HIGHLY PATHOGENIC AVIAN INFLUENZA (HPAI) IN NIGERIA:

STRATEGIES FOR PREVENTION OF INTRODUCTION, DISEASE SURVEILLANCE NETWORKING AND CONTINGENCY PLAN FOR A DISEASE EMERGENCY

REPORT OF THE TECHNICAL COMMITTEE OF EXPERT ON THE PREVENTION AND CONTROL OF HPAI IN NIGERIA

Federal Department of Livestock & Pest Control Services
P.M.B. 135 Garki, ABUJA

Acknowledgements

The Technical Committee of Experts on Prevention and Control of Avian Influenza in Nigeria wishes to thank the Honourable Minister of Agriculture and Rural Development and the Director, Federal Department of Livestock and Pest Control Services for the opportunity to contribute in the on-going efforts to prevent the introduction of Highly Pathogenic Avian Influenza (HPAI) into the country and to develop emergency preparedness plans for dealing with any incursion of the disease into Nigeria.

Cover Picture: A homing Pigeon from Britain caught at Sagbama, Bayelsa, Nigeria. (courtesy Dr K. A. Majiyagbe)

MEMBERSHIP

1.	Prof. T. U. Obi	University of Ibadan, Ibadan. (Chairman)
2.	Dr. K. A. Majiyagbe	FAO-NSPFS, Abuja
3.	Prof. P. A. Abdu	VTH, Ahmadu Bello University, Zaria.
4.	Dr T. M. Joannis	NVRI, Vom.
5.	Mr S. O. Akpa	Poultry Association of Nigeria.
6.	Dr M. Magaji	Vet. Quarantine Services Division, FDL&PCS, Abuja
7.	Dr I. G. Ahmed	PACE Project, FDL&PCS, Abuja.
8.	Dr P.A. Okewole	NVRI, Vom.
9.	Dr A. Jambalang	NVRI, Vom
10.	Dr G. M. Muhammed	Animal Health Division, FDL&PCS, Abuja

Terms of Reference

1. Develop strategies towards prevention of the introduction of introduction of Avian Influenza into Nigeria.
2. To develop surveillance network against the disease and
3. To prepare an emergency preparedness plan for the disease in Nigeria.

ABU	Ahmadu Bello University
AGID	Agar gel immunodiffusion test
AIVs	Avian Influenza viruses
AU	African Union
AU-IBAR	African Union-Inter-African Bureau for Animal Resources
AUSVETPLAN	Australian Veterinary Plan
AVO	Area Veterinary Officer
CAHWs	Community Animal Health Workers
c-ELISA	Competitive Enzyme linked Immunosorbent Assay
CIDA	Canadian International Development Agency
DFDL&PCS	Director Federal Department of Livestock and Pest Control Services
DFID	Department For International Development
DG-SSS	Director General State Security Services
DIVA system	Differentiating Infected from Vaccinated Animals
DVSs	Director of Veterinary Services
ECOWAS	Economic Community of West African States
FAO	Food and Agricultural Organization of the United Nations
FAO-EMPRES	FAO-Emergency Prevention System
FDL&PCS	Federal Department of Livestock and Pest Control Services
FMARD	Federal Ministry of Agriculture and Rural Development
FMF	Federal Ministry of Finance
FMH	Federal Ministry of Health
FMS&T	Federal Ministry of Science and Technology
H	Haemagglutinin
HIT	Haemagglutination Inhibition Test
HPAI	Highly Pathogenic Avian Influenza
IAEA	International Atomic Energy Agency
IB	Infectious bronchitis
IC	Infectious coryza
ILT	Infectious Laryngotracheatis
JIB	Joint Intelligence Board
LADC	Local Animal Disease Control Centre
LGA	Local Government Area
LGVO	Local Government Veterinary Officer
N	Neuraminidase
NADC	National Animal Disease Control Centre
NADCU	National Animal Diseases Coordinating Unit
NADEC	National Animal Disease Emergency Committee
NADIS	National Animal Disease Information and Surveillance System
NAIC	National Agricultural Insurance Corporation
NAPRI	National Animal Production Research Institute, Zaria
NEPAD	New Partnership for Africa’s Development
NEMA	National Emergency Management Agency
NLPD	National Livestock Projects Division
NSPFS	National Special Programme for Food Security.
NVQS	National Veterinary Quarantine Services
NVRI	National Veterinary Research Institute Vom
OIE	International Office of Epizootics
PACE	Pan-African Programme for the Control of Epizootics
PAN	Poultry Association of Nigeria
RT-PCR	Reverse Transcriptase-Polymerase Chain Reaction

SADCUs	State Animal Disease Control Units
SDT	HPAI Specialist Diagnostic Teams
SDVS	State Director of Veterinary Services
SOP	Standard Operating Procedure
TADs	Transboundary Animal Diseases
TCP	Technical Cooperation Project
UN	United Nations
UNDP	United Nations Development Programme
USA	United States of America
USAID	United States Agency for International Development
VCN	Veterinary Council of Nigeria
VTHs	Veterinary Teaching Hospitals
VVND	Viscerotropic Velogenic Newcastle Disease
WHO	World Health Organization

TABLE OF CONTENTS

List of Figures:

List of Tables:

EXECUTIVE SUMMARY

The Technical Committee of Experts on the prevention and control of Highly Pathogenic Avian Influenza (HPAI) in Nigeria which was inaugurated by the on December 12th, 2005, deliberated extensively on the nature, the global spread of the disease and its potential risks to Nigeria. The strategies for the prevention and control of the disease were discussed as well as its surveillance network. The developed contingency plan which is for the prevention and control of the Highly Pathogenic Avian Influenza (HPAI) in Nigeria contains details of resources required for rapid and efficient mobilization of human and material resources for the containment and eradication of the infection. The preparation of the document is based on the Food and Agricultural Organisation (FAO) format for preparing National Emergency Preparedness and Contingency plans for Transboundary Animal Diseases (TADs) and the Australian Veterinary Plan (AUSVETPLAN). The HPAI disease could be a disaster to the poultry industry (which through government supportive policies has shown positive signs of recovery) including other livestock and a major threat to public health. Consequently, the prevention and control of HPAI requires National, Regional and International as well as multi-sectoral collaboration.

The HPAI is a viral disease that affects the digestive, nervous and respiratory systems of all domestic and wild birds with high morbidity and mortality. It is highly infectious and contagious disease which can be fatal in humans.

The Avian Influenza Viruses are classified as types A, B and C with 15 subtypes of the type A. To date, all Highly Pathogenic AI Viruses that cause the disease belong to H5 or H7 subtypes. The HPAI viruses affects pigs and humans with the pigs serving as a mixing vehicle for re-assortment of the virus while domestic ducks get infected without showing clinical signs hence serve as a source of infection for domestic poultry.

It has been reported that the distribution of outbreaks of HPAI in Europe, Asia and Turkey has been associated with the presence of wetlands and lakes where migratory birds rest. In Nigeria, such wetlands exist with free flying wild birds and domestic ducks visiting and resting. The possible source of introduction of the disease into Nigeria could be through importation or smuggling of infected poultry and poultry products across the borders and through migratory birds that fly through identified pathways. However the status of HPAI in Nigeria needs to be investigated. Therefore measures to be taken to prevent introduction of the disease into the country should include ban on importation of poultry and poultry products from high risk countries, effective disease surveillance, functional National Veterinary services and Quarantine facilities, and community based participatory epidemiological system for HPAI surveillance and control.

In order to enhance our capacity and capability for HPAI diagnosis, a laboratory diagnostic network comprising of the NVRI and five designated laboratories at Zaria, Ibadan, Nsukka, Maiduguri and Sokoto with strong linkage to the FAO, OIE, WHO Regional and World Reference laboratories is being advocated. It is envisaged that there would be collaboration with laboratories working on human Influenza in the various areas of Influenza diagnosis and research.

It is pertinent to note that the threat to human health will persist as long as the problem persists in livestock and poultry flocks. It is thus obvious that the primary focus of attention in the prevention of the introduction and perpetuation of the virus in the country should be from the animal health perspective. The measures outlined in this report therefore require urgent attention and implementation to forestall any eventuality.

Funding for diagnosis, surveillance and control measures against the disease should be provided by the Government, while exploring the possibility of TCP on HPAI from FAO, IAEA, WHO, OIE. Similarly collaborative linkages with Federal Ministry of Health and other related Institutions are emphasized.

