-disciplinary and multi-sectoral research network. It has enabled researchers and experts from the agricultural and health sectors to explore joint research and policy questions in animal and public health. APEIR has served as a platform for exchange of and discussion on emerging infectious diseases (EIDs) both at country and regional levels, allowing partnering institutions to learn from past experiences and to plan for future collaborations. In order to address the complexity of emerging infectious diseases, the partnership uses an ecohealth/onehealth approach and brings together a combination of researchers with a mix of knowledge and skills.



APEIR's Vision: To Be the Leading EID Research Network in Asia by 2015.

APEIR's Mission: To develop a strong regional partnership in Asia that generates multi-disciplinary collaborative research on emerging infectious diseases based on ecohealth/onehealth concepts, and which facilitates communication and knowledge sharing among countries to reduce the threat of EIDs and the burden on these countries, especially on poor and marginalized groups in the region.

More information on APEIR can be found in the paper by Silkavute et al (2013)¹.

This booklet presents a summary of the first five APEIR projects developed in 2006-2007 and conducted between 2007 and 2011 that focused on avian influenza. The five studies were:

- (i) Forming of Regional Network for Surveillance and Monitoring of Avian Influenza Viruses in Migratory Birds (Wild Bird Project);
- (ii) Socio-Economic Impact of Human Pandemic Avian Influenza Outbreaks and Control Measures on Small-Scale and Backyard Poultry Producers in Asia (Economic Impact Project);
- (iii) Characteristics and Dynamics of Backyard Poultry Systems in Five Asian Countries in Relation to Reduce and Manage Avian Influenza Risks (Backyard Poultry Project);
- (iv) Policy Analysis for Pandemic Influenza Preparedness (Policy Analysis Project);
- (v) Studies on the Effectiveness of Avian Influenza Control Measures in the Asian Partnership Countries (Control Measures Project).

The first part of the booklet provides a summary of the key findings from the five projects. It is accompanied by five annexes in which each of the individual projects is discussed.

With the recent cases of H7N9, findings from the APEIR studies have become even more relevant and important. On 18 April 2013, APEIR released a statement on "Combating H7N9: Using Lessons Learned from APEIR's Studies on H5N1." The press release is included as Annex 6.

¹ Silkavute et al. Sustaining a Regional Emerging Infectious Disease Research Network: A Trust-Based Approach. Emerging Health Threats Journal – Supplement 1, 2013: 48-53.





Main Findings

The five APEIR studies were conducted at a time when global interest in avian influenza, especially viruses of the H5N1 subtype, was very high. Much was already known about this disease and its control measures by this time (see, for example, Sims and Brown 2007, FAO 2007), and it was, therefore, important during APEIR project preparation to ensure that the work conducted was addressing existing problems and issues of importance to policy makers and disease controllers rather than revisiting ground that had already been covered.

Each of the APEIR studies generated considerable new knowledge on avian influenza in poultry and wild birds, its control and prevention, and the effects of the disease and the control measures on poultry producers and others in poultry value chains.

In the case of the wild bird studies, the funding from APEIR helped to provide a bridge between the different research groups working in this area across the SE Asian region.

The studies were planned and implemented at a time when many other related studies were being conducted. In the case of the wild bird studies, the funding from APEIR helped to provide a bridge between the different research groups working in this area across the SE Asian region. In some cases, the information from the studies also provided data or findings that contrasted with those of other studies conducted at the same time, such as the work of the smallholder team in Vietnam.

The text box below highlights the most important findings, integrated from the five studies, which added to the knowledge already available from a disease management and policy perspective.



Key Findings from the Five APEIR Projects on Avian Influenza

- Technical information on use of vaccination of poultry for H5N1 HPAI was interpreted differently in Thailand compared to Vietnam and Indonesia, resulting in different conclusions on its utility. This study demonstrated how factors other than science influenced the decision and how uncertainty in science can play a role in the way results are interpreted and converted to policy (in this case, the trade-off between reduction in virus shedding by vaccinated infected poultry and the risk of low level silent shedding in some poultry infected after vaccination was interpreted differently). Some illegal vaccination of layer flocks was still recorded in Thailand, despite the decision not to allow the use of vaccination there.



- The data showed adverse economic consequences of wide area culling when outbreaks of highly pathogenic avian influenza occur. This finding was supported by evidence from studies on control measures that suggest it is not necessary to use wide area culling to control the disease.
- Information demonstrated that despite control and preventive measures being implemented imperfectly in a manner that left poultry vulnerable to infection, along with surveillance/ reporting systems that did not detect all infected poultry, H5N1 virus was apparently eliminated from the provinces studied in Thailand and did not return during the study period. This has implications for avian influenza control policy (focus resources on areas at higher risk of disease transmission).
- Information to suggest benefits from strengthening grassroots technical services for small scale producers.
- Demonstration that fighting cock passports as applied in Thailand did not greatly reduce the risk of transmitting avian influenza. Movement controls on poultry could be easily circumvented and did not apply to small consignments.
- In the countries where biosecurity measures on farms were assessed, a number of vulnerabilities were identified, including poor protection from wild bird incursions, especially but not only on small farms. The risk associated with wild birds in Cambodia, Indonesia and Thailand appeared to be relatively low at the time the studies were undertaken. In Thailand, the fall in prevalence of infection in wild birds corresponded with low prevalence in poultry and cases occurred in poultry in



provinces where wild bird cases were not detected. This suggests that the main direction of spread of infection was from poultry to the wild birds. If H5N1 HPAI virus was present in or returned to the areas studied, transmission of virus to and between poultry farms, including smallholder farms, would be expected to occur.

- Comprehensive data on the characteristics and economics of smallholder and backyard producers and the way they rear and market their birds, which provide valuable information for policy makers. There are marked differences between countries (e.g. Thailand where backyard poultry are kept mainly for social reasons). This work reported a larger contribution of small scale and backyard poultry production to household incomes in Vietnam than that reported in other studies conducted at the same time.



- Further information on the importance of wild birds in long distance transmission of H5N1 viruses but there are still major gaps in understanding the species involved and the precise mechanism for transmission of viruses by wild birds to South Asia. Demonstration of spatial links between migratory patterns and poultry outbreaks in Tibet but weak temporal links along this flyway between outbreaks in poultry and in wild birds. This highlighted the importance of viral gene sequences for understanding the epidemiology of HPAI and the absence of some critical sequence data.
- Better information on migratory patterns of wild birds especially in the central Asian flyway and additional confirmation that few healthy wild birds are shedding H5N1 viruses by the cloacal and respiratory route. More evidence on the potential role of song bird trade in virus dissemination.

Capacity Building



The two areas where capacity building has been most evident are broadening the skills of researchers beyond core scientific disciplines and consolidating regional capacity and networks. This has been particularly valuable for the non-social scientists who were used to conducting quantitative trials with clearly defined control groups and interventions made under controlled conditions. Exposing them to social scientists and their methods has greatly broadened their horizons. Similarly the interactions between animal health specialists and economists also provided new insights for the latter. The studies helped to build a better understanding of what was happening in the field and why, such as the reasons for gaps in existing biosecurity measures, especially on smaller scale farms.

Some of the scientists had little experience with avian influenza previously and these projects provided them with the opportunity to learn more about this disease. Others in the research teams were already recognised experts in this (and related) field(s) and the formation of the regional teams allowed others in the region to tap in to this expertise.

A number of post graduate students were trained via the projects and gained valuable practical experience that would not have been possible if the projects had not been undertaken.



Advocacy and Avian Influenza Policy

The involvement of officers from central and provincial government agricultural services in research teams, including some involved in policy decisions, allowed the findings from these studies to be considered during policy deliberations. Similarly, the involvement of high level officials and advisors on the APEIR Steering Committee provided an avenue for research findings to be considered at a national and regional level.

One specific example of uptake of policy includes the shift in policy to reduce the radius of culling zones in China, as has already been done in Vietnam and Thailand. Similar changes were applied successfully in Myanmar in an outbreak in 2012 based on advice given to government officials which relied on information from the APEIR studies.

The following recommendations derived from the work in the five studies should be advocated to senior officials and international agencies. A series of more detailed policy messages on these issues has been prepared in the Annexes to this report.



Key Messages to Policy Makers and International Agencies from the APEIR Avian Influenza Studies

- Regional policies and strategies to avian influenza control and prevention in Asia will need to recognise differences between countries.
- Stronger justifications than those provided in the past for use of wide area culling need to be provided if it is used as a control method given the level of disruption and hardship it causes producers and the rural poor, and the lack of evidence to suggest it is likely to be more effective than limited culling.
- Many areas currently considered free from highly pathogenic avian influenza remain at high risk of disease transmission if the virus returns to these areas because of deficiencies in biosecurity measures, especially, but not only, in small scale to medium scale production systems. Disease control measures recommended for smallholders must be seen to be feasible and inexpensive by farmers and must recognise the realities of existing production systems.



