



Highly Pathogenic Avian Influenza in Africa

**A Strategy and Proposed Programme
to Limit Spread and Build Capacity
for Epizootic Disease Control**

ECTAD

Emergency Centre for Transboundary Animal Disease

HIGHLY PATHOGENIC AVIAN INFLUENZA IN AFRICA

A STRATEGY AND PROPOSED PROGRAMME TO LIMIT SPREAD AND BUILD CAPACITY FOR EPIZOOTIC DISEASE CONTROL

EXECUTIVE SUMMARY

This paper sets out to place Africa within the highly pathogenic avian influenza panzootic emergency which continues to evolve in the world. 2006 marked a dramatic deterioration of the global status when introduction of H₅N₁ HPAI was recognised in Africa for the first time. As of July 2006 eight countries (six sub-Saharan) are recognised to be infected. Establishment of a stable enzootic situation and further transboundary spread is inevitable unless the disease is rapidly brought under control and eliminated wherever feasible. Timely and decisive interventions in the small number of countries currently infected could pre-empt a more serious situation developing in the near future; as more countries become infected, contiguous spread to neighbouring countries becomes an increasing risk.

The precepts of effective HPAI control are outlined drawing on lessons from Asian experience and the specific conditions which impinge on disease control in Africa are defined. Subsequently the means of energising the African control effort are described. Essentially these relate to creating an enabling infrastructure at regional (continental), sub-regional and national levels through existing institutions, assisted technically by FAO, OIE and AU/IBAR and within the framework of the ALive Platform and the GF-TADs Initiative.

The objective of the proposed programme is to safeguard human health, livelihoods of African families and the commercial poultry production industry from the threat of HPAI by eliminating the incursions which have occurred and building capacity, including the improvement of national veterinary services, in countries to be able to establish effective rapid detection and response capacity to combat future introductions of epizootic diseases. A four component programme is described which (1) establishes control over the infection in the small number of countries currently infected and (2) builds the capacity to detect and respond rapidly to future incursions of infection in all countries. The components of the African programme are:

Component 1: Immediate emergency national actions to initiate the fight against disease already present

Component 2: Longer term national actions involving progressive capacity development

Component 3: Regional support through OIE FAO IBAR Regional Animal Health Centres and networks of Laboratories and Epidemio surveillance teams

Component 4: International support coordinated by FAO and OIE in collaboration with WHO and UNICEF

The prime outputs are expected to be:

1. effective control of HPAI and expansion of the disease stopped
2. national veterinary services complying with international standards (OIE)
3. affected countries having sound strategic plans in place to guide programmes of progressive control
4. all countries with emergency preparedness plans in place to prepare for introduction of infection
5. a regional committee guiding the continental preparedness and control programme
6. sub-regional committees monitoring and reviewing progress

7. sub-regional Animal Health Centres driving and facilitating capacity development for epizootic disease control with a focus on HPAI

1. INTRODUCTION

Highly pathogenic avian influenza (HPAI) caused by avian influenza virus sub-type H₅N₁ is a serious disease in poultry, resulting in severe mortality in domestic birds and major disruption to production and trade. Whilst low pathogenicity avian influenza (LPAI) viruses of many subtypes are ubiquitous in wild bird populations throughout all continents, in the last 50 years disease caused by HPAI viruses was infrequent and predominantly limited to industrialised poultry production units. Outbreaks were not generally recognised in village poultry. However, the situation has changed in the last decade with emergence of a new relationship between domestic poultry and wild birds in Asia. In about 1996 a new highly pathogenic H₅N₁ virus started circulating in domestic poultry in southern China with involvement of wild birds detected from 2002 after the virus had undergone reassortment and extended its host range to ducks. Extension of disease into neighbouring countries occurred primarily through trade in live poultry. By 2001 the affected area extended from Hanoi to Shanghai and further into South East Asia in late 2003, affecting 10 countries by late 2004. Ducks (*Anas platyrhynchos*) play an important epidemiological role in sustaining and transmitting infection, whether wild or domestic. Although the current H₅N₁ virus subtype is highly pathogenic across a broad range of avian species, for reasons that are not well-defined at present, sometimes HPAI can be propagated within duck flocks for considerable periods of time in the absence of any obvious clinical disease. Thus, markets can easily be seeded with infection when apparently healthy but infected ducks are offered for sale. Where ducks and geese are a significant element of poultry production systems in a country, they have to be accorded special attention. Generally this is probably not a factor in Africa yet it could be relevant to Egypt. The role played by pigeons in Egypt is far from clear but could also be significant.

From the middle of 2005, the virus spread in a north-westerly direction from China, with wild migratory water birds being implicated. Mongolia, Kazakhstan and the Russian Federation were rapidly contaminated and thereafter, the infection spread into the Middle East, Southern and Western Europe, with cases detected in poultry and/or sick or dead wild birds. Africa recorded its first outbreak of the disease when Nigeria officially reported HPAI in February 2006 and since then, at least seven other African countries have reported infection and disease. Further spread within Africa is obviously possible as long as these foci remain and repeated introductions in future by migratory wild birds and trade in live birds can be expected.

H₅N₁ HPAI remains primarily a disease of birds but sporadic infection of other species with the virus, including cats, occurs and people can be infected through contact with infected birds. The ability of H₅N₁ HPAI viruses to cause human disease and death and the potential for emergence of a major human pandemic influenza virus has dramatically increased official concerns. To date there is no evidence of swine being a relevant factor in the epidemiology of H₅N₁ in Asia, where there is a high density of swine being raised in the vicinity of poultry affected by the disease, or where there is an endemic situation. By virtue of limited clusters of human to human transmission having occurred, the current Pandemic Alert Phase remains at level 3 (limited animal-to-human transmission) in the classification of the WHO Global Influenza Preparedness Plan which comprises 6 levels. From 2003 to May 2006, according to WHO, 218 human cases were reported with 124 deaths. Only two African countries, Egypt and Djibouti, have reported human cases.

A vision shared between human and animal health sectors of coordinated global disease tracking and response has taken form following the Avian and Pandemic Influenza Senior Official Meeting in Washington, October 2005, the Global Meeting on Avian Influenza and Human Pandemic Influenza in Geneva, November 2005 and the International Pledging Conference in Beijing, January 2006 and was further streamlined at the Vienna Senior Official Meeting on Avian and Human Pandemic Influenza in June 2006.

The Geneva Meeting was co-organized by WHO, FAO, OIE and the World Bank (WB) and it was attended by delegates from many countries, regional organizations, among them AU IBAR as well as

several development partner organizations. The meeting agreed that the global HPAI control strategy should give priority to both animal and human health interventions, coupled with a multi-sectoral approach to mitigate the risk of a human pandemic. The need for high level political direction was recognised together with strong information dissemination and social mobilization targeted to stakeholders and the general public. Mechanisms to sustain vulnerable livelihoods and relieve distress caused by highly pathogenic avian influenza outbreaks and control measures were recognised to require strategic alliances across all levels of government, engaging private and NGO sectors. The International Pledging Conference jointly sponsored by the government of China, the EC and the WB brought together delegates from 100 countries to describe their national HPAI programmes and for donors to pledge financial support. FAO, WHO OIE and regional organizations, including AU IBAR, were represented and WB proposed an estimate of the needs. Almost US\$ 1.9 billion (of which 500,000 was to be in the form of loans) were pledged to support HPAI prevention and control programmes at the global, regional and country levels. However at the time of the Beijing Conference, Africa had not been affected by the disease and as such little financial resource was specifically committed to preventing and controlling highly pathogenic avian influenza outbreaks on the continent.

A vision and an outline of a strategy for prevention and control of HPAI in Africa is proposed in this document and is consistent with the FAO/OIE Global Strategy which was published in November 2005. A related strategy document proposed by AU IBAR was adopted at the Ministerial Meeting in Kigali, Rwanda in November 2005. While that document is current, the situation has already progressed and it is important to understand that a strategy must be itself evolve in the context of constant evolution of the disease situation.

National veterinary services have the responsibility within their countries for HPAI control. FAO and OIE together with AU IBAR will assist those national veterinary services and regional agencies. The International and Regional level activities will be consistent with the FAO/OIE Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs) also building on the multi institutional partnership of the African Livestock (Alive) initiative.

