OFFLU review of avian influenza surveillance and epidemiological projects in some European, African, and Asian countries

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Summary

This review aims to examine approaches to avian influenza surveillance and epidemiological projects in some European, African, and Asian countries. Information about projects in these regions was gathered by means of a questionnaire sent to OIE and FAO regional offices.

Objectives for surveillance and epidemiology projects appear to vary between different regions, with a trade focus in European countries and a development focus in African countries. The limited numbers of responses from Asian countries suggest that an objective of surveillance in this region is to understand the role of the environment in the epidemiology of avian influenza. Implementation and funding mechanisms also vary between the regions, with many African projects being funded by external donors. The review raised questions about the longer term sustainability of AI surveillance projects, particularly in Africa. The responses also suggested that investments in surveillance and good veterinary governance play a broader role in capacity building.

The questionnaire based survey was initiated and overseen by the OFFLU applied epidemiology group. OFFLU is the joint OIE-FAO global network of expertise on animal influenzas, and the applied epidemiology group is a small working group of leading epidemiologists with specialist expertise in avian influenza.

Introduction

Between 2005 and 2010 H5N1 highly pathogenic avian influenza (HPAI) spread rapidly to over 60 countries on three continents. National and regional avian influenza surveillance programmes and reporting of disease outbreaks to the World Organisation for Animal Health (OIE) have enabled the international community to monitor the global disease situation and target their interventions accordingly.

H5N1 HPAI and other notifiable avian influenzas remain a significant threat to animal health and welfare, public health, agricultural productivity, economies and the livelihoods of some of the world's poorest farmers. In 2011 H5N1 HPAI remains enzootic or entrenched in several areas, and countries continue to report reoccurrences of outbreaks (OIE-WAHID). The disease continues to have a significant impact on poultry health and causes significant economic losses through restricted production and trade.

As well as causing devastating losses to animal health, H5N1 HPAI is an important zoonosis with a high case fatality rate, and like other animal influenza viruses there is potential for it to evolve into a pandemic virus

(WHO, 2010). It is well acknowledged that to reduce direct zoonotic risks from H5N1 HPAI it is best to control the virus in the poultry source. Early detection allows a more rapid and effective response keeping losses in the agriculture sector to a minimum, and significantly reducing public health threats. Effective surveillance vastly improves the chances of early disease detection, informs control strategies so that interventions can be targeted properly, and allows monitoring of the disease situation so that a body of evidence can be gathered to eventually self-declare freedom from disease for trade purposes (K.Hamilton and G.Bruckner, 2010). Surveillance generates important data about the characteristics of virus, allowing scientists to detect emerging public and animal health threats early, and better describe the epidemiology of the disease.

In response to HPAI H5N1 donor funds from international agencies have been mobilised on a large scale to improve capacity for avian influenza surveillance and response. This has resulted in unprecedented levels of avian influenza surveillance programmes world-wide, including both poultry and wild birds. Surveillance has been undertaken by a range of bodies including national governments, international organisations, research institutions, NGOs, and regional organisations.

There are various approaches to avian influenza surveillance and these are often adapted to the local setting and resources available. The OFFLU Applied Epidemiology Technical Activity decided to gather information to compare and contrast approaches to avian influenza surveillance in different regions, and to identify gaps and areas of overlap.

Methodology

In April 2009 the OFFLU Applied Epidemiology Technical Activity designed a questionnaire to collect information about objectives, funding, duration, and institutes involved in AI surveillance globally for the period 2005–2009. This was sent to OIE and FAO Regional Offices by email.

The questionnaire was completed by the OIE/FAO Regional Representations in Europe and Africa, and responses from Asian countries were coordinated by the FAO AI network for Asia. Although the response rate varied from region to region, sufficient data were received from Africa and Europe and, to a lesser degree, from some Asian countries to allow comparisons to be made.

Data received from respondents in Africa, Europe, and some Asian countries were summarised and described.

Information about outbreaks of notifiable AI was sourced from the OIE World Animal Health Information Database.

Broad findings of a needs assessment carried out in 26 sub-saharan African countries called the Integrated National Action Program on Avian and Human Influenza (INAP) were also considered with responses from Africa. These findings include an analysis of veterinary and public governance of the 26 beneficiary countries.

Results

The responses received from the European, African and Asian countries have been summarised along with information about outbreaks of AI in respective countries retrieved from the World Animal Health Information Database (WAHID).

