Highly pathogenic avian influenza and beyond

The FAO response

COVER PHOTO: CREDIT: FAO/S. Sarkar

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Young girl with sick backyard chicken in Africa

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Situation of HPAI and emerging lessons

Highly pathogenic avian influenza (HPAI) will not be eradicated in the short term. However, it can certainly be eliminated from the poultry sector if husbandry and marketing practices are significantly improved and the regulatory authorities take necessary measures to improve animal health and secure livelihoods. Governments need to create an enabling policy environment in which the private sector is encouraged to adopt better production and market standards.

So far, a new human influenza pandemic has not occurred, yet the possibility of it emerging remains a constant threat. Continued vigilance is thus required through continued public information and communication interventions; reinforcement of early reporting and inspection systems; ensuring good laboratory diagnostic structures and capacities, as well as ensuring that an immediate and effective response is rolled-out immediately in case a human influenza pandemic were to emerge. So far the World Health Organization (WHO) has not elevated the risk level and of the more than 65 countries that have reported H5N1 infection in poultry since 2004, active virus transmission, in poultry, remains only in 10 - 11 countries, including two heavily infected countries — Indonesia and Egypt. Great progress has been achieved in improving rapid detection and response measures. Preparedness and prevention are key ingredients for success in preventing and controlling HPAI, as is information-sharing and communication.

Strong surveillance is particularly required in high-risk areas. Intensive and focused surveillance is essential in areas with high poultry density (especially those with a large duck population); opportunities for frequent interaction between wild birds and poultry production units; and crossborder trade (where one area is or was affected by H5N1). Clinical disease and agent characterisation, i.e. tests that can identify the presence of virus, isolate the virus and characterise it, is fundamental. On the other hand, taking blood samples for determination of antibody response is of limited value for disease surveillance.

Countries have taken different approaches to disease control. Responses range from massive surveillance without vaccination and quick culling when disease is found, to wide-spread vaccination and extensive monitoring of markets. Successful plans have been those where there has been strong political commitment from the highest level of government and a superior level of professionalism throughout the ranks of the integrated animal health systems. A key factor for success is the direct line of command from the Chief Veterinary Officer to those in charge of field animal health operations, laboratory information flow, surveillance data, and the interface with other Ministries responsible for health, public works, security, and the like.

Improvement of public-private partnerships is indispensable since the private producers, traders and other stakeholders are at the forefront for surveillance, reporting, prevention and control of diseases.

Taking tracheal samples from a sick chicken, Africa

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The epidemiology of avian influenza

The current H5N1 virus has its origins in southern China, with its first characterisation in a goose in 1996. The virus was seen to fatally affect humans when outbreaks occurred in Hong Kong in 1997.

Between 1997 and 2003 the spread of the H5N1 virus remains unclear, but sometime in 2003 it gained a foothold in several countries across Southeast Asia. Subsequently, and over just a few months more than ten countries reported HPAI among their flocks for the first time, with some affected by human illness and death.

The world has never experienced an HPAI virus that has spread so rapidly across continents and countries. Many avian influenza viruses have been found in wild birds, but these have generally been of low virulence. These viruses gain in virulence only when cycled through susceptible poultry or, combine with other influenza viruses to produce a novel HPAI virus.

The case of H5N1 has several exceptions:

- Many wild birds are highly susceptible to H5N1 and disease or death is common.
- The amount of virus that causes infection is lower than for most other avian influenza viruses (infection threshold).
- Though a wildlife reservoir is yet to be found, domestic duck production – especially in open grazing systems – has been key in the maintenance-cycle of the virus in nature. This has been repeatedly shown in Asia where the open rice production systems are linked with duck production. Unlike in chickens, H5N1 in domestic ducks may be considered as an 'iceberg' infection – the virus is present, but often no clinical signs can be seen in the infected ducks.

Close contact is required, between an infected bird (or a contaminated environment) and susceptible species, for transmission of the virus to occur.

H5N1 transmission and spread is highly correlated with intensified commercial production and marketing practices, poor hygiene at the market place, and the mixing of different species of birds. The complex inter-relationships within the poultry production and market chains including the role of hatcheries, growers, distributors, egg collectors, feed suppliers etc., make a disease such as HPAI H5N1difficult to contain.

The H5N1 virus has been shown to infect over 80 species of birds, and spill over into several mammalian species, including humans. The role of pigs in H5N1 infections or persistence does not appear to be important to date, compared to other avian influenza viruses.

Wild and domestic cats are highly susceptible to H5N1 through the ingestion of infected chicken carcasses and thus, in turn, become infectious to other susceptible animals.

Traditional hatchery in Egypt

CREDIT: FAO/L. Hogerwerf

Global strategies to prevent and control HPAI

In discussing any global strategy, it must be kept in mind that success is measured at the local level; and as such, curbing the occurrence of HPAI (or any other disease for that matter) must take into account local circumstances, livestock production and marketing practices, census and demographics, customs and traditions, economies and governing structures.

No single magic bullet will solve or eliminate the HPAI problem. It is likely that a more balanced mix and integration of the various tools, applied at the right moment and time, is what will lead to success. This, however, is contingent on strong political commitment at the highest levels of government. The tools available and identified are:

- Surveillance — both an affective and necessary tool, particularly in countries at risk — i.e., those with epidemics, and those that are endemic;
- Culling supported by reasonable and fair compensation;
- Vaccination;
- Biosecurity; and
- Rapid change of policies to mitigate the worst impacts of HPAI and its control.

One of the key strategies to tackle the disease early and thus, more effectively — is to have a fair compensation policy which is known to the public at large. Farmers and households are more likely to report an outbreak if they know quick compensation will be paid. If the issue of compensation is not properly addressed, farmers experiencing disease are likely to sell their poultry quickly to avoid further losses; hence, spreading the disease further through markets and buyers.

Vaccination is often looked at as a silver bullet — but this far from the case. It needs to be managed well for it to be effective. In the first instance, the vaccine must be effective against the circulating virus strain or strains; and it must be potent and safe to guarantee efficacy. Having to inject every single bird manually complicates logistics in terms of handling and the human resources needed. The right vaccine, in the right hands and with the right strategy, can be instrumental in protecting individual birds, the flock, decrease shedding and spreading, and lower the risk of viruses of avian origin to humans.

The long-term application of massive vaccination campaigns against avian influenza in all poultry sectors is not sustainable; and a targeted approach is preferred. But this requires a good knowledge of the whole poultry production chain – from hatcheries to intermediaries, growers and distributors. Furthermore, it requires all of them to be able to

undertake risk assessments, and achieve a high level of vaccination coverage. Post-vaccination monitoring (of virus presence in a vaccinated flock, or measurement of anti-bodies after vaccination) is considered a best practice to ensure that there is no emergence of new strains, and to confirm that vaccination coverage approaches the targeted levels and that the vaccine was given appropriately. Experience has shown that when sub-optimal or improper use of vaccination is undertaken, there is quick blame that the vaccine is ineffective (i.e. vaccine failure), when in fact it has been a vaccination failure. This aspect of vaccination campaigns is all too often overlooked. Campaigns should be carefully planned and adequately budgeted.

