

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

COUNTRY REPORT: CAMBODIA

14 - 21 NOVEMBER 2009

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I. INTRODUCTION

Cambodia was one of 7 countries selected for the second Real Time Evaluation (RTE) of FAO's contributions to the preparedness and control of HPAI, 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. Although it had a relatively well funded avian influenza programme, the country was not included in the First RTE. The evaluation team visiting Cambodia as part of the second RTE comprised Professor Brian Perry, Dr. Trevor Ellis, Mr. Shashi Kapur and Mr. Carlos Tarazona. They arrived on Friday 13th November and left on Saturday 21st 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 CAMBODIA

Characteristics of the Poultry Sector

The poultry population has increased steadily over the second half of the 20th century. An increase of 50% was observed between 1995 and 2000. The last census conducted in

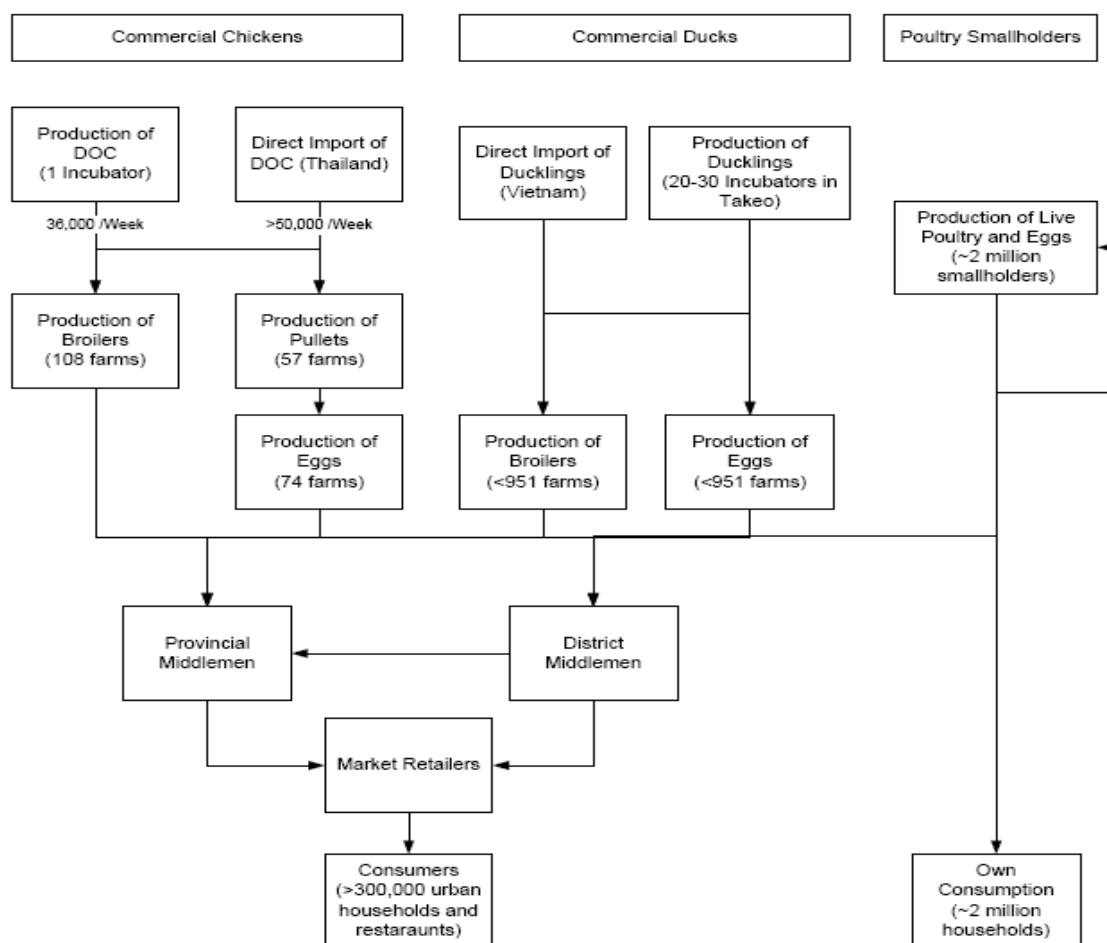
2002 indicates a poultry flock of more than 16 million in Cambodia. The main species raised are chicken (82%) and ducks (18%). Six per cent of the chickens in Cambodia are raised in commercial farms and 94% in non-commercial farms. For ducks the figures are approximately 29% and 71%, respectively, reflecting the increasing importance of small-scale duck production. The reader is referred to an extensive literature review of the poultry enterprises of Cambodia, and an early assessment of HPAI impacts¹.

Poultry density is much higher in the south-east part of Cambodia (the lower Mekong area, around Phnom Penh, and close to Viet Nam) and in the north-west part (north and around Tonle Sap, close to Thailand), than in other parts of the country. Medium & large-scale commercial production of poultry is a recent innovation in Cambodia, starting between 1995 and 2000 and associated with the start of Thai-based CP's activities in Cambodia in 1997. The establishment of CP in Cambodia has enabled poultry producers to find chicks and pullets of improved genetic stock without having to import directly from Thailand or Viet Nam (although this direct import still continues). The State Services are very little involved in the poultry sector. The National Strategic Plan for Animal Health & Production (December 2000), written in relation to the Agriculture Productivity Improvement Project (a World Bank loan), intended "to focus Government, private enterprises and livestock owners on the two livestock species (pigs and large ruminants) that have the potential to assist in the development of all livestock due to their turnover in value and volume."

A large proportion of poultry products produced is consumed by producers themselves. Middlemen play a key role in bringing poultry and eggs from producers to markets, transporting products by bicycles, motorbikes and cars. Market retailers exist at commune (very few), district and provincial levels. The biggest markets are located in Phnom Penh and in Siem Reap. Supplies of live chickens and ducks and poultry eggs are brought by middlemen directly to the markets and to restaurants. Consumers usually buy the poultry alive; the market retailer then slaughters the animal and prepares it before the consumer takes it home. There are frequent imports of poultry and poultry products from Thailand and Viet Nam. There is very little poultry export from Cambodia, but some layer ducks are sold to Viet Nam. Most of these movements of poultry and poultry products are not controllable by the State.

¹ Agricultural Development International (ADI), 2007. The impact of highly pathogenic avian influenza on the Cambodia poultry sector. Prepared for the FAO by ADI, Brisbane, Australia.

Figure 1. Marketing chain for poultry production in Cambodia (Agronomes et Vétérinaires sans Frontières, Cambodia, 2004²).



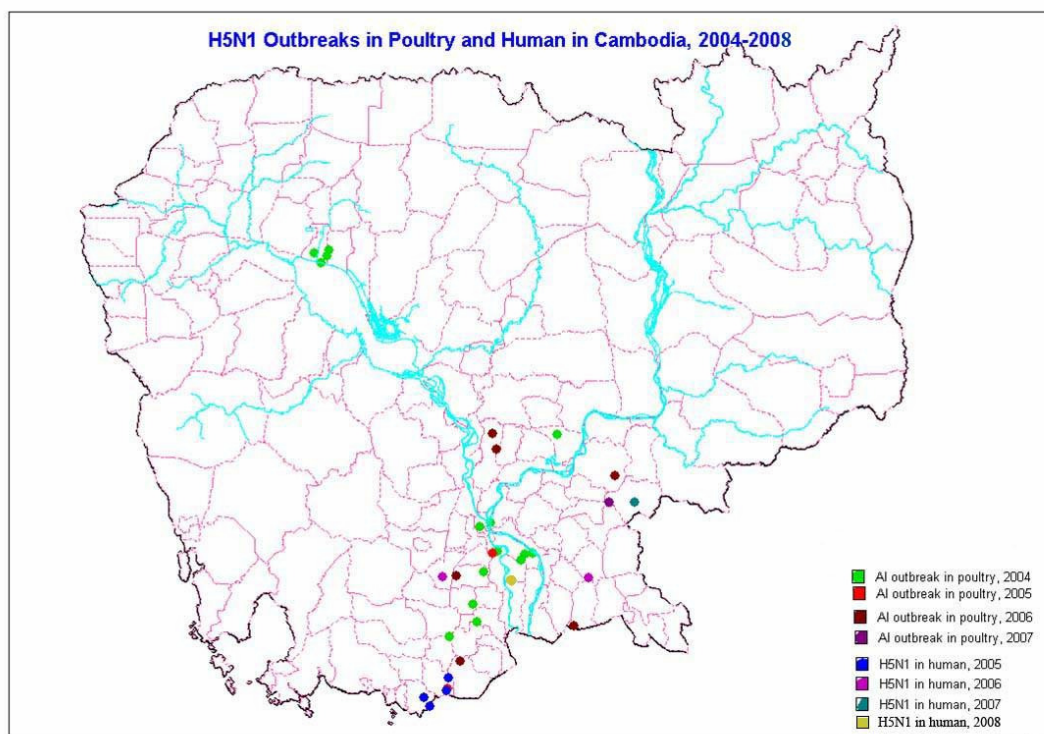
Highly Pathogenic Avian Influenza H5N1 in poultry was first suspected in chickens in Cambodia on 12 January 2004 in a commercial layer operation in Phnom Penh Province but mortalities had started around the 14 December 2003 (Desvaux et al., 2006³). The case was notified on 23 January 2004. A second confirmed case from a small-scale commercial farm in Phnom Penh, 10 km from the assumed index farm, was investigated on 16 January. It involved deaths of chickens, ducks, and geese. At this same time (14 January 2004) mortalities were occurring in a large variety of captive birds, captive exotic species and free-flying crows at the Phnom Tamao Wildlife Rescue Centre located approximately 45 km south of the city in Takeo Province⁴. Overall mortality in captive avian species reached 25%.

² Agronomes & Vétérinaires sans frontières (2004) *Review of the poultry production and assessment of the socio-economic impact of the highly pathogenic avian influenza epidemic in Cambodia*, final report for FAO's TCP/RAS/3010, Emergency Regional Support for Post-Avian Influenza Rehabilitation, Rome: FAO.

³ Desvaux, S., Sorn, S., Holl, D., Chavernac, D., Goutard, F., Thonnat, J., Porphyre, V., Menard, C., Cardinale, E., Roger, F. 2006. HPAI surveillance programme in Cambodia : Results and perspectives. *Developments in Biologicals*, 124, 211 - 24

⁴ Desvaux, S., Marx, N., Ong, S., Gaidet, N., Hunt, M., Manuguerra, J-C., Sorn, S., Peiris, M., van der Werf, S., Reynes, J-M. 2009. Highly pathogenic avian influenza (H5N1) outbreaks in captive wild birds and cats, Cambodia. *Emerging Infectious Diseases*, 15, 475 – 478.

