

SECOND REAL TIME EVALUATION OF FAO's WORK ON HIGHLY PATHOGENIC AVIAN INFLUENZA

COUNTRY REPORT: BANGLADESH

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I. INTRODUCTION

Bangladesh straddles the fertile Ganges-Brahmaputra Delta, is bordered by India on virtually all sides (except for a small frontier with Myanmar to the far southeast and by the Bay of Bengal to the south), and is a country highly vulnerable to natural disasters such as annual monsoon floods and cyclones. The country is the seventh most populous country in the world with an estimated 45% of its inhabitants below the poverty line. Per-capita GDP has more than doubled since 1975, and the poverty rate has fallen by 20% since the early 1990s. While over 50 percent of the GDP belongs to the service sector, nearly two-thirds of Bangladeshis are employed in agriculture, with rice as the dominant product. The livestock sector's contribution to GDP was 2.8 percent in 1990-91, which increased to 2.9 percent in 2005-06; the livestock sub-sector grew at a rate higher than the annual growth rate of the overall agricultural sector. Poultry is a critical element of the livestock sector. Remittances from Bangladeshis working overseas, mainly in the Middle East and East Asia, as well as exports of garments, are the main source of foreign exchange earnings.

The country faces a number of major challenges, including widespread corruption, economic competition relative to many other countries of the world, and an increasing danger of

hydrologic shocks brought on by ecological vulnerability to climate change. Highly pathogenic avian influenza (HPAI) is one of these challenges, affecting a poultry industry which is recognised as a core ingredient to processes of economic growth, food security and poverty reduction.

Bangladesh has experienced HPAI since February 2007. The disease has appeared in three season-associated epidemics (March to July 2007, September 2007 to May 2008 and November 2008 to June 2009). At the time of the visit by the Second RTE team¹ there had been no reported cases since August 2009 (a period of 3 months). Bangladesh has a very important poultry sector which has been growing rapidly over the last two decades (approximately 200 percent over the 5 years prior to HPAI²), and this industry has clearly been devastated by HPAI. It is claimed that the industry lost 40 per cent of the country's 150,000 poultry farms, put half a million poultry workers out of work and caused cumulative losses of around \$9.75m. Furthermore, recovery has been held back by the escalating cost of feed and other inputs.

The poultry industry in Bangladesh has long been considered by many to be crucial to agricultural growth, poverty reduction and the provision of dietary protein for its peoples. This sub-sector is particularly important in that it provides an important source of nutrition, is a worthwhile economic enterprise for women and the poorer sectors of society, and presents a range of employment opportunities (Raihan and Mahmud, 2008). The poultry industry in Bangladesh is very diverse. It comprises broiler chickens, layer chickens, native chickens and ducks. The production of broiler and layer chickens is characterised by large-scale, intensive, commercial production systems with modern technology and imported hybrids, and by small and medium scale enterprises of 2,000 to 25,000 birds. Native chicken production, on the other hand, is usually a backyard activity undertaken by rural households using minimal inputs, but there is also small scale commercial production of local chickens. The Bangladesh smallholder poultry model has been analysed and described in several publications (Jensen, 1996 and 2000³; Saleque and Mustafa, 1997⁴; Saleque, 2000⁵; Fattah, 2000⁶; Ahmed, 2000⁷;

¹ The First RTE, carried out in 2007, did not visit Bangladesh.

² Shamsuddoha, Mohammad and Sohel, Mir Hossain, Problems and Prospects of Poultry Industry in Bangladesh: A Study on Some Selected Areas (November 4, 2003). The Chittagong University Journal of Business Administration, Vol. 19, 2004. Available at SSRN: <http://ssrn.com/abstract=1295343>

³ Jensen, H. Askov (1996). Semi-scavenging model for rural poultry holding. In: Proceedings of XX World's Poultry Congress, New Delhi, India. Vol. I, 61-70.

Jensen, H. Askov (2000). Paradigm and Visions: Network for Poultry Production in Developing Countries. In: F. Dolberg and P. H. Petersen (eds.) Poultry as a Tool in Poverty Eradication and Promotion of Gender Equality Proceedings of a workshop, March 22-26, 1999, Tune Landboskole, Denmark.

<http://www.husdyr.kvl.dk/htm/php/tune99/3-AJensen.htm>

⁴ Saleque, A. and Mustafa, S. (1997). Landless Women and Poultry. The BRAC model in Bangladesh. In: F. Dolberg and P. H. Petersen (eds.) Integrated Farming in Human Development. Proceedings of a workshop, March 25-29, 1996, Tune Landboskole, Denmark. www.husdyr.kvl.dk/htm/php/tune96/3Mustafa.htm

⁵ Saleque, A. (2000). Scaling-up: The BRAC Poultry Model in Bangladesh. In: F. Dolberg and P. H. Petersen (eds.) Poultry as a Tool in Poverty Eradication and Promotion of Gender Equality. Proceedings of a workshop, March 22-26, 1999, Tune Landboskole, Denmark. <http://www.husdyr.kvl.dk/htm/php/tune99/5-Saleque.htm>

⁶ Fattah, K. A. (2000). Poultry as a Tool in Poverty Eradication and Promotion of Gender Equality. In: F. Dolberg and P. H. Petersen (eds.) Poultry as a Tool in Poverty Eradication and Promotion of Gender Equality Proceedings of a workshop, March 22-26, 1999, Tune Landboskole, Denmark.

<http://www.husdyr.kvl.dk/htm/php/tune99/2-Fattah.htm>

⁷ Ahmed, N. (2000). The smallholder poultry model in Bangladesh. In: G. Pedersen, A. Permin, and U. M. Minga (eds.) Possibilities for smallholder poultry projects in Eastern and Southern Africa. Proceedings of a workshop, Morogoro, Tanzania, 20-25 May 2000. Network for Smallholder Poultry Development, Copenhagen. www.poultry.kvl.dk

Dolberg, 2001⁸). It appears that the chicken meat industry, including broilers and native chickens, stands to benefit from an increase in demand because of the anticipated growth in population and household income. However, it faces a number of challenges. For the commercial broiler sector, its main concern would be the threat from global competition because it is a high-cost producer by world standards. The future of the commercial sector will depend largely on the availability of cheap feed sources and improvements in production and marketing efficiency. For the backyard and small-scale commercial sectors, the challenges are in knowledge, technical know-how and the scarcity of household resources.

In summary, the Bangladeshi poultry sector comprises of different production systems and two main species, chickens and ducks. The production systems that have developed can be divided into the traditional scavenge-based systems that produce the deshi breed chickens and local chicken eggs and also the local breed ducks and eggs. A new system introduced by the government as a poverty alleviation measure is based on a new breed “Sonali” that has higher egg production and higher bodyweight than the local breed birds. These production systems produce a bird that is intermediary in quality from the Deshi and broiler. Finally industrial chicken production systems for the production of meat and eggs have expanded rapidly in the last ten years. These systems produce a mass broiler meat bird which is considered to be an inferior product by Bangladeshi consumers, but the broiler production systems are an important component in supply protein for urban based consumers and to a lesser extent rural areas. The commercial layer systems produce white and brown eggs that are considered as being mass produced and seen as inferior to local breed eggs. A majority of products are supplied to urban consumers through a network of already established markets for eggs and live birds, and to date there has been little development or investment in slaughterhouse, processing and retailing facilities.

Battered by HPAI, floods and cyclones, the country's previously booming poultry industry shrunk in 2007 and has struggled to recover in 2008 and 2009 (Chakma and Rushton, 2008⁹).

Bangladesh was one of 6 countries selected for the second Real time evaluation of FAO's contributions to the preparedness and control of HPAI¹⁰, as part of a purposive evaluation of the country level assistance provided to countries by FAO through regional and national projects managed by the organisation. The evaluation team visiting Bangladesh comprised Professor Brian Perry, Dr. Trevor Ellis, Mr. Shashi Kapur and Mr. Carlos Tarazona. They arrived on Saturday 7th November and left on Friday 13th November. Their terms of reference and approach to the evaluation are set out in their inception report. The evaluation criteria specified in the inception report were applied to assess the relevance, efficiency, effectiveness, sustainability and – to the extent possible – the impact - of FAO's HPAI work.

II. HPAI STATUS AND EVOLUTION IN BANGLADESH

HPAI H5N1 was first declared as present in Bangladesh in March 2007 with outbreaks continuing until July 2007 and then a further two waves of outbreaks (September 2007 to May

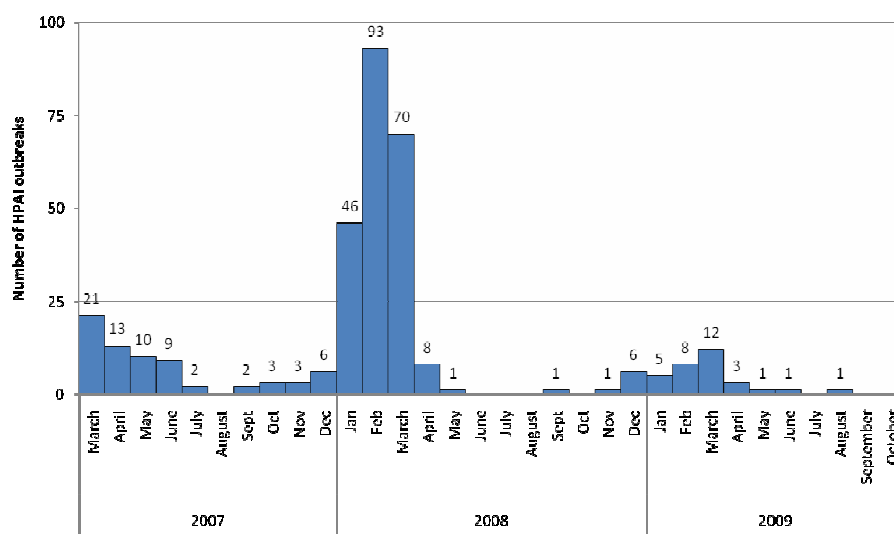
⁸ Dolberg, F. (2001). A livestock development approach that contributes to poverty alleviation and widespread improvement of nutrition among the poor. Livestock Research for Rural Development:

<http://www.cipav.org.co/lrrd13/5/dolb135.htm>

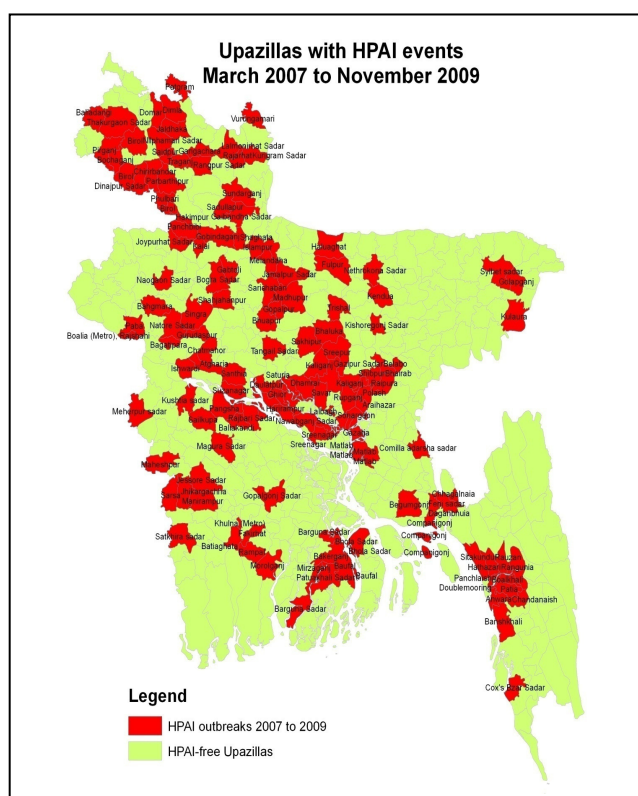
⁹ Chakma, D., Rushton, J. 2008. Rapid assessment of socioeconomic impact due to highly pathogenic avian influenza in Bangladesh, FAO, Rome, 32 pp.

