Ghana Pro-poor HPAI Risk Reduction Strategies Project

Multi-stakeholder Workshop
June 24-25, 2008

Accra, Ghana

Table of Contents

LIST OF TABLES

List of Appendix

List of Maps

I. The Highly Pathogenic Avian Influenza Risk Reduction Strategies Project

The Department for International Development (DFID) of the United Kingdom is funding the International Food Policy Research Institute (IFPRI), International Livestock Research Institute (ILRI), Food and Agricultural Organization (FAO), Royal Veterinary College (RVC), and University of California at Berkeley (UCB), in a collaborative and multi-disciplinary research project to identify and promote pro-poor Highly Pathogenic Avian Influenza (HPAI) risk reduction strategies in Africa and Asia. The research project period is from 2007 to 2010.

The goal of this research project is to assist African and Asian governments and international organisations in making informed decisions to limit the spread of HPAI, while minimising the impact thereof on different socio-economic groups, particularly the poor. The purpose is to aid decision makers in developing pro-poor control strategies that are not only cost-effective and efficient in terms of reducing risk, but also enhance livelihoods, particularly those of smallholder producers. The research project is being implemented in selected African and Asian countries. Specifically, IFPRI and ILRI are responsible for implementing the project in Ethiopia, Ghana, Kenya and Nigeria in Africa, and Indonesia in Asia, whereas FAO, UCB and RVC are responsible for its implementation in Cambodia, Thailand and Vietnam in Asia.

Preliminary project activities have commenced in all project countries, including the selection and commissioning of national researchers to write background papers on the current situation of poultry and HPAI in the study countries. The aim of these background papers is to document all the available existing information (published and grey literature, reports, etc.) pertaining to the poultry sector and HPAI in each study country, and consequently to identify knowledge gaps, so as to determine the focus of the project in each study country. The final background papers and the related documents will soon be available to download from the project website: http://www.hpai-research.net/index.html

II. Ghana Country Component of the Project

In the Ghana country component of the project, IFPRI and ILRI teams held meetings with various academic researchers in January 2008. Following these meetings a background paper was commissioned in February 2008 to three academic researchers: Prof George Aning, a poultry sector expert and Prof Samuel Asuming-Brempong a social scientist, both at the University of Ghana, and Prof PK Turkson, an epidemiologist, at the University of Cape Coast. Following the completion of the draft background paper in April 2008, a Multi-Stakeholder Workshop was held in Accra, Ghana, June 24th through 25th.

III. Objectives of the Workshop

This Multi-Stakeholder Workshop was organised jointly by the Veterinary Services Department, Ministry of Food and Agriculture and IFPRI. The specific aims of the workshop were to:

i. To introduce the project and secure buy-in from a broad range of stakeholders in the poultry industry in Ghana;
ii. To present and discuss the main findings of the background paper;
iii. Identify and prioritise the major knowledge/research gaps to help design targeted research projects to better inform decision makers;
iv. To map market value chain, and institutional linkages and mechanisms for effective communication and implementation of pro-poor HPAI control strategies in Ghana.

IV. Participants

The Multi-stakeholder Workshop was very well attended by a wide array of stakeholders from the poultry industry. Participants included government officials from the Veterinary Services Department of the Ministry of Food and Agriculture, Ghana Health Service and AI Working Group; representatives from the associations of Poultry Farmers', Live Bird Markets and Egg Sellers, as well as Researchers from CSIR-Animal Research Institute, Universities of Ghana and Cape Coast, and IFPRI and ILRI. A detailed list of participants and their contact details is presented in Table 1.

Table 1. List of Workshop Participants

	Name	Designation/Organization	Contact Information
	Ministry of Agriculture		
1.	Dr. Enoch Boye-Mensah Koney	Director, Veterinary Services Department Ministry of Food and Agriculture P.O. Box M 161, Accra, Ghana	Tel: +233-21-775777 Fax: +233-21-776021 Mobile: +233-246493139 Email: vsdghana@gmail.com
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	International Group		
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26.	Ms. Gifty Ofori Ansah	National AI Working Group Ghana Health Service Metro Health Directorate, Tema, Ghana	Tel: 22-204466 Mobile: 244-256706 Email: giftofans@yahoo.com
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V. Summary of the Workshop

The Workshop agenda is attached in the Appendix 1. During the first half of the first day, Dr Koney, the Director of Veterinary Services and Hon. Anna Nyamekye, the Deputy Minister for Livestock of the Ministry of Food and Agriculture gave the welcome addresses and launched the workshop. Following these, the DFID Pro-poor HPAI Risk Reduction Strategies project was introduced by Dr Narrod, the project Leader and the workshop agenda and objectives were introduced by Dr Birol. These presentations were followed by the self introduction of the participants.

During the second half of the day, Profs Aning and Turkson of the background paper team presented the main findings of the background paper and the research gaps identified. Their presentations were followed by presentations by Dr John Torto of the Ghana National Poultry Farmers Association , Dr Hajia Haruna Amina of the Egg Sellers Association, Dr Sam Sudi Awuluba of the Live Bird Market Sellers Association, and Dr Nicholas Oteng of the Poultry Development Board. These presentations led to some lively debate and discussions on the importance of poultry in small farmers' and traders' livelihoods, as well as the impact of the HPAI on these. Some of the issues that were discussed in great length included the inability of small farmers to access insurance and credit; the importance of biosecurity training and the potential impacts of tying of compensation to biosecurity; the role of mass

media in creating HPAI scares; small farmers' lack of access to various inputs (e.g., disinfectants, antibiotics), and the genetic material in local poultry.

These lively discussions were followed by two parallel sessions during which the workshop participants split according to their expertise and interests and discussed the background paper findings further and identified the major research gaps. The first parallel session was on disease risk, veterinary institutional and control findings, and the discussions were led and facilitated by Drs Koney and Duarte and the second parallel session discussed the socio-economic and livelihoods findings, led and facilitated by Drs Akunzule and Birol.

During the second day of the workshop, facilitators of the parallel sessions summarised the outcomes of the discussions on the background paper findings and the research/knowledge gaps identified. Participants suggested several sources of information (papers, reports, studies and data) that could be included in the background paper. A list of these sources of information and a comprehensive list of research gaps identified by the participants are reported the next section.

Parallel session summaries were followed by the introduction of the stakeholder network mapping (net-map) exercise by Dr Schiffer. The aim of this participatory exercise was to map the poultry value chain and the institutional linkages and mechanisms for effective communication and implementation of pro-poor HPAI control strategies. Participants split into two groups depending on their interests and expertise. The first group, which was facilitated by Dr Schiffer, did a net-map of the institutions associated with disease surveillance and control and the communication bottlenecks in this network, whereas the second group, facilitated by Dr Birol mapped the poultry value chain and identified the bottlenecks for communication in this network. Sections 7 and 8 below explain and discuss the findings of the net-maps in greater detail. The net-mapping exercise was followed by a plenary session during which by Drs Schiffer and Birol presented the net-maps and further discussions took place.

The Workshop concluded with a summary of the workshop and its main findings by Dr Narrod, and further discussions on the way forward with HPAI research in Ghana, which were facilitated by Drs Koney and Narrod.

All the copies of the speeches made and the presentations given during the Workshop can be downloaded from the project website, and from: ftp://ftp.cgiar.org/IFPRI/AVIANFLU/GHANA/HPAI%20Multi-Stakeholder%20Workshop%20Presentations%20Ghana/

VI. Discussions on the Background Paper and Major Research Gaps

A summary of the discussions on the findings of the background paper and research/knowledge gaps identified is reported below

Disease risk, veterinary institutional, and disease control findings:

Participants suggested some additional material/information that could be included in the background paper: These are

- Case study on AI in Ghana by the national AI Working Group (AIWG);
- Various regional reports from GAR, Brong Ahafo, Volta Regions;

- Some information suitable for this section could be found from the Proceedings of the "Impact of Avian Influenza on Smallholder Poultry Production in West Africa – the Need for Collaborative Regional Action" workshop;
- Compensation guide could be included in the background paper as an appendix;
- Papers mentioned by the Poultry Development Board:
    - Farm Biosecurity in the prevention and control of Highly Pathogenic Avian Influenza in Ghana" A Veterinarian perspective;
    - "Farm Biosecurity in the prevention of Avian Influenza in Ghana" Farmer's perspective;
- Reports from communications subcommittee of the AIWG;
- Statistics on job losses and bankruptcy due to HPAI, available from the Poultry Farmers' Association.

Some issues that were identified to be missing/incomplete and could also be mentioned in greater detail in the background paper are:

- Positive impacts of HPAI in terms of improvements in VSD and in farmers' knowledge of biosecurity;
- The impact of HPAI on urban production of poultry and the legal framework (bye-laws of local authorities);
- Information on how the various institutions worked to respond to the initial cases;
- The discussion in the disease risk group seemed to focus on how well prepared VSD was and a number of trainings had already taken place by the time of the first outbreak; the background paper should elaborate on the type of training that took place and its extent.
- On the economic impact of HPAI the background paper should provide more information on what was included in the calculation of total cost figures for the AI prevention, control and containment;
- Section 7.3 should be extended to include information on what the various ministries have done to date;
- Section 7.4 should be extended to include information on the laws and specific regulations;
- Section 7.5 should explain what each of the groups listed has done to date;
- One major concern regarding HPAI spread risk was the North-South and East-West trade corridors. The background paper should expand on this in this section;
- The background paper should expand on what the current surveillance program is doing;
- There was some discussion on farmers in certain areas having farms on both sides of the border, information on these could be added to the paper;
- There was some discussion on the masking of outbreaks due to vaccination in the sub region, information on this issue could be added to the paper.

