THIRD REPORT

October 2008–December 2009

GLOBAL PROGRAMME FOR THE PREVENTION AND CONTROL OF HIGHLY PATHOGENIC AVIAN INFLUENZA

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2010

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Executive summary

Since its emergence in Asia in late-2003, H5N1 highly pathogenic avian influenza (HPAI) has caused global concern as an extremely infectious disease threatening animal and human health and the livelihoods of the most vulnerable. In response, the Food and Agriculture Organization of the United Nations (FAO) and the World Organisation for Animal Health (OIE) have led international efforts to facilitate the prevention and control of H5N1 HPAI at its source in animals.

In the early stages of the epizootic, FAO implemented a cluster of projects with its own financial tools (Technical Cooperation Programme) and through the Animal Health service. However, it was soon apparent that more than veterinary and contingency planning skills were required in addressing a potential global pandemic. FAO initiated its Global Programme for the Prevention and Control of H5N1 Highly Pathogenic Avian Influenza for the period 2006–08 to develop a more comprehensive and coherent response to the epizootic, which included: community outreach; legislative changes at country level; cooperation between responsible ministries; strategies on compensation; understanding production practices, markets and critical control points; characterisation of virus genotypes and vaccine matching, as well as elucidating the roles of wild fowl. The FAO Global HPAI Programme attracted extrabudgetary resources to undertake global, regional, national, and village projects, worldwide – not only for affected countries, but for those at risk and where capacities were weak. This Programme was based on the regularly updated joint FAO–OIE Global Strategy for the Prevention and Control of HPAI.

Throughout 2009, FAO remained fully committed to combating H5N1 HPAI, but also understood that there was a need to extend the Global Programme. The emergence of the pandemic influenza A H1N1 2009 virus in April 2009 again prompted FAO's immediate response – using the structures and tools previously put in place for H5N1 HPAI, including the establishment of the Emergency Centre for Transboundary Animal Diseases (ECTAD) at headquarters and strategic ECTAD units in several countries (Mali, Kenya, Bostwana, Thailand, Egypt, Nigeria, Nepal, Tunisia, Lebanon, and Panama); FAO/OIE/WHO Global Early Warning and Response System (GLEWS); OIE/FAO network of expertise on animal influenza (OFFLU); and the FAO/OIE Crisis Management Centre for Animal Health (CMC-AH) – although animals have not thus far played a major role in the epidemiology of the pandemic in humans. Subsequently, FAO enlarged the scope of its activity to include all animal influenza, notably in terms of surveillance to monitor the viral evolution in animals and more specifically at the animal–human interface.

The Third Report of the FAO Global Programme on HPAI covers the period October 2008 – December 2009 and reviews: (i) the evolution of H5N1 avian influenza in domestic poultry, wild bird populations and human populations; and (ii) FAO's projects (portfolio review) and activities implemented, with a specific focus on surveillance, laboratory and biosecurity activities. It also provides overall (a survey of 34 countries) and specific (Bangladesh, Egypt,

Indonesia, Nigeria and Viet Nam) assessments of country capacity in the prevention and control of the disease. In the broader context of the One World One Health (OWOH) strategic framework and the necessary transition towards the control of emerging infectious diseases (EIDs) other than H5N1 HPAI, the Report also details FAO's response to pandemic influenza A H1N1 2009 and describes the main elements of FAO's strategy and programme in line with the OWOH strategic framework. The key findings are presented below.

In 2009, the epidemiological situation continued to evolve favourably, with an overall decrease in the incidence of H5N1 AI in animals and in the number of infected countries (11, compared with 22 in 2008, with Nepal the only newly infected country in 2009). However, in Bangladesh, Egypt, Indonesia and Viet Nam, the virus remained entrenched. The number of cases in humans increased slightly in 2009, while conversely, the mortality rate in humans declined significantly. The risk of a pandemic of human influenza originating from the H5N1 virus remains the same as before, with Egypt and Indonesia as the most likely sources, due to the high number of cases being recorded.

Since 2004, FAO has been responsible for a significant portfolio of projects under the umbrella of the Global Programme. Quantitative and qualitative reviews of active projects (107 as of December 2009) demonstrate compliance with the key principles stated in the Global Strategy and Programme, in terms of level of intervention (country focus supported by regional and global activities), geographic priorities ('hot spots'), activity timeframe (medium-term to long-term development activities) and multi-disciplinary/sectoral approach. While it is too early to conduct an impact assessment of the Global Programme, the two real-time evaluations of FAO's work in H5N1 HPAI both conclude that the delivery of the Programme has been most satisfactory and that FAO has demonstrated the capacity to provide strong leadership and performance in supporting the countries in HPAI preparedness and response.

In terms of funding, a total of US$272 million has been allocated to the Global Programme since 2004 (of the US$308 million initially requested for the first three years), with almost US$30 million allocated in 2009 for the continued implementation of ongoing activities and development of eight new projects principally focussed on H5N1 HPAI (pipeline), but also encompassing other transboundary animal disease prevention and intervention measures.

FAO's contribution to surveillance, laboratory capacity and, more recently, biosecurity has been instrumental in terms of both normative (through EMPRES) and operational (through ECTAD at headquarters, regional and country level) assistance. Notably biosecurity guidelines for poultry producers and swine farms were rapidly produced, in collaboration with OIE and the World Bank. As a result of FAO's support, and that of other partners, country capacities in these three areas improved over the reporting period. Considerable efforts are still needed to control the disease, notably in countries where the virus is entrenched.

With the advent of H1N1, the mechanisms specifically put in place at the global, regional and national levels for HPAI proved mature and flexible enough to address another transboundary animal disease of global importance under emergency conditions. As a beneficial effect of resource mobilisation to combat the presence or threat of H5N1 HPAI, much of the capacity built in 'transversal areas' is readily adaptable to many other animal diseases.

This provides an excellent indication of FAO's ability to put the newly adopted multi-

agency OWOH strategic framework into practice and to transition smoothly from a single-disease to a multi-disease (TADs, zoonoses or emerging infectious diseases [EIDs]) approach. In its new strategy, FAO proposes to address the root causes and drivers of disease emergence, recognising that disease emergence events must be addressed together with the challenges posed by poverty reduction, natural resource management, and sustainable agriculture and rural development.

It is hoped that donors are ready for longer-term commitments in animal health, following five years of unprecedented in-depth involvement in HPAI, as diseases that affect humans will more likely derive from pathogens circulating in livestock and wildlife. Veterinary systems need to be strengthened as well as their governance, and their importance highlighted in national development plans to protect citizens, trading partners and consumers. The International Ministerial Conference on Animal and Pandemic Influenza (Hanoi, April 2010) will set the stage for global efforts over the next 20 years, in the areas of high impact disease prevention, detection and control.

Acronyms

AAHL	Australian Animal Health Laboratory
ADB	Asian Development Bank
AED	Academy for Educational Development
AGA	Animal Production and Health Division (FAO)
AHI	Avian and Human Influenza
AI	Avian Influenza
AIV	Avian Influenza Virus
APHIS	Animal and Plant Health Inspection Service (USDA)
ASEAN	Association of Southeast Asian Nations
ASF	African Swine Fever
AU–IBAR	African Union/Inter-African Bureau for Animal Resources
AusAID	Australian Agency for International Development
AVS	Additional Veterinary Surgeons
CAHO	Community Animal Health Outreach
CAHW	Community Animal Health Worker
CBAIC	Community-Based Avian Influenza Control
CDC	U.S. Centers for Disease Control and Prevention
CEMAC	Communauté Economique et Monétaire d'Afrique Centrale
CERF	Central Emergency Response Fund
CFR	Case Fatality Rate
CHF	Common Fund for Humanitarian Action in Sudan
CHL	Communication for Healthy Living
CMC–AH	FAO/OIE Crisis Management Centre for Animal Health
CSF	Classical Swine Fever
CVL	Central Veterinary Laboratory
CVO	Chief Veterinary Officer
DFID	Department for International Development, UK
DLS	Department of Livestock Services, Bangladesh
DRC	Democratic Republic of the Congo
EC	European Commission
ECTAD	Emergency Centres for Transboundary Animal Diseases
EIDs	Emerging Infectious Diseases
EISMV	Ecole Inter–Etats de Science et Médecine Vétérinaires (Dakar, Senegal)
EMPRES	Emergency Prevention Programme for Transboundary Animal Diseases
EMPRES–i	Global Animal Disease Information System

EOD	Entry on Duty (date – beginning of project)
ERV	Ebola Reston Virus
ETMS	Event Tracking and Management System
FAO	Food and Agriculture Organization of the United Nations
FETPV	Field Epidemiology Training Programme for Veterinarians
FMD	Foot and Mouth Disease
FPMIS	Field Programme Management Information System (FAO)
FVI	France Vétérinaire International
GIS	Geographic Information System
GISAID	Global Initiative on Sharing All Influenza Data
GLEWS	FAO–OIE–WHO Global Early Warning and Response System
GoB	Government of Bangladesh
GoE	Government of Egypt
GoN	Government of Nigeria
GoV	Government of Viet Nam
GP	Global Programme
GREP	Global Rinderpest Eradication Programme
HA	Hemagglutination screening test
H1N1	pandemic influenza A H1N1 2009 (subtype of Influenza virus A)
H5N1	Subtype of the Influenza A virus
HI	Hemagglutinin Inhibition (lab test)
HPAI	Highly Pathogenic Avian Influenza
IAEA	International Atomic Energy Agency
IATA	International Air Transport Association
ICT	Information and Communication Technology
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
INAP	Integrated National Action Plan
IZSVe	Istituto Zooprofilattico Sperimentale delle Venezie
LBM	live bird markets
MDGs	Millennium Development Goals
MOFAL	Ministry of Forestry and Livestock, Bangladesh
NAIPRP	National Avian Influenza Preparedness and Response Plan
NAIRL	National Avian Influenza Reference Laboratory, Bangladesh
NDV	Newcastle Disease Virus
NIAH	National Institute of Animal Health, Thailand
NLQP	National Laboratory for Veterinary Quality Control on Poultry Production
NPQIP	National Poultry Quality Improvement Plan, Indonesia
NTE	not to extend (date – end of project)
NVRI	National Veterinary Research Institute, Nigeria

OFFLU	OIE/FAO joint network of expertise on avian influenza
OIE	World Organisation for Animal Health
OVI	Onderstepoort Veterinary Institute
OWOH	One World One Health
PAAT	Programme Against African Trypanosomiases
PCR	Polymerase Chain Reaction (lab test)
PDSR	Participatory Disease Surveillance and Response
PPE	Personal Protection Equipment kits
PPLPI	Pro-Poor Livestock Policy Initiative
PPP	Public–private partnership
PPR	Peste des Petits Ruminants
PTV	Porcine Teschovirus
RAHC	Regional Animal Health Centre
RAP	Regional Office for Asia and the Pacific (FAO)
REMESA	Mediterranean Animal Health Network
RESEPI	Regional Network of National Epidemiosurveillance Systems for West Africa
RESOLAB	West and Central Africa veterinary laboratory network for AI and other transboundary diseases
RP	Reporting period
RTE	Real-Time Evaluation
RT–PCR	Real Time Polymerase Chain Reaction (lab test)
RVF	Rift Valley Fever
SADC	Southern Africa Development Community
SAIDR	Strengthening Avian Influenza Detection and Response (project)
Sectors (poultry production)	Sector 1: industrial integrated production with birds or products marketed commercially. Sector 2: commercial poultry production with birds or products sold through slaughterhouses or live poultry markets. Sector 3: commercial poultry production, including water fowl, with birds or products usually sold through live bird markets. Sector 4: village or backyard production with birds or products usually consumed locally.
SFERA	Special Fund for Emergency and Rehabilitation Activities (FAO)
SMS	Short Message Service
SOP	standard operating procedure
SPINAP	Support Programme to Integrated National Action Plan
T&T	Tsetse and Trypanosomiases
TADs	Transboundary Animal Diseases
TCE	Technical Cooperation for Emergencies
TCP	Technical Cooperation Program
TF	Trust Fund

UEMOA	Union Economique et Monétaire Ouest Africaine
ULO	Upazilla Livestock Officers
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UNSIC	United Nations System Influenza Coordination
USAID	United States Agency for International Development
US$	United States of America dollar
USDA – APHIS	Unites States Department of Agriculture – Animal and Plant Health Inspection Service
VLA	Veterinary Laboratories Agency (VLA Weybridge)
VS	Veterinary Services
WB	World Bank
WHO	World Health Organization

Introduction

In response to the H5N1 highly pathogenic avian influenza (HPAI) originating in Asia in 2003[1], the Food and Agricultural Organization of the United Nations (FAO) implemented a cluster of projects to combat the disease with its own financial tools (Technical Cooperation Programme). However, when the epizootic began spreading to other continents, with the risk of becoming a global pandemic, FAO initiated its Global Programme for the Prevention and Control of H5N1 Highly Pathogenic Avian Influenza for the period 2006–08 to develop a more comprehensive and coherent response to the disease, funded mainly from extrabudgetary resources. This programme was based on the regularly updated joint FAO–OIE Global Strategy for the Prevention and Control of HPAI.

Throughout 2009, FAO remained fully committed to combating H5N1 HPAI, implying a timeline extension of the Global Programme. The emergence of the pandemic influenza A H1N1 2009 virus in April 2009 prompted FAO's immediate response – using the tools put in place for HPAI such as the FAO/OIE/WHO GLEWS, FAO/OIE OFFLU and FAO/OIE CMC–AH – although animals have not thus far played a major role in the epidemiology of the pandemic in humans. Subsequently, FAO broadened the scope of its activity to include all animal influenza, notably in terms of surveillance to monitor the virus evolution in animals and more specifically at the animal–human interface.

The Third Report of FAO's Global Programme on HPAI covers the period October 2008 – December 2009 and provides an overview of the disease situation and of the activities conducted. The activity overview is put into perspective within the broader context of the One World One Health (OWOH) strategic framework and the transition towards the control of emerging infectious diseases (EIDs) other than H5N1 HPAI. More specifically:

Chapter 1 details the H5N1 avian influenza situation and evolution over the reporting period in domestic poultry and wild bird populations as well as in humans.

Chapter 2 provides a quantitative and qualitative review of FAO's past, ongoing and pipeline portfolios as well as a funding update.

Chapter 3 presents an assessment of FAO activities at the global, regional and national levels and of overall government capacities to prevent and control HPAI. It focuses on surveillance, laboratory capacity and biosecurity, together with preparedness, response, communication, socio–economic and wildlife activities. The assessment is based upon preliminary results from the second Real Time evaluation of FAO's work on HPAI carried out in 2009 and a survey of 34 countries conducted by FAO in November 2009.

Chapter 4 focuses on four countries where H5N1 HPAI is endemic (Bangladesh, Egypt, Indonesia and Viet Nam) and Nigeria. For each country, the chapter reviews the disease situation, FAO's contribution to the national HPAI response and overall country capacity (and remaining gaps) to fight the disease.

[1] Current chain of outbreaks.

Chapter 5 deals with FAO's response to the pandemic influenza A H1N1 2009 virus, demonstrating the positive spillover of the experience gained with HPAI in the past five years in the fight against all EIDs.

Chapter 6 details FAO's vision of the agreed multi–agency OWOH strategic framework and subsequent programme (under development).

Chapter 1

H5N1 HPAI Situation Update (October 2008–December 2009)

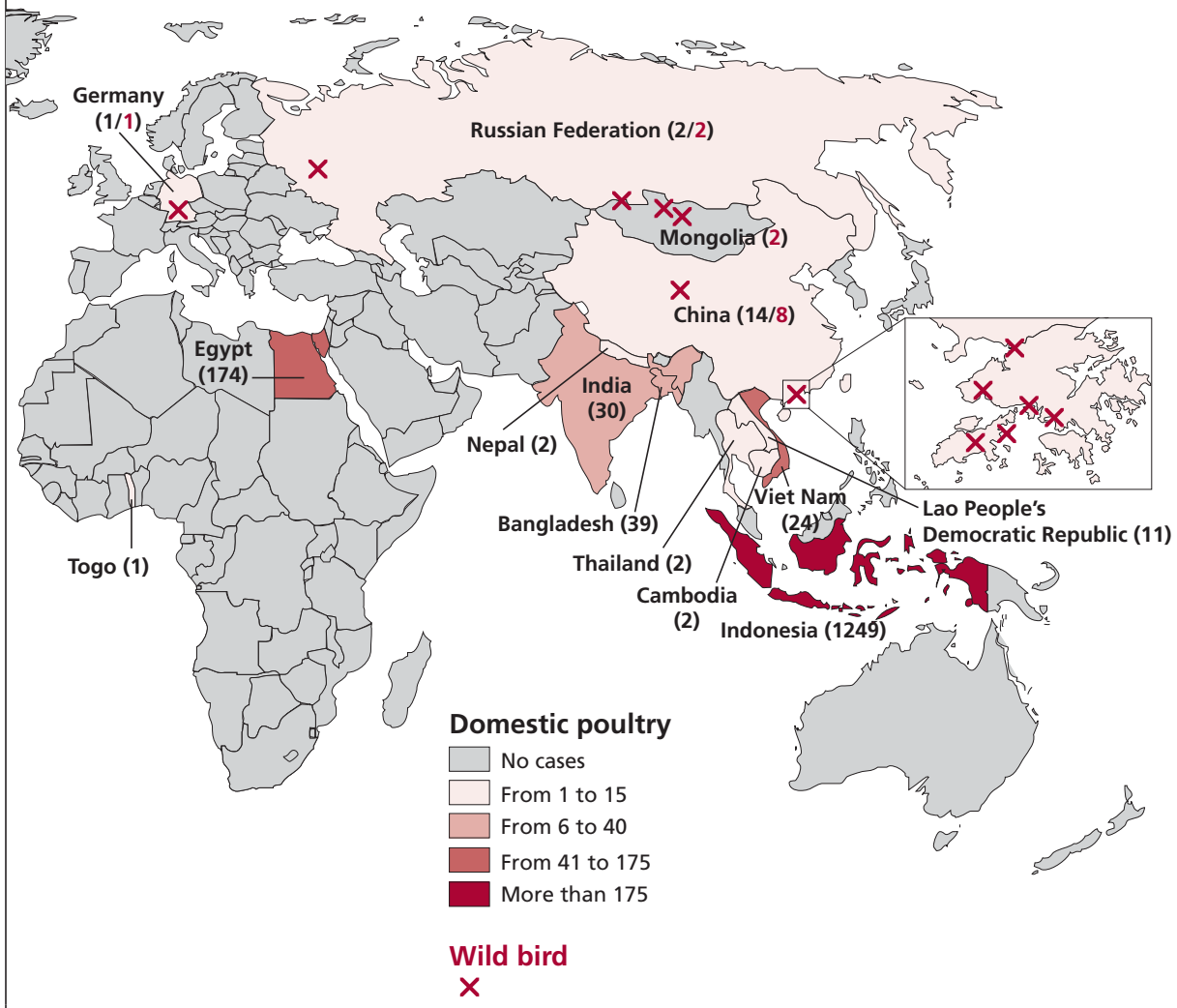
OVERALL H5N1AI INCIDENCE DECREASED IN ANIMALS IN 2009

Sixty–two countries in Asia, Europe and Africa have been affected by H5N1 AI since the beginning of the epizootic in animals in 2003. Of these, 11 countries (8 from Asia; 2 from Europe; 1 from Africa) experienced outbreaks during 2009 (FIGURES 1 and 2), against 22 in 2008 and 31 in 2007 (FIGURE 1), following the pattern of the constant diminution in the number of infected countries since the peak in 2006. Nepal was the only newly infected country in 2009, and 12 countries[1] managed to get rid of the disease in 2008, as there was no evidence of reoccurrence in 2009.

FIGURE 1
Number of infected countries over time

[1] Cambodia, Iran, Israel, Japan, Nigeria, Pakistan, Republic of Korea, Thailand, Togo, Turkey, Ukraine, United Kingdom.

FIGURE 2
H5N1 HPAI 15–month overview in domestic poultry and wild birds[2]



1 September 2008 – 23 December 2009
Source: FAO EMPRES–i

The number of reported outbreaks worldwide significantly dropped off in 2009 compared with the same period in 2008 (FIGURE 3). This was reflected at the country level, with the exception of Indonesia and Egypt (TABLE 1) where the situation appears to have worsened during 2009 – although it is difficult to say as the reporting system was different in 2008 and 2009 (Participatory Disease Surveillance and Response [PDSR] projects implemented). Besides, although there has been an improvement in disease awareness, outbreaks/cases of H5N1 HPAI are still likely to be under–estimated and under–reported in many countries because of limitations in the capacity of veterinary services to implement sensitive and effective disease surveillance and outbreak investigations and to the weakness of compensation schemes.

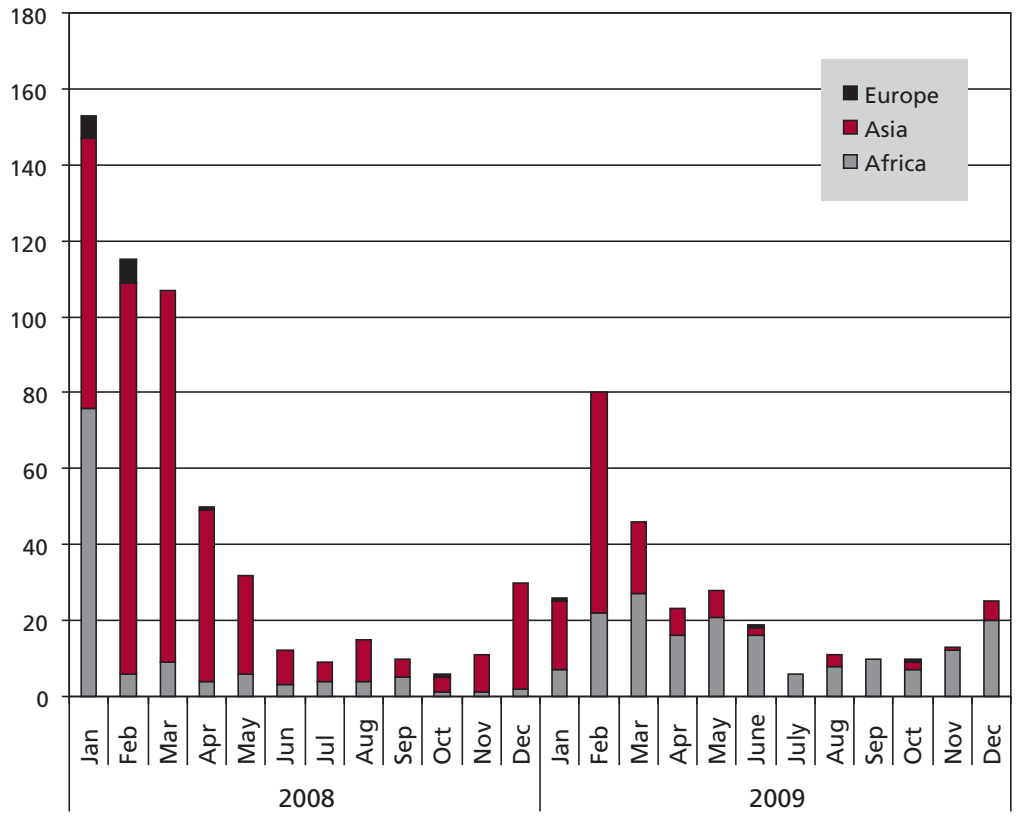
[2] Jenks' natural breaks classification was used to determine the best arrangement of values into classes, comparing (iteratively) sums of the squared difference between observed values within each class and class means.

TABLE 1
Number of outbreaks over 2008 and 2009

	Egypt	Bangladesh	China	Hong Kong	India	Indonesia	Lao People's Democratic Republic	Mongolia	Nepal	Russian Federation	Viet Nam	Germany
2008	116	227	8	12	55	20[3]	13	0	0	1	92	1
2009	160	31	4	14	10	1 236	5	2	2	2	50	1

Source: FAO EMPRES–i

FIGURE 3
Number of reported H5N1 HPAI outbreaks/cases by continent – with the exception of Indonesia outbreaks – by month since January 2008



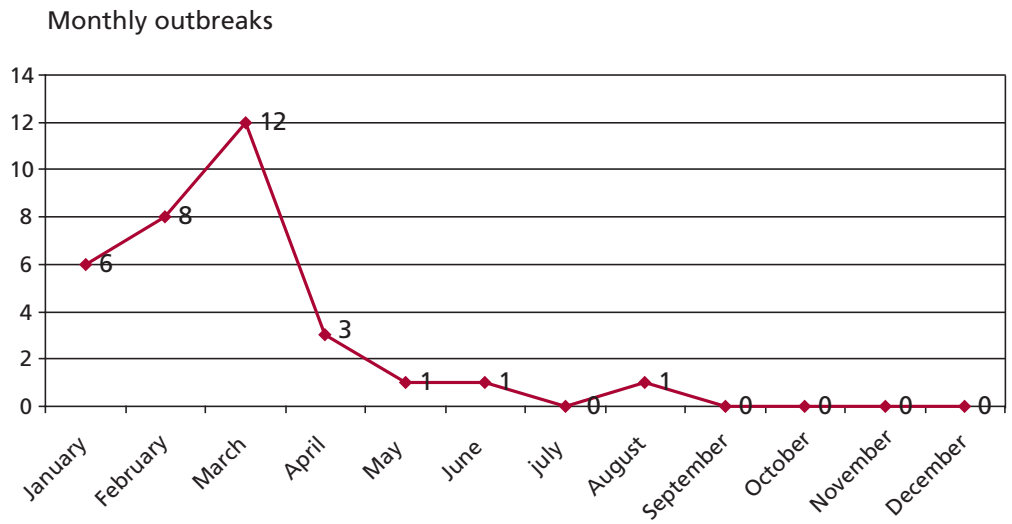
Source: FAO EMPRES–i

FOUR COUNTRIES REMAIN ENZOOTIC AND OF HIGH CONCERN

TABLE 1 shows that the great majority of outbreaks in animals occurred in Bangladesh, Indonesia, Viet Nam and Egypt.

In **Bangladesh**, although no H5N1 HPAI outbreak was reported during November 2009 for the third consecutive month, the country is still believed to be endemic, with active circulation of the virus (Clade 2.2). As of 30 November 2009, a total of 326 outbreaks were recorded in 47 out of 64 districts on both commercial farms and in backyard holdings and nearly 1.7 million birds had been culled. During 2009, 32 outbreaks were reported (FIGURE 4) and 100 000 birds were culled. This compares with 227 outbreaks reported during 2008. Active surveillance is currently being conducted (with the support of FAO) in 150 upazillas (sub–districts) across the country, including the innovative use of the Short Message Service (SMS) gateway (BOX 5, page 57).

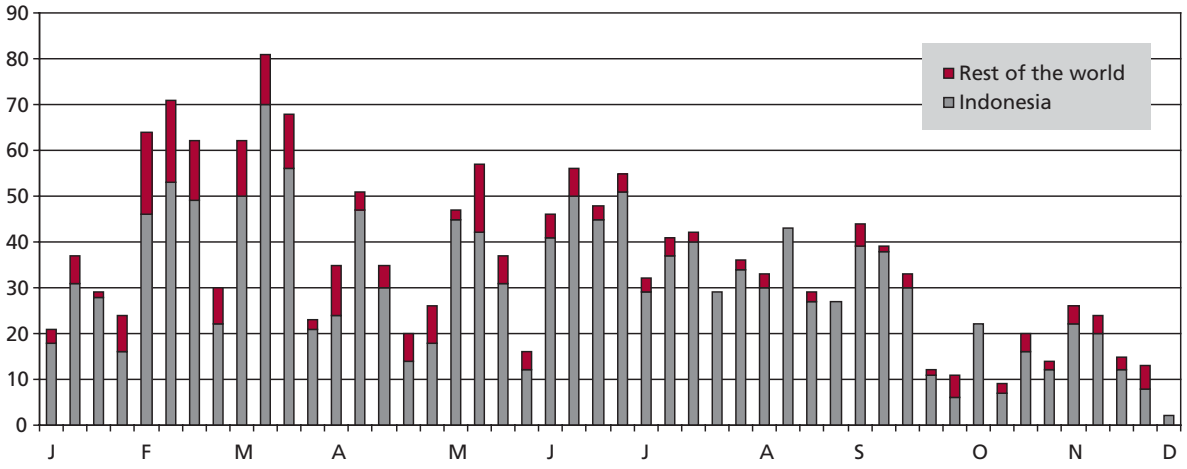
FIGURE 4
Monthly outbreaks in Bangladesh, 2009



Source: FAO EMPRES–i

Indonesia continued to report a high number of H5N1 HPAI outbreaks in poultry (Clade 2.1), as it had for the past three years. The country itself reported more outbreaks than the rest of the world (FIGURE 5). HPAI is confirmed to be endemic on the islands of Java (especially DI Yogyakarta), Sumatra (Lampung) and Sulawesi, and probably Bali, with sporadic outbreaks reported elsewhere. H5N1 HPAI prevalence by village varies widely. Only two of Indonesia's 33 provinces have never reported the occurrence of H5N1 HPAI . The high number of reports each month is partially explained by the implementation of the PDSR programme (established and supported by FAO) that targets village poultry production systems (mainly backyard) and reports evidence of virus circulation in the village.

FIGURE 5
Indonesia compared with the rest of the world outbreaks in 2009



Source: FAO EMPRES–i

In **Viet Nam**, from January 2009, the Department of Animal Health (DAH) officially reported 50 HPAI outbreaks in 15 of 63 provinces (24 percent), mostly on duck farms (65 percent) and in the small–scale commercial sector (69 percent of outbreaks in flocks with 50 to 1 000 birds). This compares with eight outbreaks reported in 2008. Consistent outbreak investigations are still not undertaken on infected farms and key information is usually missing from the field, so that it is difficult to have a thorough understanding of factors that contribute to virus spread throughout widely distributed regions of the country. Virus circulation surveillance was carried out in 16 target provinces and cities. Out of 448 unvaccinated flocks tested (selected from slaughterhouses, slaughter points or even from households), only one 500–bird duck flock in Soc Trang Province tested positive for the H5N1 virus. Based on the monitoring of surveillance activities, three currently circulating virus clades have been isolated: (1) Clade 1 (predominant in southern Viet Nam and also isolated in Cambodia); (2) Clade 2.3.4 (predominant in northern Viet Nam and also circulating in China); and (3) Clade 7 (detected in poultry seized at the Chinese border and at markets near Hanoi). In 2009, ten viruses isolated from outbreaks were sent to the U.S. Centers for Disease Control and Prevention (CDC) for sequencing, and to date, no new circulating clade has been detected.

Egypt, which reported its first H5N1 HPAI outbreak in February 2006, is considered endemic with regular reporting of outbreaks in almost all of its 29 governorates (Clade 2.2). As of 3 December 2009, 157 outbreaks had been reported in poultry for the year, mainly in backyard systems, against 114 in 2008. Detection has, however, improved since the implementation of the PDSR–like programme, the CAHO (Community Animal Helath Outreach), operating in ten governorates (Sharkia, Gharbia, Dakahlia, Menufia, Fayoum, Behera, Kafr–Elshiekh, Menia, Bani–Seuif and Qalubia). This partially explains the increase in the number of outbreaks reported in domestic poultry.

ASIA REMAINS THE MAIN THEATER OF HPAI EVENTS

In 1996, **China** first identified HPAI viruses of the H5N1 subtype in geese in Guangdong Province, and H5N1 HPAI viruses have continued to circulate and evolve since then. Almost 200 H5N1 HPAI outbreaks have been reported in poultry and wild birds in 29 provinces or Special Administrative Region of China since 2004 and a total of over 35 million poultry have been culled to control the spread of the disease. Virtually all of the identified clades of Asian–lineage H5N1 HPAI virus found so far globally have been detected in China. In 2009, 14 outbreaks in domestic poultry and eight outbreaks in wild birds (amounting to several hundred of dead birds) were recorded, against 13 and seven outbreaks in 2008 in domestic poultry and wild birds, respectively. Most of the cases were in Hong Kong and its surroundings; however the eastern, northeastern, southern and western provinces had also been infected. This sends a strong signal that the H5N1 virus is still active in several parts of China, including in locations where it has never been detected since the onset of the epidemic in 2004. No poultry outbreaks have been reported since April 2009 and the last wild bird case dates from May 2009. However, official surveillance programmes have demonstrated that H5N1 HPAI viruses continue to circulate in poultry in many provinces.

In **India**, no outbreaks have been reported since May 2009. Until then, ten outbreaks had been reported (nine in West Bengal and one in Sikkim). This compares with 55 poultry outbreaks reported in 2008 in West Bengal, Assam and Tripura.