¹⁰ Bangladesh was not visited by the First Real Time Evaluation team.

2008 and November 2008 to June 2009) peaking in the cooler months, with sporadic outbreaks in September 2008 and August 2009 (see Figure 1).



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 but given the persistence of HPAI, Bangladesh has been declared an endemic¹¹ country. H5N1 virus in poultry has been confirmed in 47 out of 64 of the districts (73%), outbreaks are geographically widespread (Figure 2) and appear to be linked to chicken and human population density and movement along major roadways throughout the country.



¹¹ Report Exercise on Highly Pathogenic Avian Influenza – FAO contribution to the UNSIC report (2008)

With peak HPAI activity occurring in the winter period (December to March) in Bangladesh in the previous 2 years, close monitoring of the situation in the coming winter period (December 2009 to March 2010) will be a good indicator of whether the HPAI situation in Bangladesh has been contained or not.

The virus isolated from the initial outbreak [A/Chicken/Bangladesh/Biman01/2007 (H5N1)] was fully characterized at the National Institute of Animal Health, Bangkok, Thailand (NIAH) and shown to be a Clade 2.2 virus based on HA sequencing and a Z genotype virus based on sequencing of the NA and internal genes. Subsequent detection of virus has been based on rapid testing for influenza A antigen from suspect cases and confirmation as a H5 avian influenza virus by real-time H5 PCR tests. Currently, H5 avian influenza isolates are then confirmed as H5N1 viruses by submission to the FAO/OIE Reference Laboratory for Avian Influenza, Veterinary Laboratories Agency, Weybridge, UK (VLA).

It is still unclear how H5N1 virus reached Bangladesh to initiate the first outbreaks. Molecular virology studies have been initiated to try and shed some light on the source of infection. Forty-seven H5N1 viruses were sent from Bangladesh to VLA, where gene sequencing was conducted on the HA gene of 25 H5N1 isolates (15 from 2007 and 10 from 2008).

Phylogenetic analysis of the HA genes of these viruses, as well as the original virus [A/Chicken/Bangladesh/Biman01/2007 (H5N1)] from Bangladesh, and 32 H5N1 HPAI viruses from different clades and sub-clades from 20 other countries was conducted (Islam et al 2009¹²). There was marked homogeneity in the HA genes of all Bangladesh isolates from 2007 and 2008 and these are closely related to viruses from Kuwait, Iran, Italy, Afghanistan, southern Russia, Mongolia from 2006 which are referred to as the European Middle East-African cluster 3 (EMA-3) and viruses from the initial Indian outbreaks in Navapur in 2006 (Ray et al., 2008¹³). The H5N1 HPAI viruses in Maharashtra, Gujarat and Madhya Pradesh in India in 2006 appears to have involved two separate incursions and may have been introduced by wild bird migration along the East Africa/West Asian flyway (Ray et al., 2008). This flyway extends to Bangladesh, and as Bangladesh does not have any common poultry trade links with these more distant countries and the western states of India, it suggests that migratory birds might have been the more likely source of initial introduction of HPAI to Bangladesh.

After the initial outbreaks the rapid spread and persistence of H5N1 infection was most probably a result of poultry trade, due to a combination of minimal biosecurity in small and intermediate sized commercial farms and village poultry, and insufficient resources deployed to rapidly detect outbreaks, control poultry movement, undertake control activities and provide adequate compensation for culled birds.

In a study undertaken in partnership with FAO¹⁴, estimates of losses associated with HPAI outbreaks in Bangladesh based on official reports of birds that have died or been culled, and of eggs destroyed indicate direct losses in the magnitude of US\$ 9.88 million. The State through its compensation policy is estimated to have borne 24% of the losses.

¹² M.R. Islam, M. Giasuddin, M.A. Samad, M.J.F.A Taimur, M.A. Baqi, A.T.M.

Mahbub-E-Elahi and M.M. Amin. Phylogenetic Analysis of Highly Pathogenic Avian Influenza (H5N1) Virus Isolates of Bangladesh

¹³ Ray K, Potdar VA, Cherian SS, Pawar SD, Jadhav SM, Waregaonkar SR, Joshi AA and Mishra AC. (2008). Characterization of the complete genome of influenza A (H5N1) virus isolated during the 2006 outbreak in poultry in India. Virus Genes K.Ray et.al..html [06/08/2008 17:29:30]

¹⁴ Chakma, D., Rushton, J. 2008. Rapid assessment of socioeconomic impact due to highly pathogenic avian influenza in Bangladesh, FAO, Rome, 32 pp.

Clearly the total losses were much greater than this, including loss of revenue from the drop in poultry consumption and therefore a drop in the prices of poultry; losses due to mortality which was not compensated; the loss of revenue as hatcheries could not sell and had to destroy chicks, and from hatching eggs not set in incubators due to the diminished demand. The worst affected component of the poultry sector both in terms of absolute and relative losses and low levels of compensation has been the layer producers.

The above estimates are based on official reports of HPAI outbreaks. However field reports, expert opinions and information of the lack of incentives for some components of the poultry sector to report, indicate that losses are far higher. It is likely that losses in the commercial layer and breeding units have been underreported and that backyard systems have not reported disease either through a lack of information or due to problems of receiving compensation.

Year	Number of outbreaks	Number of deaths	Number of birds culled
2007	68	35,000	170,000
2008	227	243,000	1,062,000
2009	31	3,600	45,000
Total	326	280,000	1,277,000

The table above shows the number of birds culled on infected farms. In 2007 and early 2008 a further 400,000 birds were culled in the “infected zones” surrounding outbreaks.

III. NATIONAL HPAI RESPONSE FRAMEWORK

The national HPAI response framework in Bangladesh is a multi-sectoral plan that is based on the National Avian Influenza and Human Pandemic Influenza Preparedness and Response Plan, Bangladesh 2006-2008. This was prepared by a National Multi-Sectoral Planning Team from the Ministry of Health and Family Welfare (MoH&FW), Ministry of Livestock and Fisheries (MoFL) and the Ministry of Environment and Forest with joint technical support from FAO and WHO and was formally approved by the Prime Minister in April 2006.

A follow on plan, the National Avian Influenza and Human Pandemic Influenza Preparedness and Response Plan, Bangladesh 2009-2011, has been developed by a multi-sector Planning Team consisting of representatives of MoH&FW, MoFL, MoEF and international organizations (WHO, FAO, UNICEF, ICDDR), is now being finalized and will be submitted for Prime Ministerial approval.

Livestock activities are regulated by the Department of Livestock Services (DLS), which is a Department within MOFL and is headed by a Director General. Each of the 64 districts in Bangladesh has a District Livestock Officer (DLO) responsible for a number of sub-districts (Upazilla) which have an Upazilla Livestock Officer (ULO) in charge. The DLS has prepared an Avian Influenza Operational Manual based on the national influenza plan and which provides detailed operating procedures for HPAI prevention, preparedness, response and recovery and repopulation.

For administrative purposes in DLS there is a system of registration of commercial farms (>200 birds) and there are reported to be 42,000 registered farms present but also an undetermined number (maybe >20,000) of unregistered small family poultry farms (in theory with < 200 birds). Certain management conditions are applied to registered farms, but

registration currently appears to be voluntary, and there is no restriction applied to unregistered farms or small family farms; as a result, any enforcement of biosecurity measures, for example, is unlikely to be effective. Establishing an effective database of the poultry industry is an important step in attempting to improve the industry structure and this will be the focus of a new FAO project OSRO/RAS/704/SWE Baby 02 “Geospatial referencing of commercial poultry farms and live bird markets in Bangladesh” supported by Sweden through SFERA funds.

Control of HPAI outbreaks in poultry to date has been by depopulation and associated control measures. Initially this was all poultry (including commercial flocks) within a 5 km radius of the confirmed case. This rather harsh approach had a major impact on the level of reporting, and many poultry were reportedly sold off before the cull started. From May 2008 a cull was initiated on the basis of a positive field test, and the culling policy was changed. In the case of an infected farm, all poultry on the farm were culled, followed by a stand down period of 3 months. In some cases, enhanced surveillance is conducted around the farm, but neighbouring farms were not culled. In the case of infection in a backyard flock, stamping out of all poultry was carried out in the “infected zone”, defined as a circle with a radius of 500 metres. This was accompanied by a stand down for 3 months, with enhanced surveillance in markets close to outbreak. A total of about 1.3 million birds (of a population of approximately 220 million) have been culled.

The Government of Bangladesh (GoB) does not currently permit vaccination for HPAI control. Initially, it was considered that the disease could be controlled by early detection and stamping out of infected flocks; and in the early stages this was supported by the commercial poultry sector, who could sustain a higher level of biosecurity and movement control. With the large number of outbreaks in the second wave in 2007-2008 the resources available for control by stamping out became stretched, and again with persistence of outbreaks in 2008-2009, consideration has again been given to possible use of targeted vaccination as part of the control options. The commercial poultry industry has also changed its viewpoint on vaccination as a control option with the disease now being endemic.

The response procedures in the AI Operational Manual included detailed procedures for initial investigation and diagnosis, declaration of infected and control areas, activation of outbreak management centres and preparation for stamping out operation, stamping out operations, movement restrictions for humans, poultry and poultry products, epidemiological investigations, surveillance in the control zone and tracing of suspect products.

In conjunction with the Operational Manual other specific documents have been prepared such as the Bangladesh Avian Influenza Compensation Strategy and Guidelines.

Reporting of suspect cases occurs at the Upazilla level, and initially this depended on passive surveillance, but this has been enhanced since February 2008 by an active surveillance programme. This programme is supported by FAO and DLS staff with funding from ADB initially then USAID, with some SFERA funding. Farms or households with suspect HPAI cases are visited by ULO veterinary officers who will investigate and submit suspect birds for laboratory testing.

The official laboratory testing for HPAI diagnosis in poultry is conducted within the MOFL and has several components including the National Avian Influenza Reference Laboratory (NAIRL) that is part of the Bangladesh Livestock Research Institute and conducts PCR

testing to confirm presence of H5N1 virus. The initial laboratory testing is conducted by the veterinary diagnostic laboratory service within the DLS that consists of the Central Disease Investigation Laboratory (CDIL) and 8 regional Field Disease Investigation Laboratories (FDIL) that are strategically located throughout Bangladesh to provide laboratory support for the avian influenza surveillance system. CDIL and FDIL conduct rapid influenza A antigen detection tests on tracheal samples from suspect cases. Positive samples from the rapid antigen testing are submitted to NAIRL for testing by real time RT-PCR tests for influenza A Matrix gene and H5 HA gene. Samples from highly suspect cases giving negative results on rapid tests are monitored over the following days with repeat testing by rapid antigen detection tests.