Summary of responses from the OIE European Region:

1. Information about AI surveillance and epidemiological activities were received from 23 of the 53 countries in the OIE European region, 16 of these countries are members of the European Union (EU).

2. Of the 23 European countries, seven countries have reported HPAI in poultry and 14 countries have reported HPAI in wild birds during the period 2005–2009. (Source: WAHID, OIE). The subtype reported in all of these outbreaks is H5N1. Six countries have also reported LPAI (low pathogenicity AI) in poultry.

3. All European respondents have a national surveillance and epidemiological programme for AI in poultry and wild birds.

4. For the European country respondents, most countries received funding for AI surveillance from their governments, and in the case of EU countries co-funding from the EU. The following countries that responded and are in the OIE European region receive funding for surveillance from external donors:

   Armenia - FAO, World Bank and Japanese Funding programme;

   Azerbaijan - FAO;

   Bosnia and Herzegovina - National fund, FAO and World Bank;

   Turkey - World Bank loan, European Union (EU), United States Agency for International Development (USAID), National fund and beneficiaries.

5. The surveillance and epidemiological programmes in European countries are on-going, usually having annual duration and are renewed every year.

6. The stated objectives of surveillance for AI in poultry in the European countries are:

   - To detect subclinical infections of notifiable LPAI virus and
   - To detect HPAI virus, contributing to the demonstration of free status in conformity with international trade regulations.

   The surveillance programmes follow general (passive) and targeted (active) types of surveillance. This includes investigation and diagnostic testing following disease suspicion (virological testing), and also a structured annual serological survey targeted to all species of poultry (breeders, layers, turkeys, ducks, partridges, quails, ostriches etc). In the annual survey, if serology is positive it is followed by virological testing.

7. The objective of surveillance in wild birds is to detect LPAI and HPAI virus in higher risk species of wild birds and those living in close proximity to domestic poultry, and also from hunted game birds. The surveillance programmes follow general (passive) and targeted (active) types of surveillance.

   Surveillance programmes for wild birds always involves virological surveillance. Anseriformes (water fowl) and Charadriiformes (shorebirds and gulls) are the main sampling targets. Active surveillance is conducted on living and clinically healthy and/or clinically diseased, injured or hunted birds. Cloacal swabs/fresh faeces and tracheal/oropharyngeal samples are collected. Passive surveillance is conducted on sick and dead wild birds. Cloacal and tracheal/oropharyngeal swabs and/or tissues namely the brain, heart, lung, trachea, kidney and intestines are collected for virus isolation and molecular detection.

8. All laboratory tests are carried out in accordance with Chapter 2.3.4 on HPAI of the *OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals*, Sixth Edition 2008, OIE and Commission Decision

2006/437/EC approving a Diagnostic Manual for avian influenza as provided for in Council Directive 2005/94/EC.

9. An international research project entitled "Constanze" was conducted in which researchers from three countries, namely Germany, Austria and Switzerland bordering Lake Constance, studied AI in relation to wild birds in that region. Since the start of the project in September 2006, a total of 778 wild birds have been sampled, 329 of them in Switzerland, 369 in Germany and 80 in Austria. LPAI viruses of different subtypes were detected in 29 of these birds. But there was no detection of H5N1 HPAI.

10. Germany and the Netherlands have reported carrying out preventive vaccination against HPAI, while Portugal, France, and Italy have reported carrying out vaccination against LPAI. (Info on all approved vaccination plans in the EU: http://ec.europa.eu/food/animal/diseases/controlmeasures/avian/eu_resp_vaccination_en.htm)

Summary of responses from the African Region:

1. Information about AI surveillance and epidemiological activities were received from 53 African countries, 51 of which are in the OIE Region for Africa

2. Of the 53 African countries, 13 countries have reported HPAI in poultry and three countries have reported HPAI in wild birds during the period 2005–2009 (Source: WAHID, OIE). The subtypes involved in all these outbreaks have mainly been H5N1 and, on one occasion, H5N2. There were no reports of LPAI.

3. The surveillance and epidemiological projects on AI are regional wherein a single project covers 4, 6, 15 or 47 countries (Fig.1 and Fig. 2). The various surveillance and epidemiological projects in Africa are tabulated as below.

4. African countries undertake AI surveillance programmes and are supported financially by external agencies including the EU/World Bank/USAID/ French Ministry of Foreign and European Affairs etc.