Countries that have not had HPAI outbreaks are in a good position to test and practice their preparedness plans. They should promote improved hygiene at the production units and markets; and based on risk analysis, institute nodes where surveillance can take place regularly (e.g., ports of entry, borders, markets etc.). Upon detecting HPAI in a flock, rapid culling operations should ensue and compensation given promptly, before the disease spreads to other flocks, households or markets. The culling of affected flocks is important even if vaccinations have been administered previously – as either the vaccine may have "not taken hold" or was performed many months before and is no longer effective; or, the virus has changed sufficiently such that a more appropriate vaccine needs to be deployed.

Communication and cooperation across countries is crucial for building trust, improved prevention practices, and the progressive control of HPAI. The establishment of networks of veterinary diagnostic laboratories (including those involved in research) and epidemiology units of the veterinary services has been important in the fight against transboundary animal diseases, including HPAI. Networks can also be those of a more thematic nature, such as socio-economic institutes, wildlife expertise, and communication professionals.

Partnerships with non-governmental groups, research institutions, reference centres, and private enterprises (i.e. pharmaceutical companies, feed producers etc.) have been important in the implementation of strategies, best practices, and communication to stakeholders, as well as in mobilizing local financial assistance.

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One World, One Health

A Strategic Framework for reducing risks of infectious diseases at the animal–human–ecosystems interface

In response to the ongoing problem of HPAI and other emerging infectious diseases (EID) a Strategic Framework has been developed jointly by four specialized agencies — the Food and Agriculture Organization of the United Nations (FAO), OIE, WHO, United Nations Children's Fund (UNICEF) — the World Bank and the United Nations System Influenza Coordinator (UNSIC). The document entitled *Contributing to One World, One Health: A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal–Human–Ecosystems Interface* identifies the key issues related to control of HPAI and other infectious diseases of animals and humans with wide ranging global impacts and articulates a medium to long term strategy to control these problems as international public good. The key elements of the Strategy are summarized below.

Humanity faces many challenges that require global solutions. One of these is the spread of infectious diseases that emerge (or re-emerge) from the interfaces between animals and humans and the ecosystems in which they live. This is as a result of several trends, including the exponential growth in human and livestock populations, rapid urbanization, rapidly changing farming systems, closer integration between livestock and wildlife, forest encroachment, changes in ecosystems and globalization of trade in animal and animal products.

The consequences of emerging infectious diseases can be catastrophic. For example, estimates show that H5N1 HPAI has already cost over USD 20 billion in economic losses. If it causes an influenza pandemic it could cost the global economy around USD 2 trillion. Therefore, investments in preventive and control strategies are likely to be highly cost-effective.

Concerns about the potential for a pandemic have spurred worldwide efforts to control the H5N1 virus subtype. This virus spread out of the People's Republic of China in late 2003 into the rest of Asia, then Europe and Africa. The success of these control efforts is reflected in the fact that over 50 of the 63 countries affected by the virus have managed to eliminate it. But H5N1 HPAI remains entrenched in several countries, and it still has the potential to cause a pandemic.

Participants in the International Ministerial Conference on Avian and Pandemic Influenza (New Delhi, 4–6 December 2007) recommended that the international community draw on experiences with HPAI and develop a medium-term Strategic Framework to address emerging infectious diseases. It was agreed that a better understanding of the drivers and causes around the emergence and spread of infectious diseases is needed, under the broad perspective of 'One World, One Health' (OWOH) principles, that acknowledges the complex nature of emerging infectious diseases, and promotes a broad multi-disciplinary and multisectoral collaboration across three principal health domains at the animal-human-ecosystems interface.

The Strategic Framework focuses on emerging infectious diseases at the animal–human–ecosystems interface, where there is the potential for epidemics and pandemics that could result in wide-ranging impacts at the international, regional and country levels. The objective of the Framework is to diminish the risk and minimize the global impact of epidemics and pandemics due to emerging infectious diseases, by enhancing disease intelligence, surveillance and emergency response systems at national, regional and international levels, and by supporting them through strong and stable public and animal health services and effective national communication strategies. National authorities play a key role in devising, financing and implementing these interventions. Successful implementation will contribute significantly to the overall goal of improving public health, food safety and security, and the livelihoods of poor farming communities, as well as protecting the health of ecosystems.

The overall objective of the Strategic Framework represents an international public good. Its achievement will involve strengthening the existing animal and public health surveillance, response, prevention and preparedness systems at country, regional and international levels.

Priority interventions and associated actions will be established by officials at the country level and will be prioritized with the help of experienced international agency personnel. They will be identified based on known areas of risk ('hotspots') for disease emergence and on research findings that point to new risks. The Strategic Framework does not propose prioritization of diseases to target: instead it brings benefits to poor communities and agricultural sectors by reducing the risks of infectious diseases that are important locally—e.g. Rift Valley fever (RVF), tuberculosis (TB), brucellosis, rabies, foot and mouth disease (FMD), African swine fever (ASF) and peste des petits ruminants (PPR). This approach will not only control existing and often neglected infectious diseases, but will also promote surveillance for emerging infectious diseases at a grassroots level by embedding global concerns within a local context.

Based on these considerations, the following six specific objectives have been identified as areas for possible priority emphasis by national authorities:

- Develop international, regional and national capacity in surveillance, making use of international standards, tools and monitoring processes;
- Ensure adequate international, regional and national capacity in public and animal health—including communication strategies—to prevent, detect and respond to disease outbreaks;
- Ensure functioning national emergency response capacity, as well as a global rapid response support capacity;
- Promote inter-agency and cross-sectoral collaboration and partnership;
- Control HPAI and other existing and potentially re-emerging infectious diseases; and
- Conduct strategic research.

Implementation of the Strategic Framework will be guided by key principles. These include the adoption of a multidisciplinary, multinational and multisectoral approach and the integration of technical, social, political, policy and regulatory issues; the establishment of broad-based partnerships across sectors and along the research-to-delivery continuum. They will include engagement of the wildlife and ecosystems interests, the human and veterinary medical community, and advanced research institutions (ARI).

National authorities will be encouraged to build on national strategies on emerging infectious diseases, engage with the private sector to strengthen local capacity and promote long-term sustainability. This would include the strengthening of institutions already in existence, in addition to the structures, mechanisms and partnerships that have been developed in response to the HPAI crisis among international agencies (FAO, OIE, WHO and UNICEF) such as UNSIC, the Global Early Warning System (GLEWS), the Global Framework for Progressive Control of Transboundary Animal Diseases (GF-TADs), and the FAO/OIE Crisis Management Centre – Animal Health (CMC-AH), as well as those developed between the public and animal health sectors. This would be done without encouraging the integration or fusion of their roles. The Strategic Framework will encourage the formation of a flexible and informal network of partners, and will promote pro-poor actions and interventions.