2. CURRENT SITUATION IN AFRICA (July 2006)

The first outbreak of HPAI in Africa was notified in Nigeria on 8 February 2006, but it is generally accepted that the H₅N₁ HPAI virus was already in the country since at least two months earlier. One month after this declaration, Niger confirmed an outbreak close to its border with Nigeria. In both countries local spread has occurred. Egypt first officially reported cases in February involving seven governorates, a situation which indicates that infection had been present for some time before the disease was first diagnosed. Subsequently the disease was detected in Cameroon, Burkina Faso, Sudan, Ivory Coast and Djibouti. In none of these has the original source of virus been declared. In six of the affected countries, the disease has remained relatively localised, with the spread and impact being greatest in Nigeria and Egypt. Given the deficiencies in surveillance systems, however, it is possible that the apparent localisation of reported cases might not reflect the actual distribution of the virus.

Despite the constant presence of wild birds in Africa and migration patterns which involve species migrating from infected northern land masses, there is no firm evidence to incriminate wild birds in the genesis of HPAI outbreaks in Africa. Human activities, and especially illegal trade in live birds, are conceived to be the most likely mode of spread of the disease into and within countries and beyond frontiers; yet, why this did not occur before 2005 is perplexing. Hence the risk of avian influenza spreading across national borders with the legal or illegal importation of live birds or poultry products represents a major concern. However, the threat of introduction and spread of highly pathogenic avian influenza virus by wild birds is a continuing issue which needs to be monitored. Recent sequencing of avian influenza virus genomes of Nigerian strains hypothesises that at least three

different introduction of virus occurred more or less simultaneously. This could be explained by mixed wild bird and commercial origins for HPAI introduction.

In Africa, as in Asia, the poultry production and marketing systems involve close contact between humans and birds. This gives rise to a risk of transmission of the virus from birds to humans, with the possibility that changes to the virus could result in human to human transmission, the prelude to a human influenza pandemic.

3. TOOLS AND METHODS AVAILABLE FOR CONTROL IN AFRICA

The essence of achieving control of HPAI is to break the virus transmission chain by progressively reducing the amount of virus circulating in poultry. Infected areas must be contained as far as is possible by control of movements of people and poultry and measures applied to eliminate infection: *inter alia* stamping out, cleaning, disinfection and focal or mass vaccination. Additional measures, such as official movement controls on poultry, market control, enhanced biosecurity at all levels and, as appropriate, culling and vaccination are implemented to create barriers between uninfected poultry and foci of infection.

Disease surveillance and monitoring are enabling aides in the prevention and control of HPAI. Knowing where the disease is at any one time facilitates mounting effective focussed control programmes. In the absence of effective real-time surveillance, until capacity issues are addressed, much can be achieved by less targeted broad control measures in places where infection is already widespread. Monitoring of the global and continental progress of the HPAI pandemic gives veterinary authorities early warning of a potential problem, providing the opportunity for the proactive introduction of risk management measures such as enhanced biosecurity. Early detection of incursions of virus by improving community awareness and by targeted surveillance provides the opportunity to control outbreaks before spread occurs. To this end, FAO and others recommend a general strengthening of animal disease surveillance and, for a pro-active international action, more emphasis on timely reporting to the OIE and other International (FAO) and Regional Organizations (AU IBAR). The process of HPAI prevention and control at the national level can be conceived as relating to differing disease scenarios, as indicated in Table 1.

Key tools available for HPAI prevention and control are presented below. It must be understood that it is not possible to be strongly prescriptive in generic descriptions because control programmes need to be carefully tailored to take into account the peculiarities of individual countries in terms of social and economic conditions, the role of poultry in social wellbeing and livelihood generation and farming systems. However, all country programmes will contain the indicated in the following sections.

3.1 Emergency preparedness planning ¹

Emergency preparedness planning aims to develop capacities for early warning and early response to disease epidemics and other animal health emergencies so that incursions of disease are not allowed to overwhelm the capacity to respond. This requires preparation, in advance, of both generic and disease-specific contingency plans and implementation of operating procedures including testing (exercising) such plans. Contingency plans should cover all aspects such as chain of command, lines of communication and management, methods of humane destruction, carcase disposal, cleaning and disinfection, compensation strategies and accountability, instructions on quarantine measures, sources, stockpile and distribution systems for supplies, disease investigation procedures and partners'

¹ Guidelines for HPAI emergency preparedness planning are available at the FAO website: <http://www.fao.org/DOCREP/004/X2096E/X2096E00.HTM> and http://www.fao.org/docs/eims/upload/200354/HPAI_manual.pdf

responsibilities. The planning process ensures that all important strategy decisions are taken before an emergency develops and that those responsible for responding to an emergency disease event are identified and prepared to respond; it goes without saying that assured access to emergency funding is essential. The plans must reflect the veterinary capacity and infrastructural issues such as local government autonomy. Independent international review of plans is recommended.

Country status	Action	Sanitary measures	Supportive measures
Free from disease	Preventing incursion of disease and emergency preparedness	<ul style="list-style-type: none"> • risk-based disease surveillance for early detection, diagnosis & reporting • enhanced biosecurity • border control • control of imports • realistic risk assessment of potential pathways of introduction • development of realistic contingency plans based on the actual capacity of veterinary services • Expansion of capacity of veterinary services to undertake the required actions. 	<ul style="list-style-type: none"> • Veterinary and community awareness and communication • Poultry census and farming systems defined and mapped • Negotiation of socio-economic aspects of disease control with community dialogue (compensation and rehabilitation issues) • Government/ private sector working group sets standards for commercial sector • Epidemiological investigation to define progress of the disease and effectiveness of control measures
Isolated outbreaks	Activation of contingency plans: rapid response actions in an attempt to contain and eliminate infectious foci before spread occurs	as above plus: <ul style="list-style-type: none"> • early culling of infected and dangerous contact flocks, disposal and disinfection • quarantine of infected places • control of movements (poultry and products) • control of live bird markets • consider early recourse to vaccination if multiple isolated outbreaks in dispersed locations, indicative of unrecognised virus dispersion, are detected 	
Extensive outbreaks	Disease control becomes more area-based	general measures as above but: <ul style="list-style-type: none"> • culling of infected and high risk flocks • ring vaccination to control spread around infected places; broader strategic, systematic vaccination in identified infected and at risk areas 	
Enzootic situation	Endemic disease control	similar actions to those above and: <ul style="list-style-type: none"> • compartmentalisation of commercial flocks on owner-pays basis • development of long term strategic plans • strategic vaccination scheme extended 	

Table 1: The process of HPAI prevention and control at the national level

National and regional disease control authorities and support agencies have access to a number of resources to enable them to follow the progress of the current HPAI pandemic and thus to plan an appropriate level of emergency preparedness.

3.2 Principles of HPAI control and eradication

The improvement of veterinary services' capacity is indispensable in undertaking the required actions for the prevention and control of HPAI. Good governance will be based on the compliance of the veterinary services with the international standards defined by the OIE.

General and country-specific epidemiological understanding of the determinants of HPAI transmission is essential for setting sound control strategies and to inform public communication to minimise disruption to the poultry industry and maintain consumer confidence.

The main tools available to prevent, control and eliminate HPAI from a country are effective disease surveillance for early detection and reporting of outbreaks; enhanced biosecurity of poultry farms and associated premises; control of movement of birds and products that may contain virus, including controls at the interface of infected and uninfected areas; changes to industry practices to reduce risk; rapid, humane, destruction of infected poultry and poultry at high risk of infection; disposal of carcasses and potentially infective material in a biosecure and environmentally acceptable manner and, the use of well formulated vaccination programmes. None of these risk reduction measures, implemented alone, will be sufficient to prevent, control or eradicate HPAI. Rather, they must be implemented in combination and supported by enabling legislation, augmented surveillance to ensure early detection and rapid response to viral incursions, and emergency funding. Public education and awareness campaigns are also important to help in controlling the disease and to safeguard public health.