Based on the results of risk analysis of HPAI in Nigeria, it is recommended that our overall policy should be modified stamping out involving slaughter of clinically affected poultry with full compensation, safe disposal of dead carcasses, adequate disinfection and decontamination and appropriate disease surveillance to determine the origin and extent of the disease. An action plan dealing with HPAI emergency which defines the command chain from the rural setting through the state veterinary services to the national veterinary service was proposed. In addition, Public awareness campaigns would be emphasized in the programme.

STRATEGIES FOR THE PREVENTION OF INTRODUCTION OF HIGHLY PATHOGENIC AVIAN INFLUENZA (HPAI) INTO NIGERIA

The technical committee of experts on the prevention and control of HPAI after deliberations in a meeting held at the Veterinary Council of Nigeria (VCN) conference hall, Abuja on December 12 – 14, 2005 recommended the under listed strategies for the prevention of introduction of HPAI into the country.

1. Ban on importation of poultry and poultry products from countries where the disease (HPAI) is known to exist. At present, there is an existing total ban on importation of live birds, poultry products including fertile eggs into the country which needs to be re-examined from time to time with a view to ameliorating the negative impact on the fragile poultry industry without compromising the present HPAI status in the country.

2. An effective animal disease surveillance involving high risk areas such as poultry markets, wet lands and poultry located along known migratory birds routes, poultry abattoirs, borders and targeted farms should be carried out. Results obtained may then be used to assess the need for a complete nationwide HPAI active disease, virus and sero-surveillance to determine epidemiological status of the disease in the country.

3. Improved and functional National Veterinary Quarantine Services (NVQS) including immediate rehabilitation and revitalisation of existing veterinary quarantine infrastructure, control posts and enhanced manpower capabilities. This is to enable a sustained surveillance of animal diseases at the ports of entry in the course of animal/animal products, biologics and germplasm trade. The NVQS service staff should maintain continuous presence at the ports of entry into the country and constitute part of the Joint Intelligence Board (JIB) which should play an active role in HPAI surveillance at the ports.

4. Targeted community based training of rural backyard poultry farmers in various aspects of HPAI recognition and control including biosecurity procedures applicable to rural small scale poultry enterprises and the role of animal disease vigilante in the control of HPAI.

5. Enforcement of the requirement for Import permits for poultry and poultry products issued by the FDLPCS.

6. Development of a traceability mechanism for animals and strict monitoring of movement of poultry and poultry products through registration and licensing of poultry farms, hatcheries and other poultry enterprises.

7. Development of a community based, participatory rural livestock and poultry disease surveillance system and integrating it into the existing epidemio-surveillance network.

8. Training of veterinarians, auxiliaries, other categories of poultry farmers on HPAI prevention and control strategies including aspects of biosecurity.

9. Effective public enlightenment and awareness programmes on HPAI.

HIGHLY PATHOGENIC AVIAN INFLUENZA SURVEILLANCE NETWORKING

With regard to HPAI disease surveillance networking, the committee recommended as follows:

1. Establishing a diagnostic laboratory network involving the National Veterinary Research Institute (NVRI) at the centre, the designated laboratories in the Veterinary Teaching Hospitals (VTH) in the Faculties of Veterinary Medicine in Zaria, Ibadan, Nsukka, Maiduguri and Sokoto as well as the OIE/FAO/WHO regional and world reference laboratories for HPAI.

2. That collaboration between the animal and human laboratory diagnostic networks should be enhanced for purposes of HPAI diagnosis, surveillance and control.

3. Considering the present void in information and knowledge on HPAI epidemiology in Nigeria, there is need for a coordinated approach to research on Influenza viruses including development of vaccine, monitoring of antigenic drift and shift and development and validation of diagnostic tests. This initiative should be supported by proper funding including assistance from WHO, FAO and IAEA.

4. That the national animal disease information and surveillance network (NADIS) covering the rural communities up to the animal health services headquarters should be linked to the human epidemiology network particularly at the rural community level for the purpose of information sharing and coordination of response to HPAI emergency.

5. Integration of the wild life surveillance system with the NADIS network with reference to HPAI diagnosis and control

CONTINGENCY PLAN

Introduction

A Highly Pathogenic Avian Influenza (HPAI) contingency plan should be a well articulated strategy document that defines the actions to be taken in the event of HPAI emergency. It should contain details of the resources required to meet such an emergency and action plan for rapid and efficient deployment of human and material resources for containment of the disease and elimination of infection. This document was prepared in conformity with the Food and Agricultural Organisation (FAO) of the United Nations format for preparing National Animal Disease Emergency Preparedness and Contingency Plans for major Transboundary Animal Diseases (TADs) and the Australian Veterinary plan (AUSVETPLAN).

This plan has been prepared within a limited period of time and should be considered as an interim report that should be upgraded and fine tuned within the first quarter of 2006. Annexes consisting mainly of the resource plans, both material and human as well as Standard Operating Procedures (SOPs) are being prepared separately.

Nature of the Disease:

Definition

Highly Pathogenic Avian Influenza is a viral disease affecting the digestive, nervous and respiratory systems of all domestic and wild birds that is characterised by respiratory, reproductive, digestive and/or nervous signs with high morbidity and mortality with an incubation period of few hours to few days. It is highly contagious and infectious and may be fatal in humans. The disease affects all ages, but is more serious in the young.

World Distribution

HPAI was first reported in Italy 1878, South Africa 1961, USA 1971, Australia 1975, England 1979, Ireland 1983, Mexico 1994 and Pakistan 1994. In recent years HPAI has become topical in Asia including Peoples Republic of China 1996, Hong Kong 1997, 2001, 2002 and 2003, Cambodia, Indonesia, Japan, Malaysia, Republic of Korea, Laos, Taiwan, Thailand, Vietnam, Turkey and Romania 2005 (OIE 2005). The most serious epidemic in recent times was in Hong Kong 1997-1998 and 2003, the Netherlands 2003 and South-Korea 2003.

H5N1 outbreaks by species between July and October 2005 according to the OIE report are shown in figure 1 below.

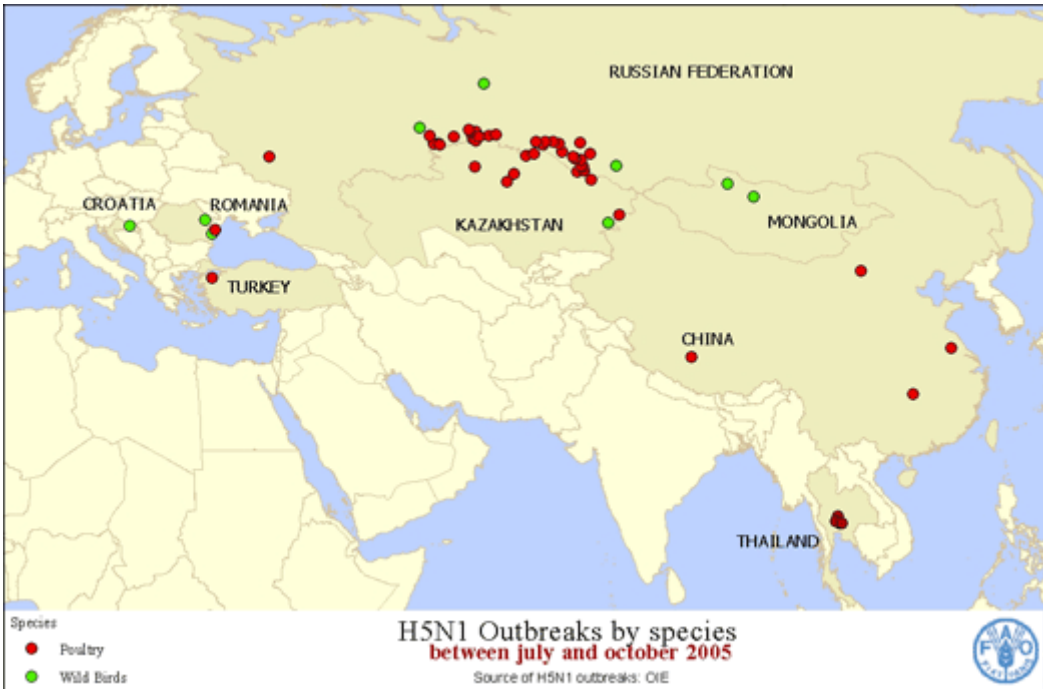

Figure 1:HPAI outbreaks by species distribution as at October 2005 (FAO)

Avian Influenza viruses (AIVs) are probably ubiquitous in wild water birds. Pathogenic strains could emerge and cause disease in domestic poultry in any country at any time without warning. In fact, outbreaks have occurred at irregular intervals in many continents.