Lao People's Democratic Republic reported five H5N1 HPAI outbreaks in 2009, in five villages of the Phongsaly Province, which had never been infected before. They all occurred in February (coinciding with the New Year celebrations), with no new outbreaks identified since then. This compares with 13 poultry outbreaks reported in 2008 in Sayabouri, Oudomxay, Luang, Prabang and Namtha provinces. Given the clade circulating (Clade 2.3), it is very likely that the virus was re–introduced in Oudomxay in August 2008 and, since then, it has been circulating at a low level (Sayaboury, November 2008 and Phongsaly, February 2009).

In January and February 2009, **Nepal** reported its first two H5N1 HPAI outbreaks ever. Both occurred in backyard poultry in the Jhapa District bordering India (in the first outbreak, the property affected was along the main highway from India, approximately 1 km inside Nepal). The haemagglutination (HA) gene from the virus isolated from the index case was sequenced at the Veterinary Laboratory Agency (VLA, Weybridge, UK), demonstrating ~99 percent similarity with publicly available sequences from contemporary viruses in eastern Asia, including viruses originating from India (West Bengal). Measures taken seem to have succeeded in containing the disease to just that district. Post–outbreak surveillance continued in the infected district for three months following the last outbreak, and FAO assisted the Department of Livestock Services (DLS) in conducting enhanced surveillance in three adjoining districts over a pilot three–month period. The major threat is to the intensive commercial production areas in the central region. For the rest of the country the national surveillance plan is implemented by the district livestock service offices with varying efficiency. The DLS informed FAO that the regional veterinary laboratories had received over 7 000 samples – mainly swabs – for diagnosis in 2009, and 3 000 of these were sent on to the Central Veterinary Laboratory (the results are awaited).

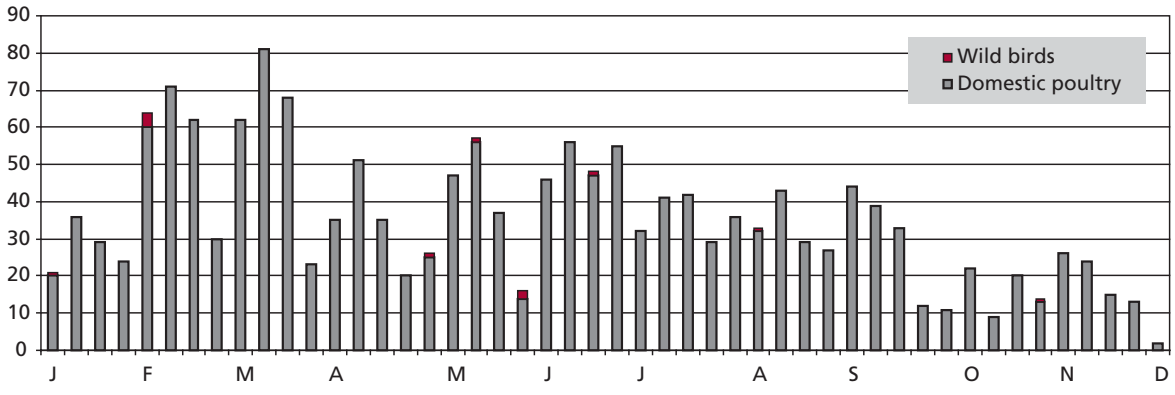
In 2009, **Mongolia** reported two wild bird events in May (one migratory swan, Arkhangai district) and in August (56 wild birds). In **Russia**, in Ovursky district, which lies on the border with Mongolia, 58 great crested grebes (*Podiceps cristatus*) were found infected with H5N1 AI virus in June 2009. A rock dove (*Colombia livia*) was also found sick in Russia in October 2009, in the district of Moskovskaya Oblast.

For the first year since it was first infected (2006), **Nigeria** did not report any outbreaks in 2009.

SIGNIFICANT KNOWLEDGE GAPS PERSIST IN THE ROLE OF WILD BIRDS

During the reporting period, there continued to be reports of wild bird mortalities, while the overall incidence of H5N1 AI in wild birds slightly decreased in 2009 and was limited: 12 outbreaks were reported (against 23 in 2008) affecting Germany (1), Russia (2), Mongolia (2) and China/HK (8) (FIGURE 2). Compared with domestic poultry populations (FIGURE 6), clinical disease in wild birds remains a rare event in terms of number of affected animals.

FIGURE 6
Number of outbreaks in domestic poultry and wild birds over 2009



Source: FAO EMPRES–i

While the decrease between 2008 and 2009 is far from being significant (given the high number of unreported outbreaks in wild birds, notably in waterfowl in over–wintering locations), none of the outbreaks were on the scale of thousands of wild birds, as was the case in 2005 in China and Russia. Although it has not been proven, it is possible that wild birds may be developing some immunity to the current H5N1 AI virus from repeated years of exposure. Alternatively, the virus may have become less virulent over time. Neither hypothesis has been tested to date, but it would be valuable to consider both.

The wild bird species infected in 2009 were great crested grebes, peregrine falcons, rock doves and swans. H5N1 AI viruses were also isolated from pikas (*Ochotona curzoniae*), a wild mammal, in Qinghai, China, in 2009. Since the beginning of the epizootic, over 90 species from 14 orders of bird have been found to be infected with H5N1 AI virus.

China – and notably Hong Kong – is the country with the most declared wild bird events. In April 2009, the carcass of a feral pigeon found in Hong Kong tested positive for

the H5N1 virus. On 8 May 2009, wild migratory birds were found dead in Qinghai. On 27 May 2009, 163 dead wild birds found in Nanhai Prefecture, also in Qinghai, tested positive for H5N1 HPAI virus. The main Clades found in wild birds are 2.2 and 2.3.2. Clade 2.2 viruses have circulated in wild birds predominantly in the northwest of the country since 2005, although such viruses were also found in South Korea and Japan in the winter of 2006–07. Clade 2.3.2 viruses have also been detected in South Korea (in poultry), Japan (in wild birds), the Russian Federation (in poultry exposed to viscera from wild birds in April 2008) and in dead wild birds in Tyva Republic, bordering Mongolia (in 2009). An outbreak of Clade 2.3.2 was also observed in Mongolia, resulting in the death of many wild birds during the summer of 2009. It is highly likely that a cycle of infection with Clade 2.3.2 viruses has become established in wild birds and could pose a threat to poultry in areas where wild birds and poultry come into close contact (over the period January to March 2009, dead domestic chickens, geese and ducks were detected on beaches in western Hong Kong in January, and in March on Tung Ping Chau, an island 12 km east of mainland Hong Kong). Viruses in other clades were also detected in wild birds, including Clade 2.3.4 viruses from Hong Kong SAR.

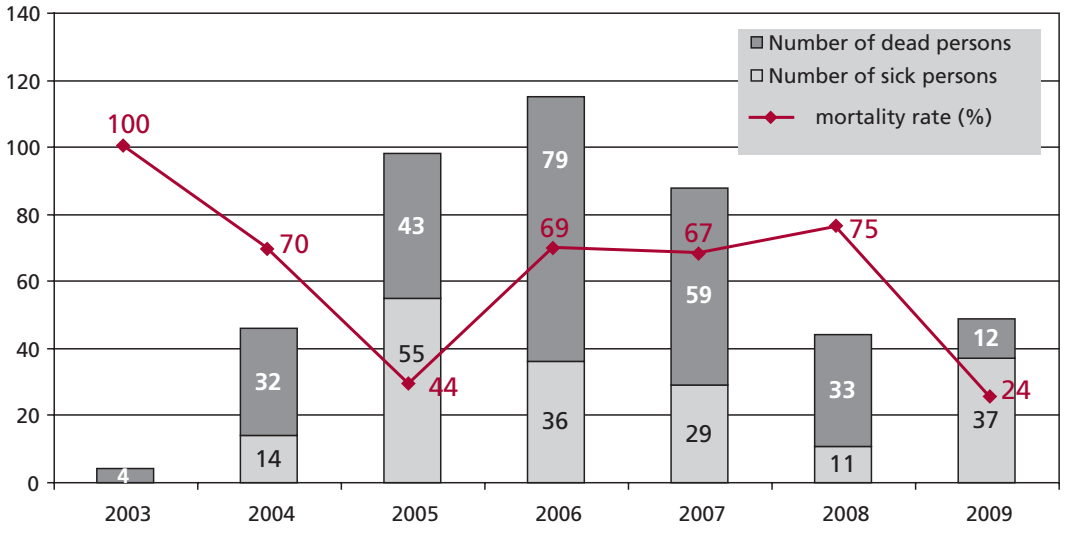
However, to date, surveillance results demonstrate that a H5N1 AI virus wild bird "reservoir" species (i.e. a healthy carrier capable of shedding the virus for months to years) has not been found. The role played by wildlife in the spread of the disease is still unclear, even if disease and migration ecology studies have shown that some of 2009 H5N1 outbreaks during spring migration correlated temporally and spatially with wild bird movements from India–Bangladesh into China–Mongolia. However, we do not know how H5N1 HPAI virus transmission is taking place among domestic poultry and wild birds, even if data suggests that the virus is moving in both directions. Data from telemetry studies carried out by FAO in 2009 are still being analysed and should provide new information in terms of migratory pathways and possibly related spread of the disease.

The spread and transmission of H5N1 HPAI is most commonly a result of poultry production, poultry practices, and trade, but as long as there are endemic nodes of infection at a global scale (Indonesia, China, Viet Nam, Egypt, etc.), wild bird cases are expected to periodically occur, and the spread to be occasionally mediated through wild birds. This weighs in favour of sustained surveillance, notably in areas where domestic poultry and wild birds come into contact.

A SLIGHT INCREASE IN HUMAN CASES IS RECORDED IN 2009

In 2009, WHO reported 49 human cases – among which 12 were fatal – from three countries: Egypt (38), China (7) and Viet Nam (4). Data are however likely to be underestimated for 2009 because the Indonesian Ministry of Health decided to no longer report human cases (0 cases reported in 2009 against 24 in 2008). Overall, the number of infected countries regarding human cases decreased in 2009, as Bangladesh and Cambodia had reported human cases in 2008 but not in 2009. Figure 8 illustrates human cases over the reporting period.

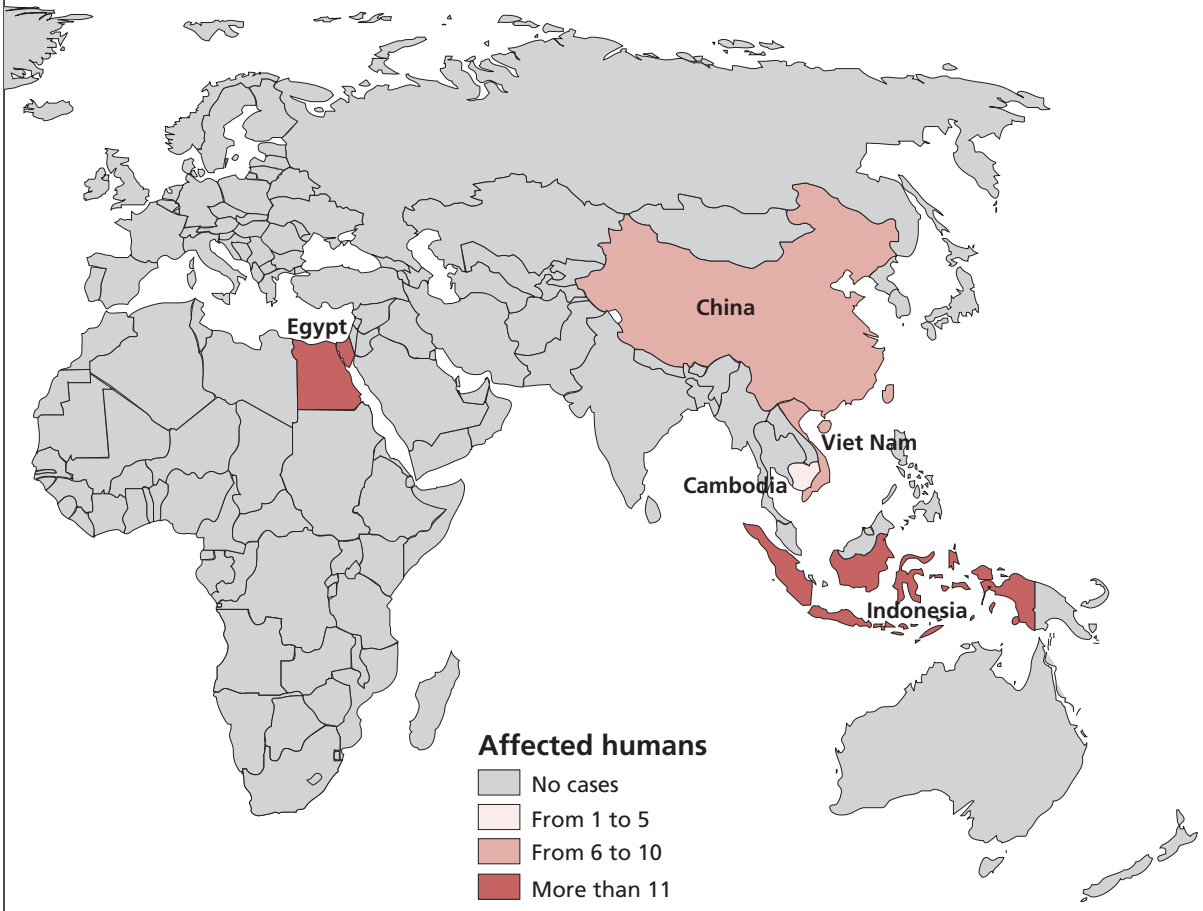
FIGURE 7
Number of human cases over time since 2003



Source: WHO

As of 31 December 2009, the total number of human cases amounted to 467 (282 fatal), with an annual peak observed in 2006; since then, the number of human cases (including fatal cases) has steadily dropped off except in 2009, with 28 more cases than in 2008. FIGURE 7 shows the yearly evolution of human cases since the beginning of the epidemic. The mortality rate, however, significantly dropped off in 2009 (44 percent) compared with 2008 (75 percent).

FIGURE 8
H5N1 AI virus infections in humans – 15–month overview

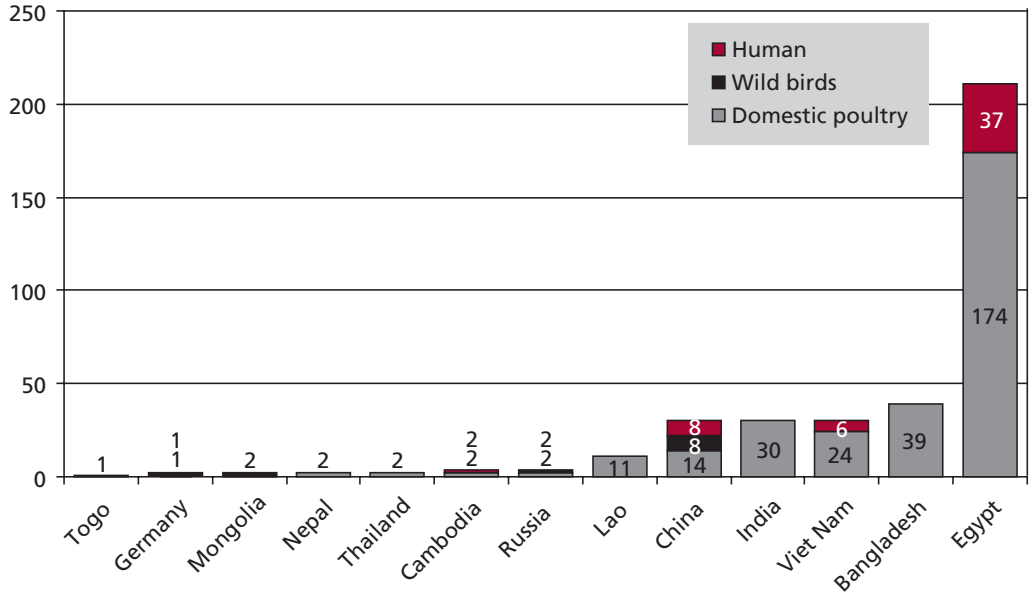


1 September 2008 – 23 December 2009
Source: WHO

FIGURE 9 combines domestic poultry, wild birds and human outbreaks/cases in all countries infected during the reporting period. The correlation coefficient between animal (domestic + wild) and human cases is 0.95 (indicating a strong correlation among cases). The increase of human cases in Egypt registered in 2009 is therefore likely to be linked to the increase of outbreaks in domestic poultry.

The overall increase in human cases in 2009 – regardless of the situation in Indonesia – is mainly because of the increase of cases in Egypt, which reported 38 cases (CFR = 11 percent) in 2009 against only eight (CFR = 50 percent) in 2008. The disease has affected all categories of the population, with a stronger impact on toddlers and children under the age of four. This situation worried WHO and the national authorities who sent a joint evaluation to assess the quality of the national strategy – both in animals and humans – and to propose a series of corrective implementing actions. China also recorded an increase in human cases, with eight cases (CFR = 50 percent) in 2009 against four (CFR = 100 percent) in 2008. Paradoxically, no epidemiological links were found among these eight human cases in 2009, although seven of them occurred in January. All other countries have managed to reduce the incidence of the disease in humans.

FIGURE 9
Comparison between domestic poultry, wild birds and human outbreaks/cases over the reporting period



Source: FAO EMPRES–i and WHO

PERSPECTIVES FOR 2010

Data from previous years have shown a peak in the number of outbreaks/cases during the January–March period – likely because of colder weather conditions and major celebrations (Têt) in Asia – in both poultry outbreaks and human cases, although there is a decreasing trend in the height of the peak as years go by. According to this general trend, we can expect an increase in the total number of outbreaks and human cases in 2010, at least in the first three months and countries affected in the coming months. This calls for maintenance of strong surveillance and overall mobilization against HPAI.

Chapter 2
H5N1 HPAI Portfolio

QUANTITATIVE REVIEW

As of December 2009, FAO implemented 170 projects specifically dedicated to H5N1 HPAI since funds became available in early 2004. One–hundred–and–seven were still active in 2009 (TABLE 2). The multi–disease and "non–disease specific" animal health projects have not been considered in this portfolio, although some of them may directly or indirectly deal with HPAI H5N1.

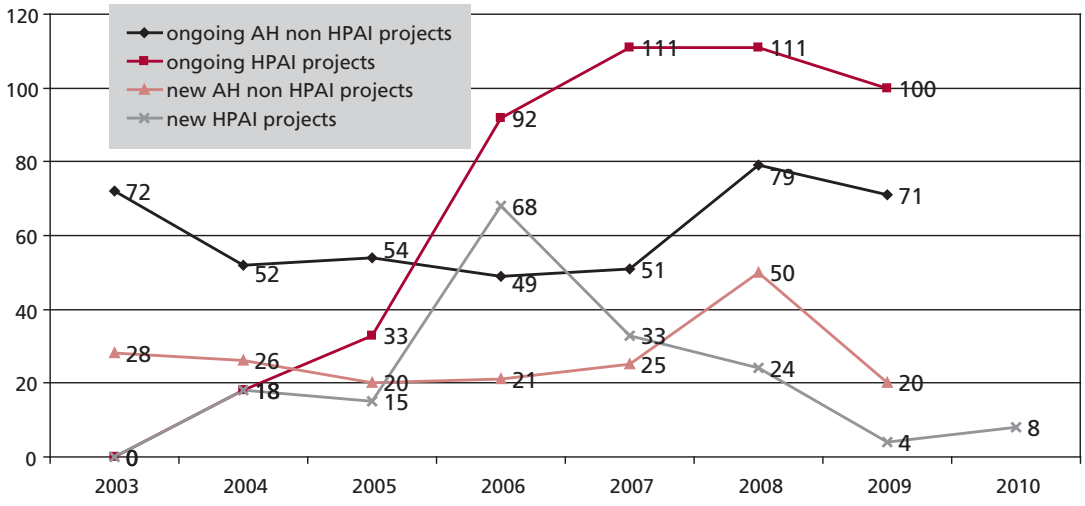
TABLE 2
FAO H5N1 HPAI portfolio as of December 2009

Total active projects	107
Total closed projects	55
Total projects in the pipeline	8
TOTAL	**170**

Source: FPMIS

Over the period 2004–2009, H5N1 HPAI projects represented 50 percent of the overall FAO portfolio in animal health, in terms of number of new projects, while in 2006–2007, at the peak of the epizootic in animals, these were largely predominant. During the reporting period, ongoing HPAI projects remained dominant, totaling 100, compared with 71 projects for other Transboundary Animal Diseases (TADs). However, the number of new HPAI projects significantly dropped in 2009 compared with 2008 (FIGURE 10). This can be explained by the fact that in 2009 priorities were redirected towards the pandemic influenza A H1N1 2009 virus, closely following the human infections observed at the end of April 2009 and the threat of a possible pandemic (see Chapter 4). FIGURE 10 also shows that, in spite of HPAI being by far the priority disease of the decade, FAO continued to address other animal diseases: The importance of HPAI resulted in a human resources shortage at the onset of the crisis but, progressively, almost all other FAO Regular Programme activities (under EMPRES) resumed and the major ones (notably GREP/Rinderpest eradication, the FMD global initiative, and T&T PAAT activities) did not suffer from a lack of attention. Other emergencies, such as the *peste des petits ruminants* (PPR) in Morocco in 2008, or the Ebola Reston virus findings in the Philippines in the same year, were also adequately addressed. In 2009, the regular/non–HPAI portfolio was back to the same level as before the crisis, and even showed an increase in 2008.

FIGURE 10
Number of H5N1 HPAI and other new animal health projects over time since the beginning of the epizootic in 2003

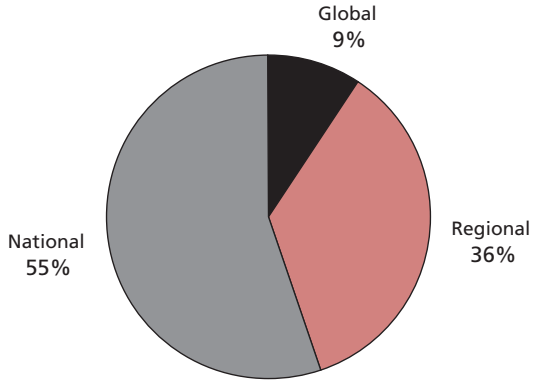


Source: FPMIS

Levels of intervention – The HPAI Global Programme has been structured to operate simultaneously at three interlinked levels, given the transboundary nature of HPAI: global, regional and national. FIGURE 11 shows that the ongoing portfolio addresses the three dimensions. Priority is given to the country level (55 percent of national projects), while the regional (36 percent) and global (9 percent) dimensions optimize national efforts through the provision of tools and guidelines, and coordination and sharing of experience. Some projects are, however, classified under "global" when no specific geographic scope has been defined, in order to be able to operate anywhere, anytime, as and when needs arise (an example is the Global Projects supporting the CMC–AH, GLEWS, or OFFLU).

N.B. Inter–regional projects (national projects combined from different regions) have been added to national projects for these calculations.

FIGURE 11
Percentage of projects (ongoing portfolio) per level of intervention

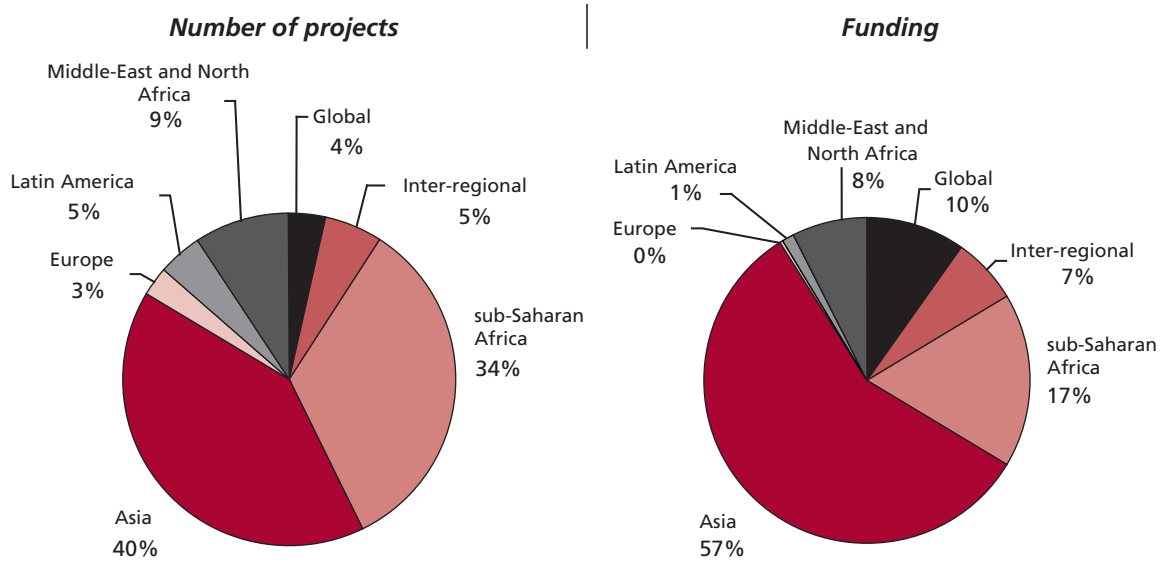


Source: FPMIS

Geographic priorities – The Global Programme states that three categories of countries should receive FAO's priority assistance: (i) countries with entrenched/enzootic infection (hot spots); (ii) countries free of infection but at high risk (countries with inadequate veterinary and laboratory services and weak disease control and prevention capacity); and (iii) countries with recent infection. The quantitative analysis of the ongoing portfolio shows that Asia followed by Africa – the two regions with the highest concentration of hot spots, at risk and newly infected regions – have received the most assistance since 2006, both in terms of number of projects implemented and allocation of funds (FIGURE 12). Few projects were implemented in America or Europe given their low/nil incidence of HPAI (preparedness assistance was, however, provided). A more detailed review of the portfolio shows that 100 percent of the past and current "hot spots" have received assistance through the Global Programme. Indonesia (six projects), Egypt and Nigeria (four projects) and Viet Nam and Myanmar (three projects) are the recipient countries with the highest number of implemented national projects (ongoing).

N.B. Eastern European countries have received assistance mainly through inter–regional projects.

FIGURE 12
Percentage of projects (ongoing portfolio) per region

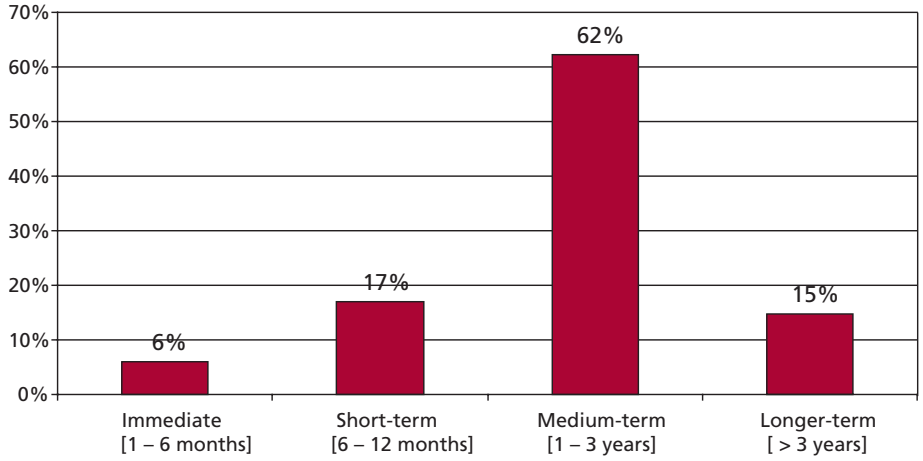


Source: FPMIS

Immediate to long–term activities – The Programme is characterized by an appropriate balance between emergency response (prevention and control of the disease in re–infected or newly infected countries) and long–term action (poverty alleviation and food security in enzootic countries). FIGURE 13 shows that the FAO HPAI portfolio ranges from immediate to longer–term actions, with the majority going to medium–term actions (62 percent of projects last between one and three years). It is still very difficult to engage donors on projects beyond the usual one to three year time frame. FIGURE 14 shows that both immediate needs and development/rehabilitation assistance are covered: A response component is present in 43 percent of the ongoing portfolio, while longer–term development activities, such as reinforcement of

veterinary services and implementation of biosecurity measures at farm level and at LBM, are present respectively in 33 percent and 21 percent of the ongoing projects.

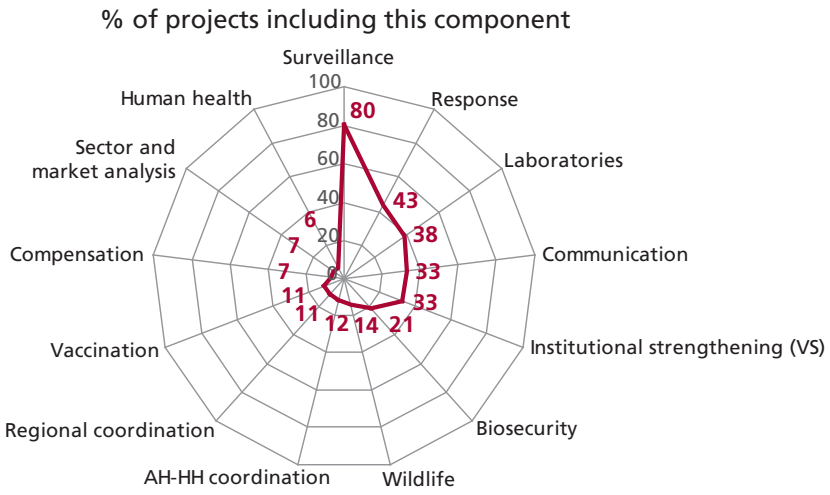
FIGURE 13
Percentage of projects (whole portfolio) according to their duration



Source: FPMIS

Multidisciplinary and integrated approach – Given the complexity of HPAI ecology and epidemiology, its socio–economic impact and the potential risk of pandemic influenza, the Global Programme emphasises a multidisciplinary and multisectorial approach to address technical, policy, institutional and socioeconomic issues.

FIGURE 14
Percentage (trend[4]) of projects (ongoing portfolio) per "disciplines"



Source: FPMIS

[4] Trends: Analysis of the portfolio was conducted in June 2009. Data may have slightly changed since then, however, the overall trend remains the same

This multidisciplinary approach is well reflected in the implementation of the Global Programme: FIGURE 14 also shows that at least 13 different disciplines are taken into consideration throughout the projects – though emphasis is placed on veterinary "disciplines": surveillance, response and laboratory capacity. Integration with human health and communication (as promoted during the Beijing Inter–Ministerial Conference in 2006) is also a reality because 30 percent and 6 percent of the projects have respectively a communication and human–health component, while 12 percent of the projects have a component dedicated to animal–human health coordination. Socio–economic receives also greater attention and HPAI projects now almost all systematically include national poultry sector reviews, as well as assessments of the national biosecurity measures in place.

QUALITATIVE REVIEW

Late in 2006, an evaluation of FAO's response to HPAI, led by FAO's Evaluation Service (PBEE), was initiated and was to include:

- A final evaluation, which was initially scheduled to take place in 2009. However, because activities were ongoing (continuation of the Global Programme at least two years beyond the expected closing date), the evaluation is more likely to occur during the second part of 2010. The final evaluation will show FAO's overall response to HPAI and will take into consideration three periods: the pre–Global Programme period (2004–2005); the first Global Programme period (2006–2008); and the adjusted Global Programme period (>2008). For the latter period, the evaluation will notably assess how lessons learned from the H5N1 HPAI epizootic have been of benefit in the management of the H1N1 episode (while H1N1 activities will not be directly evaluated *per se*).
- Real–time evaluations (RTEs), conducted during the implementation of the Programme to provide: (i) management with immediate feedback and guidance on the relevance of the proposed activities and on the efficiency of the structures deployed at global, regional and national level – and possibly offer recommendations to the Programme as the epizootic evolves; and (ii) participating donors, governments and other stakeholders with financial reports to promote accountability and transparency of the use of resources.

The **first RTE (RTE1)** began in February 2007 and was completed in May 2007. It concluded that FAO had made a major contribution to the monitoring and management of HPAI, in spite of severe initial resource constraints, operational difficulties and bureaucratic delays. A set of 34 recommendations to improve the performances of the Global Programme at the time were issued, related to organizational (ECTAD consolidation; CMC–AH set–up), strategic (corporate priority setting; from "fire–fighting" to development perspectives; multidisciplinary approach), financial (the use of SFERA as a privileged mechanism; influence of donors) and technical (communication; vaccination; etc.) matters, as well as to the overall coherence of the Programme in the broader picture of the interventions of other organizations (notably OIE and WHO) and the better positioning of FAO as a leading technical agency. RTE1 advocated that FAO place greater emphasis on monitoring progress at outcome and impact levels, rather than input and activity reporting, in order for issues of relevance, efficiency and effectiveness to be accurately assessed in subsequent evalua-

tions. All recommendations provided by the RTE1 team were accepted, with the exception of those proposing a migration of the Programme to a new coordination/management structure dedicated to HPAI only, in place of the single command system in the technical division (AGA) headed by the Chief Veterinary Officer of FAO, and with the Technical Cooperation for Emergencies (TCE) division in an operations support capacity. In 2009, a follow–up report provided evidence that all RTE1 recommendations – with the exception of two on the elaboration of a logframe for the Global Strategy and on the linkages between the Global Programme and Millennium Development Goals (GP–MDGs) – had been/were being implemented.