Socio-economic and livelihoods findings:

Participants suggested some additional material/information that could be included in the background paper. These are:

- Information on the feed ingredient imports and their prices (data available at FAO website)
- Consumption patterns and substitutions with other meat products over time and prices of all meat sources over (data available at SRID/LPIU of MOFA);
- Government interventions on domestic poultry production (such as the case of import taxes on poultry, which were imposed and lifted in 2002, could also be mentioned in order to explain the poultry related policy development process in the country);
- Cost of biosecurity measures per chicken available from the Poultry Farmers' Association;
- Biosecurity manual by MOFA VSD could be included as an appendix;
- CSIR Animal Research's previous studies on local/village poultry and the Livestock growth trend study commissioned by MOFA;
- Proceedings of the "Impact of Avian Influenza on Smallholder Poultry Production in West Africa – the Need for Collaborative Regional Action" workshop;
- Documents from the USAID CRSP project.
- Several papers by E.F. Gueye:,
    - Gueye, E.F., 2007. The role of family poultry in poverty alleviation, food security and the promotion of gender equality in rural Africa. Outlook on Agriculture, 29: 129-136.
    - Gueye, E.F., 2005. Gender aspects in family poultry management systems in developing countries. World Poultry Science Journal, Vol. 61.
    - Guèye, E.F., 2000. The role of family poultry in poverty alleviation, food security and the promotion of gender equality in rural Africa. Outlook on Agriculture, 29: 129-136.
    - Gueye, E.F, 1998. Poultry plays an important role in African village life. World Poultry 14 (10): 14 – 17.

Some issues that could also be mentioned in greater detail in the background paper are:

- Seasonal issues;
- Gender issues related to decision making on rural poultry production and marketing and spending of the income;
- Importance of poultry production as an entry point to livestock production (i.e., poultry is the first step on livestock ladder);
- Competition from poultry meat imports and the reasons as to why Ghana cannot meet its domestic demand from domestic production (i.e., what are the bottlenecks, is it the lack of technology, current husbandry practices etc.?).

Research Gaps

The research gaps identified by the participants during the workshop include:

Socio-economic research gaps:

- Measurement of the magnitude of social and economic impacts of HPAI on a variety of stakeholders along the poultry value chain;
- Investigation of the implications of compensation being tied to biosecurity: should there be different compensation and biosecurity policies for different sizes of farmers/producers; should compensation be tied to those biosecurity measures over which farmer has control? Socio-cultural setting of biosecurity should also be taken into consideration;
- Investigation of the impact of AI on poultry consumption and nutrition;
- Value chain actors' knowledge, attitude, practices and perceptions with regards to HPAI and biosecurity;
- Impact of HPAI on farmers' access to financial assistance /credit;
- Impacts of HPAI on the macro economy: Trade impacts, esp with neighbouring countries; Supply and demand elasticity of poultry inputs and outputs; impact of HPAI on the global food price crisis and the impact of rising food prices on poultry production.

Disease risk and institutional research gaps:

- Risk maps:
  - There is a need for disease risk maps;
  - Need for a proper census of the birds, live bird markets, roadways, etc so as to understand their position in relationship to disease risk.
- Disease risk pathway analysis:
  - Interested primarily on the likelihood of the re-entry of HPAI;
  - Given a lot of biosecurity measures were implemented in Greater Accra and the Volta region, interested if that reduced the probability of an outbreak relative to the rest of the country;
  - Interested in the role of the flow of poultry products and the movement of people along the value chain may play in the potential spread of HPAI in Ghana
  - Interested in the potential spread of HPAI along the main transportation corridors (North-South; East-West);
  - Interested in the potential spread if the vaccination in the sub region was masking outbreaks in the country.
- Synthesis analysis and disease risk output:
- Interested in the effectiveness of different control strategies that are currently being used (movement control, quarantine, stamping out, disinfection, fencing, netting, culling, restrictions on restocking, disposal of quarantine/culled products and by products including feathers, manure, etc…) and those that might be used (vaccination);
- Interested in the costs and benefits of each of these strategies and their cost-effectiveness in terms of risk reduction;

- Interested how this may change if moved from a sporadic case, to an acute case, to an endemic situation;
- In the future likely to maintain the 3 month (oppose to the 20 day OIE requirement) restriction on restocking as it worked; however interested in variation;
- Interested in how different culling strategies (3 km) radius alters likelihood of risk.

- Institutional analysis:
  - Interested in the effectiveness of the current permit system regarding movement control of live birds;
  - Role of monitoring institutions;
  - Role of the police in enforcing culling;
  - Interested in the effectiveness of the current compensation scheme and what might be the reaction to tying compensation to biosecurity; lots of discussion surrounding this policy; CVO says this would only be involving the large farms, not the rural backyard farmers.

VII. Mapping of the Institutions Associated with Surveillance and Control of Highly Pathogenic Avian Influenza (HPAI) in Ghana

The objective of this exercise was to identify the institutions and their relative influence associated with surveillance and control of HPAI in Ghana, the flow of information for disease reporting among institutions, and the institutional responses to disease occurrence. The following questions were asked:

- What formal and informal institutions, private/public are involved in the disease surveillance system?
- Who is influential? Who are the core actors? What are their roles? How do they interact with each other? What are the links between institutions?
- How does information about disease risk get communicated in this system?
- What areas of the system should be improved to ensure efficient and effective communication of disease risk and surveillance?
- Where and how could project findings help inform decision making in the system?

The Net-Map Tool Box was used for the exercise. Briefly, the exercise consisted of gathering the relevant stakeholders around a table and mapping, on paper, the institutions, the flow of information about suspected outbreaks, and the responses to HPAI. In addition, attempts were made to identify influential institutions and constrains in relation to the flow of information and responses to the disease. More information on the Net-Map Tool Box and its use is available at: http://netmap.wordpress.com/ and see Schiffer and Waale 2008.

The net-map was facilitated by Dr Eva Schiffer. Thirteen participants took part in the net-mapping exercise, these included Ministry of Agriculture, Veterinary Services officials, poultry sector experts from research centres and universities, as well as members of poultry associations.

Table 2. List of participants in the Net-Map exercise

	Name	Designation/Organization
1.	Dr. Enoch Boye-Mensah Koney	Director, Veterinary Services Department, Ministry of Food and Agriculture
2.	Dr. Ebenezer Nortey Barnor	SPINAP-AHI Country Coordinator, Deputy Director, Veterinary Services Dept.
3.	Mr. John S. Torto	Chairman, Ghana National Poultry Farmers Association, Oyarifa Livestock Farmers Association
4.	Dr. George Addo Opoku-Pare	Head, Veterinary Laboratory Veterinary Services Directorate P.O. Box M 161, Accra, Ghana
5.	Dr. Joseph Awuni	Veterinary Laboratory Veterinary Services Directorate P.O. Box M 161, Accra, Ghana
6.	Dr. Francis Kwabena Peterson	Deputy Director, Veterinary Services Regional Veterinary Officer-Greater Accra Region Ministry of Food and Agriculture P.O. Box M 199, Accra, Ghana
7.	Mr. Justin Hehesy Ankah	Ag. Director, Animal Production Directorate Ministry of Food and Agriculture P.O. Box AN 5779 Accra-North, Ghana
8.	Dr. Naaminong Karbo	Animal Scientist/Director, ARI CSIR-Animal Research Institute P.O. Box AH 20, Achimota, Ghana
9.	Mr. John S. Torto	(Ghana National Poultry Farmers Association) Chairman, Oyarifa Livestock Farmers Association Ankonam Farm, Oyarifa, Accra, Ghana
10.	Dr. William Kwabena Ampofo	National AI Working Group Senior Research Fellow, Virology Department Noguchi Memorial Institute for Medical Research University of Ghana, P.O. Box LG 581 Legon, Accra, Ghana
11.	Dr. Paa-Kobina Turkson	Epidemiologist, Animal Science Department, University of Cape Coast
12.	Dr. Paulo Duarte	Epidemiologist, International Livestock Research Institute (ILRI)
13.	Dr. Clare Narrod	Senior Research Fellow, International Food Policy Research Institute (IFPRI)

The Actors

The institutions involved in H5N1 surveillance and control in Ghana and their responsibilities are listed below (abbreviations in parantheses). The actors mentioned included the producers, traders, input-suppliers, government agencies, local level individuals and international organizations:

Table 3. List of actors in the Disease Surveillance and Control Net-Map (Abbreviations in parentheses)

