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YEMEN

NATIONAL AVIAN INFLUENZA ACTION PLAN (OUTBREAK RESPONSE PREPAREDNESS)

REPUBLIC OF YEMEN AVIAN INFLUENZA PROTECTION
PROGRAM



MAY 2006

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DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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ACRONYMS AND ABBREVIATIONS

AI	Avian Influenza
AGID	Agar Gel Immuno-Diffusion
CVL	Central Veterinary Laboratory
DGAR	Directorate General for Animal resources
ELISA	Enzyme-Linked Immunosorbent Assay
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GOY	Government of Yemen
GPS	Global Positioning System
HAI	Hemagglutination Inhibition
HCAI	High Committee for Avian Influenza
HPAI	Highly Pathogenic Avian Influenza
HQ	Headquarters
IFA	Immuno-Fluorescence Assay
IT	Information Technology
km	kilometers
LBM	Live Bird Market
MAI	Ministry of Agriculture and Irrigation
MPHP	Ministry of Public Health and Population
NAIAP	National Avian Influenza Action Plan
NDV	Newcastle Disease
NGO	Nongovernmental Organization
OIE	<i>Office International des Épidémiologies</i>
PCR	Polymerase Chain Reaction
PPE	Personal Protective Equipment
RT-PCR	Reverse Transcriptase- Polymerase Chain Reaction
RRT-PCR	Real-time Reverse Transcriptase- Polymerase Chain Reaction
RVF	Rift Valley Fever
SPF	Specific-Pathogen-Free
SWOT	Strengths, Weaknesses, Opportunities and Threats
TC	Technical Committee
USAID	United States Agency for International Development
WHO	World Health Organization
YASP-ARD	Yemen Agricultural Support Program- ARD, Inc.

PART I. TECHNICAL SUMMARY REPORT

I.0 OVERVIEW

The Technical Summary Report (Part One) represents the mission report prepared by the ARD consultant, Dr. Noel L. J. Miranda, and provides a technical brief of major activities accomplished during the mission. The purpose of the mission was to assist the Government of Yemen (GOY) in synthesizing their National Avian Influenza Action Plan (NAIAP). The assignment covered the period April 19 to May 6, 2006. A full description of the technical assistance activities is found in the adjoining report (Part Two), entitled National Avian Influenza Action Plan; and recommendations for GOY response and further actions follow in Part Three.

I.1 SCOPE OF WORK

The Scope of Work directed the consultant to accomplish the following tasks and deliverables:

- Review the plans and documents related to avian influenza (AI) planning and emergency action policy in Yemen. Review documentation regarding AI outbreaks in the region.
- Hold discussions with the Ministry of Agriculture and Irrigation (MAI), Ministry of Public Health and Population (MPHP), Ministry of Planning and other related authorities to determine the areas of weakness in the (current) AI Emergency Preparedness Plan and the need to improve the capacity of the disease surveillance and laboratory diagnosis for MAI.
- Conduct a SWOT (strengths, weaknesses, opportunities and threats) analysis of existing emergency preparedness.
- Organize and conduct workshop/training for local staff of MAI and private sector on Highly Pathogenic Avian Influenza (HPAI) surveillance, monitoring, prevention strategies and ensure quality and uniform data collection and recording.
- Process outputs from literature review and workshop into draft HPAI Action Plan for the GOY including specific steps to be taken when HPAI is detected in Yemen.
- Draft initial report summarizing preliminary findings, and recommendation inclusive of relevant attachments.

I.2 DELIVERABLES

- Detailed Work Plan for carrying out the HPAI Emergency Response Assessment and Outline for Final Report. **Draft completed prior to consultant's arrival in country and finalized with GOY counterparts first week in country.**
- Organize and conduct one workshop/training for public and private stakeholders. **Workshop completed April 24-26, 2006.**
- Prepare preliminary draft HPAI Action Plan and Report for the Yemen Agricultural Support Program-ARD (YASP-ARD), USAID and GOY while in country. **Draft National Avian Influenza Action Plan completed with GOY counterparts and shared during out-briefing with GOY and USAID on May 6, 2006.**

- Make oral presentations to USAID and the GOY key stakeholders. The presentation should include preliminary findings and plausible recommendations. **Oral debriefings made to GOY and USAID on May 2, 2006.**
- Final draft HPAI Action Plan and Report submitted to ARD within 10 days of return to point of origin. **Draft National Avian Influenza Action Plan completed and submitted to ARD for USAID branding May 17, 2006.**

1.3 BACKGROUND

The Government of Yemen, mainly through its Ministry of Agriculture and Irrigation, started to address the threat of avian influenza—particularly to its growing poultry industry—in 2004, during which Cabinet Decree No. 48 relating to the Protection Measures to Avoid Entry of AI to the Country, was issued. Further to this, in October 2005, another Cabinet Decree, No. 329, relating to Practicing the Necessary Measures for Bird Flu Prevention, was issued, and set into action a series of activities and planning, which generated a number of documents (detailed below), and initiated capacity-building efforts—particularly in the area of AI surveillance and diagnosis.

The Director General of Animal Resources (DGAR) at the MAI then attempted to prepare the AI outbreak contingency plan. This plan was mainly based on available documents from various sources, including plans of other countries. The Technical Committee (TC) within the MAI Operation Room reviewed this plan and concluded that it needed essential inputs from an experienced international specialist, which the GOY recognized to be lacking within their national expertise. A clearer vision of how an effective AI outbreak response shall be carried out was required.

The MAI requested the necessary technical assistance in the development of an emergency action plan from USAID, against the eventuality of the HPAI H5N1 virus being introduced into the country. The goal of the National Avian Influenza Action Plan is to take into account the threat from migratory birds within Yemen and the region, and the need to strengthen capacities for HPAI field surveillance and laboratory diagnosis. A well formulated NAIAP would help to strengthen the early warning surveillance system, as well as the emergency response system to contain a HPAI outbreak, should it occur.

An AI action planning expert was contracted to provide the needed technical assistance, and worked closely with a team of local consultants and experts from the MAI and private poultry sector. This assistance was coordinated by the USAID-funded Yemen Agricultural Support Program being implemented by ARD, Inc. in Sana'a.



The Yemen Agricultural Support Program Team.

2.0 ACTIVITIES AND FINDINGS

The consultant followed a prearranged work plan (see Chapter 3 of this section), with minor adjustments as necessary, in providing technical assistance.

2.1 REVIEW OF PLANS AND DOCUMENTS RELATED TO AVIAN INFLUENZA PLANNING AND EMERGENCY ACTION POLICY IN YEMEN

The existing plans and documents relevant to the GOY AI preparedness were obtained through ARD prior to the consultant's arrival in country. Once the consultant arrived in Yemen, additional documents and information were provided by the DGAR-MAI. The main documents included:

- **National Avian Influenza Prevention Activities:** This document describes the composition of the High Committee for Avian Influenza (HCAI) and the Operation Room under the MAI, formed through the issuance of Ministerial Resolution No. 67, in 2005. It further describes the designation and tasking of surveillance teams at the headquarters (HQ) in Sana'a and governorate level, the tasking of the Central Veterinary Laboratory (CVL) and Extension and Information team at HQ, and the available veterinary and para-veterinary professional resources. The document provides general notes on the weaknesses in the command, coordination and decision-making structures; in the national and regional surveillance and diagnostic facility and staff capacities; in conducting village extension services; and in completing the preparation of the National Avian Influenza Action Plan. The NAIAP indicates the specific elements to be described in preventive and outbreak response functional areas, such as specific personnel and their training needs; specific facility, equipment and materials/supplies needs; and specific command and coordination structures.
- **Emergency Plan of Action: Bird Flu Precautionary Measures:** This document describes the initial intended response to be undertaken by the GOY as of October 22, 2005. It further provides a situational analysis of the risk of AI introduction and spread, enumerates the activities to be implemented separately by the MAI and the MPHP under the supervision of the HCAI and the respective ministerial technical committees, and presents the general budget relating to each general activity. The initial activities under the MAI described in this document were superseded by a more recent plan referred to as the Preventative Measures Plan for Dealing with Expected Avian Influenza for January-June 2006, prepared by the MAI, which is described below.
- **Preventative Measures Plan for Dealing with Expected Avian Influenza for January-June 2006:** This is a more detailed document further describing the elements, and their implementation mechanisms and human resource requirements, in the general preventive activities to be carried out under the MAI. These elements include import restrictions and quarantine; intensive surveillance; migratory bird monitoring; establishment of poultry-free areas near migratory bird sites; enhancement of health and biosecurity awareness among farmers and villagers; requests for technical cooperation and funding support from international organizations; strengthening of the capacity of the CVL; and finalization of the NAIAP.

- **Preventive Strategy of Avian Influenza in Case of its Confirmation:** This is the first attempt to document the strategy in case the presence of AI (H5N1) in the country has been confirmed (i.e., the AI outbreak response). It outlines the implementing mechanisms of the major elements in an AI outbreak response, including zoning, stamping out, animal movement control, vaccination, disinfection, and enhanced surveillance.
- **Rapid Assessment: On Yemen Preparedness and Capabilities to Respond and Contain the Avian Influenza, April 8, 2006:** This document details the situation of the poultry sector, the various veterinary service capacities, poultry marketing, the regulatory framework for livestock management and health protection, and the current status of AI in Yemen including the existing capacity for addressing AI and related recommendations.
- **Ministerial Resolution No. 67 ... that is pursuant to Cabinet Resolution No. 329 for the year 2005.**
- **Proposal for Urgent Assistance in the Field of Avian Influenza Laboratory Surveillance:** This is a proposal detailing the capacity-strengthening needs of the CVL in relation to AI.

Other documents revealed the current state of affairs on the GOY's efforts in addressing AI prevention and control in Yemen. It is noteworthy that the GOY has undertaken, over a period of six months, a series of efforts to seriously address AI. These activities show a progressive evolution in their consideration of the scope of activities, with presentation of some of the weaknesses and threats to their planning and present functional structures and capacities, and various recommendations worthy of closer attention. Their recognition of their limitations to come up with a detailed and functional AI Action Plan had in fact led them to this stage of further planning and preparation for inclusion of specific mechanisms, strategies, and resources needs in their response. A significant portion of these essential inputs were generated in the series of discussions and workshops held from April 23-29, 2006 through the technical support of YASP-ARD (refer to the National AI Action Plan dated May 2006 in Part Two of this report).

2.2 DISCUSSIONS TO DETERMINE THE GAPS IN CURRENT AI EMERGENCY PREPAREDNESS PLAN AND THE NEED TO IMPROVE THE CAPACITY OF THE DISEASE SURVEILLANCE AND LABORATORY DIAGNOSIS FOR MAI

The consultant held four separate meetings with the Technical Committee (TC) under the Operation Room of the MAI on two occasions before the workshop (April 22 and 23) and on two occasions after the workshop (April 27 and 29). The first and second meetings with the TC identified the weaknesses (gaps) in the current AI Emergency Preparedness Plan which were then given emphasis during the workshop sessions.

The consultant also meet with Dr. Monsoor, head of the CVL, who explained the current situation, AI surveillance and testing, and the plans and needs for capacity building. A tour of the laboratories was provided, with details of the planned restructuring of the laboratory to conform to the functional requirements of AI testing.

A meeting was also held with the Minister of Agriculture and Irrigation, Mr. Jalal Ibrahim Faqeerah, on April 22. The main topics the Minister focused on were issues regarding the avian influenza workshop and the deliverables expected of the consultant.

Findings. The weaknesses identified included the lack of specific systems and coordination structures: strategies, mechanisms, capacity building (facility, methods, trainings); prioritization and specific resources needs for AI surveillance; monitoring and diagnosis (reporting and sample submission and testing channels--down to grassroots level, AI antigen detection capability such as by Immuno-Fluoresense Assay [IFA] in the CVL and regionally); regulatory framework and enhanced enforcement (especially control of live bird trade and marketing); and functional AI outbreak response (zoning/comparmentalization, stamping out, farmer's

compensation, safe stamping out practices, vaccination strategies). Additional emphasis must be placed on information and education campaigns for the public and professionals, and on community organization and mobilization.

In the meeting with the Minister of Agriculture and Irrigation, the following were areas further emphasized by the Minister:

1. Evaluation of the Central Veterinary Laboratory must include recommendations for improvement.
2. Specific tasks must be defined and personnel associated with AI surveillance must be trained and equipped to respond quickly.
3. Evaluation of the MAI plan should include disease investigation, and how it can be improved.
4. Actions and clear lines of responsibility must be clearly defined so that quick action will occur if an outbreak is detected. Time is critical once a positive sample is identified. Containment and stamping out must begin immediately or the poultry industry will be compromised.
5. Backyard poultry (*Baladi*) production puts commercial poultry facilities at great risk. Make exclusion zones around commercial production to prohibit backyard poultry production.
6. Locate five strategic regional laboratories to screen samples for the CVL. Regional labs could play a role in strengthening the disease surveillance situation in Yemen. If effective laboratories were positioned at the animal import and export points, neighboring countries would be encouraged to import animals from Yemen again.
7. Ensure all participants in the workshop understand the critical nature of their positions. If they do not act quickly and effectively in the event of an outbreak, the consequences will be catastrophic.

Other gaps became obvious as the assignment progressed, and these are reflected in the outputs of the workshop and contents of the NAIAP.

2.3 STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS (SWOT) ANALYSIS OF THE EMERGENCY PREPAREDNESS

The SWOT analysis was based on technical discussion outputs, personal encounters, literature reviewed and field visits made (see Annex 1 and Chapter 3 of this section). The SWOT were gathered and agreed upon by the Technical Committee of MAI. For the sake of brevity, we have cited the top five in each category. A full list of all the strengths, weaknesses, opportunities and threats can be found in Part Two.

Strengths:

- Veterinary sectors, MAI and GOY are paying attention—as shown by series of meetings held, plans prepared, decrees passed, and the recent holding of training workshop.
- There are interagency Operation Rooms defined and in place.
- Regulation (Law No. 17) on protection of livestock has been issued (but needs to be enforced).
- The GOY has experience from dealing with the Rift Valley Fever (RVF) outbreak in 2000-2001.
- There is a pool of trained Animal Primary Health Care Workers in some remote areas.

Weaknesses:

- Surveillance and diagnostic capacities (no clear AI case definition, cooperation among governorates, complete data, virus isolation and antigen detection tests, sample collection and storage, communication, data management, risk analysis, regional labs) are weak.
- Line of command, especially during an outbreak, is not defined.
- There are a lack of funds or delayed release of funds for such an outbreak.
- There is a need for trained staff in concerned activities and sectors (veterinarians in all districts).
- The regulatory framework needs to be enhanced (formulate the Implementing Rules and Regulations for Livestock Law No. 17).

Opportunities:

- Yemen is still AI free.
- Chicken is the primary poultry and major farms are mostly (95%) situated in a cluster in the highlands (western, central, northern and southern areas) of the country.
- Backyard chicken farming is relatively small at less than 10% of production, and far from migratory bird sites.
- There is no tradition of duck and pig raising (so no mixing with chickens).
- There is no cock fighting and therefore no fighting cocks are kept in villages.

Threats:

- Egypt, a victim of an AI outbreak, is just across the Red Sea.
- Migratory birds frequent the vast coastal areas both in the West and South.
- There is a rich wild bird population in Yemen, including crows.
- About 73% of the population is in rural areas (this encourages low biosecurity practices).
- Poultry production is increasing (7% growth) compared with the growth of human population—some farm areas are dense (e.g., Dhamar).

2.4 WORKSHOP/TRAINING FOR MAI LOCAL STAFF AND PRIVATE SECTOR ON HPAI SURVEILLANCE, MONITORING, AND PREVENTION STRATEGIES

A three-day workshop was organized according to the purposes listed above, following a set program. It was attended by 45 participants, mostly veterinary professionals from the governorates, representatives from concerned government ministries, and representatives from the private (poultry) sector. The focus was on the following priority functional areas of a National AI Action Plan:

- Surveillance, Monitoring and Diagnosis
 - Prevention before, and containment during an AI outbreak (reporting and sample submission and testing channels down to grassroots level, AI antigen detection capability such as by IFA in the CVL and regionally).



A Workshop/Training Session.

- Supportive Regulatory Framework and Enhanced Enforcement
 - Control of chicken movement from farm to market, general biosecurity in farms and markets, controlling live bird marketing (LBM) in general: quarantine and inspections, veterinary officers, registrations, zoning, and sanitation.
- Functional AI Outbreak Emergency Response
 - Aspects of zoning/compartamentalization, stamping out, farmer's compensation, safe stamping out practices, and vaccination strategies.