There have been 24 poultry outbreaks recorded to date with the last outbreak detected on 22 December 2009, and also nine human H5N1 cases, with death occurring in seven of these. The most recent human case was confirmed on 16 December 2009⁵. 20 of 24 outbreaks were detected in the winter months (November to March). These periods coincide with releases of ducklings into rice fields in South Cambodia's and Viet Nam's Mekong region. The temporal occurrence of the eight recorded HPAI infections in humans coincides with periods of HPAI outbreaks in poultry. The first 4 human deaths from January to April 2005 corresponded to the period when Viet Nam experienced a very high number of human cases and deaths (60 cases and 18 deaths between January and June 05). Since early 2006, 4 of 6 outbreaks have been detected in August.



Outbreaks have occurred in 8 Provinces [Phnom Penh (2), Kandal (6), Kampot (2), Kampong Cham (6), Kampong Speu (1), Prey Veng (1), Siem Reap (2 but 3 villages in Feb 2004 outbreak), Takeo (4)] with human cases in 5 of these [Kampot (4); Kampong Cham(2); Kandal, , Kampong Speu and Prey Veng one each]. Apart from the outbreaks in Siem Reap all other outbreaks have been in south eastern provinces which are close or adjacent to the southern part of Viet Nam. Nationally, about 30,000 birds layer and broiler farms bore most of the impact (Burgos et al., 2008⁶).

Commercial producers were more severely affected by market uncertainty and production downtime than by the disease itself. Culling caused particular hardships to smallholder farmers that had borrowed from micro-finance and banking institutions. There have been major changes in the markets for poultry products and also changes in the prices for other protein products. While this may have affected profit margins for producers with high fixed

⁵ As reported to WHO on 18 December 2009.

⁶ Burgos, S., Hinrichs, J., Otte, J., Pfeiffer, D., Roland-Holst, D., Schwabenbauer, K., Thieme, O. 2008. Poultry, HPAI and Livelihoods in Cambodia – A Review. Mekong Team Working Paper No. 3, http://www.hpai-research.net/docs/Working_papers/wp03_2008.pdf

costs and borrowings, the other losers are likely to be poor consumers who would have had to pay higher prices for protein during and after the outbreaks.

Phylogenetic analysis has shown that the H5N1 HPAI clade 1 viruses detected in Thailand, Cambodia and Viet Nam are linked to viruses isolated in Yunnan Province, China in 2002 and 2003 and the first isolates in Cambodia in 2004 cluster with a large number of H5N1 viruses isolated in Thailand in 2004 and 2005 (Buchy et al., 2007⁷). Characterization of 33 H5N1 viruses isolated from Cambodia from 2004 to 2007 indicated they are all clade 1 viruses and belong to H5N1 genotype Z (Buchy et al., 2009). Phylogenetic comparison of these isolates with 116 H5N1 viruses isolated from Southeast Asia in GenBank showed that viruses isolated from chickens, humans and ducks in Cambodia from 2005 onwards were grouped into 7 discrete clusters or sublineages that cluster with viruses that were isolated previously or contemporaneously in southern Viet Nam (Buchy et al., 2009).

Given the direction and volume of live poultry trade movements from Thailand and Viet Nam into Cambodia and particularly by middlemen into Phnom Penh, with virtually no biosecurity practised (van Kerkhove et al., 2009⁸), coupled with the recent molecular epidemiology findings (Buchy et al., 2009), it is highly likely that the source of the H5N1 viruses for the initial Cambodian cases in 2004 was poultry movement from either Viet Nam or Thailand. However, the poultry trade movement pattern and the molecular epidemiology studies, particularly the temporal findings, indicate that there have probably been multiple incursions of H5N1 viruses into Cambodia since 2005; the most likely source of these viruses was the live poultry trade from Viet Nam, followed by local dispersal within Cambodia.

Migratory wild bird movement appears less likely as the source of virus in Cambodia. Although the wild bird surveillance studies conducted in Cambodia have not detected any H5N1 viruses⁹, the numbers and species of live birds examined would likely not be of sufficient sensitivity to detect H5N1 viruses in live birds at the prevalence levels that are likely in healthy birds.

There have been no clinical outbreaks of HPAI detected in Cambodia from December 2008 until December 2009 when a human H5N1 case was reported and a poultry outbreak was subsequently detected in the same district. With endemic H5N1 infection in Viet Nam, the poultry trade from Viet Nam into Cambodia and a passive and active surveillance system of low sensitivity in Cambodia (as discussed later), it is not possible to conclude that Cambodia has remained free from H5N1 infection between December 2008 to December 2009. With the level of surveillance and reporting it is also difficult to identify if H5N1 infection has persisted at a low level in ducks or other village poultry in between incursions and new outbreaks or if the virus infection dies out before another incursion event.

⁷ Buchy, B., Fourment, M., Mardy, S., Sorn, S., Holl, D., Ly, S., Sowath, V., Vong, S., Emouf, V., Peiris, J.S.M., van der Werf, S. 2009. Molecular epidemiology of clade 1 influenza A viruses (H5N1), southern Indochina Peninsula, 2004 – 2007. *Emerging Infectious Diseases*, 15, 1641 – 1644.

⁸ Van Kerkhove, M.D., Vong, S., Guitian, J., Holl, D., Mangtani, P., San, S., Ghani, A.C., Poultry movement networks in Cambodia: implications for surveillance and control of highly pathogenic avian influenza (HPAI/H5N1). *Vaccine*, 27, 6345 – 6352.

⁹ Joyner, P., Yang, A., Gilbert, M. 2009. Wild bird surveillance for avian influenza in Cambodia. Wildlife Conservation Society, Final Report to FAO.

III. NATIONAL HPAI RESPONSE FRAMEWORK

Cambodia has had a National Comprehensive Avian and Human Influenza Plan since July 2007. This was developed from the 'Cambodia and UN Joint Programme for Addressing Avian Influenza and Pandemic Planning in Cambodia' that had earlier been endorsed by the Deputy Prime Minister (December 2005). The plan meets the objectives of the Government of Cambodia, the Asian Regional Framework and the FAO/OIE Global Strategy for the containment of avian influenza and its major components include:

- Component 1: Veterinary Service Strengthening
- Component 2: HPAI surveillance investigation and response
- Component 3: Strengthening Biosecurity in Poultry Production and Trade
- Component 4: Information Education and Communication
- Component 5: Pandemic Planning
- Component 6: Strategy Management

FAO is a major partner in all components. For national policy decisions, there is an Inter-ministerial Committee for the Control and Prevention of Avian Influenza at the central level (composed of representatives from MAFF (Chair), MoH as well as Ministries of Commerce, Interior, Finance and Economics, Council of Ministers, Customs Department, Provincial and Municipal Governors and DAHP (Secretary)). At the local government level Provincial Committees were established with multi-sector representation, headed by the Provincial or Municipal Governor with the Head of the Provincial Animal Health and Production Office as the Secretary. The international partner organizations providing technical assistance and emergency resource support include FAO, WHO, UNICEF, Pasteur Institute and funding agencies (AUSAID, ADB, EU, JICA, German Government, USAID and USDA).

In addition, the National Committee for Disaster Management (NCDM) has been designated to serve as the focal point agency for inter-ministerial cooperation on pandemic preparedness planning including avian influenza. The co-ordination structure also includes decentralized Government offices, the UN system and other partners.

NaVRI/DAHP is the lead technical agency for implementation of the avian influenza preparedness and outbreak plan. This entails many responsibilities. These include: rapid response to reports of suspect cases; formation of emergency response teams to investigate; collection and submission of samples to NaVRI; confirmation of laboratory diagnosis; notification of relevant agencies; declaration of outbreaks through the Minister; liaison and communications activities; establish infected, control and surveillance zones; initiate and ensure appropriate movement restrictions; coordinate depopulation and disposal; conduct outbreak and epidemiological investigations into source and spread of infection; liaise closely with CDC/MoH to determine public health risk. At the provincial level the DAHP takes a lead role in local liaison and coordination to implement control measures, assisting with field investigations, culling teams, carcass disposal, movement control and managing public awareness at village, district and provincial levels zones.

The outbreak plan activates the establishment of three Technical Task Forces overseen by DAHP during an outbreak. These include the Communications Task Force (led by NaVRI), the Investigation Task Force (also led by NaVRI), and the Control Measures Task Force (led by the Provincial Animal Health Offices, which control the relevant activities and report to the designated emergency response team leader). With FAO support NaVRI/DAHP/MAFF

has prepared an official Guide for Avian Influenza Outbreak Investigation and Emergency Response that forms the basis of the outbreak investigation and response activities.

Control of HPAI outbreaks in poultry to date in Cambodia has been by depopulation and associated control measures. Vaccination against avian influenza is not permitted and there is no process or system for compensation for loss of poultry or livelihoods in Cambodia.

Case detection in poultry originally depended on passive reporting of mortalities or outbreaks from farmers or villagers to NaVRI /DAHP or provincial animal health officers and from tracing and investigations after human case detection. In an attempt to enhance passive reporting, a considerable effort has gone into specific awareness, biosecurity and human safety training for HPAI by FAO/DAHP and NGO groups for village animal health worker (VAHW), village chief (VC), district veterinary officer (DVO) and small-scale commercial duck farmers as well as at community forums for backyard farmers. A system of monthly reporting of individual disease investigations by VAHW and VC to DVO's provides information on background mortality rates in districts and it is expected that the VAHW or VC will report directly to NaVRI if suspect HPAI cases occur. As well as attendance at training courses, supply of PPE and a substantial amount of communication material is left with VAHW and VC. No other incentives are provided to encourage reporting and the lack of any compensation system may lessen the chance that farmers or villagers will report to VAHW or VC or directly to NaVRI by an avian influenza hotline.

It is widely recognised that the competency and skills of the veterinary services need to be reinforced substantially, particularly at the local level. This process has been initiated by the conduct of a PVS mission by OIE in June to July 2007; this will be followed up with a PVS gap analysis in 2010. One critical factor is the lack of legislation regarding veterinary services. This was initially addressed by participating in a the First Workshop on Veterinary Legislation and Governance organised by the OIE/AusAID Program on Strengthening Veterinary Services in Southeast Asia (PSVS), held in Phnom Penh in April-May 2008. Some progress has also been made in developing veterinary legislation through an FAO project supported by the German Government funding, but legislation is not yet in place, and this needs further follow-up.