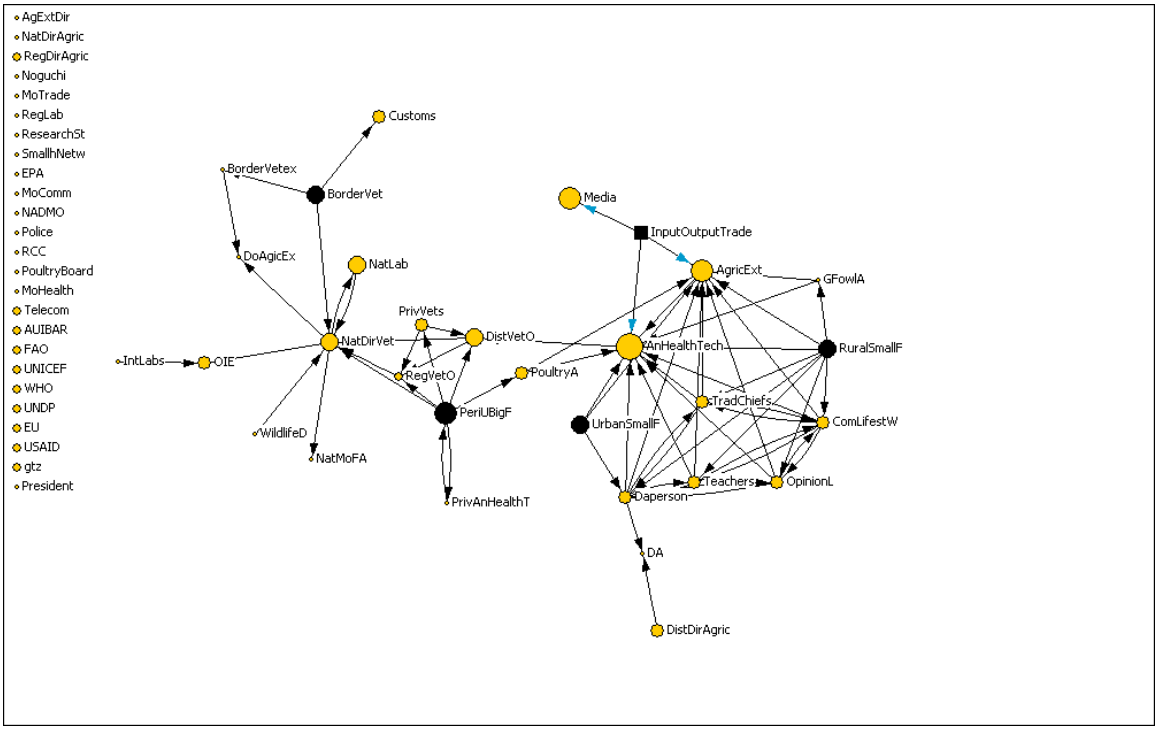
Different kinds of facilities where chicken and eggs are produced:
Peri-Urban Big Farmers (PeriUBigF)
Urban Small Farmer (UrbanSmallF)
Rural Small Farmer (RuralSmallF)
Different levels and units of the Ministry of Agriculture:
National Ministry of Food and Agriculture / Minister of Food and Agriculture (NatMOFA)
National Director of Agricultural Extension Services (AgExtDir)
National Director of Veterinary Services (NatDirVet)
Other National Directors of Agriculture (NatDirAgric)
National Diagnostic Laboratory (NatLab)
Regional Director of Agriculture (RegDirAgric)
Regional Diagnostic Laboratories (RegLab)
Regional Veterinary Officer (RegVegO)
Agricultural Extension Workers (AgricExt)
District Director of Agriculture (DistDirAgric)
Animal Health Technicians (district level) (AnHealthTech)
Veterinary Officer at the Border Post (BorderVet)
District Veterinary Officer (DistVetO)
Other governmental agencies
President of Ghana (President)
Environmental Protection Agency (EPA)
Customs/Immigration Officer (Customs)
District Assembly (DA)
Ministry of Communication (MoComm)
Ministry of Health (MoHealth)
Ministry of Trade (MoTrade)
Ministry of Interior (National Disaster Management Organization) (NADMO)
Noguchi Institute (University of Ghana, Legon) (Noguchi)
Police (Police)
Poultry Board (PoultryBoard)
Regional Coordinating Council (RCC)
Research Stations (ResearchSt)
Wildlife Division of the Forestry Commission (WildlifeD)
Governmental agencies in neighboring countries
Veterinary Officer at the Border Post of a Neighboring Country (BorderVetEx)
Director of Agriculture of a Neighboring Country (DoAgicEx)
Local level groups and individuals
Community Livestock Worker (ComLifestW)
District Assembly Person (Daperson)
Opinion Leaders on Community Level (OpinionL)
Teachers (Teachers)
Traditional Chiefs (TradChiefs)
Private sector actors (apart from farmers)
Day-Old Chicken Providers (DOC)
Egg Sellers Association (EggA)
Mobile Egg Traders (EggTradeMob)
Stationary Egg Traders (EggTradeStat)
Importers of Life Poultry (ImpLifeBirds)

Mobile Life Bird Traders (LifeBirdMob)
Stationary Life Bird Traders (LifeBirdStat)
Poultry Transporters (Transport)
Veterinary Medicine Suppliers (Medicine)
Private Animal Health Technicians (ProvAnHealthT)
Private Sector Veterinarians (PrivVets)
Ghana Telecom (Telecom)
International Organisations
African Union Inter-African Bureau for Animal Resources (AUIBAR)
European Union (EU)
Food and Agricultural Organization (FAO)
Feed Suppliers (FeedSuppl)
Gesellschaft fuer Technische Zusammenarbeit (gtz)
International confirmation Laboratories (IntLabs)
World Organization for Animal Health (OIE)
United Nations Development Programme (UNDP)
United Nations Children's Fund (UNICEF)
United States Agency for International Development (USAID)
World Health Organization (WHO)
Producer and Trader Associations:
Guinea Fowl Association (GFolwA)
Poultry Association (PoultryA)
Smallholder Network (SmallhNetw)
Wet Market Association (WetMarketA)
Media (Media)

Flow of information

After identifying this list of 65 actors, the next question the participants answered was: "If there is a suspected outbreak of HPAI, how is the information about the outbreak transferred to the respective authorities?" The flow of information was drawn for outbreaks on the different levels of farms, at the border posts or in the trade system. As Ghana has experienced HPAI outbreaks in the past and the participants were involved in the activities around this outbreak, the links drawn are intended to depict the actual situation following a suspected outbreak. Further the group was asked: How strongly can these actors influence that the information actually reaches the respective authorities. The result is depicted in Map 1. The size of the nodes indicates the influence that actors have on the flow of information about outbreaks. For easier visual structuring of the data, those places where the information *originates from* have been indicated by using dark dots. While listing a diverse group of trade actors, the group members basically treated the input and output trade system as a rather homogeneous actor group with the same levels of influence and the same kind of links to the rest of the system. Thus, to simplify the picture, the input and output trade system has been collapsed into one group actor.

Map 1: Flow of information about outbreak



size of node = influence of actor on effective flow of information
black node = source of outbreak

The information about a suspected outbreak basically needs to be communicated from the site to the National Veterinary Services, who communicate with the national and international laboratories and the Minister of Food and Agriculture to set appropriate action in place. One striking characteristic of the network drawn by the participants is the potential break point of the communication flows between the Animal Health Technician and the District Veterinary Officer. While both, Animal Health Technicians and Agric Extension Agents are important collectors of risk information on the local level, the only link that transmits this information from the frontline staff to the higher levels, comes from the Animal Health Technician. Here, it is important to note that the coverage of Animal Health Technicians per farmer was described as relatively low with 1 per 5000 farm households. As in other countries in the sample, the pathways for small farmers (both urban and rural) and big commercial farmers differ from each other, as the commercial farmers have direct access to the regional and national level actors, while small farmers have to go through their district level intermediaries. The group described a high level of exchange of information on the local level, with different agricultural and non-agricultural actors being involved. However, the information about suspected outbreaks only moves up to the next level, if any of these actors contacts the animal health technician. Also note that a number of actors who are crucial in the response network (see below) are not or only marginally involved in the network of disease reporting.