- Smallholder poultry production is and will remain an important source of income for rural families and especially rural women. Technical support services for this sector remain weak and methods need to be found to provide better support so as to maintain the health status of these poultry. Infection and disease outbreaks in smallholder poultry can have both direct and indirect effects on large scale producers. Opportunities exist for producer groups to play a larger role in this area.
- Until such time as H5N1 viruses are eliminated from Asia (and this will not occur in the near future) long distance transmission of H5N1 viruses by wild birds is expected to recur. This has implications for virtually all of the countries that have been infected previously but which are now free from the virus. Warning systems based on strategic testing of birds in key concentration points along migratory pathways and especially investigations of abnormal mortality in migratory birds need to be maintained. The global public good of this activity needs to be recognised and supported.
- All H5N1 avian influenza viruses especially those detected along major wild bird migratory pathways must be sequenced and characterised antigenically as soon as they are detected, with the results made public within one month (and preferably earlier) of virus detection.
- The major differences between smallholders and backyard producers in terms of losses (greater for smallholders) and resilience (greater for backyard producers) warrant attention by policy makers when devising control policies.



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ANNEX 1

Forming of Regional Network for Surveillance and Monitoring of Avian Influenza Viruses in Migratory Birds (Wild Bird Project)



Brief summary of what was known about H5N1 highly pathogenic avian influenza viruses and wild birds prior to the APEIR project

When highly pathogenic influenza viruses of the H5N1 subtype (H5N1 HPAI) first emerged as a serious health problem for poultry and people in Hong Kong in 1997 there was no evidence to suggest that wild birds were involved in the transmission of these viruses (although, presumably, an ancestral low pathogenicity virus from wild birds was the initial source of the virus). However, in late 2002 and early 2003 wild bird cases of H5N1 HPAI were detected in Hong Kong in two zoological collections and related wild birds (Ellis

et al 2004). This was the first time since 1961 that an outbreak of disease in wild birds had been attributed to an HPAI virus, when terns in South Africa were infected (Becker 1966).

The spread of H5N1 to multiple countries in 2003-04 resulted in considerable discussion on how the viruses had dispersed. The epidemiological characteristics and timing of outbreaks in the Republic of Korea and Japan strongly pointed to wild bird introductions although there were still doubts (Kilpatrick et al 2006), with some arguing that trade in wild birds, poultry or poultry meat were also probable routes, especially given that virus had been detected in duck meat imported to Korea in 2001 (Tumpey et al 2004). Genetic evidence from viruses (and evidence from a subsequent outbreak in 2007 in the Republic of Korea) provided additional support for wild bird introduction.

The means of introduction to South East Asian countries in 2003-04 remained unclear. Different strains of virus were introduced to the different countries/sub-regions (e.g. Clade 2.1 to Indonesia, Clade 1 to Thailand, Vietnam, Laos and Cambodia) at least demonstrating that there were no direct links between the two.

In 2005, H5N1 HPAI viruses caused a severe disease outbreak in wild birds at Qinghai Lake in China. When disease and virus were reported in wild birds in Mongolia and Russia shortly afterwards it was evident that wild birds were playing a role in the dissemination of the virus. Although there was considerable debate about the mode of long distance transmission, the lack of poultry in the area around the sites in Mongolia pointed strongly to transmission by migratory birds (Promed 2005, Sims and Brown 2008).

Similarly, spread across Russia and through the former Soviet states and onwards to Turkey, Europe and also north and west Africa by late 2005 and early 2006 provided further strong circumstantial evidence for wild birds as the mode of transmission (Kilpatrick et al 2006, Sims and Brown 2008), although even at this time there were many who still believed trade in poultry was the most likely means of introduction (Feare 2007).

Following introduction of H5N1 virus to Thailand in 2003, a number of cases of infection and disease were detected in wild birds covering 16 species, both migratory and local, with almost equal numbers of positive waterbirds and other types of bird (including passerines) (Siengsanon et al 2009). Testing of wild birds in markets in Thailand in 2006 and 2007 found virus in moor hens (*Gallinula* spp) and water cocks (*Gallicrex cinerea*) sold there (Amonsun et al 2008). In Cambodia wild bird cases were seen in a zoological collection in a wildlife sanctuary (and probably reflected spillover from infected poultry) in late 2003 (Desvaux et al 2009). Reports of positive samples from wild birds were rare from Indonesia. Studies conducted in Indonesia in 2006 and 2007 (but not published until 2009) (Stoops et al 2009) found a few infected wild or pet birds but no evidence of a role for migratory birds in disease transmission. Studies conducted in China from 2004 onwards resulted in detection of H5N1 avian influenza viral RNA in 10 provinces from both live and dead wild birds. Mallards were the species with the highest percentage of positive samples. More positive cases were detected in Qinghai than all other provinces combined (Kou et al 2009).

By 2006 when APEIR held its first workshop in Vietnam, the following key points were already evident:

- i) Wild birds, including migratory species, represented a highly likely source of H5N1 HPAI virus for poultry, and were already recognised as a source of low pathogenicity avian influenza (LPAI) viruses. Recommendations had already been made to segregate poultry from wild birds so as to avoid direct and indirect contact (via feed and water) through improvements to farm biosecurity measures.
- ii) In some places, measures had already been introduced to minimise the contact between wild birds and poultry. However, many poultry, especially domestic waterfowl, were reared in a manner that allowed direct and indirect contact with wild birds.
- iii) Concerns had been raised about possible action being taken against wild birds or wild bird habitats to prevent the disease (Birdlife International 2006).
- iv) Long distance transmission of H5N1 HPAI virus had occurred and was almost certainly the result of movement of migratory birds.

At this time there were also a number of gaps in knowledge about the role of wild birds including the species that were involved in long distance virus transmission, how they got infected and whether there was a permanent cycle of infection in wild birds or if infection depended on reinfection from poultry.

Questions were also being asked about how viruses managed to move from East Asia to West Asia, and then into Europe, especially given most migratory pathways for wild birds tend to be aligned on a north-south axis, albeit with crossover between the pathways. It was not known whether wild birds were maintaining virus in places such as Indonesia and Thailand or whether wild bird cases were secondary to persistence of virus in poultry. The project examined these issues.

Main Findings from APEIR Activities

- The group, comprised of Cambodian, Thai, Indonesian and Chinese scientists, formed a regional network for the surveillance and monitoring of avian influenza in wild birds, to share information, and to help understand the role of wild birds in transmission and persistence of H5N1 HPAI and other avian influenza viruses.
- The group consolidated findings about the role of wild birds in the transmission of HPAI and collected additional samples from selected wild birds in known high risk areas.
- The group was recognised by ASEAN as an important regional resource.
- The work conducted included major studies on birds in the Central Asian flyway that connects areas in South Asia, where H5N1 HPAI viruses have been endemic since 2007, with major spring and summer breeding grounds in North West China, Russia and Mongolia.
- The evidence gathered, in association with other wild bird investigations, suggested that the main direction of viral spread was from north to south (to South Asia) despite most wild bird outbreaks occurring at or towards the northern end of their spring migration.



- A strong spatial link between outbreaks of HPAI in poultry in Tibet and migratory patterns was found. Temporal links were weaker between the cases in poultry and those in wild birds, with the former usually occurring several months before the latter.
- A lack of information on viral gene sequences from poultry outbreaks in Tibet prevented epidemiological links with those in wild birds from being proven but for the few cases for which sequence data were available, the strains involved in poultry outbreaks were not the same as those in wild birds. Nevertheless, wild birds were strongly suspected of transmitting new strains of virus to poultry in South Asia on several occasions, based on the genetic characteristics of the poultry viruses and those isolated in migratory birds prior to the disease occurring in South Asian poultry.
- Migratory wild bird species considered likely to bring virus to Qinghai Lake, a vital site of congregation where a major wild bird HPAI outbreak occurred in 2005, were ranked based on a number of criteria and field studies, providing guidance on targets for future viral surveillance.
- Studies in Thailand and Indonesia found evidence of infection in wild birds but no evidence of long distance transmission as detected in China. In Thailand a link was found between provinces that had poultry outbreaks and those where positive wild birds were detected but spread via poultry appeared to be the predominant route of viral dispersal nationally.

- In Thailand, fifty percent of positive samples collected from 2004 to 2007 (largely completed before the project) were from apparently healthy birds but, on a percentage basis, significantly more dead birds tested positive than live birds. In 2008-09 some 2,200 samples were tested but only four were positive. As the prevalence of HPAI in poultry fell so too did the number of positive wild birds, with no wild bird samples testing positive in 2009, corresponding to a period when there were no reported poultry outbreaks.
- Only Clade 1 H5N1 viruses or their derivatives were detected in wild birds in Thailand – the clade that became established there in 2003-04.
- In Indonesia more local species were found to be infected with H5N1 virus (based on tests that detect viral nucleic acid) than migratory species and a number of the positive samples were in species sold as song birds. This finding raised concerns about the possible role of trade in song birds in spread of the virus.
- No viruses were isolated in Cambodian studies but it is evident from field observations that wild birds and free ranging ducks share the same ecosystems providing opportunities for cross infection.
- Tracking studies helped to fill in gaps in knowledge about movement patterns of migratory birds beyond the broad flyways that had been developed previously. For example, it was demonstrated that southern Tibet is a major wintering ground for bar headed geese with only one of the geese fitted with a transmitter flying

over the Himalayas to South Asia. The rest of the birds remained in the area around Lhasa during winter.