In considering options for financing implementation, key issues to be addressed include the benefit–cost of various options, long-term sustainability, public versus private goods and political commitment of the key stakeholders. Donor funding will be sought, including a combination of grants and loans.

This joint Strategic Framework will be presented as a consultation document at the International Ministerial Conference on Avian and Pandemic Influenza in Sharm el-Sheikh, Egypt, 25–26 October 2008. It will be discussed by high-level participants from countries, international technical agencies, regional organizations, ARI, donors and the private sector.

HPAI and wild birds

The movement of poultry and poultry products as well as wild bird trade are known to be main routes for H5N1 HPAI spread locally, across national borders, and inter-continentally. Movement of virus via wild birds most likely occurred in Mongolia and Russia (2005 and 2006), in Europe (northern winter 2005/06 and summer 2007), and Turkey (2008) demonstrating instances where wild birds transported the virus. Since the large geographical expansion of H5N1 HPAI from eastern Asia in 2005 to Africa and Europe, millions of wild birds have made multiple inter-continental migrations through infected countries to breeding grounds and back to non-breeding locations, moving through every country in the world. Yet, to date, H5N1 HPAI has only infected 61 of 192 (32 percent) countries worldwide.

Marking whooper swans with GPS transmitters CREDIT: Mongolia WSCC/N. Batbayar

Close interactions between domestic poultry and wild birds exist in Asia, Africa and Europe, but demonstrating H5N1 HPAI virus movement between them is difficult. However, the virus was discovered in domestic chickens and a goose in 1996/7; thereafter, isolated in over 90 species from 14 orders of wild birds indicating likely spill over from domestic to wild birds. Conversely, it is believed that virus introduction from wild to domestic birds is also occurring periodically. At this point in time, virus is likely circulating in both directions, particularly in wetlands (often rice paddies) used by wild birds and for grazing domestic ducks.

Of the approximately 350 000 wild bird surveillance swab samples that have been collected, only a handful have been positive for HPAI H5N1 virus. To date, no wildlife reservoir for HPAI H5N1 virus has been identified despite 72 percent of the 61 countries reporting outbreaks (since 2003) and confirming that wild birds have died. This demonstrates that wild bird species are being exposed to HPAI H5N1 virus either through contact with poultry, other wild birds, or environmental sources of virus, and after exposure, they are susceptible to this strain of virus. Experimental exposure trials with HPAI H5N1 virus have shown that multiple wild bird species can shed virus for an average of 2-5 days before they die demonstrating the importance of targeted wild bird surveillance to understanding the role they play in the epidemiology of outbreaks at both poultry farms and in more natural wildlife habitats, and especially in rice producing wetland areas where there is a high likelihood of interaction and virus exchange amongst domestic ducks and wild waterfowl species.

Despite the importance of targeted wildlife surveillance, relatively few countries are currently implementing activities due to financial, technical, or human resource and expertise limitations. Wildlife surveillance is primarily carried out at the regional and global level by international organizations and NGOs, guided by predictive species risk tools and spatially oriented to include the most important migratory flyway, breeding habitats, or stop-over sites.

Recommendations from the FAO/OIE International Scientific Conference on Avian Influenza and Wild Birds hosted at FAO headquarters in Rome (May 2006) included the need to improve our understanding of wild bird (both migratory and resident species) behavior and migratory routes through the use of telemetry. To gain a better understanding of the potential for wild birds to spread virus, FAO has deployed over 150 ARGOS or GPS transmitters on 15 species of birds categorized as high risk species for HPAI spread. These projects have been implemented in partnership with international, national and local partners at multiple sites in Mongolia, China, Kazakhstan, Nigeria, Malawi, and Mali with additional projects to be implemented shortly in India and Egypt.

While it is known that the legal and illegal trade of poultry and poultry products, or unintentional movement of the virus by humans are the primary sources of disease movement, the extent to which free-flying wild birds contribute to sustaining and spreading the disease needs to be determined. In certain instances, data suggests that wild birds have been the source of disease spread and movement. However, the extent of their involvement in maintaining and translocating the virus has yet to be determined, and understanding the spatial and temporal relationships between bird migration and HPAI outbreaks has been one of the main objectives of a series of studies supported and implemented by the Emergency Centre for Transboundary Animal Diseases Operations (ECTAD) of FAO.

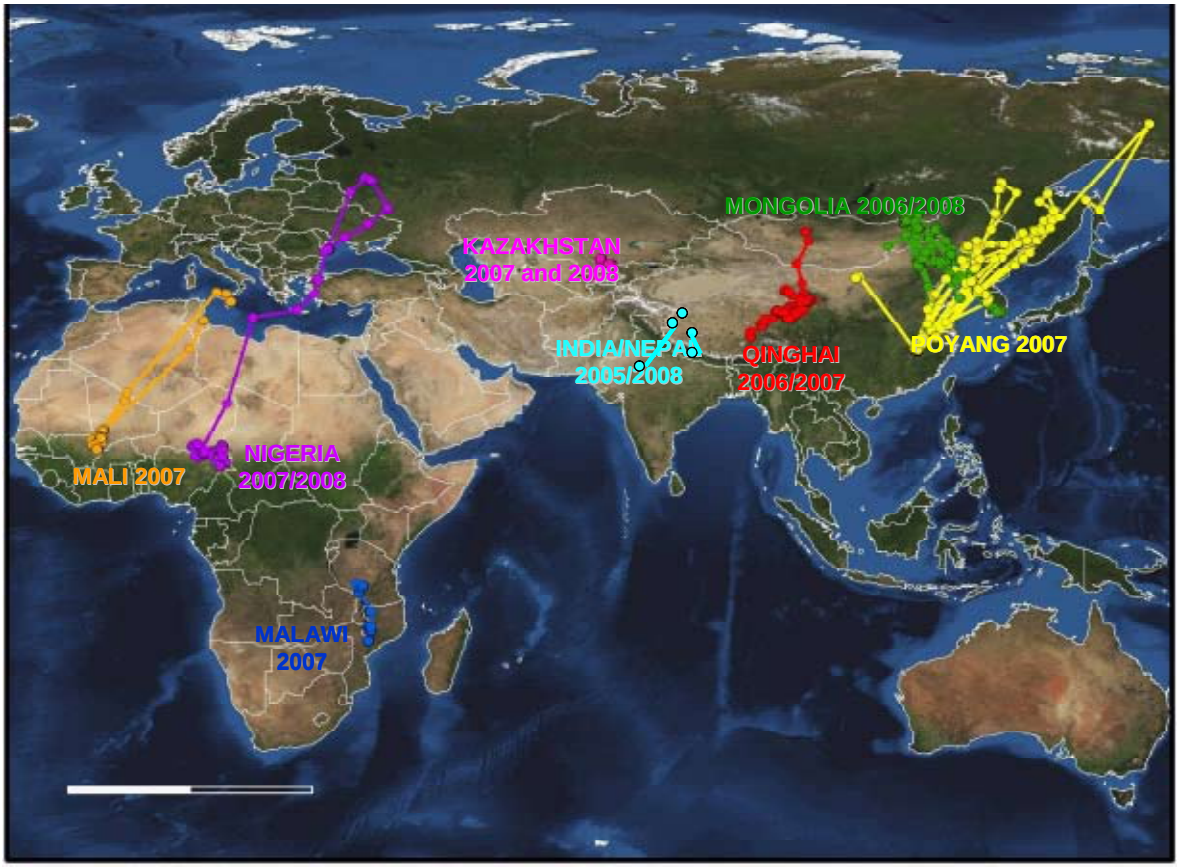
To date, only one human case of H5N1 HPAI infection, in Azerbaijan (2006), is through plucking feathers from a dead infected swan. Most human cases are a result of contact with infectious materials from domestic poultry related activities. The risk of human exposure by visiting wildlife areas or urban parks is low.