The **second RTE (RTE2)** began in September 2009. While RTE1 was "process–oriented", focusing on the relevance and efficiency of the environment and system (institutional, organizational, financial aspects) put in place to deliver the Programme, RTE2 is expected to be more "result and impact–oriented" with, as primary focus, country–level assistance provided through regional and national interventions (the evaluation will pay particular attention to the role of the regional Emergency Centres for Transboundary Animal Diseases [ECTAD] and the Regional Animal Health Centers [RAHCs]). The RTE2 final report is expected at the end of February 2010; however preliminary results were used in this Report notably for Chapters 3 and 4.

The Independent External Evaluation of FAO conducted in 2006 and 2007 assessed FAO's technical work and concluded that overall, FAO has made an important contribution to managing avian influenza. It regretted, however, the too single–minded focus on veterinary regulatory approaches to disease management and that the interdisciplinary strengths present in AGA and throughout the Organization had been underexploited. Of particular importance was the socio–economic dimension of disease management to national economies and to the poor. However, Figure 14 shows that the multidisciplinary approach has been underpinned in more recent HPAI activities. The overall satisfactory rating of FAO's work in the management of the HPAI crisis has meant that animal health (in addition to its global public good dimension and contribution to the MDGs) will be one of the high priorities when it comes to resource allocation.

FUNDING UPDATE

Funding status – FAO's HPAI Global Programme funding requirements were estimated in March 2006 at US$308.5 million over a three–year period (2006–2008), with the following annual distribution: US$131 million in 2006; US$90 million in 2007; and US$87 million in 2008.

As of 31 December 2009, FAO had mobilized support of 162 donor– and/or FAO–funded projects, worth an estimated US$215 million. This left a funding gap of approximately US$57 million. However, FAO was negotiating a further eight donor–funded projects valued at over US$98 million to cover some programme activities planned for 2010 and beyond. The funding status of the Global Programme at the end of the three years (up to December 2008) and as of 2009 is presented in Table 3.

TABLE 3
Current funding shortfall for the HPAI Global Programme as of 31 December 2008 and 31 December 2009

	Totals	Total (US$)
HPAI Global Programme (2006–2008)	Funds requested	308 506 363
	Funds received (as of 31 December 2008)	190 911 443
	Funding gap	117 594 920
Continuation of the HPAI Global Programme (>2008)	Funds requested (Total budget)	271 941 041
	Funds received (as of 31 December 2009)	214 554 719*
	Funding gap	57 386 322
	Funds in the pipeline	98 085 509**

Source: FPMIS
*This amount reflects the cash received against the total budget of 271 million.
** This amount includes the pipelines and the contribution to be received.

Donors – As of December 2009, the HPAI portfolio was financed by 33 donors (22 governments and 11 organizations) (Table 4). The United States of America is by far the biggest donor (US$115.5 million), followed by Sweden (US$23.7 million), Australia (US$15.4 million), the European Commission (US$13.8 million) and Japan (US$13.7 million). FAO comes in eighth (US$18.1 million – see the paragraph below on FAO's Technical Cooperation Programme (TCP).

N.B. No mention is made here of donors contributing in the following ways: (i) through in–kind support, such as the provision of technical assistance to ECTAD, although this can represent an important input; (ii) to multi–disease (including HPAI) projects, such as for instance the Italian contribution through project GTFS/INT/907/ITA, which aims at the control of TADs in Central Asia.

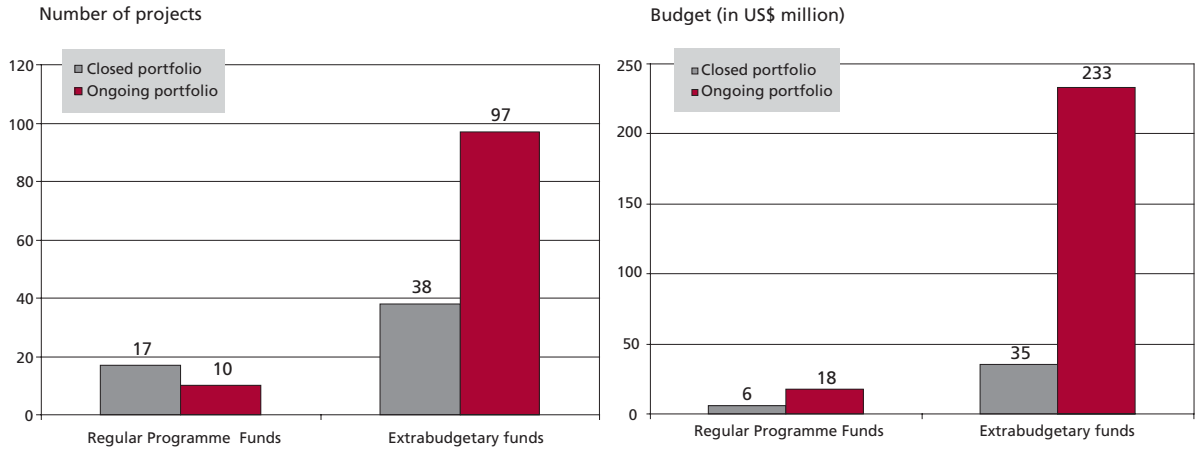
TABLE 4
Budget per donor in the HPAI portfolio

Donor	Amount (US$) as of December 08	Amount (US$) as of September 09
1. Asian Development Bank (100%) Total	7 990 000	7 990 000
2. Australia (100%) Total	14 270 089	15 369 016
3. Belgium (100%) Total	2 834 767	2 834 767
4. Canada (100%) Total	9 482 759	9 750 971
5. CHF (100%) Total	299 990	263 199
6. China Peoples' Republic (100%) Total	500 000	500 000
7. European Commission (100%) Total	13 782 994	13 782 994
8. FAO (100%) Total	9 216 456	9 701 456
9. France (100%) Total	6 742 481	6 742 481
10. Germany (100%) Total	9 534 184	9 534 184
11. Greece (100%) Total	188 443	188 443
12. ILRI (100%) Total	0	260 000
13. Ireland (100%) Total	321 043	321 043
14. Italy (100%) Total	284 387	284 387
15. Japan (100%) Total	13 675 051	13 668 793
16. Jordan, Hashemite Kingdom of (100%) Total	50 000	50 000
17. Nepal Total	2 392 743	2 392 743
18. Netherlands (100%) Total	629 238	629 238
19. New Zealand (100%) Total	340 000	340 000
20. Norway (100%) Total	3 699 476	3 699 476
21. Office Of Coord. For UN Assistance Programme to Afghanistan (100%) Total	25 000	25 000
22. OPEC Fund (100%) Total	700 000	700 000
23. Saudi Arabia, Kingdom of (100%) Total	1 000 000	1 000 000
24. Spain, Kingdom of (100%) Total	1 679 453	1 679 453
25. Sweden (100%) Total	23 665 980	23 665 980
26. Switzerland (100%) Total	3 696 573	3 696 573
27. UNDP (100%) Total	459 014	770 014
28. UNDP Administered Donor Joint Trust Fund (100%) Total	6 756 671	7 810 539
29. United Kingdom (100%) Total	10 154 267	10 101 214
30. United Nations Development Group Office (DGO) Service & Support UNDG/EXECCOM Secretariat (100%) Total	759 599	932 666
31. United States of America (100%) Total	91 931 651	115 551 351
32. Viet Nam Total	800 000	800 000
33. World Bank (100%) Total	4 785 554	6 905 060
TOTAL	**242 647 863**	**271 941 041**

Source: FPMIS

FAO's Technical Cooperation Programme (i.e. FAO's Regular Programme) was instrumental in enabling FAO's first reaction to the HPAI crisis during the early phase, at a time when donor funding (i.e. extra–budgetary funding) had not yet been made available (2004 – 2009). This financial commitment reflected the seriousness with which FAO viewed the HPAI crisis and provided a signal to donors of the scale of investment required to address the HPAI threat. Before the launching of the Global Programme (period 2004–2006), TCPs represented 31 percent (17 projects) and 16 percent (US$6.5 million) of the closed portfolio respectively in terms of number of projects and of funds. FAO's contribution to the ongoing portfolio is almost threefold that of the past portfolio, while proportionally it has decreased to 9 percent (10 projects) and 7 percent (US$18.1 million) (FIGURE 15). Of the ten ongoing TCPs, three are national (Gabon, Lebanon and Sierra Leone) and seven are regional (five for Latin America, one for Asia, and one for Western and Central Africa). To date, TCPs are the only financial tools used for Latin America (country preparedness) in a region still free of H5N1 HPAI, again demonstrating that TCPs can bring in early and required needs as a bridge to gaps in (expected) donor funding support.

FIGURE 15
Comparison of TCPs/EB in terms of number of projects (left) and budget (right) in the closed and ongoing HPAI portfolios



Source: FPMIS

Special Fund for Emergency and Rehabilitation Activities (SFERA) – SFERA was established in April 2004 to enhance FAO's capacity to deal rapidly with an emergency situation. SFERA provides FAO with a means of taking initial rapid action in crises even before donor funding is secured and/or complementary action to ensure continuity of follow–up of emergency activities. SFERA provides funds that are not necessarily tied to specific programmes or geographic areas (majority of un–earmarked funds). The use of SFERA funds contributes to the overall implementation of the HPAI Global Programme and has key functions in targeting areas that are of priority in the Global Strategy and Global Programme but have not received sufficient funds. Notably, SFERA contributions continue to play an essential role in plugging critical gaps in priority countries and regions, especially when

there is a shortfall of earmarked funding. For example SFERA was crucial in kick–starting the ECTAD response in Egypt and remains essential in providing most support to Nigeria, where it funds approximately 85 percent of FAO HPAI activities in the country. SFERA is a critical financial tool in the case of HPAI, where funding priorities must be constantly reoriented depending on emerging needs (unexpected outbreaks). SFERA has been instrumental as well in addressing other TADs in the current contest of broadening interventions beyond HPAI under the OWOH strategic framework.

As of 31 December 2009, 10 donors had contributed around US$46.9 million to SFERA for HPAI operations (no new donor to SFERA in 2009), representing almost 22 percent of FAO's total funding portfolio for HPAI activities (Table 5). SFERA funding has supported country–specific initiatives as well as regional and global coordination activities. The Fund has also supported a wide range of operational and technical activities, including the: (i) provision of laboratory supplies, veterinary equipment and other HPAI disease control essentials; (ii) recruitment of technical experts for country field missions; (iii) coverage of travel costs; (iv) organization of meetings and conferences; and (v) establishment of the CMC–AH at FAO headquarters.

TABLE 5
List of donors contributing to SFERA as of 31 December 2009

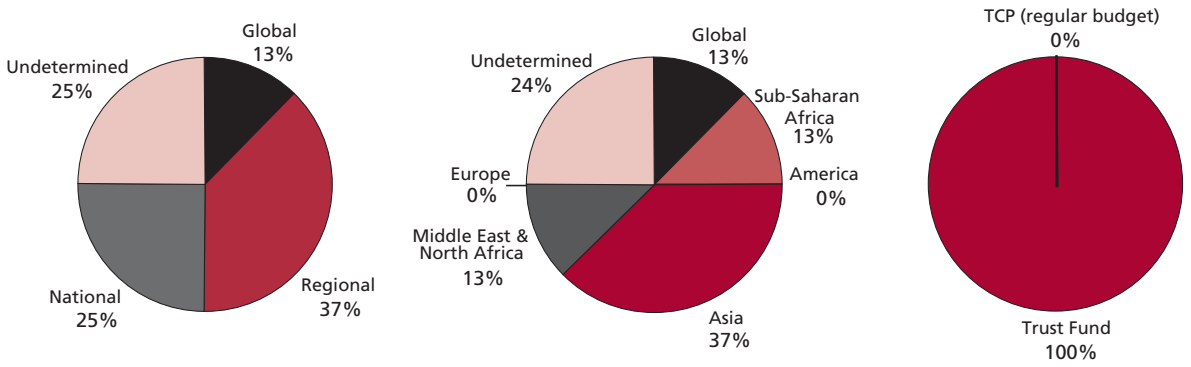
Donors	Amount (US$)
Sweden	23 665 980
UK	6 943 655
France	6 635 910
Switzerland	3 696 573
Norway	3 506 326
Saudi Arabia	1 000 000
OPEC	700 000
China	500 000
Greece	188 443
Jordan	50 000
TOTAL	**46 886 887**

Source: TCE

PIPELINE

As of 31 December 2009, the HPAI pipeline portfolio was composed of eight projects, amounting to a total budget of US$23.1 million. The main features of the HPAI pipeline portfolio are presented in FIGURE 16 (to be viewed as general trends; in four projects, the level of intervention and the geographic areas are not determined yet). It shows that: (i) all three levels of intervention (global, regional, national) are addressed; (ii) Asia remains the geographic priority; and (iii) it is entirely funded from extra–budgetary resources.

FIGURE 16
Main features of the pipeline HPAI portfolio: number of new projects per level of intervention (left); per geographic area (middle); per source of funding (right)



Source: FPMIS

Chapter 3
Thematic Review

Preamble

The content of this chapter derives from two main sources of information:

(i) the global, regional and country Reports of the second Real Time Evaluation (RTE2).

(ii) the results of the country survey, conducted by FAO headquarters in November 2009, which aimed to assess national capacities to prevent and control HPAI and monitor progress made over the reporting period. Thirty–four representative countries[5] were surveyed. Countries were selected according to their fluid epidemiological situations (enzootic, infected and newly infected and at risk countries) and/or to the importance of the FAO HPAI portfolio in the country. Latin America and Caribbean countries are therefore not included in the survey. The survey was completed by FAO staff positioned in the countries and regional offices and does not necessarily reflect views from other agencies or the governments. As mentioned in the Introduction, special attention was given to surveillance, laboratory capacity and biosecurity.

Results presented in the following section should be read as a preliminary assessment of overall government capacities to prevent and control HPAI. A more comprehensive assessment against the objectives, outputs and their impact set in the Global Programme (2006–2008) is scheduled to take place in 2010.

SURVEILLANCE

FAO's Global Support to Surveillance

Progress report of GLEWS (Global Early Warning System) – Over the reporting period, GLEWS increased its capacity in terms of disease event analysis, early warning and forecasting over the last year. Integrated risk analyses of pathogen transmission at the animal–human interface were primarily for H5N1 HPAI, but now include other priority diseases such as FMD, ASG and PPR. The emergence of the pandemic influenza A H1N1 2009 is a good example of this increased collaboration between GLEWS partners – FAO, OIE and WHO. Other examples include events with uncertain or serious implications for public health, such

[5] Sub–Saharan Africa: Benin, Botswana, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Ghana, Kenya, Mozambique, Nigeria, Sudan, Togo and Uganda.
South and Southeast Asia: Bangladesh, Cambodia, China, India, Indonesia, Laos, Myanmar, Nepal and Viet Nam
Central Asia: Kyrgyzstan, Pakistan, Tajikistan, Turkey and Turkmenistan.
North Africa and the Middle–East: Egypt and Mauritania.
Eastern Europe and the Caucasus: Armenia, Azerbaijan, Bosnia and Herzegovina, and Georgia.

as the Ebola Reston virus in the Philippines and Rift Valley Fever (RVF) in Southern Africa and the Indian Ocean.

The FAO–GLEWS team has been summarizing global H5N1 HPAI occurrence in poultry and wild birds from official and unofficial sources and human H5N1 disease occurrence on a weekly basis since the beginning of the epidemic in 2004. A weekly "HPAI Update" describing the main HPAI events and a monthly overview of H5N1 HPAI are published, describing global trends, epidemiological analysis and events occurring during the month in question. Access to animal data provided by OIE and FAO has been valuable to WHO in assessing the risk of people contracting H5N1 infection and subsequently deciding on risk management and risk communication strategies at global, regional and country levels.

On average over the last 12 months, approximately 35 communications per month (against an average of 26 per month over the previous reporting period) were sent through the GLEWS mechanism, in addition to the public, global electronic reporting systems. These communications included requests for verification of suspected disease events, disease surveillance reports, epidemiological analysis and specific risk assessments.

The joint GLEWS electronic platform – developed by FAO – designed for data sharing became operational in February 2009 and is hosted by FAO. The platform provides a disease event management tool that facilitates and logs information exchange between the focal points of the three organizations. E-mail exchange has been progressively replaced through communication via the platform. A real time–map showing the main events tracked by the GLEWS platform has been online since November 2009. The GLEWS platform is password protected to safeguard sensitive information http://www.glews.net/Glews–Platform.

The GLEWS public website was launched on 31 March 2009 and is available at www.glews.net. Joint early warning messages from the three organizations have been encouraged with regard to specific emergent risks and communicated via the GLEWS website (e.g. RVF and Crimean–Congo hemorrhagic fever) and through the existing communication and official dissemination mechanisms of each organization.

A landscape analysis of risk mitigation guidelines was conducted initially by WHO during 2009 to determine whether comprehensive, international best practices and guidelines on risk mitigation of infectious disease at the human–animal interface were available and to collate an index of such guidelines. Based on this analysis, FAO, OIE and WHO considered that there was a need to develop guidelines addressing mitigation of human risk of infectious diseases at the human–animal interface.

During 2009, two meetings of the GLEWS Task Force were organized to discuss progress, identify and prioritize items of work and develop a work plan for 2009–2010. Issues discussed during those meetings included refinements to the functionality of the GLEWS platform and GLEWS public website to support the exchange and follow up of disease events and their verification.

Future GLEWS strategy – notably on how to carry out better integrated surveillance of zoonotic diseases (animal, food, human) – and funding will be discussed during the FAO/OIE/WHO Tripartite Coordination and Executive meeting, which includes the 5th GLEWS Management Committee (February 2010).

FAO's Regional Support to Surveillance[6]

ECTAD Bangkok – ECTAD RAP initiated regional surveillance of H5N1 and the pandemic influenza A H1N1 2009 virus in poultry in Southeast Asia and South Asia, and in pigs in ASEAN countries, respectively. In order to launch field activities related to surveillance, two regional workshops were held in Bangkok in September 2009, followed by a workshop at the Australian Animal Health Laboratory (AAHL) in Geelong to provide technical training to laboratory and field workers in diagnosis and surveillance, to harmonize protocols for diagnostic tests and determine sampling frames for the target countries. The longitudinal surveillance for these two viruses is expected to be completed by the end of 2010. This is the first time a coordinated regional approach to virus surveillance, isolation and characterization has been initiated, strengthening regional cooperation and sharing of virus information. These regional activities are supported by USAID, USDA, the Government of Japan, the Asian Development Bank, the Government of Sweden and FAO.

The regional Field Epidemiology Training Programme for Veterinarians (FETPV) was formally initiated through an inception workshop in September 2008 in order to provide governments with field epidemiologists with competencies in applied epidemiology, including outbreak investigation and disease surveillance. Regional FETPV is based on "training through service" and is supported by national and international partnerships that include animal health and human health sectors, with support from academia and international donors through a formal partnership between USAID, FAO–ECTAD RAP and the Thailand Department of Livestock Development (DLD). An office locus, programme management structure and curriculum development were introduced during the reporting period. The prerequisite short course entitled "Veterinary Field Epidemiology in Action" was held in February 2009 and was attended by nine international participants from eleven countries. The first cohort of regional FETPV began in June 2009 and included joint training with human health FETP and veterinary specific training following a newly developed curriculum, thus supporting the One World One Health (OWOH) approach. Six trainees from Thailand, Myanmar, China and Indonesia are participating in the full two–year programme. Training modules were developed, including laboratory surveillance, application of software for animal disease surveillance and field investigation training exercises. Additionally, mentors were identified for trainees at the country level with support from agriculture agencies and public health agencies at national and international levels. Field–based activities were initiated by trainees with support from technical mentors to conduct secondary data analysis to assess an issue of importance to the national government and to the trainee. The FETPV programme in Asia is expected to make a significant contribution to improved epidemiological capacity in the region and serve as a testing ground for expansion into Central Asia, Middle East and throughout Africa, funding permitting. A wildlife module has recently been introduced into the curriculum.

ECTAD Nairobi – Several important meetings for the prevention and control of HPAI in Eastern Africa took place over the reporting period. The first FAO–ECTAD and AU–IBAR HPAI coordination workshop for prevention and control of HPAI in Eastern Africa was hosted in December 2008 in Zanzibar, Tanzania. The need for institutional collaboration and synergy of actions was

[6] Some of these regional activities have been conducted together with OIE within the broader framework of the RAHCs.

stressed at this meeting. A workshop was also held in May 2009 with the support of ECTAD Nairobi to discuss and endorse the conclusions of a feasibility study on regional epidemiosurveillance networks in Africa, carried out within the ALive (African Livestock partnership) framework. On this occasion, FAO's crucial role in guiding the process for setting up regional economic communities–hosted epidemiological surveillance networks was acknowledged. Also, links with the International Livestock Research Institute (ILRI) in Nairobi, Kenya, were further strengthened through a Letter of Agreement for the implementation of training and fieldwork on HPAI using Participatory Disease Surveillance tools in Kenya, Tanzania and Sudan.

In support of Integrated National Action Plans for Avian and Human Influenza and the national task forces, the existing animal disease information systems were reviewed and assessed at an inaugural epidemiology network workshop for the Eastern Africa Region in April 2009 in Mombasa, Kenya. Data entry and analysis using digital pen technology[7] was undertaken as a pilot study in Kenya, to be rolled out to countries in the subregion in the near future.

ECTAD Gaborone – In early 2008 the SADC Avian Influenza Working Group agreed that a consultancy should be commissioned to adapt the FAO/OIE generic guidelines on surveillance of HPAI to the specific context of Southern Africa. Surveillance guidelines for poultry sectors 3 and 4 for the disease–free Southern Africa Development Community (SADC) region were therefore developed, with a companion practical field manual, describing the design and implementation of surveillance programmes, more specifically passive, active and scanning surveillance in backyard poultry systems. Calculation of sampling frames was included and these sampling frames were tested in four different countries during the second half of 2009 (Malawi, Mozambique, Zambia and Zimbabwe). The guidelines were endorsed by AU–IBAR and integrated into the Support Programme to Integrated National Action Plan (SPINAP) for Southern Africa, particularly for those countries that wished to carry out surveillance. The guidelines can be found at www.fao–ectad–gaborone.org

ECTAD Bamako – During the reporting period, several workshops and training courses connected to surveillance and preparedness were organized, such as the "Training for Experts Participating in CMC–AH Missions" and the "Workshop on Field Tools for Effective Detection and Control of Highly Pathogenic Avian Influenza (HPAI)" (co–sponsored by USDA and FAO).

The launching of the regional network of national epidemiosurveillance systems for West Africa (RESEPI) was a good opportunity to validate and structure West African epidemiology activities. RESEPI aims to harmonize and stimulate surveillance through: exchange of information, training and capacity building and cross–border meetings. Future RESEPI activities are the staging of simulation exercises, the prioritization of transboundary diseases and the preparation of regional, medium–term priority plans for animal health.

ECTAD Tunis – During the third "Animal Health Regional Coordination Meetings" that took place in Algeria from 8 to 10 February 2009, with the participation of nine of the ten countries of the incipient REMESA network (Algeria, Egypt, France, Italy, Mauritania, Morocco, Portugal, Spain and Tunisia), UMA, EU, and OIE, short technical sessions were dedicated to discussing the situation and disease surveillance capacity for certain priority TADs (HPAI but also brucellosis, RVF, PPR, FMD) with the countries' CVOs and the support of FAO headquarters staff (Box 1).

[7] Digital pen is a recent technology to facilitate instant disease reporting from the field. An optical sensor embedded in the pen captures the handwritten images, which can then be transferred using a computer or a mobile phone.

BOX 1

The Mediterranean Animal Health Network (REMESA)

Ten countries of the Mediterranean basin (Algeria, Egypt, France, Italy, Libya, Mauritania, Morocco, Portugal, Spain and Tunisia), EU, FAO, OIE and UMA are partnering together to improve the surveillance of HPAI and TADs in the region and across the Mediterranean.

- October 2008 – Preparation: A feasibility study on the need for a regional "trans–Mediterranean" network was carried out and an operational structure plan produced. The study was finalized and approved in May 2009.
- July 2009 (Tunis) – Establishment of the REMESA governance and action plan: the terms of reference for the Joint Permanent Committee (JPC) and the Regional Coordination Unit were endorsed and the REMESA annual Plan agreed for the period July 09–June 10. Spain and Algeria will assume the co–presidency of REMESA in 2010.

The FAO–OIE Regional Animal Health Center for North Africa (RAHC–NA) plays the role of the REMESA Regional Coordination Unit.

- October 2009 – Development and distribution of the first six month REMESA action plan.
- October 2009 – Coordination meeting with OIE at FAO headquarters to discuss coordination mechanisms for the Regional Coordination Unit of REMESA.

FAO's role in the development of REMESA has been instrumental through the ECTAD Unit based in Tunis.

There was a regional training workshop on GIS for epidemiosurveillance in animal health for ten officials of the five North African countries (Algeria, Mauritania, Morocco, Libya and Tunisia) and a Regional Epidemiosurveillance Network for North Africa (REPIVET) meeting with the national epidemiology chief officers of the ten REMESA countries (Algeria, Egypt, France, Italy, Libya, Mauritania, Morocco, Portugal, Spain and Tunisia), in Rabat (7–11 November 2009).

ECTAD Beirut – In 2009, a database was set up to provide countries of the region with the necessary information on animal diseases, to enable them to get to know each others' capacities and competencies and to encourage exchange of information and disease reporting; the data were collected thanks to a country–specific questionnaire on animal health status, disease management, laboratory capacities, vaccine production capacity, staff competencies and sufficiency, availability of experts, etc.

An "Avian Influenza: Intersectoral Collaboration" workshop took place under the umbrella of the Global Framework for the Progressive Control of Transboundary Animal Diseases (GF–TADs), in Cyprus in 2009: The objective was to improve national and regional responses to sanitary crises, as a result of influenza viruses, through the sharing of experiences, both at regional and international levels.

FAO's National Support to Surveillance

One of the cornerstones of FAO's work in preparedness and response to HPAI, TADs and other emerging problems is in disease surveillance. Over 45 percent of FAO national projects (all statuses included) on HPAI have a surveillance component. Over the reporting period, passive surveillance systems were improved to varying degrees by the funding support provided to respond to HPAI. This improvement was notably enhanced by the training of veterinary field staff (all countries), the training of ancillary field staff, such as paravets and community animal health workers (e.g. in Cambodia, Indonesia, Egypt, Bangladesh, the Lao People's Democratic Republic and Viet Nam), the strengthening of communication links between field and central veterinary services (Bangladesh, Nigeria) and between the field and central or regional laboratory capacity (Nigeria, Indonesia, Egypt, Bangladesh). Passive surveillance systems were augmented with different types of active surveillance, a number of them supported by FAO, in which new ways of searching for HPAI cases were created. The PDSR system in Indonesia calls its structured, scheduled PDSR team visits "active surveillance". Other initiatives of particular interest were the active surveillance being undertaken in Bangladesh where an active clinical surveillance system was developed for poultry using community animal health workers, additional veterinarians and upazilla livestock veterinarians, supported by a SMS Gateway electronic reporting system. These two innovative systems are detailed in Chapter 4.

Although improvements have definitely taken place, with FAO being instrumental in this domain, further efforts are still needed for the effectiveness and sustainability of systems put in place and, overall, for effective HPAI control. In particular, there is a need to develop greater national epidemiological capacity to support targeted surveillance and identify critical control points to disease introduction, spread and control. Further efforts at the national level are also needed on wildlife surveillance, in line with the guidelines for wild bird AI surveillance produced in 2006 by FAO and the Wildlife Conservation Society. The comparative advantages of the different approaches used, based on their sensitivity, cost and sustainability, should be assessed. The FETPV is one of these approaches, already conducted in four Asian countries, with possible expansion to other countries and regions if funding permits.

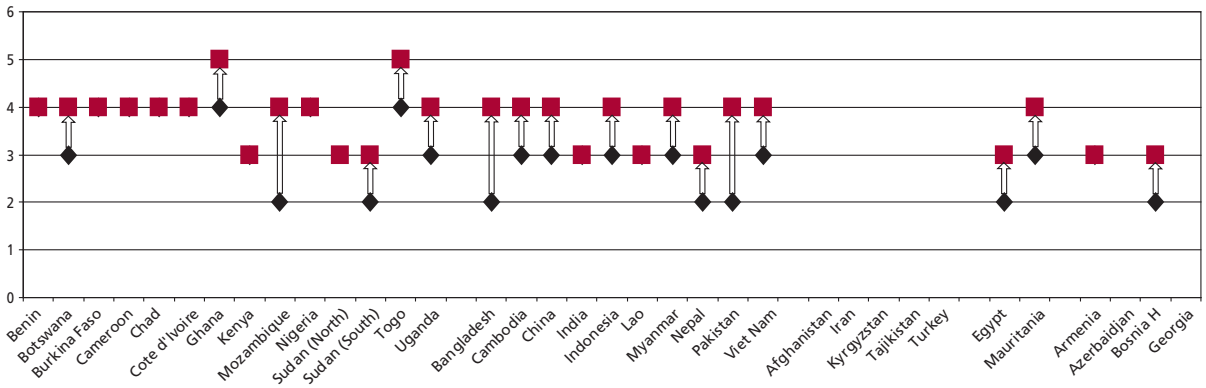
Country Assessment on Surveillance

The results of the country survey (Figure 17) show that most surveyed countries improved their surveillance capacity over the reporting period, with the exception of the ten countries that had already "fair" (level 3) to "good" (level 4) surveillance capacity. Seven countries (Mozambique, Sudan [south], Bangladesh, Nepal, Pakistan, Egypt, and Bosnia and Herzegovina) made substantial efforts to increase their capacity from "poor" (level 2) to "fair" (level 3). As of December 2009, all countries had an at least "fair" (level 3) surveillance capacity and 70 percent had a "good" (level 4) to "excellent" (level 5) capacity. Significant progress has been made in terms of human resources (availability and training), of funds available (still predominantly from external sources), which has translated into efficient, active and passive surveillance in 95 percent of the countries surveyed: Only Sudan (south) still has a surveillance system that is currently considered as "poor" (level 2). FAO has significantly contributed to these positive achievements, in particular with regard to capacity building aspects.

However, there is still room for further improvements. Notably, surveillance plans have three major weaknesses in terms of design: (i) they are not sufficiently based on a strong

risk analysis (most often because the countries lack capacity in epidemiology); (ii) the private sector (poultry producers and private veterinarians) is not consulted/involved enough, while the "tripod" in animal health (partnership between official veterinary services, private veterinarians and producers) – crucial for the efficiency of the surveillance system – is based on transparent and trustworthy relationships between the official veterinary services, the private veterinarians and the poultry producers and other actors of the chain; and (iii) insufficient surveillance is carried out at the interface where wild birds come into contact with domestic poultry. These weaknesses have been noted in particular in Egypt, Nepal and Bangladesh, but also to a lesser extent in Mauritania (risk–base), Sudan (interface), Indonesia (risk–base), Myanmar (interface) and Ghana (interface).

FIGURE 17
Comparison of surveillance capacity (rating: 1=very poor; 2=poor; 3=fair; 4=good; 5=excellent) before the reporting period (< RP) and after the reporting period (>RP)



Source: FAO country survey

LABORATORY CAPACITY

Global Support to Laboratory Capacity

Progress report of the OIE/FAO joint network of expertise on animal influenza (OFFLU) – Over the reporting period, OFFLU made significant progress in improving its infrastructure, in identifying and addressing technical gaps, and in establishing linkages among leading veterinary institutions (it now includes all eleven OIE/FAO Reference Laboratories and Collaborating Centres for influenza, other diagnostic laboratories, research and academic institutes, and experts in the fields of virology, epidemiology, vaccinology, and molecular biology). Interaction with the WHO Global Influenza Programme (GIP) is also a critical component and mechanisms for permanent interaction are being developed. OFFLU has been invited as an observer in the WHO consultation for the selection of human influenza vaccine strains. Meanwhile OFFLU already contributes to discussions by sharing veterinary epidemiological, virological and genetic data.