- Testing of healthy wild birds resulted in a low proportion of positive samples in all countries, again demonstrating that shedding of H5N1 HPAI virus via the oral/respiratory or faecal route by these birds occurs infrequently. Some additional influenza virus subtypes were detected, other than H5N1 viruses, and this information helps in understanding the transmission of other influenza viruses by wild birds.
- The information obtained confirmed the need to segregate poultry from wild birds (although this is a difficult task in places where large numbers of free running ducks share habitats with wild birds). It also demonstrated that, even in places where migratory birds and poultry are co-located, the wild birds may not necessarily be the source of infection for poultry or that poultry were necessarily infecting wild birds, although both could occur. It showed the need to target surveillance in wild birds (so as to minimise the cost and maximise the benefits) given the large number of negative samples if healthy wild birds are tested.
- Testing of dead birds also has its problems because they are not always easy to find. The results also provided indirect evidence to suggest that other means of testing that increase the likelihood of virus detection should be considered in future programs given the low success rate with oral and faecal swabs. This might include collection of feathers as a sample for virus detection as has been proposed by others.

- Overall only a small percentage of samples positive for H5N1 virus by polymerase chain reaction yielded a virus suggesting low levels of viral RNA or non-viable viruses in the samples.
- The studies also reinforced the importance of sequencing of genes of all avian influenza virus isolates and rapid uploading of the sequences onto public databases. It demonstrated that important gaps in knowledge remain about migratory pathways and the precise role played by different avian species in long distance transmission of H5N1 HPAI viruses.
- Evidence gathered from the Central Asian flyway suggests that H5N1 viruses may not persist for an extended period of time (more than several years) in wild bird populations and their associated environment, based on the change in virus clade from clade 2.2 (present in wild birds between 2005 and 2007) to Clade 2.3.2.1 from 2009 onwards in wild birds in this flyway. This finding raises questions about the long term survival of H5N1 avian influenza virus in summer breeding grounds which has been proposed by others as a potentially important mechanism for viral persistence.
- The absence of introduction of new strains of H5N1 virus to Indonesia over the past 8 years (only Clade 2.1 viruses and their derivatives have been detected there since the initial introduction in 2003 until 2012 when Clade 2.3.2.1 was identified) demonstrate that if migratory birds were the source of the original introduction of virus to Indonesia such events occur rarely.

Policy Advocacy

Each of the groups provided information to national and state authorities (e.g. Agriculture and Conservation/ Forestry Ministries) and to regional bodies (ASEAN) on the role of wild birds in the transmission of the disease. Findings from the studies were used by international agencies such as FAO in the development of policies and guidance related to control of infection in countries where the virus remains endemic to poultry (FAO 2011).

The following section contains information on the key messages that should be provided to policy makers from this work distilled from the findings of the country studies.



Key Policy Messages on Issues Related to Wild Birds

- Until such time as H5N1 viruses are eliminated from Asia (and this will not occur in the next 5 to 10 years) long distance transmission of H5N1 avian influenza viruses by wild birds is expected to recur. This has potentially serious implications for virtually all of the countries where poultry have been infected previously, including those currently free from infection.
- To provide early warning, systems based on strategic testing of wild birds in key concentration points along migratory pathways in mainland Asia, especially investigations of abnormal mortality in migratory birds, need to be maintained and strengthened. This should include systems for detection and investigation of disease outbreaks in remote locations on the Qinghai Tibetan plateau. The global public good of these investigations needs to be recognised and supported.
- Early warning systems require results of testing of poultry and wild bird outbreaks (including sequences of all genes from isolated viruses) to be shared regionally and made available on public databases as soon as they are available (not longer than one month after virus isolation). This is readily achievable given the network of laboratories providing these services both regionally and internationally.



- Infection in wild birds will probably disappear once infection in poultry is controlled, as has been demonstrated in Thailand. Action on wild bird habitats or wild bird populations is not required to achieve this result.
- Song birds sold as pets (or for religious release) represent a potential source of virus. Farms raising wild birds (such as farms rearing or housing bar headed geese and song birds) could transmit virus between free flying and farmed wild bird populations (in both directions). They should be monitored closely and measures implemented to minimise this risk in line with those proposed below for poultry.
- The evidence gathered in these studies provides further justification for separating poultry from wild birds. For management systems that do not allow segregation (such as free running ducks) other ways of preventing or minimising the risk of infection or onward transmission of infection such as well-managed vaccination programs and/or movement controls (as used in Thailand for ducks) must be considered.
- Regional approaches to wild bird monitoring and sharing of information should be retained and strengthened, bringing in additional partners from South Asia, South East Asia and East Asia.
- A number of questions remain unanswered about the relative contribution of different wild bird species to the movement of H5N1 avian influenza viruses. Additional research aimed at answering these outstanding questions is recommended especially if the expected results will also help to improve targeting of surveillance programs, control the disease and/or prevent new outbreaks in both poultry and wild birds.

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ANNEX 2

Socio-Economic Impact of Human Pandemic Avian Influenza Outbreaks and Control Measures on Small-Scale and Backyard Poultry Producers in Asia (Economic Impact Project)



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Avian Influenza: Impacts and Key Policy Messages for Asia

Brief summary of what was known prior to the project about the economic impact of avian influenza

Much had been written about control measures for highly pathogenic avian influenza (HPAI) prior to the development of this study but less had been presented on the socio-economic impact of the disease. Studies by Rushton et al (2005) provided some background information on the broad effects of the disease on different parts of the poultry sector in East and South East Asia.

At the FAO/ OIE/ WHO Technical Meeting on avian influenza in Rome in June 2007 much of the available information on economic studies was summarised in a paper presented by McLeod and Hancock (2007), focusing on work conducted for and by FAO. It was evident from these studies that smallholder producers had been affected significantly by HPAI and the control measures used. A multi-agency paper on compensation had been produced (World Bank 2006) but recommendations in this on appropriate rates were not fully supported by specific field studies (discussed in more detail in Annex 3 (smallholder studies)).

The FAO/ OIE/ WHO Technical Meeting in June 2007 concluded that improved information on social and economic effects of the disease, the control measures implemented and market shocks was available but that better information was required based on comprehensive baseline research to allow vulnerable groups to be identified and protected. Regional networks of socio-economists, farming system and biodiversity specialists have to be strengthened (FAO 2007). It was evident there were still significant gaps in knowledge regarding the effects of avian influenza in East and South East Asia and the economic impact study was designed to fill some of these gaps.

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Main Findings from APEIR Activities

- Studies were conducted in China, Indonesia and Vietnam and involved in-depth assessment of households rearing poultry in three provinces per country in which HPAI had occurred.
- Clear differences were evident in the response to the disease between the three countries reflecting, to a large extent, the systems of governance.
- HPAI enhanced the state-community relationship in China and Vietnam where the government effectively mobilized the state forces as well as the community organizations and villagers in combating the AI.
- In Indonesia, neither the government agencies nor the community organization was well organized to combat AI outbreak.
- The study confirmed much of the information (tacit and explicit) that had been noted or assumed previously through the evidence obtained from farmers in affected areas.
- It found that poultry rearing plays an important role in farmer household livelihood, providing some 30% of total income, and up to 80% for small scale producers, in rural areas. The share of income from poultry in backyard producers accounted for a smaller proportion (8-9%) of total income in this study.



- H5N1 HPAI reduced the average number of poultry kept per household by 20-30% percent. In general, those keeping more birds reduced the size of their flock by a greater percentage.
- Households rearing backyard poultry on average increased the number of birds kept by 12 head in China and Vietnam. This was an unexpected finding and demonstrated the flexibility of backyard producers who require less capital requirements to increase the size of their flocks.
- The number of households rearing poultry decreased by 17-32%. Many farmers were unable to return to poultry production due to debts, increased production costs, upgraded requirements, and lack of access to support such as loans.
- The net income from poultry production decreased by 25% in Vietnam and 75% in China as a result of HPAI in the areas studied. In general, low income groups were more vulnerable to the market shocks from HPAI. The effect was greatest on poor households in Vietnam (70% reduction in income albeit from a low base) compared with 27% for the high income group in losses due to HPAI.
- The ability of the poor households to recover and to restock their farms with poultry was weak.
- Outbreaks of HPAI also affected poultry prices and the input prices for poultry production. It was found that farmers had to bear much higher costs of production after HPAI because of the prices for day-old chicks as well as the quality problems of day-old chicken and the commercial feeds.
- Losses were especially large for households that destroyed poultry. Households who borrowed money fell into debt and took several years to repay loans,

and their savings reduced significantly. To cope with the effects of HPAI, many households diversified by focusing more on alternative agricultural activities such as raising other livestock or turning to non-farm work.