A programme of active surveillance has also been established to target the (largely small scale) commercial duck population. Market surveillance initially planned to be undertaken through all 24 provinces. Following the market assessment in 24 provinces, the team decided to focus on the main markets. Twelve markets in eleven provinces are now targeted and cloacal, tracheal swabs and blood samples, collected from 30 ducks from each market twice monthly. Swabs are tested by virus isolation in chicken embryos and influenza A and H5 PCR tests and serum can be tested for antibody to avian influenza H5N1, H7N1 and H9N2 viruses by haemagglutination inhibition (HI) tests at NaVRI.

Wild bird surveillance has been contracted out to the Wildlife Conservation Society (WCS) with the samples submitted to NaVRI for virological testing. The first study (Nov 07-June 08) collected samples from 955 birds of 71 species (62% wetland species; 47% wild-caught and 53% from wild bird trade for food, pets, or merit-release). The wetland areas targeted were in Kandal (Koh Thom) and Banteay Meanchey (Ang Trapeaeng Thmor). The second study (Dec 08 to June 09) collected samples from a total 606 birds of 38 species from 9 sites within 6 provinces (Battambang, Siem Reap, Takeo, Kandal and Phnom Penh) Two sites were for wild bird surveillance in important wild bird habitat areas (Kraing Chek, Kandal Province; Phnom

Tameo, Takeo Province); one site for wild bird sampling at a restaurant, 3 sites for trapper-caught birds for food and 3 sites for merit bird sampling. None of the birds sampled were positive for H5N1 viruses¹⁰.

NaVRI conducts the official laboratory testing for HPAI diagnosis, or surveillance in poultry. Swabs from suspect cases or surveillance samples are inoculated into 9-11 day-old chicken embryos and haemagglutinin positive samples are tested for H5 and N1 genes by PCR tests as well as by HI tests to detect H5 subtype antigenically. Positive cases must be confirmed by submission to the National Influenza Reference Laboratory at the Pasteur Institute in Phnom Penh prior to any official declaration of an outbreak. The laboratory staff at NaVRI received initial support and training in avian influenza diagnosis from the Pasteur Institute after the first outbreaks. FAO arranged further training in virus isolation and HI testing by consultants from USA. Additional enhancement of the HPAI diagnostic capacity at NaVRI was undertaken in 2007-2008 through a series of missions by an international consultant from Australia (Dr Ibrahim Diallo) who helped upgrading the biosafety in the virology unit, introduced real-time PCR testing for influenza A and H5 detection and compiled a laboratory manual with SOPs for the virology testing. Improved quality control systems were introduced and the laboratory has successfully participated in proficiency testing for the HI and PCR tests with samples from IPC and AAHL, Geelong. NaVRI has recently been relocated to a new laboratory facility. The new facility has been designed to conduct the relevant virology procedures with a high level of proficiency in a safe manner. Although there were some initial problems exacerbated by electricity failures, the facility appears to be working reasonably well. The consultant returned to assist with the checking and calibration of the PCR tests after the relocation and this testing appears to be working well and has resulted in detection of some LPAI viruses (not H5N1). NaVRI staff has been included in the Regional Laboratory Network Meeting and Biosecurity Training in Bangkok in September 2009. Further antigenic and genetic characterization of any isolated avian influenza viruses can be conducted very efficiently at the National Influenza Reference Laboratory at IPC.

NaVRI has set up an epidemiology unit that would be expected to have a role in analysis of data from the HPAI surveillance systems and providing risk assessment advice to DAHP. However it appears that data is kept within NaVRI, and not analysed. Currently, the capacity of this unit needs further development to be effective in this role. Further specific epidemiology training, and database and mapping system development appear to be needed.

IV. DONOR, PRIVATE SECTOR AND TECHNICAL ASSISTANCE SUPPORT

There are several agencies involved in providing technical assistance and support in Cambodia contributing to the HPAI programme.

FAO has been the dominant actor in the past five years in relation to control of HPAI at its source. In this process FAO has co-operated with UN sister organizations such as WHO, UNICEF, IOM and WFP under the co-ordination of the UN Resident Co-ordinator in the Avian and Pandemic Influenza Partnership Co-ordination Meetings. Another active player has been the NGO CARE, with AusAID funding. The World Bank is poised to become a leading actor with their recently started US\$ 11 m project on Human and Avian Influenza, which will very likely see FAO as responsible for the provision of technical assistance.

¹⁰ Joyner, P., Yang, A., Gilbert, M. 2009. Wild bird surveillance for avian influenza in Cambodia. Wildlife Conservation Society, Final Report to FAO.

Donors such as the US, Germany, France, Japan, Australia and the EC have also supported not only FAO but several other international organizations (OIE, USDA, CARE, AED, GAINS, VSF, etc.) and research centres (Pasteur Institute, CIRAD, etc.) for HPAI related work. FAO has had collaborative arrangements with a number of NGOs (CELAGRID, WSF/GAINS, etc) and Government authorities to undertake studies and active surveillance in markets, villages and wildlife but mostly in the context of specific projects. AusAID has funded a regional programme for developing community-based avian influenza prevention and control capacity for CARE implementation in the Greater Mekong area until 2010. In Cambodia, CARE is working with communities to reduce the vulnerability of people to HPAI across the Mekong Region. It is also playing a role in influencing the confinement of chickens as a step towards increased bio-security; to this end it has set up a pilot programme in 194 villages using Village Animal Health Workers (VAHW's) in fencing the birds with locally available material; providing know how to grow water spinach and breeding earthworms which mixes with rice husks to provide alternate feeding because of relative confinement versus scavenging. There has been some element of success in this programme and an increase in income from poultry has been recorded. However, by its own estimates, it is not likely to impact more than 10% of the backyard poultry growers in the country.

In March 2006, the World Bank Board approved a US\$ 11 million grant for Cambodia to support the implementation of the Cambodia Comprehensive AHI National Plan, which is designed to minimize the threat posed to humans and the poultry sector by AHI infection in Cambodia, and to prepare for, control, and respond if necessary, to a human influenza pandemic. It was officially signed and launched in May 2008, but it is not fully operational to date¹¹. This Project is expected to provide direct support to the implementation of the National Comprehensive AHI Plan to produce the following outcomes: (a) contain the spread of the disease, thus reducing losses in the livelihoods of commercial and backyard poultry growers and damages to the poultry industry and diminishing the viral load in the environment; (b) prevent or limit human morbidity and mortality by stemming opportunities for human infection, and strengthening curative care capacity; and (c) prevent or curtail macroeconomic disruption and losses by reducing the probability of a human pandemic and improving emergency preparedness and response. The project would finance activities fully consistent with the objectives and the description of the National Comprehensive Plan, with a focus on the financing of items not already covered by other financiers (technical and financial gaps). The Project would include three components. The first component on animal health is detailed below.

Component A -- Animal Health Systems (total cost of about US\$5.80 million). The objective of the animal health component is to minimize the levels of infection with H5N1 HPAI virus in Cambodia. The component objective would be achieved through six subcomponents (four major and two minor). The first subcomponent will strengthen veterinary services from the central to the village level so as to enhance the capacity to prevent, recognize and respond to avian influenza and other emergency animal diseases. This will be achieved through strengthening and consolidation of training resources, reviews of training needs and curricula for village animal health worker (VAHW) training, enhanced reporting by trained VAHWs to

¹¹ This World Bank project has been under discussions with partners such as UNDP (for component with NCDM), WHO (for human health) and FAO for animal health for more than two years. The partnership between UNDP and NCDM was terminated at the end of 2007. Finalization of contracts with the remaining UN agencies depends on administrative procedures set within the UN agencies, the Government and the World Bank. Discussions on implementation modalities have reportedly been the major source of delays for project operations.

District Veterinary Services, provision of resources to support disease responses for district and provincial level veterinary services, and development of appropriate animal health laws. The second subcomponent will provide training in emergency vaccination, and necessary resources to implement emergency responses. Some additional epidemiological studies including studies in wild birds will also be conducted under this subcomponent. The third subcomponent will review high risk practices in production and marketing that facilitate persistence and transmission of infection, and implement appropriate measures to reduce these risks. The fourth subcomponent will include some additional epidemiological studies including studies in wild birds, and will strengthen existing animal health IEC programs. The fifth subcomponent will enhance pandemic preparedness response for animal health staff, and the sixth subcomponent will provide support for management of the animal health component. FAO is expected to play a role as provider of technical assistance for this component through a contract with the Government.

Besides the World Bank and FAO, the UN system has been active in avian influenza prevention and control mainly through WHO, UNICEF and the office of the UN Resident Coordinator (UNDP). The UN Resident Coordinator has indeed played an important coordinating role between government ministries and other UN Agencies. This office produces a weekly newsletter in collaboration with the relevant ministries, FAO and WHO.

The WHO is currently engaged in surveillance for H1N1, of which at the time of the RTE visit there have been approximately 400 cases with 4 deaths reported. The Pandemic preparedness response plan has been modified in the light of H1N1, focusing more on managing a low mortality but high incidence of disease. Currently sentinel sites in the country are used for the collection of biological samples. There was a technical working group on infectious diseases created in the light of the H5N1 outbreaks. This involved the MOH, Pasteur Institute, WHO and FAO; this group now focuses on H1N1, also includes NAMRU, and does not meet regularly.

With funding from Japan and Australia, UNICEF in collaboration with the Ministry of Health and World Health Organization launched a massive communication campaign in 2006. Over 1.5 million posters, 560,000 booklets have been printed and distributed through multi-sectoral meetings involving government officials, and through the existing networks of NGOs, Cambodian Red Cross, religious leaders and teachers in all 24 provinces. UNICEF also trained 6,000 monks and 78,600 teachers on public awareness on avian influenza. 7,200 school kits were developed and distributed along with soaps and brushes to all primary schools in the country. 406 billboards have been erected throughout the country and 12 TV/radio spots have been produced and aired. Under this programme there has been an emphasis on communicating the nature of disease and its impact on human health. In 2008, UNICEF also prepared material for pandemic preparedness and these posters/leaflets are used in awareness campaigns. These have also been distributed to villages and schools.

Whereas the awareness on avian influenza has become very high and Cambodia is reportedly 'better prepared' for a pandemic, the representative of UNICEF believed that it has probably not had a great impact on the behaviour of the population in terms of washing hands, etc. unless human deaths are reported. It also believes that despite several efforts in the direction of 'fencing and caging' chickens, poultry growers in the backyards are unlikely to effect these changes since it would result in feeding the chickens (incurring costs) versus scavenging (no cost).

Private Sector: Poultry, Duck Meat and Egg production.