Aetiology

AIVs are members of the family *Orthomyxoviridae* and genus *Influenza* A. The influenza viruses that constitute this family are classified into types A, B or C based on differences between their nucleoprotein and matrix protein antigens. AIVs belong to type A. Influenza viruses are further categorised into subtypes according to the antigens of the haemagglutinin (H) and neuraminidase (N) projections on their surfaces. There are 15 haemagglutinin subtypes and 9 neuraminidase subtypes of influenza A viruses, and AIVs viruses have representatives in all of these subtypes. However, to date all highly pathogenic AI viruses that cause generalised rather than respiratory disease belong to either the H5 or H7 subtypes. For example, the classical fowl plague virus is H7N7 and the virus responsible for the major epidemic in the eastern United States in 1983/84 was H5N2. However, not all H5 and H7 viruses are virulent for poultry.

Epidemiological features:

Susceptible species

AIVs virus is infective for almost all commercial, domestic and wild avian species, Chickens and turkeys are highly susceptible to infection and clinical disease, and ducks and geese although susceptible to infection with all AI virus strains suffer clinical disease from only highly virulent strains. Ostriches, rhea, emus, quails, muscovy ducks, guinea fowls, chukars, partridges, pheasants, pets, sea and shore

birds are susceptible to AI to varying degrees. Pigs and humans are equally susceptible to infection by the HPAI virus and the potential of pigs serving as a mixing vehicle for re-assortment (mutation) of the virus should be borne in mind. Reports of infection and mortality in domestic and wild cats have occurred in Thailand. Interspecies infection with AIV, for example between chickens, turkeys, pigs and humans has been reported. It may be pertinent to note that domestic ducks can be infected without showing clinical signs and may serve as a source of infection for domestic poultry.

Reports from USA show a rather high percentage of infection with AI in mallard ducks. The recent popularity of mallard ducks in Nigerian villages, most likely attributable to their persistence in egg laying and of geese as ornamental and pet birds among the elites, may have implication for AI infection and disease in the country. Therefore the possible role of ducks and geese in the transmission of AIV in Nigeria needs to be investigated.

Virus survival

In general AIVs are not hardy and are susceptible to warm environmental conditions but may remain viable in cold and humid conditions. The virus can survive for 35 - 44 days in faeces at 4^0C but for only 4 days at 25^0c. Within the poultry house environment the virus can survive for up to 35 days, and some reports indicate that it is possible to recover the virus from houses even after more than100 days.

Short term exposure to ultraviolet radiation, desiccation and common detergents and disinfectants such as calcium and sodium hypochlorite and Virkon$^{(R)}$ can readily inactivate the virus. Provided adequate and suitable decontamination of poultry houses, equipment and personnel is carried out as detailed in the standard operating procedure, restocking could be done 21 days thereafter.

AIV can be isolated from lake water and the virus has been known to persist and retain infectivity in water for more than 30days at 0^0c and for up to 4days at 22^0c. The distribution of outbreaks in Europe including Turkey has been associated with the presence of wetlands and lakes where migratory wild birds.

In Nigeria the sources of water for poultry in the rural areas include slow flowing rivers, open wells, stagnant waters which are often visited by free flying wild birds and domestic ducks. The survival of the AIV in these sources of water needs to be investigated.

AI virus can be shed in faeces and respiratory tract for at least 14 days and can be recovered from refrigerated carcases for 23 days. Birds processed during the viraemic stage will contaminate other carcases with blood and faeces containing the virus. Virus can persist in poultry meat products. Based on the Australian recommendation the minimum condition for inactivation of the virus is 70^Oc for a minimum of 30mins, 75^0c for a minimum of 5mins and 80^0c for a minimum of 1min. In Nigeria the possibility of meeting this minimum requirement is difficult and therefore the existing ban on the importation of live or processed birds and other poultry products is justifiable. Eggs laid in the early stages of AI infection could

contain the virus on the egg yolk, albumen and the egg shell. The virus can also penetrate cracked or even intact egg shells.

Current pasteurisation procedures on products such as liquid whole egg, liquid yolk, and dried whole or dried yolk are not sufficient to inactivate the HPAI virus. HPAI virus has been isolated from eggs laid by infected breeding hens. Therefore importation of fertile eggs from HPAI endemic zones should be prohibited. HPAI virus can persist in waste products from hatcheries, laboratories, dead birds, farms, egg marketing establishments as well as chicken manure and litter; and therefore could be disseminated by vehicles, foot ware, clothing, equipment, formites, including cages and egg crates, unless these products have been decontaminated.

Incidence (with reference to Nigeria)

Although limited serological studies showed the presence of Influenza virus Type A antibodies in Nigeria, there is no evidence of clinical disease resulting from HPAI in Nigeria to date. However there is an urgent need to carry out active disease, virus and sero-surveillance for HPAI in both domesticated poultry and wild avian species including ducks, geese, turkeys and wild birds. Emphasis should be placed on disease search at wet lands and known wild birds' migratory routes, back yard and commercial poultry establishments in the country.

Disease transmission

HPAI virus is present in all secretions and excretions of infected birds. Transmission may be by direct inhalation of contaminated aerosol, dust or indirectly via ingestion of contaminated water, feeds or infected carcasses. Transmission of HPAI between flocks is primarily attributed to movement of infected birds and action of humans through movement of feeds/personnel, equipment and vehicles into or out of contaminated premises. In addition direct or indirect contact with migratory birds such as the water fowl is a likely source of infection in poultry.

Spread of the disease into the country could be through importation or smuggling of infected poultry and poultry products across the border and through migratory birds.

Eggs laid in the early stages of AI infection could contain the virus on the egg yolk, albumen and the egg shell. The virus can also penetrate cracked or even intact egg shells. However vertical transmission via infected eggs has not been proven to date.

Clinical signs

The clinical signs are very variable and are influenced by factors such as the virulence of the infecting virus strain, species affected, age, sex, concurrent diseases and environment.

In virulent (or highly pathogenic) AI of the type traditionally associated with fowl plague, the disease appears suddenly in a flock and many birds die either without premonitory signs or with minimal signs of depression, inappetence, ruffled feathers and fever. Other birds show weakness and a staggering gait. Hens may at first lay soft-shelled eggs, but soon stop laying. Sick birds often sit or stand in a semi-

comatose state with their heads touching the ground. Combs and wattles are cyanotic and oedematous, and may have petechial or ecchymotic haemorrhages at their tips. Profuse watery diarrhoea is frequently present and birds are excessively thirsty. Respiration may be laboured. Haemorrhages may occur on unfeathered areas of skin. The mortality rate varies from 50 to 100%.

In broilers, the signs of disease are frequently less obvious with severe depression, inappetence, and a marked increase in mortality being the first abnormalities observed. oedema of the face and neck and neurological signs such as torticollis and ataxia may also be seen. The disease in turkeys is similar to that seen in layers, but it lasts 2 or 3 days longer and is occasionally accompanied by swollen sinuses. In domestic ducks and geese the signs of depression, inappetence, and diarrhea are similar to those in layers, though frequently with swollen sinuses. Younger birds may exhibit neurological signs.

Pathology

Birds that die of peracute disease may show minimal gross lesions, consisting of dehydration and congestion of viscera and muscles.

In birds that die after a prolonged clinical course, petechial and ecchymotic haemorrhages occur throughout the body, particularly in the larynx, trachea, proventriculus and epicardial fat, and on serosal surfaces adjacent to the sternum. There is extensive subcutaneous oedema, particularly around the head and hocks. The carcase may be dehydrated. Yellow or grey necrotic foci may be present in the spleen, liver, kidneys and lungs. The air sacs may contain exudates. The spleen may be enlarged and haemorrhagic.

HPAI is characterised histologically by vascular disturbances leading to oedema, haemorrhages and perivascular cuffing, especially in the myocardium, spleen, lungs, brain and wattles. Necrotic foci are present in the lungs, liver and kidneys. Gliosis, vascular proliferation and neuronal degeneration may be present in the brain.

Diagnosis

Diagnosis is based on the clinical signs of the disease and laboratory analysis.

Field diagnosis

Field diagnosis is based on clinical signs and gross pathological lesions such as sudden death, severe depression, sudden egg drop, respiratory symptoms, facial subcutaneous oedema, swollen and cyanotic combs, wattles, and shanks.

Differential diagnosis

However the disease has to be differentiated from diseases with similar clinical and pathological features such as viscerotropic velogenic Newcastle disease (VVND), Mycoplasmosis, Acute Fowl cholera, infectious laryngotracheatis (ILT), infectious coryza (IC), infectious bronchitis (IB), Pulmonary aspergilosis and Chlamydiosis.

There is marked similarity in the clinical signs and gross lesions between VVND and HPAI. These include swelling of the head and wattles, sudden death, marked reduction in egg production and quality, nervous, enteric and respiratory signs. Gross lesions include haemorrhages and/or necrotic lesions in the gastrointestinal tract and the respiratory system.