OFFLU "technical activities", led by scientists from OIE/FAO reference institutions and coordinated by OIE and FAO focal points, have been prioritized and currently cover the following seven topics:

- Compilation of an inventory of commercially available kits for diagnosing avian influenza (AI) and, where manufacturers provide consent, list information about their performance and purpose of use.
- Applied epidemiology – to review epidemiological efforts contributing to surveillance and control and explore options for linking epidemiological and virological data.
- Biosafety – to draft guidance on minimum biosafety standards for handling AI viruses in veterinary laboratories, particularly to provide advice for less well–resourced laboratories in developing countries. The guidance approved by the OIE Biological Standards Commission will be included in the OIE Diagnostic Manual. This group is now working on recommendations for disinfection and decontamination of organic material, equipment and housing.
- Vaccination – with specific reference to vaccine efficacy and quality in Indonesia and Egypt, where the current OFFLU national projects are being implemented (see "Direct assistance to countries" mentioned below). In addition, these projects have pioneered the use of antigenic cartography for avian sera, which helps to monitor antigenic changes in virus populations and select candidate vaccine strains (2). The outcomes of these projects will also contribute to the development of recommendations on vaccine quality for the "OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals".
- Proficiency testing – to evaluate AI proficiency testing coordinated by reference laboratories and to develop recommendations to support harmonization between national laboratories.
- Development of standardized reference materials for sera and viral RNA; to select the most appropriate panel of sera (for HI, AGID and ELISA tests) and to ensure their availability for all laboratories. It will also address the issue of providing standardized RNA references for Polymerase Chain Reaction (PCR) detection of H5, with extension to other AI subtypes if successful.
- Establishment of a formal mechanism for coordination, collaboration and information exchange at the human–animal interface. The proposed activities aim to improve the coordinated assessment of influenza zoonotic/pandemic risks and bridge cultural gaps between the animal and human health sectors, to promote research at the human–animal health interface and to improve linkages between regional laboratory networks.

Regional Support to Laboratory Capacity[8]

The Regional Support to Laboratory Capacity carried out by FAO is targeted on the coordination and support to Regional Laboratory Networks. As of today, most regions where FAO has implemented HPAI projects the past year have seen the support to their existing network (i.e. SADC) or establishment of a laboratory network (West and Central Africa, Central Asia, Eastern Africa, North Africa, Central Asia). There is however no such network currently established in Middle East. Annual meetings, strategy, procurement, proficiency tests, laboratory assessment missions, etc. have been conducted by FAO in the context of these regional networks. Regional laboratory networks are expected to be run closely with epidemiological surveillance networks and coordinated by regional ECTAD FAO offices. The

[8] Some of these regional activities have been conducted together with OIE within the broader framework of the RAHCs.

scope of these networks should go beyond influenza. It is recognized that their sustainability is uncertain without national or international support (Regional Economic Communities, donors, international organizations). National laboratories have welcomed the FAO initiative. It is hoped that nations and regional bodies will take the ownership of these networks in the future.

ECTAD Bangkok – ECTAD RAP has organized a number of workshops and consultations with a range of stakeholders, including international agencies, leading regional diagnostic laboratories and Reference Laboratories to strengthen national and regional diagnostic capacity in AI diagnosois and virus characterization. The partner agencies have agreed to support regional, national and subnational laboratories to meet international standards through the subregional AI laboratory network. Collaboration has been developed to enhance cooperation among a range of partners, ensuring increased efficiency of implementing capacity building activities in the region. In partnership with OFFLU, OIE and AAHL, training priorities have been identified, and a mechanism to coordinate inputs in AI laboratory network activities has been finalized. Training has also been provided on quality assurance and biosecurity in collaboration with AAHL and the National Institute of Animal Health (NIAH) of Thailand. The national partners have also initiated the development of regional guidelines for HPAI surveillance and diagnosis with standardization of laboratory diagnostic tests, quality assurance and biosecurity protocols. The regional laboratory network activities have been supported by the Government of Japan, AusAID, USDA and the ADB. The key workshops held were the "Consultative Meeting of Regional Laboratory Network Partners for HPAI Diagnosis in Southeast Asia" in Bangkok from 23 to 24 June 2009 and The "Quality assurance and biosecurity training" workshop from 28 to 30 September 2009 by ECTAD RAP, AAHL and NIAH in Bangkok, Thailand.

ECTAD Nairobi – The foundation for the establishment of laboratory networks and capacity building for HPAI diagnosis was set by a regional TCP project. The formal launch of the laboratory network was at a meeting in Debre Zeit, Ethiopia, in 2008, with the initial workshop reviewing laboratory set–ups, safety codes, existing capacity and gaps in AI diagnosis, training needs and collaborative mechanisms that needed to be established among central veterinary laboratories in the ten countries served by the decentralized ECTAD unit for Eastern Africa based in Nairobi.

Activities that were implemented during the reporting period included:

- Inter–laboratory proficiency tests on PCR and serological diagnostic techniques for AI and Newcastle Disease (ND), involving four central laboratories in Ethiopia, Kenya, Sudan and Tanzania. The exercise was organized by the Istituto Zooprofilattico Sperimentale delle Venezie (IZSVe.), the OIE/FAO Reference Laboratory in Padova, Italy, and the FAO–ECTAD Unit based in Nairobi.
- Advanced training of three laboratory personnel from Ethiopia, Kenya and Tanzania at IZSVe on diagnostic techniques for AI and ND. An *in situ* training of PCR techniques for the diagnosis of AI and pathogen characterization was carried in the central veterinary laboratory of Sudan.
- Laboratory capacity assessments in Ethiopia, Kenya and Tanzania, as one of the prerequisites for selecting regional laboratories for AI. The exercise was carried out between April and June 2009 with the assistance of IZSVe.

The findings of the laboratory assessments and proficiency tests were presented and discussed during the annual coordination meeting of the HPAI and other TADs regional laboratory network for Eastern Africa network (EARLN) meeting in Kigali, Rwanda, in July 2009. Financial support to national laboratories (US$90 000) was provided in support of purchase of equipment, reagents and other materials through a global project funded by Canada.

ECTAD Gaborone – Veterinary laboratories in the SADC region have networked under the SADC Laboratory Diagnostics Sub–Committee umbrella since 1992. With the heightened awareness of HPAI, this network gained importance in assisting countries to build the necessary diagnostic capacity to detect the infection, should it appear in the region. Since 2007, FAO–ECTAD has actively supported this network. One of its first actions was to carry out a regional capacity assessment of all 14 SADC laboratories and three provincial laboratories in South Africa. This major exercise took over 12 months. The report has been published and is available at www.fao–ectad–gaborone.org. The information contained in the report forms a very important baseline and gives evidence of the level of capacity and ability of the laboratories. The results have been used by FAO–ECTAD and other international collaborating partners to focus their support and to give very specific assistance by providing missing equipment, needed reagents or training of laboratory personnel. This has led to an upgrade in the number and reliability of tests that can be carried out by the different laboratories. From the survey, it became obvious that the majority of the laboratories were using HA/HI as a serological screening test. With the support of ECTAD, the network embarked on harmonizing the protocols used by the different laboratories and developing a harmonized SADC protocol for HA/HI. This protocol was subsequently tested by undertaking proficiency tests in the region, in which 10 countries and 12 laboratories successfully participated. A full report is available and can also be found on the ECTAD website above.

ECTAD Bamako – ECTAD Bamako organized three workshops on laboratory capacity for Central and Western Africa laboratory directors and quality managers in June, September and November 2009. Three experts of the RESOLAB regional network conducted bench training at the national veterinary laboratories of Burkina Faso, Cape Verde, Guinea Bissau, Gambia, Ghana, Liberia, Sierra Leone and Togo.

The availability of standardized reagents was facilitated by the buffer stock set–up in Bamako for the main reagents for AIV and NDV laboratory diagnosis. All laboratories were provided with PPE, necropsy kits, sampling material, shipping boxes and AIV and NDV rapid tests kits.

Interlaboratory proficiency tests on AI and Newcastle Disease laboratory diagnosis were conducted in 12 laboratories in the region.

The synergy between epidemiosurveillance and laboratory networks has been enhanced with the launching of RESEPI, the regional epidemiosurveillance network. The links have also been strengthened with other networks, such as the East Africa Laboratory Network (participation at the annual Assembly in Kigali, 28–30 July 2009), FLUTRAIN (attendance at a workshop in Vom) and FAO/IAEA (a training workshop in Vienna). Collaboration has increased with academic institutes (EISMV and UGA) and traditional technical partners such as FVI, STOP–AI, USDA/APHIS.

ECTAD Tunis – A number of training sessions were organized by ECTAD Tunis at the regional and national level to enhance national laboratory capacities over the reporting period: training of four Libyan laboratory technicians in PCR and serology diagnosis of AI in NLQP, Cairo, from 7 to 11 June 2009; training of six laboratory technicians (two from each of the central laboratories) from Algeria, Morocco and Tunisia in PCR and serology diagnosis of AI and in PCR platforms in the CERVA laboratory/research centre in Brussels in September and October 2009. The Director of the CNERV laboratory in Mauritania was trained in laboratory quality assurance in Dakar, June 2009. The training of four laboratory technicians from CNERV Mauritania was also organized: two in serology diagnosis of AI at the Biopharma laboratory in Rabat, from 6 to 10 July 2009, and the other two in PCR diagnosis of AI in CIRAD, France, from 6 to 10 July 2009.

FAO launched a laboratory equipment needs assessment mission to the central and regional laboratories of Algeria, Mauritania, Morocco and Tunisia, from June to September 2009. Based on these needs, the second procurement plan for laboratory equipment in North Africa (US$580 000) was launched from September to November 2009.

ECTAD Beirut – Over the reporting period, FAO's regional support in North Africa and the Near East consisted of the procurement of technical equipment and diagnostic materials for laboratories, the distribution of IATA–approved sample shipment boxes and the provision of technical advice and recommendations to the national laboratories. ECTAD Beirut also participated in the "Surveillance and diagnosis of avian influenza" workshop held in Amman (November 2008), with the aim of enhancing the epidemiological and laboratory skills of veterinary staff involved in national animal disease prevention and control programmes.

National Support to Laboratory Capacity

The strengthening and, in some cases the initial establishment, of diagnostic facilities capable of supporting HPAI preparedness and response has been a very prominent and effective part of FAO's contributions. Over 38 percent of FAO national projects (all statuses included) on HPAI have a laboratory capacity building component. This has involved supporting the purchase and installation of equipment, provision of reagents, training of laboratory staff, facilitation of proficiency testing networks for PCR and HI testing, interactions between laboratory staff in the regions and beyond through both formal and informal networks, training in (and funding for) sample collection and shipment, international sharing of virus isolates and the raising of scientific and risk awareness on influenza viruses. In some countries (such as Viet Nam) this has included supporting the development of a string of regional laboratories serving different parts of the country, and the evaluation of regional laboratory capacity with a view to the accreditation of regional laboratories. This has been one of the major products of FAO's initiatives. While the procurement of equipment and materials took place at the early stage of FAO's intervention, building diagnostic capacity is a priority area of FAO's current activities, notably in Asia (Bangladesh, Cambodia, Mongolia, the Lao People's Democratic Republic and Myanmar).

OFFLU also provides direct assistance to countries and notably contributes to targeted national capacity building for virological diagnosis and virological/epidemiological surveillance of influenza viruses of veterinary importance. Throughout much of 2009, an FAO/

OFFLU scientist worked technically at the country level addressing specific issues of concern in the animal health sector and increasing capacity in certain countries. Emergency laboratory assistance was provided as part of the CMC–AH missions in response to H5N1 and its emergence in Nepal (February 2009) and H1N1 Mexico (May 2009), and an OFFLU vaccine efficacy project implemented in Indonesia included project advocacy within the Ministry of Agriculture, laboratory training for Indonesian laboratories, procurement of supplies and equipment, and coordination of introductory workshops on molecular and antigenic analysis for more than 35 Indonesian scientists. These projects were technically enhanced by collaboration with laboratory project partners in Australia, the Netherlands and the United States, through cooperative review and analysis of project data on antigenic and genetic virus characterization. The OFFLU vaccination group has been a useful resource providing field–level personnel with additional expertise, and OFFLU has been able to include additional vaccination experts in technical discussions, especially on H5N1 vaccination of poultry in Indonesia. Teleconferences and meetings have been held to share technical inputs regarding vaccination of one–day–old chicks and broilers, results of new candidate vaccines, and vaccination strategies in Indonesia, and OFFLU has provided technical advice to Indonesia on the selection of vaccine strains/types against circulating field viruses. A meeting on vaccination strategy was held in Jakarta on 14 November 2008, resulting in an update of the recommendations for vaccination strategy in Indonesia. A similar national project on H5N1 poultry vaccine efficacy has now been initiated in Egypt. The first technical meeting on vaccine efficacy in Egypt took place from 30 September to 1 October 2009. A private vaccine manufacturer and two international laboratories requested FAO/OFFLU to act as a neutral technical platform for presentation and discussion of confidential results. Finally, to increase direct laboratory support to countries, the two OFFLU officers in FAO, working with CMC–AH, have prepared a list of critical reagents and laboratory items for diagnosis of African swine fever, PPR and RVF, as well as animal influenza. At FAO's request, a selection of laboratory items from pre–selected providers can be provided within a few days to any country requesting such assistance.

A first opportunity of proficiency testing for avian influenza and Newcastle disease diagnostics was offered to a selection of African and the Middle Eastern national veterinary laboratories. The purpose of this exercise was to evaluate the overall and individual technical capacities of national veterinary laboratories to diagnose AI and ND, either by serology and/or molecular (PCR) tests. The first round of AI/ND proficiency test (PT) was co-organized by FAO and IZSVe (contracted by FAO) and invited 26 African and Middle Eastern countries to participate. Panels were shipped to laboratories in September and October 2008. Results were obtained from 25/26 laboratories, which represents an excellent level of participation. This evaluation values for the international community, by objectively measuring the outputs of the investment made over the last 5 years, especially through projects related to highly pathogenic avian influenza (HPAI) virus detection. In addition, it has enabled to identify regional and national needs for training and capacity building. Finally it gave regions, countries and laboratories an opportunity to measure their technical skills and reliability. The overall results of this first proficiency testing showed that diagnostic capacities still need substantial improvements although some laboratories do already have acceptable capacities to diagnose avian influenza, identify the main subtypes and differentiate with

Newcastle disease. Interestingly, a relatively simple serological test such as the Agar Gel Immuno Diffusion (AGID) test, provided many false results and only 50% of the laboratories obtained more than 9/10 correct results. These results also confirm that samples submission to international reference laboratories remains essential for results confirmation and advanced characterisation of animal influenza viruses. To this regard, the FAO account (empres_shipping_service@fao.org) for request of assistance for international shipment is still active. This exercise has also confirmed that shipment of biological material remains the most delicate as well as the most costly part of this exercise. Constant availability of good quality reagents is also difficult to achieve in many countries. A new round of proficiency tests has been launched in November 2009, on the same principle as in 2008, but with a large number of participating countries: 48 selected countries from Africa, Middle East, Eastern Europe and Central Asia. Results are being reviewed.

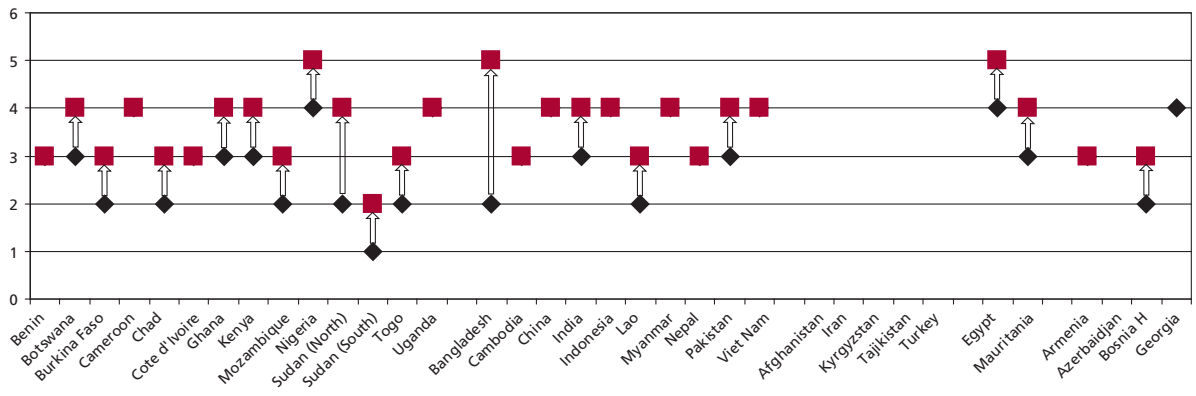
In addition to this large international proficiency test, FAO has supported in 2009 an intra-regional proficiency test in the SADC African region on detection of antibodies against avian influenza ran by OVI with the technical assistance from VLA. FAO will carry out a second intra-regional proficiency test in SADC in 2010, this time under the coordination of the Botswana National Veterinary laboratory.

Country Assessment on Laboratory Capacity

The results of the country survey (FIGURE 18) show that most surveyed countries improved their laboratory capacity over the reporting period – except for the ten countries that already had "fair" (level 3) to "good" (level 4) laboratory capacity. Eight countries (Burkina Faso, Chad, Mozambique, Sudan [north], Togo, Bangladesh, the Lao People's Democratic Republic, and Bosnia and Herzegovina) made substantial efforts to increase their capacity from "poor" (level 2) to "fair" (level 3). While Sudan (south) also improved, its laboratory capacity remained "poor" (level 2). As of 31 December 2009, all countries had national capacity to conduct AI virus identification (though not characterization).

FIGURE 18

Comparison of lab capacity (rating: 1=very poor; 2=poor; 3=fair; 4=good; 5 =excellent) before the reporting period (< RP) and after the reporting period (>RP)



Source: FAO country survey

Also the three countries that currently implement vaccination on a wide scale (Egypt, Indonesia and Viet Nam) have the capacity to monitor the serological vaccination response. These results have been made possible thanks to the provision of equipment, the reinforcement of human resources (provision of training, both in–country and abroad) and the allocation of funds (mostly through projects) to run the laboratories. However two (Togo and Myanmar) and six (Armenia, Botswana, China, Ghana, Georgia and Sudan south) countries registered a decline respectively in the human and financial capacity allocated to laboratories. All African countries surveyed and, to a lesser extent Asia, are part of a subregional network of laboratories with very positive results, but this is not yet in place for Eastern Europen and Central Asian countries. FAO's support has been instrumental over the reporting period in upgrading laboratories worldwide and, in particular, regarding the networking aspects (FAO global initiative on regional veterinary laboratory networks).

There remains at national level: weak support of national laboratories by their respective governments; persistent instability of laboratory personnel; absence of advanced training in laboratory topics; and a deficiency in laboratory equipment maintenance and calibration.

BIOSECURITY

Global Support to Biosecurity

FAO recognizes the importance of biosecurity in the prevention and control of many infectious diseases and is addressing this in particular for H5N1 HPAI and in response to H1N1. In 2008, FAO, collaborating with the OIE and the WB, produced a paper entitled "Biosecurity for Highly Pathogenic Avian Influenza: Issues and Options". This emphasizes the importance of biosecurity for the control of HPAI because transmission is largely human mediated via the movement of infected birds and contaminated materials. The basic principles of biosecurity are described and discussed. An approach to working with producers to develop locally appropriate and sustainable biosecurity measures is being developed. This stresses the need to involve all actors and stakeholders in the poultry production and marketing network and in particular to involve not only producers but also intermediaries and service providers such as traders, chick sellers and veterinarians, all of whom play an important role. The document has been distributed widely and further copies are being produced.

The rapid spread of the pandemic influenza A H1N1 2009 virus in the human population and the ability of the virus to infect pigs is a global concern. FAO, again collaborating with the OIE and the WB, prepared a document on "Good Practices in Biosecurity in the Pig Sector". The document targets stakeholders across all pig production systems in developing and in–transition countries. While it is mainly addressed to pig farmers, its content is also very valuable for veterinary personnel, technical service providers and project managers. Decision–makers in government structures will also find this document useful as they plan for the improvement and prevention of pathogens affecting swine population.

Regional Support to Biosecurity – Progress Report of the Regional ECTAD Units[9]

ECTAD Bangkok – The "Regional Activities on Biosecurity Aspects of the Public Private

[9] Some of these regional activities have been conducted together with OIE within the broader framework of the RAHCs.

Partnership" project covers Bangladesh and Indonesia. In Bangladesh, FAO in collaboration with the Ministry of Forestry and Livestock (MOFAL), DLSs and representatives from the commercial sector, has supported the development of a comprehensive and detailed biosecurity strategy document entitled "Biosecurity Guidelines for the Commercial Poultry Industry in Bangladesh", outlining the strategic actions and decisions required to develop biosecurity guidelines that will form the National Biosecurity Plan for the commercial poultry industry in Bangladesh. The strategy has focused on a number of important issues that include: the guiding principles for the development of biosecurity, biosecurity guidelines, and policy and operational application of the biosecurity guidelines. The strategy also defines the roles and responsibilities of the different stakeholders and the implementation structure. The strategy is expected to be endorsed by MOFAL in the near future.

In Indonesia the Roadmap for the National Poultry Quality Improvement Plan (NPQIP, 2009), was prepared by the Indonesian Poultry Association. The NPQIP has a chapter on technical programmes that includes components on monitoring and surveillance, biosecurity, vaccination, compartmentalization and zoning, and marketing and distribution of poultry and poultry products. Through feedback from stakeholders in the poultry industry a number of weaknesses were identified; FAO has agreed to support technical review and improvement of NPQIP. The document is expected to be finalized in the first quarter of 2010.

ECTAD Nairobi – Activities accomplished during the reporting period include the preparation and distribution to member countries and FAO headquarters of 1 000 "Training of Trainers" (TOT) manuals ("Good Practices in Small–Scale Poultry Production") and 2 000 copies of a farmers' guide, "How to Grow and Breed Healthy Chickens". Poultry sector reviews were undertaken in Burundi, Ethiopia, Kenya, Rwanda, Tanzania and Uganda. The reports for this activity have been published and sent to each country's FAO office, the department of veterinary services and put on the FAO–ECTAD regional website (http://www.fao–ectad–nairobi.org/). Poultry biosecurity assessment studies were conducted in Ethiopia, Kenya, Uganda and Tanzania as well as biosecurity studies in the poultry value chain (Kenya) and appropriate biosecurity measures to be adopted in sectors 3 and 4 (Tanzania). Field testing of Hay Box Brooder technology for improved chick survival and biosecurity in Ethiopia, Kenya and Tanzania was carried out as well during the period under review. Preparation of regional biosecurity guidelines for East African Community member states was another activity initiated in September 2009, and the first draft has been reviewed and finalization of this Report is in progress.

ECTAD Gaborone – In 2008/09 the FAO–ECTAD office for Southern Africa contracted a regional expert to produce HPAI surveillance guidelines for the SADC region with an emphasis on backyard and free–range poultry systems. The consultant visited several SADC member states and evaluated the regional status with respect to HPAI preparedness that included issues of biosecurity. In summary, the consultants' evaluation revealed that poultry production systems in the region generally fall into four sectors:

- Industrial and Integrated – Under this system, the biosecurity level is considered relatively high. As a business enterprise, biosecurity is strictly enforced by management.
- Commercial sector – Here there is moderate to high biosecurity; again biosecurity issues are largely addressed by the management of the enterprise.
- Small holder commercial – In this sector there is low to minimal biosecurity. Here national Ministries responsible for Agriculture offer technical advice to the farmers on

biosecurity issues. However, because of limited resources most farmers are not able to implement the required standards of biosecurity.

- Village or backyard free range – In this sector biosecurity issues are difficult to address because birds are largely allowed to roam. However, again through Ministries of Agriculture, farmers are advised on best practices during extension services.

In the SADC region, sectors 3 and 4 predominate. In addition to these two sectors, some countries have informal live bird markets (LBMs) that are characterized by rapid live bird turnovers with minimal sanitary controls. These LBMs largely receive birds from sectors 3 and 4, posing challenges to biosecurity control.

Regional activities have therefore focused more on communication and farmer education regarding biosecurity.

ECTAD Bamako – The ECTAD–Bamako Unit has advocated at the regional level, through various fora, that "Improved biosecurity along the poultry chain is key for HPAI prevention and control and improved performance of the sector"; "Improved biosecurity requires involvement and partnerships between all private and public poultry sector actors"; "Smart information, communication and training strategies need to be formulated and implemented to support the behavioral changes required". This advocacy work has contributed, especially in West Africa, to an overall mindset change at the level of public and private leaders. The regional approach, which creates both competition and cooperation, plays an important catalytic role. As poultry associations can be essential in promoting biosecurity (as well as participatory surveillance) and safe animal production, the ECTAD Unit maintains continuous exchanges with the West Africa poultry association (UOFA/UEMOA) and has provided determining support in the creation of a Central Africa poultry association (IPAR/CEMAC).

Beyond this essential advocacy work, the Unit participated in or conducted the delivery of four regional training sessions on "Biosecurity for Poultry Farms and Live Bird Markets", both in French and English for West and Central Africa, involving 117 participants from 20 countries. Training materials have been improved and will be used to develop "biosecurity training and communication toolkits" that will facilitate capacity building and cost–effective implementation.

As a contribution to risk analysis at subregional level, the biosecurity situation of 70 poultry markets in four neighbouring countries was assessed. In this connection, pilot operations to improve biosecurity of LBMs are being conceived and planned.

RESECOP, the sub–regional network on socio–economics of animal production and health, facilitated by the ECTAD–Bamako Unit, is expected to serve as a main platform for collection, exchange and promotion of biosecurity in the poultry sector.

ECTAD Beirut – A regional training course of trainers on biosecurity took place in Damascus in July 2009, in which competent trainers from the region were taught skills on biosecurity issues: veterinarians were identified in each country with basic knowledge of biosecurity and were trained in such a way as to be able to demonstrate the benefits of improved biosecurity. These trainers transferred the knowledge they gained through in–country training courses for other veterinarians, paraprofessionals, farmers (and other stakeholders).

A biosecurity manual (in Arabic and English) is being prepared and will treat all biosecurity concepts on poultry farms, at poultry markets and those of small–scale producers, taking into consideration the local situations, circumstances and raising methods in the

region. The guide is directed at poultry farmers, small–scale producers and market personnel, using concise basic and clear messages, to reach the final recipients such as farmers and workers.

PPE kits and disinfectants were also bought and distributed to countries for the same purpose – to enhance biosecurity measures in daily practices.

A survey on the existent biosecurity levels on poultry farms was conducted in several countries of the region. The results of the survey were presented during one–day workshops in Syria and Lebanon. Overall, it demonstrated that there is a poor understanding of biosecurity, even among veterinarians.

National Support to Biosecurity

Biosecurity is seen to be paramount in reducing virus load in the growing smallholder commercial sectors, notably in endemic countries such as Egypt. But these concepts are new to the poultry sector stakeholders. FAO has increased its involvement with biosecurity on farms in many countries, with activities being designed following the publication of a paper on biosecurity for poultry (see above). Twenty–one percent of FAO national projects (all statuses included) on HPAI have a biosecurity component, with greater emphasis put on biosecurity over the past year. It is believed that poultry production sectors 1 and 2 have a higher level of understanding and compliance of biosecurity and may only require upgrading dating or supplementing measures. FAO's national projects have increasingly focused on sector 3. There is a narrowing gap between the understanding of what needs to be done and what is communicated to the various stakeholders. The FAO pilot activities in Egypt and Cambodia aim to develop "cost–effective and feasible biosecurity measures for resource limited circumstances". The engagement of the private poultry sector together with the veterinary services (notably regarding biosecurity at LBMs) is key to the process; this is why design of biosecurity guidelines involving the two parties has been a major activity of the PPP project (USAID funded) in Bangladesh (Box 2). How to reduce human risk of infection and the risk of exposure to poultry through biosecurity is also a key aspect of FAO's communication programmes.

BOX 2

Public–private partnership (PPP) is a key for the design and implementation of realistic and affordable biosecurity measures

The PPP project in Bangladesh has been involved in two biosecurity related activities during the reporting period:

- The development of "National Biosecurity Guidelines for the Commercial Sector". During the three–day workshop, members of the public, private, NGO and university sectors discussed and collaborated to produce a comprehensive guideline and implementation strategy. This was presented to the Secretary of the Ministry of Forestry and Livestock for endorsement and successful implementation.
- A Biosecurity Training Coordinators Committee was formed. Members of the public, private, NGO and academic sectors were involved in biosecurity training in Bangladesh, and met regularly to share and standardize the available training material. A website was created with training and other biosecurity related materials being posted.

As a result, there is an increased awareness of HPAI (notably in Cambodia). However there is still a wide gap between knowledge–belief of people and practice at all levels (vendors, intermediaries, farmers, etc), as revealed in the Knowledge, Attitudes and Practices (KAP) surveys conducted in several countries.

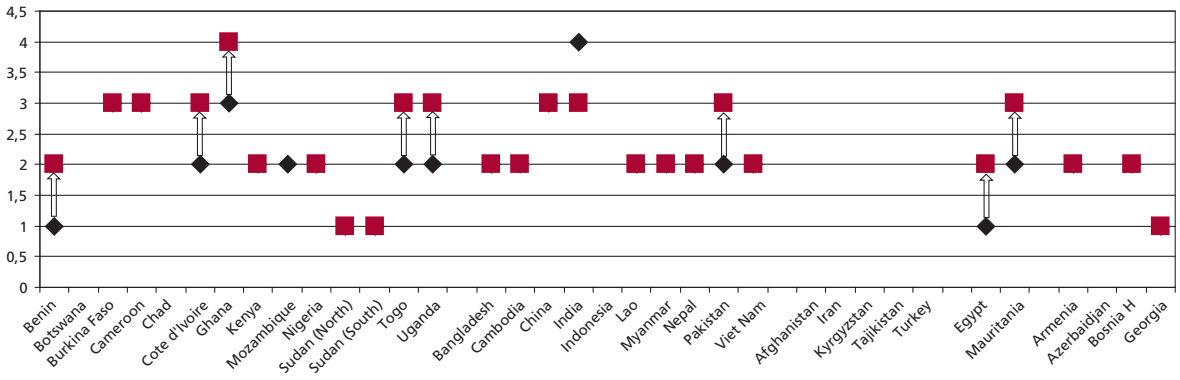
Country Assessment on Biosecurity

The results of the country survey (Figure 19) (Benin, Ivory Coast, Ghana, Togo, Uganda, Pakistan, Egypt and Mauritania) show that very few countries put biosecurity measures in place over the reporting period and that the global level of biosecurity in the poultry production and marketing system remains low. This is mainly the case in sectors 3 and 4 as the survey reveals that in 52 percent of surveyed countries, there are no biosecurity measures at all in these sectors and when they do exist, the resulting level of biosecurity is rated poor or very poor in 67 percent of the countries. On the other hand, in sectors 1 and 2, efficient measures (level > 3) are implemented in 80 percent of countries surveyed. LBMs received very little attention in terms of biosecurity, with no measures implemented at all in 51 percent of countries surveyed. All sectors included, Africa seems to be the region where most efforts have gone on biosecurity. Main bottlenecks result in the facts that: (i) in most countries, there is neither a legal/regulatory act on biosecurity (48 percent) nor a mandatory poultry farm registration system (that includes sectors 3 and 4) in place (43 percent), and therefore measures cannot be enforced; (ii) incentives to implement biosecurity measures are inexistent, such as, for instance, a compensation system connected to the level of biosecurity present on farms, except in two countries (Pakistan and Sudan [north]); on the contrary, the price and constraints for implementing biosecurity on a daily basis is regarded as a disincentive; and (iii) the level of awareness of the benefit of such measures is low, notably in sectors 3 and 4. However, national biosecurity campaigns have recently

been conducted in 85 percent of countries, with limited effects to date, except in Togo, Ghana and Cambodia (campaigns rated satisfactory with a score = 4). FAO's support to the implementation of biosecurity measures at the country level has been limited to date. Recently published FAO Guidelines, however, should serve as a support to implement better practices on farms and at markets.

FIGURE 19

Comparison of the biosecurity level (rating: 1= very poor; 2= poor; 3= fair; 4= good; 5 = excellent) before the reporting period (< RP) and after the reporting period (>RP)



Source: FAO country survey

OTHER KEY TOPICS – MAIN FACTS

Preparedness

In 2007, FAO and OIE produced the manual "Preparing for Highly Pathogenic Avian Influenza" to help national animal health authorities and other stakeholders prepare for a possible incursion of HPAI, to detect the disease as soon as possible and to respond as rapidly as possible to contain the disease. The Manual was updated in 2009.