Both NAIRL and CDIL are able to conduct avian influenza serological testing for surveillance purposes using c-ELISA kits and haemagglutination inhibition (HI) tests and staff have attended in-country training courses in HI testing and PCR for avian influenza provided by experts from USA. The facilities at CDIL are quite old and have significant problems with electricity supply. They would need significant upgrading to permit PCR testing for avian influenza or other disease diagnosis. However, the throughput for PCR testing at NAIRL is around 20 samples per day with existing equipment and procedures and in severe outbreak situations it may be valuable to have back up facilities at CDIL capable of conducting PCR testing for avian influenza and increasing test throughput.

The technical staff at NAIRL have had post-graduate training in molecular biology and received specific training in avian influenza PCR testing in Denmark and at AAHL, Geelong, Australia and participated in local training courses in PCR and HI testing for CDIL and FDIL staff with experts from USDA. They have participated in proficiency testing for avian influenza PCR testing and avian influenza serological testing by HI and ELISA in Denmark and Australia and will participate in a further round of PCR proficiency testing from AAHL later in November. Currently, the facilities available at NAIRL are not suitable to permit cultivation and further characterization of H5N1 viruses. However, the laboratory will soon move into a newly renovated facility containing two fully functional, secure BSL 3 laboratory suites as well as other BSL 2 laboratory rooms provided by World Bank funding. Plans are also in place to purchase gene sequencer equipment and train staff to conduct genetic characterization of avian influenza viruses. This will permit characterization of H5N1 viruses within the NAIRL and enable molecular epidemiology studies of H5N1 viruses in Bangladesh.

The DLS recognizes that it has limited capacity in epidemiology to support its surveillance activities and in discussions with the evaluation team the recently appointed DG indicated this was an immediate focus for him and he plans to set up a surveillance group with strong epidemiological support. In the short term this will require support from international funding bodies and international epidemiology experts for in-country training but in the longer term the plan is to send selected national staff off for postgraduate training in epidemiology.

The key issues relating to the national response mechanisms include:

- Completeness of the farm database;
- Understanding of market value chains;
- Sensitivity of the active and passive surveillance systems;

- Level of compensation and possible role of vaccination and need for input from private industry in discussions affecting the poultry industry;
- Quality of outbreak investigation, tracing and definition of epidemiology of outbreaks;
- Capacity of epidemiology units to plan surveillance activities, analyse surveillance data and providing advice on management and control of HPAI based on risk analysis;
- Structured virological surveillance of duck flocks ;
- Improved career pathways for trained laboratory experts and epidemiologists within the DLS structure.

IV. DONOR AND TECHNICAL ASSISTANCE SUPPORT

There are several agencies involved in providing technical assistance and support to Bangladesh in the HPAI programme. The list includes the USAID, World Bank, Asian Development Bank (ADB), UNICEF, WHO, DANIDA, CARE, Japan International Cooperation Agency (JICA), Rural Employment Generation Foundation (PKSF), Stop A.I., AI.COMM., Research, Training and Management International (RTM), Bangladesh Rural Advancement Committee (BRAC), etc.

There is a regular meeting of donors on HPAI (chaired by USAID), which reportedly seeks complementarity of contributions and tries to avoid duplication. Also, there is an element of coordination amongst the various UN agencies involved in providing support to HPAI control. FAO appears to be playing an effective lead role in these activities. There is a nominal division of labour, with FAO responsible for animal health matter, WHO for human health and UNICEF leads the responsibility for health communications¹⁵.

WHO and FAO assisted in the formulation of the National Avian Influenza and Human Pandemic Influenza Preparedness and Response plan 2006-2008. The plan was drawn up in association with Ministry of Environment, Health, and Livestock & Fisheries. After the occurrence of H1N1, the plan has been revisited in 2009, and is now relabelled the National Pandemic Influenza Preparedness & Response Plan. It has been drawn up under the leadership of the Ministry of Health and supported by WHO, FAO, UNICEF, DLS (Dept of Livestock) and DOE (Department of Environment) for the period 2009-2011; it is awaiting the approval from the Prime Ministers office.

USAID has been by far the main donor with investments of around US\$ 20m in the past three years (2007-09) on human and avian influenza control. Most of this assistance has been channelled through FAO and implementing partners such as STOP AI and KTM (see below).

The World Bank started in June 2007 an Avian Influenza and Human Pandemic Preparedness and Response Project (AIPRP) in Bangladesh to minimize the threat posed by highly pathogenic avian influenza (HPAI) to humans by controlling such infections in domestic poultry, and preparing for, controlling, and responding to possible human infections, especially an influenza epidemic and related emergencies. This objective is expected to be achieved through three types of interventions: (i) prevention; (ii) preparedness and planning; and (iii) response and containment. This US\$ 16m project (excluding US\$ 3m from the GoB and a US\$2m grant from the AHI facility) has to date only disbursed about US\$ 1.2m. The main reasons for this unsatisfactory progress have reportedly been “an inadequately staffed project unit, the inability to resolve tax issue in order to sign the technical assistance contract

¹⁵ UNICEF has a pandemic preparedness project on H1N1/H5N1; previous HPAI activity was funded by Japan.

with FAO... and availability of substantial grant funding from other development partners for national AI program”.¹⁶ The evaluation team was informed that the first two bottlenecks would be solved by the time of the next project review mission scheduled for January 2010. As discussed later in the text, FAO’s role as provider of technical services is seen by all stakeholders as a natural role for the organization given its technical expertise and heavy involvement in the response.

STOP AI is an initiative of the Development Alternatives Inc. (DAI), based in the US and initiated worldwide in 2007. Funded by USAID, it has been operating in Bangladesh since 2008. The objectives of the initiative are:

- Training in biosecurity to people working in the live bird markets in the country,
- Pilot cleaning, disinfection and pressure washing in two live bird markets in Dacca. FAO will then take over these markets for further bio-security infrastructure building and also extend the same cleaning and disinfection to 6 other markets in Dacca and 12 markets in other parts of the country,
- Promote Public Private Partnerships in promoting the concept of biosecurity amongst all stakeholders in poultry production, notably the producers.

Along with other partners, the organization short-listed 2 markets (Kaptaan Bazaar and Mohammadpur market) in Dacca. In these markets the organization has upgraded the facilities by providing sanitary measures and power points as well as water points so that effective cleaning of the markets can take place. There is a plan to overhaul the drainage facilities of these markets which is presently either non existent or not working.

The two projects have been completed by Stop AI and handed over to FAO who will continue to provide improvements in infrastructure. The organization has conducted a TOT (Training of Trainers) programme for cleaning of the live bird markets in collaboration with the DLS and the local market committee in 5 divisions of the country. The training programme was reviewed by FAO. The organization has conducted one day training in 5 Upazilas of Gazipur and 6 Upazilas of Dinajpur on bio security for hatcheries, commercial farmers, backyard poultry growers and poultry sellers.

RESEARCH, TRAINING & MANAGEMENT INTERNATIONAL (RTM) has been contracted by AED (Academy for Educational Development) for training of Government officials in 18 out of the 48 affected districts of Bangladesh. Between 2007 and 2009, it has conducted training on Operation and Management of AI outbreaks to 1018 officers in the Departments of Livestock, Health, Forest and Environment.

Other donors supporting the development of the poultry sector are DANIDA and JICA. The Danish started their development programme in the late 80s. In partnership with CIDA, IFAD and the ADB, DANIDA promoted smallholder livestock development throughout the country and is currently working on poultry rearing in 5 districts in the south as part of the Agriculture Development Sector Support programme 2000-10. JICA has supported the Poultry Management Techniques Improvement Project since the late 90s with the objective of improving feeding management, breeding and disease control. It’s currently working in 12 locations and has a target of training 100 farmers on poultry production (up to 1000 birds) and biosecurity (including HPAI) at each of these locations.

¹⁶ Aide memoire Mid-term Review Mission (August 2009)

The Institute of Epidemiology, Disease Control and Research (IEDCR), as a part of capacity building ICDDR, B (International Centre for Diarrhoeal Diseases Research, Bangladesh) is putting up a BSL 3 Laboratory funded by CDC at the request of WHO. WHO also supports epidemiology programmes and training. The institute, in collaboration with UNICEF has trained a large number of people (managers) at the National and the District level on emergency response. An 11 member emergency response team has been established at the District level and a 5 member team at the Upazila levels all of who have been trained. A total of 2320 managers have been trained at the Upazila level. 60 training courses have been held for training of trainers and the UN (mainly UNICEF) bodies have been involved in almost all the training activities. After the occurrence of H1N1 in April, the Institute has established a Level 3 BSL Laboratory by importing a prefabricated unit with an RT PCR and this receives samples from 12 sites – 2 from each Division of Bangladesh – one from a Govt. hospital and another from a private source on a regular basis to closely monitor the virus scene.

The Bangladesh Rural Advancement Committee (BRAC) is a very large NGO operating in 12 countries, and has extensive involvement in the poultry production, finance, animal health and marketing of poultry products in Bangladesh. It essentially works in the rural areas (present in more than 80% of all villages in BD), with the objective of poverty alleviation and improvement in incomes of the lower income group. It has one of the three poultry processing plants in Bangladesh. BRAC has been participating in several awareness programmes and also has the unique advantage of having over 20,000 trained vaccinators (all women) who vaccinate for ND and Fowl Pox. This very large human resource in the rural areas involved directly with poultry could play a very meaningful part in the surveillance programme.

V. ROLE AND ACTIVITIES OF FAO

Since 2006 FAO has been supporting the efforts of the Government of Bangladesh to prevent and control avian influenza through global, regional and country level initiatives conducted mainly with funding provided by the Asian Development Bank (ADB), USAID and the Swedish contribution to SFERA. FAO, mainly through ECTAD, has played a strong strategic role at the technical level, participating actively in the development and subsequent update of the National Preparedness and Response Plan¹⁷ for HPAI, as well as a major front line role, such as supporting the implementation of active surveillance, as well as other training and capacity building activities. The FAO Representation has also played a commendable role in advocating for, and seeking, political and financial support for the avian influenza response, both at the time of the initial outbreaks and subsequently over the last 18 months. The involvement of the FAO Representative was reportedly instrumental in seeking, securing and maintaining the attention of Government during a period characterized by continuous changes in senior staffing at the Ministry of Livestock and Fisheries (including Ministers, Secretaries, Director Generals and Chief Veterinary Officers).

FAO front line activities have been guided by an Operational Matrix first developed by FAO in June 2007 to co-ordinate the implementation of the avian influenza component of the National Preparedness and Response Plan (see annex 3). Following the update of the Government's Plan in late 2008, the operational matrix was updated and used as a management and communications framework to cover the period 2009-11. The matrix

¹⁷ Recommendations of the FAO Crisis Management Centre (CMC) primary assessment mission report (Tripodi et al, 2007) and FAO's technical experiences in the control of avian influenza in Southeast Asia (2004-06) were reportedly taken into account during its elaboration (originally led by FAO consultant C. Ahlers). The evaluation team was informed that the Plan is being currently updated to also cover H1N1.

provides a list of priority areas for FAO (highlighted in bold) as well as clear linkages between activities and results on five different “pillars”: coordination & policy; disease detection; disease diagnosis; disease control & eradication; and disease prevention. The evaluation team was informed that the matrix has served as a framework not just for FAO but also for other development partners in view of the need to coordinate the numerous activities funded by primarily the World Bank, USAID, ADB (through FAO), DANIDA and JICA.