Hunting, handling, and cleaning/dressing of apparently healthy but infected wild birds poses a risk of virus exposure. In particular, infected internal organs or feathers that domestic or wild birds have access to, serves as a mechanism for potentially infecting these species as well as pets, other animals, and humans.

The large scale use of wild birds for consumption, ornamental purposes and cultural/religious practices has contributed to spread of the H5N1 HPAI virus. While impact of trade (illegal and legal) of wild birds in virus spread is difficult to monitor, religious practices in Hong Kong, bird trade to support falconry activities, and inter-continental trade to Europe are all examples geographic movements of H5N1 HPAI virus via trade.

A Scientific Task Force on Avian Influenza & Wild Birds was established by the UNEP Convention on Migratory Species (CMS) in close cooperation with the Agreement on the Conservation of African Eurasian Migratory Waterbirds (AEWA) in August 2005 following concerns about the role of migratory birds as potential vectors of HPAI virus subtype H5N1. The FAO, originally an observer of the Task Force, became a full member in March 2007, and in June 2007, ECTAD, Wildlife Disease Programme of FAO was invited to co-convene and co-coordinate the Task Force along with UNEP/CMS.

The Task Force comprises representatives and observers from 14 international organizations, including four UN bodies, specialist non-governmental organizations, and individual experts and aims to obtain the best scientific advice on the conservation impact of the spread of HPAI H5N1, including assessing the potential role of migratory birds as vectors of the virus. The Task Force promotes objective information on the role of wild birds as vectors of HPAI H5N1, and aims to avoid over-reaction by decision/policy makers that could be detrimental to the conservation of waterbird species and their habitats. Most recently, a Resolution on H5N1 and wild birds, which contained significant inputs from FAO and other Task Force Members, was adopted at AEWA Meeting of Parties in Madagascar.



Flight lines of migratory birds marked as part of FAO's effort to study the disease ecology of HPAI

CREDIT: USGS/S. Iverson

Vaccinating ducks in Viet Nam

CREDIT: FAO/A. Bhatiasevi

Vaccination against HPAI

Avian influenza vaccines confer protection by increasing the host's resistance to disease through a strong immune response against the avian influenza virus. Experimental and field studies have shown that if vaccines are used properly, they will protect against clinical signs and death; reduce shedding of the field virus if vaccinated poultry become infected; and prevent transmission of the field virus through contact . However they do not, as most other vaccines for humans and animals, give 100 percent protection from avian influenza infection or prevent shedding of the virus by infected birds.

To be effective, the vaccine has to be of good quality and administered appropriately. This implies: inoculation at the right age, using quality controlled vaccines and, maintenance of the cold chain. A vast majority of the vaccines currently being used are conventional inactivated virus vaccines. To be effective, the vaccine strain has to be of the same H subtype as the field viruses, i.e. H5 for a vaccination against H5N1. As avian influenza viruses have high mutation rates, field viruses tend to evolve, and in such cases the vaccine will not match with the circulating viruses anymore. A new vaccine strain would then be required, to ensure efficacy.

Avian influenza vaccines are developed mainly for chickens, but they are also used for other avian species, including domestic poultry (turkeys, ducks, geese, quails) and exotic or endangered wild species. Additionally, new vaccine technologies have been developed, such as reverse genetic vaccines and vectored vaccines. The latter allow vaccination of one-day old birds (e.g. in hatcheries).

When properly applied, vaccines have been successful in controlling avian influenza in several countries including Italy, the United States of America, Mexico, Hong Kong, China and Viet Nam. In these countries, vaccination has prevented, or substantially reduced, the large-scale depopulation of poultry. However, to ensure the full benefits of vaccination, it is critical that accompanying measures such as enhanced biosecurity, surveillance, early warning systems, culling of infected flocks, movement control, monitoring of circulating viruses and effective communication, are also implemented simultaneously.

Vaccination may become necessary when other methods such as culling and control of movements cannot be enforced, or when the number of outbreaks are so high that it may require the elimination of a very high percentage of the poultry population. Vaccination cannot be successfully implemented if the accompanying measures (described above) are not put in place. Unfortunately this is the case in many countries, particularly those where backyard, village, and small-holder production systems are prominent.

A vaccine that can be delivered to all susceptible poultry would be one that is easy to administer. For example, to one-day-old chicks in hatcheries or through the mucosal route (drinking water, feed, conjunctive route by spray) instead of injecting the birds. Among the new technology vaccines, the vectorised vaccines are the most promising allowing vaccination at hatchery which helps overcoming logistical problems of vaccination of poultry flocks in the field. However the interference of maternally derived antibodies with vaccination at young age still needs to be assessed.

Vaccine delivery to all susceptible poultry in a contaminated or at-risk country requires that all practical conditions, accompanying methods, adequate political commitment, and investments are put in place. This is not very often the case.

Vaccination can allow a certain degree of sub-clinical poultry infections to develop. Monitoring of the circulation of virus among vaccinated populations is therefore one of the indispensable measures that need to be applied. The isolation of virus strains in countries implementing vaccination is also necessary as field virus can always mutate, rendering the vaccine ineffective.

Various methods are available to carry out surveillance of virus circulation in vaccinated regions or flocks such as the "sentinel bird" and DIVA techniques. Surveillance through surveys in live bird markets is also a very effective technique to monitor virus circulation.

The cost of delivering a vaccine to a bird depends on the production system and the scale of the vaccination campaigns being implemented. For example, in the large-scale vaccination programmes in Viet Nam where around 350 million birds were targeted for vaccination in the initial stages of the campaign, the cost of vaccinating a bird was between 5.5 to 6 US cents. In smaller vaccination programmes, such as the ones in Indonesia and Côte d'Ivoire, the cost of vaccinating a bird were higher at between 8 to 15 US cents, respectively. In all countries the most expensive production system to vaccinate was predicted to be the backyard poultry systems.