Table 4: Degree Centrality = Number of links per actor in the risk communication network

Actor	Degree	InDegree	OutDegree
AnHealthTech	22	21	1
AgricExt	21	20	1
Daperson	11	5	6
Media	11	11	0
NatDirVet	10	6	4
ComLifestW	9	4	5
RuralSmallF	8	0	8
OpinionL	7	3	4
TradChiefs	7	3	4
Teachers	7	3	4
PeriUBigF	7	1	6
DistVetO	5	3	2
InputOutputTrade	5	2	3
RegVetO	4	3	1
LifeBirdMob	4	0	4
LifeBirdStat	4	0	4
BorderVet	3	0	3
UrbanSmallF	3	0	3
GFowlA	3	1	2
PoultryA	3	1	2
PrivVets	3	1	2
ImpLifeBirds	3	0	3
Transport	3	0	3
DOC	3	0	3
Medicine	3	0	3
FeedSuppl	3	0	3
BorderVetex	2	1	1
DoAgicEx	2	2	0
DA	2	2	0
OIE	2	2	0
NatLab	2	1	1
PrivAnHealthT	2	1	1
Customs	1	1	0
NatMoFA	1	1	0
DistDirAgric	1	0	1
IntLabs	1	0	1
WildlifeD	1	0	1

The measure of closeness centrality describes, how many steps one actor has to take to reach everybody else in the network. A low closeness value indicates that an actor is not very close to the other actors in the network, thus has to go through many intermediaries to reach everyone. As Table 2 shows, the animal health technician is the actor who can reach everyone else in the network on the shortest path, which underlines the crucial importance of this actor. This is further underlined by the high influence scoring that participants assigned to the animal health technician (see figure 1)

Table 5: Closeness centrality in communication network

Actor	Closeness
AnHealthTech	0.014
DistVetO	0.013
AgricExt	0.012
PoultryA	0.011
NatDirVet	0.010
Daperson	0.010
RuralSmallF	0.010
PeriUBigF	0.010
OpinionL	0.010
TradChiefs	0.010
Teachers	0.010
ComLifestW	0.010
EggA	0.010
WetMarketA	0.010
UrbanSmallF	0.010
RegVetO	0.010
EggTradeMob	0.010
EggTradeStat	0.010
LifeBirdMob	0.010
LifeBirdStat	0.010
ImpLifeBirds	0.010
Transport	0.010
DOC	0.010
Medicine	0.010
FeedSuppl	0.010
GFowlA	0.009
PrivVets	0.009
Media	0.008
BorderVet	0.008
DoAgicEx	0.008
OIE	0.008
DA	0.007
NatMoFA	0.007
NatLab	0.007
WildlifeD	0.007
PrivAnHealthT	0.007
BorderVetex	0.006
Customs	0.006
IntLabs	0.006
DistDirAgric	0.006

Bottlenecks in disease reporting

The participants pointed out a number of bottlenecks that might delay the reporting of an outbreak. While the general assessment was that farmers had strong incentives to report, because of the compensation for culled birds (but not for those died of the disease), the trade system has a different incentive structure. The participants explained that especially a cross border trader with infected birds would have strong incentives to hide the disease from the border veterinary officers or to try to bribe the customs and immigration officer, as there is no compensation plan for traders and thus it is economically tempting to avoid control and sell sick birds off – thus spreading the disease. In case an outbreak is reported at a border post, the information flows both through formal channels (from border veterinary officer in Ghana, through national director of veterinary services in Ghana, national director in neighbouring country, to border veterinary officer in the neighbouring country) and informal channels (directly between the veterinary officers on both sides of the border.

While participants saw some potential challenges concerning the reporting by traders, however, especially in the peak of the scare period, in Ghana the input-output trade system also acted as an informal early warning system, providing information about observed suspicious deaths of birds to the respective authorities and to the media. Participants saw the role of the media critically. Ghana has a vibrant and free system of public and private media. During the peak of the bird flu scare especially private radio stations were seen as unnecessarily nurturing panic and thus contributing to the collapse of the market for poultry products. However, participants also related that a meeting between government officials and media representatives was a successful step towards facilitating more realistic reporting and that as the situation moved on the media was a strong partner in distributing valuable information.

Response network

After drawing the information network, participants outlined the ways response to an actual outbreak of HPAI involves different actors in the network. The response pathway is similar for small scale and big scale farmers, with the difference that the national and regional level veterinary officers get involved in response at the commercial farm level while the district level veterinary officer takes over the same role on the small farm level. However, in both cases, the animal health technicians, who were crucial in the information network, seem to have a less defined role in the response.

Once the suspected case is confirmed, the response takes the following steps: The Director of Veterinary services informs the Minister of Food and Agriculture so that the Minister can evoke the animal disease act. In an informal memo he informs all members of the National Committee on Avian Flu Preparedness about the crisis. The committee consists of:

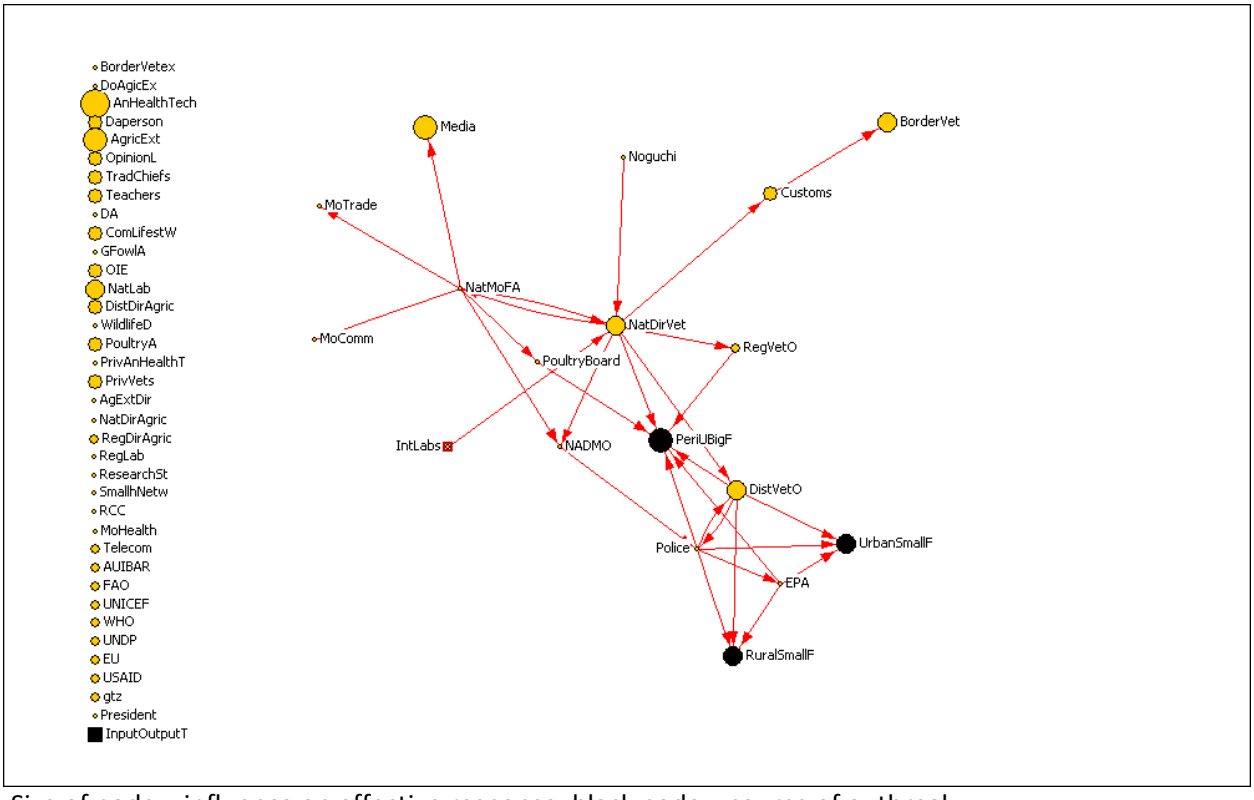
- Director of veterinary services
- Director of agricultural extension
- Immigration services
- Noguchi Institute at the University of Ghana, Legon
- Ministry of the Interior
- National Disaster Management Organization

- Ministry of Health
- Wildlife Division of the Forestry Commission
- FAO
- WHO
- UNICEF
- GTZ
- USAID and
- EU

After sending out this memo, the Minister of Food and Agriculture holds a press conference to inform the public about the situation and sets the response in motion. The first activity in the field is to quarantine the infected area. The implementation on the ground is done by the National Disaster Management Organization, the police, veterinary services and the environmental protection agency, which organize and enforce, if necessary, the destruction of the birds in affected areas.

Immigration services are informed about the crises and take action at the border. Ghana Telecom supported the response by providing cell-phones and free HPAI hotlines. Other actors who were seen as highly supportive while not directly involved in the enforcement and implementation on the ground, were international organizations, who provided funds and training to prepare Ghana to react effectively and efficiently to a HPAI crisis.

Map 2: Response to actual outbreak



Size of node = influence on effective response; black node = source of outbreak

In terms of degree centrality (number of direct links per actor), the different farm types and the national director of veterinary services range especially high in terms of in-degree (incoming links). The other actors involved in the response receive one or two incoming links, pointing towards a rather clear line organisation of the response. Many of these links originate either from the Minister of Food and Agriculture (initiating the

response) or from the national director of veterinary services (coordinating the response), who range highest in terms of out-degree.

Table 6: InDegree in the response network = from how many agents do actors directly receive response?

Actor	InDegree
PeriUBigF	6
NatDirVet	3
UrbanSmallF	3
RuralSmallF	3
Police	2
DistVetO	2
NADMO	2
NatMoFA	1
EPA	1
Customs	1
RegVetO	1
PoultryBoard	1
BorderVet	1
Media	1
MoTrade	1
MoComm	1

Table 7: OutDegree in response network = how many agents do actors directly give response to?