There is a very small role played by the commercial private sector in poultry production in Cambodia. Other than the large Thai based company CP, there are a few small chicken layer farms in the country. These are mostly of the sector 3 type and poorly managed, contributing a very small percentage of the total egg production. There is insignificant broiler production in the country.

There are some small to medium duck (300 to 5000 ducks) growers in the country. These growers play a role in both duck egg and meat production. The production methods followed by them are very basic and no real biosecurity norms are followed. Many of these growers have attended the FAO sponsored training programmes but with limited uptake from the course content. There are also traditional hatcheries which produce ducklings for three months (dry months) of the year but which have had no formal biosecurity training and follow very poor biosecurity principles.

Other players in the private sector are the VAHW's (Village Animal Health Workers) who have also received training (in several cases more than once) who form the basic layer of the biosecurity and awareness programme. They also are providers of field information of poultry population and disease situation data (for TADinfo), but their real contribution to the surveillance for and reporting of the H5N1 disease situation in Cambodia is limited due to the lack of incentives to farmers for reporting disease.

CELAGRID is an NGO with some commercial enterprises that takes on output-based contract for the FAO HPAI programme (and others). It has been involved in the following activities which have been outsourced by FAO.

- a) Questionnaire-based market survey of poultry in Cambodia, carried out in 24 provinces in 2007, and working with FAO Rome.
- b) Village animal health worker evaluation in the 24 provinces in which FAO had trained up to 2007 more than 5,000 people. Results showed that they were effective, but many necessary skills still lacking.
- c) Asian Partnership for Emerging Diseases (APED) project, funded by IDRC. CELAGRID in undertaking the backyard livestock component of this multi disciplinary and multi country project.
- d) Duck production system and hatchery survey, currently being finalised with the Animal Production group in Rome.
- e) Fertile egg production for laboratory; started with 120, now 720 eggs per week.

V. ROLE AND ACTIVITIES OF FAO

Since early 2005, FAO has been supporting Cambodia's efforts to prevent and control HPAI. As end-March 2009, twelve regional and national projects have contributed to this objective.

The HPAI programme in Cambodia is probably the most comprehensive in terms of areas covered (e.g. socio-economic studies, IEC activity, poultry disease surveillance, laboratory capacity, poultry genetics studies, wild bird surveillance, etc.) and also one of the longest and better funded on a per capita basis. FAO's HPAI work was thoroughly reviewed in the 2007 Evaluation of FAO activities in Cambodia. A detailed review of the main projects conducted can be found in annex 3.

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

Project	EOD	NTE	Donor	Total Approved Project Budget	Total Expenditures under the project	Budget Allocated for Cambodia through FBA	Expenditures and Commitments under FBA for Cambodia
National - (OSRO/CMB/402/AUL)	01-Apr-04	30-Jun-05	Australia	50,000	50,081	46,948	47,024
National - (OSRO/CMB/502/AUL)	25-Nov-05	24-Feb-06	Australia	33,197	21,818	33,197	21,818
National - (TCP/CMB/3002)	01-Feb-04	31-Oct-05	FAO	349,935	349,935	99,433	99,433
National - (GCP /CMB/027/GER)	01-Dec-07	31-Mar-09	Germany	3,506,892	3,256,090	1,890,124	1,892,452
National - (OSRO/CMB/401/GER)	30-Mar-04	30-Jun-05	Germany	50,000	49,866	49,866	46,823
National - (OSRO/CMB/403/FRA)	23-Apr-04	30-Jun-05	France	53,571	53,639	15,200	15,365
Total National Projects:				4,043,595	3,781,429	2,134,768	2,122,915
Regional - (OSRO/RAS/602/JPN)	30-Mar-06	31-Dec-09	Japan	11,400,052	11,003,464	275,095	276,492
Global - (GCP /INT/010/GER)	13-Jul-06	15-Nov-09	Germany	2,563,665	2,152,851	128,030	113,503
Regional - (OSRO/RAS/505/USA)	25-Sep-05	31-Mar-07	USA	6,000,000	5,944,049	545,110	544,432
Regional - (OSRO/RAS/401/JPN BABY 01)	29-Mar-04	30-Nov-05	Japan	334,068	353,008	304,170	231,646
Regional - (TCP/RAS/3010)	01-Apr-04	30-Sep-05	FAO	362,013	362,013	35,668	35,668
Regional - (OSRO/RAS/604/USA BABY01)	01-Aug-06	31-Dec-10	USA	4,050,000	3,223,883	2,174,577	1,758,085
Total Global/Regional Projects:				24,709,798	23,039,268	3,462,650	2,959,826
Grand Total:				28,753,393	26,820,697	5,597,418	5,082,741

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 has been at the front line since the first outbreak of HPAI in 2004, providing advice to the Government and advocating to donors and several levels of government for the need to improve the funding and structure of the veterinary services to deal with avian influenza and other TADs. Actions plans were developed first within the UN System (in 2005) and later under Government leadership (2007). Several challenges and gaps however remain, chiefly among them the absence of adequate animal health legislation to deal effectively with TADs, and the poor delivery capacity of the veterinary services. Despite FAO providing specific support, including the hiring as national consultants of staff purposively released by the Government, the structural weakness of the Cambodia Government has limited the uptake of the assistance provided (e.g. for drafting a new veterinary law, upgrading the laboratory equipment and staff skills, etc). FAO global (GCP/INT/010/GER), regional (OSRO/RAS/505/USA, OSRO/RAS/604/USA) and national (GCP/CMB/027/GER) interventions have all had to deliver under very difficult conditions. Some have achieved the expected outputs, mainly those which used appropriate strategies for the country e.g. working directly with decentralized governments and involving the network of Village Animal Health Workers.

Cambodia is in a sensitive position. It has seen only 24 outbreaks of HPAI, seven of which were associated with human fatalities. The last human case was recorded on 16 December 09 before a confirmation of a poultry outbreak on 21 December 09. Inevitably, with the relatively small number of outbreaks, low numbers of human deaths, relative absence of commercial poultry enterprises and many other priority constraints to national development, there is considerable complacency regarding the disease; the USAID and WHO offices both indicated that there are much higher priority human and zoonotic diseases which affect the country, for example. So should so much be spent by FAO on such an apparently small problem in Cambodia? Clearly it is not that simple. Cambodia is wedged between two countries which have both experienced considerable losses from HPAI (Thailand and Viet Nam, and in the case of Viet Nam a country which continues to have human cases), and is a country in which the disease may well persist and/or be reintroduced, given the weaknesses of surveillance and movement controls, and the strength of informal (including trans-frontier) trade in poultry. FAO must consider the vulnerability of Cambodia, but must do that in a much broader context than purely HPAI preparedness and response.

On the great efforts by FAO in its communications programmes, undoubtedly an increased awareness of HPAI, of how to reduce human risk of infection, and of how to reduce the risk of exposure to poultry through biosecurity, has been brought about as a result of the various campaigns and training programmes; nevertheless, as reported in the last KAP survey¹² and from the evaluation team observations, there appears to be an astonishingly wide gap between knowledge-belief of people and practice at all levels (vendors, middlemen, farmers, etc).

¹² TNS (2009) Impact of AI Campaign 2008.



Phnom Penh market. Left, multiple species of poultry for sale in a public pathway through the market, and right the slaughter and processing immediately adjacent. Photos by the RTE2 team. FAO has been engaged in conducting a market forum on biosecurity practices in this building complex on the floor above.

- 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);

The FAO programme is generally in line with the Organization's priorities, and particularly with those included in the FAO/OIE Global Strategy. In the past it focussed on active disease surveillance and the strengthening of laboratory and overall government staff capacity. Today, and following a decline in funding, it is placing particular attention to surveillance in live bird markets, issues of awareness of HPAI, and of biosecurity measures necessary to reduce the disease in poultry and to reduce the risk to humans. However, there has been very weak adoption of measures being advocated. Some innovation in approach is undoubtedly required to induce behavioural change. For marketers this can probably only be achieved by regulation and investment in simple but well designed facilities (the stick), and for small-holders to report disease as part of the surveillance programme, there is undoubtedly the need for more attractive incentives (the carrot).

- 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;

Comprehensive national avian and human influenza plans covering appropriate activity areas are in place, with high level policy support at the central and provincial government level and clearly defined operational roles and responsibilities for the NaVRI/DAHP as the lead technical agency. FAO has had a major role in facilitating this.

The National Comprehensive Avian and Human Influenza Operational plan exists and has associated documents such as the AI Outbreak Investigation and Emergency Response Guide. The evaluation team considers that these need to be kept under constant review and updated periodically. There is also an urgent need to involve a wider set of partners in the process, such as representatives of the poultry industries and the NGOs in review and revision. This is particularly relevant with respect to the practicalities of biosecurity and movement controls. Feedback from these groups is also required to determine what incentives are needed for the

industry to report suspicion of disease and this probably needs to include discussion on compensation.

On the one hand, the FAO's programme relates directly to the six components of the National Comprehensive Avian and Human Influenza Plan, and the programme has developed a set of outputs which are linked to 4 of the 6 components; but on the other hand the components and the outputs are very broad, and there is not a clear, well articulated framework that can be used as a planning and communication tool for FAO's engagement, which is amenable to regular updating. FAO's comparative advantage is in setting out clear planning tools, providing strategic technical inputs, and acting as a lead facilitator in bringing other stakeholders around the table to ensure consensus, to ensure an evidence base to policy and strategy, to ensure that gaps are identified, and to promote advocacy for sustainable funding based on a gap analysis.

Veterinary legislation to support existing policies and operational plans is not enacted despite good progress on drafting legislation in the FAO/German Government funded project (GCP/CMB/027/GER). This needs to be followed through.

- Coherence and integration of regional projects into country programmes/activities;

The cross-boundary market value chain studies involving Cambodia, Viet Nam, Thailand and Lao PDR, and managed through ECTAD RAP, appears to be well integrated within the country programme, with use of a local NGO (Celagrid) to carry out the job, and with a final joint workshop planned for February 2010. Joint government to government MOU's to tackle emerging issues have been developed with Thailand and Viet Nam to date. Other regional/global projects with large national components agreed at local level (such as OSRO/RAS/604/USA baby 01 and GCP/INT/010/GER) have been operated in close association with national projects (such as GCP/CMB/027/GER).

- 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

As raised above, FAO cannot afford to have all the eggs of its support to transboundary disease preparedness and response in the basket of HPAI, with the contrasting understanding of the high priority of other constraints to human and animal health, as well as the relatively low, but ever present, risk of further human disease. A broader approach to the interventions is considered appropriate.

The FAO interventions have targeted major issues relating to HPAI in the Cambodian context but there will be a need for long-term technical support to achieve sustainable improvement in surveillance, disease diagnosis and control responses for HPAI and other TADs, as discussed below.