Cost-effectiveness analysis requires a combination of strong epidemiological and economic knowledge and skills.

Chicken meat with government inspection stamp being sold in Ha Tay market, Hanoi, Viet Nam

CREDIT: FAO/A. Bhatiasevi

Costs of HPAI outbreaks and benefits of controlling HPAI

HPAI outbreaks and their control have impacts on individual households and national economies. Some of these impacts are obvious and direct, others are more subtle but very far reaching.

The costs have been shared between international and national public funds, private companies and individuals. Averting the risk of a human influenza pandemic has been a strong motivation and justification for the provision of large amounts of international and national public funding. Some elements of control confer a private benefit, for example preventive vaccination, and these justify shared or private investment.

Direct costs from HPAI outbreaks result from the deaths of birds and consequent loss of their production, and the direct costs of implementing culling, disposal, compensation schemes, movement restriction and vaccination.

In an increasing number of countries, compensation is paid to farmers when birds are culled as part of a stamping out operation, although it is extremely rare that this fully recompenses for lost production. The primary objective for compensation is to encourage reporting by providing an assurance to poultry owners that the government will share their loss. Compensation rates are most commonly estimated on the basis of a percentage of market value and have ranged from as little as 30 percent to a more realistic range of 70-100 percent. People other than producers who make a living from poultry receive no compensation after culling.

Costs of vaccination in commercial poultry are largely borne by the farmers, but may be heavily subsidized when vaccination is practiced in backyard flocks. In 2007 estimates were made of the cost of providing a single dose of vaccine to a chicken in three different countries and three production systems, which ranged from 4 to 15 US cents. Out of this total, the cost of the vaccine, the vaccinator and the cold chain made up between 63 percent and 90 percent. Commercial producers often pay for these components. The remaining cost was for post vaccination monitoring, communication and government staff involved in coordination and regulation.

Governments bear the direct costs of managing and coordinating stamping-out activities, deploying their staff and equipment and following up with outbreak investigation. They also pay or subsidize the costs of surveillance.

Indirect costs can be many times larger than direct costs and are usually underestimated. They include market shocks, wider livelihoods impacts beyond the immediate loss of birds, and opportunity costs.

The effect of market shocks spread far beyond an outbreak, as consumer worries about the safety of eating poultry products lead to falling demand and reduced prices. Since 2004, market shocks from HPAI have caused market fluctuations and changed international patterns of trade in live birds and poultry products. Shocks to poultry markets may also have changed the movement patterns and demands for other livestock in ways that have upset their

markets and spread disease. There are differences in impact according to the production system, at different points in market chains, and over time. The initial market shock is mainly driven by consumer fears and in some places has led to 70 percent or more of consumers temporarily ceasing to eat poultry products, while in other places there has hardly been any impact on demand. If outbreaks occur in waves over a long period of time, but are mostly brought under control, as in Thailand and Viet Nam, the market shock effect diminishes with each outbreak.

Wider livelihood impacts have largely been felt by women who have lost small flocks, causing hardships within households. The contribution of poultry to the incomes of poor households varies from approximately 3 percent to over 40 percent depending on the place and season. The birds are a flexible asset that provides high returns on investment, approximately 700 percent for a backyard hen. Their loss results in sacrifices in household nutrition, education for children, dowries, social obligations and reduced standing within the community as well as some longer lasting impacts where there has been a reluctance to return to poultry keeping. Shrinkage of the poultry population from deaths, culling or running down of stock can also lead to a reduced supply of affordable protein to urban consumers.

It can be assumed that there have been opportunity costs of diverting attention from control of other diseases and switching to other less productive species. In the long term, if investment is made to improve the capacity of animal health systems, the balance may be redressed.

Benefits of controlling H5N1 HPAI can be considered on three scales. Globally, the prevention of a human influenza pandemic could prevent losses of billions or trillions of dollars and enormous suffering. Within the global poultry sector, there will be a benefit in removing a destabilizing element in international markets so that production and trade value can continue, for the time being, to expand - overall, the sector has already recovered from a dip in 2004-5. For individual exporting countries, control offers the possibility to recover lost markets, albeit against strong competition, and to provide a stable supply of products for growing domestic urban markets. For individual producers on all scales, protection of their asset is the primary benefit.

There has been no estimate of the total costs or benefits of HPAI control. However, a growing body of information and tools is available for partial estimates. The priority now is to assist countries in assessing the trade-offs for use of their limited national resources, using social and economic analysis to highlight approaches that will maximize the benefits of reduced disease risk without applying unduly harsh control measures. This requires a thorough understanding of the dynamics of the poultry sector and the people whose living depends upon it.

Worker at a layer farm in Africa

CREDIT: FAO/S. Sarkar

Importance of the poultry sector

The poultry sector is possibly the fastest growing and most flexible of all livestock sectors. Over the past decade or so it has expanded, consolidated and globalized, driven primarily by very strong demand. However, the sector faces considerable and multiple challenges that will require entrepreneurship and flexibility from the players in the sector if they are to continue to participate in this dynamic market.

The demand for poultry products over the past 15 years has grown in countries of all income levels, with the exception of a slight decline in egg consumption in high income countries, where the effect of income growth may have reached a peak and demand may be more strongly influenced by changes in consumer taste.

Poultry meat production is the most efficient way of producing meat in intensive production systems since it has the lowest feed conversion ratio of all common domestic species. This is particularly relevant in today's context of food crisis with the price of grain having gone up tremendously.

Finally, poultry is an important source of food and income for a majority of rural families. More than a billion people live with less than a dollar per day. 700 million poor depend entirely or partially on animal production for their subsistence and poultry is often part of the equation. For example, 65 percent of rural families in Viet Nam and even 90 percent of rural families in Egypt or Cambodia have backyard poultry.

Indeed, livestock offers one of the few rapidly growing markets that poor, rural people can join, even if they lack substantial amounts of land, training and capital. Small scale and backyard poultry production enables the poor to earn income from animals feeding on common property or fed household waste.

Notwithstanding its rapid growth the sector continues to be very diverse in structural terms. There are and will continue to be traditional small-scale, rural, family-based poultry systems which play a crucial role in sustaining livelihoods and importantly supporting women farmers. As long as there will be rural poverty, poultry will be there to offer opportunities for income generation and quality human nutrition.

HPAI has been a big shock to the industry, but by no means the only external pressure that it faces. Concerns about environmental pollution, shortage of water, rising cost of feed and (at least in the EU) rising welfare standards are all putting pressure on the livestock sector, including poultry. However, efforts to contain HPAI and reduce its impact have accelerated moves towards dividing and differentiating different production systems and value chains. These concerns can then be addressed more specifically within each production system.

Long-term restructuring of the poultry sector

What is "restructuring" of the poultry sector? In the simplest terms, it means regulating or otherwise controlling how or where production, sales, and marketing can take place. Moving a live bird market, closing the slaughter points in an area, banning the production of poultry in a city, are all restructuring activities. So is introducing a "compartment", which is a population of birds under a common and very well regulated biosecurity plan, like the vertically integrated market chain of a global company.