FAO Country Programme

FAO Avian Influenza field programme has been running for about three years (2007-2009). The table below includes a timeline of FAO main activities in Bangladesh:

Year	Activities
2007	<p>Supplied rapid antigen detection kits and emergency reagents for national reference laboratories and field laboratories</p> <p>Contributed to the development of the national communication strategy for avian and pandemic influenza (2008-09)</p> <p>Supported Government to develop operational manual</p> <p>Supported BRLI laboratory to develop protocol for HPAI diagnosis using PCR</p> <p>Supported Government to establish an epidemiology unit</p> <p>Fielded an international consultant to recommend plan for strengthening epi capacity</p> <p>Supported Government to send first batch of virus sample overseas to confirm index case</p> <p>Fielded an CMC mission after the first outbreak</p> <p>Formulated a laboratory working group to coordinate lab activities</p> <p>Deployed a lab engineer and a microbiologist to develop plan for lab upgrade</p> <p>Develop a 3 year operational matrix to coordinate HPAI activities in the country</p> <p>Develop active surveillance project</p> <p>Develop a wet market communication pilot project</p> <p>Establish (in late 2007) a national ECTAD unit at DLS</p>
2008	<p>Supported government in epidemiological investigation</p> <p>Supported NRLI with additional laboratory staff</p> <p>Conducted meetings of the laboratory working group</p> <p>Established the SMS Gateway system</p> <p>Participated in the development of the Animal Diseases Rules (Under Bangladesh Animal Diseases Act of 2005)</p> <p>Participated in the development of the 2nd National Avian Influenza Preparedness and response plan</p>
2009	<p>Participated in the revision of the 2nd NAIPRP to include H1N1 and other influenza diseases</p> <p>Continued and expanded the active surveillance and the use of SMS gateway system</p> <p>Conducted outbreak investigation for FMD</p> <p>Prepared biosecurity guidelines for backyard poultry</p> <p>Strengthened national capacity in Veterinary Epidemiology through overseas training of DLS staff</p> <p>Geospatial mapping of commercial farms and markets was initiated</p> <p>Supported the development of biosecurity manual for commercial poultry (PPP)</p> <p>Started work on LBM cleaning and decontamination</p>

As October 2009, nine projects had directly contributed to HPAI prevention and control activities in Bangladesh (see table below). The evaluation team has assessed these projects based on discussions with a wide range of local stakeholders, field visits and a throughout documentation review. Specific comments on their performance can be found in annex 4 on a project-by-project basis; here some more general observations are made regarding surveillance and epidemiological activities (surveillance being the bulk of project assistance).

Table 1. Avian Influenza Projects implemented in Bangladesh as of October 2009

Project	EOD	NTE	Donor	Total Approved Project Budget	Total Expenditures under the project	Budget Allocated for Bangladesh through FBA	Expenditures and Commitments under FBA for Bangladesh
OSRO/BGD/902/USA	01-Sep-09	31-Oct-10	USA	3,082,800	-	-	-
Total National Projects:				3,082,800	-	-	-
Global- (OSRO/GLO/504/MUL BABY02)	01-Jan-06	31-Dec-07	Switzerland	3,696,573	3,597,935	9,600	7,186
Global - (OSRO/INT/805/USA BABY02)	01-Jan-09	31-Jan-10	USA	301,000	16,304	-	50,153
Global – (OSRO/GLO/802/USA BABY02)	01-Jan-09	31-Jan-10	USA	575,000	19,860	510,000	13,979
Regional - (OSRO/RAS/605/USA BABY01)	01-Jul-06	31-Dec-09	USA	2,590,000	1,694,483	824,147	443,599
Regional - (OSRO/RAS/701/USA)	31-Mar-08	31-Mar-10	USA	2,000,000	805,736	79,300	31,784
Regional - (OSRO/RAS/601/ASB)	28-Apr-06	31-Aug-10	ADB	11,140,000	7,757,712	815,138	754,523
Regional – (OSRO/RAS/704/SWE BABY 02)	08-May-06	31-Dec-09	Sweden	1,680,849	1,173,773	251,167	139,892
Total Global/Regional Projects:				21,983,422	15,065,803	2,489,352	1,441,116
Grand Total:				25,066,222	15,065,803	2,489,352	1,441,116

The active clinical surveillance system developed using community animal health workers (CAHW), additional veterinarians and Upazilla Livestock Veterinarians with the SMS Gateway electronic reporting system is an innovative approach to tackle the difficult issue of getting adequate reporting of outbreaks from farms and villages where incentives to report are insufficient. However, at this stage the resources available, compared to the number of households and farms to be visited in each Upazilla, means that the system is relatively insensitive in real time. An improved or more targeted sampling strategy based on epidemiological analysis of existing data, may give better use of the resources available.

With the possibility that initial incursions of H5N1 in Bangladesh came from wild bird movement and also with the importance of duck flocks in H5N1 virus persistence in the region, some active virological surveillance of ducks in relevant parts of Bangladesh is warranted.

FAO epidemiological capacity and mentorship is still needed to build up the capacity of the epidemiology units within DLS to plan surveillance activities, analyse surveillance data and providing advice on management and control of HPAI based on risk analysis. In the longer term advocacy to improve the capacity of epidemiology units in DLS, expand the emerging infectious disease and differential diagnostic capacity of the laboratories and to build good career structures in the epidemiology units and laboratories will be the major sustainable contribution by FAO from the HPAI programme.

New initiatives from FAO to foster closer interaction/partnerships between the public and the private sectors, including small and large scale commercial poultry farms, animal health companies and the NGOs are encouraging and have initially focused on developing, implementing and auditing practical biosecurity guidelines for commercial poultry. A complementary project is introducing practical biosecurity and hygiene improvements at 18 selected live bird markets in Dhaka and 5 other Divisions with active involvement of city market authorities and private stall-holders. Socio-economic benefits of improvement in the marketing system will be assessed and potentially used to role out improvements in livebird market systems in Bangladesh.

A synthesis of the evaluation team's views on the projects' overall contribution to avian influenza prevention and control can be found in section VI of this report.

FAO Country Team

A significant share of the ADB (2006-07) and USAID (2006-09) funding has been used to set up a technical unit for Avian Influenza within the premises of the Department of Livestock Services (DLS). The unit, which was created in late 2006 with the recruitment of a national consultant, was not fully manned (i.e. absence of a multi-disciplinary team) until October 2007. The unit has supported DLS in a myriad of activities and played a significant role in the co-ordination of post-outbreak activities in 2007-08, including laboratory capacity development and on the establishment of an active disease surveillance network and related information system (SMS gateway).

The core staffing of the unit is currently composed of two international and eight national consultants¹⁸. However there have been substantial variations in the levels of staffing from

¹⁸ www.aitubd.org

only one national staff in late 2006/early 2007 (working with short-term consultants) to three international and three national staff for most of 2007/08, and two international and three national staff in early 2009.

Shortage and rapid turnover of personnel in 2006-07 was reportedly the result of financial constraints to offer long-term (one year) contracts (there were 3 CTAs and several consultants were fielded in this period) and the apparently difficult living conditions in Bangladesh. Since mid-2006 donors made funding available for several long- and short-term international and national positions, but again a combination of delays from FAO and the Government in selecting and providing staff clearance, respectively, constrained the capacity of the country team to deliver the outputs originally planned. As an example, following the decision not to extend the contract of the previous CTA in December 2008, FAO selected a replacement only in June 2009 but until very recently his appointment has been pending Government clearance. This has now been resolved, and a new CTA has been in post since mid December 2009.

The evaluation team was unable to assess the effectiveness of all the short-term missions conducted by ECTAD Bangkok and ECTAD Rome (particularly those funded by global and regional projects). However, some of these visits were reportedly very productive, particularly when funding and responsibilities for follow-up were clearly specified at the outset. Examples include the consideration given to the recommendations of the CMC-AH mission during the preparation of the National Preparedness Plan's operational matrix and work related to the revamping of Laboratory capacity (Mueller's, Finlay's and Sudarat's consultancies were said to have been effectively followed-up by FAO and taken into account by the World Bank AIPRP and DANIDA funded projects). On the contrary, the application of initiatives resulting from the socio-economic studies carried out in 2008 (Dipta and Rushton) and the FAO technical assistance project in support of the AIPRP (first elaborated by TCEO with support from M. Nosseir in late 2007) have yet to be approved/implemented.

The evaluation team is of the view that FAO has been a valuable partner for the Government and the donor community. It has also played an important co-ordination role with civil society organizations and the private sector. In the early days, FAO seems to have been successful in mobilizing, under the strong leadership of the FAOR, key policy and technical services in support of the Government. Upon the establishment of the technical team, FAO's support focussed more on field implementation for which neither the organization nor the Government were fully prepared. The team noted that there are several lessons to be learned from this period regarding the adequacy of short-term (vis-à-vis long-term) consultancies and the procedures followed for staff deployment (most staff are new to FAO and have to go through a steep learning curve under limited guidance; international staff are all new to the country as well), which could be used to improve FAO's management of human resources in the programme.

Another point that requires further consideration is the role of the donor community and the civil society at large. The strong partnership with USAID, which is by far the main FAO donor in the country, seems to have been the source of very constructive dialogue on issues to be tackled (notably strong involvement of USAID contractors in FAO-led support; open and continuous dialogue at regional and national level on avian influenza status). But there are issues such as the short-term nature and uncertainty of USAID funding and in a few occasions differing views on the FAO programme's management and outcomes, which have contributed to tensions in the relationship.

VI. SYNTHESIS AND DISCUSSIONS OF FAO's CONTRIBUTIONS AND ROLES

Relevance and Appropriateness of FAO's Strategy and Programme at country level:

- Adequacy of FAO's support vis-à-vis the national agenda and priorities, national development needs and challenges and decision-making processes;

FAO is seen and recognised as the lead institution in supporting Bangladesh's efforts towards HPAI preparedness and response. The high stature of FAO in the HPAI arena has been there since the personal interventions of the FAOR when HPAI was first reported in Bangladesh, and it has matured over time, in particular over the last 12 month period.

- Extent to which FAO's field work is in line with the Organization's priorities (as described in programming documents such as the National Medium Term Priority Frameworks, the FAO's Programme of Work and Budget, the FAO/OIE Global Strategy and the FAO Global Programme for the Prevention and Control of HPAI);

FAO has a programme in Bangladesh which is very much in line with the Organisation's priorities. It has developed a full understanding of preparedness and response mechanisms, has translated these into an operational matrix, and has played a key role as a facilitator between government and the various national and international stakeholders in the HPAI programme.

- Extent to which the various FAO activities at country level are underpinned by a strategy and form a coherent programme, with consistent approaches and common goals;

Bangladesh is one of the few countries visited by the evaluation team in which the FAO programme has developed a conceptual framework for planning and communication of its contributions to the National Avian Influenza and Human Pandemic Influenza Preparedness and Response Plan. This Operational Matrix clearly articulates a set of five strategic pillars for the control of transboundary diseases, sets out the clear objectives and components under each, and then updates the priorities within each component annually, according to funding streams obtained. According to donor representatives, this matrix is used at the regular meetings of the donor agencies to discuss the complementarity of donor engagement and funding.