- There was a short term impact on consumption of poultry meat and eggs but expenditure on food and health increased significantly, which affected the nutrition status of the poor households.
- The retail price of poultry increased (after initial falls) caused by the shortage of poultry products after outbreaks which increased household costs if having to purchase chicken for consumption. Some households had to take loans to cover their food costs, and other households had to reduce the expenditure on education.
- Some improvements in biosecurity practices were found but dangerous behaviors persisted among some farmers who continued to butcher and eat sick and dead poultry, throw them into rivers, or sell them to the markets.
- Psychological effects of HPAI were also evident including anxiety and loss of direction in earning a living which weighed heavily on farmers and caused some social unsettlement in rural areas.
- The three countries implemented the same control measures, but the actual practices and effects varied. Overall, the control measures appeared to be implemented more effectively in China and Vietnam, than in Indonesia.
- Overall, farmers were reluctant to report suspected cases of HPAI since it may result in culling of their own poultry as well as those of their neighbors. Of the control measures available, vaccination and low cost biosecurity measures were the most popular ones among farmers, because they were easy to implement and involve limited investment.

- In general, farmers were willing to cull their poultry if diseased, but farmers are concerned with the financial loss caused by culling. This is a rational fear when the compensation paid for stamping out ranges from less than 1% to 45% of poultry value (across the three countries), which is considered by farmers to be insufficient. As has been highlighted for other APEIR studies, if all infected flocks of poultry are not detected, stamping out is not as efficient as it could be if systems were in place to detect all infected flocks.
- Until systems that allow detection of all infected flocks are in place, stamping out programs in these three countries will not result in virus elimination especially in areas with high poultry density.
- When applying control measures for HPAI, farmers are most concerned about the financial costs, labor inputs, and time inputs.
- Results of probit models developed in this study suggest that the main factors affecting household decision in applying control measures include levels of infection at household and regional level, having poultry destroyed, the proportion of income from poultry in total household income, awareness of available control measures, production scale, total value of assets, and market selling prices.
- The result also shows that the knowledge on control measures has a positive relationship with farmers' willingness to adopt the measures.
- Across the three countries, the community veterinary services and network were regarded as being very weak, with veterinary staff lacking incentives and job support to fulfill their tasks.
- In Indonesia it was evident that the areas with lower concentrations of poultry had fewer outbreaks and therefore lower losses from HPAI.

Policy Advocacy

The research teams disseminated the information from the project widely. In China specific policy recommendations for HPAI prevention and control measures based on research results was presented to the National Center of Animal Disease Control at the Ministry of Agriculture. In Indonesia the research reports were provided to the province and districts where the studies were conducted and a policy brief based on the study outputs was presented to the Ministry of Agriculture. In Vietnam the findings from the work were incorporated into policy advice provided to the Minister of Agriculture and Rural Development.



Key Policy Messages on Issues Related to Socio-Economics for Smallholder Producers

- There are strong grounds for switching stamping out policies from mass culling to selective culling of poultry in infected households and nearby places. Surveillance around outbreaks should be enhanced to detect additional cases of infection or disease.
- The major differences between smallholders and backyard producers in terms of losses (greater for smallholders) and resilience (greater for backyard producers) warrant attention by policy makers when devising control policies.
- The effects of the disease and of control measures are felt disproportionately by the poorest households and these effects and ways to mitigate them need to be considered when governments develop disease control strategies.
- Consideration should be given to training farmers to implement stamping out poultry infected with HPAI at home when an outbreak occurs and to pay compensation to farmers who undertake destruction of their own flock to prevent disease transmission. Alternatives based on strict quarantine of sick poultry could also be considered.
- Compensation rates for destroyed poultry should be increased to cover 80% of the poultry value with the rates adjusted according to types of poultry and weight ranges.
- Consideration should be given to not paying compensation and to apply fines to farmers if they do not comply with bio-security regulations.



- The time households have to wait for compensation from local authorities should be minimised.
- Community-based animal health workers should be remunerated appropriately for the work they undertake in disease control and prevention. The government should consider improving their allowances as well as employing them (even part time) so that they will be more willing to undertake flock health and public health responsibilities. The equipment and facilities of community veterinary stations should be upgraded.
- Community-based epidemic information report and surveillance systems that can be integrated into provincial and national recording systems should be developed.
- Enhancing awareness, knowledge, and skills of farmers on prevention of AI outbreak through improved, gender-sensitive propaganda, mass media or other instruments should be undertaken.
- The effectiveness of veterinary and extension activities should be re-assessed and the methods of delivery/messages diversified, based on findings from the assessment.
- Small scale producers should be trained in vaccination and other disease control activities so as to reduce the burden of work for local veterinarians, who should supervise these activities. This would free the veterinarians up to undertake other activities.
- It is necessary to promote the role of community and social organizations in such activities as knowledge dissemination and encouragement to apply control measures.
- Households practising traditional poultry rearing should be encouraged to change gradually towards more biosecure production in order to prevent

poultry contacting wild birds or poultry from other farms taking in to consideration constraints to their uptake.

- Policies are needed that stipulate quality standards for inputs of poultry production, (such as day-old chicken, feeds, and vaccines), to improve farm productivity and reduce the vulnerability of farmers to economic shocks, especially when outbreaks occur.
- Support from the government is needed to build slaughtering facilities and freezers to help to adjust market price fluctuation.
- Support for taking up alternative jobs should be provided for poultry raising households when HPAI spreads so that the households can make up for their losses from raising poultry and maintain their living standards.
- Despite shifts towards and support for large scale industrial poultry production, small scale production should still be supported as it is a major source of income for women and the rural poor.

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ANNEX 3

Characteristics and Dynamics of Backyard Poultry Systems in Five Asian Countries in Relation to Reduce and Manage Avian Influenza Risks (Backyard Poultry Project)



Brief summary of what was known prior to the project about backyard poultry production systems

From the 1970s onwards when the role of domestic ducks in the carriage of a wide range of avian influenza viruses and the potential role of pigs as mixing vessels for influenza viruses became apparent, village level production systems were considered to be important in the genesis of human pandemic influenza viruses.

Southern China, with its close associations between humans, terrestrial poultry, pigs and domestic waterfowl, was proposed as an epicentre for their emergence (Shortridge and Stuart-Harris 1982).

Prior to the outbreaks of highly pathogenic avian influenza caused by viruses of the H5N1 subtype (H5N1 HPAI) in 2003-04 most public sector agricultural agencies focused their attention on the commercial poultry sector. In most countries less was known about the importance and structure of the backyard sector. A number of non-governmental organisation and donors recognised the very important role that backyard poultry could play in improving livelihoods, especially for women. DANIDA and other agencies had funded a number of projects aimed at supporting smallholder production. BRAC in Bangladesh and elsewhere had been an active supporter of smallholder poultry production (Dolberg 2007). Studies of local poultry production systems had also been undertaken in South East Asia (e.g. Tung 2005).

When H5N1 HPAI emerged as a regional problem in 2003-04, most countries gave little consideration to the effects on backyard producers of control measures such as wide area culling and restrictions on access to certain markets (such as closures of live poultry markets in major urban centres). Following the spread of H5N1 HPAI through Asia, one paper that looked at the effects of the disease and control measures in multiple South East Asian countries included some notes on smallholders (Rushton et al 2005). The DFID sponsored pro-poor livestock group commenced a series of studies on the effects of market changes and avian influenza policies on the rural poor and also provided information on the nature of the industry (see, for example, Maltsoğlu and Rapsomanikis 2005).

In addition, a number of studies were commissioned to examine the effects of H5N1 HPAI and the policies and practices introduced to control the disease in individual countries such as projects in Vietnam that included information on the effect of these measures on small scale producers (ACI 2006, 2007). The importance of this sector was recognised in decisions to introduce vaccination for smallholder and backyard poultry in Vietnam and China, with the decision in the former, in part, based on the fact that most human cases had occurred at village level, not in association with larger commercial farms.

Some work had been conducted on compensation and its effects on disease reporting including a multiagency report issued in 2006 (World Bank 2006). It was already evident that compensation did not cover the full cost of destroyed poultry in most jurisdictions or the cost of consequential losses. Under-reporting was known to occur even in places where appropriate compensation was available, including cases in Hong Kong and Japan (Sims 2007), demonstrating that availability of compensation was not the full answer to enhanced disease reporting. In addition, compensation as an incentive for disease reporting was recognised as being of little value for species such as domestic ducks in which infection does not necessarily result in clinical disease.