Restructuring is currently receiving a great deal of attention because it is seen as a way of improving the biosecurity of the poultry sector. Well designed and implemented restructuring activities can certainly be helpful to produce safer poultry. However, restructuring usually restricts those who can be involved in producing, trading and processing poultry and their products. This can under some circumstances create competition and inequity, with the most vulnerable people suffering a loss of livelihood. It can also be difficult to regulate.

Various restructuring activities in some countries, introduced or planned since 2003, have had the following results:

- A large proportion of small scale producers in one area have lost their market and moved out of poultry production. Those who were able to comply with new regulations and remain are mostly making a greater profit than before;
- After very abrupt banning of production, a number of poor families suffered from loss of income, and the dynamic within households changed when women lost their independent livelihood activity. The ban only worked for a while, and many people have partially restocked;
- A market that was upgraded for hygienic reasons after a long consultation with stakeholders is now showing a good return on investment to the municipality that runs it; and
- An assessment of one restructuring plan suggested that there would be considerable problems associated with land tenure. Apart from making it difficult to implement, this would have gender implications since women had limited possibilities to own land.

When restructuring is being considered as part of a plan to reduce human and animal disease risk in the poultry sector, it is recommended that it be given the same careful planning and implementation as for any long term development activity:

- A careful risk assessment in advance to learn where the biggest gains can be made in biosecurity with the least effort;
- An assessment of the potential environmental and social impact in any restructuring proposal;
- A consultative process;
- Gradual steps, to maximise buy-in and minimise livelihoods damage;
- Investment of public money in basic infrastructure, training and quality monitoring; and
- Impact monitoring once the plan has been initiated.

Backyard poultry in Egypt

CREDIT: FAO/P. Pagani

Strategic communication and advocacy for risk reduction

FAO formally established the ECTAD Communication Unit in June 2007 to respond to new demands for strategic policy guidance and technical assistance in animal health communication. Since its inception, the Unit has successfully established itself as a critical technical support unit for ECTAD activities in general, and for the provision of specific, need-based technical assistance in strategic communication for risk reduction to Ministries of Agriculture/Livestock in HPAI-infected and at-risk countries. Currently, the Unit comprises of communication specialists at FAO headquarters in Rome; regional communication advisers for South-East Asia (Bangkok), East Africa (Nairobi) and West Africa (Bamako); and in-country specialists in Egypt, Viet Nam, Cambodia, Lao People's Democratic Republic, Bangladesh and Indonesia.

Along with its key communication partners including WHO, UNICEF, OIE, the World Bank, and others, the ECTAD Communication Unit has carried out reviews of numerous knowledge, attitude and practice research studies in HPAI affected or at-risk countries to better understand the underlying dynamics of community/individual beliefs and behavior, and incorporate this knowledge into its community-based approach to strategic communication for the prevention and control of HPAI.

Several anthropological research studies on rural beliefs and practices related to HPAI prevention and control were commissioned by ECTAD in Cambodia (2007), Timor-Leste (2008) and Indonesia (2008). The studies explored pre-existing practices and perceptions of rural populations with regard to poultry and poultry diseases in general and avian influenza in particular, and called for a new wave of communication messages and strategies, based on emerging evidence from the studies.

Elsewhere, innovative participatory communication interventions have been developed and are being carried out in Lao People's Democratic Republic, Indonesia, Viet Nam, Cambodia and more recently in Nigeria. These activities range from the training of village animal health workers as communicators at the community level, to community forums enabling community members to increase their capacity for decision-making to combat avian influenza.

Posters with ambiguous messaging at a border post in Africa

CREDIT: FAO/S. Sarkar

Community awareness activities have been conducted in hundreds of villages and reached thousands of farmers, to inform and educate poultry producers and villagers about HPAI, its means of transmission, ways of reducing risk, and prevention and control measures. FAO along with other partners have also produced a wide range of in-country communication materials including posters, leaflets, flip-charts, and newsletters.

FAO recognizes the crucial role that media can play in setting the global and national development and policy agenda. Besides keeping the media informed through regular media releases and a dedicated Avian Influenza web site, FAO is also piloting an innovative media fellowships program focusing on animal health issues and community voices in Viet Nam, Indonesia, Egypt and Nigeria.

The Unit has been very active in the provision of technical assistance and building capacities for communication planning, where the emphasis has been on strengthening the technical capacities and competencies of Ministries of Agriculture/Livestock in a number of at-risk countries in outbreak, risk, and behavior change communication. It has taken a multidisciplinary approach, through collaborating closely with epidemiology, biosecurity, socioeconomic and compensation experts. Four major regional multi-disciplinary workshops in communication planning and skill-building for HPAI prevention and control have been held for North Africa, West and Central Africa, Central Asia, and East Africa, involving 40 countries and over 100 participants and partners.

FAO has also provided technical inputs and helped develop avian influenza training packages in several countries, and has been involved in 'training of trainers' programmes at national and sub-national levels. Many of these training packages have been joint initiatives with partners such as UNICEF, WHO, CARE, Community-Based Avian Influenza Control (CBAIC) Project in Indonesia, and the Academy for Educational Development (AED), to name a few.

The Unit is also well on target for carrying out Integrated National Action Plan (INAP) assessments in over 40 countries of sub-Saharan Africa. Fifteen have already been completed and a further 20 are scheduled for completion by 2009. FAO/ECTAD Communication Unit's responsibility within the inter-agency INAP process (an initiative of the Alive Platform, and jointly organized by FAO, the World Bank, the African Union/Interafrican Bureau for Animal Resources (AU-IBAR), OIE and WHO) is to evaluate the communication component of INAPs in individual African countries, assessing capacities and preparedness, and formulating planning assistance for HPAI communication strategies.

Over the past year, the ECTAD Communication Unit, at FAO headquarters as well as regional/national levels, has been proactively strengthening relations with all its key partners towards improving coordination, harmonization of approaches, and guidance to countries on communication issues. This has taken the form of joint planning meetings, joint review/assessment missions in several countries, the conduct of joint training workshops, partnering in development and refinement of national communication strategies, and participation in key global and national processes. Of particular relevance are the inter-agency review of global guidance on HPAI communication; participation at the New Delhi Ministerial Conference; and the consensus-building process in the development of the One World, One Health strategy which is to be released at the Ministerial Conference in Sharm-al-Sheikh, in October 2008.

The ECTAD Communication Unit will continue to advocate at the highest policy levels for strengthening the animal health communication constituency, and at the same provide need-based technical support at the country level. Responding to the demand from member-states and Ministries of Agriculture/Livestock in particular, a strong focus in the coming year will be to create a critical mass of animal health communication specialists across the globe, to work at the animal-human-ecosystems health interface. Towards this, the ECTAD Communication Unit will concentrate on developing and implementing a robust program for rapidly building in-country capacities, competencies, and leadership in strategic communication for risk reduction and the prevention and control of HPAI, other transboundary animal diseases (TADs), as well as, emerging infectious diseases.