The three main workshop sessions and concluding discussions were able to generate a significant amount of outputs, which the TC then synthesized during further meetings held on April 27 and 29, 2006. These outputs were embodied in the presentations made by the consultant during his debriefing with USAID and MAI, and shall be reflected accordingly in the National AI Action Plan.

2.5 PROCESS OF LITERATURE REVIEW, WORKSHOP AND VARIOUS OTHER ACTIVITIES INTO A DRAFT (PROPOSED) HPAI ACTION PLAN FOR THE GOY

Refer to Part Two of this report for the National AI Action Plan.

2.6 OTHER ACTIVITIES

The consultant visited several poultry farms on April 20, 27 and 30, 2006. On April 27, he also made a presentation on avian influenza at the meeting of the Yemen Veterinary Association in Dhamar Governorate that was attended by 50 to 60 veterinarians from all practices.

The farm visits revealed the lack of information on AI case recognition and reporting. The low level of biosecurity in the small commercial farms was also noted. Even in a large commercial farm situated in Sana'a, layer chickens were seen to be a bit overcrowded, although higher levels of biosecurity seem to exist. Overall, there is still room for improvements in biosecurity at the farms visited and possibly in educating chicken caretakers on AI recognition and associated risk.

3.0 CONSULTANT ITINERARY, FIELD VISITS AND WORKSHOPS

WORK ITINERARY (BASED ON THE WORK PLAN) FOR THE CONSULTANCY OF NOEL L. J. MIRANDA IN YEMEN (APRIL 18 TO MAY 6, 2006)

April 18 (Arrival/ travel day)

- Arrival in Yemen (at about 4:00 pm)
- Met briefly with the concerned ARD personnel to review the work plan and various mission matters.

April 19

- Met with USAID officers (made PowerPoint presentation).
- Met with MAI officers (Central Veterinarian Lab and Animal Health Department). Toured the laboratory facilities and epidemiology unit.

April 20

- Visited the field (poultry farms around Sana'a).

April 21 (Holiday)

April 22

- Met with the Technical Committee of the MAI (made PowerPoint presentation).
- Met with the MAI Minister.
- Prepared for the workshop.

April 23

- Met with the Technical Committee and discussed gaps in the AI Plan and surveillance and diagnosis.
- Discussed workshop matters—desired outputs.

April 24-26 (Held Workshop with 45 participants: see separate workshop program)

April 27

- Made presentation in Thamar University and conducted field visits in Dhamar and Ibb (see Mission report).

April 28 (Holiday)

April 29

- Had final meeting with the Technical Committee (at Movenpick Hotel):
 - Initiated the SWOT analysis.
 - Finalized the synthesis of the AI Action Plan.

April 30

- Field visit (Marib Farms in Sana'a).

May 1 (Labor day)

May 2

- Debriefing at USAID at 9 am (made PowerPoint presentation).
- Debriefing at the MAI at 11 am with Deputy Minister in attendance (made PowerPoint presentation).

May 3 and 4

- Prepared draft Mission Report and AI Action Plan.

May 5 (Holiday)

May 6 (Departure/travel day)

- Submitted draft Mission Report and AI Action Plan to ARD.
- Made presentation to the High Committee for AI (in the presence of the Ministers of the MAI and the MPHP).

FIELD VISITS

Location	Name of Farm	Type of Farm	Capacity	# of Poultry houses	Diseases	Mortality rate	Notes
Ka'a Al-Gaidi		Layers	16,000	2	ND	24%	
Ka'a Al-Gaidi		Layers	Empty	2			Closed / Disease problems; low biosecurity
University of Thamar/ Vet college							Presentation on AI
Yarim	Hammod Al-Bahry	Layers	70,000	9	ND	12	45 weeks of age

Location	Name of Farm	Type of Farm	Capacity	# of Poultry houses	Diseases	Mortality rate	Notes
Yarin/AIFAO	Many farms						to know the density of farms
Yarim/Khaw	Yehya Al-Galal	Layers	30,000	4	ND	few	51 weeks of age
Yarim	Al-Kohizah	Layers	4 projects	many	DN	few	different ages & looked from outside
Thamak	Slaughter house		3000/H				generally low biosecurity
Al-Rahabah	Marib	Layers	300K	17	ND	few	closed system & feed factory; some overcrowding

WORKSHOP ON AI SURVEILLANCE AND CONTROL, EAGLE HOTEL , SANA'A 24-26 APRIL 2006

Development of the AI Action Plan for Yemen

Sana'a, Eagle Hotel

Day 1 Opening and Presentation

April 24 (AM)

Opening Ceremony will start at **9:00 am to 10:00 am** (with the MAI Minister)

10 :00 am to 1:00 pm

Presentations from the Technical Committees

- Yemen Poultry Industry Data (Dr. Turqi Sarakbi)
- Current situation of disease investigation. (Dr. Sami, MAI)
- MOH- Action Plan and Surveillance System (Dr. Al-Kohlani)
- Action Plan and Current Prevention Measures (Dr. Monsoor, MAI)
- Outbreak of AI (Dr. Najib)

April 24 (PM)

2:00 pm to 4:30pm

Workshop 1: Rapid HPAI Detection/Feedback/Monitoring and Protection of AI-Free State

- Presentations of N. Miranda
 - AI Action Plan: Various Considerations.
 - AI Surveillance and Monitoring N. Miranda.
- Discussion
- This portion will focus on the Surveillance and Disease Monitoring issues, as well as on various measures to protect Yemen from an AI Outbreak

Day 2

April 25 (AM)

9 :00 am to 1:00 pm

Summary presentations on outputs on surveillance and diagnosis, and poultry vaccination

Workshop 2: HPAI Preventive or Spread Reduction Measures

- Presentation
 - Regulations Supportive of AI Control Measures- N. Miranda
- Discussion
- This portion with focus on regulatory and non-regulatory approaches to AI control, the support measures to the general stamping out operation and the relevant command chains (e.g. IEC and community mobilization)

April 25 (PM)

2:00 pm to 4:30pm

Workshop 3: Rapid AI Stamping Out Operation

- Presentation
 - AI Outbreak Control- N. Miranda
 - Safe Procedures During Stamping Out- N. Miranda
 - Public Health Concerns- N. Miranda
- Discussion
- This portion will focus on the stamping out issues including compensation, command chains, veterinary public health considerations

Day 3

April 26 (AM)

9:00 am to 1:00

Summary presentations on outputs on stamping out operations

Presentation (Summary of stamping out requirements and poultry vaccination)-

- N. Miranda

Other Concerns and AI vaccination

- General Situation and Biosecurity and vaccination – Dr. Turkey
- Discussion
- Closing ceremony

April 26 (PM)

Meeting with Technical Committee (MAI) to summarize and synthesize the workshop outputs.

**PART II. NATIONAL
AVIAN INFLUENZA
ACTION PLAN**

I.0 OVERVIEW

Avian influenza (AI) is a zoonotic disease that can be transmitted from wild birds and poultry to people. This not only endangers livelihoods and food security by affecting poultry raised for food, but also compromises human health and survival. Socioeconomic research on the agriculture side has also shown how poultry and livestock can be a major component of the coping strategies of the poor, and the presence of diseases that compromise both these and the modest income generated from the animals of low and even middle income people can have disastrous consequences for the farming communities and growing poultry sector.

Since December 2003, the highly pathogenic avian influenza (HPAI) viruses have swept through poultry populations across several continents. The outbreaks are historically unprecedented in scale and geographical spread. To date, Yemen is among the countries that are yet unaffected by the HPAI that is ravaging the Middle East. The Government of Yemen (GOY) is understandably concerned, as the negative implications for Yemen would be enormous.

This National AI Action Plan (NAIAP) was synthesized through consultative discussions held by the Technical Committee (TC) for Avian Influenza of the Ministry of Agriculture and Irrigation (MAI), with technical inputs from the USAID-funded Yemen Agricultural Support Program (YASP) being implemented by ARD, Inc., a US-based firm. Emphasis was placed on filling the gaps in the existing AI outbreak preparedness by specifying the essential inputs for enhancing AI surveillance, monitoring and diagnosis, AI antigen detection capability, regulatory framework and enforcement, and the functional areas of the AI outbreak response. The NAIAP also specifies proposed policy directions, major activities for further actions, as well as the logistical and human resources required. It takes into consideration the need to respond to the impending threat of AI outbreaks in Yemen, and anticipates future challenges, in particular in relation to the implementation of a community-based outbreak response and mitigation plan.

This Plan also aims to place additional emphasis on community organization and mobilization at the grassroots level. It highlights the need to provide essential core capacities to village primary animal health care volunteers (or para-veterinarians), village health workers and local government staff to prepare themselves, under the context of the GOY NAIAP, for a possible avian influenza outbreak. It hopes to effectively link the national response activities to the poultry farming communities at risk of being affected by AI outbreaks. An important component is the dissemination of information on the overall GOY National AI Action Plan, the preparation of community-based prevention and outbreak action plans, and the defining of roles and responsibilities through training workshops at the “Uzla” (group of villages) or district levels throughout Yemen.

Strengthening national, state (governorate) and local community capacities to detect, investigate and contain epizootics is a goal that requires continued efforts if it is to be sustainable. Thus, an objective of this Plan is the bridging of implementation gaps from the national level down to the village level, so that local farming communities will acquire core capacities in implementing the activities. This will ensure effective surveillance, preparedness and response to the impending threat of avian influenza in Yemen. A program for assisting farming communities to cope with economic loss after an outbreak occurs may be subsequently developed.

This current document is essentially a Draft Version of what would be the final National AI Action Plan endorsed by the Technical Committee and approved by the High Committee for Avian Influenza (HCAI).

I.1 GLOBAL AND REGIONAL SITUATION

The HPAI H5N1 virus is the most recently emerged zoonosis that has vastly impacted the economies of many countries in Asia, and now some countries in Europe, Africa and the Middle East. HPAI has propagated among a wide range of wild and domestic bird populations, and has become endemic in poultry in Southeast Asia. Since December 2003, the pattern, scale and geographical spread of the outbreaks have been historically unprecedented. Their economic impact on the agricultural sector of the affected countries has been huge, amounting to an estimated US \$10 billion. Across Southeast Asia, the impact of a single large outbreak was estimated to result in the reduction of up to 1.5% of GDP. Current updated estimates call for investments of up to US \$494 million for the global fight against the disease in animals through the year 2008.

From December 2003 to December 2005, outbreaks of H5N1 in poultry have occurred in nine countries in Asia (Cambodia, China, Indonesia, Japan, South Korea, Laos, Malaysia, Thailand and Vietnam). Since late July 2005, outbreaks in domestic poultry as well as wild birds have been reported in the Russian Federation, Kazakhstan, Romania, Mongolia, Turkey and Croatia. In addition, in recent months, outbreaks in poultry have increased again in Indonesia, Thailand, Vietnam and China, and H5N1 virus has spread to Austria, Italy, Germany, Greece, Azerbaijan, Iran, Iraq, Egypt, India, Niger, Nigeria, Albania, and Cameroon, apparently though migratory birds. The situation in Egypt demonstrates that even with the lessons learned, carrying out HPAI stamping out operations can be very difficult.

H5N1 is the first AI virus that is capable of wiping out poultry stocks, simultaneously causing a number of human fatalities. Its implications thus concern both health and economics—mass culling of poultry exacts a heavy toll on the food security of affected farming communities, often with only minimal compensation. The health issue is linked to its potential to result in a catastrophic human influenza pandemic, possibly in the near future.

I.2 BACKGROUND SITUATION IN YEMEN

To date, Yemen joins other countries still free of HPAI. The poultry industry produces more than 100 million chickens annually, and contributes US \$2 million to the total agriculture revenue per annum. The total current investment in the entire poultry industry is estimated at US \$0.5 billion. The industry is growing at a rate of 7% annually, similar to the rates identified in Southeast Asian countries. The occurrence of AI would lead to the devastation of this industry. Consequently, it will also result in the rise in prices of livestock products, fish and other food items, loss of market for corn producers and other raw material suppliers, and of course the threat to the health of the Yemeni people.

The GOY, mainly through its Ministry of Agriculture and Irrigation, started to address the threat of avian influenza—particularly to its growing poultry industry—in 2004, during which Cabinet Decree No. 48, relating to the Protection Measures to Avoid Entry of AI to the Country, was issued. In October 2005, another Cabinet Decree, No. 329, relating to Practicing the Necessary Measures for Bird Flu Prevention, was issued, and set into action a series of activities and planning, which generated a number of technical documents and initiated capacity-building efforts, particularly in the area of AI surveillance and diagnosis (see Annex 1).

The Directorate General for Animal Resources (DGAR) in the MAI then attempted to prepare the AI outbreak contingency plan. This plan was mainly based on available documents from various sources, including plans of other countries. The HCAI and Operation Rooms in both the MAI and the Ministry of Public Health and Population (MPHP) were then formed with the following main objectives:

- Ensure that the Yemen remains free of HPAI.
- Control and eradicate HPAI in case of disease introduction.

- Control transmission of HPAI from fowls to humans.

A Technical Committee, formed within the MAI Operation Room, reviewed the draft of the AI outbreak contingency plan and concluded that it needed essential technical inputs to make it more specific and comprehensive. A clearer vision of how an effective AI outbreak response will be carried out was required. The gaps identified included the lack of specific systems and coordination structures; strategies; mechanisms; capacity building (facility, methods, trainings); prioritization and specific resource needs for AI surveillance; monitoring and diagnosis (reporting and sample submission and testing channels—down to grassroots level, AI antigen detection capability such as by Immuno-Fluorescence Assay [IFA] in the Central Veterinary Laboratory [CVL] and regionally); regulatory framework and enhanced enforcement (especially control of live bird trade and marketing); and functional AI outbreak response (zoning/compartmentalization, stamping out, farmer's compensation, safe stamping out practices, vaccination strategies). Additional emphasis must be placed on information and education campaigns for the professionals and the public through cooperation with the MPHP, and on community organization and mobilization. The filling of these gaps served as the focus of this National AI Action Plan document.

A major activity currently being undertaken by the GOY is improving surveillance and diagnostic capacities, restricting importation from AI-affected countries, preventing contacts between migratory birds and poultry, and enhancing the dissemination of information for public and health worker awareness. The inadequate human and financial resources available to enable the implementation of this action-specific plan down to village levels, particularly in high risk regions, poses a challenge to the overall success of the GOY in dealing with HPAI.

2.0 COMMUNITY-BASED ACTION: A MAJOR STRATEGY TO INITIATE

As mentioned, an objective of this Plan is to assist in bridging implementation gaps in the GOY program. Another goal is to facilitate the involvement of local farming communities to acquire core capacities in implementing the national program at the grassroots level and in coping mechanisms in case the outbreak actually occurs in Yemen. To achieve these objectives, the Plan should be rooted on strengthening state (governorate) capacities in:

- AI prevention and control, surveillance and monitoring, early AI case recognition and rapid reporting, and AI outbreak containment;
- Networking of specific commands, functions and practical skills, as well as interdisciplinary collaboration up to the community and farm levels; and
- Public health aspects of biosecurity and potential transmission of disease to human populations.

A comprehensive grassroots action plan must consider addressing the following four key areas:

1. **Strengthening of specific grassroots capacities for early detection, reporting and response to possible disease outbreaks.** The strategic objectives are (i) coordinating and monitoring local efforts to detect potential outbreaks, and (ii) developing basic capacities for prompt detection and reporting of outbreaks. Rather than building another system for monitoring and detecting, local systems should instead feed into the existing national structure for disease surveillance and reporting.
2. **Strengthening of specific grassroots capacities for disease prevention and control in support of the implementation of the national program.** The strategic objectives are (i) familiarization and training in biosecurity and best practices for disease prevention and control, (ii) improved hygiene and sanitation in immediate household environment and farm premises, and (iii) training and involvement of para-veterinarians and other community volunteers.
3. **Public information management and awareness campaign, including support to the production and dissemination of technical documents and farmer teaching materials.** An important element of these activities will be to develop innovative strategies and tools for sharing knowledge and best practices to farmers and their communities. Activities such as enhancing relations with local institutions, NGOs, commercial stakeholders, the media and the general public will be needed to improve public awareness, cooperation and participation. Outreach, advocacy and external relations are included as support functions. These activities will likewise serve as a portal for local communities to access national program plans, activities and resources.
4. **Program for coping mechanisms for farmers in the event of outbreaks.** The strategic objectives are (i) assisting in mechanisms for farmers' compensation for animal loss after stamping out operations, (ii) assisting in the economic recovery efforts of affected farmers and communities post-outbreak, and (iii) assisting in establishment and provision of alternative sources of livelihood in case of inability to restock poultry and livestock post-outbreak.