5. The duration of surveillance programmes in African countries varies from 1 to 3 years; some of them have already been completed, others are due to be completed in 2010.

6. Objectives of surveillance programmes in African countries are reported to involve strengthening capacity for HPAI surveillance, preparedness, and response.

   The activities of AI surveillance programmes followed in most African countries include:

   a. Training field staff in disease diagnosis,

   b. Training in sampling and surveillance techniques,

   c. Supply of reagents to all national laboratories through demand–supply hub for performing serological surveillance on poultry,

   d. Creating awareness among the target groups about the disease through pamphlets, posters, booklets and T-shirts, and

   e. Implementation of scanning, active and passive surveillance through development of surveillance guidelines and harmonised data capture forms for HPAI surveillance.

7. In two projects, namely GRIPAVI and OSRO/RAF/811/ILR, the AI surveillance programme is linked with the surveillance of Newcastle disease.

8. Apart from South Africa and Zimbabwe, no information was provided about wild bird surveillance in other African countries, although it is known to take place.

9. Routine vaccination against HPAI has been reported in Egypt from year 2006 onwards in birds. Also the Sudan and Niger have reported preventive vaccination against HPAI in birds in 2006 and 2007, respectively.

Summary of responses from the Asian Region:

1. Information about AI surveillance and epidemiological activities were received from seven countries of the 35 in the OIE Region for Asia, the Far East, and Oceania; these were Bangladesh, Cambodia, People's Republic of China, Myanmar, Nepal, Thailand and Vietnam.

2. All seven countries have reported HPAI in poultry and two countries (China and Vietnam) have reported HPAI in wild birds during the period 2005–2009. The subtype reported in all of these outbreaks was H5N1. One country has also reported LPAI in poultry.

3. The surveillance and epidemiological projects on AI are national as well as regional covering 2–3 countries. The various projects in Asian countries are as follows.

4. Epidemiological and surveillance programmes are supported financially by external agencies such as French Ministry of Foreign and European Affairs, CIRAD, EU, United Nations, USAID, Avian and Human Influenza Facility (AHIF), AusAID, World Bank, etc.

5. All the surveillance programmes in Asian countries are on-going and the duration varies from 2 to 5 years.

6. The objectives of the surveillance and epidemiological programmes are reported to involve understanding the role of the environment in the survival of the virus and in the re-emergence of outbreaks; quantitative assessment of AI surveillance systems; epidemiology and ecology of AI in local areas and capacity building for prevention and control of HPAI.

7. The activities of AI surveillance programmes followed in Asian countries include:

    a. Active and passive surveillance in poultry and wild birds,

    b. Laboratory and epidemiology capacity building,

    c. Training of technicians and field personnel to monitor AI,

    d. Retrospective studies of the determinants of H5N1 outbreaks,

    e. Ecology of the AI virus.

8. Vaccination against HPAI has been reported by Vietnam in 2006 and 2007.

Discussion

There was a variable response rate to the questionnaire. Information about AI surveillance and epidemiological projects was received from all countries in the African continent, from 23 countries (50%) in the OIE European region and from only 7 Asian countries. Most of the European country responses are from EU members and therefore, for the European countries, there is a bias towards EU data and policy.

Of the countries covered by the questionnaire responses, all the Asian countries and 25–30% of the European and African countries had reported outbreaks of HPAI in poultry to the OIE during the period 2005–2009 (OIE-WAHID). A larger proportion of European countries (60%) reported outbreaks of HPAI in wild birds than African

countries (5%) (Fig.3). In line with the global trend, and as illustrated in Figures 4 and 5, the European and African countries reported a decreasing trend in the number of HPAI outbreaks in poultry and wild birds between 2006 and 2009.

There was variability in the geographical coverage of surveillance projects among the different regions. All European countries had national surveillance programmes for AI whilst in Africa, the surveillance programmes were all implemented at a regional level covering 4, 6, 15, or 47 countries. Both national and regional surveillance programmes were reported from the Asian countries.

Most of the European countries are members of the EU where all surveillance programmes are co-funded by the national government and the European Union (EU). The funding situation is different in Africa and the 7 Asian countries, where surveillance is funded by international donors. The programmes in Africa rely on fixed-term financial commitment. Continuation of surveillance in the African and Asian countries will depend on availability of external donor funds and longer term donor commitment.