Efficiency

As concluded in the 2007 evaluation of FAO activities in Cambodia, HPAI-related initial interventions (2004-05) were quick, but not at the level required. The start of project GCP/CMB/027/GER (early 2006) provided the critical mass needed to effectively respond to

HPAI outbreaks. FAO was slow to provide adequate backstopping and staff to the HPAI programme in Cambodia. The absence of an FAOR and the recruitment of staff who were new to FAO operational and administrative regulations caused delays and some frictions within FAO and with the Government. The arrival in 2007 of a full-time international team, composed of a CTA, an operations officer and administrative staff dramatically improved programme delivery. The adoption of a programme approach, whereby the CTA was responsible for the main projects implemented in the country (such as GCP/CMB/027/CMB and OSRO/RAS/604/USA) was indeed very efficient.

A major issue affecting project delivery was the payment of incentives to nationals, a widespread but controversial practice in Cambodia. It was considered that in the absence of such incentives Government and private sector (VAHW) staff would be less inclined to deliver. Thus, most FAO field activities between 2007 and early 2009 were conducted with Government staff, who were temporarily released from their other duties, under contract with FAO and VAHWs being paid on a monthly basis (for a short period of time in 2007 only) or receiving monetary incentives according to UN regulations (restricted to those attending training from 2008 onwards) for their work. The FAO HPAI programme stopped this practice in early 2009 following the end of project GCP/CMB/027/GER. More recently, in December 2009, the government issued a note to stop all salary incentives to government counterparts in all programmes implemented by development partners from January 2010.

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

While generally the timeliness of FAO's responses have been appropriate, and has improved over time; there have been considerable delays in the negotiations with Government and the World Bank (WB) on FAO's technical assistance role in the WB project; it is understood that these delays have been multi-factorial and multi-institutional, but it is an area which remains unresolved, and which requires urgent attention of all parties. Communication and coordination with DAHP, NaVRI, other UN agencies and donors appears to be generally sound and the FAO staff appears to be respected within these bodies.

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

The FAO response was considered adequate both in terms of financial (over US\$ 5.5m in total to date) and human resources (52 staff in total, with 4-5 regular international staff) in the period 2007-09. Operational and administrative arrangements now seem to be satisfactory as well. It is unclear whether the resources mobilized for 2010 (mainly OSRO/RAS/604/USA) will be enough to sustain ongoing activities and the operational structure built for implementing the programme. FAO involvement in the World Bank project would certainly be a major boost, and besides helping FAO play a major technical role on animal health issues it would provide the FAO HPAI programme with an opportunity to build on the success of previous activities while reforming or shedding those that prove to be not very effective.

- 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:

There have been significant difficulties in the past associated with support to many projects from the in country FAO representation and FAO Regional office, most of them raised in the

2007 evaluation of the FAO activities in Cambodia¹³, but these have largely been resolved, and current support from ECTAD Bangkok is seen as strong and effective. The programme has also received backstopping from FAO HQ on many areas, including the socioeconomic impact assessment, TADinfo deployment and wildlife activities. Follow-up to FAO HQ missions has been less noticeable than in the case of ECTAD Bangkok, with the former being more in the form of one-time visits while staff from RAP (C. Ahlers and then C. Benigno in particular) has been more often to the country.

Effectiveness of individual country programmes

The substantial resources committed to fight HPAI in the country have certainly strengthened individual skills and knowledge of several hundreds Government staff and VAHWs. The effects are less noticeable at institutional and organizational levels. For example, in spite of FAO support to developing national HPAI policies and preparing a draft veterinary law, the lack of an adequate legal framework has reportedly limited the engagement with the private sector (both large and small commercial producers) and preparedness for other TADs. Another major challenge to the use of FAO outputs (particularly of public awareness work) is public fatigue (i.e., in view of the small number of human cases reported) and inobservance by public and poultry producers alike of several practices promoted by the programme.

The FAO/DAHP training programmes in HPAI awareness, risk communication and biosecurity to the VAHW, VC and DVO, and the involvement of DVO's with FAO in re-training of VAHW and in community and market forums, is helping to foster grass-roots level public-private partnerships. However some groups appear not to have been included in HPAI awareness and biosafety and biosecurity training activities, for example: duck egg hatcheries, staff involved in poultry slaughter at markets.

The quality of the printed and audio-visual communications material used for awareness, risk communications and biosecurity training is generally good. However some of the literature produced in the early days focused mainly on public health aspects (e.g. washing hands, sleeping well, etc.). This has now largely been corrected by developing more targeted messages, but still the team noted that poultry producers and other targeted audiences should have been more involved in preparing such documents to ensure adequacy of the material.

Despite the broad improvement in HPAI awareness and the biosecurity and biosafety training for farmers, middlemen and live bird market sellers, safety and biosecurity practises are poorly adhered to or completely ignored. FAO needs to foster innovative approaches to improve the uptake of practical safety and biosecurity activities in farms, villages and markets.

The combination of enhanced passive surveillance for early outbreak detection through the VAHW, VC, DVO network, and of active surveillance of ducks through the high-throughput duck markets to detect build up or new incursions of H5N1 viruses, is a sound approach to risk assessment. This should enable Government to reduce the risk of further outbreaks and prevent human infection. However, the lack of a compensation for poultry or livelihood loss from culling, the absence of legislation that would require reporting of diseases, and other incentives, all reduce the chances that farmers will report disease to VAHW, VC or NaVRI. The detection of the recent human case in December 2009 in Kampong Cham province 5 days

¹³ <http://www.fao.org/pbe/pbee/common/ecg/370/en/CambodiaEvaluationReport.pdf>

before detection of the poultry outbreak in the same district serves as an indicator that despite an improved surveillance system the incentives to report suspect disease cases are lacking.

The efficiency, effectiveness, sensitivity and sustainability of the active surveillance in ducks through live bird markets needs to be kept under constant review to ensure the best value results from this activity. Are the best markets being targeted? Are the district staff attempting to get the most appropriate samples according to the study design, or just the most convenient samples? Is there adequate rationale for the sample size, frequency and location for the duck surveillance so that sound and scientifically valid explanations can be provided to funding partners to justify ongoing funding?

The wild bird surveillance activity based on sampling of healthy birds is too insensitive and not cost-effective. If the objective is to determine if wild birds are being infected with H5N1 viruses either in, or on route to, Cambodia, collection and testing of swabs from dead wild birds of selected high risk species in selected districts with wetlands or habitats would likely be more effective. VAHW in selected districts could be trained to submit suspect sick or dead wild birds to DVO for swabbing and submission to NaVRI.

The Animal Health Hotline for passive surveillance is a useful initiative and is meant to be manned 24 hours a day. The throughput is recorded and checked at monthly meetings but it is relatively expensive. In addition, some reportedly lost confidence in the hotline as “nobody came to help”. Furthermore, more epidemiology value-adding is need with both the passive and active surveillance systems. Some level of mapping, analysis and measure of sensitivity is needed on a spatial and temporal basis for the negative data gathered from the surveillance activity since December 2008.

Training of staff at NaVRI has been well supported from FAO through the engagement of international consultants from the USA and Australia for training in HPAI virus isolation, PCR testing and HI serology testing. The trained staff has been shown to be proficient by inter-laboratory proficiency testing panels from IPC and AAHL. The new facilities at NaVRI are suitable for quality diagnostic testing for avian influenza viruses. There is also ready access to the National Influenza Reference Laboratory at the Pasteur Institute for confirmation of positive cases and high quality antigen and genetic characterization of viruses.

With the lack of outbreak cases the laboratory does not have a lot of diagnostic sample throughput, and has limited experience with positive field cases. This is offset by a reasonable throughput of surveillance cases. The ongoing maintenance programme for technical equipment and maintaining facilities at the required biosecurity level is expensive. A clear policy and ongoing funding are needed to build and sustain laboratory capacity at NaVRI.

Although it is apparently planned in the World Bank project, the evaluation team consider that it is not cost-effective to set up virus sequencing capacity at NaVRI. This is given: the good access to the Pasteur Institute for antigenic and genetic characterization of H5N1 and other avian influenza viruses; the specialist skill levels required; the expense of reagents and the cost of equipment and maintenance.

DAHP has engaged OIE to undertake a PVS evaluation of Veterinary Services and has committed to the next step of undergoing a gap analysis in 2010. This shows commitment to improve veterinary services and provides an opportunity for advocacy by FAO to enhance the process. Having said that, it must be stated that the competency and skills of the veterinary

services at the district level need to be reinforced, particularly at the local level. Continuous training and support for this group will underpin a sustainable disease investigation and surveillance capability in Cambodia.

Epidemiology Capacity – there is a need to enhance this capacity in DAHP, especially analyzing and using data from the surveillance system to conduct risk assessment and for risk management. Improvement in demographics of the samples sources at district and provincial levels for ducks could contribute to risk assessment and management. It was also uncertain as to how much analysis was being conducted on passive surveillance data with respect to risk assessment for districts and provinces. The TAD-Info system in Cambodia is not being used effectively, and should arguably have been introduced in a few selected provinces before being expanded as training and capabilities improved. Now it is only operational in the five provinces supported by the FAO SLPP project (GCP/CMB/028/EC) but no analysis or use is reportedly made of the data gathered.

Cross-border market chain studies are being coordinated by the ECTAD-RAP so that markets can be mapped at the regional level. Individual country workshops have been held by Celagrid including a final workshop with local stakeholders. There has also been separate government to government activity with MOUs for Cambodia/Viet Nam and Cambodia/Thailand in place and Cambodia/LaoPDR in progress. The plan is to target adjacent areas in each country for the initial studies.

- Extent to which improvements in these areas have contributed to increasing national capacities to prevent and control future outbreaks of HPAI and of other transboundary and zoonotic animal diseases

Clearly there have been some spillovers to the capacity to detect and respond to other diseases, but it must be emphasised that this capacity is very weak.

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.

FAO initiated its emergency response technical assistance to the Government of Cambodia soon after the regional outbreaks in 2004 and have contributed to emergency response activities as required and contributed to the development of the National Comprehensive Avian and Human Influenza Plan for Cambodia.

- 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 sent to National Influenza Reference Laboratory at the Pasteur Institute in Phnom Penh for genetic and antigenic characterisation. Virus sequences are deposited in Genbank

and viruses are shared with international colleagues so they are accessible through the OFFLU network. Phylogenetic comparisons of viruses from Cambodia with other H5N1 viruses from the region and internationally have been undertaken and published.

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

Staff from NAVRI are members and have participated in the Southeast Asia Regional HPAI Surveillance and Laboratory Network and will be involved in the coordinated laboratory proficiency testing programs.