3.0 INDICATION OF SWOT IN RELATION TO YEMEN'S AI RESPONSE

The identification of the following strengths, weaknesses, opportunities and threats (SWOT) served as guidance to the discussions that generated most of the inputs to this Plan.

Strengths:

1. Veterinary sectors, MAI and GOY are paying attention—as shown by series of meetings held, plans prepared, decrees passed, and the recent holding of training workshop.
2. There are interagency Operation Rooms defined and in place.
3. Regulation (Law No. 17) on protection of livestock has been issued (but needs to be enforced).
4. The GOY has experience from dealing with the Rift Valley Fever (RVF) outbreak in 2000-2001.
5. There is a pool of trained Animal Primary Health Care Workers in some remote areas.
6. Health workers are available to support at villages and districts.
7. Surveillance centers in some governorates have information technology (IT) capability (although not enough).
8. The GOY has diagnosis capability and equipment but needs improvements.
9. The Central Veterinary Laboratory (CVL) can link with reference labs in UK and Egypt.
10. There is international organization support (FAO, USAID, World Bank).

Weaknesses:

1. Surveillance and diagnostic capacities (no clear AI case definition, cooperation among governorates, complete data, virus isolation and antigen detection tests, sample collection and storage, communication, data management, risk analysis, regional labs) are weak.
2. Line of command, especially during an outbreak, is not defined.
3. There are a lack of funds or delayed release of funds for such an outbreak.
4. There is a need for trained staff in concerned activities and sectors (veterinarians in all districts).
5. The regulatory framework needs to be enhanced (formulate the Implementing Rules and Regulations for Livestock Law No. 17).
6. There is wide practice of recycling untreated manure as fertilizers in Yemen.
7. More than 95% of poultry farms are Sector 2-3 with low biosecurity.

8. Ambulant or street live bird markets (LBMs) are present.
9. The implementation details of the AI Action Plan are just now being formulated.
10. People and veterinary professionals lack motivation.
11. Reports of suspected cases have been received mostly from accessible areas and few or none from remote areas.
12. There is a need to develop the coordination between government-related authorities.
13. There is no compensation system at present.
14. The means of transport to support the surveillance activities is not defined.
15. There is no reporting system between the private sector and the government.
16. There are few central slaughterhouses (there are only two in Dhamar and one may not be functioning well).
17. The quarantine ports are not fully functional (especially at high-risk areas).
18. Full authority over meat inspection and live bird markets is not yet with the MAI.
19. There is low public awareness (needs improvement and better approaches).

Opportunities:

1. Yemen is still AI free.
2. Chicken is the primary poultry and major farms are mostly (95%) situated in a cluster in the highlands (western, central, northern and southern areas) of the country.
3. Backyard chicken farming is relatively small at less than 10% of production, and far from migratory bird sites.
4. There is no tradition of duck and pig raising (so no mixing with chickens).
5. There is no cock fighting and therefore no fighting cocks are kept in villages.
6. Climate is moderate (with low humidity) in the highlands. The coastal areas are hot and humid. Some areas are favorable for AI spread reduction.
7. Rivers and lakes are dry throughout most of the year; big desert areas exist.
8. Some high-risk farming practices are absent such as raising chickens above bodies of water. Chicken farms are usually far from beaches.
9. LBMs tend to be less crowded compared with Southeast Asia.
10. There are already lessons learned from Southeast Asia, Egypt, etc. (since 1997).
11. Funding for AI seems to be much more readily available than before (but competition for funds increasing).
12. Good poultry vaccines are becoming more available.

Threats:

1. Egypt, a victim of an AI outbreak, is just across the Red Sea.

2. Migratory birds frequent the vast coastal areas both in the West and South.
3. There is a rich wild bird population in Yemen, including crows.
4. About 73% of the population is in rural areas (this encourages low biosecurity practices).
5. Poultry production is increasing (7% growth) compared with the growth of human population—some farm areas are dense (e.g., Dhamar).
6. Yemen is bordered on the North and East by other countries.
7. Presence of H9N2 and Newcastle Disease Virus (NDV), other poultry diseases that may complicate case detection and diagnosis.
8. Importation of chickens and poultry feeds still being done.
9. Yemen serves as livestock transit/passage way from Africa to the Middle East.
10. Some high risk chicken marketing practices are present (LBM, slaughtering on site, etc.).
11. There are uncontrolled stray dogs roaming around the streets and villages.
12. There is need for funding.

4.0 GUIDING PRINCIPLES AND POLICIES

The following are brief policy statements that are meant to be further elaborated and elevated into their higher administrative forms by way of the issuance of decrees or regulations. These policies are intended to support the effective implementation of all the functional elements of the Plan.

1. Ban backyard poultry raising in coastal areas.
2. Ban backyard poultry raising around major commercial poultry farms (flocks of more than 10,000).
3. Initiate vaccination only upon the initial AI outbreak detection.
4. Provide incentives and compensation to farmers affected by stamping out.
5. Strengthen the central surveillance and diagnostic capability of the MAI and set up AI surveillance centers for each district.
6. Set up AI surveillance centers, including regional laboratories in priority governorates.
7. Use at least any AI antigen detection test for determining H5N1 infections in poultry.
8. Create an integrated public health law that addresses the outbreak threats of emerging zoonoses.
9. Strengthen the regulatory enforcement of Livestock Law No. 17 in view of the threat of H5N1.
10. Ban ambulant or street live bird marketing (LBM) and situate LBM at premises.
11. Encourage central chicken slaughtering and selling of dressed chilled chicken.
12. Stamping out shall be the first line of action against an H5N1 outbreak in poultry.
13. Stamping out and related operations shall be a multi-agency emergency task.
14. Staff training needs, with regard to this action plan, shall be completed and prioritized.
15. The actions and measures in this action plan shall be directed to priority governorates as to risk and poultry industry loss.
16. The criteria for declaring stamping out a failure shall be set and followed so that enhanced contingency measures may be applied.
17. Enhance public awareness as this is a priority activity.
18. Related authorities involved in implementing this action plan shall be expected to strengthen their coordination.
19. Field staff expected to handle infected poultry or take part in high risk operations shall be provided complete prophylaxis.
20. This National AI Action Plan shall be a unified plan from the MAI and MPHP and shall be approved by the National High Committee and issued through a Cabinet resolution.

Guiding Principles/Main Considerations Relating to HPAI:

1. Backyard or free-range poultry and the movement of live poultry through markets in general have been the principal means for the epizootic spread of AI infection.
2. H5N1 is known to cause peracute infections resulting in death of poultry within one to two days with up to 100% mortality.
3. The virus can easily be spread through direct contact with feces and respiratory secretions, droplets, and fomites (e.g., mechanical transfer in hair, clothing and footwear of people, and on equipment, materials and vehicles). Fomites comprise the major means of transmitting infection between premises.
4. AI virus can remain viable for longer periods in cold and humid environments. It can survive in feces from 6 to 35 days.
5. AI virus can be carried by most avian species (e.g., migratory waterfowls) without signs of clinical disease. It can be carried and shed by live poultry for at least two weeks and up to 30 days by recovering birds. The principal means by which AI viruses initiate outbreaks is through wild birds contaminating food or water supplies (such as lakes) of poultry. It can remain infective in lake/pond water for up to four days at 22°C.
7. The AI virus may contaminate the inside and outside of eggs and poultry meat and can survive in frozen carcasses for as long as three weeks.
8. Improving biosecurity (biocontainment and bioexclusion) is the most important approach for poultry producers in preventing the spread of AI.
9. Widespread H5N1 infections in the animal population can result in mutations that may increase the disease potential of this AI virus in humans and animals.
10. Several countries have successfully stamped out widespread AI infections in poultry through rapid imposition of quarantine, isolation of infected and potentially-infected poultry, culling, sanitary disposal of carcasses, comprehensive decontamination, movement restrictions, surveillance (reporting and diagnosis), and enhanced biosecurity in general.
11. It is important that all the emergency outbreak response strategies in this National AI Action Plan will be carried out simultaneously within the shortest time feasible (target 24-48 hrs.) to realize an effective end to an outbreak.

5.0 MAIN ACTIONS REQUIRING EFFECTIVE IMPLEMENTATION

This National AI Action Plan focuses on the major functional areas in an AI preventive and outbreak response. These are:

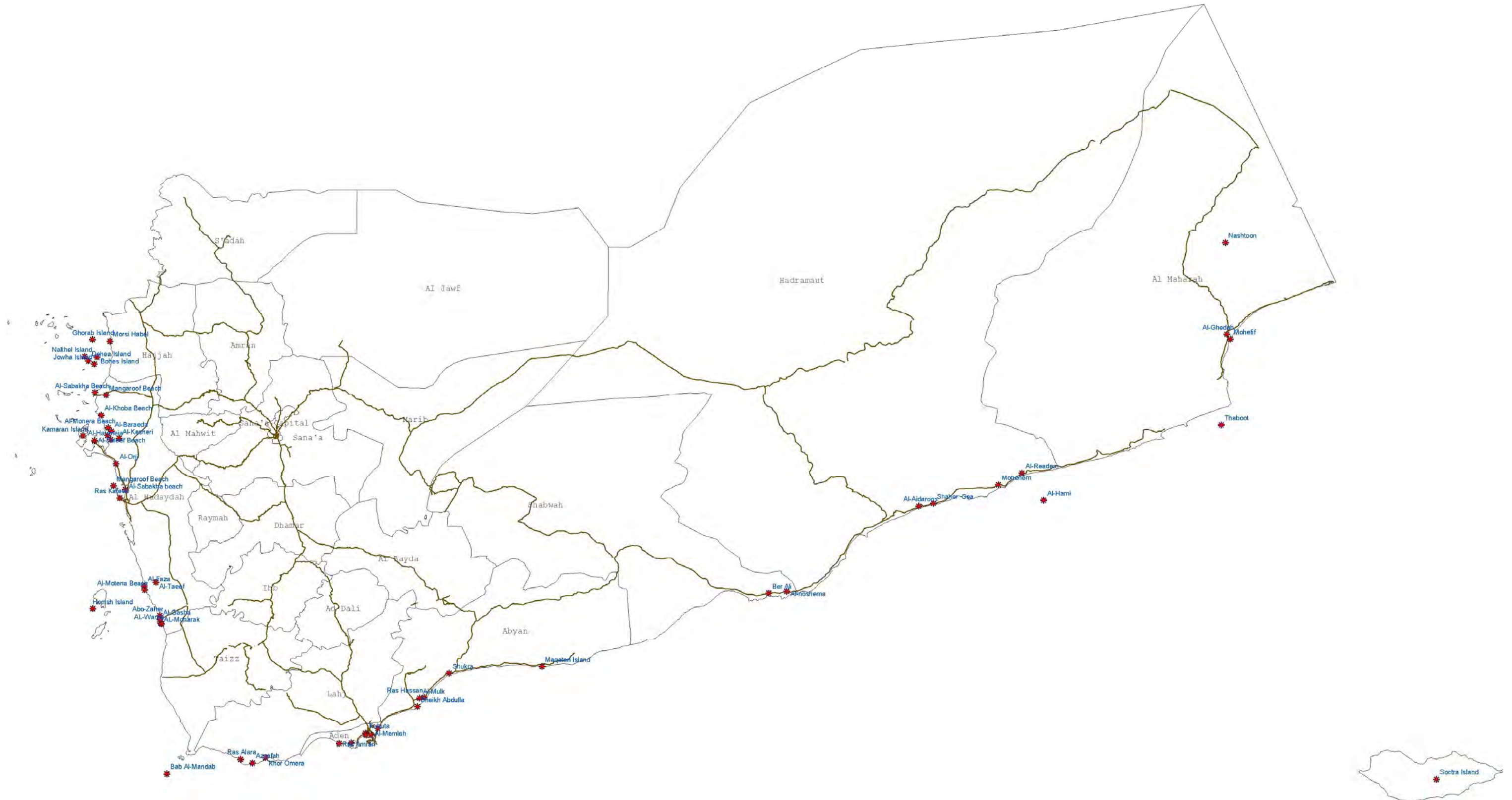
- **Surveillance, Monitoring and Diagnosis (both during the AI preventive and outbreak containment stages):** These areas are most important especially at this stage where Yemen is still AI free, or at the stage where HPAI H5N1 has in fact entered Yemen and an early emergency response could be realized. However, other preventive functions such as poultry import control and policing poultry movement through borders should also be established. These major functions will need to be enhanced during the outbreak stage.
- **Supportive Regulatory Framework:** This element must address main areas where regulatory control may be valuable such as in the control of chicken movement from farm to market, general biosecurity in farms and markets, and controlling live bird marketing in general: quarantine and inspections, instituting veterinary supervision, registrations, zoning and sanitation. It must be anticipated that HPAI H5N1 may escape surveillance detection, and enters and starts to spread until its obvious detection—in this case, regulations that are already in place could restrict the scale of the initial outbreaks.
- **HPAI Outbreak Emergency Response (including zoning and stamping out activities, compensation, vaccination):** These functions are most important to ensure the early containment of outbreaks, possibly within 24 hours from first onset.

5.1 SURVEILLANCE, MONITORING AND DIAGNOSIS

Surveillance activities will be conducted throughout the country; however, there are regions that seem to be more at risk or are important poultry-raising regions. In this regard, surveillance and diagnosis capacity building will be regionally prioritized based on the following AI risk criteria:

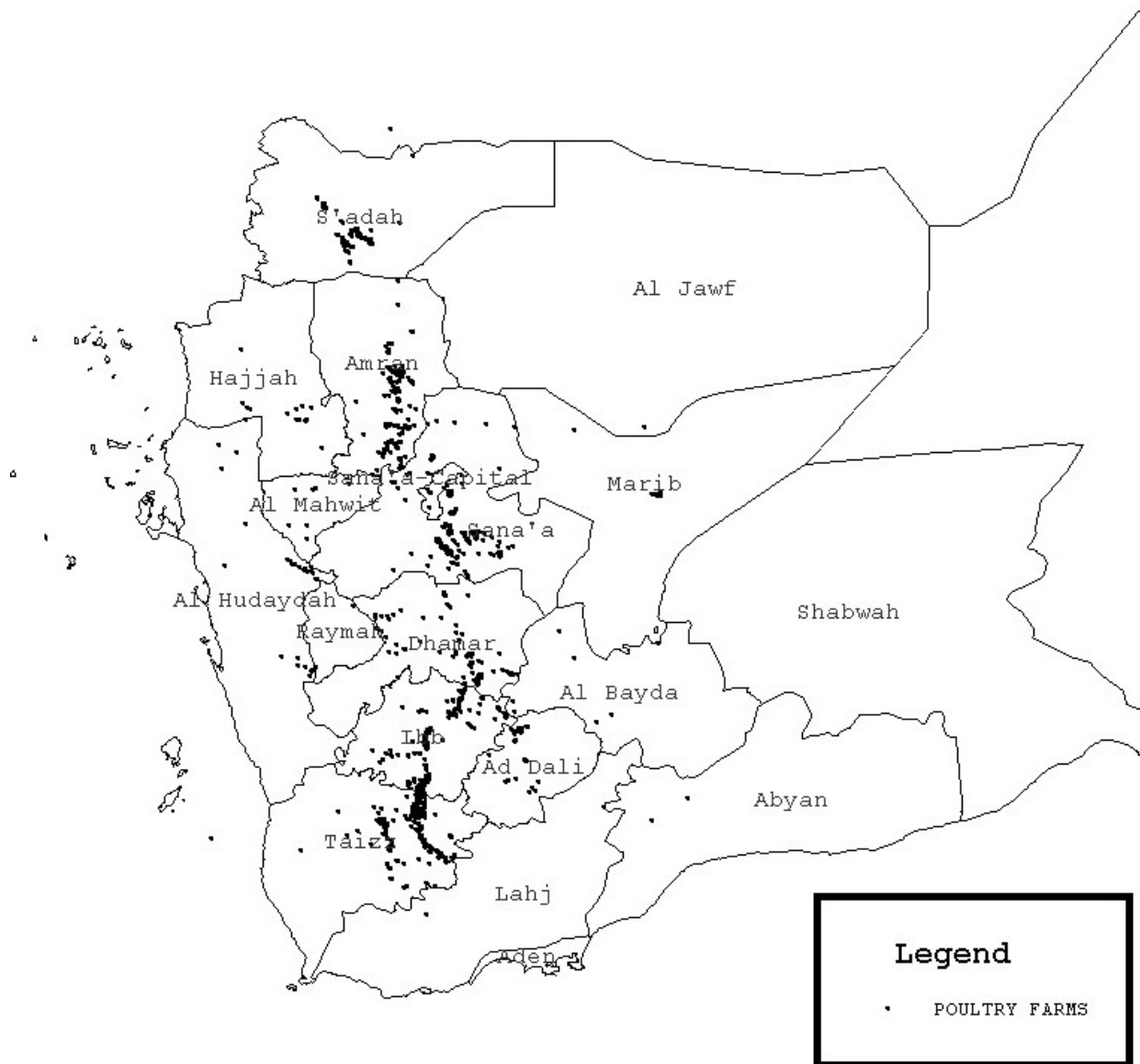
- Coastal areas where migratory birds are present (see Figure 5.1). The western coastal areas are more important than the southern coastal areas as these pose greater threats to the nearby, dense, poultry population.
- Areas where there are high backyard (free-range) poultry population, especially near the coastal areas.
- Live poultry markets within the above areas.
- Areas with a significant cluster of poultry farms (Figure 5.2), especially surrounded by villages with free-range chickens.
- Areas where ducks and pigeons may be raised and are in close proximity to the above areas.
- Areas along regional trade routes and unsecured borders, especially those in close proximity to the above areas.