At the regional level, FAO organized many simulation exercises that took place over the reporting period, namely: For Eastern Africa (ECTAD Nairobi), a tabletop simulation exercise on HPAI, with participants from Burundi, Rwanda, Kenya, Tanzania and Uganda, was held in Zanzibar, Tanzania, in December 2008. A regional Joint Animal and Human Influenza Training of Trainers workshop for rapid response teams was held in Kenya in June 2009 in collaboration with WHO, AU–IBAR and STOP–AI and included both desktop and field simulation exercises. For Western and Central Africa (ECTAD Bamako), simulation exercises for the control of HPAI outbreaks took place in Mali for Western African countries (field exercise), in Cameroon for Central African counties (desktop exercise) and in Cape Verde for Portuguese speaking countries. For Southern Africa (ECTAD Gaborone), the first and only field outbreak simulation exercise in the SADC region was successfully implemented in Zambia in September 2009. Seven neighboring countries, each with a representative from animal health, human health and communications, participated in this exercise (Angola, Botswana, DRC, Malawi, Mozambique, Tanzania, Zimbabwe). A full report on the event is available on the ECTAD website. A film was also produced and has been distributed to

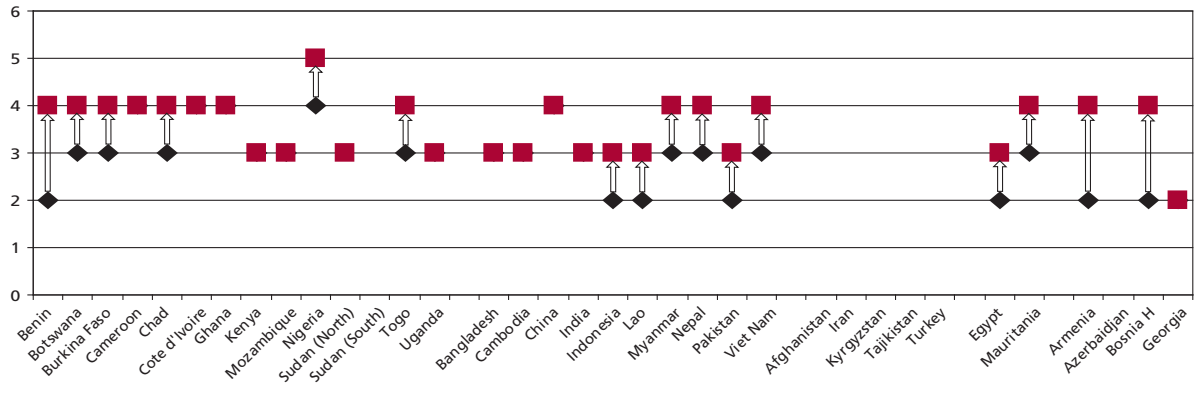
SADC countries. The event was considered successful and has triggered other countries in the region to carry out national desktop simulation exercises, mainly funded and supported by SPINAP. For the Near East (ECTAD Beirut), a three–day desktop simulation exercise based on a scenario of a simulated outbreak of the H5N1 HPAI virus mainly affecting poultry took place in Cairo in February 2009, to refine and improve HPAI preparedness and control plans. For Northern Africa (ECTAD Tunis), a training of national facilitators/focal points to conduct national HPAI (and other TADs) simulation exercises in the four North Africa francophone countries (Algeria, Mauritania, Morocco and Tunisia) was organized in Tunis in August 2009. Finally, in the Balkans region / Eastern Europe, many simulations exercises were undertaken over the past year with some of them conducted jointly with WHO ("national hybrid table–top/field simulation exercise").

FAO, principally through ECTAD, played a strong strategic role at the technical level, participating actively in the development and subsequent update of integrated multisectoral National Preparedness and Response Plans for HPAI.

The results of the country survey (FIGURE 20) show that most surveyed countries improved their preparedness over the reporting period – with the exception of the ten countries that already had a "fair" (level 3) or "good" (level 4) level of preparedness and, as of December 2009, all countries had at least a "fair" (level 3) preparedness plan. Georgia was the one exception, with a preparedness plan qualified as "poor" (level 2), explained by the lack of proper veterinary services in the country. Significant improvement was made in Benin, Armenia, and Bosnia and Herzegovina. An adequate budget remains the limiting factor to the proper implementation of the plan while, on the other hand, a big effort was made over the reporting period in terms of availability and training of the staff involved (except in Georgia). Simulation exercises have been conducted in African countries mostly (with the support of the RAHCs), in Eastern Europe (Balkans) and in Asia to a lesser extent. It has triggered the update/revision of the preparedness plan in a very limited number of countries (Africa). FAO has significantly contributed to the increase of preparedness in Asia; in other regions, it has been supported collectively (including FAO and the country itself).

FIGURE 20

Comparison of preparedness (rating: 1= very poor; 2= poor; 3= fair; 4= good; 5 = excellent) before the reporting period (< RP) and after the reporting period (>RP)



Source: FAO country survey

Communication

Communication and awareness raising activities have featured in many FAO projects. The Communications Unit at ECTAD headquarters is actively participating in the backstopping of regional and national initiatives, with the field programme largely being implemented by FAO local staff with specific inputs from the (sub–) regional ECTAD units.

At regional level, besides providing backstopping to national projects, networks have been set up (such as RESOCOM in Western Africa and RECOMSA in Northern Africa) and regional workshops have been organized to improve outbreak communication and media skills. Notably, in West Africa, a Training of Regional Trainers on Message Design in the context of HPAI and Other Priority Diseases took place in 2009. In Northern Africa, communication for animal health assessment needs missions were conducted in Algeria, Mauritania, Morocco and Tunisia in 2009 and based on the results of these assessments, a regional meeting was organized in November 2009 in Tunis to discuss national and regional needs. In Southern Africa, with the support of ECTAD Gaborone, a regional communication strategy for HPAI is currently being developed so that all countries pass well tested and approved messages to consumers and producers.

At the country level, FAO is engaged in various elements of awareness raising, related to reducing the risk of disease spread between poultry populations, and reducing the risk of human infection, together with CHL in Egypt, CBAIC in Indonesia and AED in Asia. FAO has put important focus on awareness raising activities in rural settings using the infrastructure and other partnerships developed through other FAO–led activities (for example, using government and private sector staff involved in active surveillance) as primary mechanisms to reach poultry producers and support behavioral change. Quality and innovative communication materials have notably been developed in Cambodia, the Lao People's Democratic Republic and Indonesia over the reporting period. In Nigeria, a major community–centered biosecurity project is being systematically piloted and documented in 27 sites using participatory communication approaches. A wide–range of community stakeholders (including poultry farmers, traders and live bird market authorities) as well as sub–national level government veterinary staff have been engaged in community dialogues to find local biosecurity solutions for the prevention and control of poultry diseases. In December 2009, the ECTAD communication unit participated in an in–depth joint UN (FAO, WHO, UNICEF) mission to review the strategies and situation in Egypt, including a thorough assessment of the communication interventions to date. Based on the analysis, the animal health communication strategies in Egypt are being revised and adjusted to enhance efficacy and impact.

Through funding from Canada, an innovative multi–media communication project was implemented towards re–framing the avian influenza communication discourse, through centre–staging community voices of those most affected and at risk, of contracting highly pathogenic avian influenza HPAI. The project provided media fellowships to 40 selected in–country journalists from various disciplines – print media, photo–journalists, radio/video journalists – in Indonesia, Viet Nam, Nigeria and Egypt. Creative audio–visual and print material/stories generated through the process, which directly centre–stage actual community voices and images, are being used as input for the development of critical training, advocacy and communication materials for a range of audiences, including policy–makers, donors and general public.

Capacity–building in strategic communication and advocacy for risk reduction, among Ministries of Agriculture/Livestock, remains at the heart of ECTAD's communication work. Following a systematic review of needs and gaps, through a series of regional workshops and nearly 30 INAP missions, FAO is focused on developing a strong programme for building risk communication competencies and leadership among Ministries of Agriculture. As part of this developmental work, FAO is participating in, and partnering closely with, WHO's Working Group on International Health Regulations Risk Communication, as well as the Global Health Security Communication Network, in developing and finalizing indicators and benchmarks for core risk communication capacities.

Response

Progress report from FAO/OIE CMC–AH – From October 2008 to December 2009, FAO and OIE continued to operate CMC–AH in close collaboration with WHO to assist FAO member countries to establish effective initial responses to TADs emergencies or emerging threats.

Missions – As the operational platform of FAO–ECTAD, the CMC–AH deployed 11 response missions to provide rapid assistance to 11 countries responding to animal disease emergencies or critical epidemiologic situations involving African Swine Fever (ASF), Ebola Reston Virus (ERV), HPAI, porcine teschovirus (PTV), pandemic influenza A H1N1 2009, brucellosis and rabies in association with the OIE. In addition, the CMC–AH deployed a cross–border mission to assist five West African countries to develop a regional control strategy for ASF (Table 6). Disease investigation in the Ivory Coast was prompted by increased cattle deaths during the rainy season. A mission in Nepal is detailed in Box 3 as an example.

TABLE 6
List of FAO/OIE CMC–AH missions conducted over the reporting period

Dates	Country/Region	Disease
October 2008	The Lao People's Democratic Republic	HPAI
November 2008	Ivory Coast	Disease investigation
December 2008	Indonesia	Rabies
January 2009	Philippines	ERV
February 2009	Nepal	HPAI
February 2009	Togo	ASF
April–May 2009	Mexico	H1N1
May–June 2009	West Africa regional	ASF
June 2009	Haiti	PTV
July–August 2009	Fiji	Brucellosis

Source: FAO/OIE CMC–AH

BOX 3

FAO/OIE CMC–AH efforts to support Nepal's efforts to contain HPAI (February 2009)

Poultry is an important resource for Nepal. To help protect this resource from the threat posed by significant prevalence of HPAI near Nepal's borders, the CMC–AH fielded a two–week mission in early 2008 to help the government strengthen preparedness and response planning efforts.

Mission findings indicated that the government required additional, medium– and longer–term support, especially when noting the threat posed by poultry transport across the Nepalese–Indian border. In light of this need, the CMC–AH deployed a second mission of two months to help cover gaps while longer–term efforts funded by the World Bank were being formulated.

With support from the CMC–AH and the ECTAD team in Nepal, the government developed and institutionalized contingency operation plans that proved extremely useful when avian influenza eventually did succeed in penetrating Nepal's borders in January 2009. When the HPAI outbreak occurred, the government effectively contained the response by putting its newly enhanced capacities to work to mount a major response. Having largely brought the outbreak under control, the government then requested supplementary assistance from FAO on 28 January 2009 to assess the post–outbreak epidemiologic situation and help further strengthen the government's response capacity for future events.

The resulting CMC–AH mission concluded that the Nepalese authorities had controlled the outbreak with notable speed and efficiency owing to effective government planning and also in part to the implementation of recommendations made by previous CMC–AH missions. Noting possible gaps in response capacities for multiple outbreak scenarios or disease spread within the commercial sector, the third CMC–AH mission provided recommendations on disease investigation; control and cross–border issues; laboratory support; communication activities; and funding and resource mobilization.

Event tracking, alert and analysis – As per standard operating procedures (SOPs), the CMC–AH was placed on alert for all critical animal disease events tracked by EMPRES through the FAO–OIE WHO Global Early Warning System for Major Animal Diseases, including Zoonoses (GLEWS). During the period in question, the CMC–AH undertook event management in the form of: (i) follow–up – liaison with national, regional authorities and FAO structures; (ii) analysis of response requirements; (iii) advocacy with external parties or agencies; and (iv) close–out and stand–down procedures for the following nine events: Angola, rabies; Bhutan, HPAI; Burundi, foot–and–mouth disease; China, HPAI; Ethiopia, disease investigation (toxic plant suspected); Namibia, rabies; Nigeria, ASF; United Republic of Tanzania, PPR; and Zimbabwe, Anthrax. CMC–AH missions were not deployed as a part of FAO, OIE or partner response activities for the above–mentioned events for a variety of reasons. Missions were either: (i) not requested by the affected country nor deemed neces-

sary by FAO and partners; (ii) less strategically positioned to provide response support when compared with the other FAO units/offices; or (iii) not necessary, because remote support proved sufficient to meet situation requirements.

Other missions – CMC–AH members participated in the following strategic meetings or seminars:

- Meeting of Global Outbreak Alert and Response Network partners (GOARN) (Geneva, 16–17 April 2009): The objective of the meeting, convened by WHO, was to look at the technical and operational functions of GOARN and the Steering Committee and to make suggestions for its future development.
- Information and Communication Technology (ICT) Tools for Public Health Security (Geneva, 22–23 April 2009): This seminar brought together representatives from United Nations (UN) agencies, ICT providers, national authorities, and technical institutions to debate innovative solutions to improve preparedness and response in the public health sector. Working groups addressed the topics of: (i) threat detection, risk assessment and decision support tools; (ii) data collection, analysis, visualization and reporting; and (iii) event management and operations with a view to identifying more comprehensive and integrated ICT solutions and the right tools for different actors.
- Swedish Resource Base (Uppsala and Stockholm, 21–22 April 2009): The CMC–AH Administration Coordinator and two other FAO experts travelled to Sweden to explore opportunities for collaboration between FAO's Animal Health Programme and the Swedish Resource Base. The team worked with local organizations and technical experts to map interests and discuss compatibilities. In addition, the team presented the work of FAO's Animal Health Programme, including ECTAD and the CMC–AH. The mission laid the groundwork for continued discussions on potential arrangements for the loan of Swedish experts to future CMC–AH and ECTAD missions.

Involvement in UN pandemic preparedness – The CMC–AH actively participated in the United Nations System Influenza Coordination mechanism through its role in the United Nations Technical Working Group. The CMC–AH has further contributed to international processes and dissemination of information through its participation in teleconferences of the Humanitarian in Pandemic group and the Pandemic Influenza Coordination regional retreat held in May 2009. The CMC–AH has also made contributions to the influenza pandemic contingency and preparedness planning of FAO's Emergency and Rehabilitation Division.

Streamlining of internal CMC–AH SOPs – After an in–depth audit of operations and internal procedures, the CMC–AH team successfully synthesized the organizational description of its activities into four functional SOPs to guide future operations. Living documents constantly updated, these SOPs have helped maximize efficiency of current operations and raise key issues for future review in light of efforts to develop FAO's overall rapid response capacity.

Outbreak communication guide and toolkit development – Development of an outbreak communication guide and toolkit for animal health specialists is ongoing, based on numerous consultations with a wide range of stakeholders both at headquarters and field level. The materials were tentatively scheduled for finalization by the end of 2009.

Technical SOPs – Draft technical SOPs and guidelines have been developed including expert opinions from OIE and ECTAD at FAO headquarters and field level. They are currently being finalized with FAO and partner experts from around the globe.

Reagent contingency stock – A list of reagents is being prepared for ASF, CSF, HPAI, PPR and RVF. Possible contract arrangements for fast delivery under cold chain are being discussed.

Event Tracking and Management System (ETMS) – A prototype of the ETMS has been developed by FAO information technology experts tailored to CMC–AH needs. The ETMS will be linked–up to the EMPRES Global Animal Disease Information System (EMPRES–i). ETMS was launched in autumn 2009.

Socio–economics – Understanding social drivers of prevention and control

Understanding the social drivers, and thereby, improving the efficacy of prevention and control measures continued in 2008–2009 with increasing success. Among the three areas, the socio–economics group worked on: compensation, risk analysis and value chains, and cost–effectiveness analysis.

Based on the success of its work over the past year, the socio–economic group has had more requests to support countries, such as Myanmar, Gabon, and Sudan (south), in developing compensation strategies. This has been coupled where there are compensation plans in countries with an increased interest in developing compensation funds, and thus, in funding animal health emergencies, in a sustainable manner. The socio–economic unit is taking the lead in helping these countries develop these funds from tradition and non–traditional sources.

In collaboration with veterinary epidemiologists in the socio–economic group, initiatives to link risk analysis and market value chains are underway. Understanding the poultry production – market value chain, the dynamic supply and demand factors along the chain allows for a systematic approach to understanding where the risk of spread of disease is, which people and what motivations are involved and where interventions or surveillance could be more successful. Consequently, countries are able to target the right people and critical control points in the chain for targeted interventions, making efficient use of, often scarce, resources. A "success story" in this regard is the cross–border project between Bangladesh, India and Nepal, dealing with HPAI risk transmission associated with cross–border activities (Box 4).

Cost–effectiveness analysis has also been conducted for several HPAI control interventions, such as vaccination, surveillance and market biosecurity. Quantifying the costs of control interventions and comparing them against their outcome has supported decision–makers in selecting the effective set of different HPAI control measures competing for scarce animal health funds. Simultaneously, cost–effectiveness indicators have been developed and used to monitor the success of HPAI projects. Quantifying the costs of intervention measures such as vaccination has effectively been used by policy makers to plan and budget vaccination costs.

BOX 4

Strengthening cross– border activities among Bangladesh, India and Nepal to control possible cross–border spread of hpai

The overall objective of the programme is to contribute to the elimination of the threat posed by HPAI as a result of cross–border activities in the Gangetic Plain subregion of South Asia. More specifically, the project aims to strengthen the capacity of the countries sharing an epidemiological environment in the Gangetic Plain sub– region to deal with the risks and threat of HPAI posed by cross–border activities.

In South Asia, through the USAID funded project, FAO has initiated several poultry value chain mapping studies across common border points between India, Bangladesh and Nepal. These studies have resulted in the development of a uniform methodology generating data on risk of introduction and spread of HPAI at defined cross–border corridors agreed between the countries. The cross–border illegal trade was seen in terms of broilers (live and processed), DOCs, table eggs and live village chickens. The main actors involved included wholesalers, slaughterers, institutional consumers and individuals. The level of awareness was found quite low in the people associated with production and marketing of poultry and poultry products. The adoption of biosecurity measures by various stakeholders was also low. The key drivers identified were the demand and supply, price differential, profit, socio–cultural events and employment motives. Meetings of policy level and technical level people from Bangladesh, India and Nepal were held to initiate dialogue and exchange views over two meetings held in April and July 2009. The Government of India has also offered to provide training to the neighboring countries and support testing and characterization of HPAI viruses at OIE Reference Laboratory for HPAI at Bhopal at no cost. The member countries have agreed to strengthen the existing information sharing mechanism between governments.

Wildlife

The FAO EMPRES Wildlife Unit has significantly expanded its global activities focusing on the role of wildlife in the epidemioecology of disease emergence, persistence and transmission. Capacity building, wildlife surveillance, and migration and disease ecology projects facilitated by marking wild waterbirds with GPS transmitters has been the primary field activity undertaken over the past year to address the role of wild birds in the maintenance and spread of AI H5N1 and other pathogens. Marked birds have provided greater insight into potential movement of AI viruses from India/Bangladesh to the Tibetan plateau, to the Qinghai Lake region in China, and on to Mongolia, as AI outbreaks appeared to be temporally and spatially associated with wild bird movements in this flyway in the spring of 2009. In addition, capacity building activities in India, Bangladesh and Nigeria took place, training participants from more than 10 countries (in Africa, Near East, Asia and America) on wildlife techniques, wildlife epidemiology and surveillance, and outbreak strategies. Surveillance of wild birds also continued in multiple countries, with most all results being negative for H5N1, contributing to the more than 500 000 global wild bird samples collected thus far.

The FAO EMPRES Wildlife Unit continues to co–convene the Scientific Task Force on Avian Influenza and Wild Birds with the UNEP Convention on Migratory Species, and recently, the Wildlife Unit was asked to convene a new task force with much broader scope, "The Scientific Task Force on Wildlife Diseases and Migratory Species". In co–convening the Scientific Task force on Avian Influenza and Wild Birds, FAO has helped facilitate statements on conservation, protection of wildlife and the implications of diseases in wildlife populations. Along the lines of expansion beyond AI, the EMPRES Wildlife Unit is supporting bat disease surveillance and ecology studies in the Philippines and Southeast Asia, bushmeat and zoonotic disease transmission issues in central Africa, PPR and other transboundary animal disease surveillance in small wild ungulates in East and North Africa, a wildlife capture and sample collection training programme in Kenya for ten African countries, and development of a Wildlife Module for FETPV.

The EMPRES Wildlife Unit has also focused efforts, as part of capacity building programme at a regional and national level, to ensure that wildlife issues are now being discussed by both Ministries of Agriculture and the Ministries of Environment or Forestry. Great effort has been made to bring both of these Ministries together to address H5N1 AI, as this is an issue that encompasses both poultry and wildlife populations, with specific efforts being focused on the livestock–wildlife interface. In China, Egypt and Nigeria, efforts have been supported to more carefully examine how poultry and wildlife interact, where high risk of contact locations are, and FAO has worked with both Ministries to address issues of poultry and wild birds. There has also been some effort to address live bird market issues and market chains, where it is well known that domestic and wild birds are housed together or close to one another, again demonstrating the opportunity for virus transmission.

As human health is inextricably connected to the health of the environment and the species that share it (wildlife, livestock and humans), it has become apparent that the OWOH approach is necessary. At FAO, it is recognized that an integrated multidisciplinary approach is necessary to address the complex issues of disease emergence, food security, socio–economic stability, livelihoods and conservation. The EMPRES Wildlife Unit is an essential part of the solution.

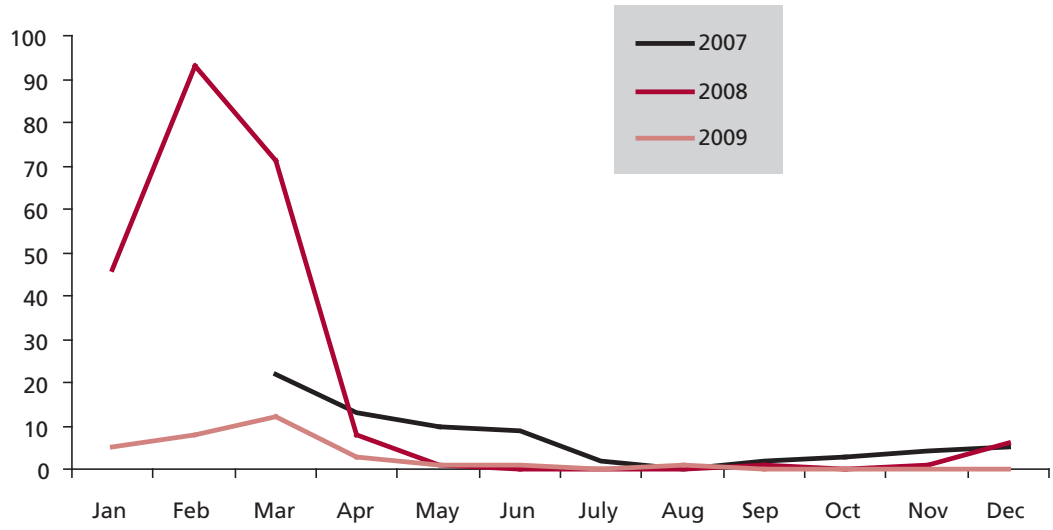
Chapter 4
Country Highlights

BANGLADESH

Disease situation overview

H5N1 HPAI was first reported in Bangladesh in March 2007 with outbreaks continuing until July 2007 and then a further two waves of outbreaks (September 2007 to May 2008 and November 2008 to June 2009) peaking in the dry months, with sporadic outbreaks in September 2008 and August 2009. FIGURE 21 shows the monthly incidence of H5N1 HPAI in 2007, 2008 and 2009. The situation over the reporting period (RP) is detailed in Chapter 1.

FIGURE 21
Number of H5N1 outbreaks in poultry over the period 2007–2009 in Bangladesh



Source: FAO EMPRES–i

With 55 outbreaks detected in the first wave, 232 outbreaks in the second wave (2007–2008) and 39 detected in the third wave (2008–2009), the HPAI situation in the country appears to have stabilized at the time of this writing, but given the persistence of HPAI, Bangladesh can be considered as endemic. The H5N1 virus in poultry has been confirmed in 47 out of 64 districts (73 percent), outbreaks are geographically widespread and appear to be linked to chicken and human population density and movement along major roadways throughout the country.

With peak HPAI activity in Bangladesh occurring in winter (wet months) (December to March) in 2008 and 2009, close monitoring of the situation over the same period in

2009–2010 will be a good indicator of whether the HPAI situation in Bangladesh has been contained or not.

It is still unclear how the H5N1 virus reached Bangladesh to initiate the first outbreaks. Molecular virology studies (comparison of virus strains and clades) suggest that HPAI may have been introduced there by wild birds during their migration along the East Africa/West Asia flyway. After the initial outbreaks, the rapid spread and persistence of H5N1 infection was most probably a result of poultry trade, owing to a combination of minimal biosecurity on small– and intermediate–sized commercial farms and in village poultry, as well as insufficient deployment of resources to rapidly detect outbreaks, control poultry movement, undertake control activities and provide adequate compensation for culled birds.

Bangladesh has a very important poultry sector, which has been growing rapidly over the last two decades (approximately 200 percent over the five years prior to HPAI[10], and this industry has clearly been devastated by HPAI. It is claimed that 40 percent of the country's 150 000 poultry farms were lost, putting half a million poultry workers out of work and causing cumulative losses of approximately US$9.75 million. Furthermore, recovery has been held back by the escalating cost of feed and other inputs.

FAO's contribution to the national HPAI response

Since 2006, FAO has been supporting the efforts of the Government of Bangladesh (GoB) to prevent and control HPAI through global, regional and country–level initiatives. As of October 2009, nine projects had directly contributed to HPAI prevention, detection and control activities there (see FAO's portfolio in Bangladesh, Table 7), with the main donors being ADB, USAID and Sweden (through its contribution to SFERA).

TABLE 7
FAO portfolio (closed and ongoing projects) in Bangladesh

Project	EOD	NTE	Donor	Total Approved Project Budget (US$)
National projects				
OSRO/BGD/902/USA	01–Sep–09	31–Oct–10	USA	3 082 800
Regional/Global projects				
Global– (OSRO/GLO/504/MUL BABY02)	01–Jan–06	31–Dec–07	Switzerland	3 696 573
Global – (OSRO/INT/805/USA BABY02)	01–Jan–09	31–Jan–10	USA	301 000
Global – (OSRO/GLO/802/USA BABY02)	01–Jan–09	31–Jan–10	USA	575 000
Regional – (OSRO/RAS/605/USA BABY01)	01–Jul–06	31–Dec–09	USA	2 590 000
Regional – (OSRO/RAS/701/USA)	31–Mar–08	31–Mar–10	USA	2 000 000
Regional – (OSRO/RAS/601/ASB)	28–Apr–06	31–Aug–10	ADB	11 140 000
Regional – (OSRO/RAS/704/SWE BABY 02)	08–May–06	31–Dec–09	Sweden	1 680 849

Source: FPMIS

[10] Shamsuddoha, Mohammad and Sohel, Mir Hossain, Problems and Prospects of Poultry Industry in Bangladesh: A Study on Some Selected Areas (14 November 2003). The Chittagong University Journal of Business Administration, Vol. 19, 2004. Available at SSRN: http://ssrn.com/abstract=1295343

FAO's technical assistance to the GoB began well before the HPAI crisis. It actively participated with WHO in the development of the first National Avian Influenza and Human Pandemic Influenza Preparedness and Response Plan (2006–2008). FAO also contributed to the second (2009–2011), now being finalized before submission for Prime Ministerial approval. Its scope has been broadened to include other influenza viruses.

Reporting of suspect cases has been enhanced since February 2008 by an active disease surveillance network and related information system (SMS gateway – Box 5) developed by GoB and FAO, and supported by FAO (ADB and USAID projects). Further FAO's assistance to surveillance consists of regional wildlife studies in India and Bangladesh, aiming at providing useful data in relation to potential H5N1 transmission via migratory wild birds that can be used in planning in–country surveillance and control activities.

BOX 5

SMS Gateway data collection in Bangladesh

Bangladesh is conducting active HPAI surveillance in 150 out of 487 subdistricts as part of an USAID–funded FAO project. A total of 450 Community Animal Health Workers (CAHW), 50 Additional Veterinary Surgeons (AVS) and 150 Upazilla Livestock Officers (ULOs) are using the Short Message Service (SMS) gateway to collect data and report on disease and death in poultry.

Since October 2008, 21 HPAI outbreaks out of a total of 35 have been detected through this active surveillance programme. The SMS reporting structure is rather simple: At the end of the working day, each CAHW sends an SMS message with the total number of all investigated poultry (chickens, ducks and other birds) and their health status (the number of sick and dead birds) to the SMS gateway system. This data is used to: (a) monitor trends in disease and mortality in poultry; and (b) monitor who is working that day. Additionally, CAHWs send flash reports by SMS on suspected outbreaks according to a case definition. The system then automatically contacts the ULO in the same area by SMS, who initiates an investigation by sending an AVS or visits the suspected outbreaks him/herself. After the investigation, the ULOs and AVS send a SMS message to the gateway server to declare the suspected outbreak as negative or report that it may require further (diagnostic) tests. Initially a Gateway server receiving these messages was located at the Department of Livestock Services in the capital, Dhaka. Currently the system is internet based. Specialized staff monitors changes in mortality and morbidity rates and perform spatial and temporal analysis against concurrent HPAI outbreaks and monitor the number of suspect cases and the results of the investigations of ULOs and AVS. The results are submitted to the Chief Veterinary Officer, used in workshops to sensitize staff and farmers, at donor meetings and in periodic project reporting. This real–time reporting using SMS has been contributing to effective HPAI outbreak response and control. The key to its success may be the simple approach and clearly defined work–sharing by using familiar tools (mobile phones).

FAO does not currently support Bangladesh with regard to response to outbreaks where vaccination is not permitted. However, in response to the first outbreaks that occurred in March 2007, the CMC–AH deployed a mission in April 2007 to work with veterinary services, poultry producers and veterinary professionals, as well as local leaders, in order to help develop plans for potential outbreak response efforts.

After the outbreaks in early 2007, diagnosis of HPAI was made possible thanks to the facilitating role played by FAO, notably through OFFLU in dispatching samples to reference laboratories abroad (Veterinary Laboratories Agency, Weybridge) for genetic and antigenic characterization and in the successful setting up of the technical unit for Avian Influenza within the premises of DLSs of the GoB.

FAO supported, in collaboration with Development Alternatives Inc. (USAID project), the development of practical guidelines for biosecurity training in the commercial poultry sector and for improvement of hygiene and biosecurity at LBMs. Pilot cleaning, disinfection and pressure washing at several LBMs in Dacca are also part of the activities. FAO encourages closer interaction and partnerships between the public and the private sectors, including small– and large–scale commercial poultry farms, animal health companies and NGOs.

In 2008, FAO carried out a "Rapid assessment of socio–economic impact because of highly pathogenic avian influenza in Bangladesh", which estimated that direct losses associated with HPAI outbreaks in Bangladesh, based on official reports of birds that had died or been culled and of eggs destroyed, amounted to US$9.88 million (indirect losses making the amount much higher). Other socio–economic work from FAO consists of understanding poultry dynamics across the common borders of Bangladesh, India, Nepal and Myanmar, with the intention of improving ways to manage cross–border trade to minimize the risk of HPAI incursion and/or spread (USAID project). FAO also contributes to establishing an effective database of the poultry industry (geo–referencing of commercial poultry farms and LBMs) as an important step in attempting to improve the industry structure (Sweden project).

Table 8 includes a timeline of FAO main activities in Bangladesh.

TABLE 8
FAO main activities over the period (2007–2009) in Bangladesh

Year	Activities
2007	• Supplied rapid antigen detection kits and emergency reagents for national reference laboratories and field laboratories. • Contributed to the development of the national communication strategy for avian and pandemic influenza (2008–09). • Supported the government in developing an operational manual. • Supported the BRLI laboratory in developing a protocol for HPAI diagnosis using PCR. • Supported the government in establishing an epidemiology unit. • Fielded an international consultant to recommend plans for strengthening epidemiology capacity. • Supported the government in sending the first batch of virus samples overseas to confirm index case. • Fielded a FAO/OIE CMC–AH mission after the first outbreak. • Formulated a laboratory working group to coordinate laboratory activities. • Deployed a laboratory engineer and a microbiologist to develop plans for laboratory upgrades. • Developed a three–year operational matrix to coordinate HPAI activities in the country. • Developed an active surveillance project. • Developed a wet market communication pilot project. • Established (in late 2007) a national ECTAD unit at DLS.
2008	• Supported the government in epidemiological investigations. • Supported NAIRL with additional laboratory staff. • Conducted meetings of the laboratory working group. • Established the SMS Gateway system. • Participated in the development of the Animal Diseases Rules (Under the Bangladesh Animal Diseases Act of 2005). • Participated in the development of the 2nd National Avian Influenza Preparedness and Response Plan (NAIPRP).
2009	• Participated in the revision of the 2nd NAIPRP to include H1N1 and other influenza diseases. • Continued and expanded active surveillance and use of the SMS Gateway system. • Conducted outbreak investigations for Foot and Mouth Disease. • Prepared biosecurity guidelines for backyard poultry. • Strengthened national capacity in veterinary epidemiology through overseas training of DLS staff. • Initiated geospatial mapping of commercial farms and markets. • Supported the creation of a biosecurity manual for commercial poultry (PPP). • Started work on live bird market cleaning and decontamination.