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

Cambodia has been involved in wild bird surveillance field projects through collaboration with WCS; as recorded above the sensitivity of the surveillance to date has not added to the understanding of role of wild birds in spread at the country level.

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 are several areas of work whose effects will be noticeable even after a prolonged period of time e.g. public awareness of HPAI; laboratory capacity; VAHW and Government staff's knowledge of HPAI symptoms and diagnosis. There are others which will very likely end or diminish without further assistance e.g. active surveillance, disease reporting, etc. It is more difficult to evaluate to what extent the work done so far has contributed to a reduction in the prevalence and circulation of the virus. It has been suggested that the low density of poultry in the country and the lack of incentives for reporting are behind the relatively low number of outbreaks. After all, human cases since 2005 have been few and far apart, and no great impact on mortality in chickens, even if it is being caused by HPAI, has been reported. In any case, the dismantling of the ongoing active surveillance and subsequent fall of disease reporting will not allow for tracking of the status of virus prevalence, nor will allow building on this capacity for surveillance of other diseases. For the time being the FAO HPAI programme and the incoming World Bank project should still provide funding for these activities but there is certainly a need to have a fuller understanding of the dynamics of HPAI in Cambodia.

The main concern however is the minimal change of behaviour taking place both by the public sector and by the poultry producers, which is a key element for reducing the risk of new outbreaks and of poultry to human disease transmission. One reason for this situation is that HPAI has not resulted in devastating effects to Cambodia's economy, livelihoods and food security, leaving people with the feeling that they are untouched by the disease. FAO needs to develop and explore new approaches to increase actual practice, particularly by farmers and traders, of HPAI preventive measures. For example CARE and the FAO EC Livestock (SLPP) project are providing subsidized equipment to farmers (so that they can now follow HPAI advice, e.g. separating ducks from chickens, keeping birds in cages and/or in quarantine facilities for 14 days in case of new acquisitions), training VAHWs and producers on other animal diseases and assisting farmers with marketing and costing of their produce. In other countries, poultry slaughterhouses and markets are being progressively revamped to comply with minimum safety standards. The role of the Government might also

have to be enhanced through new veterinary legislation, so that it can take over the implementation of such public good activities as well as law enforcement.

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

Without broader thinking on the strategy to build on current capacity improvements to encompass broader disease surveillance and response for other TADs and national priorities, and funding to support this, the prospects for sustainability are not good.

- 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 Cambodia, and only a superficial understanding of the risk factors, while the investment in surveillance and 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 the unknown status of HPAI in the country, the high-risk for re-infection from neighbouring countries¹⁴, and that Cambodia 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.

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: OIE, World Bank, Asian Development Bank, ASEAN, WHO and UNICEF.
 - Major Bilateral/donor agencies

The programme in the country seems to have exploited the comparative advantages of each constituency met (e.g. local knowledge and networks of Cambodian NGOs; specialized expertise for wildlife surveillance). Some reports have highlighted that potential synergies, particularly with OIE and USDA regarding laboratory equipment and training, were not fully realised. An increased co-ordination at regional level would probably have allowed a more effective collaboration between these three agencies. At national level the Government gave limited priority to co-ordinate the different donors and agencies, and the holding of UN Resident Co-ordinator-led "partnership meetings" did not avoid the reported duplications and overlaps. Partnerships with emerging private sector actors is probably an area that requires more support with FAO playing a facilitating role in the establishment of representational bodies.

¹⁴ Report Exercise on Highly Pathogenic Avian Influenza - FAO contribution to the UNSIC report (2008)

- 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 understanding of value chains in the Mekong region, roles 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
Communication and coordination with DAHP, NaVRI, other UN agencies and donors appears to be generally sound and the FAO team appears to be respected within these bodies.	Issues like the slow commencement of the WB project, with an underlying concern about public sector governance, require additional input from higher levels of FAO, WB and Government.
Comprehensive national avian and human influenza plans covering appropriate activity areas are in place, with high level policy support at the central and provincial government level and clearly defined operational roles and responsibilities for the NaVRI/DAHP as the lead technical agency. FAO has had a major role in facilitating this.	Veterinary legislation to support existing policies and operational plans is not enacted despite good progress on drafting legislation in the FAO/German Government funded project. This needs to be followed through.
The FAO/DAHP training programs in HPAI awareness, risk communication and biosecurity to the VAHW, VC and DVO and involvement of DVO's with FAO in re-training of VAHW and in community and market forums is fostering grass-roots level public-private partnerships	Some groups appear to have not been included in HPAI awareness and biosafety and biosecurity training activities, for example: duck egg hatcheries, staff involved in poultry slaughter at markets.
The quality of the printed and audio-visual communications material used for awareness, risk communications and biosecurity training is very good	Despite the broad improvement in HPAI awareness and the biosecurity and biosafety training for farmers, middlemen and live bird market sellers, good safety and biosecurity practises are poorly or not adhered to. FAO needs to support innovative approaches to improve uptake of practical safety and biosecurity activities in farms, villages and markets.
The combination of enhanced passive surveillance for early outbreak detection through the VAHW, VC, DVO network and active surveillance of ducks through the high-throughput duck markets to detect build up or new incursions of H5N1 viruses	The lack of compensation for poultry or livelihood loss from culling, absence of legislation that can require reporting of disease, or other incentives, reduce the chance that farmers will report disease to VAHW, VC or NaVRI.

<p>is a sound approach to risk assessment and should enable Government response activities to reduce the risk of further outbreaks and prevent human infection.</p>	<p>The efficiency, effectiveness, sensitivity and sustainability of the active surveillance in ducks through live bird markets needs to be kept under review to ensure the best value results from this activity.</p> <p>More epidemiology value-adding is need with both the passive and active surveillance systems. Some level of mapping, analysis and measure of sensitivity is needed on a spatial and temporal basis for the negative data from the surveillance activity since Dec 2007.</p>
<p>Training of staff at NaVRI has been well supported from FAO through engagement of international consultants from USA and Australia for training in avian influenza virus isolation, PCR testing and HI serology testing. The trained staff have been shown to be proficient by interlaboratory proficiency testing panels from IPC and AAHL. The new facilities at NaVRI are suitable for quality diagnostic testing for avian influenza viruses.</p> <p>There is ready access to the National Influenza Reference Laboratory at IPC for confirmation of positive cases and high quality antigen and genetic characterization of viruses.</p>	<p>Initial problems of unreliable electricity supply, lack of reliable internet connectivity, difficulty with re-calibration of equipment needed to be addressed but seem to have been resolved.</p> <p>With the lack of outbreak cases the laboratory does not have a lot of diagnostic sample throughput and has limited experience with positive field cases. However, this is offset by a reasonable throughput of surveillance cases.</p> <p>The ongoing maintenance programme for technical equipment and maintaining facilities at the required biosecurity level is expensive. A clear policy and ongoing funding are needed to build and sustain laboratory capacity at NaVRI</p> <p>With access to IPC for antigenic and genetic characterization of H5N1 and other avian influenza viruses; the specialist skill levels required; the expense of reagents; and the cost of equipment and maintenance it is not cost-effective to set up virus sequencing capacity at NaVRI.</p>
<p>DAHP has engaged OIE to undertake a PVS evaluation of Veterinary Services and has committed to the next step of undergoing a gap analysis in 2010. Shows commitment to improve veterinary services and provides an opportunity for advocacy by FAO to enhance the process.</p>	<p>The competency and skills of the veterinary services at the district level need to be reinforced, particularly at the local level. Training and support for this group will underpin a sustainable disease investigation and surveillance capability in Cambodia</p>

	<p>The competency and skills in the epidemiology unit within NaVRI need to be enhanced so that this unit has greater input into planning of surveillance activities, analysis of data and providing advice on management and control of HPAI based on risk analysis.</p> <p>The TAD-Info system in Cambodia is not being effectively used and should have been introduced in a few selected provinces then expanded as resources, training and capabilities improved.</p>
	<p>The wild bird surveillance activity based on sampling of healthy birds is too insensitive and not cost-effective. If the objective is to determine if wild birds are being infected with H5N1 HPAI viruses either in, or on route to Cambodia, collection and testing of swabs from dead wild birds of selected risk species in selected districts with wetlands or habitats would be more effective. VAHW in selected districts could be trained to submit birds to DVO for swabbing and submission to NaVRI.</p>

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

- The FAO team should evaluate more critically the design and implementation of the active and passive surveillance, and the biosecurity support to poultry producers and markets, to ensure credibility of the FAO programme. This would include:
 - Revising the design of the active surveillance in live bird markets;
 - Considering options for increasing disease reporting (such as the setting up of a SMS voicemail system modelled in the Bangladesh example);
 - Formulating a long-term proposal for biosecurity work that includes other constraints for safe poultry production beyond HPAI.
- The FAO team should continue to engage in whatever consultations it deems necessary at the appropriate level to ensure that the WB project activities it is due to carry out can get underway as soon as possible.
- As already identified in the 2007 PVS Cambodia report, there is a need to follow through on the veterinary legislation activities to ensure that this component ceases to be a stumbling block for the implementation of more effective surveillance and control measures.

In the medium term, the evaluation team considers that:

- The FAO Team should give greater attention to the broader context of its activities, particularly as to how to ensure that the measures it is supporting for HPAI surveillance and response can have broader impact to other priority transboundary and zoonotic

diseases in the country. FAO should explore the extent to which the World Bank project activities are and/or could be aligned with this objective.

- Particular attention should be given to enhancing the epidemiology capacity at NaVRI. Consideration should be given to engaging specific medium term consultancy through FAO in this area.
- There should be a proactive attempt to facilitate better engagement with the various representatives of the poultry industry private sector, particularly when it comes to securing greater compliance and behavioural change in farm and market level biosecurity and movement control. Perhaps there is a longer term role for FAO to facilitate the establishment of representational bodies which give a voice to sector 3 in particular.
- FAO staff should have greater involvement in the PVS gap analysis to take place in 2010 as this process will potentially result in priority areas for future animal health field work and provide opportunities for fund-raising with donors.