This matrix is an exemplary initiative. The evaluation team suggests that it could be further enhanced by including an additional pillar on epidemiology (currently seen as cross cutting, but merits a separate pillar with interface with other pillars), and broadening the context of some pillars. The six suggested pillars are presented below:

- I. Policy development and programme coordination
 - II. Disease surveillance mechanisms
 - III. Disease diagnosis, differential diagnosis and infection characterisation
 - IV. Disease control and/or eradication
 - V. Epidemiological data synthesis, analysis, presentation, communication and use
 - VI. Disease prevention
- Coherence and integration of regional projects into country programmes/activities;

The Bangladesh programme has several regional perspectives which are worthy of attention. Firstly is the link to the Regional ECTAD in Bangkok. The Bangkok office provides valuable oversight and backstopping to all the activities undertaken. The role of the ECTAD RAP in support of the national programme is also recognised. The regional coordinator went several times to Bangladesh to cover for the absence of a CTA; there was also support to the laboratory work, and the strategy itself was undertaken with major inputs from Bangkok staff. The sub-regional Manager of South Asia has also provided technical support to Bangladesh as and when required, especially during the first outbreak of H5N1.

In addition there is a South Asia Cross Border project entitled “Strengthening cross-border activities among Bangladesh India, Nepal and Myanmar to control possible cross-border spread of HPAI” (OSRO/RAS/701/USA). This project aims to gain greater understanding of poultry dynamics across the common borders of these three countries, with the intentions of improving ways to manage cross border trade in a way that minimises the risk of HPAI transmission. This project has managed to bring together the veterinary authorities of the three countries, a milestone that needed HPAI (and the facilitation skills of FAO) to achieve.

Two other short term projects have regional implications, namely the Public Private Partnership (PPP) project (Developing and Maintaining Public-Private Partnership for the prevention and control of Highly Pathogenic Avian Influenza H5N1, OSRO/INT/805/USA), coordinated from Rome and Bangkok, and a project on biosecurity (Improved Biosecurity and Hygiene at Production, Collection Points and Live Bird Markets including Decontamination, OSRO/GLO/802/USA); both projects involve Bangladesh, Egypt and Indonesia.

The Bangladesh PPP project has placed considerable emphasis on bringing various public and private stakeholders together in a workshop setting, and trying to understand the roles that different stakeholders play.

- Appropriateness of FAO interventions in terms of:
 - Approach: comprehensiveness;
 - Duration: short term inputs versus long-term technical assistance; and,
 - Focus: HPAI versus other Transboundary Animal Diseases

FAO’s interventions could not be described as comprehensive, but are strategic, based on the needs of Bangladesh. However it is very evident that much greater capacity is required on the epidemiology side to strengthen the risk-based aspects of surveillance and response. Bangladesh is recognised as being a highly vulnerable country, and while there has been a decrease in HPAI cases, it is evident that poor reporting is contributing to this, and it will be important to minimise both the human risk from any new wave of cases, as well as any negative impacts on the economy and the poultry-dependent livelihoods of the Bangladesh population.

As discussed earlier, inputs have been accomplished by a mix of short term consultancies, long term international staff, and national consultant contributions. The FAO programme is still struggling to achieve the right balance of these three human resource ingredients; the evaluation team commends the recruitment of national consultants, but considers that careful consideration should be given to their mentoring, through key international staff positions in epidemiology and value chain analysis, complemented by stronger linkages with national universities (such as the Chittagong Veterinary and Animal Sciences University in Chittagong).

FAO initiated its technical assistance to the Government of Bangladesh (GoB) well before the HPAI crisis by participating actively in the development of the National Preparedness Plan. After the outbreaks in early 2007 diagnosis of HPAI was made possible thanks to the facilitating role played by FAO in dispatching samples to reference laboratories abroad and several FAO projects (see Table 1) contributed to successfully setting up the technical unit for Avian Influenza within the premises of the Department of Livestock Services (DLS) of the GoB.

The focus of the FAO programme is still very much on HPAI, but the team considers that much of the capacity built is readily adaptable to other diseases such as Newcastle disease and duck plague in the poultry sphere, and to foot and mouth disease in ruminants and pigs, for example, both in the field, in the laboratory and in the epidemiology unit.

Efficiency

- Timeliness of FAO's response to requests for assistance on HPAI prevention and control

There have been several timeliness issues affecting the Bangladesh programme, and the reasons for them have been complicated and multi-institutional. The first and most serious relates to an extended delay of more than two years in gaining Government approval for an FAO project funded out of a World Bank credit, ostensibly due to the reluctance of Government to agree to tax-free status for international consultants. The second, also serious, relates to an extended delay in approving the appointment of replacement CTA. The evaluation team brought both of these to the attention of the newly appointed Secretary in the Ministry of Fisheries and Livestock. It is understood that both of these approvals have now been given, and that a new CTA was in place in mid December 2009.

- Adequacy of FAO's response, including human/financial resources, operational, administrative, monitoring and reporting arrangements

The office of the FAOR provides strong administrative support and guidance to the programme. In addition, the location of the FAO team within the Department of Livestock Services is considered highly appropriate, and supports partnership.

It has been difficult to have a CTA in post for an adequate length of time. There have been 4 CTAs since the programme started (including the current acting CTA), and a 5th is about to take up his post.

The evaluation team was informed that the relationship between FAO and the DLS, and between FAO and other partners, most notably the USAID office, were deleteriously affected by conflict and behaviour associated with the immediate former CTA. Through decisive recommendations from the donor and strong leadership by the FAO in Bangladesh and Rome, the CTA contract was not extended. Nevertheless, it took some time to rebuild those relationships, and at least one year during which the epidemiologist had to assume team leader duties. In view of the evaluation team, the current acting team leader has done an outstanding job, but inevitably the productivity of the epidemiology section has been affected.

The appointment of a dedicated international staff member in charge of avian influenza operations in Bangladesh is seen by the team as an excellent move.

- Timeliness and adequacy of technical and operational support from FAO Headquarters (HQ) and decentralized offices (including ECTAD units and RAHCs) to country level activities, including:
 - quantity and quality of co-ordination and support from HQ, decentralized offices and Regional ECTAD/RAHCs (in terms of backstopping/supervision missions);
 - quantity and quality of country level work undertaken by the ECTAD national units and, where relevant, the FAO Representations

The support provided by FAO Rome and FAO Bangkok was considered overall to be adequate, with frequent missions particularly from Bangkok on a wide variety of topics including short-term missions of senior staff to cover for the absence of a CTA. The main limitation for a timely provision of support and follow up on recommendations made by visiting consultants was the relatively high turn over of staff and the small size of the national ECTAD unit when compared to the size of the country, the size of the problem and to staffing levels in similar affected countries (such as Indonesia and to a lesser extent, Vietnam). Resources allocated to the FAO HPAI programme in Bangladesh are half of those to Cambodia, a quarter of those to Vietnam and less than a tenth of those to Indonesia. On the other hand, the strong leadership and guidance provided by the FAO Representation in the early days was met with appreciation by all the stakeholders consulted.

Effectiveness of individual country programmes

- Achievements in terms of outputs and outcomes, including:
 - development of effective national policies, preparedness measures, communication and public awareness campaigns, surveillance systems, laboratory capacities and contingency plans to deal with the disease;
 - new or strengthened institutional frameworks, organizational structures and processes, as well as knowledge, skills and competences acquired resulting in improvements in the performance of public and private veterinary services; and,
 - enhanced preparedness and response capacities of the poultry sector to deal with the risk of HPAI outbreaks, and of other animal diseases.

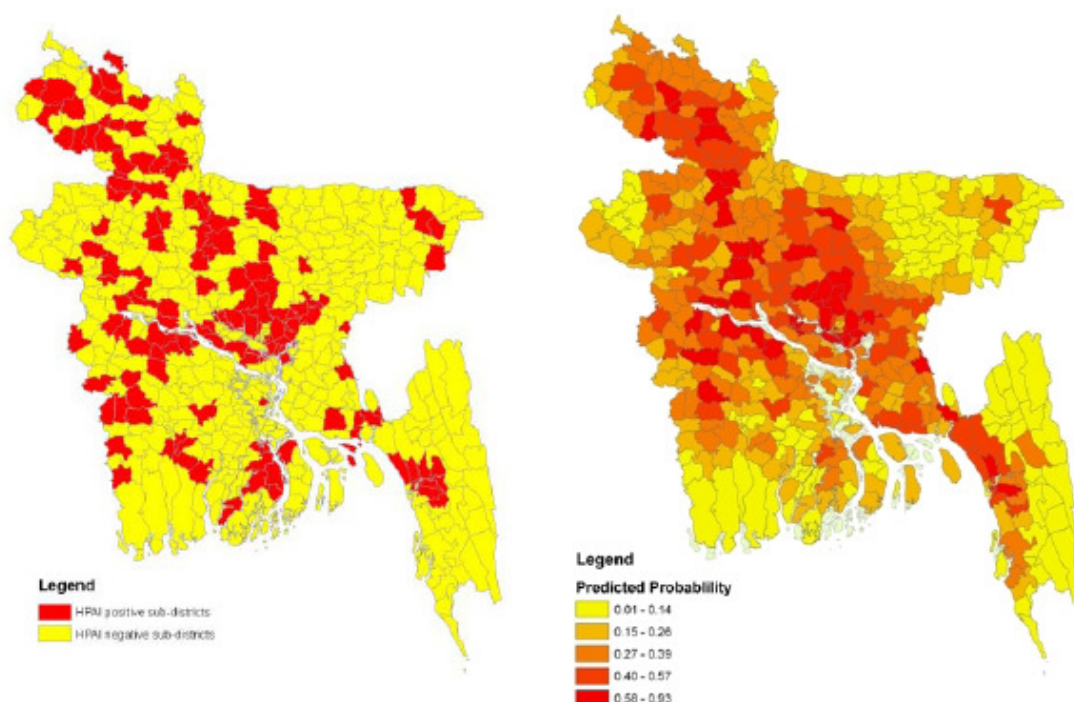
The Bangladesh country programme has provided substantial support to government and other agencies in HPAI preparedness and response. The acting CTA has strengthened cooperation with DLS, funding partners and has improved team work with the national FAO consultants and with DLS partners. The three year operational plan for FAO's activities in Bangladesh provides excellent planning and communication framework, and is used as basis for focusing activities and measuring output achievement.

In the laboratory, the disease investigation framework with ULO investigation, sample submission to, and rapid antigen testing at, FDIL/CDIL, PCR confirmation at NAIRL, then virus characterisation at VLA Weybridge, all provides nationwide coverage and acceptable speed of confirmation of H5N1 outbreaks. The staff at NAIRL who conduct real-time PCR testing have been well trained, equipment is good and the nearly completed laboratory renovations will provide very suitable facilities for PCR and virus culture. They have participated in and performed well in proficiency testing programs for PCR and HI serology testing. The transport system and electricity supply problems can cause significant delays.

The throughput for real-time PCR at NAIRL is limited, especially if multiple outbreaks occur and there would be a major problem if machine failure occurs. Introduction of PCR testing to CDIL would provide a back up facility and increase test throughput for surveillance and outbreak investigations. The laboratory building, facilities and electricity back up at CDIL needs to be upgraded for it to provide backstopping function and for capacity building. There also appeared to be some weakness in laboratory capacity required for other non-H5N1 endemic disease investigations. None of the laboratories observed had active histopathology facilities for example.