Some additional considerations should be taken into account and disease surveillance, biosecurity and control of movements can be adjusted according to the epidemiological situation. Epidemiological studies and surveillance outcomes allow swift re-adjustment of disease control measures. Surveillance programmes can be planned and implemented jointly with the public health personnel. Priority areas are: (i) identification of factors governing infection dynamics, (ii) determination of disease transmission pathways, (iii) molecular characterization of HPAI virus strains to determine geographical locations and genetic changes, (iv) evaluation of the level of human exposure to determine risks of human-to-human transmission, (v) participatory methodologies, and (vi) analysis of disease event data within a GIS environment.

In setting a national policy for HPAI prevention and control many factors need to be considered and adapted to local conditions. Countries need to be aided by skilled professionals in developing appropriate strategies for their conditions but the following are basic issues to consider:

3.2.1 Rapid recognition of disease incursion and reliable diagnostic facilities

All epizootic disease control programmes, if they are to be effective, need to be supported by surveillance programmes which themselves rely on effective diagnostic services. Regional networking for quality assurance of diagnostic services has been proven to be an effective approach in Asia (highly pathogenic avian influenza) and Africa in the past (Rinderpest).

3.2.2 Biosecurity

Enhanced biosecurity is undoubtedly the single most important undertaking to protect commercial poultry units from invasion by HPAI; yet, the cost to implement even the simplest of programmes can

be prohibitive for smallholders. Excluding wild birds and their excreta; practising all-in/all-out production systems; protecting against transmission by fomites including people and the use of cages and egg trays for transporting poultry and eggs to market; and safe feed supply are basic requirements which should be acted on to the extent possible. FAO/OIE guidelines provide extensive information on the subject. Biosecurity principles need also to be applied at village level; for example, providing communities with a safe means of disposal of dead and sick birds; not purchasing live birds for introduction into the homestead from markets at times of high risk; sighting village markets away from poultry holdings are some easily applied means of reducing risk to traditional communities.

3.2.3 Stamping out and compensation

“Stamping-out” – the destruction of diseased and at risk poultry populations based on proximity or history of movement – is undoubtedly the ideal response when the index case is the first case detected. It is a highly effective means of rapidly eliminating a source of infection. Combined with strict quarantine of the affected area with movement control out of it and thorough disinfection of premises, both difficult to implement effectively in the village environment, it is also an effective tool to progressively reduce the weight of infection in an infected population where disease is more widespread thus assisting to break an established virus transmission chain. In general, if a commercial farm is infected, the whole farm should be culled. If in backyard poultry, the whole village or other epidemiologically appropriate unit should be culled. However, to be effective stamping-out has to be applied rapidly, before there has been extensive onward transmission, and thoroughly so that infected flocks are reduced to as close to zero as possible. Many countries lack the control infrastructure and enabling legislation to achieve this. Although few societies outside the industrialised nations readily accept the imposition of stamping-out, in reality many societies will accept total or partial stamping-out if they are adequately engaged, informed, consulted and compensated. Although it remains a viable option even for African countries, if capacity for implementation can be raised and appropriate compensation schemes put in place, in reality if it is not done effectively then disease will be reduced but not eliminated and a great deal of social disruption will have occurred for little overall return.

The payment of a realistic level of compensation, preferably at the time of culling or at least within 48 hours, is an absolute pre-requisite to gain community support for disease reporting and control programmes in the village poultry and small-scale producer scenarios. FAO currently recommends rates which meets criteria of affordability, acceptability, accurate pricing and simple payment methods within a system which is capable of being validated. In each country, government and private sector commercial companies need to negotiate a policy for the large-scale, industrialised commercial sector.

Existing FAO draft guidelines for a compensation strategy include a checklist to advise policy makers on the factors to consider when they decide to compensate. Compensation at levels significantly below current market rates does not encourage reporting. Realistically, it must be understood that payment of compensation even at realistic rates does not adequately recompense farmers for long term losses and that even when available it might not persuade farmers to cooperate in terms of early reporting and movement control.

3.2.4 Vaccination

Recognizing that it might be neither desirable nor feasible to proceed with massive area-wide culling in some situations, the strategic use of vaccination is considered a suitable option. It is also a useful tool for the commercial poultry sector to reduce its vulnerability in high risk situations; here it should be viewed as a tool to enhance biosecurity and as a temporary expedient being abandoned in favour of reliance on biosecurity alone once conditions are right. However, once enzootic infection is established, achieving the appropriate conditions to abandon vaccination might realistically require a considerable time.

Vaccination is capable of reducing susceptibility to infection and it decreases shedding (both in duration and virus titre) and it is therefore an appropriate tool to reduce the incidence of new cases and viral load in the environment. This should limit maintenance of the disease in poultry and should also contribute to other measures to reduce the potential for spread to humans. Although sub-optimally vaccinated flocks can undergo limited infection, the significance of this to virus maintenance and transmission is probably quite low until the final stages of an eradication programme are reached although of course the virus could still be exerting a considerable economic effect in affected poultry houses. Overall, the benefits of vaccination in the control phase of a programme far outweigh the possibility of low level excretion by vaccinated poultry which is unlikely to be sustained. The disadvantage of virus infection, despite vaccination with conventional inactivated vaccines, is one reason why vaccination should not be resorted to routinely except in circumstances where infection has become enzootic or the risk of infection is deemed to be extremely high, in which case the on-going need for vaccination should be reviewed regularly.

Vaccination can be used to control the disease either by 'ring' (focal) vaccination to limit spread from infected areas or more extensively by mass (area-wide) vaccination to reduce the viral load in the environment. Vaccination alone will rarely be sufficient, without culling of diseased birds, improved management of animal movement, and legislated market inspection, to eliminate infection from extensive farming communities. Yet, routine, tactical vaccination does have a role to play within a time-bound, systematic control programme. In this scenario, controlling the disease through vaccination may be a prelude to elimination of infection from a country. Should elimination of infection not prove to be feasible then the whole rationale of vaccine use will need to be re-evaluated.

The appropriate management of a vaccination campaign under the control of the veterinary administration is compatible with international trade, if it is done in compliance with the OIE *Terrestrial Animal Health Code*. Culling and vaccination should not be considered mutually exclusive and the mix or sequence of measures may differ between production systems and stages of a control programme. Vaccination should be used in a strategic manner with careful consideration of target groups and areas based on the outcome of deliberations by the national authorities.

Currently, inactivated heterologous or homologous vaccines are generally considered to be candidates for emergency use. The use of fowl pox-vectored vaccines for inoculation of day-old chicks which, potentially at least, offer significant gains in efficacy in certain situations, not the least of which being discrimination between field and vaccine virus-induced antibodies; these vaccines need to be constantly assessed for use and employed when appropriate. However, there are continuing developments in vaccine technology, such as the use of live antigens produced through 'reverse genetics', bivalent Newcastle disease/AI recombinant vaccines.

It is recommended that vaccination programmes should be carefully planned, controlled and monitored:

- Vaccination needs to be coupled to surveillance to detect promptly any change in properties (antigenic change) of virus circulating and must be carried out with appropriate products manufactured and quality-controlled to ensure compliance with international standards referred to in the OIE *Terrestrial Manual of Standards for Diagnostic Tests and Vaccines*.
- There should be a process in place for monitoring vaccine and vaccination performance. The 'differentiation of infected from vaccinated animals' (DIVA) approach is recommended either through the use of an appropriate diagnostic test or the use of sentinel birds. However, it needs to be recognised that many African national laboratories do not currently have the capability for undertaking serological DIVA, which requires neuraminidase inhibition testing in addition to HI testing. Also monitoring sentinel birds is difficult in any event and very difficult, probably impractical, in the village poultry sector. Thus, it may be necessary to

monitor vaccine performance by combining HI serology with laboratory and field monitoring of viral activity through targeted surveillance. Another complicating factor is that almost nothing is known of the range of LPAI subtypes circulating in African poultry.

- Vaccination programmes need to use only quality-assured vaccines. Experience from rinderpest and foot-and-mouth disease control programmes indicates this to be a fundamental principle. Fortunately many vaccines are produced under rigorous quality-assurance procedures by ethical pharmaceutical companies. Less well-known companies which are often producing safe and efficacious vaccines are hampered in gaining acceptance of their products by lack of an independent vaccine quality assurance programme.
- Part of the planning process should be an assessment of the cost effectiveness of proposed vaccination schemes, taking into account the livelihoods impact of vaccination compared to that of wide scale culling.