Hands-on training with a rapid detection test kit, Africa

CREDIT: FAO/S. Sarkar

The FAO response to HPAI

As of September 2008, FAO had secured contributions totalling USD 209.13 million in support of its Global Programme for the control and eradication of HPAI. Activities are being implemented through ECTAD.

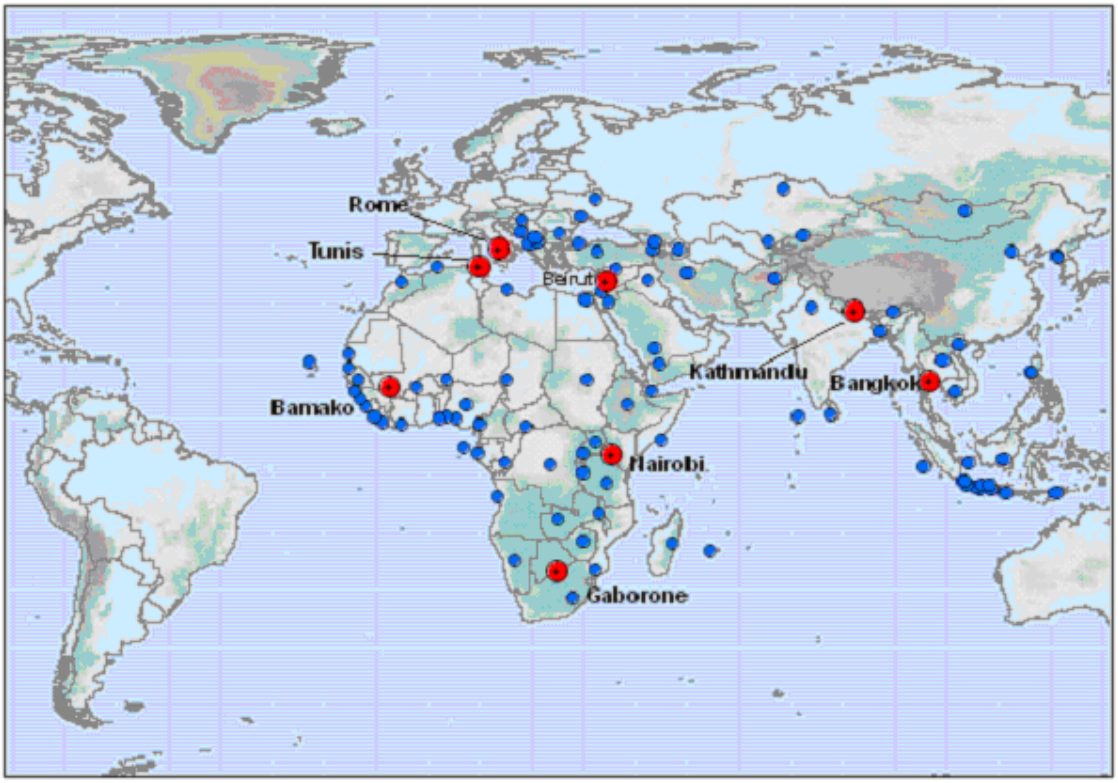
Twenty countries (Australia, Belgium, Canada, China, France, Germany, Greece, Ireland, Italy, Japan, Jordan, the Netherlands, New Zealand, Norway, the Kingdom of Saudi Arabia, Spain, Sweden, Switzerland, the United Kingdom and the United States of America); and nine international and regional organizations (the Asian Development Bank, the World Bank, the United Nations Common Fund for Humanitarian Action in Sudan, the European Commission, the Organization of Petroleum Exporting Countries-OPEC, the Office for the Coordination of UN Assistance Programme to Afghanistan, the United Nations Development Programme (UNDP) Administered Donor Joint Trust Fund, UNDP and the United Nations Development Group-UNDG/EXECCOM Secretariat) have generously contributed funds to FAO in the effort to control and eradicate HPAI. In addition, FAO's initial investments through its Technical Cooperation Programme also played a catalytic role.

Furthermore, nine countries and one intergovernmental organization (Sweden, the United Kingdom, Norway, France, Switzerland, the Kingdom of Saudi Arabia, Greece, Jordan, China, and OPEC) have channelled their contributions (worth USD 40.81 million) through the Special Fund for Emergency and Rehabilitation Activities (SFERA). This pooling of funds through the SFERA mechanism paved the way for a programmatic approach and has greatly improved FAO's flexibility to respond.

Since the ECTAD operations began in December 2004, FAO has been active in over 90 countries and has been able to spend and commit more than 65 percent of the secured contributions.

Activities are implemented by teams composed of technical and operational staff based in FAO Representations, governmental offices and ECTAD units in nine countries (Bangladesh, China, Cambodia, Egypt, Indonesia, Lao People's Democratic Republic, Nigeria, Timor-Leste and Viet Nam). National teams are also present in an additional 22 countries (see Map 1). In close cooperation with its partners FAO has established one ECTAD regional unit for Asia (Bangkok), six ECTAD sub-regional units for South Asia (Kathmandu), the Near East (Beirut), North Africa (Tunis), West and Central Africa (Bamako), Southern Africa (Gaborone) and East Africa (Nairobi).

Currently, the programme employs more than 420 people throughout the world, of which 270 are professional staff (47 percent national and 53 percent international). Seventy-seven percent of the overall ECTAD personnel is based in the field of which 76 percent are nationals.



Map 1: Countries where FAO has teams and main activities ongoing

In the initial stages of ECTAD's response to HPAI, a substantial amount of funds and efforts were invested in mobilizing international technical (veterinary) and operational expertise in key countries, especially in Asia, to respond to the global crisis. To date, more than half of the overall funds (53 percent) are sustaining interventions in the Asia region. Africa also became a main focus of activities with HPAI reaching the continent in early 2006. Nearly a quarter of available funds (24 percent) are being used to support activities in the Africa region. Affected countries in the Near East, North Africa and Eastern Europe also benefited from FAO's support (Table 1). Around 16 percent of the received funds are allocated to thematic and transversal activities such as communication, wildlife, GLEWS, OFFLU and Laboratory Networks, socio-economics, poultry production and biodiversity analysis, as well as deployment of rapid response teams from the CMC-AH.