Actor	OutDegree
NatDirVet	6
NatMoFA	6
Police	5
DistVetO	4
EPA	3
NADMO	1
Customs	1
RegVetO	1
PoultryBoard	1
IntLabs	1
Noguchi	1

As the national director of veterinary services and the Minister of Food and Agriculture are central in directly initiating and implementing the response, they establish close links to all different areas of the network, which is reflected in their high closeness centrality. While the peri-urban big farmers range high in terms of closeness centrality as well, the rural and urban small farmers seem to be more removed from some actors in the network. This might be due to the fact that the response for commercial farms comes directly from the national or regional level, while the response for small farms comes from the national level, going though regional and district level actors until it reaches the local farm level.

Table 8. Closeness in response network

Actor	Closeness
NatDirVet	0.038
NatMoFA	0.031
PeriUBigF	0.031
NADMO	0.031
DistVetO	0.030
Police	0.028
RegVetO	0.026
PoultryBoard	0.026
Customs	0.025
IntLabs	0.024
Noguchi	0.024
EPA	0.024
UrbanSmallF	0.022
RuralSmallF	0.022
Media	0.021
MoTrade	0.021
MoComm	0.021
BorderVet	0.018

Bottleneck in the response network

The participants mentioned a number of bottlenecks that challenged the ability of the system to ensure a rapid and effective response.

The District Assemblies were seen in need of information and empowerment to be able to take more responsibility instead of always having to rely on action from the national level.

Participants criticised that the information about compensation and other procedural issues was not clearly delivered to all those concerned. Members of producer organisations had a higher chance of being targeted, but even in the discussion group, participants disagreed about the question whether or not compensation would be paid for birds that died from the disease (instead of only compensating for culled birds). One participant proposed that this conception might come from the fact that in the real case, some officials of the Ministry of Food and Agriculture “took pity in the farmer and counted all dead birds for compensation.” While the outbreaks and the resulting scare led to a serious shock on the market, some participants observed that traders used the situation strategically to bargain for lower prices with small farmers who had incomplete price information.

In terms of compensation payment, participants had different opinions about the effects of a time lapse in payment, which occurred in the past, on the farmers. On the one hand, timely payment would enable the farmer to meet his or her immediate needs after

having lost an important source of livelihood. On the other hand, farmers who received payment before the end of the ban on re-stocking were very unlikely to invest this money in poultry again and would rather either use it for consumption or invest in alternative livelihoods. The re-stocking issue was made more severe by the fact that the government of Ghana decided to impose a ban of 3 months instead of the internationally recommended 20 days.

Two hazards to an effective eradication of the disease at the source are the reluctance of traders (especially cross border) to report outbreaks as discussed above and the reluctance of farmers with and outbreak on their farm to disclose their sources of life birds.

In terms of logistics, the actual destruction and disposal of tens of thousands of birds with limited technical infrastructure and in tropical climate proved put a great strain on the extension agents involved and participants criticised that no additional funds/compensation was made available for the workers involved in the task.

VIII. Net-Map analysis of Value Network and HPAI Information Flow in Ghana

The aim of this net mapping exercise was to draw the live poultry value chain/network, specifically to answer the following questions:

- What formal and informal actors, private/public are involved in the live poultry value chain?
- How does live poultry move? between various actors?
- How does communication on HPAI information flow in the value chain and what are the bottleneck of information?
- Who in the value chain is influential in communication of information about HPAI?
- Where and how could project findings help inform decision making in the value chain?
- How should research findings be communicated?

This net-map exercise was facilitated by Dr Ekin Birol. 14 participants took part in the net-mapping exercise. These were members of various stakeholders along the poultry value chain, poultry input and output associations Ministry of Agriculture, Veterinary Service Directorate, Agricultural Research Institute, and universities.

Table 9. List of participants

	Name	Designation/Organization
1.	Dr. Anthony Nsoh Akunzule	Veterinary Economist, Veterinary Services Dept, Ministry of Food and Agriculture
2.	Dr. Samuel Herbert Mark Opoku	Municipal Veterinary Officer (Akuapem South), Ministry of Food and Agriculture
3.	Ms. Lisa Bazzle	Intern Veterinary Services Directorate, Cornell University
4.	Mr. Godwin Yao Ameleke	Research Scientist, CSIR – Animal Research Institute
5.	Prof. K. G. Aning	Poultry Scientist, Department of Animal Science, University of Ghana, Legon, Ghana
6.	Dr. Akwasi Mensah-Bonsu	Agricultural Economist, Dept. of Agricultural Economics and Agribusiness University of Ghana, Legon, Ghana
7.	Mr. Aaron Kofi Agyei-Henaku	Executive Secretary, Ghana National Association. of Poultry Farmers and Member, Poultry Development
8.	Ms. Amina Haruna Jania	President, Egg Sellers Association-Kumasi
9.	Mr. John K. Tamakloe	Egg Sellers Association
10.	Dr. Sam Sudi Awuluba	Chairman, Live Bird Market Sellers Association, Accra, Ghana
11.	Ms. Gifty Ofori Ansah	National AI Working Group, Ghana Health Service, Metro Health Directorate
12.	Mr. Ben G. Guaye	Ghana Feed Millers Association
13.	Mr. Oteng Nicholas	Member and Executive Secretary, Poultry Development Board

The Actors

The key actors in the live poultry value chain and those actors that provide HPAI risk and risk minimsation information were identified by the participants and listed in Table 9.

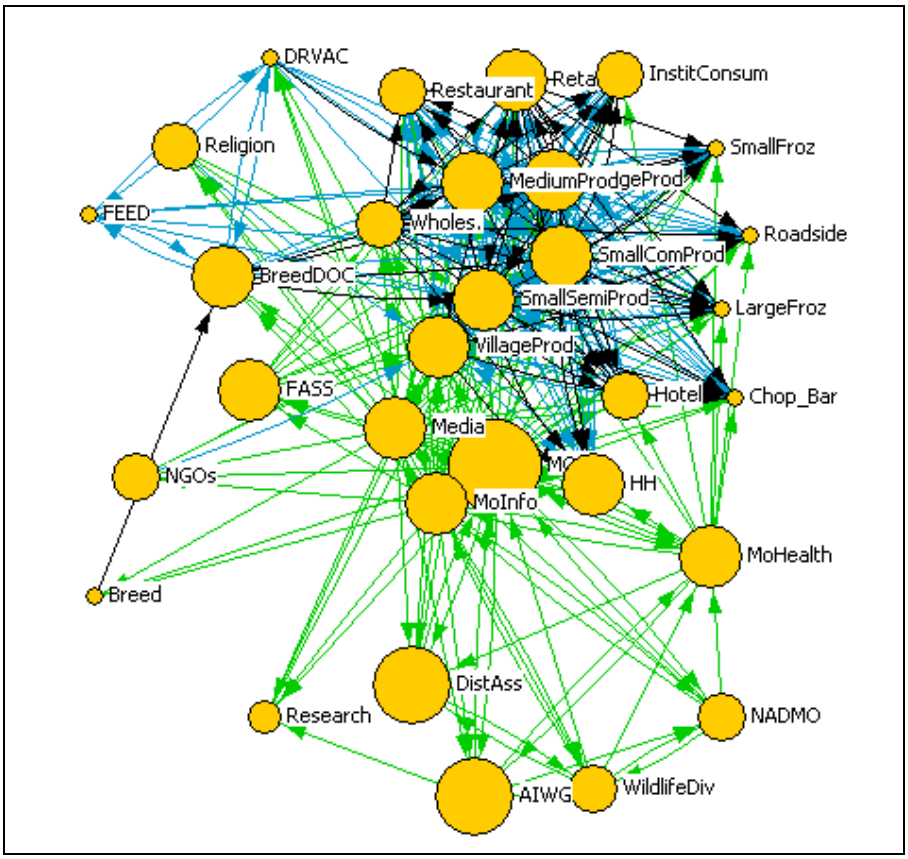
Table 10. List of actors in the poultry value chain network and those who inform them about HPAI (abbreviations in parentheses)

Input dealers	
	Drug companies, Vaccination producers (DRVAC)
	Feed millers (FEED)
	Hatcheries (for day old chicks) (BreedDOC)
	Breeders (BREED)
Poultry producers	
	Large-scale producers with > 10,000 birds, Biosecurity Level 2 (LargeProd)
	Medium scale producers, 1-5,000 birds, Biosecurity Level 3 (MediumProd)
	Small scale commercial 500-1000 birds, Biosecurity level 3 (SmallComProd)
	Small scale semi-commercial 150-500 birds, Biosecurity level 3 (Small SemiProd)
	Village poultry keepers, less than 200 birds, Biosecurity level 4 (VillageProd)
Traders	
	Wholesalers (Wholes)
	Retailers (Retail)
Consumers	
	Individual/household consumers (HH)
	Restaurants (Restaurant)
	Hotels (Hotel)
	Institutions (prisons, schools, hospitals) (InstitConsum)
	Chop bars (Chop_bar)
	Street kebab sellers (Roadside)
	Live bird processors – large scale with frozen system (Large Froz)
	Live bird processors – small scale (SmallFroz)
Information sources	
	Ministry of Agriculture (MOFA)
	Media (Media)
	Farmers' associations (FASS)
	Ministry of Information (MOI)
	Ministry of Health, Ghana Health Service (MoHealth)
	National Disaster Management Organization (NADMO)
	Wildlife Division (WildlifeDiv)
	Avian Influenza Working Group (AIWG)
	District assemblies (DistAss)
	Livestock NGOSs (NGO)
	Religious and educational institutions (churches, mosques, schools) (Religion)
	Research institutes (Research)

Next participants were asked to identify the types of linkages among the actors along the live poultry value chain. Three types of links were identified: flow of live birds, flow of formal information and flow of informal information. In addition to these, the most influential actors in the dissemination of information were identified.