Laboratory diagnosis

As clinical signs and pathological lesions are not definitive for HPAI, there is need for confirmatory laboratory diagnosis. This can be achieved by a rapid antigen detection test such as the Immunoflourescence and Directigen^{TM} FluA tests (Becton Dickinson Diagnostics systems USA). Confirmatory tests include virus isolation and identification, reverse transcriptase polymerase chain reaction (RT - PCR), virus characterisation, haemaglutinin typing, neuraminidase typing, gene sequence detection and live bird challenges.

Serological diagnosis may be achieved through Haemaglutination Inhibition Test (HIT), Agar Gel Immunodiffusion test (AGID), and competitive Enzyme Linked Immunosorbent Assay (c-ELISA). Serological tests that could differentiate between infected and vaccinated animals known as “Differentiating Infected from Vaccinated Animal” (DIVA) system are also available.

In Nigeria the recommended screening tests would be the Directigen^{TM} FluA test, and the Immunofluorescence test. It is expected that each of the six designated laboratories should have capacity to conduct the two tests. The confirmatory tests on the other hand include virus isolation and gene sequence detection. It is expected that this should be carried out at the National Veterinary Research Institute (NVRI). The capacity of four other laboratories at ABU, Ibadan, Maiduguri and Nsukka to conduct these tests should equally be strengthened. Further characterisation of AI isolates would be done by Haemaglutinin and neuraminidase typing as well as gene sequence detection and analysis. It is recommended that this would be carried out at the NVRI as well as other Regional and World Reference laboratories.

Serological assays which would be useful in sero-surveillance of HPAI include HIT, AGID test and c-ELISA. It is expected that each of the designated HPAI laboratory in the country should have the capacity to carry out these tests.

Samples required for laboratory diagnosis

The recommended samples required for laboratory diagnosis include tracheal and cloacal swabs, as well as faecal samples and paired sera from live birds. In addition intestinal contents, cloacal swabs or nasal swabs, samples of the trachea, lungs, air sacs, intestine, spleen, kidneys, brain, liver, pancreas and heart may be collected from dead birds. Other samples that could be taken for analysis include water from wetlands and ponds where there are high concentrations of migratory birds.

RISK ASSESSMENT OF HPAI IN NIGERIA

To date there is no incontrovertible evidence of HPAI disease in Nigeria. Similarly there is no available report of the presence of the disease in any of our neighbouring countries – Benin, Cameroon, Chad and Niger.

Risk factors:

a) Risk of Introduction into the country.

The risk factors that may aid introduction of HPAI into Nigeria include:

- Through Migratory birds – Nigeria lies in the East Africa/West Asia fly ways and the North Atlantic flyway of the migratory birds (see map)
- Presence of HPAI in South East Asia and South Africa and increased trade and human traffic with Nigeria
- The present expansion of infection zone of AI due to globalisation and relative ease of movement and transportation.
- Nigeria's long porous borders and informal livestock movement/trading across the border especially at border markets
- Smuggling/illegal movement of poultry and poultry products into Nigeria from infected countries.
- Inadequate veterinary quarantine facilities and manpower

b) Risk of Sustenance and maintenance of HPAI in Nigeria.

In the event that HPAI is introduced into the country, the factors that may aid sustenance and maintenance of the disease include:

- Structure of poultry industry in Nigeria consisting predominantly of backyard poultry with little or no biosecurity and peri-urban and urban commercial poultry production with minimum to moderate biosecurity and constant introduction of new birds from relatively unknown and unverifiable sources.
- The rearing of flocks of different species of poultry and different ages together
- Uncontrolled livestock and poultry movement within the country as a result of lack of enforcement of animal disease control laws and regulations in the country.
- Increased close contact between poultry and human.
- Lack of organised poultry marketing and existence of open live poultry markets characterised by interspecies mixing and poor sanitary conditions.
- Lack of registration and licensing of poultry farms, hatcheries and establishments as provided by the law.
- Inadequate early warning and early reaction capabilities including inadequate experience of most animal health workers in the recognition and diagnosis of HPAI
- Deteriorating animal health delivery services due to inadequate funding and inefficient restructuring programme of the veterinary services.

- Poor communication facilities for dissemination of information on HPAI and other TADs.
- Lack of funding for compensation of livestock/flock owners in the event of slaughter of their animals for purposes of disease control.
- Improper disposal facilities
- Sale and consumption of sick and dead birds

Despite the risk factors identified above certain factors that may reduce the above risk factors are presented below

Organisation of the animal health services

The Veterinary service in Nigeria is headed at the federal level by the Director Federal Department of Livestock and Pest Control Services (FDL&PCS) of the Ministry of Agriculture and Natural Resources and at state level by the Director of State Veterinary Services. The FDL&PCS is divided into eight Divisions, namely: the Animal Health, Quarantine Services, the Veterinary Public Health, Livestock Development, the Planning and Research, Pastoral resources, NLPD as well as the Pest Control Division. The FDL&PCS has field offices at the various state capitals while each state veterinary service has area offices at the local government headquarters. This present setup is designed to enable efficient and early collection of information on TADs including HPAI. Although by law the state Directors of Veterinary Services are in-charge of animal disease control, emergencies arising from major transboundary animal diseases such as HPAI should be under the overall command of the DFDL&PCS.

Human and other resources for HPAI diagnosis and control

The country has five University veterinary faculties that produce graduate veterinarians and at present there are about 4,586 registered veterinarians in addition to 7,810 livestock scientists, laboratory technologists and animal health auxiliaries in the country. The country therefore has sufficient number of manpower to be able to detect and control most TADs. However the fact that most of these have no first hand experience with AI being an emerging disease, would make early detection of AI incursion in the country rather difficult. There is therefore a need for continuing education and specialization in poultry disease recognition, diagnosis and control.
At present, the only laboratory statutorily charged with livestock disease diagnosis is the NVRI, Vom. With the emergence of new TADs such as HPAI it is unlikely that this laboratory will be able to cope in the event of the introduction and spread of the disease in Nigeria. There is therefore the need to strengthen the diagnostic capabilities that exist in NVRI as well as the suggested designated laboratories in selected veterinary teaching hospitals in the universities.

An Act to establish a National Veterinary Quarantine Service is being proposed to the National Assembly. When operational, the service would be expected to make fresh provisions to control and prevent the introduction and spread of infectious diseases among animals, poultries, hatcheries and other breeding facilities in Nigeria, to regulate the importation and exportation, sale, distribution and movement of trade animals, biologics and animal products of biotechnology. This service would

be very relevant to the control of AI in the country. At present the existing quarantine infrastructure and manpower are grossly inadequate to handle its statutory responsibilities and therefore needs immediate attention at the highest level.

In conclusion the risk of HPAI being introduced into the country may be considered as moderate to high while the risk of its establishment and spread within the country may be rated as very high. In addition the probable socio-economic as well as the public health consequences may be considered as very severe should the disease be introduced into Nigeria.