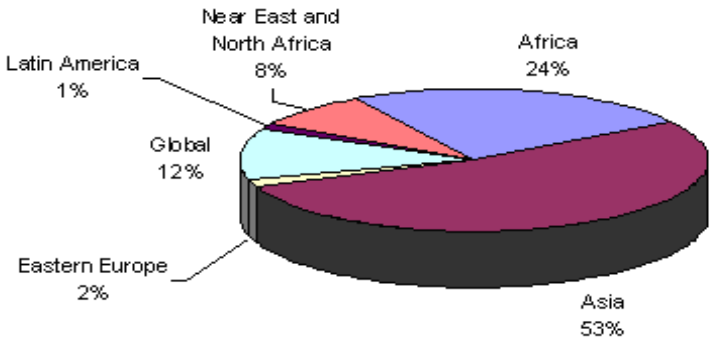
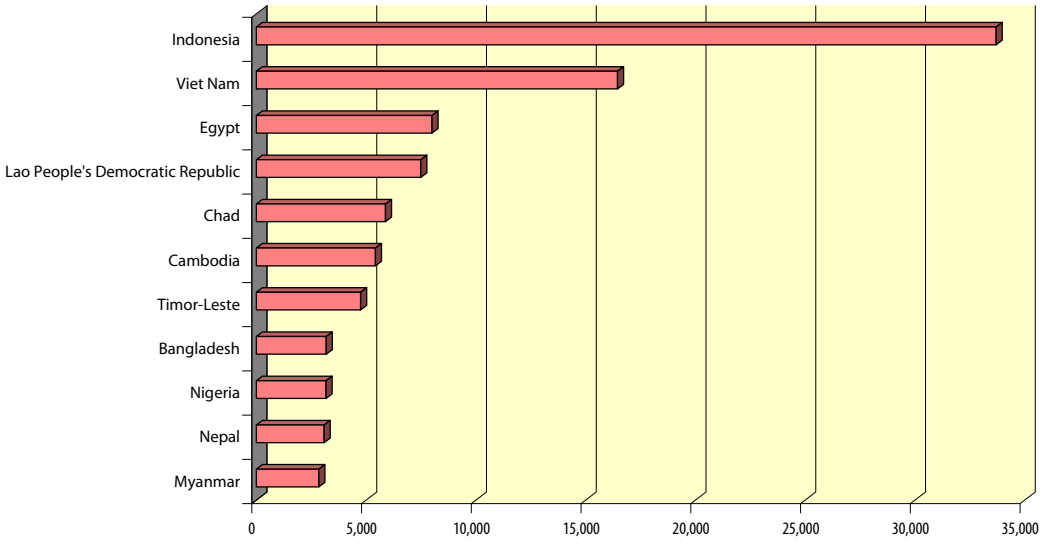


Table 1: Geographical funding distribution

The eleven countries with the highest financial investments from FAO are Indonesia, Viet Nam, Egypt, Lao People's Democratic Republic, Chad, Cambodia, Timor-Leste, Bangladesh, Nigeria, Nepal and Myanmar (Table 2).

Table 2: Top eleven beneficiaries (USD million)



ECTAD has channelled emergency funds to help refurbish laboratories; provide laboratory equipment and veterinary supplies; and train national veterinarians and laboratory technicians in the most advanced techniques and strategies for surveillance and control of HPAI. ECTAD has supported regional networking initiatives to encourage countries and organizations to share information and experiences and build a unified defence system against HPAI. Since HPAI can quickly spread from one nation to another, international cooperation is vital to halting the disease.

After emergency equipment and supplies were put in place, more targeted approaches have been developed to combat HPAI in countries where avian influenza has become endemic (usually due to a particular combination of economic and social factors), or could easily become endemic. Socio-economic studies have been conducted in Egypt and Indonesia, for example, to help shed light on these factors. A wildlife unit within the Animal Health Division of FAO is investigating the role of migratory wild birds in the spread of HPAI to domestic poultry. An ECTAD Communication Unit was also established in June 2007 to assist member-states in the development and implementation of effective, multi-disciplinary communication strategies for the prevention and control of HPAI.

Scientists taking swab from a chicken that were under a vaccine challenge trial in the national laboratory in the National Centre for Veterinary Diagnosis in Hanoi

CREDIT: FAO/A. Bhatiasevi

International coordination

FAO, together with OIE, have taken a lead role in providing international technical and policy support to contribute to the control of HPAI. This joint effort has provided the platform for the animal and public health sectors to work together in seeking common solutions to the avian influenza threat.

FAO and OIE are coordinating the international response to the spread of the disease in animals. They have provided sound technical and policy advice in harmonizing national, regional and global plans, and in improving the effectiveness and efficiency of implementation of disease prevention and control programmes in the poultry sector.

FAO and OIE, in consultation with WHO, have developed The Global Strategy for Prevention and Control of H5N1 HPAI which is regularly updated based on the evolution of the disease situation. FAO subsequently formulated a proposal for a Global Programme that presents its approach to addressing the needs for control of the current panzootic of HPAI over a projected period of three years (2006-2008). This too will be revised and updated for 2009 and beyond.

The Global Programme has the following goals: to coordinate and manage, in collaboration with OIE, the international effort in assisting countries to control and ultimately eradicate avian influenza the poultry producing sectors, and to prepare non-infected countries to rapidly detect and respond to incursions of the disease. The programme is managed from the global level, while facilitating improved synergies at the regional level and accommodating specific needs at the national level.

To ensure a coordinated and efficient global response to HPAI, FAO has established ECTAD, which makes both, technical and operational assistance on HPAI immediately available to countries. In addition, joint actions with OIE have been undertaken in the preparation of technical documents on HPAI control and surveillance, organization of international conferences, establishment of the Regional Animal Health Centres in several parts of the world, and the creation of the CMC-AH at FAO headquarters. The CMC-AH is designed to respond rapidly to requests for technical and operational assistance to countries in relation to transboundary animal diseases in general, and HPAI in a particular.

FAO, other UN agencies and OIE work under the umbrella of the office of the United Nations System Influenza Coordinator (UNSIC). FAO has contributed to the formulation and development of the UNSIC Consolidated Action Plan, which describes the concerted efforts of the relevant UN agencies and OIE in the global fight against avian and human pandemic influenza.

FAO and OIE collaborate with other international and regional organizations such as ASEAN and SAARC in Asia and AU-IBAR in Africa; and with other agencies and national governments in order to facilitate information exchange within the international community, avoiding unnecessary overlap, and ensuring that all partners are providing complementary support to a unified approach.

Furthermore, and in response to the ongoing problem of HPAI and other emerging infectious diseases, a Strategic Framework has been developed jointly by four specialized agencies — FAO, OIE, WHO, UNICEF — the World Bank and UNSIC. The document entitled Contributing to One World, One Health: A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal–Human–Ecosystems Interface identifies the key issues related to control of HPAI and other infectious diseases of animals and humans with wide ranging global impacts and articulates a medium to long term strategy to control these problems as international public good. This joint Strategic Framework will be presented as a consultation document at the International Ministerial Conference on Avian and Pandemic Influenza, in Sharm el-Sheikh, Egypt, 25–26 October 2008.

FAO also works with international donor institutions involved in combating HPAI, such as the World Bank, Asian Development Bank, the European Union, as a well as strategic bilateral donors such as USAID, Japan, Canada, Australia, France, Italy, Norway, Sweden, Germany, and the United Kingdom, among others.

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