Net-map of formal (green) and informal (blue) information flow and live bird (black) flow links, as well as the actors' influence levels, as represented by the size of their node, is depicted below in Map 3.

Map 3. Formal and informal information and live bird flow



size of node = influence of actor on effective flow of formal and informal information

Flow of Live Poultry

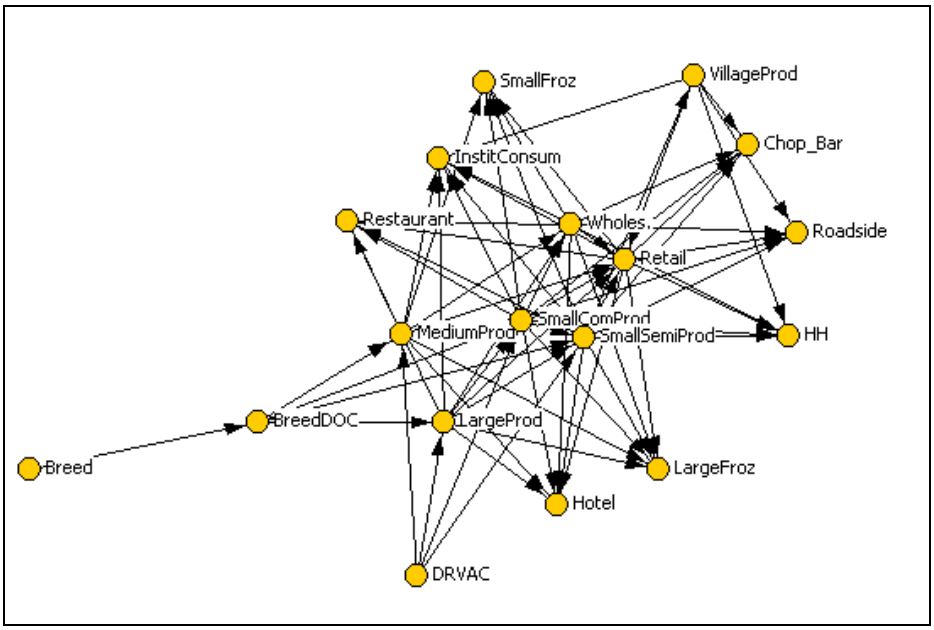
Flow of Live Poultry system is as follows: Commercial hatcheries supply day old chicks to ALL poultry producers, except for village poultry keepers (rarely, as village poultry is supplied by small scale semi-commercial farms). Large, Medium commercial farms sell to wholesalers, retailers and consumers, whereas Small scale commercial farms sell to retailers (not so much wholesalers) and consumers. Small scale semi-commercial farms sell to retailers (not wholesalers), consumers, and supply village poultry farms. Finally, village poultry is sold to retailers or directly to consumers (mostly chop bars, kebab sellers, institutions).

There is also exchange of live poultry among poultry producers. Large commercial farms sell to Medium and small commercial farms, small semi-commercial farms. Medium commercial farms rarely supply to other farmers, though small commercial farms sell to small semi-commercial farms. Finally, village poultry can go to small scale semi-commercial, large/medium/small commercial farms for foraging.

Once at the market, wholesalers sell to retailers, ALL consumers and retailers sell to ALL consumers

The outcome of the discussion of the participants regarding the movement of live birds along the value chain is depicted below in a net map. The participants exercise indicated that the producers, wholesalers and retailers are at the centre of bird flow, surrounded by input suppliers and consumers, which is indicated in Map 4.

Map 4. Flow of live birds in the value chain



Actor centrality measures for live bird flow are reported for degree centrality, and closeness centrality. Degree centrality results reveal that small commercial and semi commercial producers as well as retailers exhibit the highest degree centrality, dominated by out degree centrality, followed by wholesalers and large and medium scale producers. Since small scale producers are crucial in outflow of live birds, they seem to be the first points of surveillance for diseases such as HPAI.

Closeness shows how many steps an actor would need to take to reach everybody in the value chain. High closeness value means that the actor is closer to other actors (fewer steps to reach other actors) and hence if they are contaminated, they might be epicentres of HPAI risk spread. Those actors with the highest closeness centrality are small scale commercial and semi commercial producers, followed by retailers and wholesalers.

Table 11. Degree Centrality: Number of links per actor in the value chain

Actor	Degree	InDegree	OutDegree
SmallComProd	14	3	11
SmallSemiProd	14	4	10
Retail	14	6	8
Wholes.	12	3	9
LargeProd	10	2	8
MediumProd	9	2	7
InstitConsum	7	7	0
Restaurant	6	6	0
Hotel	6	6	0
LargeFroz	6	6	0
VillageProd	6	1	5
BreedDOC	5	1	4
SmallFroz	5	5	0
HH	5	5	0
Chop_Bar	5	5	0
Roadside	5	5	0
DRVAC	4	0	4
Breed	1	0	1

Table 12: Closeness Centrality in the value chain

Actor	Farness	Closeness
SmallComProd	20.0	0.050
SmallSemiProd	20.0	0.050
Retail	21.0	0.048
Wholes.	23.0	0.043
LargeProd	24.0	0.042
MediumProd	25.0	0.040
InstitConsum	28.0	0.036
BreedDOC	29.0	0.034
Restaurant	29.0	0.034
Hotel	29.0	0.034
LargeFroz	29.0	0.034
VillageProd	29.0	0.034
SmallFroz	30.0	0.033
HH	30.0	0.033
Chop_Bar	30.0	0.033
Roadside	30.0	0.033
DRVAC	31.0	0.032
Breed	45.0	0.022

Flow of Formal Information

Formal information constitutes written material. It is disseminated as follows (in order to importance): MOFA, provides information to all actors in the value chain as well as Livestock NGOs, District assemblies, Ministry of Information. MOFA also works with Wildlife commission. MOFA acts on the ground in a very applicable way and confirms presence of AI and delivers information to NADMO. The AI Working Group (AIWG)is an implementation body that meets monthly and is comprised of scientists, agricultural police, MOFA, NADMO (in essence a think tank). AIWG is linked to MOH, MOFA, Ministries of Defense/Interior, dispenses technical information up and down and to actors in value chain. They receive, synthesize, and redistribute information. Information from AI Working Group is less influential than MOFA, but more influential than anybody else.

District Assemblies mostly inform village, small semi-commercial farms, as well as schools, churches, they also disseminate some information disseminated to MOFA.

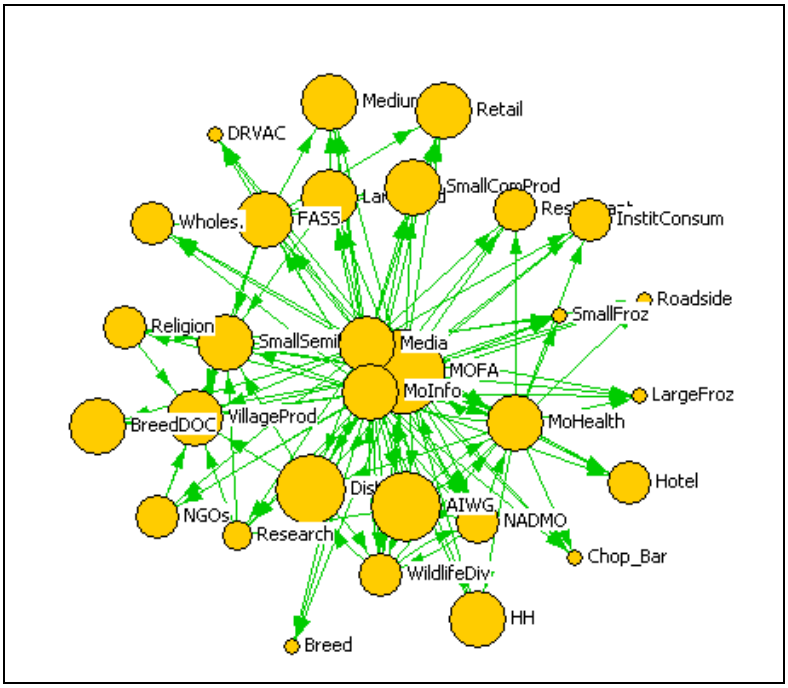
Media, Minister of Information, Ghana Health Service (GHS), Farmers' Association (all equal in influence). Media (including internet) is both public and private, and informs everyone. Minister of Information receives information from MOFA, also informs media. GHS informs District Assemblies. Farmers' Association informs all farmers, sometimes marketers/traders. Strength of association depends on locale.