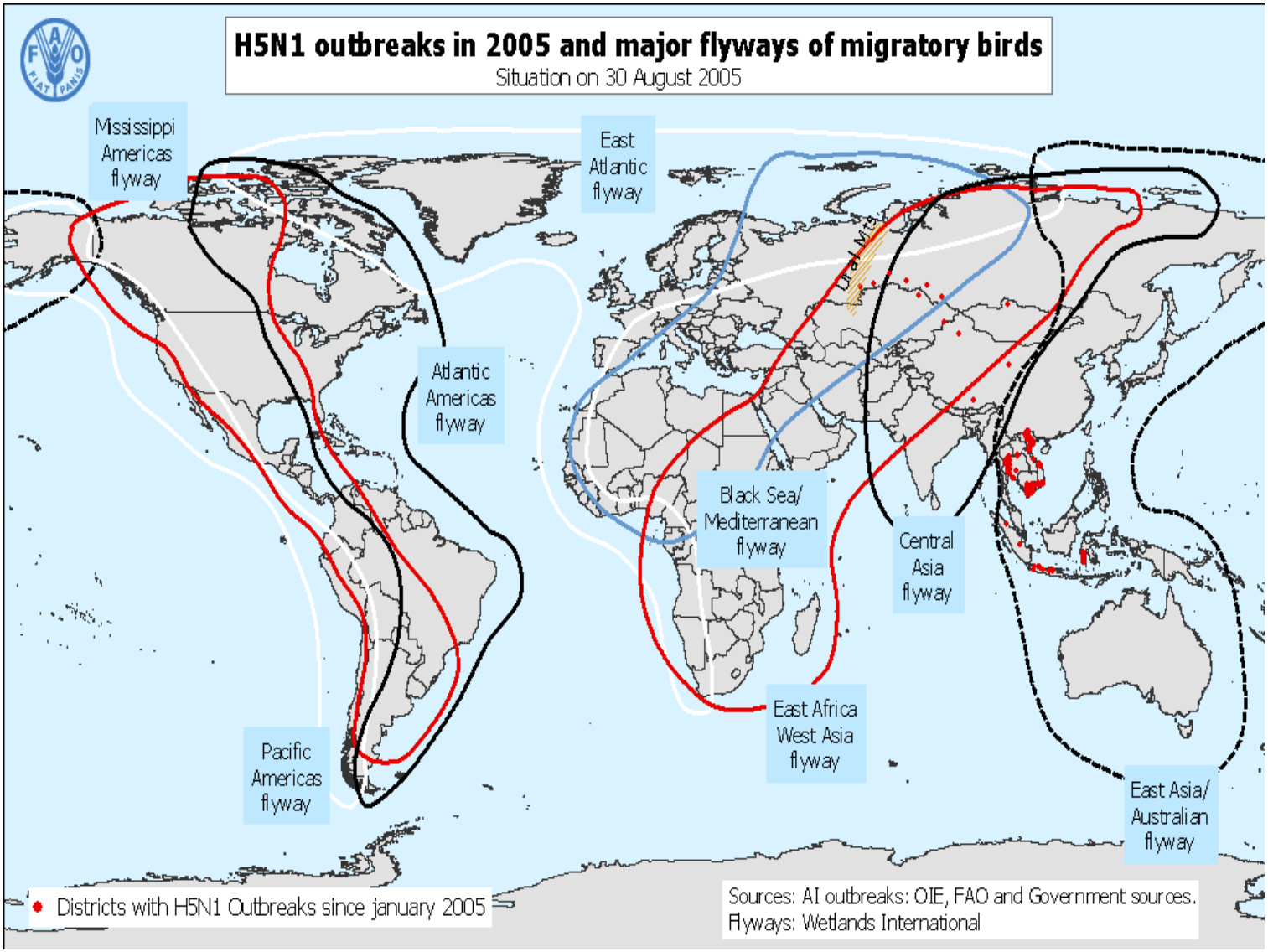

Figure 2: HPAI outbreaks in 2005 and major flyways of migratory birds (FAO)

1.Abia
2.Adamwa
3.Akwa Ibom
4.Anambra
5.Bauchi
6.Bayelsa
7.Benue
8.Borno
9.Cross River
10.Delta
11.Ebonyi
12.Edo
13.Ekiti
14.Enugu
15.Gombe
16.Imo
17.Jigawa
18.Kaduna
19.Kano
20.Katsina
21.Kebbi
22.Kogi
23.Kwara
24.Lagos
25.Nassarawa
26.Niger
27.Ogun
28.Ondo
29.Osun
30.Oyo
31.Plateau
32.Rivers
33.Sokoto
34. Taraba
35.Yobe
36.Zamfara
37.Abuja FCT

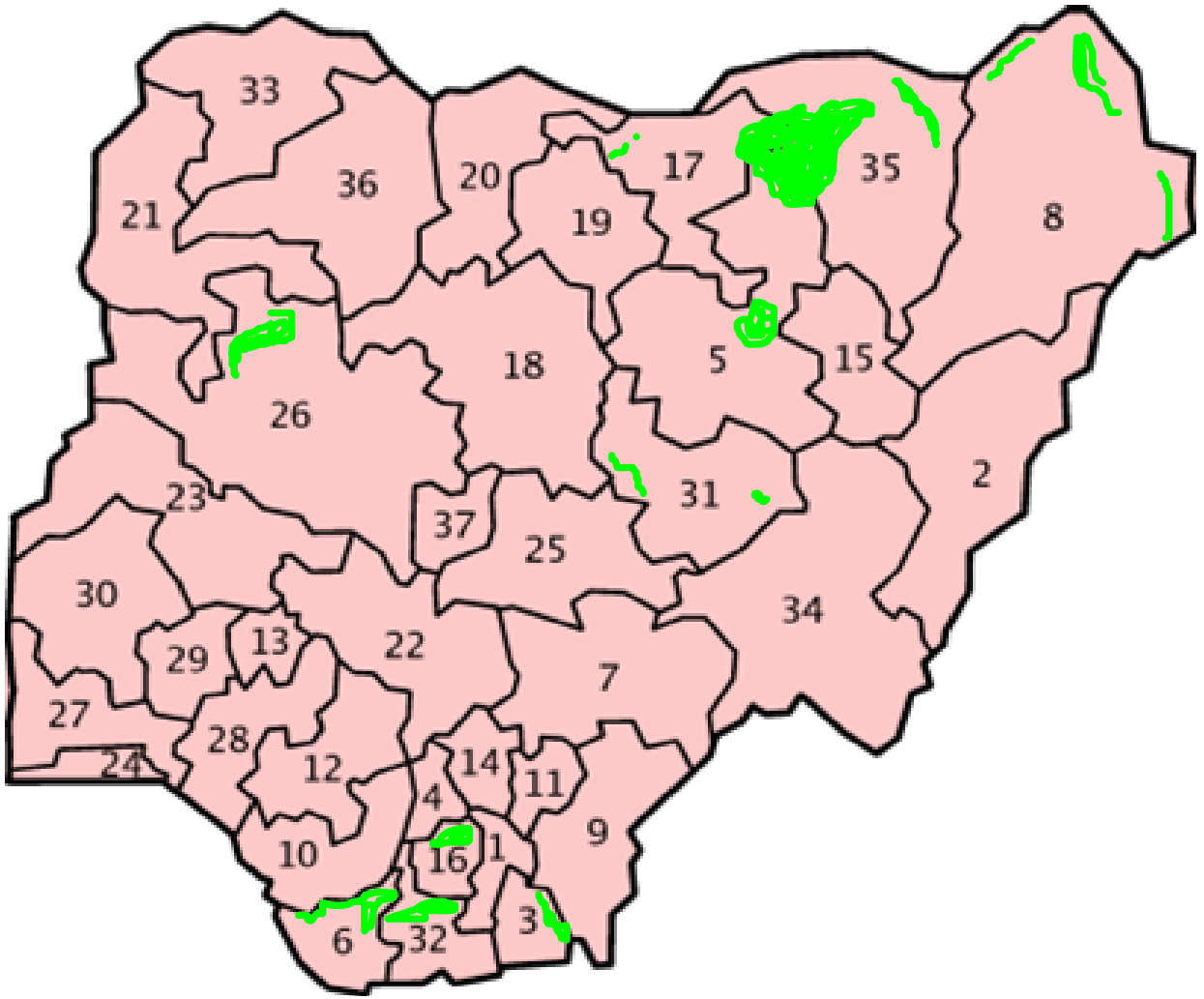

Figure 3: Map of Nigeria showing identified wetlands (possible nesting sites of Migratory birds)in the country

Figure 4: Picture of a dead migratory bird of prey from Germany found at Makurdi, Benue State.

Figure 5: A picture of a migratory falcon from Finland caught at Sokoto showing leg tags

STRATEGIES FOR THE PREVENTION OF INTRODUCTION OF HIGHLY PATHOGENIC AVIAN INFLUENZA (HPAI) INTO NIGERIA

1. Ban on importation of poultry and poultry products from countries where the disease (HPAI) is known to exist. At present, there is an existing total ban on importation of live birds, poultry products including fertile eggs into the country which needs to be re-examined from time to time with a view to ameliorating the negative impact on the fragile poultry industry without compromising the present HPAI status in the country.

2. An effective animal disease surveillance involving high risk areas such as poultry markets, wet lands and poultry located along known migratory birds routes, poultry abattoirs, borders and targeted farms should be carried out. Results obtained may then be used to assess the need for a complete nationwide HPAI active disease, virus and sero-surveillance to determine epidemiological status of the disease in the country.

3. Improved and functional National Veterinary Quarantine Services (NVQS) including immediate rehabilitation and revitalisation of existing veterinary quarantine infrastructure, control posts and enhanced manpower capabilities. This is to enable a sustained surveillance of animal diseases at the ports of entry in the course of animal/animal products, biologics and germplasm trade. The NVQS service staff should maintain continuous presence at the ports of entry into the country and constitute part of the Joint Intelligence Board (JIB) which should play an active role in HPAI surveillance at the ports.

4. Targeted community based training of rural backyard poultry farmers in various aspects of HPAI recognition and control including biosecurity procedures applicable to rural small scale poultry enterprises and the role of animal disease vigilante in the control of HPAI.