Participatory disease surveillance was reported to take place in 15 countries in Africa and was not reported for the Asian or European countries, although it is known to contribute to AI surveillance in Indonesia.

The surveillance and epidemiological programmes in Europe had a focus on disease detection, agent characterisation and self-declaration of disease freedom for trade purposes. The responses for African countries implied that objectives for projects in these countries were also focused on capacity building, raising social awareness of the disease and risks, and minimising the socio-economic impact of HPAI.

Several of the countries covered by the questionnaire were using vaccination as part of their control strategy. This can present certain challenges, particularly with respect to serological surveillance. In such instances surveillance strategies should be able to identify infected vaccinated birds from non-infected vaccinated birds.

Ad hoc wild bird surveillance projects were also reported from Europe, where a collaborative project involving Germany, Switzerland and Austria surveyed wild birds for LPAI and HPAI around Lake Constance.

An assessment of avian influenza control and pandemic preparedness in Africa called Integrated National Action Program on Avian and Human Influenza (INAP) has been implemented in 26 African countries from 2006-2009 by the Africa Livestock Partnership (ALive), in collaboration with FAO, OIE, WHO-AFRO, and AU-IBAR. INAP identified weak surveillance and insufficient laboratory capacity to be the most serious concerns in the ability of countries to deal with H5N1 HPAI outbreaks or a pandemic. With underinvestment from national governments, there will be implications for sustainable avian influenza surveillance (INAP, 2010). The INAP conclusions corroborate the findings of the OFFLU study.

Conclusions

The findings of this OFFLU study suggest that surveillance for avian influenza in Africa, and veterinary governance are heavily dependent on donor investment. It would appear that some countries in Africa have support for AI surveillance from a greater number of donor agencies than others. African countries receiving support from more donors are clustered in the southern African region and North West Africa. Countries in Central and South West Africa receive less support. The disparity may lead to a bias in surveillance favouring countries receiving more funds. The reasons for the disparity are not clear, and it is not known whether it is based on risk. There are technical and economic advantages to targeting surveillance to higher risk areas, particularly when resources are limited, and targeting may also contribute to sustainability. In an environment where multiple donor agencies are funding surveillance, coordination is needed to prevent duplication of efforts and investments in some areas, leaving gaps in others.

The degree and approach to regional coordination of surveillance activities varies in different regions. In the EU a regional strategy is agreed by all member states and is prescribed in European legislation. Such legislation covers survey design and funding, provides powers for implementation, and ensures harmonisation of national programmes. Technical support and analysis of survey results are provided by the EU Reference Laboratory. In Africa multiple programmes are implemented on a regional basis, with each covering several countries. Coordination of surveillance in Africa will present greater challenges with multiple donor agencies providing financial support and no one body providing a central coordination role. The EU survey for AI could be used as a model for regional coordination. The central administrative role played by the EC ensures that national programmes are coordinated in line with a regional strategy. EC legislation ensures that countries have the legal power to enable them to implement surveillance, that funding is maintained, and that national survey design is harmonised. The principle of having one Reference Laboratory that provides technical support and coordination to regional surveillance allows data to be centralised, leading to a more comprehensive and meaningful epidemiological analysis. The centralised Reference Laboratory also creates a regional virus repository necessary for further characterisation of viruses, and development of effective diagnostic tests and vaccines.

During 2005–2009 reports to the OIE demonstrate that subtypes of HPAI and LPAI other than H5N1 are circulating in poultry in different parts of the world, highlighting the need to maintain surveillance for all notifiable avian influenzas (HPAI and LPAIs H5 and H7). From the questionnaire results it appears that AI surveillance in Africa is focused on HPAI in poultry, whilst in the European region and Asia, surveillance covers all AI subtypes H5 and H7 and includes a component of wild bird surveillance in all countries that responded. Some countries also take the opportunity to include surveillance for Newcastle disease in their AI surveillance programme. Newcastle disease is a significant poultry health problem, is a threat to food security in many countries, a barrier to trade, and is also a differential diagnosis for AI. Newcastle disease surveillance can be integrated into AI surveillance programmes and will provide additional benefits, particularly in areas where the disease is enzootic. However relatively few AI surveillance projects in Africa appeared to integrate Newcastle disease surveillance and it would appear that an opportunity is being missed.