Annex 1. List of People Met

FAO

Mr. Ajay Markanday, FAO R,
Dr. Lotfi Allal, CTA, AI Programme,
Mr. Etienne Careme, AI Operations Coordinator & Emergency Programme Coordinator,
Ms. Maria Cecilia Dy, Information & Communication Officer,
Mr. Ny Mouyry, National Project Assistant.
Mrs. Ken Dajy, NPA
Mr. Mith Sokpao, NPA
Mr. Heng Virith, NPA
Mr. Kieng Sokpheng, NPA

Mr. David B Thomson, Inception Team Leader, Food Facility
Dr. Dirk L. Van Aken, Team Leader SLPP.
Dr Yves Froehlich, FAO Consultant (SLPP)

UN Agencies

Mr. Douglas Broderick, United Nations Resident Coordinator,
Ms. Ann Lund, Office of the UN Resident Coordinator,
Dr. Nima Asgari, Public Health Specialist, WHO,
Mr. Try Tan, Programme Communication Specialist, UNICEF.
Ms. Chamroeun Mudita, Sr. Operations Officer-Rural Development, World Bank.

Government

H.E. Dr. Kao Phal, Director Deptt. Of Animal Health & Production, MAFF,
Dr. Holl Davun, Deputy Director, National Veterinary Research Institute (NaVRI),
Dr. Ren Theary, Senior Scientist, NaVRI,
Dr. Sok Daro, Vice Chief Office & Programme Coordinator, Takeo Province,
Dr. Ou Rossaran, Deputy Provincial Vety. Officer, Takeo Province,
Dr. Kay Wanthan, DVO, Kampot City,
Mr. Kong Lew, Village Chief, Kampongchrey,
Mr. Nhepsamnag, Village Chief, Banteay, Chichma Commune,
Dr. Kry Tanny, DVO Kandal,
Dy Soeuim, VAHW,
Mr. Chekseyla VAHW,
Mr. Chum Sarun, Commune Council.
Gov. Officers and farmers in Pursat province

NGO

Ms. Jacquelyn Pinat, Avian Influenza Coordinator, CARE Cambodia.
Mr. Khieu Borin, CELAGRID director

Private Sector

Sector 4 Farm (human case - 2005), Kear Tha Vong Leu Village, Bantheay Meas District
Sector 3 duck farm, Kear Thavong Krang Village, Bantheay Meas District; and nearby duck hatchery in Bantheay Meas District.
Sector 3 Duck Farm, Ms. Chayakhom, near Kampot City
Sector 4 poultry in Keal Romeas Trapiang Sangai Village, Kampot
Sector 3 chicken layer farm in Takeo City (outbreak farm)

Annex 2. Documentation Reviewed

World Bank (2008) Avian and Human Influenza Control and Preparedness Emergency Project – Project Information Document
World Bank (2009) Reports of Monitoring Missions of AHICPE project
TNS (2009) Impact of Avian Influenza Campaign 2008.
Burgos et al (2008) Poultry, HPAI and Livelihoods in Cambodia – A Review
OIE (2007) PVS Report of Cambodia
FAO (2007) Evaluation of FAO activities in Cambodia
Maria D. Van Kerkhove et al (2009) Poultry movement networks in Cambodia: Implications for surveillance and control of highly pathogenic avian influenza (HPAI/H5N1)
Epidemiology of Clade 1 Influenza A Viruses (H5N1), Southern Indochina Peninsula, 2004–2007
CARE (2009) Profile of Activities in Cambodia
CARE (2009) Community Based Avian Influenza Risk Reduction Project
Report Exercise on Highly Pathogenic Avian Influenza - FAO contribution to the UNSIC report (2008)
Sorath Ly et al (2007) Interaction Between Humans and Poultry, Rural Cambodia
J. Curry and Olaf Thieme (2007) Planning socio economic activities for HPAI control in Cambodia
Cambodia National Comprehensive Avian and Human Influenza Plan (2006)
UN Joint Programme for Addressing Avian Influenza and Pandemic Planning (2005)
J. Rushton et al (2005) Impact of avian influenza outbreaks in the poultry sectors of five South East Asian countries (Cambodia, Indonesia, Lao PDR, Thailand, Viet Nam) outbreak costs, responses and potential long term control
FAO (2004) Poultry sector country review

Plus more than 80 project reports, over 30 BTORs and end-of-contract reports, several monthly reports, etc.

Annex 3. Assessment of individual avian influenza projects

TCP/CMB/3002 “Emergency assistance for the control of avian influenza”

The primary objective of the project was to support efforts aiming at an immediate control of avian influenza outbreaks in all poultry species so as to stop the transmission of the disease from poultry to humans. Specific objectives were:

- To strengthen capacity of National Animal Health and Production Investigation Center (NAHPIC) to conduct investigation in the outbreak zones, to implement routine surveillance in the country and to perform reliable analysis in order to diagnose AI;
- To support spreading information to the Provincial Animal Health Offices, to the District Veterinarians and in the population with adequate information tools;
- To set up a control task force to conduct targeted culling and disinfection in a proper manner.

The project produced the following results:

- Capacity to control outbreaks of HPAI in a timely and safe manner has been strengthened through provision of personal protective equipment and targeted training.
- The national consultant and the national communication consultant have developed adequate information tools on avian influenza that have been distributed to provincial and district veterinarians, VAHW and farmers. One booklet providing technical information on AI (10 000 units printed) and a leaflet (300 000 units printed) were produced and largely distributed.
- The two consultants supervised production of an alert movie and radio spot (3 minutes) to raise awareness among the population on “Bird Flu” risks when a new outbreak is declared in the country. A documentary movie and radio spot (11 minutes) were also developed to inform population on bird flu risks. Both farmers and population became more aware of HPAI and the precautions to minimize the risk of disease spread and transmission.
- Assistance was provided to the NAHPIC by the international epidemiologist and GIS experts to conduct retrospective temporal and spatial analysis of outbreaks during the first wave of the disease in early 2004. This allowed tracing back all avian influenza outbreaks and making assumptions on the source and point of entry of the infection.
- The laboratory virology unit has the ability to detect AI group A virus and identify H5N1 antibodies.
- A draft national strategy was prepared with the assistance of two International Experts, in close collaboration with the DAHP and provincial authorities.

Whilst assistance through this project has contributed to containment of disease outbreaks with some success, the experience has reportedly identified serious institutional and technical constraints limiting the country’s capacity for effective control of the disease. The activities initiated through this project continue with funding provided by USAID, Japan and Germany.

OSRO/RAS/401/JPN “The Japan/FAO Joint Emergency Programme for the Control of Avian Influenza in Cambodia, Indonesia, Laos and Viet Nam”

The primary objective of the project was to enhance the capacity of Cambodia, Indonesia, Lao PDR and Viet Nam to control the HPAI outbreaks and to prevent the further spread of the disease within and out of these countries.

The project targeted farmers who had lost, or were at risk of losing, large parts of their flocks as a result of the disease and who were vulnerable to cross-infection from their birds/pigs, due to the intimate contact among their animals, local veterinary authorities, poultry producers and traders and the general public.

All project activities were implemented in coordination with other FAO projects for Avian Influenza, to avoid duplication and ensure the complementarity of the tasks achieved and an experienced national project coordinator was assigned to lead the project in each country. Project staff worked closely with various government ministries, and the national governments provided the project with local transport, office space and laboratories.

Expendable and non-expendable equipment, including four-wheel drive vehicles, were purchased in all four countries to provide essential transportation for the timely investigation of outbreaks and disease monitoring activities. In addition, 30 motorcycles were purchased in Cambodia for field surveillance by the government staff. Significant quantities of Personal Protective Equipment were procured to ensure the immediate and safe application of control measures, including culling and disinfecting. Laboratory equipment and consumables for diagnostic and surveillance activities were also procured and delivered to the main government laboratories.

In Cambodia, a three-day national training course was organized from 2-4 June 2004 for 30 provincial staff on the epidemiology of the disease including surveillance and sampling techniques. A series of computer training courses were held in December 2004 on data management using Access and Excel databases. A total of 13 participants from the NAPHIC and DAHP attended.

The project provided basic equipment and materials for disease investigation, culling operations, cleaning and disinfecting of premises, and supported the coordination of disease control activities at the local level. The activities initiated through this project continue with funding provided by Japan and USAID.

OSRO/RAS/602/JPN “Strengthening the Control and Prevention of HPAI and enhancing public awareness”

The project, which was designed to strengthen the capacity of field veterinary services on strategic surveillance and proper implementation of related policies such as stamping out and vaccination, as well as to enhance public awareness raising and dissemination, has reportedly benefited smallholder farmers. Other direct beneficiaries were small livestock and poultry producers, government veterinarians, village animal health workers or volunteers and various government institutions working on animal health.

Overall, the project focused on improving disease surveillance and outbreak response capacities in provincial and district veterinary services as well as enhancing village animal health and public awareness toward safe handling of backyard poultry. Main activities were the provision of technical and human resources support, training, procurement and distribution of inputs, laboratory networking with other agencies and strengthening field coordination.

The activities carried out in Cambodia focused on promoting improved biosecurity, strengthening surveillance and response, reporting, public awareness and coordination. Trainings on surveillance and response and biosecurity were provided to village animal health workers (VAHWs) and village chiefs, while the staff of the Department of Animal Health (DAH) was given training on Transboundary Animal Disease Information System (TADinfo).

Knowledge, Attitude and Practice Surveys (KAP) were conducted to determine the general level of awareness and understanding of the disease as well as retention and adoption of messages. Public awareness of HPAI was improved by supporting production of TV and radio spots, community theatre, community forums, film documentaries and communication workshops. The project procured equipment and supplies to be provided to DAH and the Virology Laboratory at the National Veterinary Research Institute (NaVRI). The project also sponsored workshops, trainings and meetings to facilitate coordination among various stakeholders.

A total of 800 VAHWs and village chiefs in Cambodia were trained on AI control measures including surveillance, biosecurity, reporting and outbreak response; 126 provincial and district staff participated in a multi-sectoral outbreak response training course; and seven NaVRI laboratory staff were supported on having follow-up training on real-time PCR. Training on TADinfo was provided to 24 veterinary officers from 24 provinces. The main outputs achieved include:

- Conducted public awareness campaigns to deliver simple biosecurity measures to reduce the risk of introducing disease to the village flock. KAPs have indicated that messages through these campaigns have been well received and practiced by the majority.
- 126 provincial and district staff participated in a multi-sectoral outbreak response training course and veterinary training course in sampling and active surveillance for veterinarians and members of the rapid response teams from 24 provinces.
- A fully equipped mobile laboratory unit was procured and provided to NaVRI for rapid response and outbreak investigation.
- Laboratory capacity and supply of consumables and recurrent resources have been suitably upgraded to cope with increased throughput of samples resulting from the active surveillance of markets.
- Laboratory and diagnostic capacity to analyse samples for the possible presence of AI were upgraded.
- VAHWs totalling to 800 and 577 village chiefs were trained in AI control measures such as surveillance, biosecurity, rapid reporting and outbreak response.
- Provided FAO trained VAHWs with PPEs for use in case of outbreak.
- Two TV and nine radio spots were produced. The TV spots were shown 7 202 times from April 2007 – March 2008, while the radio spots were broadcasted 36 657 times. To complement the TV and radio broadcasts, nine public awareness marches on AI were held in high-risk provinces providing communities with knowledge and actions they could take to protect their families and birds.
- Studies to measure effectiveness of communication campaigns and improve communication strategies conducted such as: (i) post-test analysis of TV and radio spots; (ii) social analysis of cultural perceptions, attitudes, resources, capabilities and priorities on HPAI prevention and response.