5. Enforcement of the requirement for Import permits for poultry and poultry products issued by the FDLPCS.

6. Development of a traceability mechanism for animals and strict monitoring of movement of poultry and poultry products through registration and licensing of poultry farms, hatcheries and other poultry enterprises.

7. Development of a community based, participatory rural livestock and poultry disease surveillance system and integrating it into the existing epidemio-surveillance network.

8. Training of veterinarians, auxiliaries, other categories of poultry farmers on HPAI prevention and control strategies including aspects of biosecurity.

9. Effective public enlightenment and awareness programmes on HPAI.

EARLY WARNING CONTINGENCY PLANNING FOR HPAI IN NIGERIA

Early warning mechanisms enable rapid detection of the introduction of or sudden increase of the incidence of HPAI before it develops to epidemic proportions and causing serious socio-economic consequences. The mechanisms embrace all initiatives, mainly based on disease surveillance reporting and epidemiological analysis that would lead to improved awareness and knowledge of the distribution and behaviour of HPAI and that allow for both forward and back tracing of HPAI outbreaks and monitoring of the effectiveness of disease control campaigns.

HPAI SPECIALIST DIAGNOSTIC TEAMS (SDT)

Six groups of HPAI expert diagnostic teams based at NVRI, VTHs at ABU, Ibadan Maiduguri, Sokoto and Nsukka would be charged with investigating reported suspected cases of HPAI. Each team would comprise of poultry/veterinary virologist, poultry/veterinary epidemiologist poultry/veterinary pathologist, experienced poultry clinician as well as an experienced veterinary laboratory diagnostician.

The specialist diagnostic team (SDT) would be expected to:

- Make clinical examinations
- Collect histories
- Make preliminary investigations
- Collect a range of diagnostic specimens both specifically for HPAI and for any other diseases that might be included in the differential diagnosis.

The team will travel to the site of the suspected outbreak with the representative of the DVS and/or the local veterinary officer. The team should also have the authority in consultation with the field veterinarian to take immediate disease control actions that are necessary at the outbreak site. They should also be empowered to provide any immediate instructions to the local animal health official.

Samples for laboratory examinations should be collected in sufficient quantities to enable the designated laboratory to send some of the samples to the NVRI who when required would be expected to send some of these to the Regional and World Reference laboratories for confirmation. It is highly recommended that the final confirmatory laboratory result be released through the Executive Director NVRI to the Director FDLPCS.

National Animal Disease Surveillance and Information system

A national animal disease surveillance system is being developed by the Pan-African Programme for the Control of Epizootics (PACE) project and the National Special Programme for Food Security (NSPFS). Under the PACE, an active Epidemio-surveillance network has been established with trained agents located at 170 points all over the country including Livestock markets, control posts and abattoirs (see map). The project has also enhanced and streamlined passive surveillance disease

reporting through state veterinary services. In addition 109 NSPFS animal health service providers, mainly paraveterinary and some professional veterinarians one at each site are involved in disease surveillance and reporting. These networks would be involved in HPAI surveillance and reporting and plans are being made to increase the capacities of these reporting systems. It is being recommended therefore that HPAI diagnosis and control should feature prominently and with adequate funding in the animal diseases and transboundary pest control programme of the NSPFS.

The possibility of TCP on HPAI surveillance and control in Nigeria should be explored from relevant bodies such as FAO, IAEA, WHO and OIE. Collaborative linkages with Federal Ministry of Health should be strengthened in line with the current global trends.

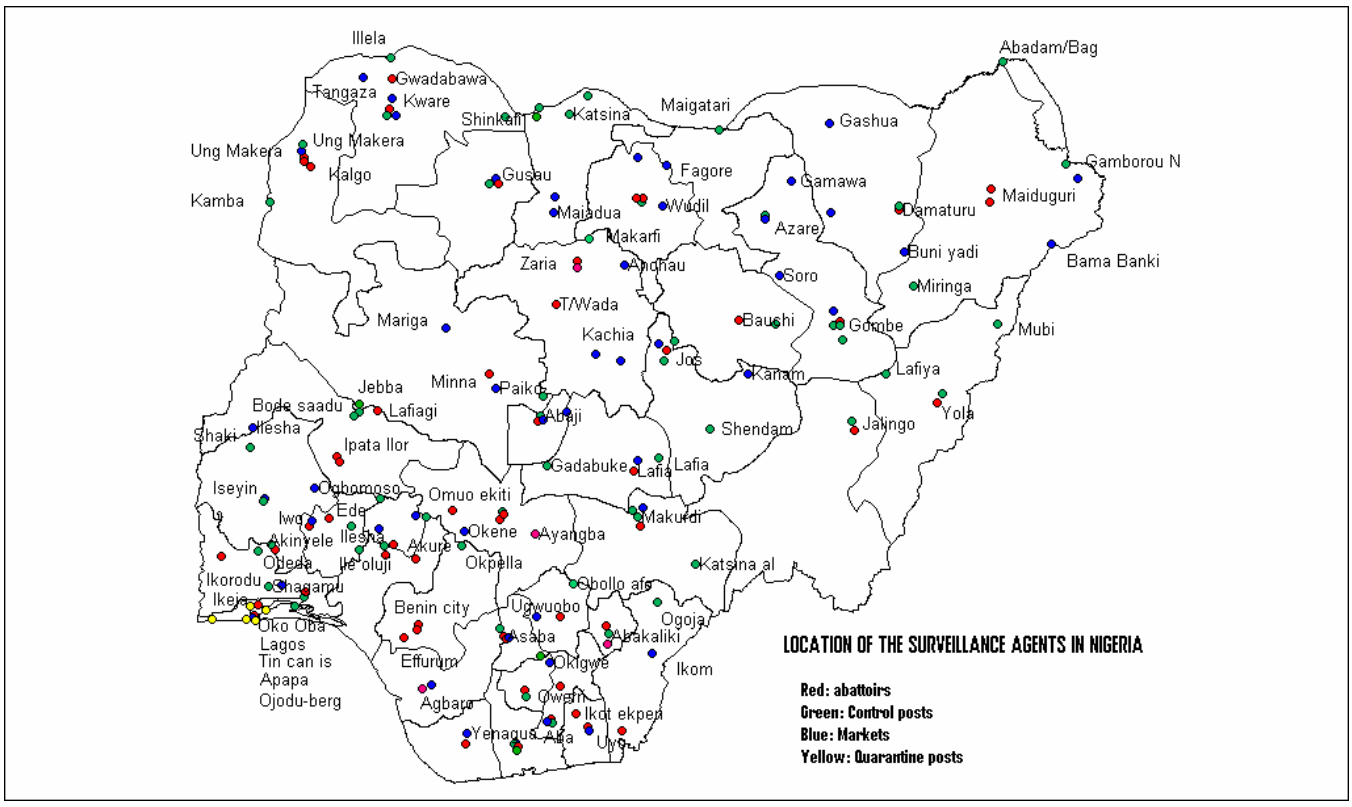

Figure 6: Map of Nigeria showing the locations of the PACE Epidemio-surveillance agents

EARLY REACTION CONTINGENCY PLANNING FOR HPAI IN NIGERIA

LABORATORY DIAGNOSTIC CAPABILITIES

The existing laboratories that have been earmarked to carry out diagnosis of HPAI in the country are: NVRI, VTHs at Zaria, Ibadan, Maiduguri, Nsukka and Sokoto. Each of these laboratories should have the capacity to carry out screening direct antigen detection tests, immunoflourescence test and serological tests for antibody detection. The NVRI would be expected to carry out virus isolation and identification and any other isolate characterisation. It is also highly desirable for samples to be sent to the Regional and World Reference laboratories for HPAI as part of the prescribed global laboratory networking for HPAI diagnosis and control. Other suggested laboratory diagnostic networking should include laboratories in neighbouring countries and the West African sub region.

The prospect for Technical Cooperation Project (TCP) to enhance our HPAI diagnostic capacity should be explored with both FAO, WHO, IAEA and OIE.