Source: RTE2

Country capacity: progress achieved over the reporting period and remaining gaps

The result of the country survey assessing six key topics and progress achieved over the RP in Bangladesh, are summarized in TABLE 9 below:

TABLE 9
Evolution of six key aspects over the reporting period in Bangladesh

Activity/Indicator	Assessment (as of December 09)	Evolution over the RP	FAO's contribution to this result	
			Over the RP	Since 2004
Preparedness	3	➔	S	S
Surveillance	4	↗	S	S
Response	5	↗	S	S
Laboratory capacity	5	↗	C	C
Compensation	5	↗	NC	S
Biosecurity	2	➔	C	C

Legend

Level: 1 = very poor; 2 = poor; 3 = fair; 4 = good; 5 = excellent

Contribution: S = significant; C = collective (with other partners and or the country); NC = no contribution*

Evolution:
↗ = capacity has increased;
➔ = capacity remains unchanged;
↘ = capacity has decreased

Source: FAO country survey

** no contribution, either because (i) Level is 5, no more work is required; or (ii) Level is < 5, because it is not a priority for the country.*

The "National Avian Influenza and Human Pandemic Influenza Preparedness and Response Plans" for 2006–2008 and 2009–2011 were drawn up by a multisectorial team and are comprehensive and well detailed. A companion Avian Influenza Operational Manual is also available and provides operating procedures for HPAI prevention, response, recovery and restocking. However, there are still inadequate human and financial resources to implement it properly and the private sector is not sufficiently involved.

Since February 2008, active surveillance has been complementing the passive surveillance already in place and the overall surveillance system has improved over the RP. Staff have been trained for this purpose. However, there is still room for further improvement because there is very limited epidemiology capacity to support risk analysis–based surveillance, notably at the wild bird/domestic poultry interface and in duck flocks. Sensitivity and specificity of the active and passive surveillance can also be improved.

Laboratory capacity is well developed in Bangladesh. The initial laboratory testing is conducted by the Central Disease Investigation Laboratory (CDIL) and eight regional Field Disease Investigation Laboratories (FDIL) that are strategically located throughout Bangladesh. They conduct rapid Influenza A antigen detection tests and positive samples are then submitted to NAIRL for testing and confirmation by real time RT–PCR tests (further characterization of the virus is not possible). Over the RP, laboratory staff received extensive training in HI and PCR testing, both in–country and abroad. Eleven suspected H5N1 samples from Bangladesh are planned to be submitted to IZSVe early 2010 for confirmation and whole genome sequencing.

Response is based on stamping out measures aimed at infected flocks and surrounding holdings (in the case of backyards) with enhanced surveillance on neighbouring farms and at markets. Vaccination is not currently permitted. At present, outbreak management is properly carried out; however with the persistence of outbreaks in 2008 and 2009, the resources available for control by stamping out likely become over–stretched and the possible use of targeted vaccination as part of the control options is now under consideration. Quality of outbreak investigations are to be improved.

The Bangladesh Avian Influenza Compensation Strategy and Guidelines were developed and implemented, and reported infected flocks were properly (in accordance with the guidelines) and timely compensated over the RP. However, compensation relies on external support and is subject to sustainability issues. The level of compensation is also debatable and involvement of the private sector in the development and update of these guidelines is highly desirable.

Biosecurity measures are implemented in sector 1 and to a certain extent in sector 2, but remain poor or even inexistent in sectors 3 and 4 and at LBMs, with no specific improvement over the RP. Registration of farms currently appears to be voluntary, with no restriction applied to unregistered farms or small family farms; as a result, any enforcement of biosecurity measures is unlikely to be effective.

In Bangladesh, the poultry industry is a core ingredient to processes of economic growth, food security and overall poverty reduction and, in this regard, the socio–economic impact caused by HPAI needs to be further explored, addressed and highlighted. A better understanding of the dynamic market value chains needs to be continued.

Conclusion

FAO is seen and recognized as the lead institution in supporting Bangladesh's efforts towards HPAI preparedness and response. The importance of FAO in the HPAI arena has been felt since HPAI was first reported in Bangladesh, and it has matured over time, in particular over the last 12–month period. Some progress has been achieved over the RP, mainly in terms of surveillance, laboratory capacity and response, with a significant contribution from FAO. This is translated into the apparent decline in outbreaks over the last year. However, overall capacity to prevent and control HPAI is still suboptimal and requires sustained efforts and commitment.

INDONESIA

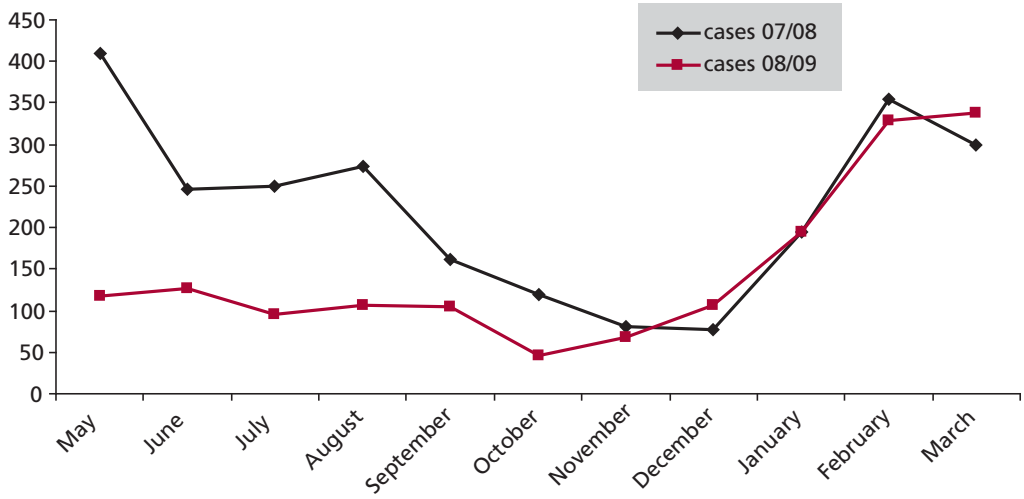
Disease situation overview

Even though Indonesia submitted its first HPAI outbreak notification in January 2004, HPAI was suspected as early as in August 2003 in a commercial layer flock. By December 2004 poultry deaths were estimated to be more than eight million in over 100 districts/cities. By the end of 2005, the disease had spread to 23 provinces covering 151 districts/cities and registered over 10.45 million poultry deaths. By June 2009, 31 of the country's 33 provinces had been affected.

The disease is indeed considered endemic in Java, Sumatra, Sulawesi and Bali (i.e. provinces where active cases have been reported in the last six months). No cases have been reported since January 2009 in Kalimantan, while Maluku, Papua and Nusa Tenggara have reported no cases since January 2008. The situation over the RP is detailed in Chapter 1.

In 2009, Indonesia reported more than one thousand outbreaks in domestic poultry, qualifying the country as the most infected country in the world. However, caution is required as the recording system differs from other countries; since the introduction of PDSR programme in 2006 (with revisions in 2008), data are collated at farm or sub–village level (FIGURE 22).

FIGURE 22
PDSR HPAI Surveillance case numbers – 07/08 (old database), 08/09 (new database)



Source: RTE2

The first human influenza case from H5N1 was confirmed in June 2005. This and other cases in the ensuing months precipitated a heightened awareness and concern over the potential impacts of HPAI in Indonesia and beyond. As of December 2009, 155 human cases had been confirmed, with 129 fatalities. The absolute risk of humans becoming infected is low, but the relative risk when compared to other countries is high.

The persistent spread and incidence of the disease in both animals and humans has been blamed on the complexity and size of the Indonesian poultry sector, the weak capacity of government agencies to deal with animal diseases, the relatively late recognition

and support provided by donor partners and, ultimately, in the entrenched risky behaviour limiting the success of prevention and intervention campaigns.

FAO's contribution to the national HPAI response

FAO is by far the most active agency supporting the Government of Indonesia in controlling HPAI (funded by USAID, AusAID, Japan and the Netherlands). FAO has implemented a sizeable and varied portfolio of activities in the country (Table 10), ranging from high level advocacy and policy work to conducting active field surveillance for early detection and control of disease outbreaks. The PDSR component of the USAID–funded project (OSRO/INS/604/USA) has been by far the major component of the FAO HPAI programme in Indonesia since 2006, and most of FAO's contributions listed below have been carried out under the PDSR programme. Several projects funded also by USAID, AusAID and the Government of Japan have partly or fully supported the implementation of the PDSR programme over the past four years.

TABLE 10
FAO portfolio (closed and ongoing projects) in Indonesia

Project Symbol	Actual EOD	Actual NTE	Donor	Total Budget in US$
National projects				
TCP/INS/3001	2004–02	2005–12	FAO	388 170
OSRO/INS/402/GER	2004–03	2004–09	Germany	61 000
GCP /INS/077/AUL	2006–03	2007–12	Australia	1 666 910
OSRO/INS/604/USA	2006–06	2009–09	USA	25 200 000
OSRO/INS/701/AUL	2007–06	2010–06	Australia	8 365 333
OSRO/INS/703/USA	2007–10	2009–09	USA	1 630 500
OSRO/IND/802/USA	2008–09	2009–09	USA	720 000
OSRO/INS/803/WBK	2008–12	2009–08	World Bank	467 874
OSRO/INS/804/WBK	2008–12	2009–08	World Bank	1 156 052
Regional/Global projects				
TCP/RAS/3004	2004–02	2006–01	FAO	384 231
TCP/RAS/3006	2004–03	2006–02	FAO	394 668
RAS/401/JPN	2004–03	2005–11	Japan	1 610 083
TCP/RAS/3010	2004–04	2005–09	FAO	398 307
TCP/INT/3010	2004–11	2006–07	FAO	370 052
OSRO/INT/501/NET	2005–04	2007–12	Netherlands	629 238
OSRO/RAS/505/USA	2005–09	2007–03	USA	6 000 000
OSRO/GLO/504/MUL BABY01	2005–12	2007–04	Norway	3 506 326
OSRO/GLO/504/MUL BABY02	2006–01	2007–12	Switzerland	3 696 573
OSRO/GLO/601/SWE BABY01	2006–03	2009–12	Sweden	6 604 494
OSRO/RAS/601/ASB	2006–04	2010–08	ADB	7 990 000
OSRO/RAS/602/JPN	2006–04	2008–04	Japan	11 400 052
GCP /RAS/221/JPN	2006–09	2011–08	Japan	658 658
OSRO/GLO/802/USA	2009–01	2009–09	USA	2 500 000

Source: FPMIS

FAO's interventions in Indonesia cover a wide range of areas, notably emergency preparedness, disease surveillance and early detection, control and containment, vaccine efficacy, operational research and socio–economic studies, communication, advocacy and policy advice. Capacity building functions are central to the role that FAO is playing in responses to HPAI, notably with regard to the strengthening of local animal health structures (veterinary services reinforcement).

In late 2005, FAO had active participation in the design of the National Strategic Work Plan (NSWP) covering 2006–2008 (animal health component). A FAO–sponsored review of the NSWP took place in mid–2007. While the general principles of the Plan remained valid, FAO advocated for an increased support towards biosecurity, harmonized disease reporting, and proposals have been made to the Government of Indonesia for a Phase 2 Strategic Work Plan for the period 2009–11. In May 2008, FAO also participated in the drafting of a strategy document "Issues for control of HPAI in Indonesia – a strategic approach for Government of Indonesia", which proposes a more comprehensive framework for disease prevention, detection and control in Indonesia.

In terms of surveillance, FAO supported the Ministry of Agriculture in 2006 to implement a pilot PDSR programme with the objective of training and operationally supporting government veterinarians and other animal health officers in rapid HPAI detection and response. While surveillance was the primary focus of the PDSR, other activities were conducted, notably outbreaks management (culling, decontamination, movement control, restructuring). FAO conducted several assessments of the PDSR, which indicated that sectors other than the backyard poultry sector play critical roles in the dynamics and maintenance of HPAI in Indonesia. As a result, FAO made the necessary adjustments to consider the broader disease dynamics in and across all the Indonesian poultry enterprises. A strong epidemiology capacity is a major outcome of FAO's work in Indonesia.

In late 2006, with funding from USAID and the World Bank, FAO contributed to an Operational Research project together with ILRI, whose aim was to evaluate the impact of a series of alternative control scenarios in the backyard poultry of sector 4, in order to make an evidence–based choice regarding an efficacious package of control options that were practical and achievable in the Indonesian context.

FAO through OFFLU has been active in the development of genetic analysis and antigenic profiling of H5N1 viruses in Indonesia, and to enhance H5N1 AI vaccine strain selection (proficiency tests). The OFFLU vaccine efficacy project also included project advocacy within the Ministry of Agriculture, laboratory training for Indonesian laboratories, procurement of supplies and equipment, and coordination of introductory workshops on molecular and antigenic analysis for more than 35 Indonesian scientists.

A well–planned strategic framework for communication was developed in Indonesia by FAO and CBAIC, in which target audiences, methods to access them and expected impacts are clearly articulated. A media fellowship project funded by Canada has been implemented in Indonesia to improve reporting on avian influenza news. FAO also supported behavioral changes in rural areas, using the infrastructure and partnerships put in place by the PDSR programme and developing very innovative and quality materials.

The poultry sector has been strongly impacted by HPAI and besides losses in the form of millions of poultry deaths, industry representatives have reported several associated mar-

ket shocks over the past three years in sectors 1–3. FAO conducted several studies on the impact of HPAI in Indonesia. FAO is expected to be part of the Road Map for restructuring the sector prepared by the poultry industry (Indonesia Poultry Association).

Country capacity: progress achieved over the reporting period and remaining gaps

The result of the country survey assessing six key topics and progress achieved over the RP in Indonesia are summarized in Table 11 below:

TABLE 11
Evolution of six key aspects over the reporting period in Indonesia

Activity/Indicator	Assessment (as of December 09)	Evolution over the RP	FAO's contribution to this result	
			Over the RP	Since 2004
Preparedness	3	↗	NC	NC
Surveillance	4	↗	S	S
Response	2	→	C	S
Laboratory capacity	4	→	C	C
Compensation	1	→	NC	S
Biosecurity	2	→	NC	NC

Legend

Level: 1 = very poor; 2 = poor; 3 = fair; 4 = good; 5 = excellent

Contribution: S = significant; C = collective (with other partners and or the country); NC = no contribution*

Evolution:
↗ = capacity has increased;
→ = capacity remains unchanged;
↘ = capacity has decreased

Source: FAO country survey

** no contribution, either because (i) Level is 5, no more work is required; or (ii) Level is < 5, because it is not a priority for the country.*

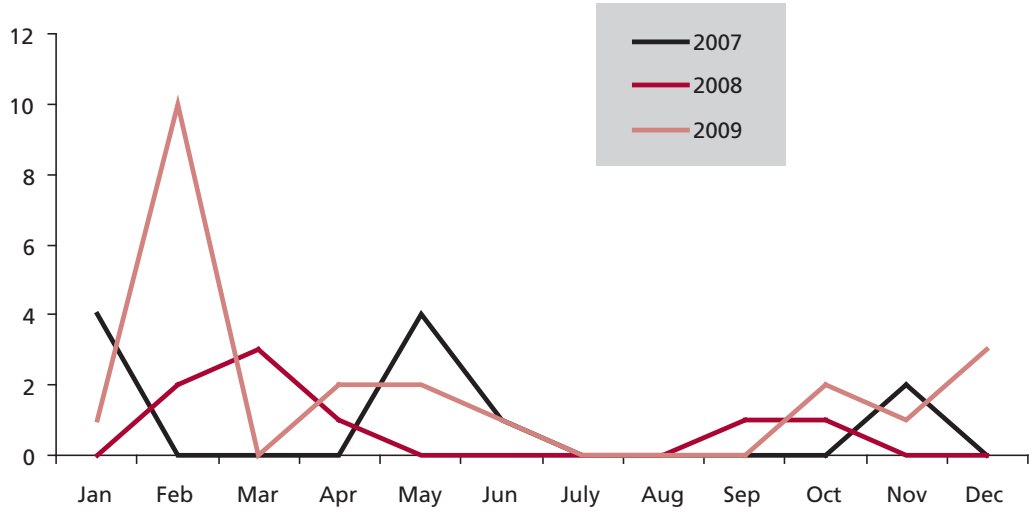
VIET NAM

Disease situation overview

Viet Nam was one of five countries in Southeast Asia affected in the first wave of the H5N1 HPAI epidemic in late 2003 and initially was one of the worst affected countries. As of December 2009, the disease is enzootic in poultry and will not be fully controlled in the short term.

Between December 2003 and March 2004, preceding the Tet festival, 24 percent of Viet Nam's communes and 60 percent of towns were affected in 57 out of Viet Nam's 64 provinces. At the peak of the epidemic in early 2004, around 17 percent of Viet Nam's poultry population died or was culled. Scattered outbreaks and a small number of human cases continued through November 2004.

FIGURE 23
Number of H5N1 outbreaks in poultry over the period 2007–2009 in Viet Nam



Source: GLEWS

A second wave of outbreaks occurred between December 2004 and March 2005, again just prior to the Tet festival. This affected 670 communes, resulting in two million poultry being culled and 64 human cases (21 fatal). Scattered outbreaks and a small number of human cases were detected through to the middle of the year.

A third wave occurred between October and December 2005 affecting 276 communes and resulting in four million poultry being culled and two human cases. Studies on the spatial and temporal patterns of the disease indicated that crop–livestock farming systems involving domestic water birds and rice production in river delta areas were important in the maintenance and spread of infection.

After commencing mass vaccination in December 2005, there appeared to be a measurable impact, and no H5N1 outbreaks in poultry or human cases were detected until late 2006 when a fourth wave of HPAI occurred (from December 2006 to January 2007), mainly affecting 12 provinces in the south. However, this may well have reflected the seasonal variation in HPAI incidence.

A fifth wave of disease occurred from May to September 2007, mainly affecting 22 provinces in the north (but not only the north). Although there were minor epidemic peaks in February and March 2008 and 2009, there were also sporadic outbreaks reported in 27 provinces in 2008.

There has been a progressive reduction in outbreaks officially reported each year. From October 2007 to October 2009 there was a higher proportion of outbreaks occurring throughout the year, rather than just in the wet months, than had been the case in previous years (Minh *et al.*, 2009[11]). Figure 23 shows the monthly incidence of H5N1 HPAI in 2007, 2008 and 2009. The situation over the RP is detailed in Chapter 1.

Temporal and spatial analysis of HPAI dynamics suggests that infection is being maintained in the north and south of the country, and there is substantial variability in the dynamics within the country. Between 2007 and 2009 there were 18 human cases (14 of which were fatal).

The initial H5N1 HPAI outbreaks in Viet Nam, Thailand, the Lao People's Democratic Republic and Cambodia were caused by Z genotype H5N1 viruses with clade 1 HA gene lineage. Phylogenetically, these viruses are closely linked to viruses isolated in Yunnan Province, China, in 2002 and 2003. There has been sporadic detection of H5N1 viruses from other clades (clades 3 in 2001, 5 in 2003, 0 in 2005, 8 in 2005 and 2.3.2 in 2005 to 2007) from surveillance samples. In 2007 and 2008 there was an incursion of clade 2.3.4 H5N1 viruses, closely related to those in southern China, and these caused a number of HPAI outbreaks in the north of Viet Nam and later some outbreaks in the south. Virological studies have also demonstrated some reassortment between clade 1 and clade 2.3.4 viruses in Viet Nam. In 2008 an incursion of clade 7 virus was detected in surveillance samples from the north of the country.

The HPAI outbreaks in Viet Nam have generally been associated with very high mortality in chickens and ducks by both clade 1 and clade 2.3.4 viruses. However, virulence studies have shown a marked age related variation in virulence of these viruses in ducks, showing high mortality in ducks under 12 weeks, and very low mortality (but still with high levels of virus shedding) in ducks over 20 weeks of age. This is further complicated with the clade 7 viruses, which have been shown to cause HPAI in chickens, but with a more protracted disease course. Furthermore these do not cause death in ducks, and there is minimal virus shedding in infected ducks.

FAO's contribution to the national HPAI response

Viet Nam has been considered a priority country by FAO and, consequently, FAO has been substantially supporting the Government of Viet Nam (GoV) in its efforts to combat HPAI, shortly after the initial confirmed outbreaks in December 2003. As in many other countries affected by HPAI, the immediate response to the crisis was funded through FAO TCPs, as this is generally the quickest way to initiate action at country level. Subsequent HPAI support to Viet Nam has been funded primarily by WB, USAID and Japan, the UN Joint Programme on Avian Influenza, and Ireland. The list of FAO–implemented projects in Viet Nam can be found in Table 12 below.

[11] Minh, P., Morris, R.S., Schauer, B ., Stevenson, M., Benschop, J., Nam, H., Jackson, R., 2009. Preventive Veterinary Medicine, 89, 16–24.

TABLE 12
FAO portfolio (closed and ongoing projects) in Viet Nam

Project	EOD	NTE	Total approved project budget (US$)
National projects			
National – (UTF /VIE/034/VIE)	12/12/2007	11/12/2010	1 040 000
National – (OSRO/VIE/701/UNJ)	01/01/2007	31/12/2010	2 056 753
National – (OSRO/VIE/501/UNJ)	01/11/2005	31/07/2006	2 017 062
National – (TCP/VIE/3003)	04/02/2004	31/01/2006	359 039
National – (OSRO/VIE/601/IRE)	01/08/2006	31/05/2007	321 042
National – (OSRO/VIE/801/USA)	01/10/2008	30/03/2011	4 000 000
National – (OSRO/GLO/504/MUL Baby 08)	31/12/2005	31/12/2009	500 000
Regional projects			
Regional – (TCP/RAS/3004) – B01	01/02/2004	31/01/2006	43 876
Regional – (OSRO/RAS/604/USA) – B06	01/08/2006	30/09/2010	9 475 000
Regional – (OSRO/RAS/505/USA)	01/09/2005	31/03/2007	6 000 000
Regional – (OSRO/RAS/401/JP) – B04	01/03/2004	30/11/2005	196 324
Regional – (OSRO/RAS/602/JPN)	01/04/2006	31/12/2009	11 400 052

Source: FPMIS

FAO's work on HPAI in Viet Nam has been generally strategic and has focused in broad terms on five areas: disease surveillance, communications, biosecurity, laboratory diagnosis and applied research (to date, there has been limited funding for biosecurity or communications). The activities conducted by FAO in Viet Nam are mostly underpinned by the "Green Book", which outlines the activities necessary to achieve the objectives of the Integrated National Plan for Avian Influenza Control and Human Pandemic Influenza Preparedness and Response (Red Book). In this regard, FAO has supported the "Green Book" implementation in full cooperation with the government.

FAO assisted Viet Nam's preparedness and planning for HPAI by playing (World Bank/FAO cooperative programme) a leading role in the development of the National Action Plan for the Control and Eradication of Avian Influenza in March 2004 and of the Green Book in May 2006 (together with WHO, UNDP, UNICEF and the World Bank) and to its update (2011–2015).

FAO enhanced epidemiology capacity in Viet Nam through the provision of training in field epidemiology for disease investigation and surveillance as early as 2004 and further supported through the Applied Veterinary Epidemiology Training (AVET) programme (modelled on the FETPV programme). In addition, epidemiology units were set up at the central level and in regional offices.

In terms of disease surveillance, a major contribution from FAO projects has been to develop Standard Operating Procedures (SOPs), now in place in all provinces and the more recent revision and structuring of SOPs with appropriate Job Cards that are being tested in pilot provinces before adoption nationwide. As a result, in addition to increased passive

surveillance, a considerable amount of disease awareness, biosecurity and personal safety training has been given at the district and commune levels.

The laboratory diagnostic capacity for AI in Viet Nam has been greatly enhanced and has been well supported by FAO and partners. This support has contributed to improved facilities with proper biosecurity and biosafety practices, equipment, training support and introduction of standardized SOPs, PCR equipment and PCR and HI test reagents in the national laboratory and six regional laboratories with a wide geographic spread throughout Viet Nam. Through OFFLU, selected viruses are regularly sent to international reference laboratories (CDC, AAHL and HKU before 2008, since then viruses have been sent from NCVD to CDC and AAHL) for genetic and antigenic characterization and phylogenetic analysis.

FAO has been advocating for a more targeted vaccination approach focused on Red River and Mekong Deltas rather than country–wide vaccination. This targeted approach, where veterinary services and infrastructure could be rationalized and considered more effective, was rejected by GoV and provincial leaders, initially.

Risk reduction through biosecurity was apparently a latecomer to Viet Nam and it is only relatively recently that FAO has become re–engaged in this aspect. FAO supports a biosecurity working group, training modules on risk assessment and management targeting district veterinary staff, value–chain studies, a poultry atlas and other studies assessing biosecurity standards, and could play a further role in facilitating the process.

FAO supports the long–term objective of the rehabilitating of the poultry industry in Viet Nam projects. FAO has carried out several value–chain studies to improve the understanding of the poultry industry. Very strategic contributions have been made through the DFID supported Pro–Poor HPAI risk reduction project.

Country capacity: progress achieved over the reporting period and remaining gaps

The result of the country survey assessing six key topics and progress achieved over the RP in Viet Nam are summarized in Table 13 below:

TABLE 13
Evolution of six key aspects over the reporting period in Viet Nam

Activity/Indicator	Assessment (as of December 09)	Evolution over the RP	FAO's contribution to this result	
			Over the RP	Since 2004
Preparedness	3	↗	S	S
Surveillance	4	↗	S	S
Response	4	→	C	S
Laboratory capacity	4	→	S	S
Compensation	2	→	NC	S
Biosecurity	2	↗	NC	S

Legend

Level: 1 = very poor; 2 = poor; 3 = fair; 4 = good; 5 = excellent

Contribution: S = significant; C = collective (with other partners and or the country); NC = no contribution*

Evolution:
↗ = capacity has increased;
→ = capacity remains unchanged;
↘ = capacity has decreased

Source: FAO country survey

** no contribution, either because (i) Level is 5, no more work is required; or (ii) Level is < 5, because it is not a priority for the country.*

A National Preparedness Plan in Response to the Avian Influenza Epidemic H5N1 and Human Influenza Pandemic and subsequent policy measures, in line with the FAO/OIE/WHO global strategy, were developed in 2006, after a contingency plan was first put in place in 2005. Financial and human resources allocated to the operationalization of the Plan remain insufficient, the involvement of the private sector is inexistent and, overall, the skills and competency of veterinary services need to be further reinforced, at the local level in particular.

Both active and passive surveillance are carried out at farm and commune level, by farmers and a network of CAHWs, supplemented by active virological surveillance at markets and in slaughterhouses in some provinces. A hotline system has also been put in place to facilitate the reporting of outbreaks. Over the RP, a considerable amount of awareness and training has been provided at the commune level with, as a result, an improvement in the overall surveillance system. Cost–effectiveness of surveillance is currently ongoing. Thoroughness in disease investigation is required with analysis.

The laboratory diagnostic capacity for HPAI in Viet Nam has been greatly enhanced over the past years, with improved facilities, good laboratory practices, equipment and regular training support. One national and eight regional laboratories perform HI and real–time PCR testing and serological monitoring for post–vaccinal antibody response. Overall laboratory capacity is good and remained unchanged over the RP.

Response has consisted of a combination of focused culling of infected birds and mass vaccination conducted twice a year since December 2005, with post–vaccine monitoring in place. Recent SOPs for rapid response have been produced (and subsequent training courses have taken place) and overall response is assessed to be efficient. However, outbreaks need to be investigated further to identify the source of infection and spread. Mass vaccination is expensive and there has been a "burn–out" of personnel after four years of vaccination. There is also thought to be substantial variation in vaccination coverage between provinces and production systems. Vaccine efficacy trials are also currently being conducted. Viet Nam is now considering a more strategic vaccination programme.

There is a compensation scheme, but the value given is less than market value (the government states at least 70 percent of the market value), and the payments are reportedly often delayed, resulting in many people selling off sick birds, destroying birds and not reporting disease. No progress has been achieved on improving the compensation practices over the RP.

The biosecurity level is good in sectors 1 and 2, and poor in sectors 3 and 4 and LBMs. A campaign on the benefit of the implementation of biosecurity measures at farm level has been conducted with no tangible positive results yet. A biosecurity working group has recently been put in place to develop and compile a considerable amount of technical material targeted at commercial poultry farmers; however, the trends in adoption of improved biosecurity and good poultry production practices are very low. Hatchery and breeding farm registration is being tested in one district.

Restructuring of the poultry industry is being discussed and requires a socio–economic scheme that better formalizes the production and marketing systems and, at the same time, protects the livelihoods of small–scale producers.

Conclusion

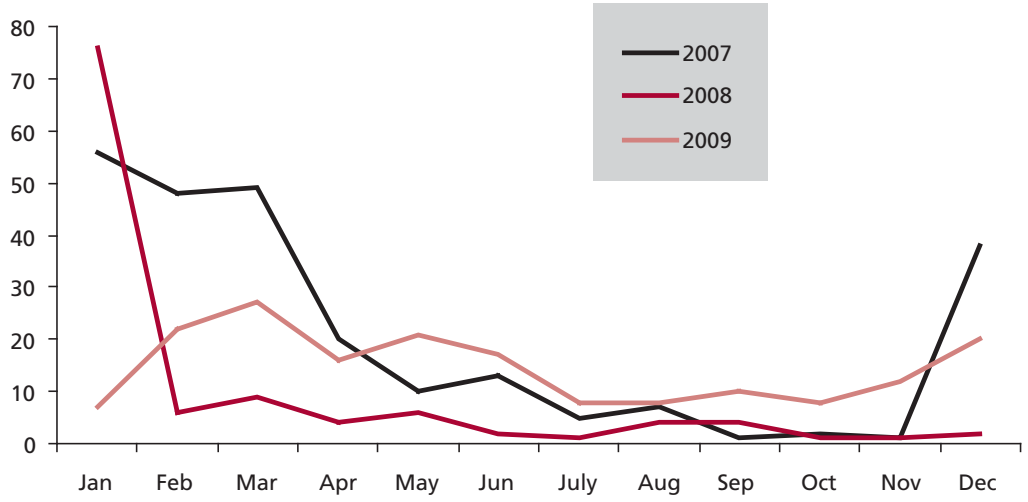
Owing to several factors (the stronger role of the central government, the fact that HPAI is now a more mature problem, high recent staff turnover and increased focus on operations), FAO is probably a less influential player, as it was in 2004–2006, in the national policy debate than it is in other countries where the disease is endemic. However, FAO has been involved with the GoV now for a number of years, and the period has been characterized by a progressively maturing partnership. As a result, FAO has, on the whole, successfully interpreted GoV aspirations and ideals, and provided a set of broad strategic technical contributions that have resulted in balanced and effective programmes. The integral link with the Green Book, and FAO's contributions to this (along with other independent contributors), have helped to cement this partnership. Several gaps in knowledge and understanding of critical control points for HPAI prevention and control remain, in spite of progress achieved over the RP in terms of surveillance and biosecurity awareness.

EGYPT

Disease situation overview

Egypt lies along the main migratory route between Asia, Europe and Africa for many migratory birds. The introduction of HPAI into Egypt probably occurred some months before the simultaneous reporting of 18 positive cases in three governorates on 17 February 2006. Since the first cases of H5N1 viruses were reported, the virus has been detected in 21 (out of 27) governorates. OIE and FAO consider the disease "endemic", with periodic outbreaks detected throughout the country. FIGURE 24 shows the monthly incidence of H5N1 HPAI in 2007, 2008 and 2009.

FIGURE 24
Number of H5N1 outbreaks in poultry over the period 2007–2009 in Egypt



Source: GLEWS

The first case of HPAI in humans was reported in March 2006. As of October 2009, there had been more than 3 000 suspected human cases admitted to hospitals, of which 89 were confirmed (over 70 percent of which occurred in women), with 27 fatalities. Egypt has one of the highest number of confirmed human cases in the world, after Indonesia and Viet Nam. There is an unusual pattern of bird flu cases in Egypt, affecting primarily toddlers, without recorded mortalities. The country has been identified by WHO as a high–risk setting for human pandemic influenza.

FAO's contribution to the national HPAI response

The FAO AI programme started as early as November 2005 – before Africa was infected – with a regional project intended to reinforce cooperation and strategy harmonization in the Middle East, and to strengthen the capacity to generate and share HPAI disease intelligence, in the perspective of a possible introduction of the virus in the region through migratory birds or trade (TCP regional project). At that time, FAO relied on global projects (mainly Swedish funds allocated to SFERA) to initiate surveillance and capacity building,

before a comprehensive portfolio was developed. FAO's HPAI portfolio operating in Egypt is presented in Table 14. FAO's major project in Egypt is the USA–funded Strengthening Avian Influenza Detection and Response (SAIDR) project (Box 6), with ambitious objectives and multi–focus activities. The project was largely latent for the first 18 months, and most of the activities illustrated in Box 6 were conducted over the RP.