The innovative mechanism of active clinical surveillance using the SMS Gateway System provides an efficient and effective way to manage the input from the CAHW and monitor progress of investigations. 22 of 33 outbreaks were detected by the active surveillance during the period October 2008 – April 2009. The time of teams is also used for awareness, and advising on biosecurity on commercial poultry farms. However, with the large number of village households and farms in Upazillas to be covered by 3 CAHWs, who visit a total of approximately 100 places per day, it would take well over a year to cover all of an Upazilla. Beyond this, the system is very expensive. The sensitivity of this approach would be high if all households were covered, but in reality is low because of the financial and logistical impracticalities of such an extensive coverage on a real-time basis.

In part due to the epidemiologist having to act as CTA, and in part due to the weaknesses of the national epidemiology capacity, there are not as many products of structured epidemiological investigations as are required for adequate feedback into updating national policy and strategy guidelines. As part of this, there is inadequate traceback of outbreaks, but this is itself contingent on the dearth of data on poultry dynamics and of trained field staff. Some products, such as the initial spatial risk assessment (see figure below), are encouraging, but the question arises as to whether such broad spatial analyses of risk, based on poultry density, human density and road networks, but without the market dynamics of poultry trade, can be used as practical risk-based approaches to surveillance and response by government.



On the left are HPAI positive and negative sub-districts in Bangladesh, and on the right is the predicted spatial distribution of HPAI.

An important part of understanding risk is to have a sound and adequately detailed knowledge of the highly complex market dynamics of poultry enterprises, and this is largely missing from the FAO agenda in Bangladesh. This in spite of the fact that there is a value chain component to the South Asia Cross Border Project based in Nepal (which includes Bangladesh's border areas), but no such study has been undertaken for the whole country.

The FAO ECTAD team has developed clear plans to develop and communicate practical guidelines for biosecurity training in the commercial poultry sector and for improvement of hygiene and biosecurity in live bird markets. These activities have not been in place for long, but from observations and discussions held in markets by the evaluation team there is still a widely prevalent lack of understanding of the concepts of biosecurity, and of how measures will reduce risk of HPAI, and more importantly improve productivity and food safety in a broader context.

The RTE team believes that much more could be done to engage the private poultry sector. Private industry grew by over 200% in the five years prior to the HPAI outbreak, and suffered huge losses. It is considered that they should be much more actively involved and engaged as a partner in the HPAI preparedness and response planning and activities. They comprise a very significant sector and their active support and engagement is desirable from the national point of view. Their closer involvement will ensure better implementation and success of the programmes.

Effectiveness of global/regional programmes at country level, in particular the extent to which the:

- Crisis Management Centre – Animal Health has improved early response and the design of follow-up interventions.

A CMC-AH mission was fielded from 13-26 April 2007 after the first outbreak was announced on 22 March 2007. The mission's main recommendation "[to develop] a consistent and comprehensive approach through the design of a Strategic Framework for HPAI Prevention and Control... to allow coordination of all control activities and actions of stakeholders and donors" was followed-up by FAO (process led by C. Ahlers from ECTAD RAP) through the preparation of the avian influenza Operational Plan in June 2007. The RTE2 team found the operational plan to be a very valuable planning and coordination tool, not just for FAO but also for other partners, and certainly acknowledge that the CMC-AH mission, by providing inputs to its formulation, did also contribute to a better design of follow-up interventions.

- GLEWS information, analysis and technical expertise have improved disease response and understanding of HPAI epidemiology

Reports are regularly made to GLEWS and the regional and international data reported via GLEWS is scrutinised by the Technical Unit on a regular basis and considered valuable.

- OFFLU scientific data exchange and technical expertise have improved national capacity for laboratory diagnostic, vaccine efficacy and development

Viruses are routinely sent to VLA Weybridge for genetic and antigenic characterisation. As a member of OFFLU, Weybridge contributes to international data exchange. They also provide information on phylogenetic relationships of viruses from Bangladesh with other H5N1 viruses. This system appears to be quite efficient with respect to Bangladesh.

- Regional networks have contributed to national capacity building and information-sharing

Close links were apparent with the regional ECTAD RAP in Bangkok and the sub-regional ECTAD Office in Nepal particularly in the context of the cross-border project. Back-stopping support from ECTAD Bangkok and the provision of specialist expertise in epidemiology, wild bird surveillance, communication and cross-border market value chain studies were acknowledged by in-country and Government staff as being useful and effective.

- Research and technical expertise on wildlife has improved countries' understanding of the role of migratory birds in the spread of HPAI

The regional wildlife studies, including on-going studies in India and Bangladesh and regional satellite telemetry studies of wild birds involving China, Mongolia, India and Kazakhstan, are 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.

Sustainability and Impacts

- The *likely* effect of FAO's work on the institutional, organizational and human capacity of affected and at-risk countries beyond HPAI

There has undoubtedly been a series of broader impacts of the HPAI programme; on awareness of disease, on approaches to disease control, on laboratory and epidemiology capacity, on field services, among other areas. However the evaluation team is of the view that in Bangladesh, with all its other development challenges, it will be almost impossible to sustain these gains in understanding, and translate them into measures that respond to long-term development priorities (in agriculture and health) without a strategic plan that links emergency responses to long-term development, and substantial funding to support such mechanisms.

- Sustainability of the strengthening taking place in public and private veterinary services

The strengthening that has taken place is relatively modest; prospects for sustainability are even more modest in the absence of a long-term programme that responds not only to emergency disease prevention and control, but also to larger development priorities.

- Extent to which disease surveillance and control interventions have likely contributed to reducing HPAI prevalence

Due to the lack of a full understanding of the dynamics of HPAI in Bangladesh, and only a superficial understanding of the risk factors, while the investment in surveillance and control measures have almost certainly benefited the country, it is impossible for the evaluation team to specify how, and to what extent, they have influenced the apparent reduced prevalence of HPAI.

- Likely macro-economic, livelihoods and food security impact of FAO's strategy and response to HPAI

Given that HPAI is endemic in Bangladesh, and that Bangladesh has many other unaddressed constraints to its poultry enterprises at both industry and smallholder levels, FAO is probably not reaping the macro-economic and livelihood returns that it could by a broader, more encompassing and development-orientated approach to livestock production and health, which incorporate the specific disease emergency elements of donor interest as specific components. In this regard, the RTE2 team acknowledge some recent initiatives (such as the purchase of FMD vaccines with CERF and Switzerland funds) and urge FAO to continue and deepen its engagement with the Government and other partners to develop more comprehensive initiatives.

Partnerships

- The clarity of FAO's role, based on its comparative advantages and capacities, as well as the degree of complementarity, co-ordination and collaboration with regional and national partners, particularly: multilaterals, major Bilateral/donor agencies

FAO in Bangladesh has attempted to clarify its role and its interface with other players well, through the Operational Matrix and the regular dialogues it holds. There is no doubt that FAO has a unique advantage in facilitation of agricultural emergency and development issues, and there is no doubt that it could do even more particularly in the context of the forthcoming World Bank funded project.

- FAO's contribution to the preparation of partners' HPAI regional and national strategies

FAO has made substantial contributions to national strategies, and more recently to regional harmonisation of animal health interventions, a role which could undoubtedly be strengthened further.

In conclusion, the evaluation team have summarized the strengths and weaknesses of the avian influenza programme as follows:

Strengths	Weaknesses
FAO programme seen as the lead institution in HPAI preparedness and control in Bangladesh	A one year period without a CTA, and periodic changes of DG of DLS and of MOFL, and issues of conflict associated with one of the CTA, previously led to poor cooperation between FAO AI programme and DLS/MOFL and funding partners.
Acting CTA has strengthened cooperation with DLS, funding partners and has improved team work with the national FAO consultants and with DLS partners.	The use of the veterinary epidemiologist as acting CTA meant reduced output in epidemiology planning and products.
Three year operational plan for FAO's activities in Bangladesh provides excellent	Capacity building for epidemiology within DLS needs to be further strengthened.

planning and communication framework, and is used as basis for focusing activities and measuring output achievement.	There is a strong role for an FAO international epidemiologist in supporting and guiding epidemiology investigations until the DLS Epidemiology Unit capacity present.
Active participation in multi-sector and technical committees and acknowledgement of leading role by FAO in promotion of private public partnership.	Advocacy for MOFL/DLS to seriously consider input from private industry in matters like compensation and vaccination policy needs to be enhanced
Laboratory: The disease investigation framework with ULO investigation, sample submission to and rapid antigen testing at FDIL/CDIL, PCR confirmation at NAIRL, then virus characterisation at VLA Weybridge does provide nationwide coverage and acceptable speed of confirmation of H5 outbreaks. Staff at NAIRL who conduct real-time PCR testing have been well trained, equipment is good and the nearly completed laboratory renovations will provide very suitable facilities for PCR and virus culture. They have participated in and performed well in proficiency testing programs for PCR and HI serology testing	Laboratory: The transport system and electricity supply problems can cause significant delays. The throughput for real-time PCR at NAIRL if machine failure occurs is limited. Introduction of PCR testing to CDIL would provide a back up facility and increase test throughput for surveillance and outbreak investigation. The laboratory building, facilities and electricity back up at CDIL needs to be upgraded for it to provide backstopping function and for capacity building. There appeared to be some weakness in laboratory capacity required for other non-H5N1 endemic disease investigations. None of the laboratories observed had active histopathology facilities.
The mechanism of the active clinical surveillance programme using the SMS Gateway System provides an efficient and effective way to manage the input from the CAHW and monitor progress of investigations	Active surveillance: With the large number of village households and farms in Upazillas to be covered by 3 CAHWs, who visit a total of approximately 100 places per day, it would take well over a year to cover all of an Upazilla. The sensitivity of this approach is too low and needs some epidemiology input to get better use of resources.
The FAO team has developed clear plans to develop and communicate practical guidelines for biosecurity training in the commercial poultry sector and for improvement in live bird market hygiene and biosecurity. These activities have not been going for long and the challenge is to drive and follow through on them.	
	FAO advocacy is needed to influence DLS policy on staff rotation for promotion, with respect to staff that undergo specialist training in fields like laboratory diagnosis

	or epidemiology. Such staff rotation can be detrimental to creating strong laboratory, epidemiology and surveillance teams that can deliver quality outputs.
	Further FAO involvement to understand market value chains within Bangladesh would be valuable to enhance surveillance and control and preparedness planning.

Based on the above, the evaluation team recommends the following priority actions for FAO:

- Focus on enhancing the capacity of the Government epidemiology units to plan surveillance activities, analyse surveillance data and provide advice on management and control of HPAI based on risk analysis. More effective epidemiological analyses should particularly be used to target resources for active clinical surveillance and duck surveillance. Quality of outbreak investigations will also be further improved with more elaborate epidemiological analysis and synthesis of data.
- Capacity building also has to become institutionalized; the current training process has to involve private actors and be rigorously followed up and evaluated by the national ECTAD unit in-country. DLS has to be given a stronger role in co-ordinating not only FAO but also the different animal health training programs being conducted in the country.
- The FAO programme should take a much more active role in engaging and partnering with the private poultry industry at all levels. This is an active and growing sector, and deserves to be a much stronger part of the preparedness and response mechanisms than it currently is. Progress on this front will be instrumental to:
 - Ensure that the roles of compensation and vaccination as tools for enhancing reporting and reducing risk are maintained on the national agenda for discussion. This is particularly in regard of protecting the poultry industry, and seeking incentives for more sustainable poultry disease control.
 - Include other potential sources of passive surveillance and communication for poultry HPAI outbreaks in villages, such as CAHWs that report to IEDCR and BRAC representatives that are present in most villages in Bangladesh; they could be given basic training and provided a system to report suspicious cases for investigation.