The expansion of community-based animal health worker networks, which had occurred prior to the outbreaks of H5N1 HPAI was given greater impetus after the disease emerged and provided some pathways for improving disease reporting and, potentially, for provision of information on disease. However, their activities and training focused mainly on management of specific diseases and outbreaks rather than preventive measures such as improvements to farm biosecurity measures.

The backyard poultry project was developed at a time when there was still considerable debate about the relative contribution of smallholder and village level poultry to the persistence and transmission of H5N1 HPAI and the effects of this disease and the control measures on households rearing the birds. No large scale studies had looked at and compared the effects and issues between countries. The international technical meeting on avian influenza held in Rome in June 2007 concluded that better information in this area was required based on comprehensive baseline research to allow vulnerable groups to be identified and protected and that regional networks of socio-economists, farming system and biodiversity specialists should be strengthened (FAO 2007).

Main Findings from APEIR Activities

- The project, involved teams from China, Thailand, Cambodia, Indonesia and Vietnam, gathered and shared comprehensive data on the characteristics of smallholder and backyard producers, including information on the way they rear and market their birds, covering changes that took place since H5N1 HPAI emerged. It allowed comparisons to be made between the five countries in which the studies were undertaken.
- The studies found marked differences in the nature of backyard poultry production between countries (e.g. Thailand where backyard poultry are kept mainly for social reasons, not for income).
- Even though changes are occurring in the poultry sector across the region with a shift towards intensive production, the study found that the backyard sector is still very important (even if the number of birds reared has not yet returned to levels before H5N1 HPAI emerged as a regional problem) with many village level households rearing poultry to provide income (especially for women) and also providing high quality nutrients for children.



- Studies in Vietnam found a larger contribution of small scale and backyard poultry production to household incomes than those reported in other studies conducted prior to or at about the same time as this study, including studies conducted by the official statistician (ACI 2007). Households in the communes studied in Vietnam earned between 7.9% and 17.6% of their income from poultry. In poor households any loss of income of this magnitude would have a major effect on livelihoods.
- The study found that most backyard farmers do not implement measures recommended for improving biosecurity related to confinement of poultry, in part because they do not regard avian influenza as a significant risk and also because the measures proposed are not in line with existing production systems that rely on scavenging for food.
- One exception was the willingness of farmers in Vietnam to build shelters for their poultry using local materials that kept the cost of construction low (although they continued to allow free grazing of their birds during the day because of the nature of the production system even after interventions).
- The study also found that knowledge about avian influenza was generally good but the public awareness messages have not always resulted in long term changes to behaviour. It reinforced earlier findings that disease reporting by backyard farmers remains weak. Risky behaviour associated with dumping poultry carcasses and eating or selling dead poultry still occurred in a number of countries. Improved compensation (faster processing and higher rates) was proposed as one way to

improve reporting and may have some effect (as the work from China suggested) although it is not clear whether this would solve the issue of under-reporting especially when farmers see other negative consequences associated with reporting.

- It was also established that information arising from disease reports in the field can be filtered at multiple levels in the veterinary services adding to the problem of underreporting of disease by farmers.
- These findings have implications for the efficacy of control measures that rely on early detection of all infected poultry, in particular stamping out.
- Veterinary administration at lower levels in China was still weak and proposed reforms had not been completed at the time the study was conducted. Elsewhere considerable training of community-based animal health workers has been conducted but further refinement is needed to shift the emphasis of their work and training towards disease prevention.
- Local township markets and other local farmers remain an important source of replacement poultry with greater risks of introduction of pathogens associated with these practices compared with direct purchase from well-managed hatcheries.
- A shift towards purchase of chicks from local hatcheries was seen in project villages in Vietnam following interventions although this was not the case for ducklings.

- In Vietnam there was a gradual reduction in uptake of avian influenza vaccine over time, a result that was in line with expectations when the vaccination campaign commenced, and correlates with the low risk perception for this disease.
- Much of the sale of poultry occurs at the farm gate to traders who obtain poultry from multiple sources. Some traders then keep and feed the birds before on-selling to other traders or markets.
- Trader vehicles carrying poultry from different places also represent a potential risk. Aggregation of poultry from different sources represents a potential high risk point in market chains because it provides an opportunity for poultry to get infected after leaving the farm of origin. This practice may help to explain some of the samples positive for H5N1 HPAI virus detected in poultry in markets in official disease surveillance programs in Vietnam and China and should be investigated further.
- In the households studied in China, with the exception of those in Yunnan, few reported raising both pigs and chickens together which represents a major change from practices 20 years ago. In most areas backyard flocks were located close together but some distance away from large commercial flocks.
- Poultry reared in backyard flocks is used for both home consumption and sale with marked variation within and between countries in the proportion sold. The study also reinforced previous findings of

the importance of poultry for social purposes (feasts and gifts). If only the value of sales of poultry is considered in economic analyses then this underestimates the true value of backyard production.

- Most farmers regard HPAI as a low to very low risk, except in places where severe outbreaks have occurred such as Ningxia in China (where large numbers of poultry were destroyed). Many backyard poultry farmers in China did not know that virus could be transmitted from poultry to human beings or the serious consequence of human infection by an H5N1 influenza virus.
- In Thailand it was found that many did not realise that movement of live poultry was a high risk practice for spreading the disease.
- Interventions were mainly aimed at increasing knowledge about the disease and of biosecurity measures but behavioural change following the changes varied between countries. Some marked improvements were recorded in Vietnam across a number of areas that would reduce the likelihood of transmission of disease to poultry and from poultry to humans, including better personal hygiene. In other areas such as keeping different types of poultry separate, cleaning of pens and keeping poultry in fenced areas few changes were evident.
- Attempts to introduce more biosecure production and marketing practices in Cambodia, including a 'trade corner' in villages, managed by a community-based animal health worker, were less successful.

Policy Advocacy

Each of the teams engaged local officials when conducting initial surveys and interviews and involved them in subsequent interventions. This provided local officials with firsthand experience and knowledge of the issues facing backyard producers. The information gained from the project was provided to local, provincial and national authorities.

The following section contains information on the key messages that should be provided to policy makers from this work, distilled from the findings of the country studies.



Key Policy Messages on Issues Related to Small Scale (Back Yard) Production

- Small scale (back yard) production of poultry still represents an important source of income, nutritional security and social capital for many families in East and South East Asia. It remains important to assess the effects of any disease control and preventive measures on backyard poultry producers and poverty reduction before they are implemented.
- Even if government policy and economic development lead to a shift towards intensive poultry production, as is occurring in much of Asia, there will still be millions of families, and especially women, reliant on backyard poultry for livelihoods and income diversity. Support for this sector by agricultural and veterinary authorities should be maintained and strengthened. This support provides advantages to all production sectors given disease outbreaks in the backyard sector can still affect the intensive commercial sector, either through market losses or as a source of virus for onward transmission of disease.
- Support for smallholders can be channelled through local women's unions or establishment of producer groups.
- Considerable training has already been provided to community-based animal health workers/veterinary paraprofessionals over the past 6 years and this



should continue with a greater focus on training of more women for these roles and on practical measures for disease prevention.

- Women continue to play a much greater role in rearing of backyard poultry than men and any programs or activities that relate to or affect backyard production must take this into account.
- The production systems used by backyard producers cannot be made 'biosecure' in the same sense as commercial farms. This difference needs to be recognised and any measures developed to reduce risks associated with backyard poultry must be simple, affordable and consistent with existing production and feeding methods. Implementing changes is compounded by the fact that not all backyard farmers see avian influenza as a major concern. An Ecohealth approach involving all parties and examining all aspects of the issue is required when dealing with this issue.
- Results from interventions in villages in Vietnam indicate that significant behavioural change that reduce the risk to human health from avian influenza can be achieved through appropriate education. The experiences from these interventions should be assessed for applicability elsewhere in Vietnam and in other countries. School-based training appears to have been successful as well.
- Fewer pigs and poultry are kept together at village level than in the past as a result of the shift towards intensive production of pigs. This has reduced the risk of emergence of a novel pandemic influenza virus at the village level through the putative poultry-pig-human cycle. This finding along with emergence in 2009 of a novel swine-derived pandemic influenza virus justify a gradual shift in the focus for studies

on emergence of new potential pandemic influenza viruses to intensive farms while maintaining a watch on village level production given the risk there has not been eliminated.

- Any attempts to standardise control and preventive measures for avian influenza regionally must take into account the many differences between countries in production systems and reasons for rearing small numbers of poultry. A 'one size fits all approach' is not appropriate.
- Coverage of mass vaccination programs for disease prevention in poultry will fall over time especially if farmers do not see the disease concerned as a risk. Reduced uptake needs to be factored in to long term planning of vaccination programs and assessments of vaccine effectiveness.
- Traders represent a major risk factor for disease transmission and appropriate ways to reduce the risk they pose should be explored further.