Objectives of surveillance programmes vary depending on the regional context. Whilst surveillance in the European countries has a primary focus on early detection, control and maintaining international trade by demonstrating country freedom, in Africa there is also a focus on development, training, and awareness-raising, and this was also reflected in responses from Asia where the disease has been entrenched in several countries. It is evident that investments in surveillance also play a significant role in providing longer term benefits for development and capacity building and for sustaining surveillance networks.

With H5N1 HPAI remaining enzootic or entrenched in at least three areas of the world there is a need to maintain effective surveillance world-wide to allow monitoring of the virus and its characteristics, and to facilitate early detection and effective control. Sustainability of existing surveillance programmes will be a key factor in achieving this. In Africa and Asia it appears that surveillance is supported by external donor funding, and sustainability of these programmes is therefore dependent upon renewal of funds. It is not clear what will happen when funding for many of these programmes comes to an end in 2011. If funds are not renewed there is a risk that activities will cease, leading to gaps in global AI surveillance. This may also impact essential infrastructure such as veterinary laboratories and human resources that have also been supported directly or indirectly by AI surveillance funds.

Globally there has been considerable investment and interest in surveillance for H5N1 HPAI over the past 5 years owing primarily to its pandemic potential; studies such as INAPs reveal that despite this in parts of Africa these investments were still not sufficient. In 2010 as the world emerges from an H1N1 pandemic and many governments are faced with economic uncertainties, the animal health sector faces challenges in

sustaining these activities and meeting new and emerging threats. A similar review of surveillance activity in 3–4 years may provide a different picture, this is something that the OFFLU intends to take forward.