NADMO (National Disaster Management Organization), Wildlife commission, Livestock NGOs, schools, churches (all equal in influence). NADMO provides general information about disease risk, coordinates information to Ministries of Health/Information, GHS, Wildlife, MOFA after outbreak. Doesn't directly communicate with value chain regarding spread of information; operates mostly in outbreak aftermath. Wildlife Commission informs and works with NADMO, GHS, MOFA, Ministries of health/information, District Assemblies. Livestock NGOs and religious bodies inform mainly producers, mostly at village level, but also small semi-commercial farms.

Finally, research Institutes generally operate at village level, informing mainly village poultry and small scale semi-commercial producers. These institutes also inform and are informed by the MOFA.

Net-map of formal information links discussed in the exercise is depicted below in Map 6. Participants suggested that MOFA, MOI and Media are in the centre of formal information dissemination, surrounded by poultry producers of all sizes as well as other public authorities such as AIWG, NADMO and MOH. Traders, processers, consumers and input suppliers are in the outer circle.

Map 5. Flow of formal information



size of node = influence of actor on effective flow of formal information

Actor centrality measures for formal information dissemination are reported for degree centrality and closeness centrality. Degree centrality reveal that MOFA, MOI and Media exhibit the highest degree centrality, dominated by out degree centrality , followed by MOH, whereas input suppliers exhibit the lowest degree centrality. Village producers and small scale semi commercial producers have the highest in degree centrality, whereas they, along with small scale commercial and medium scale producers, consumers and input suppliers have zero out degree centrality. Therefore it can be concluded that most of the formal information is disseminated through MOFA, MOI, Media and MOH, and the main recipients are small scale commercial and medium scale producers, in addition to the MOFA itself.

Table 13. Degree Centrality: Number of links per actor for providing formal information in the value chain

Actor	Degree	InDegree	OutDegree
MOFA	35	7	28
MoInfo	34	5	29
Media	31	2	29
MoHealth	18	6	12
WildlifeDiv	10	5	5
FASS	10	3	7
SmallSemiProd	9	9	0
DistAss	9	5	4
NADMO	9	5	4
AIWG	9	4	5
VillageProd	8	8	0
LargeProd	7	4	3
Research	6	4	2
MediumProd	5	5	0
SmallComProd	5	5	0
NGOs	5	3	2
Religion	5	3	2
Wholes.	4	4	0
Retail	4	4	0
HH	4	4	0
Restaurant	4	4	0
Hotel	4	4	0
InstitConsum	4	4	0
Chop_Bar	4	4	0
Roadside	4	4	0
LargeFroz	4	4	0
SmallFroz	4	4	0
BreedDOC	3	3	0
Breed	3	3	0
DRVAC	3	3	0
FEED	0	0	0

As explained above, closeness and farness show how many steps one would need to take to reach all the actors in the network. High closeness value means that the actos is closer to other actors (fewer steps to reach other actors) and hence could be the most efficient and effective actor for disseminating information. According to closeness centrality measure, MOFA, Media and MOI are the closest to all the other actors in the network, followed by MOH and Farmers associations. Those actors with low closeness centrality in the information network have to be looked at specifically because, depending on their role of info diseminators or receivers they might be actors who will find it difficult either to reach their respective audiences in a timely manner or to receive information when needed.

Table 14: Closeness and Farness Centrality for providing formal information in the value chain

Actors	Farness	Closeness
MOFA	29.0	0.034
Media	29.0	0.034
MoInfo	29.0	0.034
MoHealth	43.0	0.023
FASS	48.0	0.021
SmallSemiProd	49.0	0.020
VillageProd	50.0	0.020
LargeProd	51.0	0.020
DistAss	51.0	0.020
WildlifeDiv	51.0	0.020
AIWG	51.0	0.020
Research	52.0	0.019
NADMO	52.0	0.019
MediumProd	53.0	0.019
SmallComProd	53.0	0.019
NGOs	53.0	0.019
Religion	53.0	0.019
Wholes.	54.0	0.019
Retail	54.0	0.019
HH	54.0	0.019
Restaurant	54.0	0.019
Hotel	54.0	0.019
InstitConsum	54.0	0.019
Chop_Bar	54.0	0.019
Roadside	54.0	0.019
LargeFroz	54.0	0.019
SmallFroz	54.0	0.019
BreedDOC	55.0	0.018
Breed	55.0	0.018
DRVAC	55.0	0.018
FEED	0.0	-1.000

There are no cut off points in the formal information network, revealing that if some of the actors did not function, remaining actors could still get their information from other actors in the network.

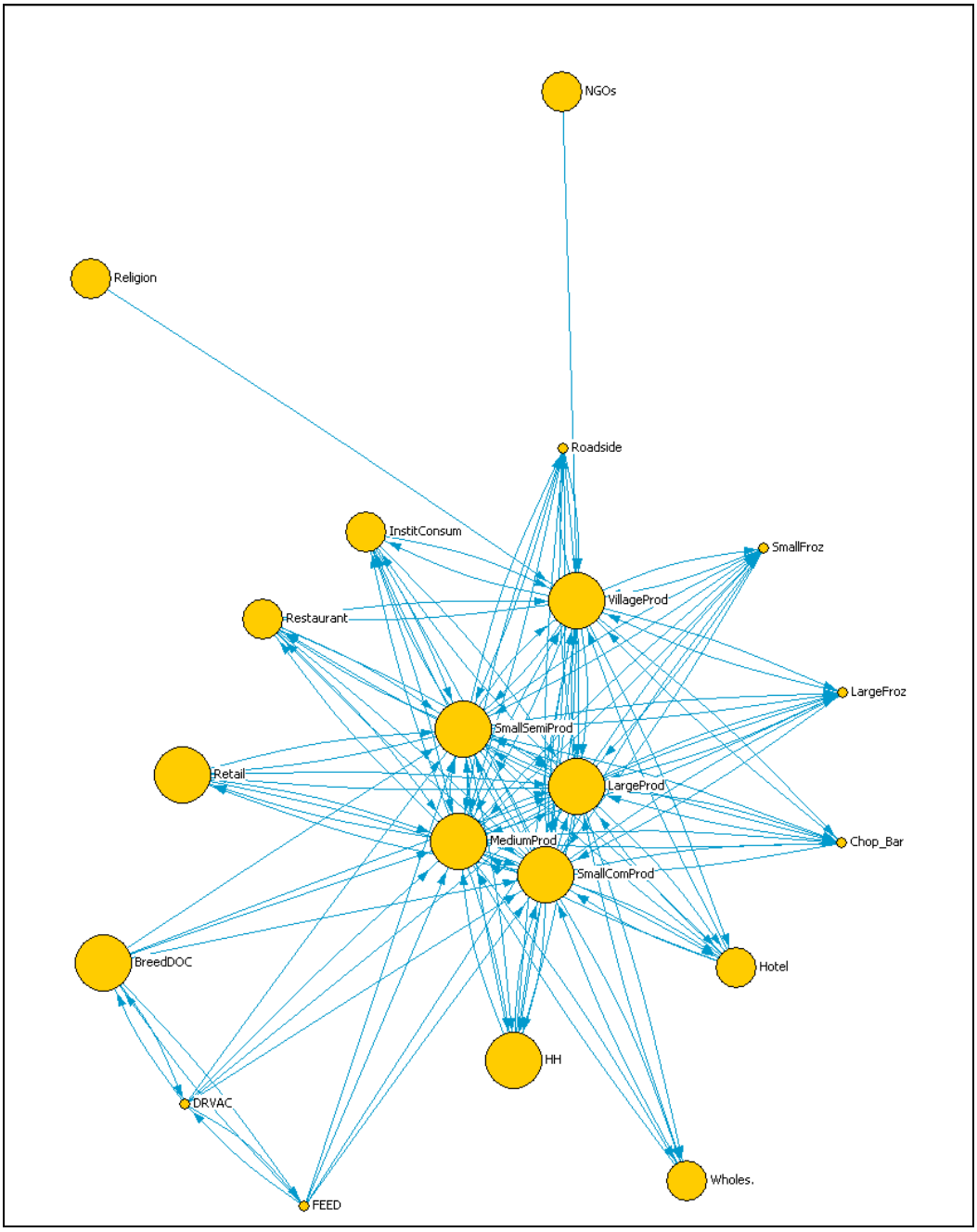
Flow of Informal Information

Informal information within the value chain is thought to be more effective by the net map participants, as farmers talk at community meetings and markets or via personal conversations or over the phone. In terms of influence, farmers, Individual household consumers, retailers, breeders are all equally influential in spreading information, followed by hotels, Restaurants, Wholesalers, and finally by other input suppliers.