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ANNEX 4

Policy Analysis for Pandemic Influenza Preparedness (Policy Analysis Project)



What was known about policy decisions related to avian influenza control and pandemic preparedness prior to the study

Highly pathogenic avian influenza caused by viruses of the H5N1 subtype (H5N1 HPAI) caused severe disease in humans and poultry in 1997 and briefly raised concerns about a possible severe human influenza pandemic. Once the disease was contained in Hong Kong these concerns were largely forgotten. Even though related viruses continued to circulate in China and occasional outbreaks were reported in Hong Kong, planning for outbreaks of this disease elsewhere and preparations for a pandemic remained weak in SE Asia.

The global outbreak of SARS in 2003 reminded all countries of their vulnerability to human pandemic disease and resulted in some moves towards greater pandemic planning. These preparations were overtaken by the emergence of H5N1 HPAI across much of SE Asia in 2003-04 and transcontinental spread of this disease to Europe and Africa in 2005-06. Few of the newly infected countries were fully prepared for widespread transmission of H5N1 HPAI viruses, the disease it caused in poultry and humans, or the potential threat of a human influenza pandemic. Policies to deal with this disease were developed in the face of outbreaks and human cases.

International agencies had long standing recommendations for control of HPAI in poultry that were no longer necessarily appropriate for a disease that was widespread before concerted control measures were in place (the recommendations were based on early detection and early response and were designed for disease in commercial poultry). New approaches were proposed by FAO in 2004 (FAO 2004). This document pointed out that the disease was already endemic in some countries and that prospects for regional eradication in the near future were poor. It also indicated that well managed vaccination was expected to reduce the quantities of virus circulating and therefore the risk to public health. FAO recommended selection of the mix of measures most appropriate to the country and the stage of the disease control program. The potential to use compartmentalisation to retain export markets if certain parts of the poultry population outside the compartment were vaccinated was also described. However at the time this document was written acceptance of compartmentalisation was still limited. As these were only recommendations, countries were not required to follow the advice they contained.

Differences in the structure of the livestock sectors in the three countries involved in this research had already been described, with Thailand having fewer small scale poultry farmers than Vietnam and a much greater reliance on export markets for produce from Thailand (Rushton et al 2005).

WHO provided guidance for pandemic preparedness in 2005 (WHO 2005) in which it asked “Does the country concerned have the resources for the provision of antiviral drugs that may be used during a pandemic? If so, is there a strategy in place to make optimal use of the available capacity?” Pandemic preparedness plans in the Asia Pacific region had been assessed (Coker and Mounier-Jack 2006), including those for Thailand and Vietnam and found that only small stockpiles of anti-influenza drugs would be kept in these two countries.

Indonesia was an early adopter of poultry vaccination for H5N1 HPAI with the commercial sector introducing vaccination when producers found alternative means of prevention, based around farm biosecurity measures, were not sufficient to prevent the disease. Government sponsored vaccination programs for smallholders were introduced later but were largely abandoned because of the problems in sustaining sufficient immune coverage.

Vietnam introduced vaccination at a time when global attention was focused on the country because it had more human cases of Influenza A (H5N1) than any other country. Vaccination was extended to all poultry sectors in high risk areas (Domenech et al 2009) rather than just the commercial sector because most of the human cases had occurred in association with small flocks of poultry. Vietnam also produced two major policy papers on influenza control - the so called ‘Red Book’ (avian influenza

strategy) and the ‘Green Book’ (work plan) - which represented collaborative efforts between government and donors to develop appropriate plans for handling a potential pandemic and reducing the risk posed to humans by infected poultry.

Thailand did not adopt vaccination despite some poultry producers calling for its adoption but had a well-developed pandemic preparedness plan.

At the time the study was undertaken no formal assessment and comparison of the policy decisions in the three countries had been conducted.

Analysis of the political economy of avian influenza was undertaken on these three countries independently by the STEPS centre, concurrently with the APEIR studies. Results were not available at the time the APEIR studies were conducted (working papers were published in 2009 (Forster 2009, Safman 2009, Vu 2009). Rather than trying to cover all issues the APEIR studies chose to focus on the basis for policy decisions on two issues (vaccination of poultry and stockpiling of antiviral medications) rather than conduct a broader more superficial assessment of all policies.

Main Findings from APEIR Activities

- The study examined two main policy issues in Vietnam, Thailand and Indonesia. These were the background and rationale for decisions on whether to include vaccination of poultry as part of the response and for decisions on stockpiling of antiviral agents for pandemic preparedness.
- The main findings of the three countries have been published (Pongcharoensuk et al 2011).
- The study recognised that policy is never prepared in a vacuum. There are always conflicting goals and objectives and interest groups that need to be considered. This was evident in all three countries with major pressures being brought to bear on decision makers by the large scale poultry producers, especially in Thailand.
- On vaccination, Thailand came to a different conclusion to Vietnam and Indonesia despite reviewing the same technical information. The apparent sticking point in Thailand was the concern about silent infection in poultry and the potential for development of novel



more virulent viruses as a result of vaccination (the latter has never been proved to occur). The former was widely recognised as a possibility but it was not deemed to be sufficient reason to forego use of vaccination elsewhere (for example, in Vietnam a major goal was to reduce, not eliminate, shedding and, in doing so, reduce the likelihood of exposure of humans to large quantities of virus).

- In Thailand, views on vaccination differed between parts of the poultry sector with smallholders and many fighting cock owners calling for use of vaccination but not the large scale broiler producers (it is also noteworthy that evidence was found by the control measures group of illegal use of vaccine by farmers operating layer farms suggesting they too could see benefits in vaccination).
- One of the key conclusions of the study was that commercial imperatives played an important role in both decisions (vaccination and stockpiles).
- For vaccination, the cost of vaccination and the effect of use of vaccination on access to markets were among the factors that were considered in making the decision to use vaccination (and in the case of Thailand not to use vaccination).
- It is noteworthy that decisions to curtail village vaccinations in Indonesia were driven, in part, by the very high cost of obtaining reasonable vaccination coverage of smallholder flocks in which the turnover of poultry is very high and high level immunity difficult to sustain.

- Economic imperatives rather than public health research evidence, appeared to be the dominant factor influencing the target set for population coverage for antiviral drug stockpiles.
- Superficially it might appear that the approach adopted by Thailand for control of the disease in poultry was superior to that adopted in Vietnam and Indonesia given Thailand has been more successful in controlling the disease. However, this does not take into account the markedly different nature of the poultry sector as well as the greater resources available and the quality of veterinary services that probably favoured virus elimination in Thailand.
- It was also noteworthy that there were some apparent differences within FAO between country offices on views related to the merits of use of vaccine. Perhaps this, in part, reflected the differences in the poultry sector between the countries given the 'central' FAO advice was to use the most appropriate mix of control and preventive measures. Nevertheless it demonstrated that, even within a scientific organisation, views could differ, which provides one additional explanation for the different interpretations of data on vaccination at country level.
- This study demonstrates again the difficulties encountered in weighing up the 'negative' consequences of poultry vaccination (non-sterile immunity, potential for shedding by apparently healthy birds) against the positive effects (marked reduction in shedding if infected, fewer fully susceptible birds, less likelihood of farmers selling clinically affected flocks to markets).

Policy Advocacy

Publishing the work in an international journal provided high level exposure of the findings. This paper has been cited by a number of other publications, including a recent paper on control measures in poultry produced for WHO, examining the scientific basis for control measures for H5N1 HPAI (Sims in press). The study also involved high level decision makers in each country which meant that the findings were delivered directly to decision makers. Key policy recommendations derived from this study are provided below.



Key Policy Messages on Issues Related to Analysis and Formulation of Avian Influenza and Pandemic Influenza Policy

- A harmonised, regional approach to avian influenza control and prevention in Asia will prove elusive because of the markedly different disease status of countries, different structure of the industry and different attitudes towards vaccination, even in places where the disease remains endemic or recurs regularly. Regional policies and strategies will need to recognise these differences between countries.
- There is general agreement on the benefits of stockpiling of anti-viral drugs. Experiences with the H1N1 human pandemic in 2009 demonstrated the value of these stockpiles even if their main use was early treatment of patients rather than pandemic prevention.
- Policy formulation for potential pandemic diseases remains difficult for developing countries. It is unreasonable to expect developing countries to bear all of the costs of prevention of potential human pandemic diseases yet donors are not prepared to provide appropriate support to fill the gaps.
- For poultry vaccination at the smallholder level, a decision to conduct long term mass vaccination



campaigns only makes sense if it will also reduce the risk of emergence of a human pandemic virus because the costs of vaccination campaigns outweigh the direct benefits from the prevention of poultry losses.

- Decisions on the size of antiviral stockpiles are being driven by the cost of purchasing and regularly replacing expired drugs rather than public health considerations. This has significant implications if the main purpose of the stockpile is pandemic prevention.
- Scientific evidence on disease control and prevention (in this case the use of vaccination in poultry) was interpreted by expert panels in different ways suggesting that either the balance of evidence for and against vaccination was not sufficiently clear cut or that other (economic) factors influenced the decision.
- Regardless, agriculture sectoral policy should be coherent with public health sectoral policy both within individual countries and across the region and should aim to reduce the risk of emergence of human pandemic agents.