Implementing vaccination in a rural village environment is logistically extremely difficult. Complementary or alternative means of vaccine delivery by Veterinary Services need to be identified; several possibilities exist through private veterinarians bearing official sanitary mandates and community vaccinators doing the work for appropriate remunerations.

The establishment of vaccine banks is also necessary at national and international or regional levels. Ad hoc mechanisms have been set up by the OIE (Emergency Vaccine fund for Africa under AU IBAR-PACE-EC agreement) and FAO (Special Fund for Emergency and Rehabilitation Activities: SFERA).

3.2.5 Modified stamping out with 'ring' (focal) vaccination

Inactivated vaccine needs to be given twice for optimal protection efficiency in chickens, and more frequently in duck or geese populations, yet even a single dose of vaccine can provide useful protection within two weeks thus supplementing the use of focal culling and movement control to provide effective control.

In the African context, recognising the weakness of surveillance systems in most countries, it is very likely that when HPAI is first detected it may well have been present for some time and already disseminated over a considerable area. Veterinary authorities will need to judge whether an outbreak observed is an isolated focus or a manifestation of a much larger occurrence. While stamping out is the most effective means of eliminating the disease, it puts high demands on resources, creates great disruption within communities and damages already precarious livelihoods. If compensation is being paid for all birds compulsorily culled as a public good, it is also very expensive. Therefore, at such time as it is evident that infection has disseminated and the benefits of strictly containing a focus of infection are not so compelling, it is proposed that a modified stamping out procedure is used. In this case, infected flocks are culled. Ideally dangerous, high risk flocks should be taken as well but this may not be absolutely essential. Final decisions will require an assessment of community attitudes and available funding. Movement control should be attempted and 'ring' (or focal) vaccination imposed in an epidemiologically-significant population so that if spread occurs from the infected place, the impact will be reduced and there will still be an opportunity to contain it to the vaccinated area. Communities must be involved in policy setting and implementation if there is to be any chance of success in rural Africa. Many decisions will need to be made on a pragmatic basis but it is important that transition points be actively addressed in contingency planning.

3.2.6 HPAI control in an enzootic situation

In an infected country, if spread of the disease continues and escalates, it is likely that available resources will be exhausted rapidly and attempts to contain each outbreak by ring vaccination may be less relevant, since the infection will be widely disseminated. At this stage it should be accepted that the disease is going to continue in an enzootic state, at least for the short- to medium term. Strategies need to be developed with a view to implementing a sustained and systematic programme of progressive control to re-establish freedom; 'living with the disease' is not considered a viable option because of the pandemic risk. Disease control on commercial farms should be considered a private good at this stage and producers in sectors 1² (vertically integrated industry) and 2 (large commercial production) should be considering increasing biosecurity, with or without vaccination on a user-pays basis, with a view to developing and demonstrating HPAI freedom on a compartment basis, even though the disease is still present in small commercial (sector 3) and backyard (sector 4) poultry.

Efforts to control the disease should still continue. However, because decisions on continuing disease control will be dependant on the actual situation in a particular country and do not need to be planned on an emergency basis, details of the strategy are not developed in this document. It may however include market interventions to reduce the movement of poultry within the country and interventions on sector 3 and 4 poultry production to reduce populations or change the character of holdings. Mass vaccination may be considered to reduce the susceptible population of birds, thus limiting the opportunity for virus to be maintained in a population. It should be recognised that in the African context, where the productivity of backyard poultry is low and mortality of birds from other diseases, especially Newcastle disease, is high, it may be very difficult to justify mass vaccination on a cost-benefit basis regarding losses prevented. It becomes a more viable option when meeting obligations for control of a zoonotic disease with pandemic potential is concerned. As such, the international community might perhaps assume responsibility for the costs as an international public good activity. In any event, in the enzootic stage of HPAI, detailed epidemiological and economic studies will be required for the development of a cost-effective and efficient long-term disease control strategy. Economic considerations may be transcended by concerns for escalation of the human influenza pandemic threat, so that the decision-making process will necessarily involve public health authorities as well.

3.2.7 Compartmentalisation and zoning

Compartmentalization and zoning are concepts which could be applied when complete eradication cannot be achieved in a country in the short- to medium-term. These concepts are developed particularly in order to allow OIE guidelines for international trade to be followed but forms of compartmentalisation have been used by integrated large scale producers for many years to keep livestock free from specific infections and diseases. However they are also applicable to domestic marketing to provide assurance to consumers that produce is derived from disease-free sources.

Compartmentalisation relies on demonstration of disease freedom within an industrial sector and is most likely to be applicable to sector 1 and 2 operations. Potentially, it could also be applied to a situation where HPAI virus is present in wild birds but is proved not to be circulating in domestic poultry. However, in the absence of mandatory application of biosecurity for licensing purposes, it is

² FAO has defined four poultry production systems (FAO Recommendations on the Prevention, Control and Eradication of Highly Pathogenic Avian Influenza in Asia, September 2004) according to the level of biosecurity and the marketing of birds and products. Sector 1: vertically integrated large scale commercial producers; Sector 2: large, independent broiler and layer producers; Sector 3: small-scale independent operators; Sector 4: producers of free-ranging village poultry. This is a useful working classification but the distinction between sectors 3 and 4 is not rigid.

likely to require an extremely competent national authority to be able to demonstrate separation of domestic poultry from wild birds sufficiently securely to confidently maintain compartment freedom.

Zoning relates to demonstration of disease freedom on a geographic basis. In most African situations, it is unlikely that the farming systems and veterinary capacity will allow movement control to be sufficiently robust to achieve zonal freedom.

3.2.8 Public awareness and communication

There are two main issues which require improved community awareness and cooperation. The first is to gain public support for HPAI disease control activities, for so many of which community cooperation is critical. Poultry owners, other stakeholders in the industry and the general public need to understand why early reporting, culling of infected birds, movement control and market controls are necessary to gain their support. The second issue is to educate the community on the actual risks of transmission of HPAI virus to humans, so that on the one hand they can avoid risks but on the other hand they do not over-react with consumer rejection of poultry products and consequent market shocks.

These messages need to be delivered in a context in Africa in which community awareness of hygiene issues is often low and poultry slaughtering and marketing practices are very basic. There is also a generally poor appreciation of disease control needs and a high risk of poultry owners considering their individual situation rather than contributing to the best community outcomes. It is difficult to over-emphasise the importance of effective public communications at all stages of HPAI prevention and control and at all levels of the community.

3.2.9 Socio-economic impact analysis

Economic, political and social issues have a significant impact on the choice and implementation of disease prevention, control and eradication strategies. Analysis of the costs and benefits of different approaches supports informed choice of control strategies, because it can provide guidance on whether a proposed strategy is economically viable, the potential source of finance, the risks of non-compliance with regulations and the best means to provide exit strategies for producers and processors who cannot afford to comply with more stringent measures. It is important that such an analysis take account of indirect as well as direct impacts on a wide range of stakeholders. Full analysis of economic and social effects of control measures under emergency situations will not be possible and therefore veterinary authorities in drafting possible control strategies should assess these in advance of outbreaks based on experiences from other countries.

The duration and overall extent of the market impact of AI risk and AI outbreaks will depend heavily on currently erratic consumer perceptions about human health risks. These concerns will be highly influenced and shaped by risk communication strategies. To limit the market impact, the mitigation of market shocks should be analysed.

While it is feasible to tighten biosecurity on larger commercial poultry farms (sectors 1 and 2), this may be more difficult, or impossible, in the case of small commercial (sector 3) or non-commercial enterprises, such as back-yard production systems (sector 4), particularly where flocks forage outdoors. The probability of infection is higher in production sectors 3 and 4 than in sectors 1 and 2. However, if the virus does enter farms in sectors 1 and 2, infection may have a greater impact due to the concentration of susceptible poultry in these farms.