FIGURE 5.I. LOCATION OF MIGRATORY BIRDS IN YEMEN



Source: Ministry of Agriculture and Irrigation, Directorate General of Animal Resources

FIGURE 5.2. LOCATION OF POULTRY FARMS IN YEMEN



Source: Ministry of Agriculture and Irrigation, Directorate General of Animal Resources

Effective surveillance should start at grassroots level (that is within villages) and all the essential elements must be in place—early reporting/warning systems, collection of epidemiologic information, and collection of samples for viro-serological diagnosis.

5.1.1 Village-Level Surveillance

The village level serves as an important root for effective AI surveillance wherein suspected AI cases in chickens or wild birds can be expected to be reported within the same day as they are identified. Normally, it would be the farmer or villager who would first know about any suspected AI case. This person must be knowledgeable about the case definition of HPAI, in chickens in particular. In this regard, the approved case definition shall be:

- Acute signs of depression and respiratory disease, swollen heads (possibly periorbital edema), congestion and cyanosis of the combs or wattles, and possibly neurological signs (incoordination) and diarrhea—there is usually acute onset and high mortality (100%) in entire flock in 48 hours.
- High mortality is defined as:
 - >5% daily in a flock of <250 birds for 2 days
 - >1% daily in a flock of >250 birds for 2 days

Thus, any person seeing these signs in village chickens must immediately report the case to a designated village volunteer, who in some places could be a trained teacher or para-veterinarian with previous training in animal primary health care. Moreover village leaders (*Shikehs*) shall be trained on the importance and process of surveillance reporting. These volunteers, since they are few in number, could represent designated group of villages or *Uzlas*. These *Uzlas* (about 3,000 in the entire country) will have the following minimal functions and capability:

1. Nominate volunteers to assist farmers to report to the *Uzla* (e.g., by telephone to the local council);
2. Receive reports from the volunteers; and
3. Recognize and record symptoms of AI and other diseases. Understands the seriousness of AI, conducts public awareness campaigns and encourages farmers to report suspected cases of AI.

Volunteers in these *Uzlas* must be provided training in the above functions. At this stage, more volunteers are needed per *Uzla*, especially in the priority areas to be identified later.

5.1.2 District-Level Surveillance

There are a large number of districts in Yemen (336), and they should serve as disease surveillance centers where veterinary or para-veterinary professionals can be stationed to receive reports of AI cases from the “volunteers” as described above. There should be at least one or two of these trained professionals; they could be new graduates, volunteers from the private sector, or existing public health workers. They will be expected to do the following:

- Investigate reported AI cases within the day the report is received; collect information and samples using a standard report form (see Figure 5.3); storing or immediately transporting samples to the governorate level or to the nearest regional laboratory for quick diagnosis, together with a copy of the report form.

Additionally the para-veterinary professionals will require the following support:

- Training in AI case recognition as defined above; collecting/storing/transporting samples; writing case reports and filing report forms properly; and, possibly, how to use a Geographic Positioning System (GPS).
- Equipment and supplies including refrigerators/freezers, cold boxes and ice packs, telephone/fax, sets of Personal Protective Equipment (PPEs), GPS, veterinary kit (materials for collecting samples), and a means of transport.

5.1.3 Governorate-Level Surveillance

There are a total of 21 governorates in Yemen, each with about 15 to 20 districts. Not all are threatened by the incursion of HPAI as the risks vary from area to area depending on their proximity to the coastal borders or the density of poultry (especially free-range) susceptible to AI infection possibly originating from wild birds.

FIGURE 5.3. SAMPLE REPORTING FORM

Republic of Yemen
 Directorate General of Animal Resources
 Animal Health Department
 Strategy Unit

Avian Influenza Surveillance Form

General information

Farm: regional: raising :		Disease suspected :		Report Type:	
References Code :		Governorate :		District :	
Village/location :		N.S:		E.W:	
Farming System		Commercial farm		Semi commercial farm	
				Backyard	

Infected area's information

Date of report (d/m/y)/...../.....	Estimated date of first clinical case/...../.....
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Emergency report (complete this part)

Bird / animal sp.	Cases	Deaths	At risk	Beginning of deaths	Period of death	Comments (Age,sex,breed,etc)
Breeder of Broiler						
Breeder of Layer						
Layers						
Broiler						
Migrating bird						
Other Sp.						

If this is a Follow up report, please fill in this part

Bird sp.	No. of new cases since last cases	No. of new deaths	No. at risk

Clinical signs

<input type="checkbox"/> Reparatory signs <input type="checkbox"/> Lameness <input type="checkbox"/> Nasal discharge	<input type="checkbox"/> Nervous signs <input type="checkbox"/> Decreased egg production <input type="checkbox"/> Diarrhea	<input type="checkbox"/> Loss of feathers <input type="checkbox"/> Dermatitis <input type="checkbox"/> Loss of body weight	Tentative diagnosis
Other signs:			
PM Lesions			

Diagnosis

Tentative diagnosis	Differential diagnosis
---------------------	------------------------

Epidemiological information

Yes <input type="checkbox"/> No <input type="checkbox"/>	Did you vaccinate the poultry ? when ? for what ?	Recent Introductions	Yes <input type="checkbox"/> No <input type="checkbox"/>
<input type="checkbox"/> Backyard <input type="checkbox"/> Commercial Bird <input type="checkbox"/> Wild bird <input type="checkbox"/> Presence of stray cats & dogs <input type="checkbox"/> Others <input type="checkbox"/>			

Lab Information (sample collection)

Type of Bird	Type of samples	No. of samples	Use of transport medium	Storage condition	Remarks
Date sent to lab	/...../.....	Name of local lab		International lab

Control

Destroy <input type="checkbox"/>	Vaccination <input type="checkbox"/>	Animal movement <input type="checkbox"/>	Treatment <input type="checkbox"/>
Other <input type="checkbox"/>	Slaughter <input type="checkbox"/>	Quarantine <input type="checkbox"/>	

Prepared by (Vet. – Vet ass. – Vet. Tech.)

Name :	Signature :	Position :/...../.....Date
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All the governorates, especially those identified as priority areas, will appoint an Avian Influenza Technical Committee. Its members should be comprised of individuals who represent key government bodies such as the MAI, MPHP, Ministry of Environment and Water, Ministry of Municipality, local council, and police. The Committee's job will be to supervise all technical actions carried out within their governorates. They shall then appoint three to six surveillance teams, according to their specific needs. Ideally, each team should have one veterinarian, one technician/assistant, and one driver. Technically the heads of surveillance should be accountable to the MAI or MPHP headquarters. The roles and needs in these surveillance centers are the following:

- **Roles:** Routine disease investigation—supervise and assist the district surveillance centers, assist headquarters, perform quick AI antigen detection diagnosis, prepare and transmit daily and weekly reports, and analyze data if needed.
- **Needs:** Refrigerators/freezers, cold boxes, telephone/fax, computer, sets of PPEs, GPS (three units), veterinary kits (materials for collecting samples), and means of transport (3-6 according to the needs per center).
- **Training:** More advanced training courses to serve HQ's demands for data presentation and diagnostic reports.

Some designated governorates will also serve as the location for regional diagnostic laboratories (see below). These regional labs must be committed to diagnose cases as they are received, and immediately give feedback to the CVL and Epidemiology Unit at HQ for notification or confirmation of cases.

Refer to Annex 3 for the detailed estimates of the total logistical and material resources needed to support surveillance activities at the districts and governorates.

5.1.4 Surveillance at Headquarters (DGAR-Epidemiology Unit)

The HQ must provide overall coordination for maintaining the entire reporting systems and treating diagnostic results. It also serves as the national data repository where data from the field are analyzed and disseminated to all concerned, down to the *Uzlas* and specific farms. Additionally, it must perform these functions:

- Map locations of GPS tagged cases and generate epidemiological information and curves (suspected and confirmed);
- Ensure daily reporting and feedback;
- Report to the Supervising High Committee and High Committee for Avian Influenza (decision makers); and
- Supervise all the field surveillance, monitoring activities, and perform field and trace-back investigations together with the governorate technical staff.

HQ's needs are more technical, such as training in epidemiology field data management and risk assessment. The number of staff needed to manage this national center should be at least 10, for contingency reasons.

The data to be analyzed should include AI cases (probable or suspected and confirmed) by week, by poultry category, by village, and by virus sub-type. These are to be presented in tables, graphs, and maps. An epidemiological curve should be prepared. The reporting of data and feedback must be done daily and weekly using telephone, text, fax, or Internet, whichever is more appropriate.

5.1.5 Surveillance During the Outbreak Stage

During the outbreak stage, the surveillance system through the governorate and district surveillance centers shall be enhanced so that new cases may be detected earlier and response may be mounted sooner, thus preventing the spread of H5N1. If new farms are rapidly being infected and infected zones start to overlap, the surveillance information must be useful in answering the following questions:

- What went wrong in the Action Plan/control strategy? What circumstances caused the spread of outbreaks?
- What were the biosecurity conditions in the affected farms?
 - How were they cleaned and disinfected after stamping out?
 - Did the stamping out team practice good hygiene and safe measures?
 - What were the conditions of barriers/control points between infected and uninfected areas/zones?

For each infected farm during or before any outbreak, information must be gathered by the governorate and district surveillance teams, for trace-back investigation purposes, as guided by the following key questions:

- How and when did the farm get infected?
- From where?
 - Through wild birds, movement of people, movement of animals, feeds, equipment, and vehicles?
- Were animals brought to other farms/market? When? Which ones?
- What are other possible sources of infection?
- Further questioning to follow on to know what happened at/or around the presumed point of contamination which could be one to two weeks before the first clinical signs of AI were noted.

5.1.6 Surveillance Priority Areas

The governorates considered to be at high risk, as defined earlier, are ranked as to priority below:

The highlands governorates:

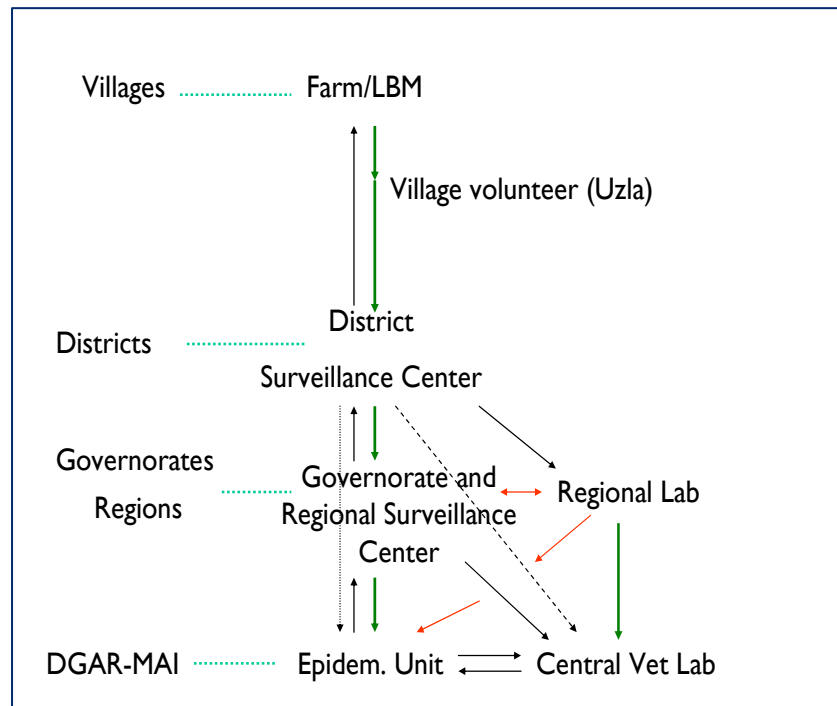
1. Ibb,
2. Ta'izz (also coastal),
3. Sana'a – Al-Amanah,
4. Sana'a – Al-Mohafadah,
5. Amran,
6. Dhamar,
7. Al-Bayda,
8. Sa'dah,
9. Al-Dal,
10. Lahj, and
11. Al-Mahwit.

Those at the costal areas are:

1. Aden,
2. Lahj,
3. Al-Hudaydah,
4. Hajjah,

5. Al-Mahrah,
6. Hadramaut,
7. Abyan,
8. Shabwah, and
9. Socotra.

FIGURE 5.4. FLOW OF SURVEILLANCE INFORMATION AND SAMPLES SUBMISSION



5.1.7 Diagnostics

Regional Laboratories

The diagnostic capacity must be established in priority regions as defined above. The tests of choice for immediate set up in these regional laboratories are the Immuno-Fluoresense Assay (IFA), rapid antigen tests and Agar Gel Immuno-Diffusion (AGID). The equipment and manpower needs would have to be decided based on the existing capacity in each selected regional facility. Some facilities are relatively more equipped and ready, requiring less time and funds to set up. It is estimated that 15,000 samples per month would have to be tested, at this pre-outbreak stage, evenly distributed to these selected laboratories. For every investigated farm there should always be more than five samples collected.

The selected priority regions and their present situation are the following:

- Ta'izz (to be improved- two staff presently available),
- Al-Hudaydah (to be improved- three staff presently available),
- Aden (no equipment- no staff available),
- Hadramaut- no lab (S'ayoon –has mobile vet labs in Al-Mukalla) (no staff),
- Hajjah - Abs (no staff, no building or Mobile vet Lab are needed), and
- Ma'rib (to be improved- one staff available).

It may be necessary to set up three standby mobile vet units that can conduct both surveillance and AI laboratory diagnosis for emergency purposes in underserved areas. The estimated time for the improvements of these labs varies from three to eight months, in the case a complete laboratory facility has to be built. Another governorate that could also be included, as a support to the CVL, is Dhamar, as it has a new Veterinary Medical College in Tamar University, with its own diagnostic laboratory.

The flow of sample submissions will essentially follow surveillance information described above. Sample collection and storage capacities (refrigeration) will be present at the district surveillance centers. Through the support of the governorate center, the district staff will ensure that all samples are sent to the nearest regional lab or to the CVL within 24 hours.

Diagnosis at the Central Veterinary Laboratory (CVL)

The CVL is an obviously important component of this National AI Action Plan. It must have the capacity to test all 15,000 samples submitted and tested in the regional labs for confirmation. About 1% of these samples are expected to be tested by Polymerase Chain Reaction (PCR). At a minimum, the CVL should have the capacity to perform the following tests:

- H5N1 antigen detection by IFA or Enzyme-Linked Immunosorbent Assay (ELISA); rapid tests; and Real-Time Reverse Transcription-PCR (RRT-PCR). This allows for less contamination of the samples and ease of operation. It is also expected that RRT-PCR will improve sensitivity of initial screening tests, so it is advised that the CVL set this up.
- A proper lab facility for isolating the H5N1 virus for conducting procedures under biosafety level 2 has been set up. Since this is highly recommended for increasing the sensitivity of detecting the H5N1 virus, the facility, staff and procedures for performing virus isolation must be established soon. This will require sourcing for Specific-Pathogen Free (SPF) or clean eggs for inoculation, and performing the hemagglutination inhibition (HAI) test for H5 typing.