Other recommendations for the FAO include the improvement of:

- The current public private partnerships initiative; which should be enhanced to develop highly practical and sustainable improvements in risk reduction through biosecurity and hygiene in farms and markets.
- Laboratory capacities, which should continue both at central and field level particularly for other non-H5N1 endemic disease investigations through the World Bank project.
- The understanding of market value chains, which is a key element for improving the sensitivity of surveillance activities and for identifying risks and critical control points at a level of resolution that is practical and sustainable.
- The approach to disease control in Bangladesh; given the poultry density, its importance for food security and poverty alleviation, and the endemic nature of the disease, control and eradication of HPAI in Bangladesh will only be possible through a comprehensive animal disease control programme that includes not only typical emergency responses but

also address long-term development constraints (including improvement of bio-security and behaviour change) and can be expanded to control other economically important animal diseases such as FMD and PPR.

- The management of human resources, from staff selection to supervision and evaluation. This includes, besides transparent advertisement of positions, consideration in the selection process to not only technical expertise but also to region and country specific knowledge and issues; clear reporting lines and coaching/supervision duties for field staff; periodic assessment of performance of particularly long term serving senior staff with the view of rewarding merit and progress (with promotion).

Annex 1. List of People Met

FAO

Mr. Ad Spijkers FAO R

Dr. Leo Loth, Officer In charge & Veterinary Epidemiologist,

Ms. Nan Mon, Operations Officer, Emergency Recovery Coordination Unit,

Dr. Mahbubul Haque, National Consultant, Disease Control & Training,

Dr. Md. Abul Kalam Azad, National Consultant Outbreak Response & Training,

Dr. Priya Mohan Das, National Consultant, HPAI Surveillance,

Dr. Md. Shahjahan, National Project Manager C&D Project,

Mr. Ishteaq Hossain, National Consultant, Communications Specialist PPP Project,

Mr. Md. Zaikul Hasan, National Consultant, PPP Project,

Dr. S.K. Mahbub Ahmed, National Consultant – Data Analyst,

Dr. K.B.M. Ashfakur Rahman, National Consultant, C&D Project,

Ms. Amina Islam, Secretary.

Government

Dr. Md. Habibur Rahman, Director General, Department of Livestock Services,

Dr. Bidhan Chandra Das, Assistant Director, Animal Health & Administration,

Dr. Md. Afzal Hossain, Program Coordinator, HPAI Active Surveillance Programme,

Dr. Md. Forhadul Alam, Upazilla Livestock officer, Savar.

Dr. Md. Giasuddin, Senior Scientific Officer & Laboratory In-charge

National Reference Laboratory for Avian Influenza,

Dr. Mahammed Abdus Samad, Scientific Officer, NRL-AI

Dr. Ranjit Kumar Chakraborty, Principal Scientific Officer, Central Dis. Inv. Laboratory,

Dr. Mahammed Ahasan Habib, Scientific Officer, CDIL,

Proff. Mahumudur Rahman, Director, Institute of Epidemiology, Disease Control & Research, National Influenza Centre,

UN Agencies

Dr. Biswas M. K Zaman, National Professional Officer (Epidemiology), WHO,

Mr. Usman Qazi, Programme Specialist, Office of the UN Resident Coordinator.

CD

Mr. Samuel Egero, Counselor/Deputy Head of Mission, Embassy of Sweden,

Mr. Syed Khaled Ahsan, Senior Programme Officer, Embassy of Sweden.

S.A.M. Rafiquzzaman, Agriculture & Rural Development, World Bank

Arun Kumar Saha, Project Implementation Officer (Agriculture), Asian Development Bank

Asm Harun Ur Rashid, Royal Danish Embassy

Zandra Hollaway Andre, Technical Advisor, USAID

Carey Gordon, Deputy Mission Director, USAID

NGO's

Dr. Md. Nazrul Islam, Project Director, PTDDP (JICA),

Prof. Dr.Md. Mujaffar Hossain, Local Consultant, PTDDP (JICA),

Mr. Md. A. Salaque, Programme Head, (Agro & Salt), BRAC,

Dr. Dewan Zahid Hossain, Senior manager Technical, Poultry Farm, BRAC,

Dr. Shankar P. Mondal, Country Team Leader, STOP AI,
Dr. Ahmed Al Kabir, President RTM International,
Dr. Md. Habibur Rahman, Senior Technical officer, RTM International,
Ms. Farhtheeba Rahat, Business Development Specialist, RTM International.

Industry

Mr. Kazi Zahedul Hasan, Kazi Farms Limited,
Mr. Moshir Rahman, Managing Director, Paragon Group,
Dr. A.K.M. Khasruzzaman, Animal health department, CP Group,
Dr. Salim H. Siddique, Secretary General, Animal health Companies Association of BD,
Mr. Kamaluddin, Poultry Farmer,

Dr. M.M. Khan, Secretary General, Bangladesh Poultry Industries Association,
Mr. Khandaker Md. Mohsin, Advisor, Bangladesh Poultry Industries Association.

Field

Mr. Abdul Hai, Commercial Poultry farmer, (Sector 2), Pandua Village
Dr. Hasina Beghum, AVS,
Ms. Sheuli Akhtar CAHW,

Technical staff at the Field Disease Investigation Laboratory at Manikgon and a Commercial Sector 3 farm in the village nearby.

Annex 2. Documentation Reviewed

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- Shamsuddoha, Mohammad and Sohel, Mir Hossain, Problems and Prospects of Poultry Industry in Bangladesh: A Study on Some Selected Areas (November 4, 2003). The Chittagong University Journal of Business Administration, Vol. 19, 2004.
- World Bank (2007) Avian Influenza Preparedness and Response Project – Project Information Document
- World Bank (November 2009) Aide Memoire Second Joint Supervision Mission 1st and 2nd National Avian and 2nd Pandemic Influenza Preparedness and Response Plan
- Plus more than 30 project reports, over 15 BTORs and end-of-contract reports, several monthly reports, power point presentations, etc.

Annex 3: Overview of Bangladesh's Avian Influenza Operational Matrix

Effective control of transboundary animal diseases needs to address five strategic pillars:

I	II	III	IV	V
Coordination & Policy	Disease Detection	Disease Diagnosis	Disease Control & Eradication	Disease Prevention
<p><i>Objective:</i> Concerted action and consistent approach on disease control based on appropriate legal and policy framework</p>	<p><i>Objective:</i> Early detection of HPAI to allow rapid response</p>	<p><i>Objective:</i> Quick and correct diagnosis of HPAI</p>	<p><i>Objective:</i> Immediate response to outbreak occurrence to avoid the spread, minimizing the impacts and eradication of the disease</p>	<p><i>Objective:</i> To prevent introduction and to avoid reintroduction of HPAI</p>

Components within the strategic pillars I-V, containing areas of activities with defined outputs to be achieved:

<p>I.1 Legal framework I.2 Contingency planning I.3 Coordination I.4 Socio economic impact I.5 Communication I.6 Research</p>	<p>II.1 Surveillance of poultry II.2 Monitoring of wild birds II.3 Epidemiology: analysis II.4 Communication</p>	<p>III.1 Laboratory network III.2 Laboratory capacity</p>	<p>IV.1 Epidemiology: outbreak investigation IV.2 Stamping out IV.3 Compensation IV.4 Vaccination IV.5 Human protection IV.6 Communication</p>	<p>IV.1 Poultry database V.2 Biosecurity V.3 Import of poultry and poultry products V.4 Animal health services V.5 Regulation of poultry farming and trade V.6 Communication</p>
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Areas of high priority requiring immediate action are presented in bold letters.

Annex 4. Assessment of FAO Avian Influenza Projects in Bangladesh

OSRO/RAS/601/ASB “Immediate Technical Assistance to Strengthen Emergency Preparedness for Highly Pathogenic Avian Influenza”

This project was expected to contribute to international efforts aiming at controlling and eliminating the threat of HPAI, thus reducing the impact on the agricultural sector and minimizing the risk to the human health. It will also contribute to regional efforts to contain the disease and reduce the significant risk of disruption of the poultry industry in the region. In addition this project will build the capacity of the Government of Bangladesh to prevent and other serious emerging animal zoonotic and epizootic diseases.

Expected outcomes of the project are:

- A reduction in the incidence of outbreaks of HPAI in poultry in Bangladesh;
- Strengthening the national capacity for avian influenza prevention and control;
- A better understanding of disease prevention and control strategies by poultry producers, traders and government veterinary services;
- The creation of more effective poultry disease reporting mechanisms at the community level;
- An increased capacity of the DLS to train and communicate with poultry farmers from different sectors;
- Better understanding of hygiene and food safety by the general population;
- Promotion of safe trade in poultry and poultry products; and,
- Reduction of risk of a human epidemic in Bangladesh.

To achieve these outcomes, the project was expected to accomplish the following:

Output 1: Project Management

- The FAO Technical Unit will be further strengthened. Two more National Consultants will be recruited for Communication as well as Training and Outbreak Response.
- The members of the Technical Unit will contribute in revising the National Response Plan and the Operation Manual.
- Technical coordination through Laboratory Working Group for renovation and refurbishment of laboratories and procurement of equipment and reagents will continue.

Output 2: Surveillance, quarantine and response activities

- Modified and expanded surveillance in 150 upazilas involving 450 CAHWs under an LoA with DLS for a period of six months will commence in July 2008. 50 veterinarians will be recruited for six months to assist ULOs in disease investigation, sample collection and supervision of CAHWs. They will be provided with motorbikes and other logistics.
- Two Laboratory Associates will continue to support HPAI diagnostic activities at the National Avian Influenza Reference Laboratory.
- Workshops on quarantine and movement restriction will be organized in six divisions for people from civil administration, law enforcing agency and DLS policy makers.

Output 3: Virus Elimination at Source and Personnel Safety

- SOPs for outbreak containment including culling, disposal, decontamination, personal safety and laboratory procedures will be finalized.

Output 4: Awareness Raising and Communication

- The wet market biosecurity and communication pilot project under the LoA with a local NGO Thengamara Mahila Sabuj Sangha (TMSS) will continue.
- Two pilot courses on wet market biosecurity and disinfection conducted in collaboration with USAID.

Project implementation was lengthy and had to overcome several challenges as follows:

- Endorsement of activities by Government was time consuming and cumbersome.
- Limited office space and number of telephone lines available to the HPAI unit at DLS affected project staff efficiency.
- Lack of full time operational officers retarded project implementation. This particularly affected procurement of vehicles and the implementation of the active surveillance. Work on markets biosecurity was eventually not conducted under this project.
- Support from multiple donors often created confusion and duplication of activities (particularly on communication and biosecurity). This was partially remedied through regular donor meetings but still activities of certain NGOs and consulting companies recruited directly by some donors are unknown.
- Activities planned and undertaken were strongly influenced by and had to be adapted to the ongoing HPAI outbreak situation and government policies. For example work on SOPs was subsequently not considered a priority by the Government.

In spite of these shortcomings, the project was instrumental to support disease surveillance and control activities as well as the deployment of a multi-disciplinary technical unit at DLS during a period of continuous outbreaks (2007-08). The project also conducted a Wet Market communication pilot at Rugpur District, staff training on GIS, and the procurement of laboratory test kits including diagnostic kits and napsak sprayers. Most of the activities accomplished have been followed-up or carried out in conjunction with OSRO/RAS/605/USA Baby01 project, so that overall results of this project are presented together below.