It is possible to reduce the risk of an HPAI outbreak and to improve control over a disease situation by changing industry practices (e.g. poultry production, transportation and marketing) that facilitate viral spread. Veterinary authorities should critically review practices within infected and "at risk"

compartments and countries to assess how these practices might be modified to reduce risk. In conducting this assessment it is important to take into account the cost and social consequences of proposed changes and weigh these against the expected benefits. Industry practices that should be considered for modification or that have already been modified in some countries in Asia include marketing systems, particularly live bird markets which can act as reservoirs of infection, segregation of species, interventions on farming systems and practices, particularly backyard, commercial farming practices including pond-based and open duck rearing systems and commercial farms without effective biosecurity systems.

Consideration needs to be given to social support and rehabilitation of communities or poultry owners whose livelihoods have been adversely affected by HPAI. This may extend to a much larger group of people than those who may have obtained compensation for culled infected birds and even for this group, compensation may be insufficient to assist owners to re-establish their poultry production enterprise or seek alternative livelihoods.

4. SPECIFIC CONSTRAINTS AND CHALLENGES IN THE AFRICAN CONTEXT

4.1 Institutional context and policy development

The spread of HPAI in Africa once again illustrates that the majority of African countries, in common with developing countries world-wide, lack the institutional capacity to cope with incursions of the major epizootic diseases, whether or not they be zoonotic, as increasingly they are. This is a complex issue not easy to address within a paper such as this but the following observations relating to veterinary service delivery provide some insight.

4.1.1 Inadequate and under-funded official veterinary services

The restructuring programmes of the past decades failed to correct the preceding institutional weaknesses in official veterinary services. Indeed, they further damaged the functionality of national veterinary services in many African countries. In particular, the ability of countries to design and implement programmes for the prevention and control of epizootic diseases has weakened considerably. According to a recent OIE questionnaire³ it was seen that 25 per cent of African countries have no programme for control of transboundary animal diseases despite the high incidence of zoonotic and non-zoonotic epizootic diseases. The same percentage of countries also relies on external funds to run their veterinary services.

Capacities for disease reporting with epidemiological investigation and differential diagnostic follow-up as well as data analysis are generally deficient. Political considerations frequently over-ride appropriate technical decisions and jeopardize the national ability to implement the necessary sanitary measures. In addition, the professional educational veterinary curriculum in many African countries is poorly resourced. As such, graduating veterinarians do not often have enough professional depth, tools, and opportunities to practice the appropriate level of veterinary activities.

Despite this, the progress made in starting to develop national surveillance systems by the PARC and PACE programmes over the last 20 years gives an indication that improvement is possible given a long term continuity of external investment and technical support. The success of the continental programme for rinderpest eradication indicates that African countries can address epizootic disease threats given international coordination and support. Sub-regional organizations have potentially an important role to play in awareness development, capacity building and the implementation of concerted plans.

³ F Le Gall. "*Justification économique et sociale des investissements en santé animale et dans les zoonoses*", presentation to 74th General Session of OIE, Paris, May 2006.

A precondition for effective disease surveillance and control is a competent, properly resourced and well-trained Official Veterinary Service. This should comply with international standards which are determined by the OIE. These standards provide guidelines on legislation, infrastructures and human and financial resources. A specific tool, the PVS (Performance, Vision, Strategy) can be used for the evaluation of veterinary services. Realistically it will be some time before competent services are developed in many countries. This highlights the need for the international community to urgently assist countries to prevent further spread and rapidly eliminate introductions of infection provided that advice given is tempered by an understanding of the conditions prevailing in the countries concerned. Attacking the problem at its current status of disease incidence is difficult enough but would probably become impossible should the situation deteriorate further. The socio-economic effects of widespread HPAI endemicity in Africa can only be guessed at the moment but there will certainly be serious effects on rural livelihoods.

4.1.2 Weak linkages between governments and the veterinary private sector

The majority of countries have a deficient private veterinary sector, which even when present is orientated towards drug supply and is not sufficiently involved in regulatory activities such as the control of infectious diseases. Mechanisms of accreditation of a private sector to perform regulatory activities have generally not been put in place. Hence official veterinary services throughout much of sub-Saharan Africa cannot rely on private veterinarians or paraveterinary personnel to reinforce public teams in case of urgent need. There are, however, notable exceptions throughout Africa from which lessons need to be learned.

In addition, due to the predominance of village farming systems in the majority of countries, no strong commercial lobby aiming to defend the marketing chain exists in most African countries, nor is there a tradition of collaboration with government technical services.

4.2 Socio-economic considerations and communication issues

4.2.1 Constraints to implementing biosecurity measures

In Africa, 80 per cent of the farmers keep poultry in village/backyard production systems, characterised by local indigenous breeds adapted to scavenging habits. Measures to increase biosecurity are difficult to put in place as birds are free-ranging and traditional producers are reluctant to invest in development of their production systems. Private entrepreneurs are emerging but small commercial farms in sector 3 will very often lack adequate biosecurity measures to prevent HPAI contamination and spread. Even if initially outbreaks are experienced in the commercial sector due to failures in biosecurity systems, it is likely that the 'industrial' poultry sector will control the disease with biosecurity, vaccination and compartmentalisation as they will see a return on their investments.

Though it will be very difficult that sector 4 owners (backyard) invest much in biosecurity, impacts of awareness campaigns can be considerable in the prevention of disease introduction (i.e., caution as to the purchasing birds at lower than market value...) and in the improvement of hygiene as inexpensive initial steps (i.e., disposal of diseased birds away from other animals and their burial).

Providing fencing or coops to keep backyard poultry enclosed in one area is an initial stage in which to implement biosecurity. However, being on the onus of the owner to find or purchase feed for the poultry will require intensive and well adapted communication campaigns.

Daily markets are common place throughout much of Africa and provide an excellent mechanism for transmission and seeding of pathogens between poultry sellers or customers. Implementing

regulatory market inspection and measures for their cleaning and disinfection, or the imposition of closed-days are not likely to be carried out without continued government inputs.

Requirements to increase biosecurity measures, assuming that they can actually be regulated, have an impact on the livelihoods of various stakeholders in the market and may limit their access to markets that they have previously supplied. Smallholder poultry keeping is often carried out by women, so that a concentration of market chains may have gender implications.

4.2.2 Difficulty of implementing 'Stamping out' policy and vaccination

The need to consider a village as an epidemiological unit, and thus in the event of HPAI detection, the culling of an entire village is extremely difficult to accept by the community, especially when poultry show no signs of disease. Furthermore, in many parts of Africa, the delineation of villages and communities is difficult at best.

In this system, immediate compensation in cash is a prerequisite for culling. Small farmers have no confidence in delayed payment, and will accept culling only if compensated in cash while it is implemented.

Vaccination campaigns may be difficult to implement particularly in sector 4 due to the nature of these free ranging systems and the dispersion of the poultry. Campaigns in poultry sectors 3 and 4 will be expensive and there is a need to convince smallholder farmers that vaccination is beneficial for them and for neighbouring villages. Cost sharing with public subsidies and effective communication campaigns are necessary.

If the government provides complete compensation whenever things go wrong, individuals are not encouraged to take steps to reduce risk. Therefore, compensation levels need to be negotiated taking into account the desirability of sharing risk (thereby not making payments too high) while encouraging farmers to comply with culling processes (thereby not making payments too low). It is important to distinguish between compensation for culled birds, which is believed to encourage compliance with stamping out, and the rehabilitation of the poultry sector after an outbreak, which may include other kinds of financial and technical support to farmers to promote safer poultry keeping in the long term.

For economic as well as epidemiological assessment, the regional aspect of disease control needs to be considered. Market chains can extend beyond national boundaries, and price differentiation on each side of these boundaries influences poultry movements. Value chain approaches are a useful tool to link epidemiological aspects of animal health planning with social and economic assessments.

4.2.3 Need for adequate communication schemes

The experiences already encountered in HPAI control in different countries of Africa as well as from earlier control campaigns such as that for rinderpest have shown the capital importance of adequate communication messages to be delivered to a carefully targeted public. Massive communication campaigns are needed to sensitise communities to the risks to health and livelihoods and the means of minimising those risks. However, it is essential that these be conducted with sensitivity to the damage that inappropriate messages can cause to commercial poultry production. One component of public awareness campaigns should be to educate the public on the risks of acquiring human infection by indicating that poultry can be consumed safely if the appropriate precautions are taken. Communication should be conceived as a highly skilled process that requires expert knowledge and recognition of socio-cultural practices.