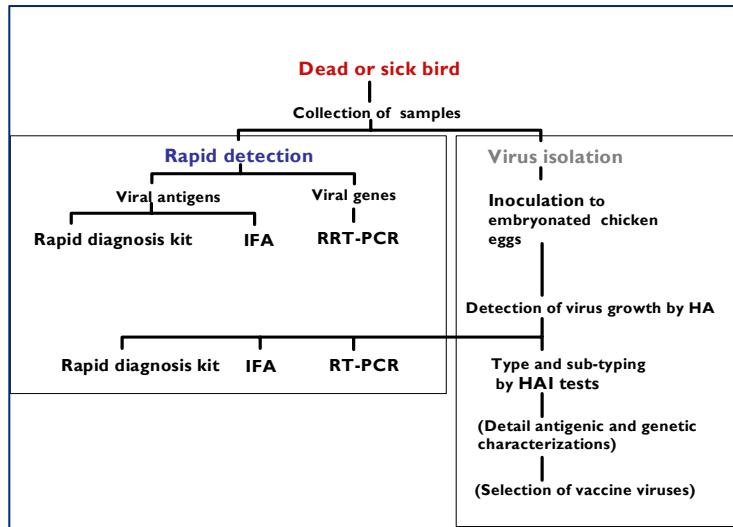
Antigen detection tests are essential due to the nature of HPAI H5N1 infections in chickens. As the disease is acute, chickens usually die before they can develop detectable antibodies against H5N1, so serology will have limited value. However, the existing serological capacity of the CVL must be sustained for purposes of monitoring the poultry vaccination operation, and also for testing for Newcastle Disease (NDV) as well as for the low pathogenic H9N1 avian influenza virus, a virus that is known to be enzootic in the chicken population in Yemen. It can also be useful for testing domestic waterfowls such as ducks, should this be applicable in some areas. In this regard, the following serological tests are further suggested:

- AGID,
- ELISA,
- HAI test for serology, and
- Neuraminidase assay/test.

Figure 5.5 on the following page is a flow diagram of the laboratory diagnoses to be established at the CVL.

An illustrative budget template to be used by the GOY for improving the capacity of the CVL and regional laboratories are to be finalized by the Technical Committee and are presented in Annex 5. The budget should include all functional areas identified in the text. The cost will consider the establishment of antigen detection tests and virus isolation procedures (as outlined above), improvements in safety, quality assurance/good laboratory practices, labor expertise and capacity, as well as the expected increase in the volume of sample submission.

FIGURE 5.5. FLOW DIAGRAM OF DIAGNOSES



5.1.8 Proper Sample Collection and Transport

This section must be delineated by the Technical Committee.

5.1.9 Other Functional Areas that may be Included in this Section by the Technical Committee

- Migratory bird monitoring,
- Protection from wild birds,
- Poultry farm registration-census, and
- Bird import control (quarantine and border policing).

5.2 SUPPORTIVE REGULATORY FRAMEWORK

There is a need to impose regulatory control throughout the marketing chain of live poultry. This is important because throughout the farm to market chain there are prevailing risk factors (see below) for the transmission and rapid spread of HPAI. Also, at the end of the chain (i.e., live poultry markets) there is the risk of human exposure to HPAI. It has been determined that the risk of human infection with avian influenza (H5N1 subtypes) is high in live poultry markets where H5N1 could be present.

Yemen currently has its Livestock Law No. 17 that requires enforcement by the MAI. The implementing rules and regulations or decrees relating to this particular law must be formulated to specifically address the reduction of the risk factors for the spread of HPAI and the risk factors for human infection.

The lack of resources, lack of implementation know-how, and possible violations will make enforcement of these regulations difficult. This then poses a real challenge for the GOY as it must ensure that

implementation is done to support the other measures for AI prevention and control stipulated in this National AI Action Plan.

The following are well-defined risk factors for the spread of HPAI throughout the farm to market chain that are known to occur in Yemen:

- Overcrowding of chickens (from different sources);
- Various transportation stresses (mishandling, distance/time, exposure to harsh environment, overcrowding);
- Poor condition of sanitation from farm to market (accumulation of secretions and excretions);
- On-the-spot slaughtering of chickens in the market;
- Transport of chickens from one place (e.g., market) to another place (e.g., another market or back to the farm);
- Moving around of chicken transport vehicles and traders (e.g., from market to market to farm);
- Free-ranging of chickens; and
- Lack of awareness among farmers, traders and market vendors (especially on basic biosecurity measures).

Based on the above considerations, the GOY must soon initiate the formulation of detailed rules aimed at feasibly reducing the above risk factors and also to support the implementation of measures mounted during the AI outbreak response stage. These rules, in the form of decrees, must stipulate appropriate penalties. In the light of prioritizing the effort of the GOY for focusing on this matter, regulations for the following priority areas of concern should be formulated initially:

- Control of poultry and animal feeds movement or transportation from farm to market;
- General biosecurity in poultry farms and markets and biosecurity measures during the AI outbreak response stage (this may be in the form of non-regulatory measures); and
- Control of all aspects of LBMs and marketplaces in general (quarantine and inspections, veterinary officers, registrations, zoning, regular market sanitation, central slaughtering).

LBM control and bird movement/transport control will be outlined by the Technical Committee who will describe how these may be approached based on Livestock Law No. 17. With regard to LBM control, an important aspect is requiring that all LBMs be closed, vacated, cleaned and disinfected at least once or twice a month.

5.3 HPAI OUTBREAK EMERGENCY RESPONSE

AI disease control and elimination is highly dependent on the organization of a rapid and effective response. Speed is of the essence; the earlier the official intervention, the fewer the number of birds that will need to be killed. Any approach adopted must ensure complete elimination of the virus. Because of the professional training and competence required, veterinary authorities must take control of all activities.

As Yemen is believed to still be free of HPAI, samples from suspected cases of HPAI will first be appropriately tested by laboratory methods described above to unequivocally determine whether the H5N1 AI infection is present in the suspected poultry flocks, before initiation of stamping out operations.

If and when H5N1 has already been positively identified in previous cases in parts of the country, the empiric detection of an HPAI outbreak should be considered if there are reliable reports of any poultry establishment experiencing an unusually high mortality rate (e.g., >15% daily mortality for 2 days) and where the mortality is associated with one or more of the following signs: depression and respiratory disease, swollen heads, cyanosis of the combs or wattles, and possibly neurological signs and diarrhea. The confirmation of these reports by the Governorate's TC should be grounds for initiating the declaration of the 1 km area/zone around the infected premises as an infected zone and commencing the stamping out operation (see note below). In all circumstances, the authorities must make the declarations promptly (within 24 hours). As several outbreaks have started to occur, the concerned governorate(s) may assume emergency authority over the entire outbreak response.

Under the present AI free-state in Yemen, the MAI Minister or the HCAI has the authority to declare stamping out in the initial AI outbreak occurrences. The DGAR, after due consultation with the Directors of the Epidemiology Unit and the CVL, the Supervising High Committee and Technical Committee, will provide the appropriate advice or recommendation to the Minister. The Minister will initiate the necessary measures to be taken through his order to the concerned governorate whose TC will facilitate the operational measures to be conducted.

The Technical Committee laid down the following parameters that must be adhered to for an effective response:

Time-bound parameters:

- AI case must be detected quickly in hours (24-48);
- Suspected sample must reach laboratory within 24 hours from collection;
- Diagnostic result must be available within 24 hours from sample receiving;
- Stamping out must start within 24 hours from detecting a positive result;
- All poultry in the infected zone will be culled in 24 hours from start of operation; and
- A maximum of three days delay will be allowed (therefore 10 days maximum total time).

Zonal parameters:

- No single bird (and other poultry farm or market equipment) must leave the zones until all the birds have been culled and no indication of presence of AI virus is found;
- All possible exit points must be guarded from the first day of the operation;
- There is total stop of any poultry-trading activities;
- All free-roaming chickens (and stray animals) are destroyed; and There is a very high level of biosecurity—cordoning off all poultry establishments (including empty) and strict policing.

Human-bound parameters:

- All persons fully cooperate with the control measures—including farmers and professionals (traders of feed and other farm items, including veterinarians);
- Farmers cannot smuggle out their chickens (alive or dead);
- All officers who are guarding, regulating, monitoring and policing are active and aware of their duties; and

- People are well informed.

H5N1 Virus-bound parameters:

- There must be total assurance that the virus is absent from stamped out farms, markets, premises; and.
- Laboratory testing in use must be most sensitive to detect for the H5N1 virus (virus isolation together with Reverse Transcriptase- Polymerase Chain Reaction [RT-PCR]/RRT-PCR or IFA).

Logistical parameters:

- All equipment and supplies are available, complete, and ready for immediate use at actual operational sites; and
- The involved facilities are ready and functional.

Note: The accurate diagnosis of all suspected HPAI cases shall still be done regardless of their value to declaring the initiation of the stamping out. All test results are useful in understanding the epidemiological nature of the epizootic and would help in managing the entire outbreak response operation. The criterion for basing the declaration on just the mortality rate and disease signs would be whether or not there is an overlap in the outbreak zones. If there is no overlap, then a positive diagnostic test result would have to be the basis for the declaration.

5.3.1 Establishment and Surveillance of Infected Zones, Free Zones and the Application of Containment Measures

The Technical Committee of the Governorate, with the support of the Epidemiology Unit at HQ, shall establish the zones and will ascertain that the parameters outlined below are followed:

Infected Zone

This zone may contain one or more infected and closely adjacent uninfected premises/farms and it shall occupy an area of 1-km radius measured from the location of the infected premises. The measures applied entail culling of all infected and potentially infected poultry flocks (and stray animals) and restricting entry into and exit from these farms and locations by people, materials, equipment, vehicles (cars, trucks, bicycles) and animals (livestock, pets and vermin) within the entire zone.

The specific measures to be further carried out in the infected zone will include the following:

- Diligent securing or policing of the contaminated poultry premises (demarcation of farms) and the boundary (circumference) of the zone by designating checkpoints;
- Application of comprehensive decontamination measures on all poultry premises, farm equipment and vehicles within the zone;
- Issuance and distribution of public advisories to residents, travellers and visitors within the zone and surrounding area with information on methods for HPAI infection prevention;¹
- Assurance and verification by the Governorate's TC of compliance with stamping out and quarantine orders, including active monitoring for the absence of poultry (until repopulation is authorized), sanitary disposal of poultry carcasses and debris, and decontamination of farms or other locations where poultry were kept; and

¹ Refer to World Health Organization's (WHO) Advice for People Living in Areas Affected by Bird Flu or Avian Influenza. 8 November 2004. (<http://www.wpro.who.int/NR/rdonlyres/04FA6993-8CD1-4B72-ACB9-EB0EBD3D0CB1/0/Advice10022004rev08112004.pdf>).

- Intensified monitoring and control around the vicinity of the infected zone boundaries. Isolate the farm/zone for 30 days.

Control Zone

From the circumference of the infected zone, the area occupying a span of 5 km (immediately surrounding the infected zones) shall be declared as the control zone. Strict quarantine measures shall be applied in this zone even though there are no reports of HPAI infection in poultry within the zone. Strict biosecurity measures are to be implemented within and between establishments to make sure that poultry are kept isolated from other birds and animals, and strict movement restrictions (e.g., farms to markets) are in place (see Biosecurity Measures below). All free-range poultry (Sector 4 chickens) shall be culled.

The specific measures to be further carried out in the control zone will include the following:

- Implementation of heightened surveillance for poultry disease cases suspected of meeting the H5N1 case definition above;
- Immediate implementation of infected zone containment measures if HPAI infection or potential infection is identified in the zone;
- Enhanced biosecurity measures such as keeping poultry inside sheds or enclosures to prevent contact with wild birds and their excreta and keeping poultry and other animals separated and not housed in the same sheds or areas; and
- Strict discouragement or control and monitoring of the movement of poultry (live or processed), eggs, farm materials, equipment, and vehicles within the zone. Movement of these items to outside the zone is strongly discouraged. All poultry trading activities may actually be totally banned.

Free Zone

From the circumference of the control zone, the area occupying a span of 5 km (immediately surrounding the control zone) shall be declared as the free zone. All free-range chickens in this zone shall be eliminated by encouraging their central slaughter and consumption. Strict quarantine measures shall be applied, and more importantly, vaccination of all Sector 2-3 chickens shall be done within a one-week period (see Vaccination below). As in the control zone, strict biosecurity measures are to be implemented within and between establishments to ensure that poultry are kept isolated, and strict movement restrictions (e.g., farms to markets) are in place. The measures applied to the control zone may be applied in this zone should it be logistically possible.

5.3.2 Stamping Out (All Aspects)

When a case of H5N1 has been confirmed by the CVL, the DGAR shall be promptly notified within the expected timeframe above. The MAI Minister shall, without any delay, be appropriately notified in order to make the necessary declarations as stated above, and order the implementation of all the aspects of the stamping out measure through the concerned governorate. The governorate's Technical Committee shall then order the prompt mobilization of all the stamping out teams as specified below.

TABLE 5.1. MOBILIZATION OF STAMPING OUT TEAMS

Activity to conduct	Min no. of persons per 10,000 chickens	Remarks
Culling team		<ul style="list-style-type: none"> • work only 5 hours • need at least 3 PPE changes
• Sacking (and disinfect after)	10	
• Neck crushing (and disinfect after)	10	
• Disposal (bring/transport sacks to pit/cleaning)	4	
Pit digging and treatment team	5	
Support team (supplies, PPEs, setting buckets of disinfectants, first aid/safety, comforting, directing, etc.)	4	
Security/policing/public control and information team	4	
Supervision culling/disinfection (veterinarian or para-vet from district)	1	
Supervision disposal	1	
Overall supervision/coordination (Veterinarian from district or governorate)	1 for 3 farms	
TOTAL	40	Per 1 farm of 10,000 chickens

These teams are mostly composed of trained volunteers from the affected communities, and from the district and governorate veterinary services/centers. Volunteers could come, for example, from the local sanitary services. The teams assigned to known infected premises must be separate from the teams assigned to “uninfected premises” within the infected zone. A rough estimate of the possible labor requirements for the entire country in case the outbreak starts to spread is (assuming 10 million chickens [10% of total in Yemen] need to be culled) about 36,000 trained persons (less if the same persons shall be reassigned in several operations).

Refer to Annex 4 for the detailed estimates of the total logistical and material resources needed for the accomplishment of the above activities.

Entering and Leaving the Enclosed Stamping Out Operation Premises

The support and security teams will cordon off the entire premises for stamping out. The outside part of the premises will be designated as the “clean” side and will be protected from contamination.

All persons entering and leaving the stamping out premises will go through the Personal Protection Equipment (PPE) change located at a single point in the enclosed premises (one for entering and one for leaving). There will be persons assigned to support in these procedures, such as by providing the complete set of PPEs, preparing the buckets of disinfectants, and giving the necessary directions and instructions. The most important consideration is the avoidance of contamination of the “clean” side. Procedures of leaving the premises will be very strict in terms of conducting the proper removal, disinfection and disposal of used materials such as PPEs. The main aim is also to protect the workers involved in the operation. Their bodies and clothes should be protected from cross contamination as they leave the premises. The detailed entering and leaving procedures to be followed will be further described, and all the workers to be assigned in the stamping out teams will first undergo training on these procedures.

Culling of Poultry

Culling will be diligently performed, considering the risk of infection to poultry in adjacent HPAI free areas and the potential for H5N1 transmission to people. Culling will be done as close as possible to the center of infection, i.e., within the affected farm and away from public view. When appropriate, cull birds inside the

poultry house or in containers just outside the poultry house. Apply moist disinfectant to the house or container surfaces, poultry litter and debris to reduce the spread of virus during and after the culling process. Under all circumstances, the culling procedure shall be as humane as possible, without compromising human safety. The access of wild birds, vermin and stray animals to the operation area will be prevented.

Carbon dioxide saturation and electrocution are the methods of choice for destroying poultry species when large numbers are involved. However, considering Yemen's situation, the Technical Committee has decided to cull chickens by cervical dislocation or by crushing using an emasculator (tool) similar to those used for castrating large animals. Chickens are placed inside a sack (one to two per sack) and then brought to the neck crushing team who performs the culling and hands over the sacked (dead) birds to the disposal team.