Fig.1: Countries integrated in the SPINAP-AHI project

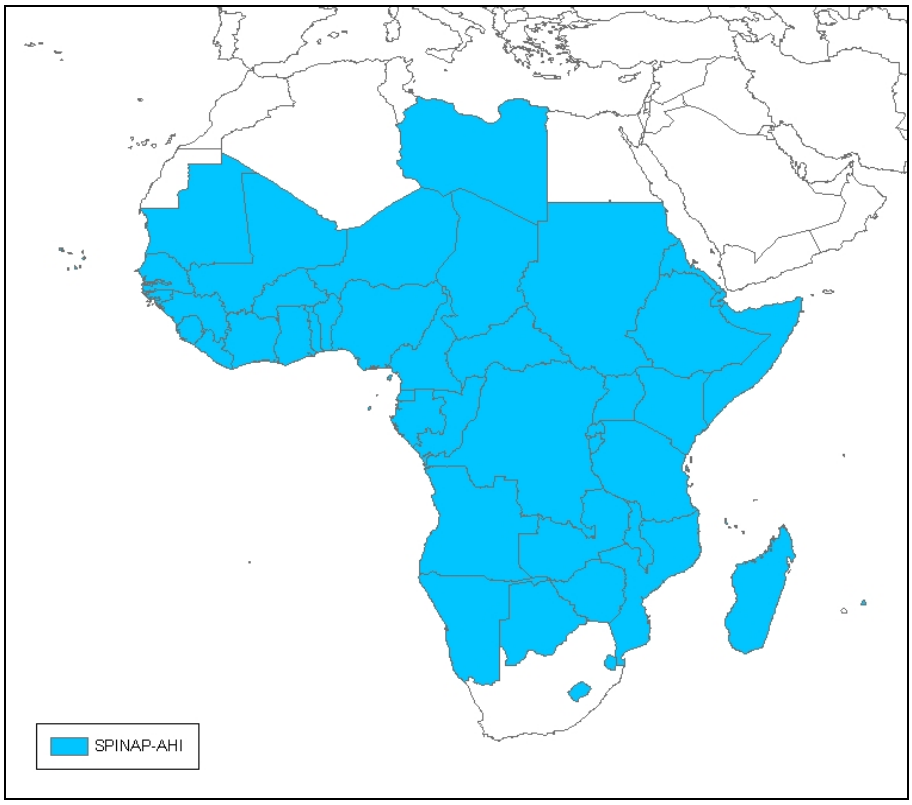
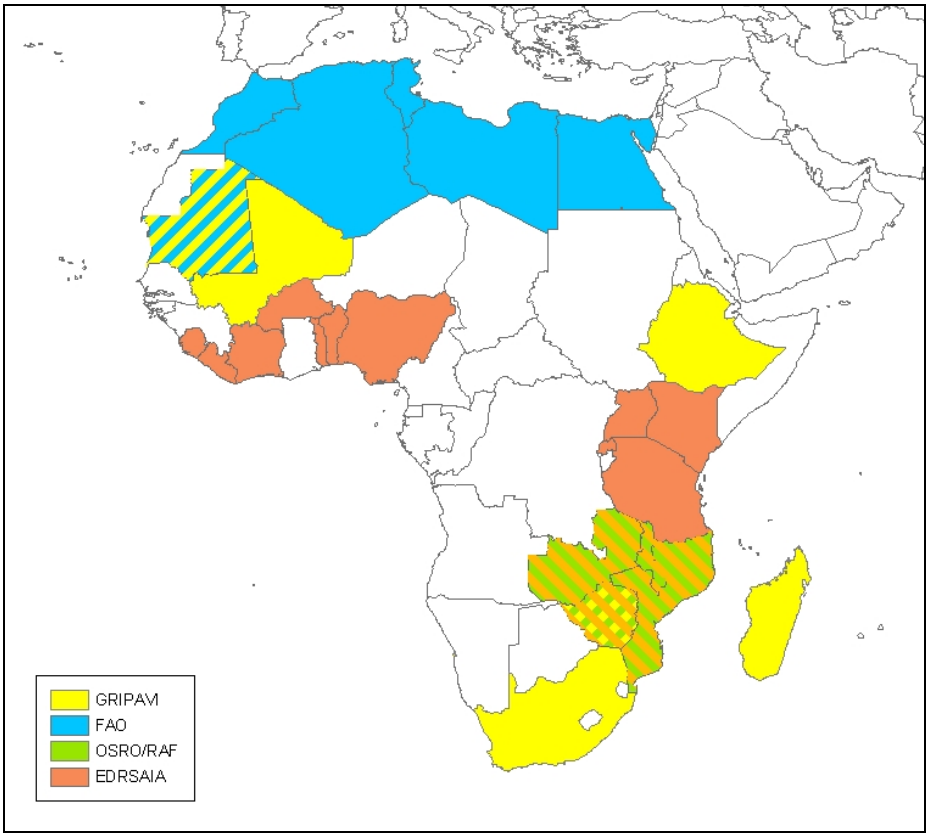
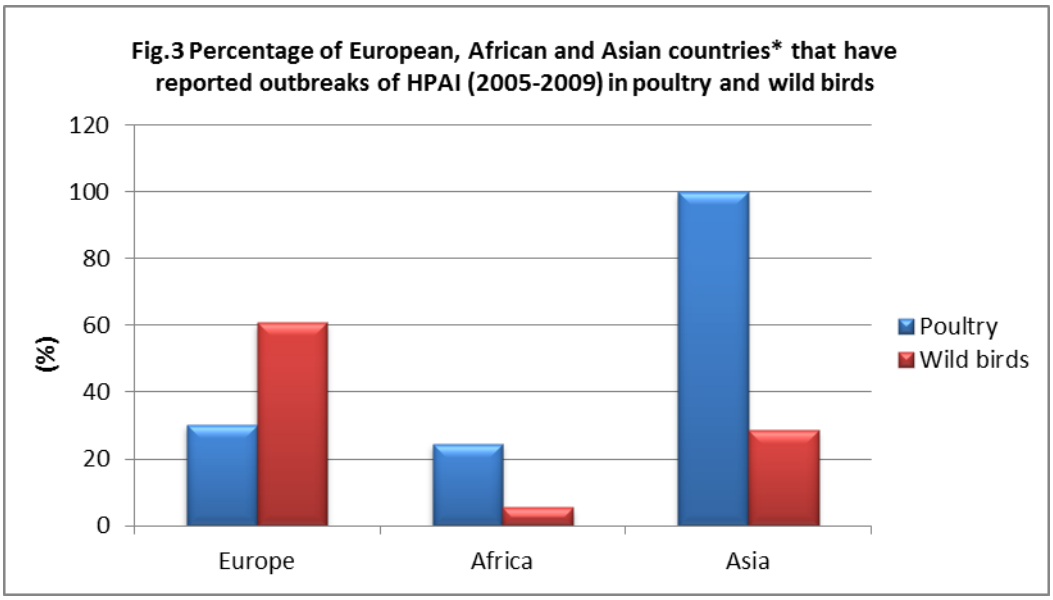
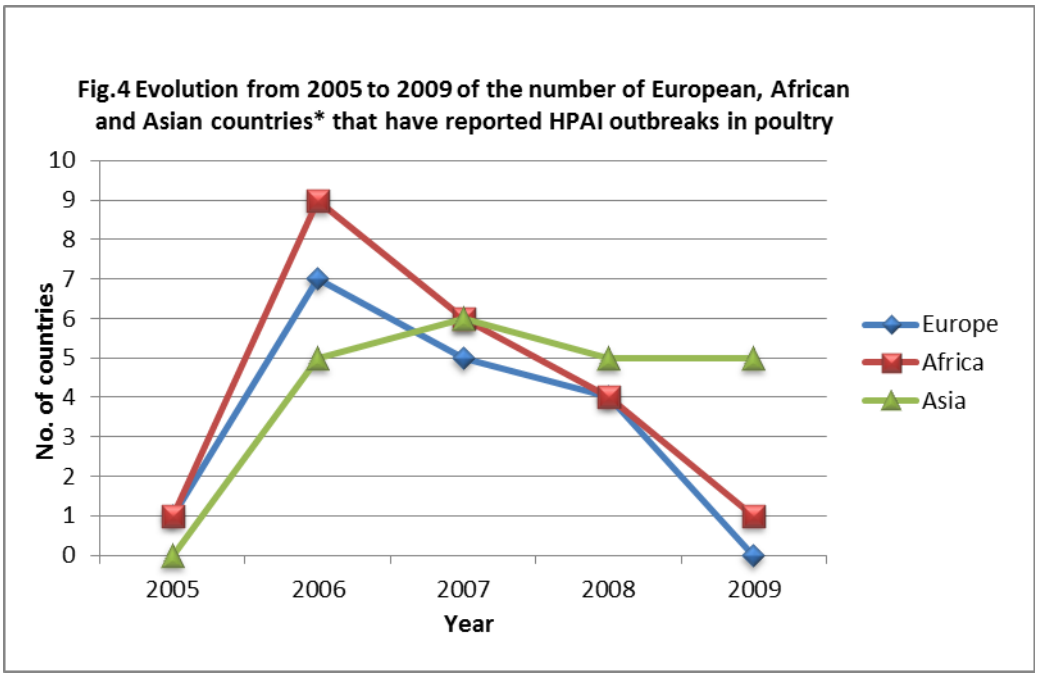