4.3 Epidemiological and operational considerations

4.3.1 Migration of wild birds

Migratory routes of wild birds extend from Central and Northern Asia, where HPAI in wild birds has been detected, to Northern and Eastern Africa's wetlands, rivers, and shorelines, where many wild bird populations over winter. Infected migrating birds may transmit the disease to local wild birds, and from there to domestic poultry. This transmission pattern has been identified in other regions but not yet in Africa.

Although the human and poultry populations in the Region are relatively low compared to parts of Asia, the Region is crossed by several important flyways crossing from Central and Western Europe into Africa. Some migratory flyways connect currently infected areas with Western and Central Africa.

A significant proportion of birds are raised under free-ranging conditions, allowing for potential contact with migratory birds. In addition, informal domestic poultry trade within and among countries in the region may also contribute to the dispersal or spread of HPAI; both wild bird migration and live bird trade need to be assessed and monitored. The fact that recent studies failed to detect H₅N₁ HPAI viruses in migrating wild birds in Africa should not lead to complacency. Since wild bird infections could be much focused, the negative results of initial investigations could have been due to the limited number of surveys undertaken, small sample size, or inadequate timing of such sampling. In another hand each year's migration season could present a new opportunity for a wave of infection to spread across Africa. Next year the situation could be very different from the 2005/6 season. Countries close to or on migratory bird flyways or in which are to be found wetlands, streams or shorelines, should still be considered at special risk.

Though it is important to the overall understanding of AI viruses/wild bird interactions, little can be done to intervene and control wild bird migrations. Activities can focus on wild bird monitoring in order to predict where the risk of virus introduction to new regions can occur and where the reinforcement of biosecurity measures at poultry farm levels must be warranted. The destruction of wild birds and their habitat as a prevention measure to HPAI introduction are totally misguided and should not be tolerated by the national authorities and international community.

4.3.2 General consideration of risk factors and operational constraints

The eastern Africa Region is host to about 300 million poultry and 287 million people; a nearly one-to-one ratio, with an important rice production sector. A correlation between rice production and outbreaks of HPAI has been observed in Asia, the linking factor apparently being the keeping of free-ranging ducks in 'travelling groups', grazing in these rice fields. Fortunately this link between duck rearing and rice cultivation does not apply to African dry-land rice agriculture. It is estimated that 60 to 70 percent of poultry in the Eastern Africa region is kept under backyard, free ranging conditions, allowing for exposure to migratory birds, with the potential of HPAI transmission.

Egypt, Sudan, Djibouti have already become infected. Since the disease has spread widely throughout the country it is likely that of these Egypt could remain infected for some time to come. Djibouti does not have sufficient poultry to sustain infection and the predictions for Sudan are uncertain.

In Central and West Africa, the HPAI H₅N₁ virus-infected countries include Cameroon, Nigeria, Niger, Burkina Faso and Ivory Coast. The non-infected at immediate risk group of countries are those free of disease but in close proximity to currently infected countries, or countries trading traditionally with infected countries in or out of Africa. The dynamic coastal trading networks provide a high risk of continued spread along the Atlantic Coast of Africa, just as it does for African swine fever.

Risk analysis remains problematic since two main areas of necessary information are insufficiently explored. The capability of the virus to persist in the environment in hot and dry climates is unknown but recent studies suggest very short survival times outside of poultry to be the case. Temperatures in the high 30s and 40's Centigrade with moderate to low humidity, as experienced in much of lowland Africa, are likely to cause rapid inactivation of virus in the environment. The risk of introducing the virus through uncontrolled importation of live birds is almost impossible to assess in some countries until there is a strong political will to do so.

The role of wild birds in the introduction of the virus to Africa, dissemination within the continent and their ability to constitute a permanent reservoir of infection is still undetermined.

There is a clear link between concentration of domestic birds and therefore trade, spread of the disease and endemicity. In the conditions pertaining in many African countries with prolonged hot dry seasons and extensive low density poultry populations primarily in dispersed village production systems, it is possible that the virus will spread more slowly than it has in several South East Asian countries. This seems to have been the case in Niger, northern Cameroon and Burkina Faso. In some countries such as Nigeria or Egypt, in peri-urban areas or some parts of the Eastern Africa highlands, the poultry density is such that HPAI could show epidemiologic characteristics similar to what happened in certain countries in Asia. Generally speaking the evolution of the African HPAI situation is very difficult to predict and there is no cause for complacency. On the contrary it is envisaged that HPAI is approaching enzootic status in some countries in Africa and could well remain enzootic, at least for the medium term. Since potential wildlife reservoirs are many, in the worst-case scenario HPAI H₅N₁ virus could become permanently established as a wild bird reservoir in African waterfowl and perhaps shorebird species.

The situation in several recently contaminated countries in Africa suggests that:

- a. culling and control of movements are extremely difficult to be put in place,
- b. the response to new outbreaks is not immediate and the spread to many parts of the country has usually commenced before control capacity is rendered efficient,
- c. in hot arid countries, such as Niger, spread from an initial introduction to other regions in the country seems not to happen easily if movement control is applied.

The implementation of vaccination campaigns can be very difficult in the village production systems particularly when the disease is absent. Therefore, without strong political commitment and appropriate investment, the vaccination coverage could be too small to provide sufficient flock immunity across broad areas but may be reached in specific farms and in specific areas.

In conclusion, due to trade and other movement conditions including the permeability of frontiers as well as the insufficient capacity of the Veterinary Services and insufficient awareness of many African populations we can consider that all countries of Africa are at risk in the medium term. In addition to movement of poultry and products across borders, the role of wild birds cannot be neglected, particularly water birds along migration routes into wintering places; both require intensive study.

4.3.3 Intersectoral linkages

A strong inter-sectoral collaboration, particularly between the animal health and public health sectors is crucial for influenza prevention and pandemic preparedness. Currently, the links between the animal health, public health and wildlife authorities in monitoring zoonoses in Africa are weak. The programme envisages the forging of closer links and interactions between these key role players. There is considerable scope for sharing elements of the surveillance and reporting systems at village level and in molecular epidemiological analysis of virus evolution.

5. PROPOSED STRATEGY FOR AVIAN INFLUENZA PREVENTION AND CONTROL IN ANIMALS IN AFRICA

5.1 Objective

The objective of the programme described here is to safeguard human health, livelihoods of African families and the commercial poultry production industry from the threat of HPAI by eliminating the incursions which have occurred and building capacity in countries to be able to establish effective rapid detection and response capacity to combat future introductions of epizootic diseases.

5.2 Expected outputs

The prime outputs are expected to be:

- a. effective control of HPAI and expansion of the disease stopped
- b. national veterinary services complying with international standards (OIE)
- c. affected countries having sound strategic plans in place to guide programmes of progressive control
- d. all countries with emergency preparedness plans in place to prepare for introduction of infection
- e. a regional committee guiding the continental preparedness and control programme
- f. sub-regional committees monitoring and reviewing progress
- g. sub-regional Animal Health Centres driving and facilitating capacity development for epizootic disease control with a focus on HPAI

5.3 Operational principles- implementation plan

The problem of HPAI in Africa will be addressed initially by a five year, four component programme with the first being of high priority for immediate implementation. The components are:

Component 1: Immediate emergency actions to initiate the fight against disease already present

Component 2: Longer term national actions involving progressive capacity development

Component 3: Regional support through OIE FAO IBAR Regional Animal Health Centres and networks of
Laboratories and Epidemio surveillance teams

Component 4: International support being coordinated by FAO and OIE in collaboration with WHO and UNICEF

Countries will be advised to adopt locally-adapted, science-based strategies building on principles outlined in "A Global Strategy for the Progressive Control of Highly Pathogenic Avian Influenza (HPAI)" (FAO/OIE November 2005), AU IBAR's conceptual approach, subsequent experience gained by FAO in Asia and the OIE strategy to support national veterinary services in complying with international standards. Close linkages are envisaged with other members of the UN team especially with WHO and UNICEF and with the members of the ALive Platform particularly with Sub-regional Organisations.