For a thorough description of various culling methods, refer to the Manual on Procedures for Disease Eradication by Stamping Out (FAO, 2001) and the Report of the First Meeting of the OIE Ad Hoc Group on the Humane Killing of Animals for Disease Control Purposes, Paris, October 14-16, 2003. However, these reports may not describe the neck crushing method.

The Governorate' TC shall ensure that all materials needed for culling are available in advance of the procedure, especially PPEs for the cullers. The supply of these materials will need to be adequate for the anticipated scale of the culling operation. The proper use of PPE is described in the WHO's Interim Recommendations for the Protection of Persons Involved in the Mass Slaughter of Animals Potentially Infected with Highly Pathogenic Avian Influenza Viruses (26 January 2004. <http://www.wpro.who.int/NR/ronlyres/7693BAF7-13E7-42DB-B92B-004CF5D517E7/0/WHOinterimrecommendation26012004.pdf>).

Designated cullers will first undergo training in safe and appropriate culling procedures. Cullers will be closely supported and supervised by the support team throughout the culling operation to facilitate their changing of goggles, taking rests/breaks, and proper degowning and decontamination. Individuals assigned to this team to assist cullers to safely remove/replace PPEs and for scheduled rests/breaks, must have been trained first in infection control and biosecurity. Individuals on the support team will also wear PPEs but must not be involved in handling the animals. Additionally, they will oversee that all the safety precautions (stipulated in the WHO guidelines) are in place—making sure that complete and correct PPE is provided and properly used, transported from storage to culling site and back, disposed of, or decontaminated and stored for subsequent use.

Portable showers and toilets will be installed to further promote personal protection. Health and animal authorities will cooperate in coordinating the close monitoring of the health of cullers for a certain period following the operation.²

Disposal of Culled Birds, Litter and Other Materials

Promptly disposed of culled birds and contaminated materials that cannot be effectively disinfected (i.e. feeds, litter, eggs) is a critical step in the containment of AI. According to the situation in Yemen, burial is the preferred method of disposal. Cover the buried carcasses with lime to protect the carcasses from being uncovered by animals and earthworms. Do not place lime directly on carcasses because in wet conditions it slows decomposition. Instead, put some soil over the carcasses first then apply the lime on top of the soil. Finish covering the pit with enough soil. Although it is best to bury poultry and contaminated materials at the affected area or farm, this may not always be possible because of the local well-water table level or other environmental conditions. Therefore, situate the burial place as close to the operation site as possible, and where it can also serve other ongoing culling operations in a given village. The pit shall be deep enough such that if burying 10,000 birds, there would still be at least a 1-meter deep empty space from the top of the pile of dead birds to the ground level (the procedures should be approved by the environmental authorities).

² WHO. Interim Guidelines for Health Monitoring of Persons Involved in Culling of Animals Potentially Infected with Highly Pathogenic Avian Influenza Viruses. 22 March 2004. (<http://www.wpro.who.int/NR/ronlyres/55DAF481-2271-4319-9C7E-DE77D02C09C5/0/InterimguidelinesforhealthmonitoringpersonsinvolvedincullingofanimalspotentiallyinfectedwithHighlyPathogenicAvianInfluenzaviruses1.pdf>).

Under all circumstances, the transportation of culled birds and other contaminated materials in “rice” sacks will be done in covered leak-proof container vehicles that can be disinfected after use. These containers and vehicles will never leave the contaminated area without first being thoroughly disinfected.

The disposal of litter can pose special problems as virus may be spread in dust. Therefore, the litter will first be moistened with detergent or disinfectant solution before disturbing the pile prior to disposal.

Composting (thermal deactivation of the virus) of litter and other contaminated organic wastes (for 60 days) is a recommended option that can best be undertaken in closed and vermin proof sheds on the affected farm. If sheds are not available, after spraying the material to be composted with detergent or disinfectant solution, push it into mounds away from any potential source of surface water and cover securely with black or dark plastic tarps. Composting will be done in a secure area not accessible by other animals such as rodents, cats, dogs or birds. To ensure inactivation of virus, the mounds will not be disturbed for at least three months (recommendation of the United States Department of Agriculture).

In general, open air burning of carcasses and contaminated materials is not recommended because of the extended time it takes to achieve complete combustion of the wet carcasses and waste, and the inability to easily verify that all infective pathogens are destroyed in the resulting incomplete combustion process. If burning will be attempted as the only practical method, closed incineration will be applied and incinerators shall be well maintained by knowledgeable operators.

Refer to the Food and Agriculture Organization’s (FAO) Animal Health Manual on Procedures for Disease Eradication by Stamping Out (2001) for a thorough description of disposal procedures.

Before disposal work starts, the teams will be fully briefed on-site by their assigned supervisor on the nature of HPAI H5N1 and the hygiene requirements associated with zoonotic diseases in general. It is crucial to select a site that is well protected from people and scavenging animals (stray dogs). It must be ensured that no culled and disposed of birds will get into the food chain of humans and animals. On some occasions it may be necessary to mount a security guard at the site for the first few days.

Decontamination and Disinfection

Strict adherence to decontamination and disinfection procedures is essential to the control of HPAI infection in affected areas. Decontamination involves thorough cleaning and disinfection of the infected site to remove all contaminated material and sources of virus. The assigned individuals on the team will first be trained to effectively conduct the procedures.

Again, refer to FAO’s Animal Health Manual on Procedures for Disease Eradication by Stamping Out (2001) for a thorough description of decontamination and disinfection procedures.

Initially, clean organic matter from sheds, equipment, and vehicles by brushing and washing with detergent and water before applying chemical disinfection such as 2-5% bleach. It is important to recognize that the influenza virus can be spread on clothing, footwear, poultry crates, feed sacks and egg fillers, so these items must be disinfected, or destroyed, after each use. Paper or wood items will be destroyed and buried as these cannot be effectively decontaminated.

All farm materials (e.g., feed containers, water buckets), tools, equipment, vehicles and the structures that are physically or functionally connected to the areas where infected poultry were located will be properly cleaned and disinfected.

It is advised that disinfection be repeated after 7 to 10 days. The farm will be vacated and isolated for at least 30 days.

Declaring Stamping Out a Failure

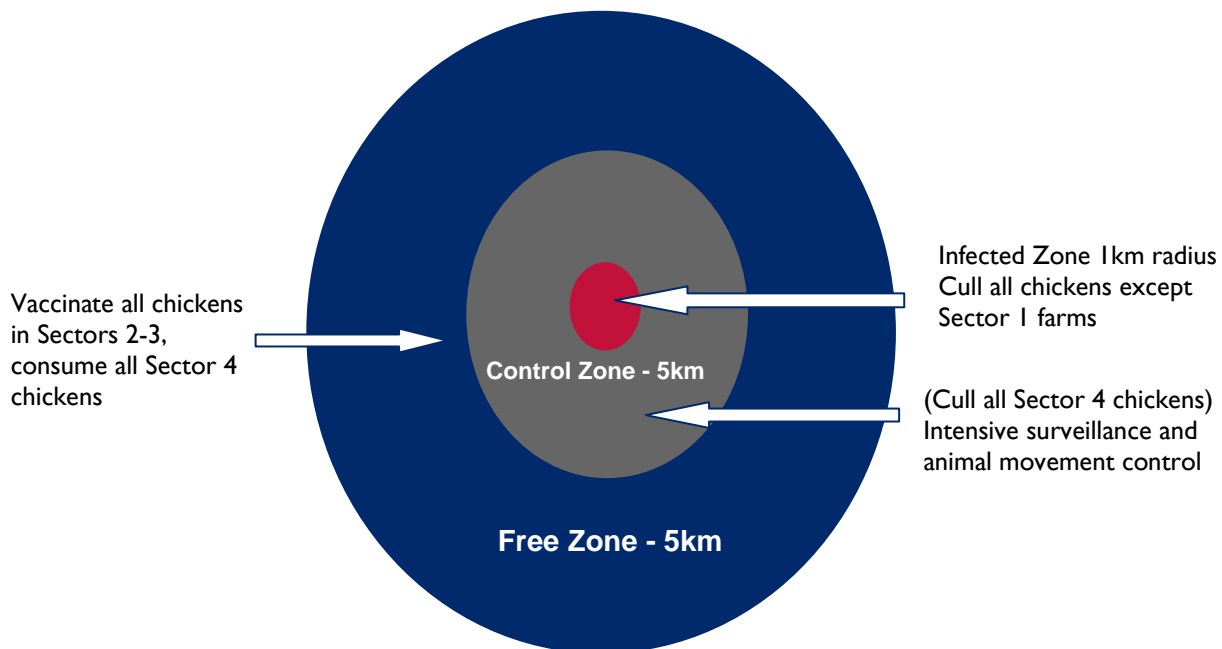
As a matter of policy, it is important to adhere to fixed criteria to say that the AI containment response is failing. In this regard, the Technical Committee laid down the following parameters:

1. Could not diagnose the disease during three days;
2. More than three days delay in starting stamping out procedures;
3. Could not cull all targeted chickens in 48 hours;
4. Could not police all the borders of the zones;
5. H5N1 is still being detected and there are more than five new outbreaks related to the first outbreak— zones are getting bigger;
6. Farmers are protesting and there is massive lack of cooperation; or
7. Supplies, materials and equipment are no longer available.

Any of these outcomes will signal the need to apply more strict measures of containment (which the Technical Committee will further formulate).

FIGURE 5.6. DIAGRAM OF THE MAIN FUNCTIONAL AREAS IN THE AI OUTBREAK RESPONSE

Initiate the vaccination of all breeders and layers on start of outbreak on a zonal scale (e.g., 30-km radius)
 Cull all Sector 4 chickens around 3 km of commercial farms and coastal areas - even before any outbreak (as a Policy of the GOY)



5.3.3 General Biosecurity Measures for Premises/Farms in HPAI Control Zones

In summary, the only way to eliminate HPAI from affected poultry farms is by:

1. Rapidly destroying all infected or potentially infected poultry, and poultry products such as eggs, and properly disposing of them by sanitary burial, composting, or incineration;
2. Sanitarily removing and destroying all disposable poultry husbandry equipment, feed, litter and other materials and equipment potentially contaminated with HPAI (burial, composting, incineration);

3. Aggressively and completely disinfecting all nondisposable husbandry equipment and shelters exposed to or used in poultry and poultry product production, transportation and maintenance; and
4. Instituting strict isolation and biosecurity procedures for human and material entering and exiting from affected farms and protection zones.

The following are some recommended biosecurity practices applicable in control zones:

1. Keep an “all-in, all-out” philosophy of flock management.
2. In warmer climates observe at least a 35-day isolation period before reintroducing poultry into the protection zone, 105 days for colder climates (numbers based on estimated survival times for virus in ‘dirty’ environments if there are breaks in the cleaning and disinfection process).
3. Permit only essential workers and vehicles on to control zone farms.
4. All persons entering control zone farms should use PPEs and should bring with them only those materials and supplies essential for the purpose of their visit to the farm.
5. All clothing, footwear, and personal items worn on to the farm and thus subject to contamination with HPAI should be washed with soap and water, and, whenever possible, soaked in 2% household bleach or other disinfectant, then sun-dried before being reused.
6. All persons entering a protection zone farm should not wear watches, rings, or items that cannot be disinfected.
7. All persons leaving the farm must first remove all clothing, footwear, and other personal items worn on the farm, shower or otherwise clean their bodies with soap and water, and only wear a new clean set of clothing and footwear for exiting the farm.
8. Vehicles such as automobiles, trucks, bicycles, etc. should always be decontaminated before being allowed to exit the control zone. This includes:
 - a. Washing with soap and water any accumulated dirt or debris, then
 - b. Disinfecting all surfaces by wiping them with 2% household bleach or other suitable disinfectant.
9. External vehicle surfaces that cannot be easily washed and wiped with disinfectant (such as tires and undercarriages) should be sprayed wet with disinfectant and allowed to dry before leaving the farm (control zone) parameter.
10. The interiors of vehicles (such as seats, dashboards) should also be cleaned and disinfected. This can be accomplished by wiping with disinfectant then drying by closing all windows and letting vehicle stand with the interior cabin exposed to direct sunlight for a minimum of 30 minutes.
11. All persons leaving a control zone should avoid visiting any area or farm where poultry are kept or raised for a minimum of 72 hours.
12. All persons living in or entering control zones should not keep and should avoid contact with pets or wild birds of any species.
13. After depopulation of infected zone farms and at the end of the isolation period, protect any reintroduced poultry from exposure to wild birds that may try to nest in poultry houses, and do not feed or otherwise provide attractants to wild birds.
14. After the end of the isolation period, all persons in control zones should exercise vigilance in helping to limit the movements of persons and materials associated with the disposal and handling of bird carcasses, litter, manure and other husbandry and production materials and equipment, and continue sanitary disposal of such materials by burial, composting, or incineration.

Materials that can be used as disinfectants³ include:

- Sodium hypochlorite 2% active chlorine solution, 10 to 30 minute contact time;
- Quaternary ammonium 4% solution;
- Potassium peroxymonosulfate and sodium chloride (Virkon-S) 2% (mixed at 2 grams/liter water), 10 minutes contact time; and
- Citric 0.2% (2 grams/liter), 30 minute contact time (safe for clothes and body decontamination).

5.3.4 Poultry Vaccination

Poultry vaccination against AI remains controversial, although in general vaccination is proven to prevent and control animal disease transmission. In the case of AI vaccination in poultry, although vaccinated birds are protected against clinical AI, they are not totally protected against infection that can still lead to some degree of viral shedding (but lowered).

If vaccination is used not only to prevent clinical disease but also to reduce viral shedding, then in the long term AI vaccination must be approached with caution, considering the need for constantly matching vaccine formulations with prevailing field virus isolates is similar to the approach to human vaccine production. An additional concern is that when vaccine is used, there is risk of spread of HPAI virus by vaccination crews.

It has been proposed by FAO that to overcome these concerns on AI vaccination, surveillance systems must be implemented that measure the response to vaccination and detects the presence of field virus in clinically normal vaccinated poultry. Isolated viruses must be fully characterized at an appropriate Office of International Epizootics (OIE) or WHO reference laboratory to provide early warning of any significant antigenic or genetic changes that might be occurring. Furthermore, FAO recommends that the following key points should be carefully considered in developing a vaccination strategy:

- Vaccination should only be considered if other approaches have failed or their implementation is not practical.
- A vaccination strategy should be developed in consultation with all the stakeholders including the private sector.
- Sufficient quantities of appropriate quality-controlled vaccines are available.
- A surveillance strategy must be developed that includes the capacity to identify and monitor vaccinated birds and record vaccine use.
- The types of poultry and production sectors to be vaccinated must be determined.
- Logistical arrangements are in place for delivery and administration of vaccine.
- A time frame for review of effectiveness of the vaccination strategy and an exit strategy is determined. It is suggested that initially a period of 12 months of vaccination should be completed before this assessment is done to allow for influence of seasonal factors.

Given the above considerations, conducting farm-wide or village-wide AI poultry vaccination would successfully reduce the risk of AI transmission among poultry. Although shedding of virus may still occur, vaccination considerably reduces the amount of shedding.

³ See Animal Health Australia. Disease Strategy: Highly Pathogenic Avian Influenza (Version 3.0). Australian Veterinary Emergency Plan (AUSVETPLAN), Edition 3, Animal Health Australia, Canberra, ACT. 2002.

In regards to the foregoing facts and other recommendations from FAO, and the AI infection risk situation in Yemen, the Technical Committee decided to apply vaccination as follows:

1. When will vaccination be done?
 - a. Upon detection of an outbreak,
 - b. At the time of onset of stamping out, and
 - c. Must be accomplished over period of one day to one week.
2. Where will vaccination be done?
 - a. Within the free zone as defined above, or
 - b. Wider depending on locations of breeders and layers.
3. What type or sector of chickens shall be vaccinated?
 - a. All breeders/parents and layers within 30 km radius from the infected zone, and
 - b. All Sector 2-3 chickens in the free zones.

Vaccination will only be conducted by highly trained veterinarians and para-veterinarians closely supervised by the Technical Committee of the concerned governorate.

5.3.5 Farmers' Compensation

The compensation system shall at this stage be a single-time indemnity to the farmers affected by the stamping out. However, long-term indemnity shall be worked out in consultation with concerned international organizations. Currently, the GOY adopts the following compensation rates according to the type of chickens affected.