Table 1: Suggested testing protocols for HPAI diagnosis for laboratories in Nigeria:

Test	NVRI	ABU	Ibadan	Nsukka	Sokoto	Maiduguri
Screening tests						
Immunoflourescence	+	+	+	+	+	+
Directigen^{TM} FluA	+	+	+	+	+	+
Confirmatory tests						
Virus isolation and identification	+	N	N	N	N	N
Reverse Transcriptase Polymerase Chain Reaction (RTPCR)	+	+	+	+	+	+
Virus characterisation						
Haemaglutinin typing	+	N	N	N	N	N
Neuraminidase typing	+	N	N	N	N	N
Gene sequence, detection and analysis	+	N	N	N	N	N
Serological tests						
HIT	+	+	+	+	+	+
AGID	+	+	+	+	+	+
c-ELISA	+	+	+	+	+	+
DIVA	+	+	+	+	+	+

Key: + = Recommended
N= Not recommended

Recommended action on laboratories:

The following interventions are needed based on the recommendations above to enable the laboratories discharge their assigned duties:

- Upgrading the diagnostic capacity of the six designated laboratories
- Procurement of diagnostic reagents and kits ahead of any outbreak
- Standardisation of tests and interpretation of results
- Training for laboratory staff in diagnosis of HPAI (may require international cooperation) – training should involve neighbouring countries
- Networking with designated laboratories in the West African sub region and other World reference laboratories.

RESOURCE PLAN FOR HPAI CONTROL IN NIGERIA

Inter-Ministerial Committee on HPAI control

There is in existence an InterMinisterial Committee on HPAI with the Honourable Minister of Health as Chairman. Other members of the committee are:

- Hon. Minister of Agriculture
- Hon Minister of Finance
- Hon Minister of Science and Technology
- Majority leader of the Senate
- Leader of House of Representative
- Representatives of FAO, WHO, UNDP
- Director General of State Security Services.

Animal Disease Emergency Committee

It is recommended that a National Animal Disease Emergency Committee (NADEC) charged with control of TADs including HPAI emergencies be established. The committee, under the chairmanship of the Minister of Agriculture and Rural Development, will comprise of the following:

- Hon. Minister of Agriculture and Rural Development;
- Director of FDL&PCS;
- Six selected State Directors of Veterinary Services representing the six agro-ecological zones of the country;
- Executive Director of NVRI;
- The Conservator General of the National Parks;
- Hon. Minister of Health
- Representatives of Ministries responsible for Finance and Planning
- Inspector General of Police
- Comptroller General of Customs
- Director General of NEMA;
- President of Veterinary Council of Nigeria (VCN);
- President of the NVMA;
- Representatives of Poultry Association of Nigeria (PAN).

National Animal Disease Control Centre (NADCC)

The NADC centre should be in the office of the Director of FDLPCS/NADIS. The center is expected to coordinate disease control activities during HPAI emergency.

Local Animal Disease Control Centre (LADCC)

The LADC will be in the office of the Local Veterinary Officer or Local Government Headquarters nearest to the site of the HPAI outbreak/emergency.

OVERALL POLICY FOR HPAI EMERGENCY IN NIGERIA

To date there is no documented evidence of HPAI disease in Nigeria. The epidemiological features of the disease mentioned earlier coupled with the fact that the risk of introduction can be considered as moderate to high while the risk of sustenance and maintenance may be ranked as very high. Therefore the overall policy for HPAI emergency Nigeria should be to restrict the disease to the primary foci, eradicate the disease in the shortest possible period and limit the economic and public health impact using a combination of measures.

These include two possible scenarios:

1. Where the disease is discovered in limited populations and has not spread beyond the immediate vicinity.

The recommended action should be:

- Modified stamping out which involves quarantine and slaughter of infected poultry with full compensation;
- Sanitary disposal of destroyed poultry and contaminated poultry products according to standard operating procedures;
- Quarantine and movement control on poultry and poultry products in the infected areas or zone;
- Decontamination of facilities, products and equipment to eliminate the virus on infected premises and prevent spread to other areas;
- Active disease surveillance to determine the source and extent of the infection;
- Effective public awareness campaign to elicit cooperation from large scale commercial and back yard poultry owners.

2. Where modified stamping out failed and HPAI becomes established in the country, a different policy involving the under listed would be adopted:

- Ring or Mass Vaccination of poultry as the case may be;
- Movement restriction of poultry and poultry products;
- Depopulation of clinically infected farms with payment of compensation;
- Sanitary disposal of dead and destroyed poultry and contaminated poultry products according to standard operating procedures;
- Disinfection and decontamination of affected premises according to the standard operating procedures;
- Active disease surveillance to determine the source and extent of the infection;
- Effective public awareness campaign to elicit cooperation from large scale commercial and back yard poultry owners.

ACTION PLAN FOR HPAI CONTROL IN NIGERIA

This action plan is a set of instructions covering various aspects of the control to be implemented and actions to be taken during HPAI emergency in Nigeria from when the disease is first suspected up to its final control. It identifies lines of communication between poultry farmers/owners and field and government veterinary services and tries to ensure a short command chain with regard to reactions during HPAI emergency.

Investigation Phase

The investigation phase is said to exist when a report with low probability of being HPAI is received by the Veterinary Services. It should be a legal obligation of any citizen suspecting the presence of HPAI to report that suspicion to a member of the Local Government/State Veterinary or Animal Health Services.

In essence, a suspicious index case is most likely to be reported to the Veterinary Services by:

- private veterinary practitioner,
- poultry farmer/ owner,
- Wildlife or Park rangers,
- animal health/ extension officers,
- surveillance agents/animal health service provider,
- community leader.

The Local Government Veterinary Officer (LGVO);

On receipt of such information, the LGVO should immediately carry out investigations and collect such necessary information as:

- location of index case/cases,
- clinical and epidemiological features,
- collect specimens that may aid diagnosis,
- impose such immediate movement restrictions as are within his power if there are sufficient grounds to suspect HPAI
- inform the State Director of Veterinary Services (SDVS) and the PACE Zonal Coordinating Officer who should similarly inform the Director, Federal Department of Livestock and Pest Control Services (DFDL&PCS) and the PACE/NADIS Coordination officer.
- dispatch any collected samples to the nearest designated National Laboratory for HPAI diagnosis.

On receipt of information from the LGVO, the SDVS should:

- analyze the information provided by the LGVO and carry out further investigations,
- take further steps to limit possible spread,
- advise DFDL&PCS on the outcome of investigation and likelihood of confirmation of HPAI

- advise the LGVO to declare false alarm and therefore winding-down of operations or progression to the Alert phase.

Alert phase

If clinical and epidemiological results are highly indicative of HPAI,

The Director Federal Department of Livestock and Pest Control Services (DFDL&PCS) should:

- instruct the SDVS to coordinate all control activities during the emergency period.
- inform the Director, National Veterinary Research Institute and request dispatch of the HPAI Specialist Diagnostic team,
- inform the Minister of Health Police, Customs, Immigrations and the Army about the suspected HPAI disease, and in consultation with the FMA convene meeting of the National animal disease emergency committee

The State Director of Veterinary Services (SDVS) should:

- instruct the LGVO to monitor the farm/premises and enforce live poultry and susceptible animal movement restrictions,
- ensure that the equipment and materials needed by various teams are available,
- delineate the various control zones on the advice of the LGVO.

The Local Government Veterinary Officer (LGVO) should:

- accompany the HPAI Specialist Diagnostic team to the infected site/s for detailed investigations,
- secure adequate supplies for the team to carry out all necessary investigations,
- brief the HPAI Specialist Diagnostic team in advance, providing as much detailed information as may be needed by the team,
- supervise disinfection of personnel and materials after investigations before leaving the infected premises.
- take steps to immediately carry out safe disposal of dead poultry and decontamination,

The HPAI Specialist Diagnostic Team

Following adequate briefing by the LGVO, the Specialist Diagnostic team should:

- proceed to the infected area/premises,
- conduct detailed clinical examination of as many affected poultry as would be needed to arrive at clinical diagnosis,
- collect epidemiological information and carry out forward and backward tracing to determine possible origin of the disease,
- collect as many specimens as possible, package, label and dispatch the

samples to the relevant national and/or the nearest designated laboratory for HPAI diagnosis,
- report findings to the Executive Director NVRI and the DFDL&PCS.

The epidemiological report from a primary outbreak by the Specialist Diagnostic team should describe:

- the situation on the infected premises,
- the number, type and species of poultry and other susceptible animals;
- the method of husbandry;
- the number of dead and clinically affected poultry,
- the size and location of the premises/flock, and its relationships with other poultry farms as well as poultry markets;
- the recent movements (live poultry, poultry products, equipment and personnel) on and off the farm;
- the possible origin and the date of the introduction of infection,
- the likely duration of infection on the premises/flock;
- the farms/poultry enterprises most at risk from spread by movements;
- any other information that the team may find relevant.

Operational phase

The operational phase is initiated when HPAI occurrence has been confirmed and the Director Federal Department of Livestock and Pest Control Services (DFDL&PCS) declares HPAI emergency and activates the HPAI emergency plans. This information should then be sent to the Directors of Veterinary services of neighbouring countries, and global authorities such as the OIE, FAO-EMPRES, AU-IBAR and relevant regional HPAI control organization.