OSRO/RAS/605/USA BABY01 “Immediate technical assistance to strengthen emergency preparedness for HPAI in Bangladesh”

The primary objective of this project was to rapidly strengthen the capacity of the official veterinary services to identify and implement strategies aimed at the control of HPAI thus preventing it from developing into epidemic proportions. Specific immediate objectives were to provide support to the DLS in: (i) strengthening national capacity in disease surveillance; (ii) strengthening capacity to undertake laboratory diagnosis for HPAI; (iii) promoting biosecurity in poultry and duck production; and (iv) establishing a HPAI technical unit within the DLS.

The original project document included the following activities:

Output 1: Strengthened national capacity in disease surveillance

- Establish a Network of CAHWs to carry out active surveillance.

Output 2: Strengthened capacity to undertake laboratory diagnosis for HPAI

- Provision of training in diagnostics, laboratory equipment and consumables.

Output 3: Increased biosecurity in poultry and duck production

- Training in biosecurity.

Output 4: Established technical unit within DLS

- Build up capacity of the staff in the concerned unit of DLS.

New activities (and further details) were added in two successive amendments to the project. The last amended ended in September 2009 but is largely being continued through project OSRO/BGD/902/USA. The main activities that were funded through this project are:

- Active surveillance programme: 5 LoAs have been signed with DLS between February 2008 and October 2010 (2 LoAs were funded by ADB, 1 by SFERA funds, and the rest by this project) reaching now 260 Upazillas (from 50 at the beginning) through 780 CAHWs and 88 AVS. Surveillance activities were initially designed to be door-to-door but from January 2009 they were also used to disseminate basic bio-security knowledge in commercial farms. New upazillas were selected on the basis of outbreaks, poultry density and bordering infected ones. The Epidemiology Unit of DLS co-ordinates this system and monitors the implementation of LoAs. By November 2009 around 6 m households and close to 50,000 farms have been visited, with 55 out of 385 samples collected resulting positive to HPAI +ve®.
- Training activities: FAO has conducted a number of training activities, with the objective of introducing HPAI control strategies both to public and private sector actors; strengthening outbreak management capacity of DLS, building capacity for HPAI diagnostic, improving knowledge on epidemiological investigation, carrying out effective surveillance, improving biosecurity and decontamination at farm and in markets, using IT in epidemiology and disease control, and define role of communication in HPAI control. Recipient groups include government officials from DLS, poultry producers, CAHWs, law and order forces, NGOs and other Government officers. Training has been provided by international and national experts from FAO and DLS. Modules were prepared by each trainer and cleared by FAO National ECTAD unit. More recently, FAO has started training over 700 school/madrasha teachers in avian influenza awareness to increase passive surveillance. The main achievements linked to the training conducted to date are:
 - there is better laboratory diagnosis capacity
 - effective outbreak management is now possible
 - biosecurity practices have improved in commercial farms
 - increased knowledge about HPAI have reduced panic
 - active surveillance is now more reliable
 There are however a number of weaknesses such as:
 - no mechanisms to follow-up on the trainings
 - selection of right trainees is sometimes difficult
 - ToT is ineffective due to lack of funds for follow-up training
 - it is difficult to get feedback from recipients
 - process of evaluation is insufficient
- Web based SMS gateway system: This system is a two way communication that enables to send and receive short text messages (SMS) over digital cellular networks. It has been used to notify and alert relevant authorities about potential disease outbreaks, and has reportedly led to quicker response.

Although project implementation reportedly suffered from the same challenges faced by the ADB project, it has been able to undertake a number of important activities in the past two years that have empowered central and local levels of the Veterinary services and increased the visibility of the FAO AI programme with the Government, donors and other local partners. The project is still ongoing and is planning to scale up the active surveillance programme as well as to consolidate the web based SMS gateway system. Although hundreds of people have already been trained by the programme, there is a need for a more formalized and regular training process that involves private actors and is rigorously followed up and evaluated by the national ECTAD unit in-country. DLS has also to be given a stronger role in co-ordinating not only FAO but also the different animal health training programs being conducted in the country.

OSRO/RAS/701/USA “Strengthening cross border activities among Bangladesh, India, Nepal and Myanmar to control cross-border spread”

The main goal of the project is to prevent cross border spread of HPAI resulting from movement of poultry and poultry products. Specifically the project aims to: (i) the development of a platform for dialogue and information exchange between countries in the region on issues related to potential cross border spread of HPAI (ii) strengthen capacities of institutions to deal with the threat of transboundary spread of HPAI and (iii) increase understanding of ways to manage cross border trade to reduce risk of HPAI outbreaks. Planned activities include:

Output 1: Project management and coordination mechanisms established and operating

- Recruitment of local and international staff, procurement of office equipment and vehicle.
- Project inception workshop.
- Establishment of modality for communications and dialogue to facilitate coordination.

Output 2: High risk areas for introduction of HPAI via cross border routes identified and mapped

- Identification of suitable partners to gather information on cross border value chains for poultry and poultry products.
- Mapping of market chains and poultry trade volumes across borders.

Output 3: Increased capability for emergency response to HPAI outbreaks due to cross border spread of disease

- Development of standard operating procedures for emergency response to disease in high risk areas related to cross border trade.
- Provision of laboratory training and supplies in key locations.

Output 4: Increased capability to prepare import and export protocols in conjunction with trade partners

- Review of regulatory frameworks for import and export (regional workshop approach to initiate).

In the case of Bangladesh, procurement of non expandable and expandable equipment was reportedly late in part due to frequent changes requested by the donor. Poultry value chain and risk mapping studies across the Bangladesh and India borders have been conducted by an NGO. Other activities conducted include:

- Stakeholder meetings: a regional meeting was held in March 2008 in Nepal; this was followed by a technical and policy level meeting in April 2009 in India with the participation of senior officers from the beneficiary countries, FAO and the donor. The South Asian Association for Regional Cooperation (SAARC) has also been engaged through the joint FAO/OIE sub-regional meeting of GF-TADS for the SAARC region held in June 2009 in Nepal. Bimonthly bulletins are also produced since April 2009.
- Animal surveillance: poultry value chain mapping across Nepal-India, Bangladesh-India, Bangladesh-Myanmar and India-Bangladesh, India-Nepal borders has been completed. The data reflects large volumes of poultry and poultry products from India going into Nepal at several border training points with people engaged full time in transporting live birds and products. Similarly, a large volume of poultry enters from Myanmar into Bangladesh. Comilla in Bangladesh and Sonamura in India were identified as a hot spot for large volume of poultry trade in both directions between the two countries. Price difference, gap in demand and supply and socio-cultural events were the main driving

factors. The result of the value chain mapping studies were shared with local stakeholders in June 2009 (Nepal-India) and in July 2009 (Bangladesh-India and Bangladesh-Myanmar borders). This was followed by a regional workshop in September 2009 on understanding and using value chain analysis.

- Animal response: A regional workshop to develop Standard Operating Procedures (SOP) for emergency response was held in May 2009 with the objective of sharing available SOPs and working on their harmonization. The workshop led to the development of draft SOPs for guidance, technical support and infrastructure development for emergency response in border areas.

The project is still ongoing but in view of the project manager it has already achieved a few important successes: i) contrary to the situation at the beginning of the outbreaks, country representatives now frankly discuss issues of mutual interest and work towards finding solutions at the regional level; ii) findings of the value chain mapping led the GoB to open egg imports from India to bring down prices and fill the gap in demand and supply; and iii) the Government of India has shown greater interest in engaging with FAO for greater collaboration and technical advice. As a result, a new 3-year project (OSRO/IND/802/USA) to improve epidemiological capacity and establish a risk based surveillance programme in India has just been approved for implementation.

The project manager has also identified the following lessons learnt:

- Looking at the large informal trade of poultry and poultry products within the three countries it is clear that the disease will continue to appear periodically.
- Sorting out policy issues and restructuring the poultry industry in the region can reduce current incentives for informal trade and thus minimize the risk of disease incursion.
- Countries have recognized that a concerted regional approach is needed to avoid likelihood of disease becoming entrenched.

OSRO/INT/805/USA B04 (PPP) “Developing and Maintaining Public-Private Partnerships for the Prevention and Control of Highly Pathogenic Avian Influenza H5N1”

The main objective of this project is to strengthen and maintain public-private partnerships to support poultry health and production systems in countries worse affected by HPAI. The Bangladesh component of the project expects that by project end (January 2010) “functional public-private forums and networks will be available (biosecurity and vaccination) to facilitate on going cooperation and coordination for the prevention and control of HPAI H5N1 and other poultry diseases”.

PPP activities to date include the holding of a workshop on sharing and harmonizing training materials for biosecurity (August 2009), a workshop on public and private veterinarians interaction and the prospect of roles delegation (September 2009), a meeting to review identify and recommend ideal material for biosecurity training (October 2009) and a workshop for developing biosecurity guidelines for the commercial poultry sector (October 2009). The PPP project has also developed working relationships with poultry associations, academicians, and civil society.

Some outputs achieved so far by the project in Bangladesh include:

- Bio Security Guidelines have been developed for commercial poultry in Bangladesh.
- Roles of public and private veterinarians and the prospect of roles delegation have been assessed.

The project has also “mapped” relevant actors and reviewed the status of industry players.

According to project management the project have to operate within a number of constraints:

- Poor communication between public and private sector.
- Limited participation of private sector in decision making processes.
- Lack of formal forums and platforms for interaction.
- Inadequacy of public sector capacity to deal with private sector issues.
- Unclear status and representativity of poultry associations.

The project is coming soon to an end, and according to project management, the following areas of work are being prioritized:

- Use results of “roles workshop” to create a legal provision for delegation of roles.
- Formally pursue the implementation of the biosecurity guidelines for commercial poultry
- Organize additional training for private sector actors on biosecurity for input providers and for public sector on biosecurity auditing practice.

OSRO/GLO/802/USA “Improved biosecurity and hygiene at production, collection points and live bird markets, including decontamination”

The main objective of this project is to develop and implement an integrated programme for cleaning and decontamination of selected Live Bird Markets (LBM) in target countries, thereby contributing towards the efforts to minimize the risk to human health and reduce transmission and spread of HPAI virus. In total 18 LBM have been selected (8 in Dhaka and 10 in other five major cities). Some outputs achieved so far by the project include:

- Infrastructure improvement of 3 LBMs in Dhaka are completed.
- Upgrading work for 6 LBMs in other divisions is under way.
- Trainings to markets cleaners is ongoing.

OSRO/RAS/704/SWE Baby 02 “Geospatial referencing of commercial poultry farms and live bird markets in Bangladesh”

This project is expected to identify the exact geo-spatial location of all commercial poultry farms and the main poultry markets in Bangladesh to facilitate and support HPAI outbreak related control and response measures. To this end over 100 CAHWs will be trained in the use of GPS and reporting precise geographical coordinates of the poultry farms and the major wet markets in each district. Data will then be entered at DLS and analyzed to produce spatial information at the upazilas, district and country levels. All poultry farms will be registered and identified by codes which can be used for the active surveillance through the SMS gateway system. This project was originally designed in late 2008 but has yet to be implemented. The evaluation team was informed that it was considered a priority for early 2010 depending on the availability of staff time for project supervision.