- 54 drama performances and 25 shows promoting messages in HPAI prevention and control in the poorest and most vulnerable areas were supported by the project in collaboration with AED and UNICEF.
- The project sponsored three community forums organised by Medical Cambodia in remote districts that have limited access to mass media.
- Two film documentaries were produced: (i) 20-minute film 'Bridging the gap between awareness and practice: participatory learning on rural beliefs and participatory learning practices on HPAI prevention and control in Cambodia'. Its eight-minute version 'Are we listening? Community Perceptions and Avian Influenza' have been shown in various conferences and meetings and was translated into French for showing at four regional workshops in French speaking countries, (ii) 'Avian Influenza: A Country Responds' which shows how the Cambodian Government and its partners fought back to contain HPAI outbreak after Cambodia's seventh human case in April 2007.
- 'Super chicken' printed T-shirts numbering 1 299 and caps were distributed to nine teams of boat rowers participating in the three-day Water Festival held in November 2007. Leaflets, paper hats and other public awareness materials were produced and distributed to the public during community meetings organized by the Ministry of Health and the University of Research Co., Ltd (URC) in Kompongcham in November 2007.
- The project supported the National Communications Workshop jointly organised with AED and UNICEF. IEC materials based on the outcome of this workshop, findings of focus group, post-test analysis and other relevant studies were produced.
- The project supported the conduct of the national trainers' course on HPAI surveillance and control for field veterinarians and paraprofessionals in collaboration with OIE. 24 District Veterinary Officer and 24 VAHW attended the training.
- Coordination meeting with NGOs active in animal health issues was supported to harmonize the training curriculum for VAHWs.

The main challenges identified for the control and prevention of AI in Cambodia lies in the fact that the great majority of poultry (over 90 percent) are raised as small-scale assets under scavenger systems of management. As such, they are largely beyond the need or reach of veterinary attention. Overall, the project was able to contribute to the international efforts of progressively controlling HPAI in the already affected participating countries. The project enhanced capacity for HPAI control, increased public awareness on HPAI prevention, improved rapid response to and control of HPAI incidence in the provinces where it was active. A major challenge for sustainability of results in Cambodia, as in other countries in the region, is the limited human resources and the very low pay offered in the Government Service. Also, to be able to achieve lasting behaviour change, the project was too short and required additional work particularly at grass-root levels to improve biosecurity and economic returns of poultry production, and at policy level to implement bold structural changes of the poultry sector.

OSRO/RAS/505/USA "Immediate assistance for strengthening community-based early warning and early reaction to avian influenza outbreaks in Cambodia, Indonesia, Lao PDR, PR China and Viet Nam"

The project was implemented in line with the global strategy and plans to control Highly Pathogenic Avian Influenza (HPAI), developed by FAO and the World Organisation for Animal Health in collaboration with the World Health Organization. The project conducted

field operations in five beneficiary countries in Asia – Cambodia, Indonesia, Lao PDR, PR China and Viet Nam – with the overall objective of countering HPAI threats posed to animals and people across the sub-region and restoring sustainable poultry production and associated rural and socio-economic development. The primary beneficiaries of the project included smallholder farmers, animal health workers, Government veterinary staff and local nongovernmental organizations (NGOs) involved in animal health.

The project reportedly enhanced the capacity of the beneficiary countries in early detection and early warning of HPAI by establishing informal networks for early warning and disease information flow, improving disease information and data management systems and strengthening the diagnostic capacity for field surveillance. Laboratories were upgraded to competently diagnose HPAI and participatory methods were used in training villagers and Government staff in surveillance and response. The capacity of beneficiary countries to respond effectively to the disease outbreaks was enhanced by providing technical and logistic support to ensure safe culling operations and disinfection activities.

In Cambodia project activities were carried out in the following provinces: Battambang, Banteay Mean Chey, Takeo, Kampot, Prey Veng, Kampong Cham, Stung Treng, Kratie, Kampong Chhnang and Kampong Thom. The activities focused on supporting field early detection and reporting system, effective outbreak containment and contingency planning, and improvement of bio-security for poultry production. Training was organized for farmers in bio-security measures and for VAHWs as well as provincial staff in early detection, reporting, sample collection and outbreak containment. In addition the project produced various communication materials and procured laboratory equipment and supplies. 444 farmers were trained in bio-security measures and good practices for avian influenza prevention, and 2000 VAHWs were provided with an equipment kit and trained in field early detection, reporting, sample collection and submission as well as outbreak containment. Training workshop on Transboundary Animal Disease information system (TADinfo) was organized. The following are the outputs produced throughout the project life:

- A training manual for VAHWs and a bio-security manual for farmers were developed;
- Laboratory equipment, supplies and Personal Protective Equipment (PPEs) were distributed to veterinary workers;
- HPAI hotline to be called to report mortality of poultry was established and 200,000 calendars showing poultry mortality and providing the hotline number were distributed in the field. As a result, the Communication Unit received approximately 4-5 calls/day;
- 4,500 posters on AI were distributed in the field to the VAHWs;
- 6,000 exemplars of the journal “Health Messenger” were financed by the project;
- The project supported the publishing of “AI Bulletin in Cambodia” in collaboration with WHO;
- The project supported Community theatre activities in collaboration with AED;
- TADinfo programme was installed at the National Animal Health and Production Investigation Centre (NAHPIC).

As highlighted in other projects, lasting impact and sustainability will depend on increasing the capacity of veterinary personnel to address HPAI and pandemic threat and upgrading the animal health regulatory framework in Cambodia. These issues cannot be solved in a short term, and would require long-term efforts and approach in collaboration with other stakeholders. As a result of the project activities, province and district veterinary staff reportedly gained more understanding on the disease, but more capacity building activities are needed in the field level. The implementation of activities initiated under

OSRO/RAS/505/USA continues currently under new regional and country projects (OSRO/RAS/604/USA), funded mainly by United States Agency for International Development.

OSRO/RAS/604/USA “Immediate Technical Assistance to Strengthen Emergency Preparedness for Highly Pathogenic Avian Influenza (HPAI)” – Ongoing

This project addresses short and medium-term actions that are to be undertaken by the Cambodian Government to strengthen its capacity to prevent the occurrence of HPAI and minimize its spread. The immediate objectives of the project will be to assist the Government of Cambodia in general and the Department of Animal Health in particular, in the areas of:

- 1) Surveillance;
- 2) Laboratory diagnosis;
- 3) Reporting and response;
- 4) Bio-security;
- 5) Public Awareness and Education;
- 6) Socio-economic and livelihoods studies related to HPAI; and
- 7) Supportive and protective legislative environment.

Specifically the project’s objectives are defined as part of FAO’s Avian Influenza programme in Cambodia in support of the Department of Animal Health and Production’s effort to fight against HPAI. The sevenfold approach of the FAO HPAI programme expects to attain the following outcomes:

- Strengthened national capacity in disease surveillance;
- Strengthened capacity to undertake laboratory diagnosis for HPAI;
- Reinforced capacity of the authorities in containment operations of HPAI outbreaks, and reporting;
- Promoted bio security in poultry and duck production at the farm level;
- Improved public awareness and information on HPAI (Animal Health);
- Better understanding of cultural attitudes and the socio economic impacts of HPAI (and of HPAI controls) upon the livelihoods of rural households. Using this knowledge policies and strategies for disease control and rehabilitation will be developed that are more appropriate and acceptable to this overwhelming majority of the poultry owning population, thus improving the overall control of AI, and other diseases, among the extensive poultry and animal husbandry systems of the country.
- Improved supportive and protective legislative environment in relation to HPAI;

This project is still ongoing (new NTE is December 2010) and has been throughout the years the main source of funding of FAO activities in Cambodia. Besides funding the procurement of office inputs and other materials, as well as the conduct of disease surveillance, bio-security and communication activities, the project has covered the cost of core (CTA, communications, operations and administrative officers) and national staff working on the integrated HPAI programme in Cambodia. The assessments made in the main text of this report largely correspond to the activities conducted through this and the German-funded project below.

GCP/CMB/027/GER “Building Capacity at the Grass-roots Level to Control Avian Influenza”

The development objective of this project is the containment of HPAI in Cambodia thereby contributing to the reduction and minimizing of the risk of a human pandemic, and promoting

healthy trade in poultry products for improving the livelihoods of the resource poor farmers and enhancing food security of the rural poor in Cambodia and also in the region. The immediate objectives and expected outputs of the project are:

Immediate Objective 1. Legal and regulatory framework capacity applied to carry out and enforce HPAI containment and control.

Outputs:

- 1.1. Effective national HPAI control and eradication policy, supported by legislation promulgated.
- 1.2. Legislative and regulatory requirements for HPAI and other disease control measures developed.
- 1.3. Contingency plan for HPAI control established.
- 1.4. Economic evaluation of the AI control programme completed.
- 1.5. Veterinary services restructuring study completed.

Immediate Objective 2: A sustainable disease control and surveillance system based on strong epidemiological services and grassroots veterinary services is working

Outputs:

- 2.1. Disease surveillance - an epidemiological information system established.
- 2.2. HPAI grass-roots level field surveillance by farmers groups, paraveterinarians and other extension workers activated.
- 2.3. National diagnostic laboratory at NAPHIC strengthened and providing effective support to field surveillance.
- 2.4. Disease control measures developed and effectively delivered.

Immediate Objective 3. Improved public awareness of the HPAI public health hazards amongst the rural and urban public leads to greater understanding of food safety and cooperation for reporting suspected HPAI cases.

Outputs:

- 3.1. Increased public awareness created and fostered
- 3.2. The poultry small holders and workers well informed on HPAI and biosecurity practices.

This project finished in March 2009 and till its end was together with OSRO/RAS/604/USA the main source of funding of FAO activities in Cambodia. The project developed strong linkages with the above USAID funded project as well as with other FAO initiatives funded by Germany (chiefly GCP /INT/010/GER) particularly for the review of veterinary legislation and allowed the strengthening of the technical base in Cambodia through the recruitment of a long-term expert and short-term consultancies on veterinary legislation, laboratory development, etc.