Various teams in the state veterinary services would be expected to go into operation as listed below:

Stamping out, safe disposal of carcasses and decontamination.

Infected premises Team

This team will be expected to carry out proper disposal of carcasses of dead poultry that died of the disease as well as decontamination in the infected zone.
Disposal of carcasses will be in accordance with standard operating procedures. Decontamination of vehicles, equipment and animal houses should equally be carried out according to the standard operating procedures.

Disease surveillance teams
At least, two teams would be required for repeated active disease search and sero-surveillance one in the infected and the other team in the surveillance zone.

Stand-down phase
This phase may exist when HPAI is not confirmed as well as when the disease is confirmed. When investigations carried out during the alert phase fail to confirm the

disease, the LGVO on the instructions of the SDVS must notify all organizations and persons who had been informed of suspected HPAI occurrence and possible emergency that the situation had ceased to exist.

On the other hand, if HPAI was confirmed, stand-down phase begins as soon as all necessary operations for containment, control and elimination are completed to the satisfaction of the DFDL&PCS. Winding-down operations should not be unduly delayed but must be systematic, gradual and supervised by the State Government Veterinary Officers.

ACTION PLAN AGAINST HIGHLY PATHOGENIC AVIAN INFLUENZA (HPAI)

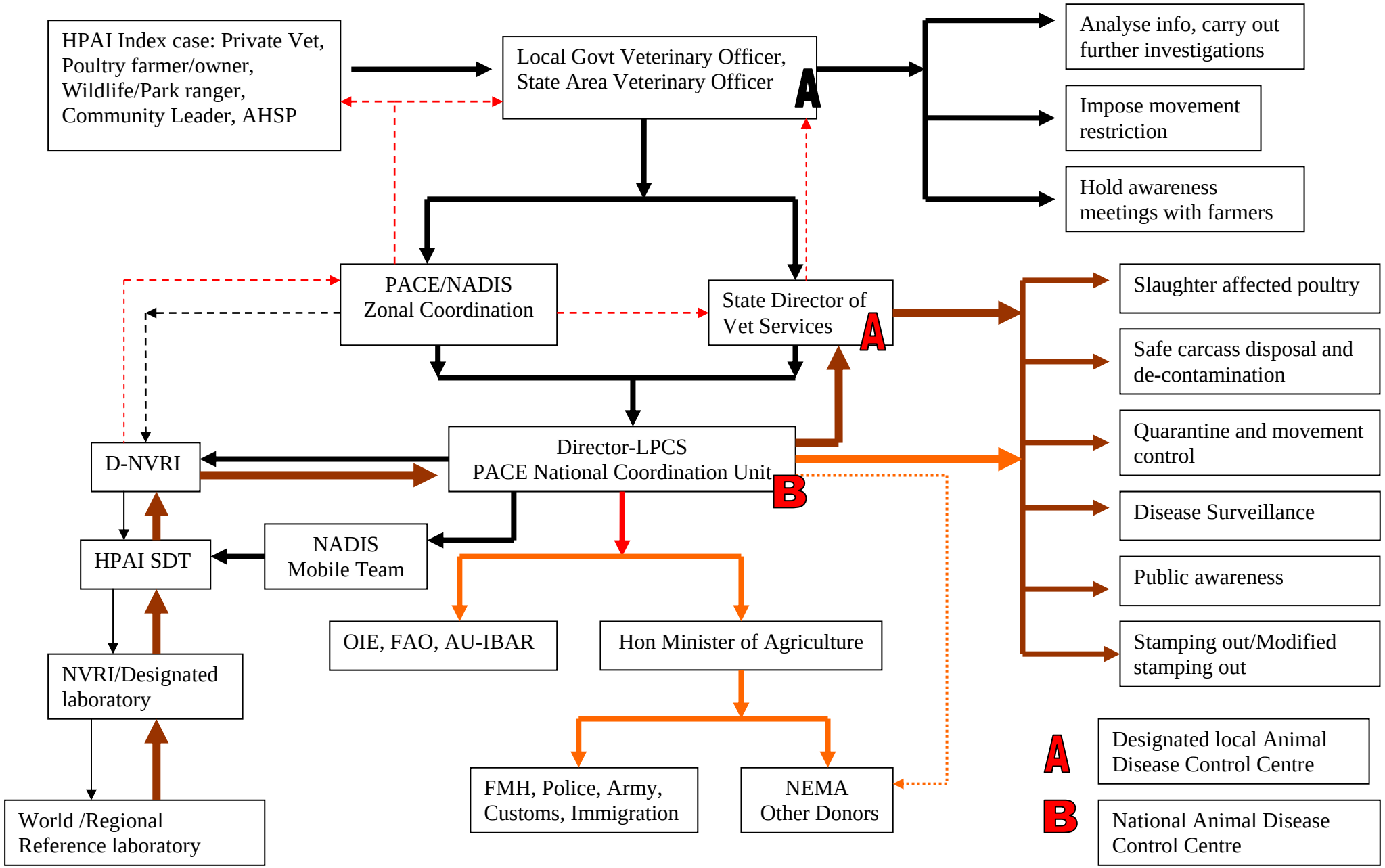

Table 2: COSTINGS AND BUDGET PROPOSAL FOR HPAI EMERGENCY PREPAREDNESS AND RESPONSE

SN	ACTIVITY	RESPONSIBLE	EXPECTED OUTPUT/OUTCOME	TIME FRAME (2006/07)					COST
				Q1	Q2	Q3	Q4	Q1	
1.	International and regional initiatives, travels and technical exchange programmes	FMARD, FAO, OIE, NEPAD, AU, ECOWAS	Harmonization of global plan of action Technical and manpower development Exchange of information		X	X	X	X	N 10.0m
2	Establishment and meetings of inter- ministerial committee and intersectoral linkages	FMARD, FMOH, FMST, FMF and other stakeholders	Development of national policy and integration of intersectoral plan of action	X	X			X	N 1.5m
3	Establishment and meetings of Livestock sector expert committee on HPAI, and Coordination meetings with stakeholders.	FDL&PCS, NVRI NAPRI, PAN, VCN NSPFS and other stakeholders	National Animal Disease Emergency Committee established Technical committee of experts on HPAI established; strategy action plan on HPAI developed.	X	X	X	X	X	N 5.0m
4	Development of technical guidelines	FDLPCS, FAO	Operational guidelines/procedures standardized and mass produced.	X	X				N 7.0m

5	Training for AH staff, Poultry farmers and public awareness programmes on HPAI	FDLPCS, NEMA, FAO, USAID, DFID, OIE, EU, PAN	Improved capacity for HPAI recognition and control; Participatory rural epidemiology established	X	X	X	X	X	N 20.0m
6	Targeted disease, virus and sero-surveillance livestock/poultry	FDLPCS, NVRI, designated VTHs, FAO, SDVS, LGAs, WHO	Status of HPAI in Nigeria defined	X	X	X	X	X	N 80m
7	Strengthening of designated diagnostic laboratories *******	FDLPCS, NVRI, USAID,FAO, OIE, EU, IAEA, Private sector partners	Improved capacity and capability for designated laboratories for HPAI surveillance and diagnosis.	X	X	X	X	X	N 400.0m
8	Research on HPAI virus and disease including vaccine development	FDLPCS, NVRI, IAEA, OIE, Vet Faculties, FMST, WHO, FAO, USAID, CIDA, DFID, EU, World Bank, (PAN) & other private sector partners	Scientific information needed for the prevention and effective control of avian influenza provided	X	X	X	X	X	N 100.0m
9	Strengthening of Veterinary quarantine infrastructure including manpower	FDLPCS,FAO, NSPFS, World Bank, OIE, WHO	Improved and functional animal diseases quarantine services for prevention of HPAI and other TADs incursion	X	X	X	X	X	N 100.0m

10	Vaccine procurement (20,000 doses/annum)	FDLPCS, FAO, OIE, AU-IBAR, PAN.	Regional Vaccine Bank established and easy access by the country assured in any emergency		X	X	X	X	$400,000.0
11	Simulation exercises and drills	FDLPCS, Tech expert Committee on HPAI	Functional HPAI emergency plan achieved	X	X	X	X	X	N 2.0m
12	Stamping out of affected poultry population with compensation	FDLPCS, SDVS, PAN, NAIC, NEMA.	HPAI disease and infection eliminated.	X	X	X	X	X	N 200.0m
	TOTAL	**LOCAL CONTENT = ~~₦~~ 905.5 MILLION** **FOREIGN CONTENT = $400,000 USD**							

***** Funding from government and donor agencies.**