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ANNEX 5

Studies on the Effectiveness of Avian Influenza Control Measures in the Asian Partnership Countries (Control Measures Project)



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Avian Influenza: Impacts and Key Policy Messages for Asia

Brief summary of what was known prior to the project about control measures for avian influenza

Highly pathogenic avian influenza caused by viruses of the H5N1 subtype (H5N1 HPAI) was first detected in Asia in 1996 in China but no specific national program was developed to control the disease. Outbreaks in Hong Kong in 1997 causing severe disease in poultry and humans were controlled using mass culling of commercial poultry in local farms and markets followed by a raft of measures

to reduce the risk of reinfection, including changes to the way poultry were reared, transported and marketed. The strain of the virus found in Hong Kong was eradicated but other related viruses continued to circulate in China and caused outbreaks of disease in 9 countries in 2003-04 and in subsequent years spread widely to affect over 60 countries. A range of control measures was adopted. In places with well-developed veterinary services and relatively recent infection the disease was eradicated quickly (Japan, South Korea and Malaysia), on multiple occasions, but for other countries including China, Indonesia and Vietnam virus had been present for some time before formal control programs were implemented and the virus was already well entrenched (FAO 2007) resulting in endemic infection. In Vietnam over 45 million poultry were destroyed or died from the disease in 2003-04 yet the disease remained endemic. Virus also persisted in Thailand for several years although the number of new reports diminished markedly over time.

Each of the measures recommended for use against avian influenza is known to be effective in reducing the risk of infection and can help to eliminate the virus locally if applied properly. In addition, in some places specific measures may not be required to control an outbreak, especially for farms in areas with very low concentrations of poultry and limited movement of birds or items associated with poultry (in other words some outbreaks will be self-limiting regardless of the measures used) (Sims and Brown 2007). This can complicate assessment of the effectiveness of control measures (were the measures responsible for disease control or would the disease have died out regardless of the measures used).

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In all places where H5N1 HPAI occurred a number of control and preventive measures were implemented in line with advice from international agencies (FAO 2004). Stamping out remained the mainstay of the programs but other measures were introduced including changes to the way poultry were sold such as closure of live poultry markets in large urban centres, and vaccination. Not all measures were used in all countries (e.g. no vaccination in Thailand) and it was not always possible to determine the precise effect of individual measures because the interventions were usually applied in parallel, and in most cases an untreated control population was not available. For example, vaccination was introduced in Vietnam in 2005 along with a range of other measures and was followed by a reduction in avian and human cases. All that could be concluded was that, at best, vaccination had contributed to this reduction but it was not possible to prove this or to quantify the extent to which vaccination was responsible for the fall in human cases (which was the main objective of the vaccination program). The need to determine the effectiveness of individual control measures was identified in an international technical meeting held in Rome in June 2007, demonstrating the relevance of this APEIR study (FAO 2007).

Some of the measures used (especially vaccination) differed from those used routinely in the past for control of HPAI. Indirect evidence for the effectiveness of vaccination was collected in Hong Kong when the inclusion of universal vaccination for poultry destined for live poultry markets in late 2003 was followed by a cessation of cases (virus detection through intensive active surveillance) in these markets for a number of years whereas the introduction of other measures prior to this had failed to do so (Sims 2007)

Prior to the start of the study, it was also already apparent from field observations that any measures badly applied were unlikely to prove effective – be it vaccination, stamping out or changes to the way poultry were reared and sold. Therefore, this study focused not only on the measures that were used but also on the manner in which control and preventive measures were applied.

Main Findings from APEIR Activities

- The control measures project involved teams from China, Thailand and Vietnam.
- A novel approach was adopted to assess the effectiveness of control measures in which the manner in which the measures were implemented was recorded through interviews with farmers, government officials and traders as well as direct observation of existing practices.
- The project did not rely on case-control studies because most of the areas examined were not experiencing outbreaks of disease at the time the study was performed, in some places insufficient cases had occurred, and some cases would have gone unreported making it difficult to identify true controls.
- In Vietnam some post-vaccination seromonitoring was also performed on duck and chicken flocks.
- A range of measures has been used in efforts to control and prevent H5N1 HPAI in Vietnam, Thailand and China. In conducting this study the goal was not to find fault in implementation but to assess how well the measures were working and the extent to which they were reducing the risk of infection for poultry in the areas under study.



- The study found that there is room for improvement in implementation of all of the measures and they will not prevent virus incursion onto farms if H5N1 HPAI viruses continue to circulate or return to the provinces studied.
- The study found that stamping out was performed effectively when cases were reported but disease reporting systems and active surveillance programs in place would not have detected all cases of disease or all infected premises. This was compounded by sub-clinical infection which can occur in infected waterfowl and potentially in vaccinated flocks of birds that are subsequently infected.
- For stamping out to be effective it requires early detection of all cases but the project found (as did the backyard poultry project) that disease reporting was far from perfect which means that many cases go unrecognised, reducing the value of stamping out as a control measure.
- In all three countries a change occurred between the initial approach of wide area culling to local culling (affected flock only or perhaps including other flocks in contact). This was done in part because of the high cost of the wide area approach and also the adverse effects this method had on producers.
- There was no evidence to suggest that wide area culling was superior to local culling but the disruption caused by the former was far greater (and compensation in Vietnam and China did not cover the cost of all poultry as discussed in the backyard poultry project).

- Disinfectants are used widely by farmers and government during and after outbreaks but are often used inappropriately, often without preliminary cleaning of surfaces and objects, resulting in considerable waste and potential environmental pollution, for limited gain.
- Vaccination of poultry in Vietnam in the areas included in the study appeared to be increasing the resistance of the vaccinated chicken population to infection and disease based on antibody levels detected in chickens after vaccination. Questions remain about the overall level of population immunity and protection in the vaccinated duck population with many duck flocks appearing to have little or no immune response to vaccination.
- The extent of risk reduction afforded by vaccination depends on many complex factors, among which is the probability of any individual vaccinated flocks being exposed to H5N1 virus. This could not be measured in this study and remains a major limiting step in developing targeted vaccination programs.
- Unsanctioned use of vaccines was recorded in Thailand despite the ban on importation and use of the product. Over time the number of farms using vaccines illegally fell dramatically.
- It was evident from this study that farm biosecurity measures remain weak in most of the farms/ households studied in the three countries. This means that they remain vulnerable to virus incursion if virus is circulating in the area, in which case vaccination and/or additional improvements

to farm biosecurity both could play a role in protecting poultry. The low incidence of this disease on a household basis provides little incentive for small scale farmers to invest more in biosecurity measures.

- The simple scoring system developed by the team was used for assessing biosecurity measures by examining each of the main risk pathways for virus incursion onto farms. Exposure to wild birds was one of the main vulnerabilities detected. Fortunately, it appears that this route of transmission is rare (wild bird studies in Thailand in another related APEIR project found that when infection is not present in poultry it is not detected in wild birds, suggesting wild birds represent a low level hazard except in areas where the virus is circulating).
- Controls on visitors and vehicles, the limited quarantine applied to newly introduced poultry, and absence of all in all out management in some places also create vulnerabilities not only to avian influenza but for other diseases as well. Only very large farms in the areas studied in China had formal biosecurity plans.
- Hygiene has been improved in registered cock fighting rings in Thailand but a significant amount of cock fighting still occurs at unregulated arenas diluting the overall value of the improvements in the well run establishments.
- Some movement controls appear to have been relatively effective, especially those applied to grazing ducks in Thailand, but other movement control measures, including fighting cock passports, have had minimal impact because of their limited

uptake, the presence of many non-sanctioned cock fighting pits and the difficulty in identifying individual birds without use of some form of permanent identification.

- Movement controls are not applied to very small consignments of poultry in Vietnam (and elsewhere) and as most backyard farms only rear small numbers of birds a very high proportion of consignments of poultry do not require and do not have certification.
- The project found that fighting cock owners had moved cocks past road blocks in Thailand without inspection although fighting cock owners also self-regulate movement as they would not knowingly introduce a sick cock to a fighting ring.
- The study found that existing health certificates provide limited assurance that poultry are not infected when transported, even in places where testing is conducted, given that the tests are performed a number of days prior to movement (infection can occur after testing) and the number of samples collected would not detect all infected consignments anyway, especially any consignment with a low prevalence of infection.
- In countries where vaccines are used, certification provides some indication of whether the birds were vaccinated but the absence of systems for individual identification of poultry means that certificates do not guarantee that the poultry being transported are the ones for which certificates have been produced or that the birds are necessarily immune to H5N1 virus as a result of vaccination.