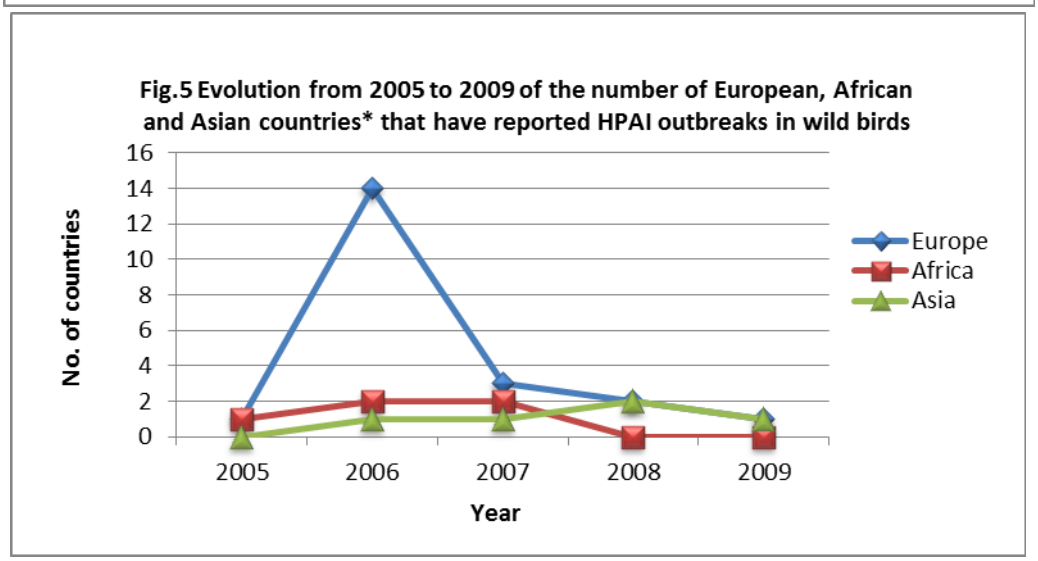


Fig. 2: Countries integrated in the other projects









* 23 European, 53 African and 7 Asian countries that have sent their responses

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