TABLE 5.2. GOVERNMENT OF YEMEN COMPENSATION RATES FOR AFFECTED CHICKENS

Types	Age of chicken	Compensation rate
Breeders	1-20 weeks	1500 YR
	21-40 weeks	3000 YR
	41 – 50 weeks	1500 YR
	> 50 weeks	1000 YR
Layers	1 – 10 weeks	300 YR
	11- 20 weeks	700 YR
	21 – 40 weeks	1000 YR
	41 – 60 weeks	700 YR
	> 60 weeks	200 YR
Broilers		300 YR
Backyard Chickens		500 YR

The Ministry of Finance is responsible for the administration of compensation systems. The private sector will be encouraged to support the GOY in areas within their vicinity.

More consultations will be conducted to decide the remaining issues relating to both short- and long-term indemnity, including the aspects of poultry industry recovery and restructuring.

5.3.6 Other Critical Elements to be Included in the National AI Action Plan by the Technical Committees

1. General capacity building,

2. Trainings and workshops,
3. Information and education campaign (professionals and public),
4. Community mobilization,
5. Stamping out simulation exercises,
6. Resource mobilization,
7. Coordination,
8. International cooperation,
9. Funding budget,
10. General epidemiological activities,
11. Information management,
12. Good governance, and
13. Scientific development.

6.0 COMMUNITY WORKSHOPS, TRAINING AND MONITORING AND EVALUATION

A workshop, as stated, specifically aimed at providing a venue for interaction among the primary stakeholders and implementers of a community-level plan for preparedness and prevention of avian influenza in known risk communities in Yemen must be organized.

The workshop will attempt to gather information on the existing resources and perceived gaps to implement an effective AI prevention program and preparedness for rapid outbreak response. It will also prepare specific community-based prevention and outbreak action plans with defined roles and responsibilities. Both are designed to support the National Avian Influenza Action Plan.

There is a need to sustain community awareness in Yemen of the continuing multi-country AI outbreaks that are challenging public health, agriculture and food security elsewhere, and are real threats to Yemeni communities. It is deemed important that appropriate information emphasize simple, practical, and inexpensive measures for disease prevention and control. The leadership and guidance for program implementation can be made available at the grassroots level through trained para-veterinary and paramedical volunteers since they represent the major provider of public and animal health services to livestock and poultry smallholders in the communities. Therefore, activities to provide essential core capacities to these target groups in potential high-risk communities should be carried out.

In the long run, it is envisioned that these community-based trainings reach clusters of villages in every district that is at risk of AI outbreak all throughout Yemen. Avian influenza can best be fought if outbreaks are recognized and reported early, and interventions and containments are accomplished immediately. The battle against this disease requires different people at different levels and sectors working together. The community volunteer para-veterinarians and health workers are keys to reaching out to farmers and rural communities.

6.1 PROPOSED COMMUNITY TRAINING EVENTS

Although the long-term vision is to provide community-based capacities through trainings throughout Yemen, it is proposed as a first phase to conduct trainings to ensure protection and outbreak preparation in some of the most critical areas (districts and governorates) identified. As previously mentioned, it is recommended to communicate and disseminate AI preparedness information through conducting

community-based training sessions. Therefore, a consortium of stakeholders, together with the relevant AI Technical Committees under the MAI and MPHP will provide essential core capacities to village animal health volunteers, health workers, and local representatives to prepare themselves for an outbreak in their community. The activities will disseminate information on Yemen's AI national and regional plans, prepare community-based prevention and outbreak action plans, and define roles and responsibilities through several two-day training workshops per governorate. It is anticipated each training event will have about 50 participants representing at least 10 *Uzlas*.

The events will be hosted and conducted in close coordination with the governorates' Technical Committees and veterinary services, respective district veterinary or agriculture offices, Yemeni AI experts, and various NGOs and international agencies such as USAID, where appropriate. The clustered training sites will be chosen based on their risk for potential AI outbreak using criteria such as wild bird migration routes, legal and illegal trade routes, entry ports to governorates via boat or plane, domestic bird and human population densities, and major farm to market activities as previously defined.

The consortium to be engaged in these activities will have the following core competencies:

- Previously established partnership in conducting training workshops in local settings;
- Experience with community- and farmer-based programming;
- Can mobilize international and local expertise on avian influenza;
- Has financial controls and systems to ensure fund usage transparency;
- Impact—result-oriented framework with pre-post workshop evaluation and contingency action plan output formalized by participants to ensure ownership;
- Relationships with national government and international organizations enabling consortium to apply global best practices; and
- Ready to mobilize—on the ground presence.

6.2 PROJECT SUPPORT FUNCTIONS

- **Information management**, including support to the production and dissemination of technical documents and increasing access to information and training materials on epidemic alert and response through the outreach programs;
- **Outreach, advocacy and extension services** that value local experiences and practices that are seen as important components of strategies for a sustainable implementation; and
- **Management and administration** of the activities, including logistics, information technology support and monitoring and evaluation of activities.

To this end, the activities will:

- Support the identification of potential local partners and facilitate their engagement in collaborative activities;
- Provide services to the local community, e.g., through dissemination of information on the national program activities including, but not limited to disease monitoring; surveillance and response; participating in the organization of health seminars and other events; and

- Contribute to the development of advocacy tools corresponding to specific audiences and illustrating the activities and plans of the national program, and define a dissemination strategy including the use of the farmers' forum, training seminars, community assemblies, audio and print media

6.3 AI OUTBREAK EMERGENCY RESPONSE SIMULATION EXERCISES

The stamping out operation is a complex series of events involving multi-agencies, established surveillance and diagnostic capacities, and numerous persons that require technical training. It also has to be strictly accomplished under severe time pressures. For this reason, it is highly recommended that the stamping out operation be simulated, even on a smaller scale of operation. The Technical Committee has decided to schedule this simulation exercise within the near future. It is to be guided by the final version of this National AI Action Plan so that it can be tested. The simulation will attempt to test the organizational and operational aspects of the Plan. Briefly, it will include simulating the following main functions:

- Planning and organizing events,
- Surveillance channels,
- Diagnostic channels,
- Command chains,
- All aspects of the zoning and stamping out operations,
- Poultry vaccination, and
- The application of regulatory control and relevant decrees.

The events will also be utilized to generate further information to the benefit of getting the country more prepared to handle an AI outbreak. Therefore, a descriptive study of the entire series of events and processes will be conducted. Outcomes based on the various parameters that measure stamping out success will be recorded and evaluated. The successes and failures will be determined and used to lay down possible “lessons learned.”

6.4 AI ACTION PLAN IMPLEMENTATION MONITORING AND EVALUATION

The progress in the implementation of this NAIAP will be through the regular mechanisms for monitoring and evaluation of programs. The Technical Committee shall discuss this aspect in more detail and indicate herein their outputs.

PART III.
RECOMMENDATIONS

I.0 RECOMMENDATIONS

The consultant focused recommendations on aspects that relate technically and organizationally to the response of the Government of Yemen (GOY) to the current threat from Highly Pathogenic Avian Influenza (HPAI) in poultry and to the effective implementation of the National AI Action Plan (NAIAP) that is currently under preparation. Most of these were arrived at through consultation with the Technical Committee during discussion meetings cited in Section 1. These also were embodied in the presentations made by the consultant during his debriefing with the USAID and the Ministry of Agriculture and Irrigation (MAI), and will also be reflected in the NAIAP.



Consultant presents findings to the High Committee for Avian Influenza.

I.1 RECOMMENDED POLICY STATEMENTS

- Ban backyard poultry in coastal areas.
- Ban backyard poultry around major commercial poultry farms (with more than 10,000 birds).
- Vaccinate only upon AI outbreak detection.
- Provide farmers with incentives and compensation.
- Strengthen the central surveillance and diagnostic capability and set up AI surveillance centers per district.
- Set up AI surveillance centers, including regional laboratories.
- Conduct testing by at least rapid antigen detection.
- Create public health law (integrated).
- Strengthen regulatory enforcement (Livestock Law No. 17).
- Ban ambulant live bird markets (LBMs).
- Encourage selling of dressed, chilled chicken.
- Stamping out is the first line of action against an outbreak.

- Stamping out shall be a multi-agency emergency task.
- Complete and prioritize staff training needs.
- Actions and measures will be directed to priority governorates as to risk and poultry industry loss.
- Criteria for declaring stamping out a failure will be set and followed.
- Public awareness shall be a priority activity.
- Strengthen coordination between the related authorities.
- Provide prophylaxis to field staff.
- The National AI Action Plan shall be a unified plan from the MAI and Ministry of Public Health and Population (MPHP) and shall be approved by the National High Committee and issued through a Cabinet Resolution.

I.2 RECOMMENDED CRITERIA FOR DECLARING THAT THE OUTBREAK RESPONSE FAILED

- Central Veterinary Laboratory (CVL) could not diagnose H5N1 within three days of sample submission.
- There is more than three days delay in starting stamping out activities.
- All targeted chickens could not be culled in 48 hours.
- All the borders of the entire control zone could not be policed.
- H5N1 is still being detected in farms and there are more than five new outbreaks related to the first outbreak—the zones are getting bigger/overlapping.
- Farmers are protesting and there is massive lack of cooperation.
- Supplies, materials, and equipment are no longer available (there is shortage).

I.3 GENERAL SUCCESS MEASURES RECOMMENDED FOR AI RESPONSE

- Policies/objectives are well observed.
- Regulations are in place and enforced.
- Surveillance, diagnosis, and all structures and capacities are complete and in place and are fully operational.
- Enough people are trained across all major functional areas of the AI outbreak response.
- Farmers are compensated.
- Information to public is circulated. Farmers understand the risk to poultry, community, and their immediate family members.
- Public health is well protected (for the general public and those involved in the AI responses—workers know how to protect themselves and the environment).

- All sectors are actively involved (including international and nongovernmental organizations).
- Leaders are leading, staff and people are following.
- Resources are completely available and are distributed to their destinations for immediate use.

I.4 GENERAL RECOMMENDATIONS FOR FURTHER ACTIONS

- A stamping out failure contingency action plan needs to be drawn up so that alternative measures can quickly be put in place, such as increasing the size of the zones, engaging more people, applying more intensive vaccinations, improving the field investigations of cases, etc.
- A compensation system to address the long-term loss to the commercial poultry raisers must be planned, taking into consideration options such as insurance/indemnity and possible participation of international agencies in giving out grants and loans. This can be related to some extent to the poultry industry restructuring or recovery plan. The FAO recommendations should be followed. The private poultry sector may be encouraged to participate in the compensation scheme for small chicken farmers, particularly in areas around their vicinity who were affected by the policy of banning the raising of chickens. This, of course, will require consultation with this sector.
- Since it has been decided that poultry vaccination will be part of the outbreak response, the stockpiling of enough vaccines, e.g., 1 million doses, should be prioritized and made available soon. Another option is for the Director General of Animal Resources (DGAR) to draw up a contract with a company that can provide vaccines immediately upon request by the DGAR.
- A mini stamping out simulation operation should be carried out as appropriate in the near future. However, the simulation operation must be guided by the final NAIAP so that the Plan can be tested. The simulation must test the organizational and operational aspects of the Plan.
- As the public health aspect of the response was not elaborated in this mission, which focused on the agricultural aspect (saving the poultry sector), it must be emphasized that should H5N1 be detected in the country, the public health emergency response must also be quickly carried out. Thus, the public health aspects of the NAIAP must equally be addressed soon, relating it to the veterinary response.
- The training and program implementation at the grassroots level is very important and should be prioritized. For example, more trained teachers or volunteers should be made available in most *Uzlas* (a group of villages—there are about 3,000 in Yemen). Training should include proper case identification, case information gathering, sample collection, sanitation and biosecurity (protection from infection from wild birds), and village education and information dissemination.
- In public education and information dissemination, a unified message from the MAI and MPHP is important. Additionally, the authorities must be transparent in their messages and make sure that the purposes of their operational actions in the field are understood by the community. The clear communication of risks is important.
- Further workshops and training must be planned in areas related to the functional areas of the outbreak response (stamping out operation, public health protection, vaccination, monitoring and disease investigation, regulatory enforcement, biosecurity, public education and information planning, etc.) and to target these at village community levels.
- It must be emphasized that surveillance and laboratory capacity strengthening is the key to an effective HPAI prevention and containment. The expansion of this capacity must be strategically distributed regionally and a testing result quality assurance and validation scheme must be put in place under the charge and supervision of the CVL. The improvement of the capacities of the Epidemiology Unit and

CVL should be prioritized and offer staff development including conducting trainings on advanced diagnostic methods, field epidemiology, data analysis, risk assessment and mapping program. Organizing several mobile veterinary units, which can do both surveillance and laboratory work, such as rapid antigen detection, should be considered in the extreme high risk areas.

- The AI outbreak response may require the handling of a large volume of material and physical resources (from purchasing, transporting, storing, releasing, managing, distributing, mobilization, servicing and monitoring). Therefore, the logistical capacity of the government must be ensured. In some cases, the support of NGOs can be useful in the distribution and protection of these resources. A distribution plan must be formulated to this effect.
- The policy recommendations previously laid out should be reviewed and, as a whole, formally expanded into decrees. In relation to this, the decision of the GOY to set up more chicken dressing plants to discourage consumers to buy freshly slaughtered chickens is an essential risk-reducing policy both from the public health and agricultural points of view. It would also encourage consumers to buy chilled, dressed chickens as there is a greater assurance of safety.

ANNEXES

ANNEX I

References

1. Animal Health Australia. Disease Strategy: Highly Pathogenic Avian Influenza (Version 3.0). Australian Veterinary Emergency Plan (AUSVETPLAN), Edition 3, Animal Health Australia, Canberra, ACT. 2002. Disease Strategy: Highly Pathogenic Avian Influenza.
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6. Food and Agriculture Organization of the United Nations. Animal Health Manual on Procedure for Disease Eradication by Stamping Out. Rome, 2001.
7. GOY AI preparedness documents are described below:
 - **Avian Influenza Prevention National Activities:** This document describes the composition of the High Committee for Avian Influenza (HCAI) and the Operation Room under the MAI, formed through the issuance of Ministerial Resolution No. 67, in 2005 by the Minister of Agriculture. It further describes the designation and tasking of surveillance teams at the Headquarters (HQ) in Sana'a and governorate level, the tasking of the CVL and Extension and Information team at HQ, the available veterinary and para-veterinary professional resources, and general notes on the weaknesses in the command, coordination and decision-making structures, in the national and regional surveillance and diagnostic facility and staff capacities, in conducting village extension services, and in completing the preparation of the National AI Action Plan that indicates the specific elements to be described in the AI preventive and outbreak response functional areas, such as the specific personnel and their training needs, the specific facility, equipment and materials/supplies needs and the specific command and coordination structures.
 - **Emergency Plan of Action: Bird Flu Precautionary Measures:** This document describes the initial intended response to be undertaken by the GOY as of October 22, 2005. It further provides a situational analysis as to the risk of AI introduction and spread, enumerates the activities to be implemented separately by the MAI and the MPHP under the supervision of the HCAI and the respective ministerial technical committees, and presents the general budget relating to each general activity. The initial activities under the MAI described in this document were superseded by a more recent plan referred to as Preventative Measures Plan for Dealing with Expected Avian Influenza (AI) for January-June 2006, prepared by the MAI, which is described below.
 - **Preventative Measures Plan for Dealing with Expected Avian Influenza (AI) for January-June 2006:** This is a more detailed document further describing the elements, and their implementation mechanisms and human resource requirements, in the general preventive activities to be carried out under the MAI. These elements include import restriction and quarantine; intensive surveillance; migratory bird monitoring; establishing poultry-free areas near migratory bird sites; enhancing health and biosecurity awareness among farmers and villagers; seeking technical cooperation and funding support from international organizations; strengthening of the capacity of the CVL; and finalizing the National AI outbreak emergency plan.
 - **Preventive Strategy of Avian Influenza in Case of its Confirmation:** This is the first attempt to document the strategy in case the presence of AI (H5N1) in the country has been confirmed (i.e., the AI outbreak response). It basically outlines the implementing mechanisms of the major