FAO strongly supported preparedness in Egypt by providing technical assistance and advice to national authorities on strategies and structures to deal with HPAI, notably in the first year that the disease occurred. A first "Rapid Assessment of Country Preparedness in Egypt" was commissioned to a national consultant (global multi–donor project) in April 2006, followed by a four–month mission by an epidemiology expert with the purpose of reviewing, assessing and making recommendations on strategies to prevent and control HPAI in the country and another consultant to review and develop a strategy for the strengthening of the General Organization of Veterinary Services. In 2009 at the request of the GoE, in view of the recent increase in human cases, FAO together with WHO and UNICEF, fielded a joint assessment mission to look into strategic, management and governance issues hampering the effectiveness of control activities. This joint assessment provided the government and FAO programme with an opportunity to draw attention to policy level issues hampering effective HPAI control. Results are still awaited, but follow–up intervention from FAO is expected.

TABLE 14
FAO portfolio (closed and ongoing projects) in Egypt

Project	EOD	NTE	Donor	Total approved project budget (US$)
National projects				
National – (OSRO/EGY/801/USA)	09–Jun–08	29–Sep–10	USA	2 416 500
National – (OSRO/EGY/701/USA)	01–Oct–07	30–Sep–10	USA	9 000 000
Regional and global projects				
Regional – (TCP/RAB/3006)	01–Nov–05	31–Oct–07	FAO	333 711
Regional – (TCP/RAB/3005)	01–Nov–05	31–Oct–07	FAO	310 230
Global – (OSRO/GLO/504/MUL BABY04)	01–Jan–06	30–Apr–07	France	5 930 420
Global – (OSRO/GLO/601/SWE BABY01)	30–Mar–06	31–Dec–09	Sweden	6 604 494
Global – (OSRO/GLO/604/UK) child	29–Mar–07	31–Mar–10	UK	5 388 655
Global – (OSRO/GLO/601/SWE BABY02)	28–Apr–06	31–Dec–09	Sweden	3 418 047
Global – (OSRO/GLO/504/MUL BABY06)	31–Jan–06	31–Jan–07	Saudi Arabia	1 000 000
Global – (GCP /INT/010/GER)	15–Aug–06	15–Nov–09	Germany	2 563 665
Regional – (OSRO/RAB/701/SWE)	28–Nov–07	31–Dec–09	Sweden	2 452 234
Global – (OSRO/INT/805/USA BABY03)	01–Jan–09	31–Jan–10	USA	312 000
Global – (OSRO/GLO/802/USA BABY01)	01–Jan–09	31–Jan–10	USA	575 000
Global – (OSRO/INT/603/USA Baby04)	01–Jul–06	30–Mar–09	USA	300 000
Global – (OSRO/GLO/702/CAN)	14–Mar–07	13–Apr–10	Canada	9 750 791

Source: FPMIS

BOX 6

Strengthening Avian Influenza Detection and Response (SAIDR) in Egypt (OSRO/EGY/701/USA)

The SAIDR project started in October 2007. It has a three-year duration (phase III ongoing) for a total budget of US$ 9 million, with FAO as the main implementer. SAIDR is of paramount importance to Egypt since it groups most key aspects from detection to control.

Objective 1 – Improve preparedness and planning to contain bird–to–bird and bird–to–human transmission of H5N1

1.1. Ensured use of the regularly updated National Integrated Plan (NIP) for design of projects where viral load reduction can be addressed

Objective 2 – Prevent future outbreaks in poultry

2.1. Improved biosecurity to reduce virus circulation in all production sectors of the poultry industry, but especially in sectors 3 and 4 where viral load is entrenched

2.2. Reduced virus load by implementation of a comprehensive vaccination programme, from selection of vaccine to administration in the field

2.3. Limited circulation of virus in the value chain

Objective 3 – Improve detection of H5N1 in poultry and wild birds

3.1. Assured functioning of the HPAI hotline

3.2. Established system for active surveillance

3.3. Strengthened surveillance in wild and migratory bird population

3.4. Improved laboratory capacity for detection of virus

Objective 4 – Improve containment measures in poultry populations

4.1. Effective dealing of HPAI outbreaks in poultry to reduce viral load

4.2. Improved ability to respond rapidly and effectively to small or large outbreaks

Objective 5 – Limit exposure of bird–outbreak investigators, poultry cullers, and poultry vaccinators to H5N1 virus

5.1. Protected health of personnel working in presence of virus, both in field and laboratory conditions

FAO supported (national USA project) the development of epidemiology capacity at the central and governorate level, and epidemiology units were set up and equipped in central and in ten governorate veterinary units. The system has contributed to the development and smooth functioning of epidemiological data flow from districts and governorates to the central epidemiology Unit located at the General Organization of Veterinary Services.

FAO also supported (national USA project) the development of a national HPAI surveillance plan (including methodologies for passive and active surveillance, sentinel birds, country–wide monitoring of all sectors, LBM monitoring, outbreak–related surveillance patterns, post–vaccination serosurveillance). In 2009, participatory epidemiology tools

were used to initiate a Participatory Disease Surveillance (PDS)–like system, mirroring the Indonesia model, in six pilot governorates; this community–based animal health outreach (CAHO) project proved to be useful, as it detected 33 out of 239 positive HPAI outbreaks reported in poultry in 2009. It is however too early to prove efficient in a context of widespread under–reporting, lack of private sector collaboration and absence of compensation.

In terms of wild bird surveillance activities, the FAO EMPRES Wildlife Unit conducted research in 2006 and 2008, together with Wetlands International and the National Laboratory for Veterinary Quality Control on Poultry Production (NLQP), to better understand the interface between poultry and wild birds, particularly at resting sites. A wild bird surveillance study to investigate the migratory behaviour, ecology and host status of AI among waterfowl from Manzala Lake in the Nile Delta was also conducted by FAO in conjunction with the Western Ecological Research Center, the US Naval Medical Research Unit and the Egyptian Ministry of the Environment.

FAO has not been very involved in outbreak management at the field level, but has supported the response at a more strategic level by carrying out in 2009 (national USA project) a comprehensive assessment of the AI mass vaccination programme in Egypt to determine the efficacy of the vaccines and vaccination strategies. Recommendations for an elaborated, sound strategy, with an operational plan and exit strategy, as well as SOPs encompassing selection of vaccines, organization and implementation of vaccination campaigns and their monitoring were produced. This work is expected to lead to a change in government policy from mass to risk–base targeted AI vaccination. A population and vaccination model was also developed to predict the level of annual flock immunity and advise on an optimal vaccination strategy to implement in sector 4 and 3. As part of the response strategy, a compensation plan for Egypt, including the principles and the elements of policy application and fund governance, has been developed (PPP project). Finally, tailor–made outbreak response training has been provided to key veterinary staff.

OFFLU has been very active in Egypt through the national project on vaccine efficacy (OSRO/EGY/801/USA) and has so far made some progress in identifying circulating H5N1 virus isolates (sequencing data and phylogenetic map of Egyptian H5N1 HPAI isolates 2006–09) and evaluating the efficacy of the vaccines available. OFFLU support has also been instrumental in establishing working relationships between national key laboratories and several international reference laboratories (such as [IZSVe, the EU's education and training programme [ERASMUS], the South–East Poultry Research Laboratory [SEPRL] and CEVA). Thanks to the support of OFFLU, the capacity of the NLQP in terms of quality of service and speed of delivery of diagnostic results has substantially increased.

FAO supports the adoption of sustainable biosecurity measures by poultry keepers and other stakeholders in the poultry production and marketing chain. Tailored sets of locally sustainable biosecurity measures for producers are currently being tested in two governorates. Biosecurity measures are also being reinforced through the USA project, including cleaning and decontamination of LBMs.

FAO, together with the World Food Programme (WFP), conducted a rapid assessment of the socio–economic impact of HPAI on vulnerable households. It was carried out to gain a better understanding of the traditional poultry system, poultry keepers' livelihood strategies and the impact of HPAI on the livelihoods of vulnerable households. FAO's role

was to provide technical assistance and training to local actors on socio–economic impact assessments. FAO's Livestock Information Sector Analysis and Policy Branch, and Gender and Population Division, collaborated in the development of gender–sensitive guidelines and tools.

Enhanced animal health communication and the dissemination of key messages (SAIDR project) were implemented at village level, in particular through extension personnel in agriculture and local development ministries. The Media Fellowship project (Canada project) intends to award ten journalists/people working in the media with a fellowship to attend a training course on how to communicate on the subject of avian influenza.

Country capacity: progress achieved over the reporting period and remaining gaps

The result of the country survey assessing six key topics and progress achieved over the RP in Egypt are summarized in TABLE 15 below:

TABLE 15
Evolution of six key aspects over the reporting period in Egypt

Activity/Indicator	Assessment (as of December 09)	Evolution over the RP	FAO's contribution to this result	
			Over the RP	Since 2004
Preparedness	3	↗	S	S
Surveillance	3	↗	S	C
Response	2	↗	C	C
Laboratory capacity	5	↗	S	S
Compensation	n.a		n.a	NC
Biosecurity	2	↗	C	C

Legend

Level: 1 = very poor; 2 = poor; 3 = fair; 4 = good; 5 = excellent

Contribution: S = significant; C = collective (with other partners and or the country); NC = no contribution*

Evolution:
↗ = capacity has increased;
➔ = capacity remains unchanged;
↘ = capacity has decreased

Source: FAO country survey

** no contribution, either because (i) Level is 5, no more work is required; or (ii) Level is < 5, because it is not a priority for the country.*

An Integrated National Plan for Avian and Human Influenza (2007–2008) was prepared in May 2007 and then enacted, but not in a way capable of stimulating good practices and required level of response. Significant training was carried out over the RP, but financial resources allocated by the government remain inadequate, given the huge needs caused by the endemic situation in the country. Overall, the Plan needs to be updated, based on a revised national strategy that takes into account the current disease dynamics and the overall endemic nature of AI in Egypt.

Surveillance has improved during the RP owing to the implementation of a Participatory Disease Surveillance–like system (while still pilot in only a few governorates) and a risk–based surveillance strategy, with a resulting increase in HPAI reporting. The overall surveillance system remains weak, in particular owing to weak capacity in epidemiology.

Over the past years, including the RP, substantial efforts have been made to enhance

the institutional (manpower, infrastructure and networking with international laboratories) and technical (equipment, training, development of SOPs) capacity in the national reference laboratory and its satellite branches, resulting in excellent laboratory capacity.

Gaps in outbreak response and management still prevail, owing partly to the lack of identified critical control points and weakness in veterinary services governance (command chain and legislative reinforcement). Compulsory vaccination has been implemented throughout the country since 2006, targeting all poultry production systems (the traditional poultry sector in rural areas is, however, barely touched–on in the vaccination plan). To date, the vaccination plan has proved ineffective, probably because of the limited vaccination coverage and subefficacy of the vaccines used. The government is currently keen to revise its vaccination strategy towards a more targeted approach. In addition, outbreaks need to be properly investigated and traced back to increase knowledge on the source of infection and spread, and to adapt subsequent control measures. Finally, the lack of compensation (see below) has seriously compromised control efforts.

Compensation was initially part of the 2007 preparedness plan but was implemented for only a very short period of time. It is supposed to be re–established in 2010, as a detailed compensation policy and a funding mechanism have just been developed and submitted to the GoE for consideration.

Biosecurity has received little attention over the past years and the level of biosecurity in sectors 3 and 4 is very poor, although adequate on big commercial poultry farms. Awareness of the importance of biosecurity as a control tool is however growing.

Conclusion

FAO's interventions in Egypt have been quite comprehensive in terms of the range of issues covered and sustained over three years. In a complicated decision–making environment, the initial strategy and response (notably with regard to vaccination and compensation) took a long time to put in place, and, overall, with the limited influence of FAO. Many activities have been conducted during the RP and outcomes will hopefully be measurable in the coming months. Huge challenges remain in terms of disease control in an enzootic context and in addition to immediate response needs, longer–term activities, such as institutional reforms, changes to the organizational and legislative framework, with the government's political backing and commitment, will be required to address them. These will be the objectives of the third "generation" of FAO projects.

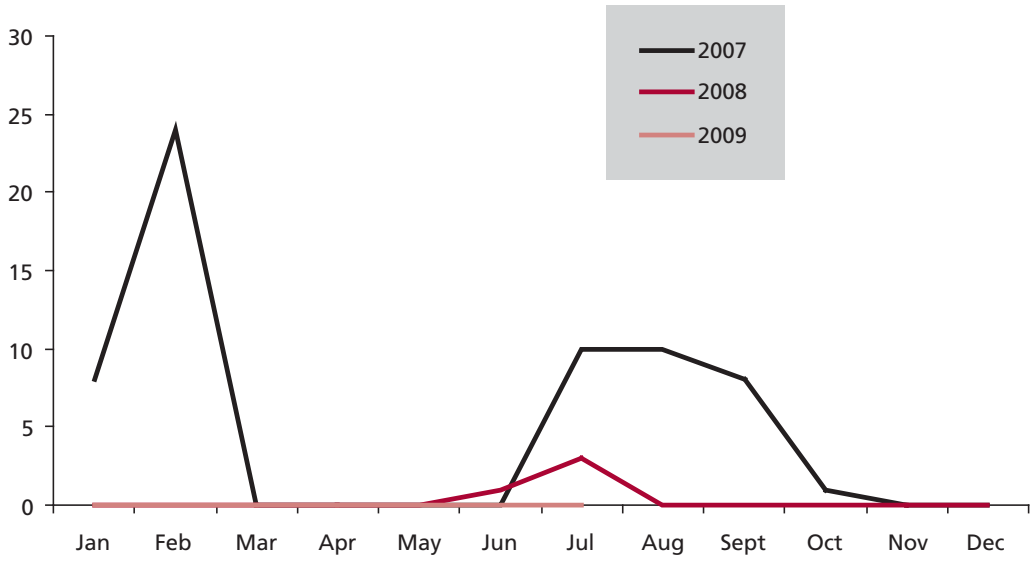
NIGERIA

Disease situation overview

Nigeria was the first country in Africa affected by the H5N1 virus, with HPAI outbreaks first reported in the Kaduna State and confirmed by the Ministry of Agriculture and Rural Development on 8 February 2006. How the disease was introduced to Nigeria is still unknown, while illegal trade remains the most plausible option. The disease then spread rapidly to 97 Local Government Areas in a total of 25 states and the Federal Capital Territory, with some 440 000 birds culled in the first two months.

Nigeria suffered waves of HPAI outbreaks that peaked twice in February 2006 and February 2007. The disease was again reported in July 2008 in Kano and Katsina States, and was quickly brought under control. Since then (July 2008), no new outbreak has been reported. FIGURE 25 shows the monthly incidence of H5N1 HPAI in 2007, 2008 and 2009. The situation over the RP is detailed in Chapter 1.

FIGURE 25
Number of H5N1 outbreaks in poultry over the period 2007–2009 in Nigeria



Source: GLEWS

One documented human case of disease infection occurred in January 2007, associated with a LBM in Lagos.

The outbreaks affected 3 057 farms/farmers causing 1.3 million of the country's 160 million birds to be destroyed at a cost of US$5.4 million paid in compensation by the Government of Nigeria (GoN).

FAO's contribution to the national HPAI response

The FAO country level Strategy and Programme focussed on a limited number of specific subject areas where the government considered that FAO could play a strategic role, as follows: national cross–sectional prevalence study; active surveillance project at LBMs;

biosecurity and biosecurity communication; media fellowship programme; and laboratory diagnostics and response mechanisms. FAO's support has mainly translated into capacity building and improved epidemiological knowledge on HPAI. Most of these topics were addressed through national projects, while support was also brought to a lesser extent through regional and global projects. As of October 2009, 16 projects had directly contributed to HPAI prevention and control activities in Nigeria (see FAO portfolio in Nigeria in TABLE 16).

Immediate FAO assistance (global projects) after the virus had been detected consisted in the provision of equipment and technical advice. In early 2006, the GoN initiated the development of a preparedness plan, bringing in strategic support from FAO headquarters to help with the development of SOPs (notably on the existing compensation strategy). More substantial strategic support was brought by FAO in 2008 to assist the government in the formulation of a three–year National Medium–Term Priority Plan for HPAI Control.

TABLE 16
FAO portfolio (closed and ongoing projects) in Nigeria

Project	EOD	NTE	Donor	Total approved project budget (US$)
National project				
OSRO/NIR/602/EC	01/08/2006	31/12/2007	EC	953 274
OSRO/NIR/601/MUL BABY01	06/11/2006	31/01/2009	USA	1 635 520
OSRO/NIR/601/MUL BABY02	06/11/2006	31/01/2009	UNDP	90 000
NIR/08/002/01/12	03/04/2009	02/04/2010	UNDP	311 000
Regional and global projects				
OSRO/GLO/706/FRA	01/12/2007	31/12/2008	France	705 490
TCP/RAF/3016	01/11/2005	30/06/2007	FAO (TCP)	400 000
OSRO/RAF/612/USA	05/07/2006	30/03/2009	USA	290 000
OSRO/RAF/612/USA B1	05/07/2006	30/03/2009	USA	65 000
OSRO/RAF/612/USA B3	05/07/2006	30/03/2009	USA	225 000
OSRO/RAF/717/USA	01/03/2008	31/03/2010	USA	1 432 000
OSRO/INT/604/USA	17/01/2007	30/04/2014	USA	7 000 000
OSRO/GLO/504/MUL BABY01	01/12/2005	30/04/2007	Norway	3 506 326
OSRO/INT/604/USA BABY02	17/01/2007	29/09/2009	USA	1 000 000
OSRO/GLO/702/CAN child	14/03/ 2007	13/04/2010	Canada	7 827 361
OSRO/GLO/604/UK child	29/03/ 2007	31/03/2010	UK	5 388 655
OSRO/RAF/722/SWE	28/11/ 2007	31/12/2009	Sweden	6 738 646

Source: FPMIS

FAO carried out surveys (EC and USAID projects) to obtain reliable data on the status of HPAI in the country. Most of the surveillance work focused on LBMs, as these were thought to be a prime source of the spread of HPAI. A study was conducted in 37 states where

H5N1 was isolated (trachea and cloacal swabs; blood samples) at seven markets (two from markets in non–infected states), but traceback of the origin of the infected birds proved to be impossible, owing to the absence of market records relating to the origin of the birds. The results obtained from these studies still form the basis of the actual government LBM improvement pilot programme.

All surveillance activities were built on the PACE (Pan–African Programme for the Control of Epizootics) achievements in Nigeria. The EMPRES Wildlife Unit in Rome and Wetlands International undertook collaborative studies with the National Veterinary Research Institute (NVRI) on active surveillance of resident (non–migratory) waterfowl in certain wetland states of Nigeria (Dagona Waterfowl Sanctuary in NE Nigeria, near Lake Chad) to assess potential risks of disease spread.

FAO supported (USAID project) assessment and communication activities subsequent to the confirmed death of a young woman from HPAI in January 2007. With the national committee and WHO, investigations were carried out to establish the source of the case and human risk exposure factors at markets. A CMC–AH mission was also deployed to the country when the first human case occurred.

Considerable laboratory capacity development work (EC and USAID projects) was carried out, including the training of staff at various levels and provision of equipment and supplies, particularly for NVRI in Vom. A seminar on advanced laboratory diagnostics for senior researchers at Vom was organized by FAO. OFFLU facilitated a five–month scholarship for the Head of Virology (Vom) at IZSVe to sequence and perform phylogenic analysis on H5N1 viruses. OFFLU also assisted in sample shipments to Padova and coordinated a Letter of Agreement (LoA) with IZSVe under which 352 samples were received and 80 viruses sequenced (December 2008).

Biosecurity activities in their early stages (Sweden, Canada and UNDP projects) aim to develop practices and messages to improve biosecurity that are technically sound, but built on indigenous solutions.

FAO (Canada project) is also working with ten media specialists to document "human face of HPAI". As early as April 2006, FAO (together with OIE and AU–IBAR) developed an HPAI information kit in Nigeria that was eventually disseminated to all African countries.

FAO (PPLPI project funded by DFID), in collaboration with IFPRI and ILRI has provided a series of papers and research briefs on different aspects of HPAI impacts in Nigeria. Of particular relevance is a detailed assessment of poultry value chains in Nigeria and of disease risks.

FAO has a sizeable project portfolio in Nigeria. Table 16 summarizes the list of projects (past and ongoing) implemented there since the first outbreak was detected in 2006.

Country capacity: progress achieved over the reporting period and remaining gaps

The result of the country survey assessing six key topics and progress achieved over the RP in Nigeria are summarized in Table 17 below:

TABLE 17
Evolution of six key aspects over the reporting period in Nigeria

Activity/Indicator	Assessment (as of December 09)	Evolution over the RP	FAO's contribution to this result	
			Over the RP	Since 2004
Preparedness	5	↗	C	S
Surveillance	5	↗	S	S
Response	5	→	C	S
Laboratory capacity	4	↗	S	S
Compensation	5	→	C	S
Biosecurity	3	↗	S	S

Legend

Level: 1 = very poor; 2 = poor; 3 = fair; 4 = good; 5 = excellent

Contribution: S = significant; C = collective (with other partners and or the country); NC = no contribution*

Evolution:
↗ = capacity has increased;
→ = capacity remains unchanged;
↘ = capacity has decreased

Source: FAO country survey

** no contribution, either because (i) Level is 5, no more work is required; or (ii) Level is < 5, because it is not a priority for the country.*

Preparedness has improved over the RP and is now estimated to be excellent with adequate human and financial resources. The preparedness plan was prepared during the months immediately preceding the 2006 outbreaks and was therefore tested during their control (no desktop simulation exercises conducted). While the preparedness plan is assessed as comprehensive, it is not based on risk mapping and risk analysis, and has not been translated into a legal or regulatory act.

The surveillance system (including both passive and active surveillance conducted on a daily basis) put in place has been maintained to the same good level of efficiency as during the RP, also with adequate human and financial resources allocated. Wild bird studies were carried out over the RP to determine the potential of wild birds as carriers of influenza viruses (results pending). In addition, individuals were trained in wild bird capture and release practices.

Laboratory diagnostic is conducted at the national level by the National Veterinary Institute, which is well–equipped, part of the RESOLAB regional network and overall is trustworthy in HPAI analysis (H5N1 HPAI virus identification). Capacity, however, improved over the RP with increased financial resources and the continuous training of laboratory staff.

With no outbreak recorded over the RP, the response capacity was not assessed. However, from past outbreak management responses, procedures put in place appear to be efficient and with immediate notification to the OIE. Vaccination has been forbidden since the first outbreaks.

The compensation strategy and delivery mechanism is fully operational and efficient, with compensation funds allocated to the farmers within one month after the declaration of cases. It is funded through external resources (World Bank project with a separate account available should they be needed. This fund was used in the 2006, 2007 and 2008 outbreaks and has contributed to the increase in outbreak reporting.

Biosecurity has received more attention over the RP than before, notably after the discovery of infected animals at LBMs (FAO study), while at the time the disease was considered to be under control. The GoN provides some incentives to implement biosecurity at

the farm level and at LBMs. However, compensation is not linked to the level of biosecurity on farms. Communication on biosecurity campaign focuses on simple, affordable and effective measures on farms. The level of biosecurity on farms increased during the RP but remained poor in sectors 3 and 4.

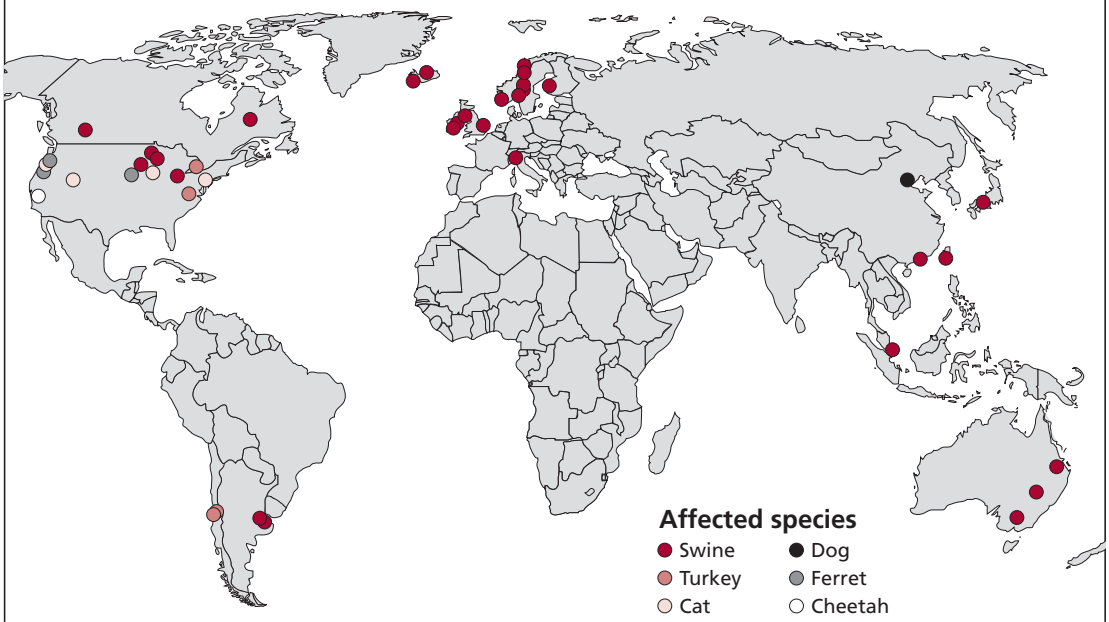
Conclusion

Compared with other affected countries, FAO has played a smaller but strategic role in Nigeria, with a relatively small budget, in a process very much led by the GoN. FAO was asked to assist with the national infection prevalence study and this was the first step in a series of constructive, demand–led and strategic interventions by FAO that helped secure the credibility of the Nigerian response. FAO is still seen as a lead agency in its technical expertise. The major leadership provided by the Nigerians has without doubt made activities surrounding HPAI prevention and control more sustainable and effective than if they were promoted or executed by external parties.

Chapter 5
FAO's response to H1N1

On 24 April 2009, transmission of a new influenza virus was confirmed in Mexico, the United States and Canada. WHO raised the pandemic alert level to 4 (on a scale of 1–6) and shortly afterwards, when community level transmission in these countries was confirmed, to level 5 and then in June of that year, as further global transmission of the virus was detected, to level 6 (global pandemic). As of December 2009, more than 200 countries and overseas territories have reported laboratory confirmed cases of pandemic influenza A H1N1 2009, including over 15 000 deaths. Laboratory diagnosis showed that the epidemic was caused by an Influenza virus genetically composed of swine, avian and human influenza virus genes. The resulting combination had never before been encountered. Although the novel virus was initially called "swine flu" (with detrimental economic impacts to swine industries worldwide), links of its origin from swine to humans have not been scientifically proven. At a later stage, with the influence of FAO and OIE, it was renamed pandemic influenza A H1N1 2009 (hereafter named H1N1). As of this writing, the virus has been identified in several animal species (swine, turkey, cat, dog, ferret and a cheetah), with mild self–limiting health effects. FIGURE 26 shows the distribution of the virus in animals, from April to December 2009.

FIGURE 26
H1N1 virus distribution worldwide per species excluding humans, from April to December 2009



Source: FAO EMPRES

The emergence of the disease prompted FAO's immediate responses: GLEWS continues to monitor the H1N1 situation on a daily basis and provides frequent updates through web–based animal health information systems (including EMPRES–i and GLEWS) (Box 7). OFFLU, a network of expertise on animal influenza, intensified the exchange of information throughout the globe, held scientific consultations to assess the potential risks of the pandemic influenza virus and, in May 2009, produced technical guidelines on the international shipment of samples for laboratory diagnostic and a list of international veterinary diagnostic laboratories for submission of suspected H1N1 swine samples or isolates (Box 8). In August 2009, EMPRES produced FAO guidelines for surveillance of H1N1 and other influenza viruses in swine populations, which provides general and specific principles of surveillance of influenza viruses in swine populations and at the animal–human interface. The CMC–AH deployed a mission to Mexico to assess the epidemiological situation and to strengthen diagnostic capacities (Box 9). The HPAI ongoing portfolio was expanded to include H1N1 surveillance activities in key countries. However, to support countries in a more targeted fashion, FAO developed a specific H1N1 portfolio, mainly through TCPs. Projects primarily operate in the Latin America region, although there is a project specifically dedicated to coordination of H1N1 activities worldwide (Table 18).

BOX 7

GLEWS support to pandemic influenza A H1N1 2009

The pandemic influenza A H1N1 2009 provides a tangible and real example of interlinking and collaboration of FAO, OIE and WHO on cross–cutting issues that result in improved integration of communication and intervention at all levels of the organizations.

GLEWS – Regarding the emergence of pandemic influenza A H1N1 2009, the GLEWS team has been intensely involved in the assessment and response to this disease although animals do not play a major role in the maintenance and spread of the pandemic in humans to date. In real time, GLEWS is able to deliver regular updates for high–level decision–makers, facilitate the flow of information between the three organizations and disseminate key messages through press releases.

On 31 April 2009, FAO, OIE and WHO issued a joint statement on H1N1 and the safety of pork, as well as an International Food Safety Authorities Network (INFOSAN) note on the human–animal interface aspects of H1N1 – FAO, OIE and WHO joint statement: http://www.glews.net/

GLEWS also contributed to the assessment of the potential risk to human health through contact with pigs and their products from primary production to consumer (farm to fork). Given the current context of the presence of a pandemic influenza strain, FAO, OIE and WHO consider it essential to base ongoing decisions on the most current and accurate science available. A scientific consultation was convened on 3 June 2009 to answer questions using the existing science on influenza viruses infecting pigs and identify knowledge gaps associated with the risk of the H1N1 virus at the human–animal interface.

TABLE 18
FAO pandemic influenza A H1N1 2009 portfolio – ongoing projects and pipeline

Project title	Geographic coverage	Donor
Active projects		
• Emergency support to global surveillance of Influenza A H1N1 virus and other potential subtypes in animal populations.	Global	FAO (TCP)
• Emergency assistance for surveillance of novel Influenza A subtype H1N1 viruses in pig and poultry production sectors in high– risk Southeast Asian countries.	Regional Asia & Pacific	FAO (TCP)
• Emergency assistance for surveillance of Influenza A subtype H1N1 virus in swine populations in Central America and neighbouring countries.	Regional Latin America	FAO (TCP)
• Emergency assistance for the vigilance and monitoring of pandemic influenza A H1N1 2009 in swine populations in Andes countries	Regional Latin America	FAO (TCP)
• Strengthening regional capacity for surveillance of influenza A H1N1 virus and other potential subtypes of swine flu in pig populations in Latin America.	Regional Latin America	USA (OSRO)
Pipeline		
• Surveillance of H1N1 swine influenza in sub–Saharan Africa.	Regional Africa	FAO (TCP)
• Emergency assistance for surveillance of Influenza A subtype H1N1 virus in swine populations in the Caribbean.	Regional Latin America	FAO (TCP)

Source: FPMIS

The H1N1 portfolio (ongoing and pipeline projects) currently amounts to US$3.6 million. A concept note addressing H1N1 in the longer term and with a wider scope is also currently being developed and should generate a programme with a budget of over US$50 million. FAO, together with OIE, planned to implement a US$3 million project within the framework of the United Nations System Influenza Coordination (UNSIC's) new initiative, "Urgent Support for Developing Countries' Responses to the H1N1 Influenza Pandemic" should such funding become available.

FAO's rapid and comprehensive response to the H1N1 episode was made possible because of all the structures (ECTAD and its central command line) and tools (GLEWS, EMPRES–i, OFFLU and CMC–AH; networks; RAHCs) put in place at the global, regional and country level since 2004 in the fight against HPAI. At the time of the emergence of H1N1, these structures were operational (fully staffed, trained and equipped) and flexible enough to address any other animal health emergency.

Mindset change on the ground

The country survey[12] shows that:

(i) In spite of the large global media coverage on pandemic influenza A H1N1 2009, preparedness of countries to cope with the epidemic as it impacted the animal industry remains weak; in 63 percent of the countries surveyed, capacities to prevent and control H1N1 in animals are rated "very poor" (level 1) to "poor" (level 2). Although animals do not play a major role in the epidemiology of the pandemic in humans to date, animal–human interactions should be under heightened scrutiny, with an enhanced surveillance in animals: continued circulation of H1N1 with other seasonal and avian viruses could provide

[12] Chapter 3 for reference.

BOX 8

OFFLU support to pandemic influenza A H1N1 2009

When H1N1 was first reported in 2009, OFFLU was strong and flexible enough to expand within a matter of days to include swine expertise and changed its scope and name to the OIE–FAO Network of Expertise on Animal Influenza.

OFFLU and WHO gathered international experts for a first WHO/OFFLU teleconference on H1N1 at the human–animal interface on 4 May 2009. Subsequent teleconferences on diagnostics, surveillance and diagnostic testing algorithms for the emergent virus in the animal health sector were held on 14 May, 21 May, and 13 June, respectively. A variety of documents were produced to assist animal health laboratories with identification of the emergent virus: a list of laboratories for international shipment of H1N1–suspicious samples/isolates, and guidance on the shipment of suspicious samples, an algorithm for laboratory detection, guidance on sampling pigs for influenza diagnostic tests, etc.