- Behavioural change communication programs appear to have raised awareness but did not necessarily change behaviour. Much attention in communication programs was focused on improving biosecurity measures but the evidence collected in this study (and confirmed by the backyard poultry study) suggests that few changes were made, especially at the smallholder level or, if they have been implemented, they have not significantly reduced the risk of viral incursion.
- Despite the evidence to suggest that the control and preventive measures were not implemented in a way that would have provided complete protection, H5N1 HPAI virus has not returned to some of the areas under study (one province in both China and Thailand), indicating that the measures implemented locally were not the sole reason for the prolonged freedom from infection in these places.
- Measures taken in other parts of the country to address potential reservoirs of infection, in particular free ranging ducks, and changes to markets and larger commercial farms may have had some effect in reducing the overall threat of infection to some of the areas studied.

Policy Advocacy

Teams in Thailand and Vietnam included staff from the provinces in which the studies were conducted so the findings were readily transferred to these staff. Staff members from central policy level were also involved in these projects providing a direct link to policymakers.

Many of the issues identified in the study were fed in to international recommendations on control and prevention of avian influenza including the FAO global strategy for avian influenza control (FAO 2008) and a paper on countries with endemic infection (FAO 2011) and, for Vietnam, into the second 5 year plan (the Blue Book) covering the period from 2011 to 2016. Major policy recommendations from this study are provided below.



Key Policy Messages on Issues Related to Avian Influenza Control Measures



- Stronger justifications than those provided in the past for use of wide area culling need to be provided if it is to be used as a control method given the level of disruption and hardship it causes producers and the absence of evidence from studies on application of control measures to suggest it is likely to be more effective than local culling.
- Many areas currently considered free from H5N1 HPAI remain at high risk of widespread disease transmission if the virus returns to these areas because of deficiencies in biosecurity measures, especially in small scale to medium scale farms. Any new disease control measures recommended for application at farm level for smallholders to overcome these deficiencies must be seen by farmers to be feasible and inexpensive, and must recognise the realities of existing production systems.
- Existing health certification systems need to be re-examined to see if there are better ways of identifying and certifying the disease and vaccination status of individual consignments of poultry, perhaps using mobile technology.
- Systems for identifying and controlling movement of fighting cocks in Thailand have not achieved their intended goal and should be re-examined.

- Far too much disinfectant is used in a manner that is unlikely to have any effect in controlling disease – and disinfectants are expensive. Improved training on the correct and rational use of disinfectants is required.
- Use of vaccination of chickens against H5N1 influenza virus appears to produce an appropriate immune response. However, vaccinated ducks had poor immune responses based on results of serological tests. Further studies are needed to assess whether vaccinated ducks with low antibody titres are still protected and, if so, to find better tests for assessing immunity in vaccinated duck populations. If not, better vaccines for ducks are required.
- H5N1 HPAI will not be eliminated from the region in the medium term. This means that infected poultry remain a low level threat to public health.
- Behavioural change campaigns must take into account the motivations for existing behaviour. Producers and traders must see a valid reason to change their approach and/or to modify production practices. An Ecohealth approach to the control and prevention of H5N1 HPAI in which all stakeholders are involved is likely to achieve better results in this area than traditional top down approaches.

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ANNEX 6

APEIR Press Release,
18 April 2013

Combating H7N9: Using Lessons Learned from APEIR's Studies on H5N1



The recent human cases of H7N9 avian influenza demonstrate the importance of adopting the lessons learned from H5N1 avian influenza. Studies on this disease recently completed by researchers from the Asia Partnership on Emerging Infectious Diseases Research (APEIR) developed a series of messages for policy makers that are highly relevant to the current outbreak.

Economic studies and studies on small scale producers showed that these producers were hit very hard by avian influenza. Professor Liu Wenjun of the Chinese Academy of Sciences Institute of Microbiology said: "With H7N9 we are already seeing marked falls in demand for poultry and this can have a major effect on the livelihoods of the rural poor who depend on the sale of chickens for a significant part of their disposable income. While it was necessary to close infected markets to protect public health, the flow-on effects for producers and other-s associated with the poultry industry are massive and there will be a need to look for alternative means of support for these producers."

The economic studies recommended that support from the government is needed to build slaughtering facilities and freezers to help adjust to market price fluctuation. "At present many farmers cannot sell their poultry and ways need to be found to support these farmers when market shocks occur."

"In areas affected by H7N9 influenza, which already covers Jiangsu, Zhejiang and Anhui provinces and beyond, support for taking up alternative jobs should be considered for households rearing poultry so that households can make up for their losses from raising poultry and maintain their living standards. The studies on H5N1 found that despite shifts in government policies towards support for large scale industrial poultry production, small scale production still needs support as it is a major source of income for women and the rural poor."

The team conducting studies on the effectiveness of control measures against H5N1 found that there were significant deficiencies in biosecurity practices in most of the farms studied, especially, but not only, small scale farms. The measures in place on these farms would not be sufficient to prevent an H7N9 influenza virus from gaining entry to farms and infecting poultry. This means that, for areas where this virus is not yet present, farm biosecurity measures need to be strengthened, as recommended also by FAO, but the measures proposed and adopted have to be affordable and in line with existing production systems.

The various studies also found that with H5N1 control, wide area culling in which all poultry in a large zone around known infected flocks are culled had very severe effects on livelihoods because of the level of disruption and hardship it caused producers and the rural poor. There was also no evidence to suggest that it was more effective than limited culling, coupled with surveillance to detect other infected flocks. Compensation provides partial coverage of the losses but does not cover the loss of business or the loans farmers have taken out if they are not allowed to recommence business for an extended period of time.

Studies on wild birds conducted as part of APEIR demonstrated the importance of undertaking surveillance in wild birds to characterise the influenza viruses carried by these birds. The genetic information obtained so far on the H7N9 virus suggests that the H and N components of this virus were probably derived from wild birds, and also possibly from poultry. It is also evident from the genetic studies that the surveillance systems in place have not detected close relatives of the original host of these viruses and need to be strengthened. The studies conducted by APEIR did find some additional influenza virus subtypes other than H5N1 viruses, and this information helps in understanding the transmission of other influenza viruses by wild birds. Although no H7N9 viruses were detected, the viruses found were fully characterised and gene sequences uploaded to gene databases, adding to the pool of data available for comparison by scientists trying to unravel the origin of novel viruses.

APEIR recommended that all gene sequences of influenza viruses should be shared as soon as they are available and this has been done by Chinese scientists for H7N9 viruses. APEIR researchers, including Professor Lei Fumin of the Institute of Zoology of the Chinese Academy of Sciences, are currently investigating the possible role of wild birds in transmission of H7N9 avian influenza. Professor Lei Fumin said, "We have already seen suggestions that this virus could be transmitted widely among migratory birds and poultry, and it is important to assess the likelihood of this through scientific studies on wild birds as they fly north through China to their summer breeding grounds."

Policy makers in China may again be faced with a decision on whether or not to use vaccination to contain this disease so as to reduce the likelihood of exposure of humans to the H7N9 virus. APEIR studies on policy development showed the importance of having sound evidence on the merits and pitfalls of vaccination so that these can be weighed up scientifically without outside interference. Although there is no evidence so far that this virus will result in a human pandemic, this outbreak provides a reminder of the importance for all countries to ensure they have an appropriate stockpile of antiviral medication.

This study on avian influenza policies also found that agriculture sectoral policy should be coherent with public health sectoral policy and should aim to reduce the risk of emergence of human pandemic agents.

Dr. Pongpisut Jongudomsuk, Director of the Health Systems Research Institute, Thailand and Chair of the APEIR Steering Committee, said: "APEIR is a unique Asian trust-based EIDs research network composed of over 30 partner institutions from six countries (Cambodia, China, Indonesia, Lao PDR, Thailand and Vietnam). We have established partnerships and networks on the global, regional and country levels."

"Much has been learned from studies conducted by APEIR researchers and we have an opportunity now to adopt the lessons so as to minimise effects on livelihoods and to prevent the disease caused by H7N9 avian influenza. APEIR is poised to play an important role in investigating and combating H7N9."

For more information about APEIR and the five avian influenza projects please contact the APEIR Coordinating Office at pornpit@health.moph.go.th and wichukorn3@gmail.com or visit the APEIR website at www.apeiresearch.net.





APEIR Coordinating Office

Health Systems Research Institute

National Health Building Floor 4

Ministry of Public Health

Nonthaburi 11000, Thailand

T: (66) 2832-9212 **F:** (66) 2832-9201

E: pornpit@health.moph.go.th | wichukorn3@gmail.com

www.apeiresearch.net

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*Asia Partnership on
Emerging Infectious
Diseases Research*

APEIR Coordinating Office

Health Systems Research Institute

National Health Building Floor 4

Ministry of Public Health

Nonthaburi 11000, Thailand

T: (66) 2832-9212 **F:** (66) 2832-9201

E: pornpit@health.moph.go.th | wichukorn3@gmail.com

www.apearesearch.net