- elements in an AI outbreak response, including zoning, stamping out, animal movement control, vaccination, disinfection, and enhanced surveillance.
- **Rapid Assessment: On Yemen Preparedness and Capabilities to Respond and Contain the Avian Influenza, 8 April 2006:** This document details the situation of the poultry sector, the various veterinary services capacities, poultry marketing, the regulatory framework for livestock management and health protection, and the current status of AI in Yemen including the national undertakings for addressing AI and related recommendations.
 - **Ministerial Resolution No. 67 which is pursuant to Cabinet Resolution No. (329) for the year 2005.....**
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 13. WHO Regional Office for the Western Pacific, Manila, Philippines. Public Health Considerations in the Application of Measures to Contain and Control Highly Pathogenic Avian Influenza (HPAI) Outbreaks in Poultry. 26 April 2004. (<http://www.wpro.who.int/NR/rdonlyres/23C21802-A0BE-42B9-825F-18977C05EE58/0/Advice30042004.pdf>).
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ANNEX 2

Pre-AI Outbreak State: Logistics Requirements

Pre-AI Outbreak State: estimated logistical requirements (monthly) for surveillance and diagnosis at priority districts (220) and governorates (11)

Items	Districts (2 persons)		Governorates (9-18 persons)	
	Per District	220 Districts	Per Governorate	11 Governorates
Computer	Not needed	---	1 unit	11 units
Fax	1 unit	220 units	1 unit	11 units
Cold boxes	5 boxes	1100 boxes	10 boxes	110 boxes
Materials for sample collection	300 sets	66,000 sets	1,000 sets	11,000 sets
PPEs	120 sets	26,400 sets	1,000 sets	11,000 sets
Bleach or iodine	10 L	2,200 L	40 L	440 L
Liquid detergent	1 L	220 L	4 L	44 L
Alcohol	1 L	220 L	4 L	44 L
Refrigerator w/freezer	1 unit (the health center can also be used)	220 units	1 unit	11 units
Freezer	---	----	1 unit	11 units
Pump sprayer	2 units	440 units	10	110 units
GPS	1 unit	220 units	3-6 units	33-66 units
Communication	1 unit (mobile telephone)	220 units	3-6 units	33-66 units
Transportation (motorcycle or car)	1 unit	220 units	3-6 units	33-66 units
Prophylaxis	2 courses and doses	440 courses and doses	9-18 courses and doses	99-198 units
Training courses	2 courses	2-3 courses	2-3 courses	2-3 courses

- Surveillance Teams: there is only 1 team per district and 3 to 6 per governorate assisting the districts
- Samples to be collected: it is estimated that about 2000 samples per day need to be collected in entire Yemen. That is about 10 samples per day per district or 300 samples for 1 month. The governorates shall also collect samples to support the districts in some areas (e.g. 30 % of demand). The governorates with diagnostic laboratories are expected to collect samples more frequently.
- PPEs: only 2 sets per person per day.
- Prophylaxes: one antiviral course and one vaccine dose per person
- Training: There should at least be 2 broad training courses per district/governorate. The trainings can be given to several districts or all governorates at a time (e.g. 100 participants each time)
- During the AI outbreak emergency response stage, the above requirements shall be increased by a factor of 10. Which may also affect the number of staff required, especially at the district level. The Technical Committee is expected to further determine the exact needs during the outbreak stage.

ANNEX 3

Equipment/Supplies Required for Veterinary Laboratory

No.	Items required	Unit of Issue	Quantity
	Equipment and supplies		
1	Biological Safety Cabinet, class II, 6 ft	EA	1
2	Ultra pure Water System, UHQ PS system, designed to produce the ultra high quality water essential to laboratory application such as ELISA, Microbiological Analysis, and HPLC. For use with pre-purified feed water of <20µs/cm and filtered to at least 0.2 microns, 50 litres/8h. Feed water. For 220-240V 50Hz single phase supplies.	Unit	1
3	Ultra low temperature chest Freezer (-80), 383 L, with all needed accessories and safety system, suitable for tropical conditions	Unit	2
4	Floor standing Centrifuge, Conformity with the international safety standards, Motor overheating protecting Exceptional speed stability, , Digital controlling with input in minutes and second,. Performance 4000, in a Swing-out rotor 6 place with its buckets with caps Capacity 120 x 15 ml.	Unit	1
5	Automatic CO2/Humidity Incubator, Digital readout of temperature CO2 and humidity. Supplied with stainless steel water dishes and stainless steel shelves. It has removable four part interior partitioning and gas baffle to reduce CO2 loss on opening. For 230V 50/60Hz single phase supplies. Capacity 108 liters, Temperature range +5 to +45 °C,CO2 range 0 to 20 %, Internal H x W x D 480x560x400mm,Overall H x W x D 775x710x620mm, 4 shelves.	Unit	1
6	Dry Ice Maker- pellet maker with CO2 syphon cylinder: Produce CO2 Dry Ice direct from CO2 syphon cylinder in one to two minutes. Pellet weight 30 g, pellet size 22 x 50 dia mm and no. of pellets at least 30.	Unit	1
7	Laboratory Refrigerator/Freezer,Tropicalised, For storage of temperature sensitive samples, the refrigerator compartment maintains its internal air temperature between +2 °C and +8 °C, the freezer compartment 20 °C, For 220-240V 50Hz single phase supplies.	Unit	3
8	Water bath, with stainless steel tanks, operating temperature rang 00-150°C with digital sitting a read-out by LED of temperature, with fitted pump, capacity 14 Liter, For 220-240V 50Hz single phase supplies.	Unit	2
9	Timer Countdown, with memory: Digital reading. Measures lapsed time up to 99 minutes 59 second. With end of period audible alarm. The memory function allows the set time period to be repeated as often as desired by simple manipulation of the start/ stop switch. With magnet attached to the back can be used to place the timer on a metal surface	Unit	5
10	Digital thermometers (Rang – 100 to 0C°) for a variety of applications requiring rapid temperature measurement with accessory probes.	Unit	2
11	Pipette Man., 200-1000 µ, conformity certified, insulating jacket for increased precision	EA	5
12	Pipettor, single 5- 10 µ, conformity certified, insulating jacket for increased precision	EA	5
13	Pipettor, single 50-200 µ, conformity certified, insulating jacket for increased precision	EA	3
14	Pipettor single 20-200 µ, conformity certified, insulating jacket for increased precision	EA	5
15	Pipettor, Multi-channel, 12 channel, 20-200 µ, conformity certified, insulating jacket for increased precision	EA	3
16	Pipettor, Multi-channel, 12 channel, 30-300 µ, conformity certified, insulating jacket for increased precision	EA	2

No.	Items required	Unit of Issue	Quantity
17	Pipettor, Multi-channel, 12 channel, 5-50 µ, conformity certified, insulating jacket for increased precision	EA	2
18	Racks (10x 12) for blood collection tubes holding	EA	50
19	Cryogenics vials 2ml, polypropylene with cap, permanent marking area.	500/pack	50
20	Cryo-boxes, polycarbonate (9x9) array for ultra-temperature storage of 2ml cryo-vials, fit to stainless steel racks.	EA	250
21	Cryo-box Racks, vertical, 9 shelves for cryo-boxes (9x9) array.	EA	30
22	Cryogenic sample storage boxes, polycarbonate , 81-places , 4-5 ml vials	EA	50
23	Storage rack for EPPENDORF micro tubes, 80-places, volume 2 ml,	EA	50
24	Micro titer dilution tubes, 96-well,format, with plug strips, 1.4 ml and also bigger size 2.5 ml is required for the dilution of samples for the AI ELISA testing	EA	50
25	Protective clothing: coveralls, TYVEK, white, unisex, with elasticated cuffs and ankles zip – fronted without pockets. Where included the hood is integral.	Pack/5	5000
26	Hood, TYVEK, Cover head and shoulders, Medium size.	Pack/10	100
27	Foot protection, TYVEK, (shoe cover) white elasticated ankle grip and PCV sole.	Pack/20	500
28	Gloves PCV, Disposable .Nun – slip with good finger sensitivity. Glove fits ether hand.	Pack/50	100
29	Respirators, with minimum level of protection (AS/NZS 1716 Standard, US NIOSH Certified N-95 or European CE P2)	EA	5000
30	Safety goggles; Soft PVC frame with adjustable headband and should be covering the whole eye area.	EA	500
31	Eye Wash Board; Wall mounting. Complete with two 500ml bottles of sterile eyewash solution.	EA	20
32	First Aid boxes, standard	EA	20
33	Disposable Bags (biohazard), 1016x1143	BX/1000	10
34	Centrifuge tube, 50 ml, Disposable - for dilution of laboratory reagents (polypropylene)	PK/250	200
35	Samples transport container, 5-places, holds 1-2 ml vials. Molded from high impact polystyrene. Lid is a friction fit design	EA	2000
36	Dispenser Trays (for multi- channel pipettors)	BX/500	8
37	Pipette Controller, Bibbyjet with charger for med-east, 230V 50Hz single phase supplies and all accessories and spares.	EA	1
38	Microtiter plate (V – Shaped)	CS/100	50
39	Pipette tips (1000 ul pipette), Bulk	BX/1000	5
40	Pipette tips (1000 ul pipette), Racked	BX/96	3
41	Pipette tips 300 ul (regular) - Bulk	BX/1000	50
42	Pipette tips, 300 ul (regular), Racked	BX/96	20
43	Pipettes, disposable, 1 ml	PK/50	5
44	Autoclave bags small and medium	BX/3000	10
45	Autoclave tape, self adhesive paper with indicator stripes change color after being autoclaved 25mm	Roll 55m	10
46	Scalpel blades	100/Pack	10
47	Medical Gloves, small size	100/Pack	200

No.	Items required	Unit of Issue	Quantity
48	Medical Gloves, medium size	100/Pack	200
49	General-purpose Gloves	12 ps/Pack	50
50	General-purpose Gloves	12 ps/Pack	50
51	Bench Protection Reel, smooth, highly absorbent, strong layer of impermeable polyethylene, Reel 50m×46cm wide	Roles	10
52	Lite Laboratory Wipes: Tissue wiping cloths for professional use in laboratories. Highly absorbent and soft for wiping up small amount of liquid and for cleaning pipettes and microscope slides. Chemical resistant and chemically natural, size 200×210 mm	Box of 200	50
53	Short Arc Mercury Lamp HBO 100 W/2 100W to fit Olympus Fluorescent Microscope, model BH2 RFCA	Unit	6
54	Brush, Cylinder	Unit	10
55	Brush, Flask	Unit	10
56	Brush, Test tubes	Unit	10
57	Platinum-iridium wire	Reel	1
58	Cryo-Gloves	Unit	3
59	Sterilin disposable specimen container 30ml universal, printed label, polystyrene	PK/400	10
60	White medical rolls,	Rolls	100
61	Disposable pipette, 10ml	250/pk	10
62	Petri dishes glass, single vent, 95×15mm dia×depth	PK/20	20
63	Petri dish polystyrene single vent, 90×12mm dia×depth	PK/500	10
64	Plastic pipettes, disposable, 10 ml	PK/50	100
65	Pipettes, Pasteur, polyethylene, disposable, 2ml	BX/3000	20
66	Centrifuge bench drive with digital setting of RCF speed and time variable speed rang 1000-12000rpm, maximum tube size 15ml with its accessories	Unit	1
67 a	TC-1 Thermal Control Unit, Air-Sea Containers packaging for the transport of dangerous Samples with high quality with the following Specification: External: 350×350×355 mm, Internal: 210×210×210 mm up to 7 Kilos Dry Ice. With an over pack consisting of a thick-walled polystyrene box set in a fiberboard case with all labels and instructions	Unit	100
	TC-2 Thermal control Unit the same as above Size: External: 305×305×320mm, Internal 175×175×160mm up to 4 Kilos With an over pack consisting of a thick-walled polystyrene box set in a fiberboard case with all labels and instructions	Unit	100
67 b	CP- 28 Thermal Control Sachet Specification: 150×150×32mm Nominal weight: 600g,	18 Sachet/Pack	1000
	CP- 3 Thermal Control Sachet Size: 280×150×32mm Nominal weight: 1 Kilo	12 Sachet/Pack	1000
	Chemicals required for Avian Influenza Diagnosis		
1	Sodium chloride	500 g	5
2	Sodium Phosphate dibasic	500 g	5
3	Sodium Phosphate monobasic	500 g	5
4	Bovine serum albumin	100 g	5
5	Sodium azide	500 g	5
6	Sodium citrate	500 g	5

No.	Items required	Unit of Issue	Quantity
7	Citric citrate	500 g	5
8	Citrate acid	500 g	5
9	Dextrose	500 g	5
10	Agarose (type I medium grade)	100 g	10
11	Virkon Disinfectant powder, 50 x 50 sachets	50 x 50 Sac.	100

ANNEX 4

AI Outbreak Response: Logistics Requirements

AI Outbreak Response: Logistical requirements in a stumping out operation per poultry house (farm) and throughout one Infected Zone

Measures	Authorities	Staff	No./ farm	No./ zone	Logistics/Supplies	No./ farm	No./ zone	Cost
Sacking of birds (and disinfection of premises)	MAI ED Sanitary	- Para-vets - Environ./ Sanitary workers - Farmers - others	10	200	PPEs Sacks (Rice sacks) Sprayers	30 sets 4000 5	600 80000 100	
Neck crushing (and disinfection of premises)	MAI ED Sanitary	- Para-vets - Environ./ Sanitary workers - Farmers - others	10	200	PPEs Neck crusher tool Sprayers	30 sets 10 5	600 200 100	
Disposal (brings/transportes sacks to pit/cleaning and disinfection)	MAI ED Sanitary	- Environ./ Sanitary workers - Farmers - others (drivers)	4	80	PPEs Vehicle (truck) Wheel barrow Sprayers	12 sets 2 3 2	240 40 60 40	
Pit digging, treatment and filling	ED Construction LC	- Various workers	5	100	PPEs Digging equipment (tractors) Trucks Lime	15 sets 1 (3 farms) 2 (3 farms) 1 truck	300 6 12 20 truck	
Supportive (supplies, PPEs, setting buckets of disinfectants, first aid/safety, comforting, directing, etc.)	MOS MPHP MAI LC YMCO NGOs Schools	- Medical/para-medical - Health workers - Various workers	4	80	PPEs Disinfectants Buckets Disposal bags Sprayers First aid kit Tables Chairs Cords Cellphones Ambulance/vehicle (Food and water)	12 sets 20 L 20 pcs 50 pcs 5 2 sets 4 10 100 m 2 units 1-2 (10 farms)	240 400 L 400 1000 100 40 80 200 2000 m 40 2-4	
Security/Policing/Public control and information	MAI/MPHP Police Defense LC	- Officers - Police - Local council leaders/staff	4	80	PPEs Vehicle Cellphones Info & education materials	12 sets 1 2 100 pcs	240 20 40 2000	
Supervision culling/disinfection (checks all procedures)	MAI MPHP LC	- Veterinarian - Para-vets - Health workers - Others	1	20	PPEs Cellphones	3 1	60 20	

Measures	Authorities	Staff	No./ farm	No./ zone	Logistics/Supplies	No./ farm	No./ zone	Cost
Supervision disposal (checks all procedures)	ED Sanitary LC Civil works Defense	- Landfill engineer/worker - Sanitary engineer/worker - Construction engineer/worker	1	20	PPEs Cellphones	3 1	60 20	
Overall supervision/coordination (Authority over all)	LC/MAI (governorate/district)	- Veterinarian from district or governorate/MAI	1	6-7	PPEs Vehicle Cellphone	3 1 1	20 6 6	
Total			40	800				

ED = Environmental Department
MAI = Ministry of Agriculture and Irrigation
MPHP = Ministry of Public Health and Population
MOS = Ministry of Purveyance
LC = Local Council
NGOs = Nongovernmental Organizations
PPEs = Personal Protective Equipment

- Compensation team should be formed and should consist of Ministry of Finance, private sector, MAI, MHP, and a livestock specialist.

Notes: The basic assumptions are:

- Each outbreak stamping out area/zone consists of 20 poultry houses and each poultry house consists of 10,000 birds. Thus, the total is 200,000 birds.
- The workers can devote only 5 hours of work time per day of operation
- Each person should be allotted at least 3 sets of disposable PPEs. The PPEs shall include:

Disposable items:

- Coverall or gown with long cuffed sleeves
- N95 respirator mask is preferred. A standard well-fitted surgical mask should be used if N95 is not available
- Cap, or hood is preferred

Reusable items:

- Goggles (non-misting type)
- Boots (rubber or polyurethane that can be disinfected)
- Gloves (heavy duty rubber that can be disinfected)

ANNEX 5

Budget Templates

FY 2006: Budget Summary (USD)

Item	Quantity	Unit Cost	Cost

Time Table

Month/ Activities	01	02	03	04	05	06

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