In the informal information network information flows mostly by word-of-mouth within the value chain. Feed millers protect customers by informal communication with the farmers whose subsequent actions affect consumer. Vaccination companies informally communicate with farmers (written, formal communication is avoided). There is also informal communication between input suppliers. Within the poultry producers information flows in ALL directions, but less so from large scale to village poultry (though this does occur informally, small scale, e.g., from the interactions between the workers of the large poultry farms and village poultry keepers). While formal and informal communication is important for information between farmers, informal communication is more prevalent (even NGOs speak to community leaders). Most information exchange between marketers/traders to poultry farmers is informal and excludes village poultry keepers (EXCEPTION: Tamale (not in other big cities like Kumasi, Accra) and some villages, where information does flow to village poultry keepers). Consumers and poultry farmers informally communicate with each other

Net-map of informal information links is depicted below. According to this figure, all poultry producers are in the centre of informal information dissemination, surrounded by village poultry keepers, traders, processers, consumers and input suppliers, who are in the outer circle.

Map 6. Flow of informal information



size of node = influence of actor on effective flow of information

Degree centrality measures for informal information dissemination reveal that it is the poultry producers have the highest degree centrality, with almost equal in degree and out degree centralities, followed by consumers, input suppliers and finally traders. NGOs and religious bodies also disseminate some informal information.

Closeness and betweenness centrality measures also reveal that poultry producers are exhibit the highest closeness and betweenness, though the ranking of different size producers changes depending on the centrality measure. Large, medium and small commercial producers are closest to all the others in the network, followed by small semi-commercial producers and village poultry keepers. Whereas according to betweenness centrality village poultry keepers are the most central actors, followed by large, medium and small scale producers and small scale semi commercial producers.

Table 15. Degree Centrality: Number of links per actor for providing informal information in the value chain

Actor	Degree	InDegree	OutDegree
LargeProd	31	17	14
MediumProd	31	17	14
SmallComProd	31	17	14
SmallSemiProd	29	16	13
VillageProd	26	14	12
HH	10	5	5
Restaurant	10	5	5
Hotel	10	5	5
InstitConsum	10	5	5
Chop_Bar	10	5	5
Roadside	10	5	5
LargeFroz	10	5	5
SmallFroz	10	5	5
BreedDOC	8	2	6
DRVAC	8	2	6
FEED	8	2	6
Retail	8	4	4
Wholes.	6	3	3
NGOs	1	0	1
Religion	1	0	1

Table 16: Closeness and Farness Centrality for providing informal information in the value chain

Actor	Farness	Closeness
LargeProd	21.0	0.048
MediumProd	21.0	0.048
SmallComProd	21.0	0.048
SmallSemiProd	22.0	0.045
VillageProd	24.0	0.042
HH	33.0	0.030
Restaurant	33.0	0.030
Hotel	33.0	0.030
InstitConsum	33.0	0.030
Chop_Bar	33.0	0.030
Roadside	33.0	0.030
LargeFroz	33.0	0.030
SmallFroz	33.0	0.030
BreedDOC	34.0	0.029
DRVAC	34.0	0.029
FEED	34.0	0.029
Retail	36.0	0.028
Wholes.	37.0	0.027
NGOs	42.0	0.024
Religion	42.0	0.024

Bottlenecks

Bottlenecks in exchange of information about AI: According to the participants, the network for flow of information on AI is overall fairly efficient. The main bottleneck in formal communication is bureaucracy. if all information is delivered to chief executive (the main recipient of information) who is out, this information will just sit and wait until the executive returns. So, the time it takes to inform everyone is increased, delaying the communication process. High level of bureaucracy impedes flow of information, delaying information distribution. At Level of Minister: as only minister can announce outbreak and make it public, outbreak response may be delayed if minister doesn't respond quickly enough. Instead, possibly consider 'copying' a few people to information documents, so that the absence of one individual doesn't hinder or delay the transfer of information to other organizations or stakeholders. Also consider increasing the power of lower level officials so there is always an open line of communication and a clear cut chain of command. In this way, there will always be someone available to receive, distribute information. So, a less top-down structure may be necessary.

There is also some confusion over path of information: sometimes, people are not sure about chain of command of information. For example, if someone gets a letter, they don't always know where information should next be sent.

There are however no communication bottlenecks within MOFA, according to participants. The collaboration between the veterinary Services Directorate and AI Working Group is crucial in working together to gather information.

Media may exaggerate information. Solution to this bottleneck is that the Ministries of Agriculture and Information (who will receive information from AI Working Group) need

to provide information to the media. If Ministries meet with Ghana Broadcasting Corporation and Private Broadcaster's Association regularly and hold press conferences informing the media of the current situation, the press will be able to distribute this information broadly to the public, possibly reducing the level of media exaggeration as public awareness increases. Even though there are rules for media to prevent sensational reporting, these rules are not followed.

Bottlenecks in Informal communication: Farmers may try to hide information or downplay severity, the solution to this is identified to be the provision of incentives and compensation for reporting, surveillance, biosecurity measures.

Communication of research findings

According to the net- map participants research findings should be communicated as follows:

1. All research should go to MOFA first, and should be presented in form of comprehensive written reports and 2-page briefs. MOFA is then responsible for the broad distribution of information in form of posters, fliers, letters (formal communication) to stakeholders, as well as conveying findings to CSIR, EGIR, GHS, MOH.
2. District Assemblies (as well as local governments) should also be informed, as they disseminate information widely and communicate with MOFA.
3. Farmers' Associations should also be informed.

Above all, research documents should concentrate on results, policy implications. Multi-stakeholder workshops should be organized to share findings, provide meetings every 6 months to update on research and findings, as well provide workshops to disseminate information to stakeholders, farmers' associations.

Appendix: Multi-Stakeholder Workshop Agenda

Pro-Poor HPAI Risk Reduction Strategies Project
Ghana Multi-Stakeholder Workshop Agenda

Crystal Palm Hotel, 4th St, Tesano, Accra-North, Ghana

June 24-25, 2008

Tuesday, June 24:

8.30-9.00	Registration OPENING CEREMONY Chair: Dr. K.O. Gyening Former Director of Veterinary Services in Ghana, and Former FAO Consultant
9:00-9:01	Opening prayer
9:01-9:20	Welcome Address **Enoch Koney**, Veterinary Services Dept. Ministry of Food and Agriculture
9:20-9:30	Workshop agenda and objectives **Ekin Birol** (IFPRI-Research coordinator for Ghana)
9:30-9:45	Self introductions of participants
9:45-10:15	Introduction of the Pro-Poor HPAI Risk Reduction Strategies Project, status of the project in Ghana **Clare Narrod**, IFPRI
10:15- 10:45	Address and Launching of Workshop - **Hon. Anna Nyamekye** Deputy Minister for Livestock, Ministry of Food and Agriculture, Ghana
10:45-11:00	Coffee break
11:00-12:00	Presentation of the background paper: Summary of Key findings, Background paper team **K. G. Aning** and **Sam Asuming-Brempong**, University of Ghana **P.K. Turkson**, University of Cape Coast
12:00-12:30	Discussion of the Background Paper Chair: **Clare Narrod**, IFPRI
12:30 – 13:30	Lunch
13:30 – 15:00	Presentation of the Impact of HPAI from the smallholder perspective Chair: **A. N. Akunzule** , Min. of Food and Agriculture **Presentations by stakeholders** Ghana National Poultry Farmers Association - **John Torto** Egg Sellers Association - **Hajia Haruna Amina** Live Bird Market Sellers Association – **Sam Sudi Awuluba** Poultry Development Board- **Nicholas Oteng**
15:00-15:30	Tea break

15:30-17:30 Feedback of stakeholders and participants on background paper and presentation and understanding on research gaps identified

Parallel session 1: Group Discussions on disease risk, vet institutional, and control findings
Facilitators: **Enoch Koney**, MOFA and **Paulo Duarte**, ILRI

Parallel session 2: Group Discussion on economic and livelihoods findings
Facilitators: **A.N. Akunzule**, MOFA and **Ekin Birol**, IFPRI

18:00 Closing Prayer

19:00 Conference dinner

Wednesday, June 25:

9:00-9:30 Summary of the key points of the group discussion on disease risk, vet institutional, and control
Paulo Duarte, ILRI

9:30-10:00 Summary of the key points of the group discussion on economic and livelihoods
Ekin Birol, IFPRI

10:00 -10:15 Introduction to the stakeholder mapping
Eva Schiffer, IFPRI

10:15-13:00 Parallel Session 1: Stakeholder mapping of the institutional of the disease surveillance system and bottlenecks for communication
Facilitator: **Eva Schiffer**, IFPRI

Parallel Session 2: Stakeholder mapping of the value network and bottlenecks for communication
Facilitator: **Ekin Birol**, IFPRI

13:00-14:00 Lunch

14:00-15:00 Stakeholder mapping continued

15:00-15:30 Presentation of the stakeholder mapping of the institutional of the disease surveillance system and bottlenecks for communication
Eva Schiffer, IFPRI

15:30-16:00 Presentation of the stakeholder mapping of the value network and bottlenecks for communication
Facilitator: **Ekin Birol**, IFPRI

16:00-17:00 Discussion on the way forward with HPAI research in Ghana
Chairs: **Enoch Koney**, MOFA and **Clare Narrod**, IFPRI

17:00 Close