The OFFLU network had also become established and respected enough to be asked by WHO to represent the animal health sector (in conjunction with OIE and FAO) in addressing two specific questions – the name of the virus, and specific issues regarding its origin – in high–level WHO teleconferences.

A secondary benefit of these discussions was increased communication about swine influenza viruses in general among public and animal health experts and those new to the field. Gaps in available information on swine influenza viruses were immediately noted during the joint discussions on origin, composition and other characteristics of the pandemic influenza A H1N1 2009 virus. Recognition of the information gaps resulted in further discussions on virological surveillance and information sharing. It was noted that scientists posted additional swine influenza virus sequences (about 150) on GenBank® and/or GISAID in the weeks after these discussions were initiated. OFFLU will keep updates of validated protocols and primers and probes and will share this information widely with national laboratories through regional laboratory networks.

substantial opportunities for H1N1 to acquire new genes and potentially become a "killer flu" virus, such as the Spanish flu of 1918.

(ii) In 83 percent of the countries surveyed, capacities to prevent and control TADs other than H5N1 HPAI are rated "very poor" (level 1) to "poor" (level 2). It is worth noting that HPAI still ranks as the top animal disease priority in many countries, some of which are reluctant to divert attention towards other animal diseases.

However, the findings suggest that HPAI has had positive spill–over effects, and a comprehensive improvement has occurred in the "most transversal capacities" such as surveillance, laboratory diagnostic, and disease response, both at central and provincial level. Much of the capacity built in these areas as a result of HPAI is readily adaptable to other animal diseases, such as ND and duck plague in the poultry sphere, and to FMD in ruminants and pigs. The economic benefits of investments to develop existing systems and infrastructures are now seen, and will continue to be seen, as more animal diseases are

BOX 9

FAO/OIE CMC–AH mission to Mexico

The CMC–AH deployed two missions to Mexico to support the government in its efforts to assess the epidemiological situation in pigs and to strengthen diagnostic capacity.

Through the CMC–AH mission, experts from FAO, OIE, CDC, the United States Department of Agriculture (USDA) and the Organismo Internacional Regional de Sanidad Agropecuaria (OIRSA), supported Mexican veterinary services by providing technical advice regarding any possible recent or new disease events in pigs; and building national capacities in surveillance, epidemiologic investigation and laboratory diagnosis. CMC–AH also coordinated with two experts from WHO's Pan–American Health Organization (PAHO) on the veterinary public health side and the Inter–American Institute for Cooperation on Agriculture (IICA).

A second CMC–AH mission was offered to further strengthen laboratory performance. A USDA laboratory expert was identified to continue laboratory capacity building activities upon government acceptance. On 26 June, Mexico submitted a request for an FAO TCP project supporting strengthened surveillance for H1N1 in swine.

Mission findings and those of scientific partners showed there was no evidence of a threat to the food chain. However, given the current lack of knowledge regarding the new virus strain, joint FAO and OIE communiqués urged national authorities and farmers to monitor pigs carefully and to investigate any influenza–like symptoms in domestic animals.

In responding to pandemic influenza A H1N1 2009, the CMC–AH carried out many of the centre's standard practices and functions, including activating and offering assistance, securing funding within a matter of days for mobilizing and deploying a team within 48 hours of government acceptance, coordinating continuously with government authorities, partner organizations and FAO units, ensuring daily mission situation reporting and information exchange, providing emergency funding for immediate in–country needs/procurement and sustaining multiple, concurrent missions for separate events.

dealt with in the future. Just as with H1N1, this capacity adapts to address other animal threats, and so will human capacities evolve to empower individuals and institutions with the necessary resilience to bounce back after primary shocks are absorbed.

Looking to the future, it is important that the contributions to AI preparedness and response be further articulated to broader long–term capacity development that targets a wider range of livestock health priorities in each region. FAO has already engaged this shift, and most notably in Asia, the ECTAD Bangkok unit has recently developed a Regional Strategy for HPAI and other emerging infectious diseases (EID) of animals in Asia and the Pacific for the period 2009–2015. This new strategy, which is an update of the initial strategy on HPAI dated 2006, is based on two major objectives. These objectives are to (i) continue to support measures specifically addressing HPAI prevention and control, and (ii) to broaden

"appropriate components" of the support to embrace the needs for other EIDs that are of international importance or of high national priority.

With the advent of H5N1 in Southeast Asia, and more recently of H1N1 spread worldwide, this is a timely moment to reflect on the critical relationships between animal food production, animal diseases, food security and global public health.

To date, much of FAO's actions are dictated by the terms of the funds allocated to it, with a very high degree of specificity to HPAI. As part of its global mandate, and supported by its international reach, FAO has the responsibility to raise awareness of the need to address other EIDs that threaten animal and human health around the globe.

Most importantly, as global animal and public health leadership, agenda–setting and funding streams shift more towards multilateral organizations – where clout remains primarily in the hands of influential nation–states – it is important to repeatedly stress to policy–makers and opinion leaders that animal diseases threaten the health status of individuals and populations, that consequently hamper development, security and order.

Chapter 6

Moving forward – FAO's approach to One Health and Development

The current dynamics in world food and agriculture are at the centre of evolving animal and pandemic influenza health risks. A set of global factors increasingly drive disease emergence at the animal–human–environment interface. These broader dynamics require a shift in veterinary–public health approaches with more emphasis on the cross–sectoral and multi–disciplinary nature of disease emergence. The Food and Agriculture Organization of the United Nations (FAO) seeks to operationalise the One Health concept, recognizing that disease emergence events must be addressed together with the challenges posed by poverty reduction, natural resource management, and sustainable agriculture and rural development: thus, disease emergence is not just about the risk that a pathogen jumps from animal to human host. Disease emergence, viewed in the continuum of natural resource management, land utilization patterns, farming systems, food distribution and marketing, reveals the options available to address the root causes of pathogen dispersal and genetic change or exchange. This supports more rational risk management and prevention that are not based mainly on national approaches, but on the macro and micro–ecosystems in existence. In practical terms, FAO seeks to assist its Member Countries, often sharing a myriad of agro–ecosystems and market links, in generic One Health capacity building, expanding on the improved infrastructure and staff capabilities established in recent years in both early detection of and response to influenza viruses. In addition to disease transmission dynamics, risk assessment now comprises disease impact profiles and identification of drivers of disease emergence. Risk management will need to rely on the melding of insights obtained from epidemiology, agro–ecology, socioeconomics and communication. Thus, FAO seeks to champion the approach to address disease emergence at source, and to duly incorporate the notion that poor people are disproportionally affected both by emerging diseases as well as chronic disease burdens. In this challenge, FAO recognizes the importance and values its partnership with other international organizations, regional economic communities and regional political associations, its reference centres and numerous research institutes, to further the cause of attaining the Millennium Development Goals' agenda.

THE TURN TOWARDS *ONE WORLD ONE HEALTH* (OWOH)

The development of the *One World, One Health* (OWOH)™ approach took place over a number of years and involved many steps. It first emerged with a focus on disease movements among human, domestic animal and wildlife populations and identified priorities for an international, interdisciplinary approach to combat threats to animal, human and

eco–system health. The phrase, first coined by the Wildlife Conservation Society in 2004, gained worldwide attention as a concept during the Fifth Inter–Ministerial Conference of New Delhi in December 2007 when the international community agreed on the need to go beyond HPAI and to address other EIDs of global impact. A first strategy paper entitled 'Strategic Framework' jointly drafted by FAO, OIE, WHO and UNICEF, with the collaboration of the World Bank and of UNSIC, was presented and endorsed during the Sixth Inter–Ministerial Conference of Sharm–El–Sheik in October 2008. Ways of implementing the Strategy, costing options, and ways to ensure the buy–in of all involved stakeholders were discussed during the technical meeting of Winnipeg in March 2009. Other international meetings (Brussels, European Commission [October 2009]; Stone Mountain, Georgia, USA [May 2010]; Verona conferences, Italy [2009 and 2010]) have or are to highlight the approach to One Health – where the link between animal and public health is stressed. It is hoped that the impetus will further fine–tune the approach and develop subsequent programmes in the perspective of the Seventh Inter–Ministerial Conference of Hanoi to be held in April 2010. On this occasion, an enumerated list of needs and actions will be presented to operationalise OWOH or *One Health*, as well as, seek buy–in from all stakeholders, partners and donors.

The One Health platform from FAO's perspective proposes a 'big picture' approach and considers the drivers for disease emergence and spread in a more holistic way. Understanding the drivers would lead to improved, targeted, efficient and cost–effective approaches to disease prevention and control. Many infectious diseases in humans have emerged from previously unidentified pathogens in livestock and wildlife and on–going climate change can trigger the emergence of new pathogens for animals and humans, and set up ecosystems where known vectors of pathogens or macro–parasites can become established and even flourish. The thrust of the OWOH concept is to diminish the risk and minimize the local and global impact of debilitating diseases, epidemics and pandemics due to known and emerging infectious diseases (EIDs) by enhancing livestock and wildlife 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 (Box 10). FAO, in collaboration with WHO and OIE, strongly support key scientific institutions involved in the development of these forecasting tools, and provide up–to–date information on diseases and potential variables that may drive the emergence and spread of TADs and EIDs. Priorities will be identified on the basis of known areas of risk ('hotspots') for disease emergence and on research findings that point to new risks.

It is now broadly accepted that OWOH is not simply about zoonoses, but also 'emerging and re–emerging animal diseases, including zoonoses', as many animal non–zoonotic diseases, such as foot–and–mouth disease, African or classical swine fever, and peste des petits ruminants, among others, pose serious problems for global food security, which is also a public health concern, and overall hampers the road to attaining the Millennium Development Goals (MDGs) in terms of poverty alleviation and eradication of hunger, improved nutrition and reduced child mortality, natural resource management and environmental sustainability, and the progress for a Global Partnership for Development.

This said, the fight against animal and human influenza will remain the priority of the first years of implementation of OWOH programmes, given the situation of H5N1 HPAI and of the recent pandemic influenza A H1N1 2009 virus.

BOX 10

Rift Valley Fever (RVF) and livelihoods

Rift Valley Fever can cause death in young small ruminants, abortions in pregnant animals and severe illness or death in humans exposed to the virus. The infection can be transmitted to humans through fluids, including during activities such as assisting in a pregnant animal's delivery and exposure to virus–containing blood of animals during routine slaughter or handling of the carcass if the appropriate biosecurity precautions are not taken. Coordinated actions between public health and animal health authorities are crucial to control outbreaks of this disease and avoid human infections.

Rift Valley Fever (RVF) has a major impact on rural economies, through restriction of markets and trade, and can therefore strongly affect the livelihoods of the poorest populations. This situation is aggravated as RVF epidemics usually occur during periods of heavy rainfall and floods following severe droughts, when the subsistence of rural people and their livestock is already critical.

Tools have been developed, with global partners, and utilized by FAO to follow in real time, and even forecast, large–scale epidemics of RVF. Based upon the identification of ecological patterns conducive for the disease and the main drivers for mosquito emergence, models using climatic and other environmental data have been used to monitor the risk of RVF emergence in space and time. Such tools are essential for improving the time available for prevention of the disease in livestock (such as for implementation of vaccination or vector control) and reducing the impact on livelihoods and human health.

While OWOH is a big step forward, it is only an evolution and certainly not a revolution: many activities implemented for decades by the development agencies – and notably by FAO – were already 'OWOH friendly' or 'OWOH suitable'.

It is strongly expected that donors who have been part of the OWOH approach since 2008 will support this ambitious initiative and revise their way of funding the animal and human health sectors. The transition away from short–term responses towards more sustainable capacity and systems strengthening requires long–term commitment, beyond the current 'normal' three to five year horizons. A longer term vision is required. This is essential to ensure that the efforts made during the H5N1 crisis and the achievements obtained (unprecedented to date in terms of financial commitment, capacity building, coordination, and networking) can be sustained and maximized towards other diseases as well, the prevention, detection and control of which is a Global Public Good.

FAO AND *ONE WORLD ONE HEALTH*

The vision

Key concepts and broad components of the OWOH strategic framework need to be translated into action–oriented sub–components that can be championed and implemented by

the different agencies and their partnerships, in line with their respective mandates and areas of expertise. In this regard, FAO seeks to address the broader dimensions of sustainable agriculture and rural development, including livelihood concerns, the protection of the natural resource base, food and income security of small holder farmers, animal health, veterinary public health, and food safety. Disease flare–ups at the animal–human–agro–ecosystems interface thus demands full consideration of the continuum given by natural resource management, land use, farming practices, food supply and marketing channels. For FAO, the response to disease emergence moves beyond the strengthening of veterinary–public health systems and encompass the efforts to restore healthy and sustainable practices in animal agriculture, ecosystem management and global food supply.

With the experience gained in H5N1 HPAI projects at the international, regional, national and local level, FAO, in line with the vision of the multi–partner OWOH Strategic Framework, is formulating a global strategy and programme of work to address the agro–ecological dimensions and drivers of disease emergence. The FAO strategy emphasizes a holistic approach to disease control.

FAO envisages three complementary focal areas of work: (1) the elaboration of One Health in normative terms; (2) the provision of One Health field programme support to Member Countries and at (sub–) Regional level (shared environments); and (3) strengthening partnerships and structures.

Normative One Health Activities

These activities concern the analysis of disease emergence together with challenges in socio–economic development, natural resource management, and sustainable agriculture and rural development. The activities will include the collation, analysis and synthesis of FAO–wide information sources suitable for the provision of decision support in risk assessment and management of emerging zoonotic diseases globally.

The normative tasks comprise analysis of:

- emerging diseases considered in conjunction with the dynamics in world animal agriculture and rural development (with due consideration of the encroachment on forest, marshlands, and game reserves, the build–up of highland pressures, climate change effects, the growth of peri–urban livestock industries, the dichotomy in smallholder and large commercial livestock holdings, and the associated risks ensuing from the distribution and marketing of livestock and their products, from local to global);
- emerging zoonotic diseases, in relation to the broader veterinary public health agenda, including food safety (with due consideration of endemic and neglected zoonotic diseases);
- human–livestock–wildlife interactions and competition for resources (preservation or exploitation), together with the need for conflict resolution with the aim of conservation with efficient agricultural livestock development;
- the socio–economic impacts of endemic diseases, with development of tools and methods aiding priority setting in disease prevention and control, with attention also to high impact TAD events and enzootic disease burdens affecting food and income security and rural livelihoods.

Field Programme Support

Field programme support entails customization of the outputs of the normative work, in order to directly serve Member Countries and respect the decentralized FAO system, undertaken jointly by FAO's Emergency Centre for Transboundary Animal Diseases (ECTAD), Regional Animal Health Centres (RAHCs) and (sub–) Regional offices. In substantive terms, the One Health agenda will focus on capacity building and improved cross–disciplinary cooperation. Country and sub–regional level modules will comprise multiple One Health sets of principles, tools and methods, including:

- disease impact assessment, comprising veterinary public health aspects, socio–economic dimensions, including food and income security, and general livelihood aspects, together with consideration of the management of natural resources, agro–biodiversity, and sustainable agriculture;
- hazard analysis and critical control points, both in the food chain and extending to the farming landscape, to the identification of drivers for disease emergence concerning human, livestock and wildlife pathogens;
- risk management and conflict resolution support, to achieve concerted action among all stakeholders.

Partnerships and Structures

The One Health initiative reflects much of FAO's core mandate. FAO intends to work closely with partners and stakeholders, from public and private sectors, and from the local to the global – towards health protection defined in broader terms and extending to social and agro–ecological resilience. Furthermore, bottom–up approaches can bring local level integration and streamlining of prevention measures, safety and sustainability. Medical, veterinary, agricultural, socio–economic, communication and other disciplines must jointly engage in risk and impact assessment, and formulate comprehensive risk management and prevention packages. Thus, One Health can redress disease emergence at source by tackling the drivers and putting people centre–stage.

FAO's approach will be multi–sectoral and multi–disciplinary, the success of which relies upon the continuing development of effective partnerships and joint ventures; and synergy with WHO and OIE, bridging their respective regulatory and other efforts in international human and animal health, and integrating health–risk pre–occupations with socio–economic development, natural resource management and sustainable agriculture and rural development.

Within FAO, the One Health initiative will be vested in the FAO Department of Agriculture and Consumer Protection, supported directly by the Animal Production and Health Division, the Nutrition and Consumer Protection Division, and the Food Chain Crisis management framework (FCC); and will rely upon inter–departmental collaborations between various key departments and entities within FAO including: Agriculture, Fisheries, Forestry, Sustainable Development, Natural Resource Management, and Technical Cooperation, to name a few.

The programme of work

To implement this strategy, FAO is developing a global programme for the prevention and control of diseases at the animal–human–ecosystems interface that echoes the FAO/OIE

initiative entitled "Global Framework for the Progressive Control of Transboundary Animal Diseases (GF–TADs). The *One Health* programme of work is expected to establish a systematic global effort to redress disease emergence at animal–human–agro–ecosystem interface with the aim to protect public health, safeguard food, agriculture production, natural resources management and livelihoods. The initial Programme is designed to function for five years, 2010–2015 and address both, immediate needs for emergency response, as well as maintaining a longer–term vision for development and attainment of the MDGs. More details about the expected outcomes are provided in Box 11.

The Global Programme builds on the prior experience accumulated during the execution of the HPAI programme over the past five years and is implemented in line with the following six strategic pillars:

BOX 11

FAO Global Programme on One Health (under development)

Addressing emerging and re–emerging infectious diseases at the animal–human–ecosystem interface – Expected Outcomes

Outcome 1: Global framework for animal disease risk assessment and management.

- Output 1.1 – Sectoral policies and strategies developed, systematically updated and harmonized
- Output 1.2 – Technical and operational disease prevention, detection and control capacities enhanced and coordinated in countries and regions

Outcome 2: Disease emergency prevented and controlled (capacity developed)

- Output 2.1 – Early Warning
- Output 2.2 – Early Detection
- Output 2.3 – Early Response

Outcome 3: Disease emergence prevented and controlled

- Output 3.1 – Disease impact assessment
- Output 3.2 – Understanding of drivers of disease emergence, spread, and persistence
- Output 3.3 – Concerted actions to implement disease control strategies

1. Building on the achievements in HPAI control (Box 12).
2. Dealing with emerging diseases while monitoring diseases affecting the rural poor
3. Utilizing a multidisciplinary and integrated approach
4. Linking with other concerted global and regional initiatives to tackle major livestock diseases
5. Addressing cross cutting issues
   a) Improvement of biosecurity in the production and marketing chains
   b) Communication and public awareness
   c) Private–public partnership
   d) Socio–economic analysis

6. Cooperation and partnerships (OIE and UN agencies, bilateral agencies, centres of excellence and research organizations, and the private sector).

The Programme is structured to operate at global, regional and national levels through a well functioning institutional system, initially tested through the FAO/OIE GF–TADs and built on a set of facilities established by FAO in collaboration with its partner agencies that can, and should, be used to address issues beyond HPAI. This system comprises:

- The FAO/OIE/WHO Global Early Warning and Response System (GLEWS)
- The OIE/FAO Network of Expertise on Animal Influenza (OFFLU)
- The Emergency Centre for Transboundary Animal Diseases (ECTAD)
- The FAO/OIE Crisis Management Centre–Animal Health
- Regional Networks for disease surveillance and diagnostic capacity
- The ECTAD regional units and the Regional Animal Health Centres (RAHCs).

OWOH in practice

Seventy percent of emerging zoonotic infections originate from wildlife. Land–use changes and the competition for natural resources are bringing human populations, agricultural lands and livestock into closer contact with wild animals. This increased contact creates

BOX 12

ECTAD Bamako regional strategy for West and Central Africa

FAO has developed a regional strategy and programme of work for West and Central Africa for the period 2008–2009, which is based on the FAO/OIE Global Strategy for Prevention and Control of H5N1 Highly Pathogenic Avian Influenza and the FAO's regional strategy for Africa developed in 2006.

According to the Regional strategy, ECTAD Bamako's overall objective for this period is to "Contribute to poverty reduction through sustainable development of the livestock sector in West and Central Africa". Within this overall objective three specific expected results and activities were defined:

- Support prevention, control and eradication of HPAI in West and Central Africa
- Strengthen National Veterinary Services
- Promote safe and sustainable animal production

FAO has developed an annual workplan to operationalize the above strategy. The workplan provides clear linkages between the overall objectives and expected results, with activities and inputs undertaken through regional and national projects. The evaluation team considered the strategy and work plan to be very positive, with potentially useful managerial tools. It is too early to assess the strategy's effectiveness in aligning ECTAD Bamako's work with regional demands and context, but it is noticeable that the existence of the strategy is already encouraging the planning of ongoing activities more strategically.

Source: Second Real–time Evaluation ECTAD BAMAKO, October 2009.

opportunities for the transmission of endemic and newly emerging infectious diseases between livestock, wildlife and humans. It is clear that there is a need to establish long–term, sustainable wildlife disease monitoring programs globally, with a focus on understanding the ecology and epidemiology of diseases between domestic and wild animals. With the emergence of H5N1 HPAI, it became apparent that multidisciplinary in–country and regional capacity building was necessary amongst, biologists, veterinarians, ornithologist, physicians and others. It is critical that environmental and wildlife elements be addressed when examining the epidemiology and emergence of new pathogens in both livestock and human populations. Since 2006 the EMPRES Wildlife Unit that has coordinated, facilitated, or implemented training of more than 500 in–country nationals from over 90 countries worldwide on wildlife disease surveillance. Trainings aim to increase the capacity to objectively investigate and evaluate the role wildlife may play in disease events in these countries. A One World One Health approach includes support and the integration of wildlife specialists into disease prevention and monitoring programs is essential to any zoonotic disease program. It is expected that through these integrated projects, the inclusion of wildlife experts and a One World One Health approach will be utilized in future surveillance and outbreak investigation activities (Box 13).

Animal diseases impact human health directly or indirectly. Some of the direct impacts are seen with zoonoses (chronic, mild or acute infections in humans) or loss of markets because of disease occurrence. Some of the indirect losses may be subtle and are not captured, such as decreased milk yield or lameness of draught animals, such that plowing

BOX 13

Egypt at the wildlife–livestock interface

The EMPRES wildlife unit implemented a study on the role of wild birds in outbreaks of avian influenza in Egypt, in 2008.

Agriculture in Egypt relies entirely on water from the River Nile, resulting in the development of an extensive system of irrigation canals. Thus, Egypt presents a unique case for wild bird interaction with poultry. Poultry, particularly domestic ducks, are kept by a majority of rural households along the Nile. Because of limited water resources, these poultry feed in agricultural fields and canals in close contact with a wide variety of wild bird species, thereby creating the potential for exchange of diseases.

The FAO study comprised two phases:

Phase 1: A migration study showed waterfowl movement from Egypt through Turkey and the Black Sea region to breeding grounds in Kazakhstan and Russia, all with H5N1 outbreaks.

Phase 2: Targeted surveillance, using satellite marking of caught and released wild birds, in El Fayoum and Manzala areas of Egypt, representing many outbreaks and human cases. Sampling of over 7,000 wild and domestic birds, including ducks feeding in canals and fields next to wild birds, will be tested and the results made available in 2010. This was the first cooperative undertaking between veterinary and wildlife officers in Egypt.

cannot take place. ECTAD Socio–economic unit looks at these issues as well as aspects of the impact of intervention measures and minimizing negative effects.

In tropical settings the disease burden is higher than that in temperate climates; and with the forecasted climate changes, disease burdens, pathogen encroachment, or agent or vector translocation and establishment will become more common (Box 14). With this knowledge, the world can use targeted prevention measures.

Rapidly rising incomes and urbanization, combined with underlying population growth, are driving demand for meat and other animal products in many developing countries. This increase in demand indirectly also increases the amount of food waste that is created which certain zoonosis–harbouring scavengers seek to survive. Historically, human food waste produced in urban areas sustained populations of free–roaming dogs and cats. Nowadays, with changing patterns of pet keeping and declines in the number of unrestrained dogs and cats in selected settings, urban food waste is increasingly supporting populations of wildlife scavengers, such as red foxes and raccoons, among many others, which have moved into urban areas to fill the niche once occupied by dogs and cats. Application of methodologies from waste management research indicate that both production of urban food waste and efficiency of municipal waste collection can be correlated to per capita GDP, thereby making it possible to estimate the amount of urban food waste available

BOX 14

Ducks and rice fields play a key role in avian influenza outbreaks

The persistence of H5N1 HPAI virus in Asia is linked to river deltas, plains or other wetland areas with irrigated rice production and high densities of domestic ducks. In Asia, ducks are often kept in rice paddies to feed on rice grains left over immediately after the harvest. Ducks also play a role in the control of rice pest problems.

Duck flocks are continually rotated in accordance with the local rice harvest distribution. Duck egg production is mainly confined to areas such as river deltas and plains, where the local hydrology and irrigation support rice crop cycles, also outside of the monsoon season. Most meat production takes place in the same areas. Rice–duck agriculture is important in Bangladesh, China, Indonesia and Viet Nam, all H5N1 HPAI endemic countries.

The inter–connection between ducks, people and rice paddies is a major factor behind outbreaks of H5N1 HPAI in Thailand and Viet Nam, and are probably responsible for outbreak persistence in other countries of the region, such as Cambodia and Lao PDR.

An integrated approach to understanding disease emergence and persistence, facilitated through FAO's current infrastructure and mandates, with local, national and international partners, helps to maximize limited resources and strategically target appropriate prevention and control measures through an enhanced ability to predict areas at risk for disease emergence.

to scavengers in a given area. Using regional and international rabies data to validate predictive models it was determined that, under certain conditions, high levels of available urban food waste can be predictive of potential scavenger–associated zoonotic infections (Box 15). Looking at ecological factors, which may serve as drivers of disease emergence, provides insight into virus persistence and disease movements allowing a more appropriate assessment of risk and when combined with socio–economics, thus presenting opportunities for targeting scare resources to more effectively prevent, control and eradicate disease while maintaining the livelihoods of the people negatively impacted by the disease as well as the control measures.

The sheer absolute numbers people and animals will have wide ranging and serious implications on the availability, use and management of land and water, forests and wildlife resources. The change in climate and ecosystems, and the greater contacts with wild animals will result in increased exposure to new disease carrying vectors and pathogens.

BOX 15

Urban food waste, scavengers and zoonotic diseases

Rabies, both a neglected and an emerging disease, is flaring up in areas where it had been previously controlled and is increasing and/or shifting its principal host in other areas. Taking a disease ecology approach, rabies emergence may be viewed as indicative of a broader process characterized by the interplay of urban food waste, scavengers, habitats and zoonotic pathogens/diseases. Preliminary work on understanding these linkages has been undertaken, and initial results shared as a basis for potential further development of this work.

The speed of demographic, social and economic changes in a country can outpace the capacity of governments and societies to provide the necessary assessment, regulatory and policy frameworks to ensure an appropriate balance between the provision of essential private and public goods. In response, FAO is approaching this fundamental veterinary public health issue from a disease ecology perspective, in which disease emergence (or flare–up) is viewed as an indicator of changing interactions among diverse disease ecological landscapes.

Preliminary findings of an ongoing FAO study suggest that further consideration of the interplay between urban food waste, habitats, scavengers and zoonotic diseases is warranted. Furthermore, the adoption of modern technologies, such as geospatial mapping capabilities could further improve our understanding of disease emergence and the multi–dimensional ecological factors that underpin pathogen evolution, establishment and persistence. These results also emphasize the important roles played by urban planning, waste management and public health in the prevention of zoonoses, particularly in ensuring that all available evidence is incorporated, upon which to base comprehensive decision–making processes, resulting in sound veterinary and public policies.

The higher density of domestic animals and humans likely present a conducive environment for existing and emerging pathogens, and the projected increase in movement of people and animals will increase opportunities for the exchanges of pathogens worldwide. A rise in the number of poor people could force farming communities to raise their animals in inadequate sanitary or otherwise high risk environments, resulting in the further entrenchment of existing disease burdens, which in turn, fuels disease spread.

Thus, FAO's commitment and engagement with the One Health approach, as reflected through its vision, programme of work, and practice, is part of the on–going endeavor to ensure a safe and secure supply of food for all people, and achievement of the Millennium Development Goals.

Conclusion

The situation continued to evolve favourably in 2009, with an overall decrease in the incidence of H5N1 HPAI in animals. Eleven countries remained infected, against 22 in 2008, and Nepal was the only newly infected country in 2009. This positive picture is, however, to be balanced against the situation in Bangladesh, Indonesia, Viet Nam and Egypt, where the virus remains entrenched. Indonesia and Egypt are of particular concern, as the situation there (in terms of both human and animal cases) worsened noticeably over the reporting period. However, recent changes in their surveillance and reporting systems (through the introduction/revision of PDSR programmes) make any comparison with previous years difficult. Under–reporting of outbreaks also hampers the accuracy/reliability of the assessment of the global situation. Under these conditions, it is difficult to determine whether poultry mortality remains below 2004–2005 levels in all targeted regions, which is one verifiable indicator of the efficiency of FAO's Global Programme. Cases in humans slightly increased in 2009, with 28 more infected persons than in 2008. Conversely, the mortality rate in humans dropped off quite significantly in 2009, but the risk of a pandemic of human influenza originating in HPAI remains the same as before, with Indonesia and Egypt as the most likely origins of such a pandemic.

Since 2004, FAO has deployed a comprehensive portfolio of activities in countries qualifying as enzootic, infected or at risk. Quantitative review of the portfolio proves its compliance with the key principles stated in the Global Programme, in terms of level of intervention, geographic priorities, activity time frame and multidisciplinary/sectoral approach. Since 2006, although HPAI has been, by far, the main focus, FAO has continued to address other animal diseases, as and when emergency or "peace time" interventions have been required. Qualitative reviews of FAO's interventions were conducted on the occasions of the Independent External Evaluation of FAO, the first (RTE1) and the second (RTE2) Real–Time Evaluations of the HPAI Global Programme, which all rated satisfactory. While the RTE1 was mainly "process oriented", the RTE2 is expected to provide significant insights on the ways the Programme was delivered and on subsequent outputs and impact. The final report is due in February 2010. In terms of funding, a total of US$272 million has been allocated to the Global Programme (out of the US$308 million initially requested), with almost US$30 million allocated in 2009 to continue implementing ongoing activities and develop eight new projects on HPAI (pipeline). FAO remains fully committed to the fight against HPAI, with eight new projects in the pipeline, mainly complementing those in Asia, in addition to the ongoing portfolio, which runs until 2010–2011.

FAO's contribution to surveillance, laboratory capacity and, more recently, to biosecurity has been instrumental, both in terms of normative (through EMPRES) and operational (through ECTAD, at headquarters, and at regional and country levels) support. A survey conducted by FAO in November 2009 shows that significant progress has been made in these three key areas, in countries where the epidemiological situation is fluid. There is

still room for further improvement, notably in terms of epidemiosurveillance capacity and sustained human and financial resources. Given the recent focus placed on biosecurity, considerable efforts are still needed to educate and convince people of the benefits of implementing good hygiene practices on farms (mostly in sectors 3 and 4). FAO also contributed to the global effort against HPAI in areas such as communication, socio–economic aspects and wildlife surveillance. In Bangladesh, Indonesia, Viet Nam, Egypt and Nigeria, FAO has implemented a sizeable and varied portfolio of activities, ranging from high–level advocacy and policy work to conducting active field surveillance for early detection and control of disease outbreaks.

The emergence in April 2009 of a novel influenza virus, the pandemic influenza A H1N1 2009 virus, which reassorted from avian, human and swine influenza genes, prompted FAO's immediate response although, to date, animals have not played a major role in the epidemiology of the pandemic in humans. In particular, enhanced surveillance in animals and virus monitoring was made possible with the rapid support of GLEWS and OFFLU and the deployment of a specific H1N1 portfolio in the most at risk areas. Biosecurity guidelines for pig farms were also rapidly produced, in collaboration with OIE. The whole mechanism specifically put in place for HPAI at global, regional and national levels proved mature and flexible enough to address another TAD of global importance, under emergency conditions. This provides an excellent signal of FAO's capacity to put into practice the newly adopted multiagency Strategic Framework, One World One Health, and transit smoothly from a single to a multidisease (EIDs) approach. Besides this, much of the capacity built in "transversal areas" is readily adaptable to many other animal diseases, as a positive spill–over effect of HPAI. It is still not known whether donors are ready for longer term commitment in animal health, after five years of unprecedented in–depth involvement in HPAI. The next International Ministerial Conference on Animal and Pandemic Influenza (Hanoi, April 2010) will set the stage for a global effort over the next 20 years.

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