There is need for a clear and strong political commitment of governments and for appropriate means to enforce the implementation of the strategies. Major international funding will be needed as the

situation relates to an international public good but this must also be matched by local funding and a commitment to building effective veterinary services capable of addressing statutory obligations.

5.3.1 Emergency National actions

- a. mounting intensive control campaigns in clusters of infected and high risk countries to bring the disease under control thereby reducing the risk of, even preventing, both internal and transboundary spread
- b. actions in non-infected countries relating to emergency strengthening of capacity for epizootic disease control
- c. creating National Animal Disease Emergency Committees with executive function to lead strategy setting and national HPAI prevention and control programmes

In addition the evaluation of veterinary services will start as soon as possible in order to define priority gaps to be filled as well as studies to assess the socio economic impacts of the disease, evaluate the role of various farming systems on the epidemiology of HPAI and evaluate various options for possible restructuring of the poultry sector and for biodiversity conservation.

National strategic plans need to be developed urgently and these will of course be adapted to the country status: non-infected, recently infected, approaching endemicity and unknown.

Obviously emergency preparedness planning linked to risk analysis will feature highly for those countries that remain free from infection. Prevention is linked closely to enhanced surveillance and early response capability. Establishing these systems requires significant investment at the country level in support to the official veterinary services. In addition a good prevention strategy needs to be based on a sound understanding of the social and economic factors that influence poultry farmers' decisions related to their enterprises as well as issues related to culture that may relate to human infection.

It is neither appropriate nor feasible to attempt to define here the fine details of national strategies that will need to be applied. It is sufficient to say that they will be based on the considerations outlined in Sections 3 and 4 of this document. The strategies need to reflect the reality of existing veterinary capacity and be subject to at least annual review.

Culling and control of movements remains the strategy of choice to eliminate the virus in cases of isolated outbreaks. This needs to be the immediate response based on available emergency preparedness plans and adequate compensation schemes. However, plans should be flexible, anticipating the need to vary the strategy based on the actual field situation, and pragmatic.

Vaccination will very likely have to be used especially in enzootic circumstances but most probably as a targeted, focussed vaccination in most cases. The conditions could be:

- Mass vaccination when there is a high concentration of farms (high poultry density) for example in peri-urban areas
- Containment of geographic spread through ring vaccination around outbreaks.
- Pre-emptive vaccination when there is a specific risk factor such as in regions close to or linked to endemic regions through trade exchanges or in areas close to wild bird concentrations if such reservoirs are proven to be an important factor of virus maintenance and spread.

Plans to implement vaccination campaigns require awareness campaigns and proper training of vaccination teams as well as adequate preparation and strategic stocks of vaccines, equipment (syringes, needles, protective clothing). Logistical support needs to be established and operational funds need to be available. OIE and FAO have set up specific mechanisms for the establishment of vaccine stocks (vaccine banks: see section 3.2.4) which will have to be expanded to get a sufficient number of doses of high quality certified vaccines, readily available and at competitive prices. Post vaccination monitoring must also be included in the programme.

All components of the programme described here have a function secondary to the direct needs of HPAI control; the structures and expertise created will contribute significantly to developing regional and national expertise and systems to address the issues of transboundary animal disease control. Such a developmental process would create an enabling environment for subsequent disease control initiatives employing structures and capability created for HPAI in the first instance.

National Strategic Plans need to ensure close functional linkages between national and international health agencies (WHO and UNICEF in particular) in surveillance, investigation of suspicious events (human and animal), and in response.

The three components of the emergency national actions are the following bearing in mind that the evaluation of veterinary services and priority support should start immediately as well as socio economic, farming systems and biodiversity studies:

i) intensive control in infected clusters of countries

This component is of pre-eminent importance and needs to be initiated immediately before all other structural deficiencies are addressed. The steps to be followed are:

- immediate appraisal of the epidemiological determinants of infection in the countries comprising the clusters concerned. This should be done by convening sequential national and cluster workshops, essentially for veterinarians, guided by international FAO and OIE experts and consultants to define as far as possible the likely extent of infection. The means of interrupting the virus transmission will be defined and a strategy for virus elimination roughly mapped out.
- rapid development of national strategic plans to provide the 'road maps' to guide the national campaigns together with funding proposals to include national and international funding. Strategic Plans will set out the control rationale and a programme for its achievement.
- timely execution of control programmes in which rapid and sensitive surveillance systems, supported by diagnostic services, elicit timely action from rapid response teams; aided by provision of financial and technical assistance
- demonstration of control of infection and progressive determination of freedom from infection which is probably best achieved on a production sector basis.

The clusters are:

- Egypt and Sudan
- Nigeria, Niger and Cameroon with Benin
- Burkina Faso and Côte d'Ivoire with Liberia, Sierra Leone, Ghana and Togo included.

These three clusters should be addressed immediately by AU/FAO/OIE programmes which will later be subsumed within sub-regional initiatives.

Given rapid start-up the prospects of success are relatively good for some countries where infection appears at present to remain relatively localised to the areas of original introduction, and spread is relatively slow with the exception of Nigeria. The problem in other countries such as Nigeria and Egypt is likely to prove more refractory. The country programmes developed will take into account and supplement existing programmes of assistance for HPAI control, particularly from the FAO ECTAD and AU IBAR coordination. National strategic plans will adapt guidelines for control to local conditions and will comprise the following elements:

- Campaign management
- Enhancement of outbreak control – area wide disease management
- Surveillance and epidemiology including diagnostic services
- Compensation mechanisms
- Animal quarantine services
- Legislation and enforcement
- Communications
- Production system and marketing restructuring
- Socioeconomic studies
- Epidemiological studies

Communication campaigns will be undertaken to target a variety of audiences such as: national and local governments, in order to generate political commitment; community leaders and women and men farmers in order to create awareness on the epidemic and its consequences, as well as on vaccination, other means of prevention and compensation where appropriate; the media, in order to involve them as stakeholders in the process and taking into consideration their needs to be well informed and cooperation gained early on.

However, fundamentally, unless the constraint of inadequate veterinary service capacity is overcome the prospects of effective control being imposed are not good.

ii) Supportive actions in non-infected countries:

Preventive incursion, emergency preparedness, rapid response capabilities, socio economic and epidemiology studies will predominate in the focus of action.

iii) *Functional National Animal Disease Emergency Committees and realistic control programmes*

There is a need for strong central direction and local support for control campaigns. Chaired by the Minister of Agriculture, these executive committees are required to guide national policy and actions in the control of HPAI and the risk of its introduction. Comprised of representatives from all relevant government agencies and private sector organisations they will be charged with developing national policy and executive function to lead national HPAI prevention and control programmes. Experience has shown that a functioning National Animal Disease Emergency Committee (NADEC) empowers official veterinary services and creates an enabling environment for disease control.

All countries will be required, and assisted, to develop National Strategic Plans for HPAI Prevention and Control. This will be the mandate essentially of official veterinary services but it will be essential for all relevant government departments to be actively engaged – Planning, Finance, Local Government, Police, Military, etc. NADEC should serve to impress on Government departments the need for a dynamic national involvement of all government departments in the HPAI emergency response. Matching this is a need since it is an international public good which is being addressed and failure to act promptly and decisively risks serious global repercussions.

In countries where provincial governments are strong the central command by the national chief veterinary office must show effective leadership, with decentralised systems subordinate during an emergency. This leadership must be without question, dynamic, rigorous, and well structured. Contingency and emergency plans must be practiced as field test exercises with all stakeholders and partners.

5.3.2 Longer term national actions

The strengthening of official veterinary services is a key component at the central level and throughout the territory. They need to be able to meet their mandates for the effective control of diseases which fall within the concept of "public goods". An effective veterinary service must include staff to perform its technical obligations (technical capability), appropriately resourced (financial and personnel), communications and partnerships with the private sector, and facilitate market access through healthy animals, products and commodities. A thorough evaluation of veterinary services will be carried out using the OIE PVS tool as well as a medium to long term plan for possible restructuring in order to improve their governance and bring them in line with the OIE required standards.

Other main issues which need to be thoroughly addressed relate to enhancing biosecurity (*bioexclusion* – good production practices that decrease the risk of disease introduction; and, *biocontainment*- should a disease be suspected or detected) and facilitating disease control by restructuring the poultry industry and informal sectors together with rationalisation of marketing systems. In a Sub-Saharan Africa setting, implementation of biosecurity will be most difficult, but emphasis on simple messages to raise public awareness and basic measures that should be quickly shown to be cost-effective can do much in prevention disease entry and spread.

With regard to biodiversity there is, in all African countries, a strong presence of indigenous breeds which should be protected and used for restocking in village backyard systems.

5.3.3 Regional support to national activities

National programmes and activities require the constant provision of technical guidance and is most efficiently organised on a sub-regional basis to coordinate and build capacity for prevention, emergency preparedness planning and control of HPAI and channel funding assistance for control.

Sub-Regional Networks of laboratories and epidemio-surveillance teams which were established by FAO for HPAI and AU IBAR PACE for other transboundary animal diseases will be continued and extended for surveillance, diagnostic confirmation and early warning.

Four Regional Animal Health Centres will be established to cover West /Central Africa, Eastern Africa, North Africa, Southern Africa and the Indian Ocean islands (see Figure 1). These Centres are being created by a joint initiative of OIE-FAO and AU IBAR building on the complementarities of the mandates of the three institutions within the framework of the FAO OIE GF TADs initiative, the PACE programme and the ALive Partnership Platform.

There will be a need for appropriate advanced international expertise both on long and short term basis to implement the activities and train technical personnel from African countries as appropriate thus adding to regional capacity building for surveillance, data analysis and disease control processes. It is essential to ensure that the personnel contracted possess the requisite advanced professional skills and are encouraged to develop and exercise managerial skills.

A Regional Management Unit for the entire African Continent needs to be established within AU IBAR in strong collaboration with FAO and OIE to oversee, coordinate and drive the sub-regional capacity

building programmes and technically backstop national programmes in the countries which fall within their mandate.

An important regional function is also to ensure that only quality-assured vaccines produced and tested in accordance with OIE guidelines are used in control programmes. AU's Pan-African Veterinary Vaccine Centre (PANVAC) laboratory needs to be strengthened for this purpose.

Regional networks are needed to support countries and national projects with socio-economic inputs to disease control. They will have a co-ordinating and backstopping function that will promote consistency and rigour in methodology, enable local national institutions to share ideas and information and build capacity, and assist in developing and reviewing strategic studies conducted by institutes in the networks. Questions of compensation, rehabilitation and safe and economically viable smallholder poultry raising all have regional as well as national dimensions, and these will be more clearly identified through regional linkages.

5.3.4 International support to regional and national activities and research

Regional organisations and countries will benefit from the support of FAO and OIE through their central teams of experts working in various fields of animal disease prevention and control. OIE is responsible for official information dissemination and standard setting and provides to countries other support through their headquarters and associated experts and most frequently in collaboration with FAO.

Within the FAO Emergency and Prevention Systems (EMPRES) and its Emergency Center for Transboundary Diseases (ECTAD), multidisciplinary teams can respond to regional and international crisis concentrating on an integrated approach of programmes against diseases thanks to the use of various sources of available data (animal health, animal populations and movements, socio economics, policies and farming systems, land use, environment...). The disease intelligence work allows better understanding of the main epidemiological trends and better prediction and warning concerning major transboundary animal diseases. These approaches are applied by the FAO OIE WHO Global Early Warning System (GLEWS) which brings to the international community, regional organisations and countries necessary information on the animal situation and risk of possible new crisis.

The FAO OIE Crisis Management Center (CMC) and their network of reference laboratories and collaborating centers (OFFLU) are additional available tools to assist in providing highly specialised expertise for emergency response to new outbreaks, strategy design, evaluation, coordination and research.

The FAO AIEA Division in Vienna can also provide support to national laboratories and UNICEF can support the coordination of communication activities. WHO will be a source of expertise and coordination to address the human-animal health interface issues.

With regard to research, a number of international laboratories and centres will work on key aspects of the disease that remain insufficiently known such as the role of wild birds and mammal species (pigs, cats, dogs...), the global epidemiology of the disease to better understand the transmission risks, the socio economic impacts of HPAI, the possible options for restructuring the poultry sector or the cost efficiency of various animal health delivery systems. Research will also address the development of new tools such as rapid diagnostic tests and vaccines.

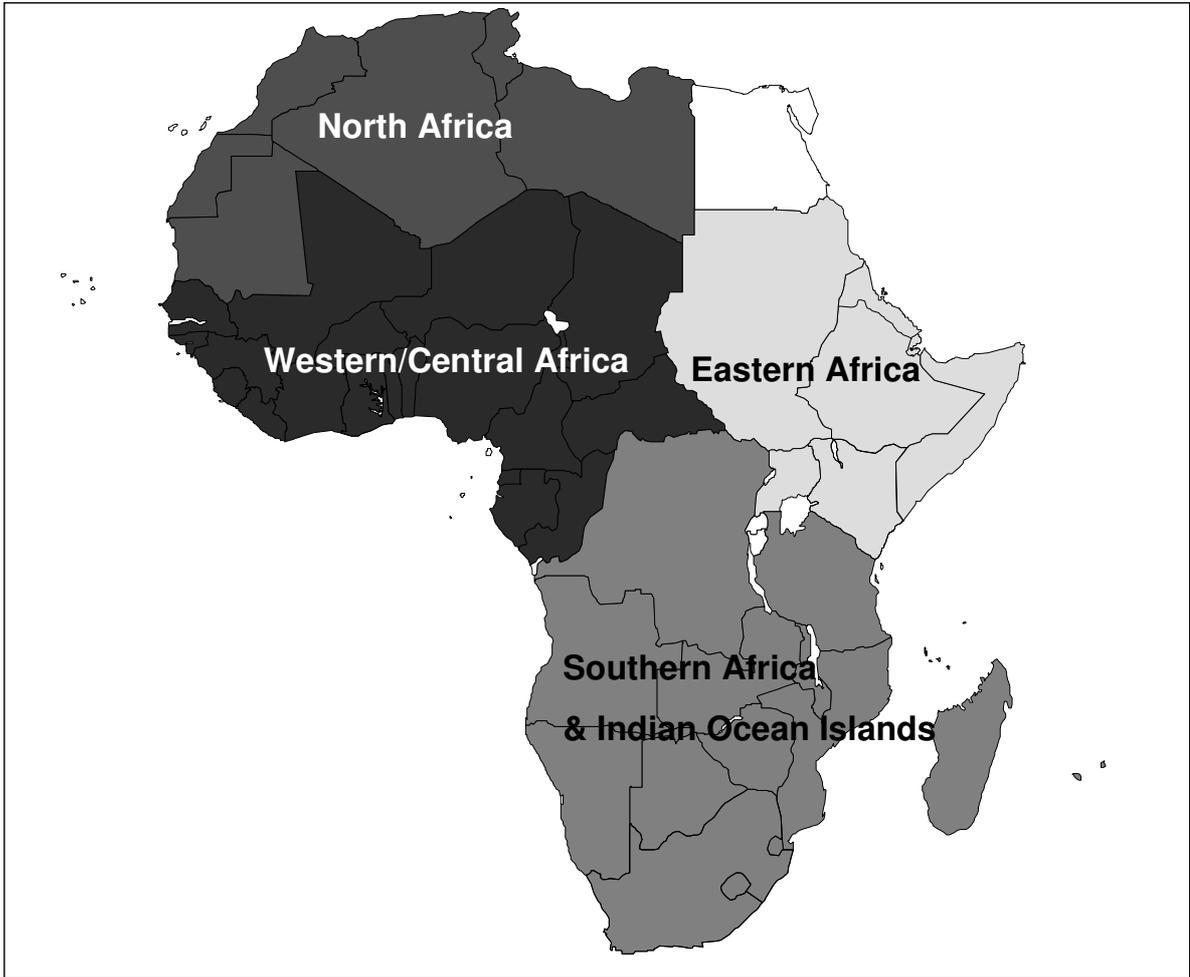


Figure 1: The groupings of countries relating to Regional Animal Health Centres